Matrix 320™ 5MP

PRODUCT REFERENCE GUIDE



Image Based Industrial Reader

DATALOGIC

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

© 2022-2026 Datalogic S.p.A. and /or its affiliates
All rights reserved. Without limiting the rights under copyright, no part of this documentation may be reproduced, stored in or introduced into a retrieval system, or transmitted in any form or by any means, or for any purpose, without the express written permission of Datalogic S.p.A. and/or its affiliates.

Owners of Datalogic products are hereby granted a non-exclusive, revocable license to reproduce and transmit this documentation for the purchaser's own internal business purposes. Purchaser shall not remove or alter any proprietary notices, including copyright notices, contained in this documentation and shall ensure that all notices appear on any reproductions of the documentation.

Electronic versions of this document may be downloaded from the Datalogic website (www.datalogic.com). If you visit our website and would like to make comments or suggestions about this or other Datalogic publications, please let us know via the "Contact" page.

Disclaimer

Datalogic has taken reasonable measures to provide information in this manual that is complete and accurate, however, Datalogic shall not be liable for technical or editorial errors or omissions contained herein, nor for incidental or consequential damages resulting from the use of this material. Datalogic reserves the right to change any specification at any time without prior notice.

Trademarks

Datalogic and the Datalogic logo are registered trademarks of Datalogic S.p.A. in many countries, including the U.S.A. and the E.U.

Matrix 320, ID-NET, DL.CODE, and X-PRESS are trademarks of Datalogic S.p.A. and/or its affiliates. All other trademarks and brands are property of their respective owners.

This is an OPC UA-based product.

Patents

See www.patents.datalogic.com for patent list.

This product is covered by one or more of the following patents:

Utility patents: EP1172756B1, EP2517148B1, EP2616988B1, EP2649555B1, EP3016028B1, EP3092597B1, IT1404187, JP5947819B2, US10229301, US6808114, US6877664, US6997385, US7387246, US7433590, US7433590, US8245926, US8888003, US8915443, US9122939, US9349047, US9361503, US9798948, US10133895, US10229301, US10540532, ZL200980163411.X, ZL201080071124.9, ZL201180044793.1, ZL201280010789.8

This manual refers to software version 2.0.2 and later.

CONTENTS

PREFACE VIII
About this Manual viii
Manual Conventions viii
Technical Support viii
Support Through the Website viii
Reseller Technical Support ix
COMPLIANCE X
General x
Power Supply x
EMC Compliance x
European Declaration of Conformity x
UKCA Declaration of Conformity x
Laser Safety xi
LED Safety xii
HANDLING XIII
GENERAL VIEW XV
Matrix 320 5mp Base Back View xv
Matrix 320 5mp with 36 LEDs Illuminator xvi
Matrix 320 5mp with 72 LEDs Illuminator xvii
Matrix 320 5mp without Illuminator xviii

CHAPTER 1. RAPID CONFIGURATION 1
Step 1 - Assemble the Reader 1
DL.CODE Focal Length Management Procedure 1
Step 2 - Connect the System 2
CBX100/CBX500 Pinout for Matrix 320 5mp 3
Step 3 - Mount and Position the Reader 4
Step 4 - Focus the reader 5
Step 5 - Automatic Setup 5
Restore Reader to Default Environment (Optional) 6
Step 6 - Installing DL.CODE Configuration Program 7
Login 8
Login and Signup 9
Offline Login 10
15-day Trial 11
Ethernet Device Discovery 12
Step 7 - Device Configuration 15
Image and Code Settings 15
Operating Mode Configuration Parameters 17
Reading Phase 17
Good Read Setup 18
Configuration Parameters 19
Data Formatting 19
Output Setup 20
Step 8 - Test Mode 21
Advanced Reader Configuration 21
Host Mode Programming 21

Configuration using Web Discovery **22**

CHAPTER 2. INTRODUCTION **23**
Product Description **23**
Standard Application Program 24
Programmability 24
Excellent Performance 24
Ease of Setup and Use 24
Flexible Solution 25
Connectivity 25
Industrial Strength 25
Indicators and Keypad Button **26**
Green/Red Spot and 360° Visual Feedback **27**
Distance Sensor **28**
ID-NET **29**
X-PRESS Human Machine Interface **31**
X-PRESS Functions 32
Test Mode 33
Aim Mode 33
Automatic Setup 34
Code Autolearn 35
Match Code Autolearn 36
Backup 36
Restore 36
Backup Erase 36
Image Auto Setup 36
Diagnostic Indication 37
Model Description **37**
Available Models **37**
Matrix 320 5mp C-Mount Assembly and Accessories **38**
Illuminators and Lenses Combinations 43
Application Examples **44**
Document Handling 44
Multiple Reading in a Single Image 44
Deformed or Overprinted Code Reading 45
Direct Part Marking 46
Ink-Jet Printing Technology 47
Laser Marking/Etching Technology 47
High Dynamic Range (HDR) feature 48
UV Fluorescence application 51

CHAPTER 3. INSTALLATION **52**
Package Contents **52**
Mechanical Dimensions **53**
Mounting And Positioning Matrix 320 5mp **62**
Mounting the BK-32-00 Standard Fix Bracket 63
Mounting the BK-32-010 Pivot Fix Bracket 64
Compact Mounting 65
Extended Mounting 65
Mounting the BK-32-020 Fast Replacement Bracket 67
Alternative Mounting 70
Mounting the BK-32-030 Safety bracket Rot-Con 72
Installation 73
Installation with BK-32-020 Fast replacement bracket 77
Matrix 320 5mp C-Mount Mounting Instructions **81**
Mounting instructions for Matrix 320 C-Mount without illuminator 81
Mounting instructions for Matrix 320 C-Mount with 36 and 72 LED illuminator 83
Heat Sink mounting instructions 86
When to mount the heat sink 86
How to mount the heat sink 86
Accessory Covers and Filters **87**

Covers 87
Standard Covers 87
Polarizing Covers 87
Cover Replacement for 36 LED Illuminator 88
Cover Replacement for 72 LED Illuminator 90
Filters 92
Filter Mounting Instructions 92

CHAPTER 4. CBX ELECTRICAL CONNECTIONS 94
CBX Connection Box Pinout 95
CAB-DSxx-S Pinout 96
CAB-GDxx-S Pinout 97
CAB-LP-0x Pinout 98
Power Supply 98
Main Serial Interface 99
RS232 Interface 99
RS422 Full Duplex Interface 100
ID-NET Interface 101
ID-NET Cables 101
ID-NET Response Time 102
ID-NET Network Termination 103
ID-NET Connection Diagrams 103
Auxiliary RS232 Interface 106
Inputs 107
External Trigger Input Connections Using Matrix 320 5mp Power 108
External Trigger Input Connections Using External Power 110
Input 2 Connections Using Matrix 320 5mp Power 111
Input 2 Connections Using External Power 112
Input 3 Connections (CBX500 Only) 112
Outputs 113
Output 1 and 2 Connections Using Matrix 320 5mp Power 114
Output 1 and 2 Connections Using External Power 115
Output 3 Connections Using Matrix 320 5mp Power (CBX500 Only) 116
Output 3 Connections Using External Power (CBX500 Only) 116
On-Board Ethernet Interface 117
User Interface - Serial Host 118
OPC UA protocol 119
OPC UA Companion Specifications 119
Available commands (methods) 119
Compatible OPC UA Clients 119
OPC UA on DL.CODE 120

CHAPTER 5. TYPICAL LAYOUTS 121
Ethernet Connection 122
Serial Connection 124
Fieldbus Connection 125
Pass-Through 126
ID-NET Multidata Network (Pass-Through) 127
ID-NET Synchronized Network 128

CHAPTER 6. READING FEATURES 131
FOV Calculation 131
Global FOV Diagrams 132
Global FOV for Matrix 320 5mp C-Mount LNS-8 133
Global FOV for Matrix 320 5mp C-Mount LNS-12 134
Global FOV for Matrix 320 5mp C-Mount LNS-16 135
Global FOV for Matrix 320 5mp C-Mount LNS-25 136
Global FOV for Matrix 320 5mp C-Mount LNS-35 137
Global FOV for Matrix 320 5mp C-Mount LNS-50 138
Reading Diagrams 139
Matrix 320 5mp 800-0xx (8 mm manual) 1D Codes 140

Matrix 320 5mp 800-0xx (12 mm manual) 1D Codes 141
Matrix 320 5mp 800-0xx (16 mm manual) 1D Codes 142
Matrix 320 5mp 800-0xx (25 mm manual) 1D Codes 143
Matrix 320 5mp 800-0xx (35 mm manual) 1D Codes 144
Matrix 320 5mp 800-0xx (50 mm manual) 1D Codes 145
Maximum Line Speed and Exposure Time Calculations 146

CHAPTER 7. SOFTWARE CONFIGURATION 148
DL.CODE System Requirements 148
Reader Configuration 149
Automatic Setup Configuration 150
Error during Automatic Setup 152
Manual Setup 155
Multi Image Acquisition Settings 158
Automatic Image Settings Selection 159
External Image Settings Selection 160
Image Cropping 162
Direct Part Marking Applications 164
Image Filter 165
Pass-Through Configurations 169
Internal Network Configurations 171
Master Configuration 172
Multidata ID-NET Network Configurations 174
Synchronized ID-NET Network Configurations 178
Verify Master/Slave Synchronized Configuration 181
Backup and Restore Through DL.CODE 183
Backup 184
Restore 185
Replacement 185
Restore Defaults 186
Restore Default Environment 186
Restore Default Startup Configuration 187
Restore Factory Defaults 187
Diagnostic Alarms 188
Statistics 189
BM150 Display Module Configuration and Messages 190
Configuration Through DL.CODE 190
Accessing the HMI Interface Through Keypad and Display Menu 191
Display Messages 193
BM150 Backup and Restore Procedure 196

CHAPTER 8. ILLUMINATORS 197
Standard Illuminators 197
36 LEDs Illuminator 197
72 LEDs Illuminator 198
Polarizer 199
Direct Part Marking Applications 202
Matrix 320 5mp Recommended Illumination 203
Color Contrast Considerations 204

CHAPTER 9. MAINTENANCE 206
Cleaning 206

CHAPTER 10. TROUBLESHOOTING 207
General Guidelines 207

TECHNICAL FEATURES 210

ALTERNATIVE CONNECTIONS 214
Power, Com and I/O Connector for Standard Models 215
On-Board Ethernet Connector 216
LTM 034-xxx Connector 216

ID-NET Network Termination 217
Inputs 217
Outputs 217
User Interface - Serial Host 219
EBC CONNECTION MODULE™ 220
Package Content 220
General View 221
Mechanical Installation 221
System Wiring/Cabling 222
Indicator LEDs 222
Electrical Connections 223
Software Configuration 225
Minimum software requirements 225
Adding new devices to the network 225
Configuration 225
Accessories 226
Typical Layouts 226
Large Synchronized Network Layout 226
Ethernet TCP/IP to Host 227
COM to Host 227
Fieldbus to Host 228
EBC - Syncnet Mixed Layout 229
Redundant System Layout 230
Redundant System Layout with Host supporting Serial COM Communications 231
Technical Specifications 232
WEBSENTINEL PLUS INVESTIGATOR 233
Overview 233
Connecting Matrix Using DL.Code 233
DL.Code Settings 234
WebSentinel PLUS Settings 236
GLOSSARY 237

PREFACE

ABOUT THIS MANUAL

This Product Reference Guide (PRG) is provided for users seeking advanced technical information, including connection, programming, maintenance and specifications. The Quick Reference Guide (QRG) and 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 following conventions are used in this document:

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 reader:



NOTE: Notes contain information necessary for properly diagnosing, repairing and operating the reader.



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



WARNING: This 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.

Reseller Technical Support

An excellent source for technical assistance and information is an authorized Datalogic reseller. A reseller is acquainted with specific types of businesses, application software, and computer systems and can provide individualized assistance.

COMPLIANCE

GENERAL

For installation, use and maintenance it is not necessary to open the reader.

Only connect Ethernet and dataport connections to a network which has routing only within the plant or building and no routing outside the plant or building.

Power Supply

ATTENTION: READ THIS INFORMATION BEFORE INSTALLING THE PRODUCT

The unit is intended to be powered by an external power supply ES1, PS2 according to IEC 62368-1:2014.

EMC Compliance

In order to meet the EMC requirements:

- connect reader chassis to the plant earth ground by means of a flat copper braid shorter than 100 mm;
- for CBX connections, connect pin "Earth" to a good Earth Ground;
- for direct connections, connect your cable shield to the locking ring nut of the connector.

European Declaration of Conformity

Hereby, Datalogic S.r.l. declares that the full text of the European Declaration of Conformity is available at: www.datalogic.com. Select the link from the downloads section of the product page.

UKCA Declaration of Conformity

Hereby, Datalogic S.r.l. declares that the full text of the UKCA Declaration of Conformity is available at: www.datalogic.com. Select the link from the downloads section of the product page.

Laser Safety

This product conforms to the applicable requirements of IEC 60825-1 and complies with 21 CFR 1040.10 except for deviations pursuant to Laser Notice N° 56, date May 8, 2019. This product is classified as a Class 2 laser product according to IEC 60825-1 regulations, except when using a LTM x2x-xxx DOE illuminator, in which case the product is classified as a Class 1 laser product.

CAUTION: Use of controls or adjustments or performance of procedures other than those specified herein may result in exposure to hazardous visible laser light.

Disconnect the power supply when opening the device during maintenance or installation to avoid exposure to hazardous laser light. The laser beam can be switched on or off through a software command.

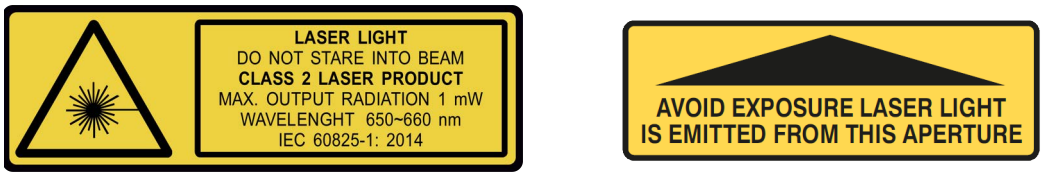
The following warning label content is applied to each of the laser equipped products indicated in the General View illustrations (Figure 2 and Figure 3).

.



Example Laser Warning Labels for Matrix 320 with 36 LED illuminator

.



Example Laser Warning Labels for Matrix 320 with 72 LED illuminator

.



Example Laser Warning Labels for Matrix 320 with LTM x2x-xxx DOE illuminator

Produit(s) conforme selon 21CFR 1040.10 sauf des dérogations relatives à la Laser Notice N° 56, du 8 Mai, 2019.

Dans le paquet il y a l'étiquette(s) pour les pays où le texte d'avertissement en français est obligatoire. Le(s) mettre sur le produit à la place de la version anglaise.



Exemple d'étiquettes d'avertissement laser pour Matrix 320 avec illuminateur à 36 LEDs



Exemple d'étiquettes d'avertissement laser pour Matrix 320 avec illuminateur à 72 LEDs

.



Exemple d'étiquettes d'avertissement laser pour Matrix 320 avec illuminateur LTM x2x-xxx DOE

LED Safety

According to EN 62471:2010, for all Datalogic Matrix 320 compatible internal illuminators, LED emission is classified into Risk Group 1, except Matrix 320 with UV illuminator which is Risk Group 3.



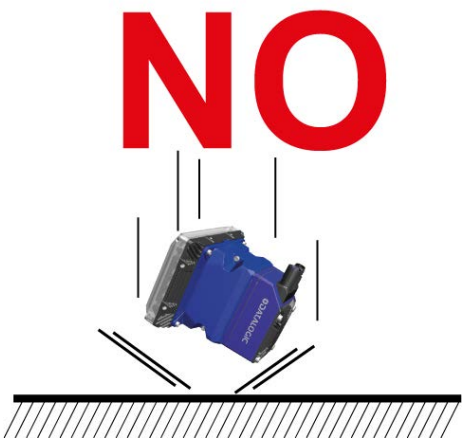
WARNING: The UV illuminator shall only be used by skilled persons using a personal safeguard (PPE, safety goggles).



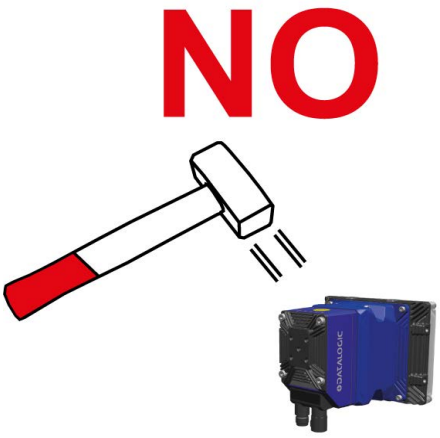
HANDLING

Matrix 320 5mp is designed to be used in an industrial environment and is built to withstand vibration and shock when correctly installed, however it is also a precision product and therefore before and during installation it must be handled correctly to avoid damage.

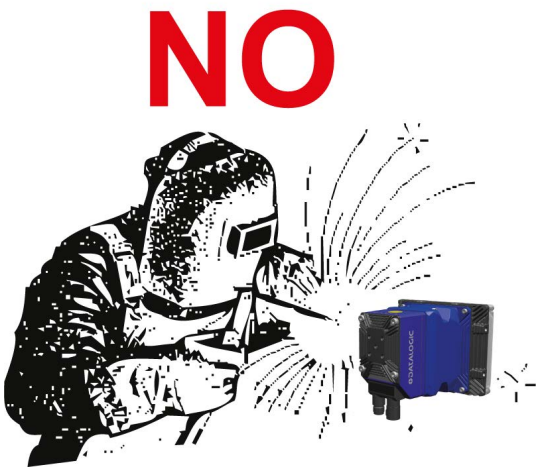
- avoid that the readers are dropped (exceeding shock limits)



- do not fine tune the positioning by striking the reader or bracket.



- do not weld the reader into position which can cause electrostatic, heat or reading window damage.



- do not spray paint near the reader which can cause reading window damage.



GENERAL VIEW

MATRIX 320 5MP BASE BACK VIEW

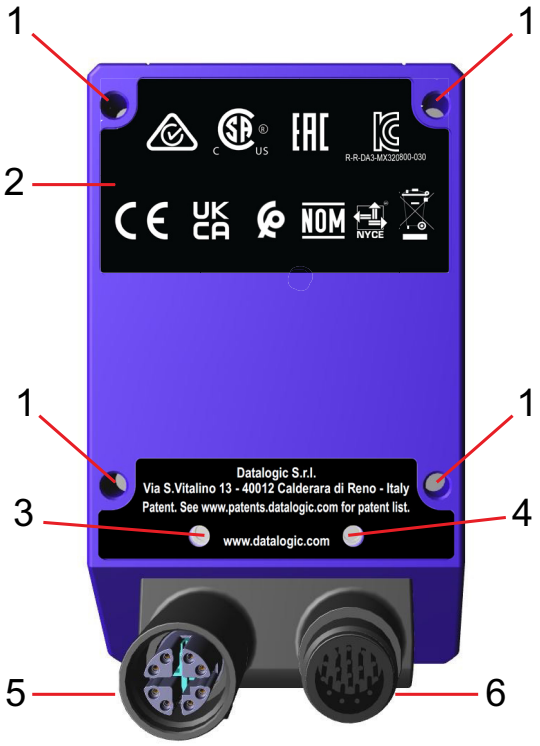


Figure 1 - Matrix 320 base back view

1. Bracket Mounting Holes (4)	**4.** Ethernet Connection LED
2. Compliance Label	**5.** Power - COM - I/O Connector
3. Power On LED	**6.** Ethernet Connector

MATRIX 320 5MP WITH 36 LEDs ILLUMINATOR

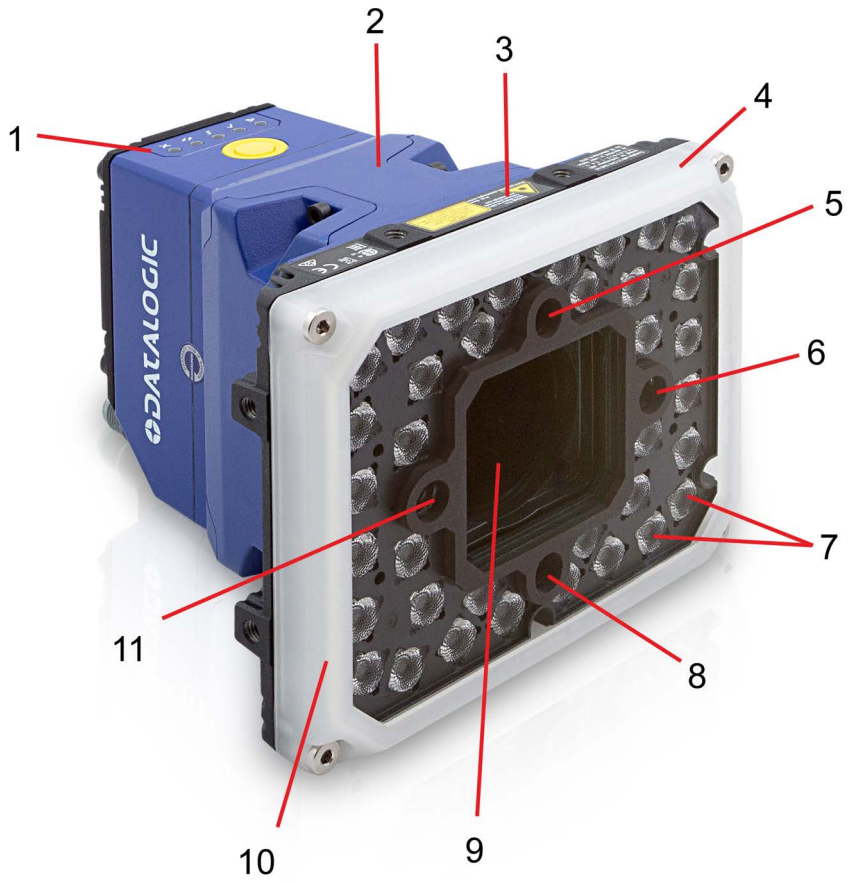


Figure 2 - Matrix 320 5mp with 36 LEDs illuminator

1. HMI X-PRESS Interface	**7.** Internal Illuminator
2. Adapter	**8.** Aiming System
3. Laser Class and Warning Label	**9.** Lens
4. Lens Cover	**10.** 360° Feedback
5. Embedded Distance Sensor	**11.** Green Spot
6. Red Spot	

MATRIX 320 5MP WITH 72 LEDs ILLUMINATOR

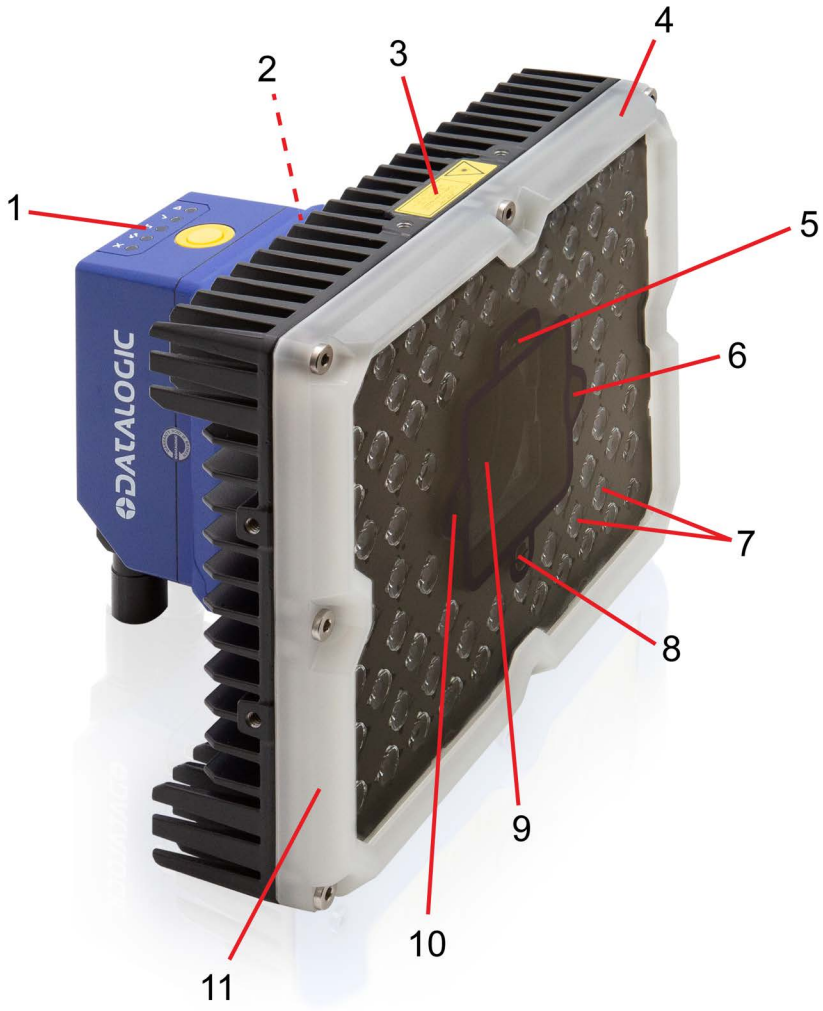


Figure 3 - Matrix 320 5mp with 72 LEDs illuminator

1. HMI X-PRESS Interface	**7.** Internal Illuminator
2. Adapter	**8.** Embedded Distance Sensor
3. Laser Class and Warning Label	**9.** Lens
4. Lens Cover	**10.** Aiming System
5. Green/Red Spot	**11.** 360° Feedback
6. Aiming System	

MATRIX 320 5MP WITHOUT ILLUMINATOR



Figure 4 - Matrix 320 5mp without illuminator

1. HMI X-PRESS Interface	**3.** Lens Cover
2. Base Cover	**4.** Lens

CHAPTER 1
RAPID CONFIGURATION

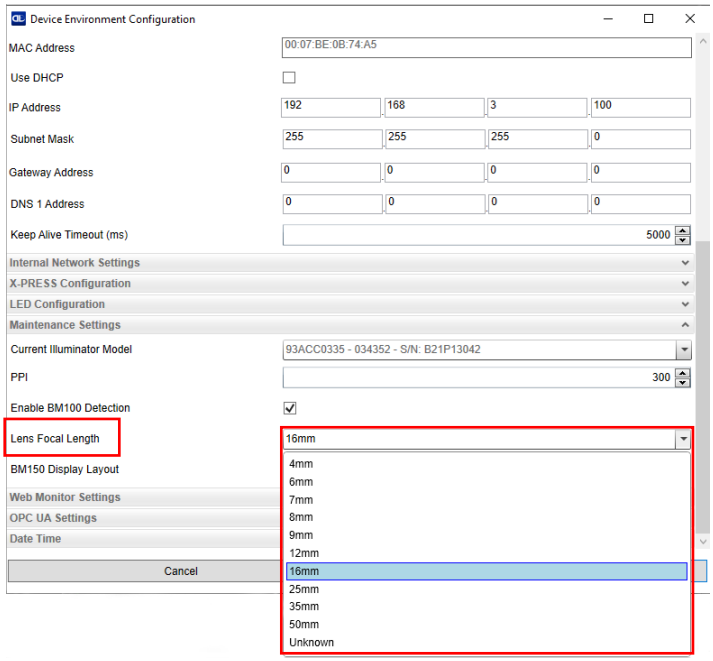
STEP 1 - ASSEMBLE THE READER

For Matrix 320 5mp 800-030 (C-Mount), the first step to perform is to assemble the accessories that make up the reader. Refer to Matrix 320 5mp C-Mount Assembly and Accessories, starting on page 38 and Matrix 320 5mp C-Mount Mounting Instructions, starting on page 81.

DL.CODE Focal Length Management Procedure

The Matrix 320 5mp 5MP reader is provided with an illumination-profile correction to optimize the reading performance according to the illuminator used. The illuminator model is detected automatically, while the focal length of the receiving lens must be set manually through the following procedure.

1. Connect the reader to DL.CODE as described in this chapter.
2. In the DL.CODE Device menu, click the Settings > Settings > Maintenance Settings > Lens Focal Length item and select the focal length of the lens being used from the list.
3. Click OK and at the device reset prompt click Yes and wait until the device resets. You can confirm by reopening this item from the same menu.



This is an example before and after setting the lens focal length:

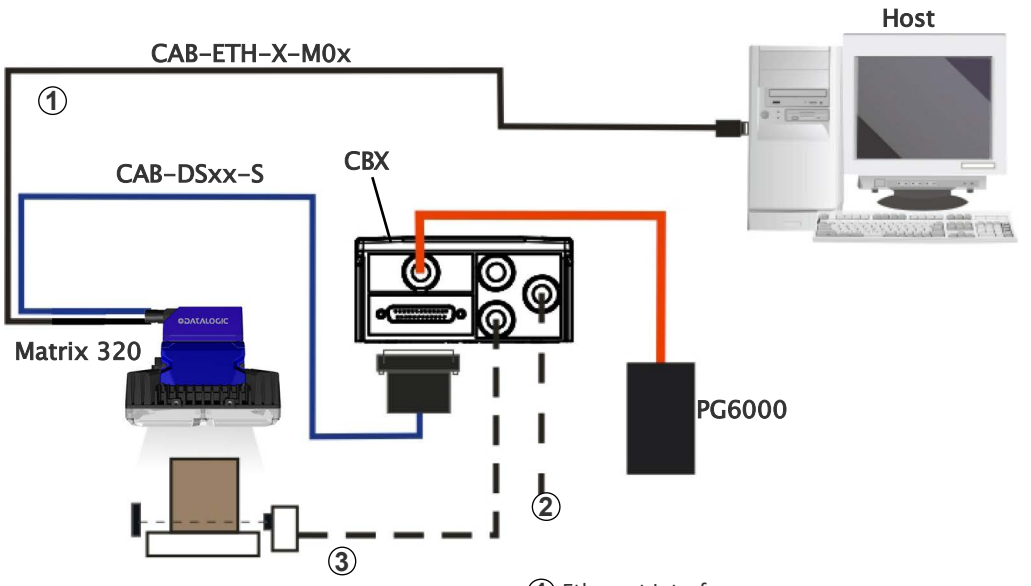




STEP 2 - CONNECT THE SYSTEM

To connect the system in a Stand Alone configuration, you need the hardware indicated in Figure 5. In this layout the data is transmitted to the Host on the Ethernet interface. Data can also be transmitted on the RS232 auxiliary interface independently from the main interface selection.

When One Shot or Phase Mode Operating mode is used, the reader is activated by an External Trigger (photoelectric sensor) when the object enters its reading zone.



① Ethernet Interface
② Auxiliary Serial Interface (RS232 - Data Monitor)
③ External Trigger (for One Shot or Phase Mode)

Figure 5 - Matrix 320 5mp in Stand Alone Layout

CBX100/CBX500 Pinout for Matrix 320 5mp

The table below gives the pinout of the CBX100/CBX500 terminal block connectors. Use this pinout when the Matrix 320 5mp reader is connected by means of the CBX100/CBX500:

GROUP	LABEL	DESCRIPTION
Input Power	Vdc	Power Supply Input Voltage +
	GND	Power Supply Input Voltage -
	Earth	Protection Earth Ground
Inputs	+V	Power Source - External Trigger
	I1A	External Trigger A (polarity insensitive)
	I1B	External Trigger B (polarity insensitive)
	-V	Power Reference - External Trigger
	+V	Power Source - Inputs
	I2A	Input 2 A (polarity insensitive)
	I2B	Input 2 B (polarity insensitive)
	-V	Power Reference - Inputs
Outputs	+V	Power Source - Outputs
	-V	Power Reference - Outputs
	O1+	Output 1 +
	O1-	Output 1 -
	O2+	Output 2 +
	O2-	Output 2 -
	O3A	Output 3 - (CBX500 only)
Auxiliary Interface	TX	Auxiliary Interface TX
	RX	Auxiliary Interface RX
	SGND	Auxiliary Interface Reference
ID-NET™	REF	Network Reference
	ID+	ID-NET network data +
	ID-	ID-NET network data -
Main Interface	RS232	RS422 Full Duplex
	TX	TX+
	-	TX-
	RX	*RX+
	-	*RX-
	SGND	SGND

* Do not leave floating, see "RS422 Full Duplex Interface" on page 100 for connection details.



CAUTION: Do not connect GND, SGND and REF to different (external) ground references. GND, SGND and REF are internally connected through filtering circuitry which can be permanently damaged if subjected to voltage drops over 0.8 Vdc.

STEP 3 - MOUNT AND POSITION THE READER

1. To mount the Matrix 320 5mp, use the mounting brackets to obtain the most suitable position for the reader. The mounting solutions are provided in "Mounting And Positioning Matrix 320 5mp" on page 62.

2. When mounting the Matrix 320 5mp take into consideration these three ideal label position angles: **Pitch or Skew 10° to 20° and Tilt 0°**, although the reader can read a code at any tilt angle provided the code fits into the Field Of View (FOV).

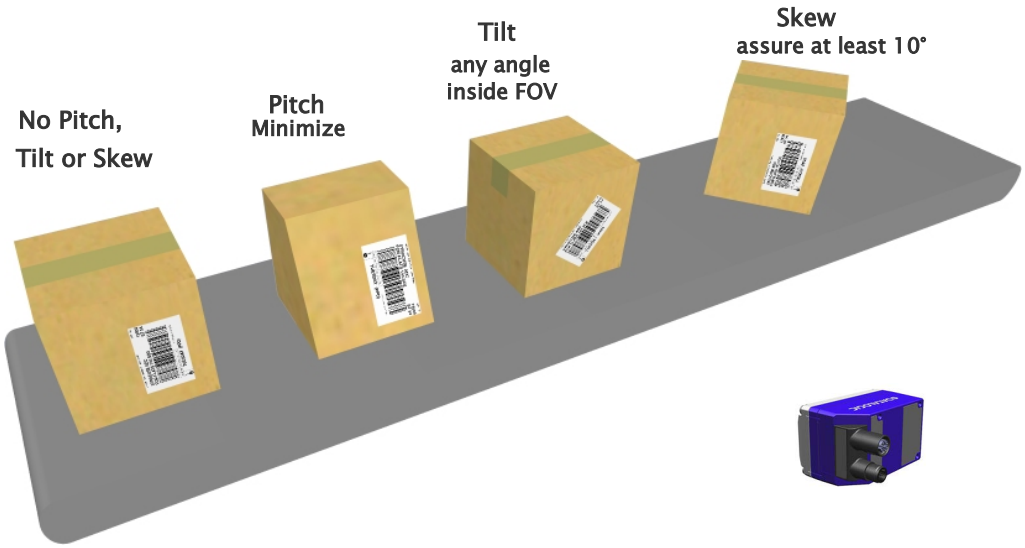


Figure 6 - Pitch, Skew and Tilt Angles

3. Refer to the reading diagrams in Chapter 6, Reading Features for FOV calculation and minimum distance requirements according to the base/lens combination used for your application.

NOTE: Rapid Configuration of the Matrix 320 5mp reader can be made either through the X-PRESS interface (steps 4-6) which requires no PC connection, or by using the DL.CODE Configuration Program (steps 7-8). Select the procedure according to your needs.

STEP 4 - FOCUS THE READER

To focus the reader, refer to Manual Setup, starting on page 155, then place the reader at the focused Reading Distance and go to "Step 5 - Automatic Setup" on page 5.

STEP 5 - AUTOMATIC SETUP

1. Enter the Setup function by pressing and holding the X-PRESS push button until the Setup LED is on.



Figure 7 - X-PRESS Interface: Autosetup Function

2. Release the button to enter the Automatic Setup function. The Setup LED will blink until the procedure is completed.
   The Automatic Setup procedure ends when the Image Acquisition and the Image Processing and Decoding parameters are successfully saved in the reader memory, the Green Spot is activated, the Setup LED will stop blinking and Matrix 320 5mp emits 3 high pitched beeps.
   If the autolearning cannot be reached, Matrix 320 5mp will exit without saving the parameters to memory, the Setup LED will stop blinking and in this case Matrix 320 5mp emits a long low pitched beep[1].

NOTE: When using X-PRESS or the BM150 menu to perform Auto-Learn, only a single code can be configured (successive Learns will substitute the current code). To configure multiple codes, use the DL.CODE Auto-Learn procedure.

NOTE: You can always exit from any X-PRESS function at any time by pressing the X-PRESS push button once. After a short delay the procedure is canceled.

NOTE: If you have used this procedure to configure Matrix 320 5mp, go to step 9.

1. The Automatic Setup procedure will not recognize the following symbologies: Pharmacode, MSI, Standard 2 of 5, Matrix 2 of 5.

Restore Reader to Default Environment (Optional)

If it ever becomes necessary to restore the reader's Environment parameters to their default values (including the default IP address), you can perform this procedure by holding the X-PRESS push button pressed while powering up the reader.

You must keep the X-PRESS push button pressed until all LEDs blink simultaneously, then release and re-press the button immediately. The Matrix 320 5mp will emit a high pitched beep and after a few seconds enters run mode.

Any previously saved configurations on the device will remain in memory, but the Default configuration is set as the startup configuration.



NOTE: If you release the button while the LEDs are all on continuously (after the blinking phase), the reader will enter the Loader program sequence and the LEDs will begin to cycle through various patterns. Just cycle power to return to run mode.

STEP 6 - INSTALLING DL.CODE CONFIGURATION PROGRAM



NOTE: Refer to the DL.CODE User's Guide for correct use of the software.



CAUTION: DL.CODE does not currently support Windows Embedded (often used in industrial PCs and/or PLCs).

DL.CODE is a Datalogic reader configuration tool providing several important advantages:

- Intuitive Graphical User Interface for rapid configuration
- Defined configuration directly stored in the reader
- Discovery and IP address setting features to facilitate remote configuration
- Device Monitoring

To install DL.CODE

1. On the PC that will be used for configuration, download the DL.CODE mini-DVD.zip file. Extract the files maintaining the folder structure and run the **start.hta** file to access the installation pop-up. Click on the **Install DL.CODE** link to run the installation program and follow the installation procedure.



NOTE: To perform a "silent" installation (without user input), see the DL.CODE User's Guide.

2. When the installation is complete the DL.CODE entry is created in the Start>Programs bar under "Datalogic" as well as a desktop icon. Double-click the desktop icon to run it.

This configuration procedure assumes a laptop computer, running DL.CODE, is connected to a factory default reader through the Ethernet port.

Login

When you launch DL.Code for the first time, you must log in via one of the following options:

1. Log in
2. Sign Up
3. Offline access with an activation file
4. Start a 15-day trial



Figure 8 - Login Popup

NOTE: Login is mandatory. If you do not proceed with any of the provided options, DL.Code will shut down.

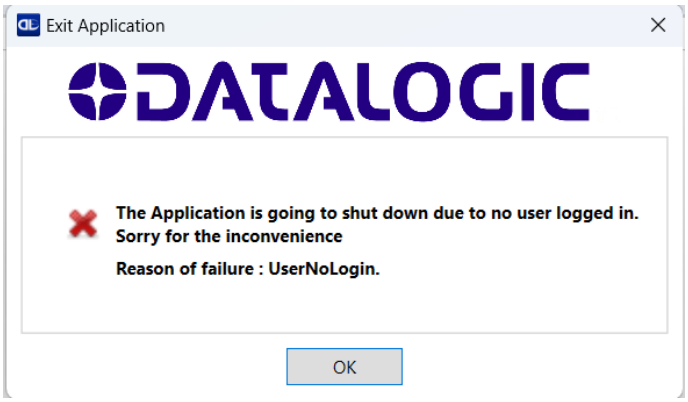
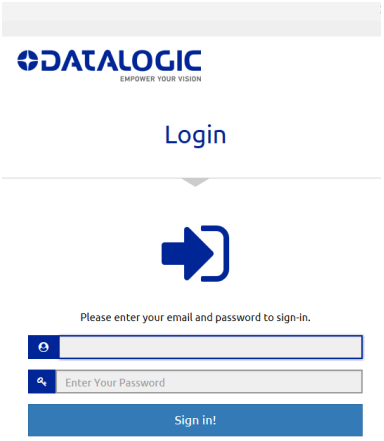


Figure 9 - Shut Down Message

Login and Signup

If you already have a Datalogic account, click the “Login” button and enter your email and password in the fields shown below to sign in.



If you do not have a Datalogic account, please click the “Sign up” button to create one.

Fill in the fields to register in the form shown below.

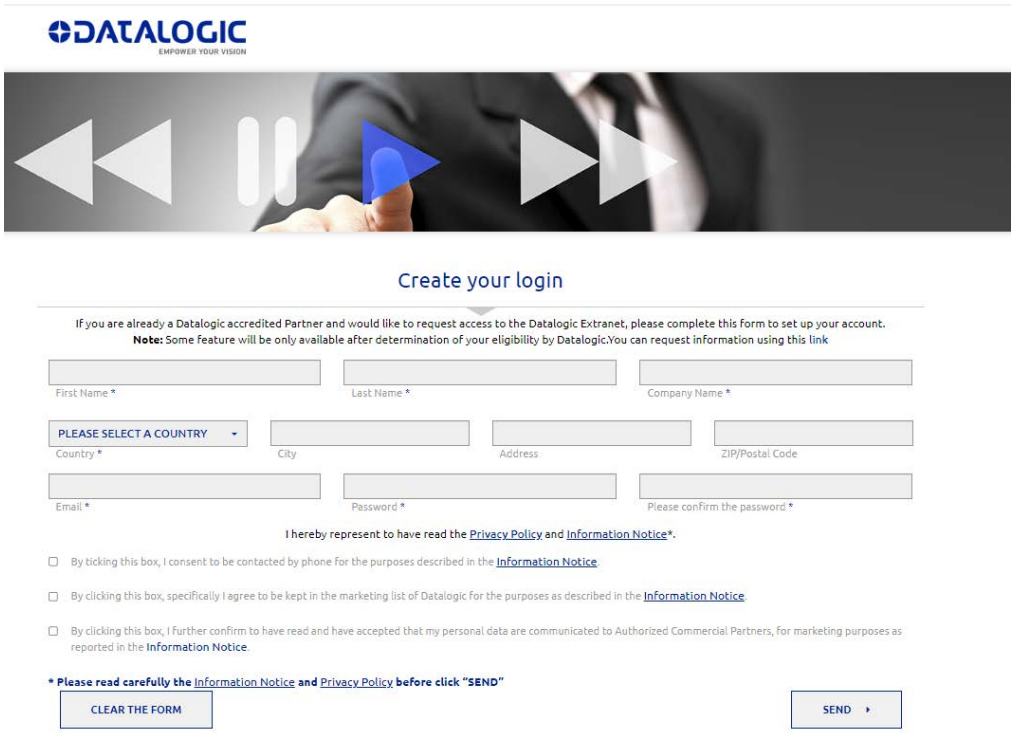


Figure 10 - Sign up Form

Offline Login

If you are offline when you first launch DL.Code, follow the steps below.

1. Click the “Offline Login” button. The Popup will show you the Machine Id.

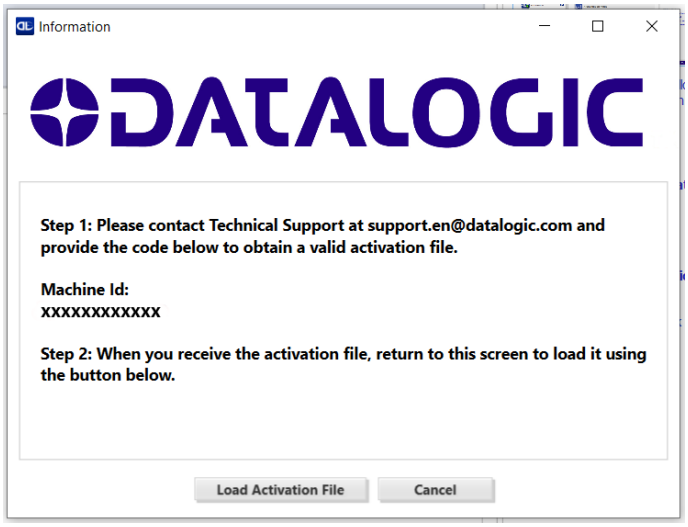


Figure 11 - Activation File Procedure

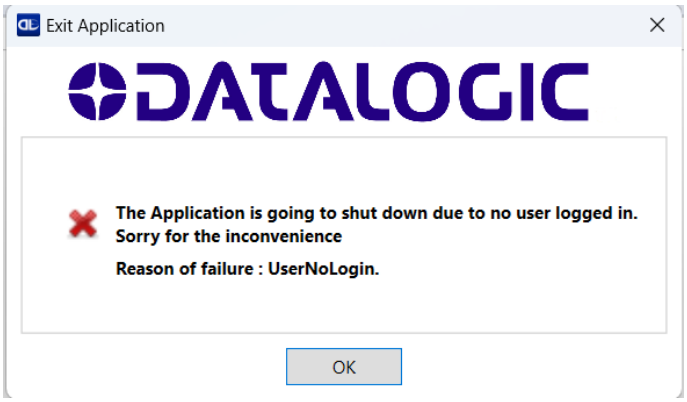
2. Contact the Technical Support and provide the Machine Id shown in your version of DL.CODE to obtain an activation file.

3. Once the Technical Support sends you the activation file, please load it using the “Load Activation File” button.

NOTE: The Machine Id shown in the picture above is for illustration purposes only. Refer to the Machine Id shown in your version of DL.Code.

Activation File Not Working

If your activation file does not work, the following window is displayed and DL.Code shuts down. Please contact Technical Support for help.



15-day Trial

If you wish to use DL.Code without logging in for a trial period, click the “Start trial” button. This will activate a 15-day trial.

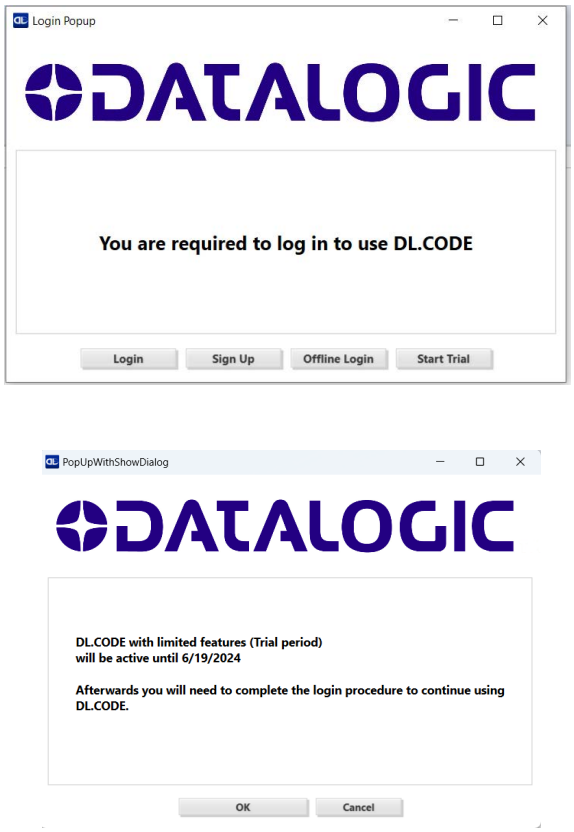


Figure 12 - 15-Day Trial

At any time during the trial period, you can decide to complete registration using the Online or Offline procedure.

At the end of the trial period, however, you are required to authenticate using one of the methods described before, otherwise DL.Code will shut down.

NOTE: The trial period is not extendable, and cannot be reused either with the same version or with future or past versions of DL.Code.

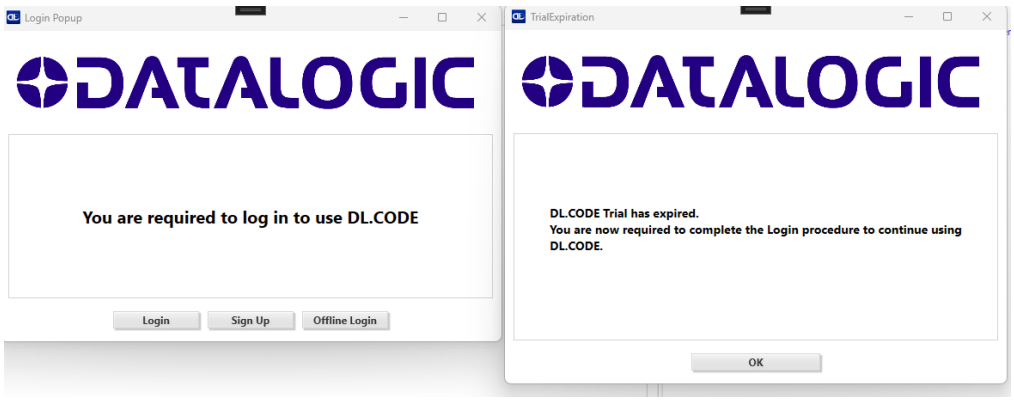


Figure 13 - End of Trial

Ethernet Device Discovery

NOTE: To discover models through serial communication instead of Ethernet communication, refer to the DL.CODE User's Manual (par. "Serial Device Discovery").

The User Interface opens and displays a list of all the devices belonging to the Local Area Network. DL.CODE has a discovery feature to accomplish this task.

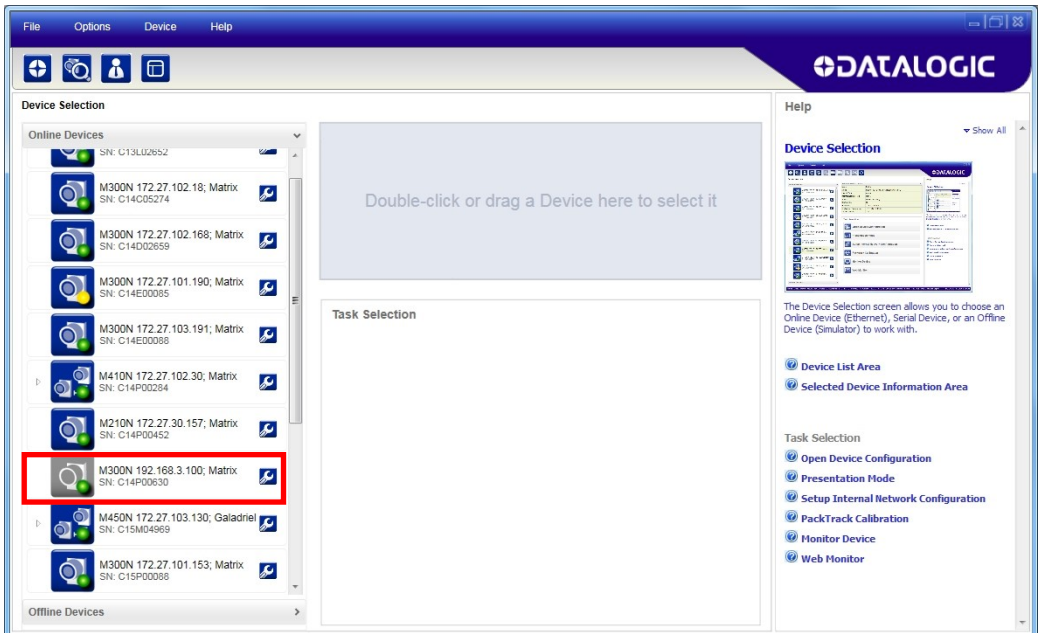


Figure 14 - Device Discovery

The discovery feature will also show devices not belonging to the LAN and display them in gray (see Figure 14).

4. First the device must be added to the LAN by aligning its IP Address to the network. The network administrator should provide valid LAN address(es).

5. Find your device in the list by matching its serial number (SN) then click on the device wrench icon to open the Device Environment Configuration window.

6. Change the Ethernet Settings (IP Address, Subnet Mask, Gateway Address etc.) according to the network requirements.

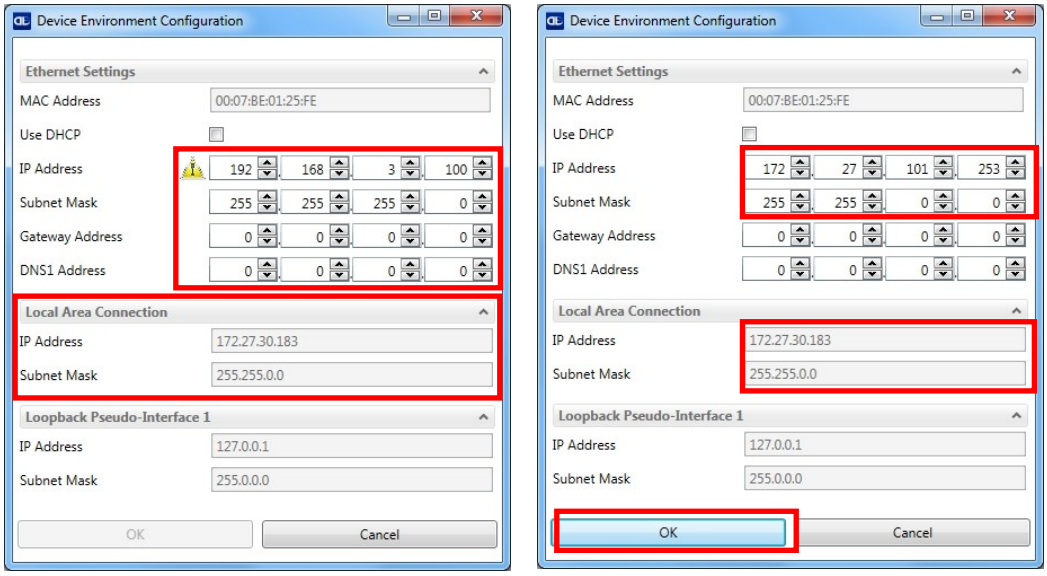
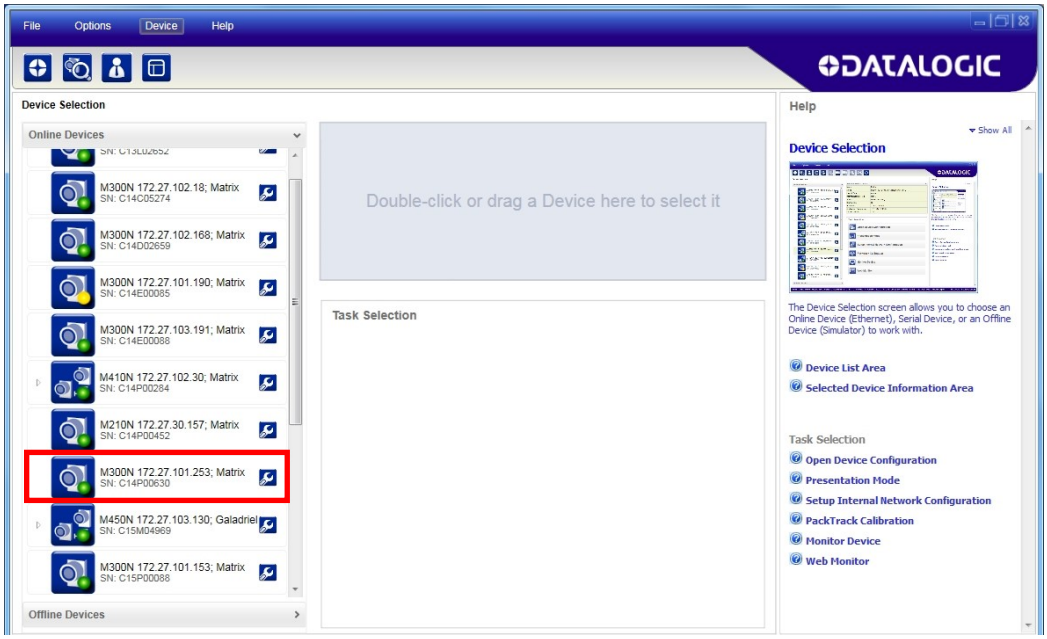


Figure 15 - Device Environment Configuration Window

7. Click OK; the device will reappear in the list of Online Devices (in color) meaning it is now part of the LAN and can be configured. The new IP address will also be displayed.



8. Double-click on or drag the device icon into the Selected Device Information Area. Details about the device will be displayed in this area.

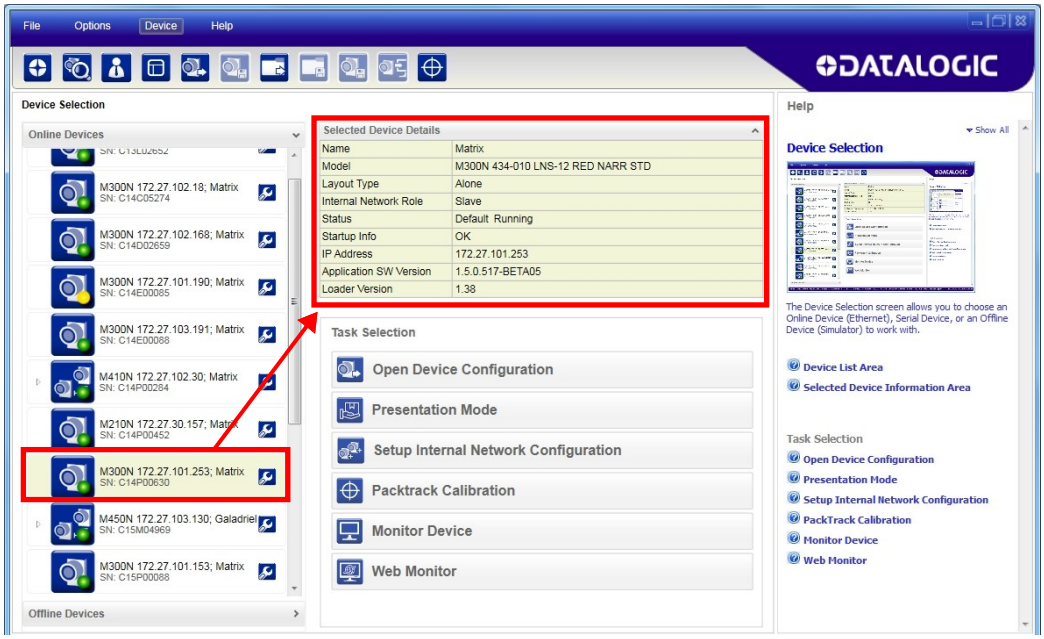
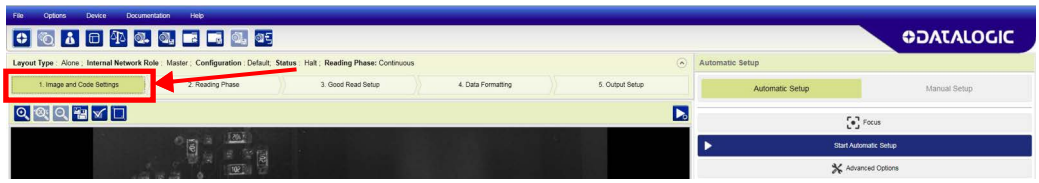


Figure 16 - DL.CODE Opening Window

STEP 7 - DEVICE CONFIGURATION

Image and Code Settings



The image and Code Settings parameters are divided into two groups:

- Automatic Setup
- Manual Setup

Automatic Setup Automatic Setup uses up to two different algorithms for the automatic setting of optical, illumination and code parameters to achieve the most stable reading conditions.

Standard **Automatic Setup** (available on all products) can read one or more of the code symbologies from the table below. It can be set to include Image Filters if necessary.

ENABLED 1D CODES	ENABLED 2D CODES	ENABLED FILTERS
CODE 128 EAN 128 CODE 39 CODE 93 CODABAR PDF417 MICRO PDF417 GS1 DATABAR GS1 DATABAR STACKED GS1 DATABAR LIMITED GS1 DATABAR EXPANDED GS1 DATABAR EXPANDED STACKED UPCEAN FAMILY EAN13 UPCEAN FAMILY EAN8 UPCEAN FAMILY UPCA UPCEAN FAMILY UPCE	DATAMATRIX ECC 200 QR MICRO QR AZTEC MAXICODE DOTCODE	ERODE 3x3, 5x5 and 7x7 DILATE 3x3, 5x5 and 7x7 SMOOTHING



NOTE: Refer to paragraph “Automatic Setup Configuration” on page 150 for more details on using the Automatic Setup.

Manual Setup provides access to the complete array of optical/illumination and code definition parameters that can be fine-tuned semi-automatically and manually to obtain the best results for applications of any complexity.



NOTE: Refer to paragraph "Manual Setup" on page 155 for more details on using the Manual Setup.

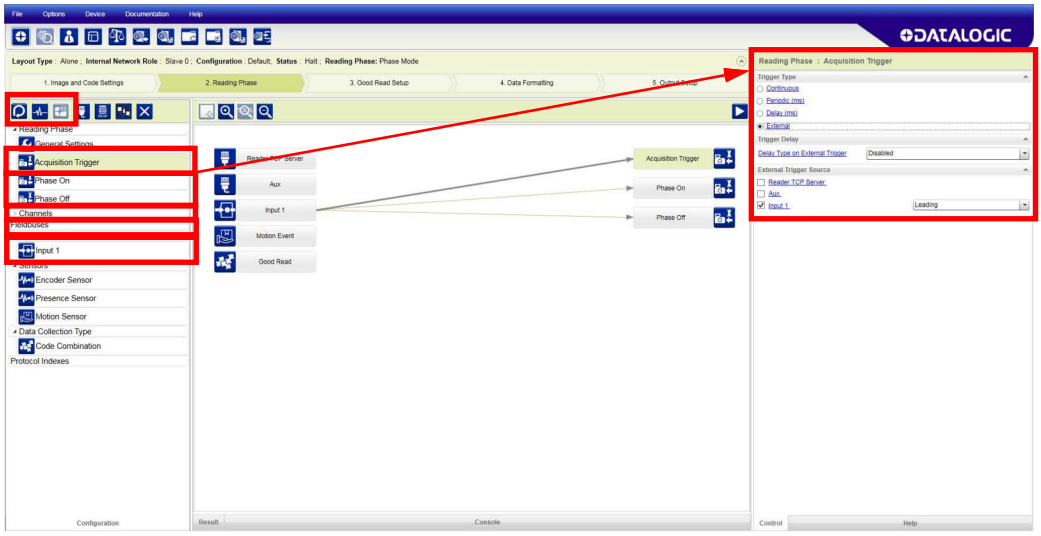
NOTE: If your application requires multiple code symbologies, multiple image settings, Code Grading or other parameter settings for decoding, then use the Manual Setup.

Operating Mode Configuration Parameters

Reading Phase



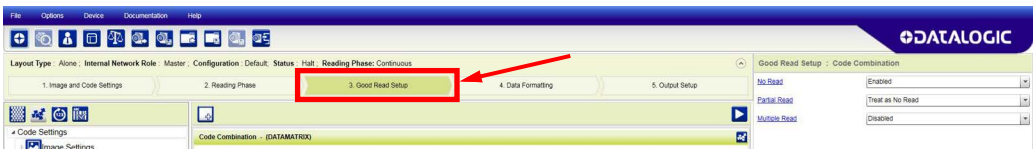
1. Select your application specific Operating Mode from the icons over the Configuration Parameters tree area: Continuous, One Shot, Phase Mode or PackTrack.



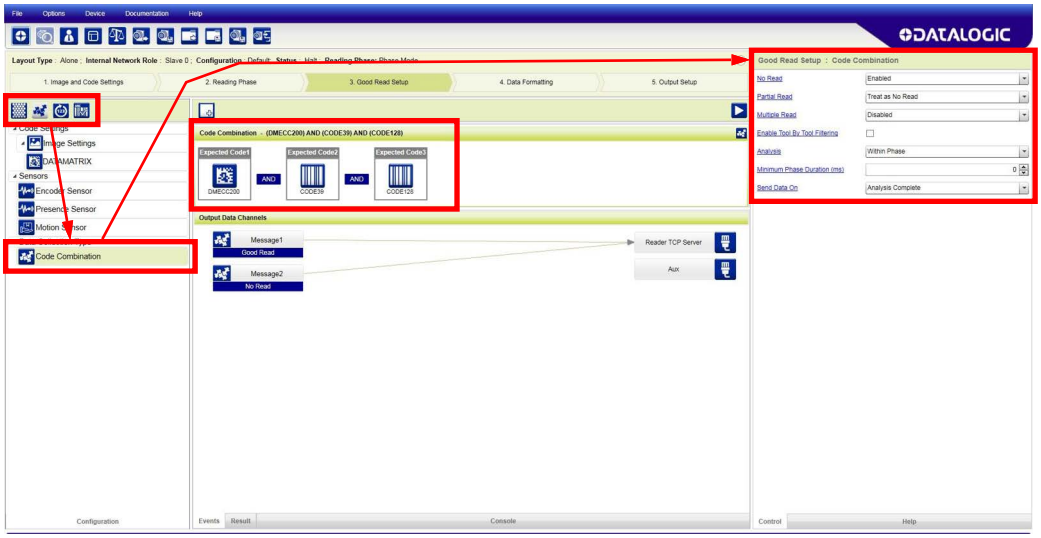
2. Configure the relative Operating Mode parameters from the Reading Phase parameters panel. Different groups will appear in the panel depending on the selected icons over the Configuration Parameters tree area.

CAUTION: If the same signal activates multiple events with the same edge, those events are fired in a random order.
If the same channel activates multiple events with the same string, those events are fired in a random order.
AVOID doing this action. The reader may not work properly, the result is not predictable!

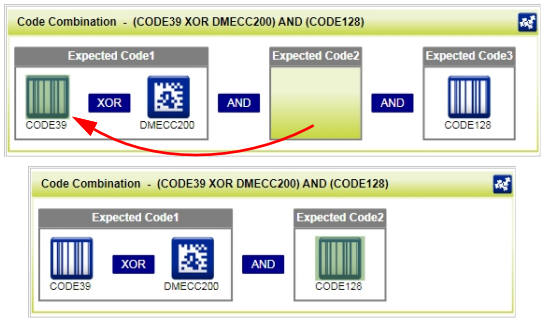
Good Read Setup



1. Select your specific data collection type from the icons over the Configuration Parameters tree area: Code Collection, Code Combination, Presentation or Match Code. Not all data collection types are available for all Operating Modes; for example PackTrack Operating Mode only supports Code Combination. Incompatible data collection types will be shown in gray and cannot be selected.
   The following example shows Code Combination. By default, the Expected Codes (when more than one code type is selected), are in logical AND, which means that all codes are required to be decoded to produce a Good Read condition.



2. If a Good Read condition should be produced when any single code is decoded, independent from the others, then they need to be combined in logical XOR. To do this, drag the code icon(s) from their relative Expected Code box into the Expected Code box of the XOR combination you wish to create. Then delete the empty box by selecting it with the mouse (highlighted) and pressing the delete key on your keyboard.





To create a logical AND condition from a logical XOR, create a new Expected Code box using the Add icon. Then drag the desired code icon from one box to the other.

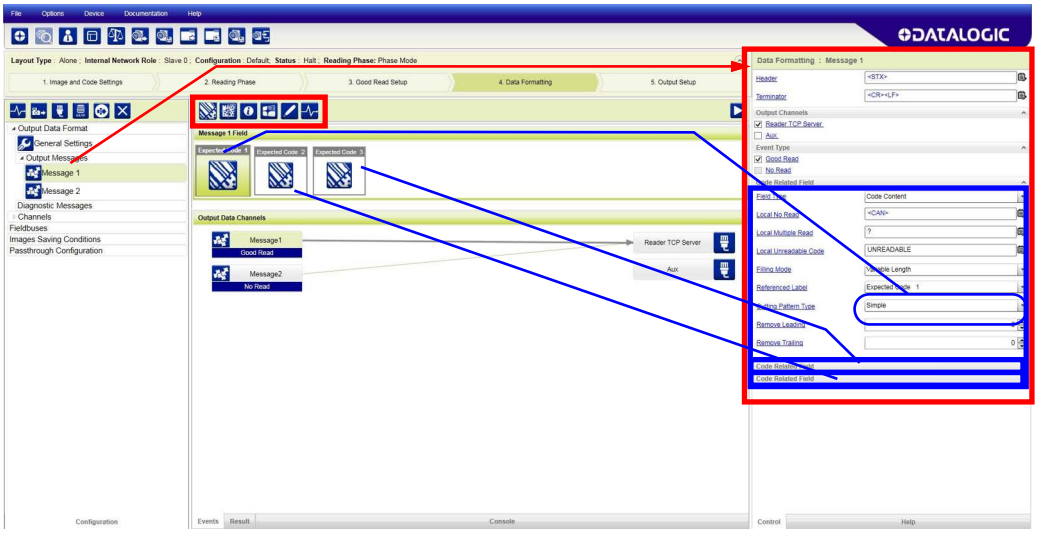


Configuration Parameters

Data Formatting



1. Configure your application specific Data Formatting Message(s) from the Configuration Parameters tree area: Message 1, Message 2, etc.



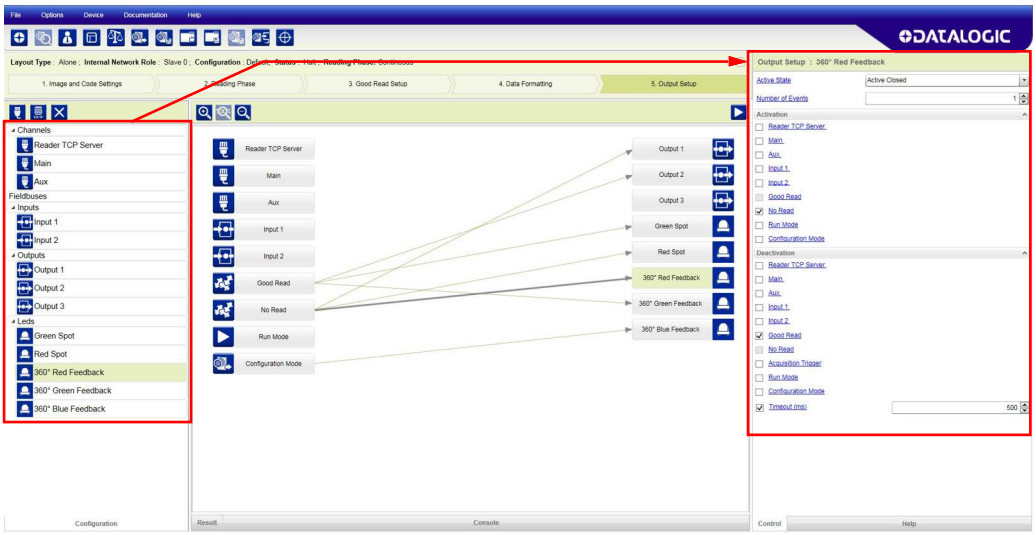
You can add fields to the output message by clicking on the icons above the Message Field area. They will be appended to the message. You can drag them to position them between other fields in the message so that the output message is ordered according to your application requirements.

Each field has its own relative configuration parameters in the parameters panel.

Output Setup



1. Configure your application specific Digital Output(s), Green/Red Spots and 360° Feedback (if used) from the Configuration Parameters tree area: Output 1, Output 2, etc.



NOTE: Save the configuration from temporary memory to permanent memory, overwriting the previously saved configuration.

STEP 8 - TEST MODE

Use a code suitable to your application to test the reading performance of the system.

1. Enter the *Test* function by pressing and holding the X-PRESS push button until the Test LED is on.

2. Release the button to enter the *Test* function.
   Once entered, the Bar Graph on the five LEDs is activated and if the reader starts reading codes the Bar-Graph shows the Good Read Rate.

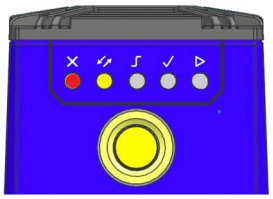
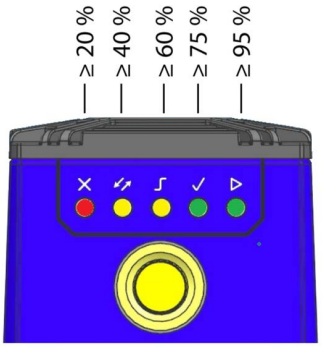


Figure 17 - X-PRESS Interface: Test Function

3. To exit the Test, press the X-PRESS push button once.

NOTE: By default, the Test exits automatically after three minutes.

The Bar Graph has the following meaning:



In case of No Read condition, only the STATUS LED (red) is on and blinks.

ADVANCED READER CONFIGURATION

For further details on advanced product configuration, refer to the DL.CODE User's Guide available in the DL.CODE Help menu.

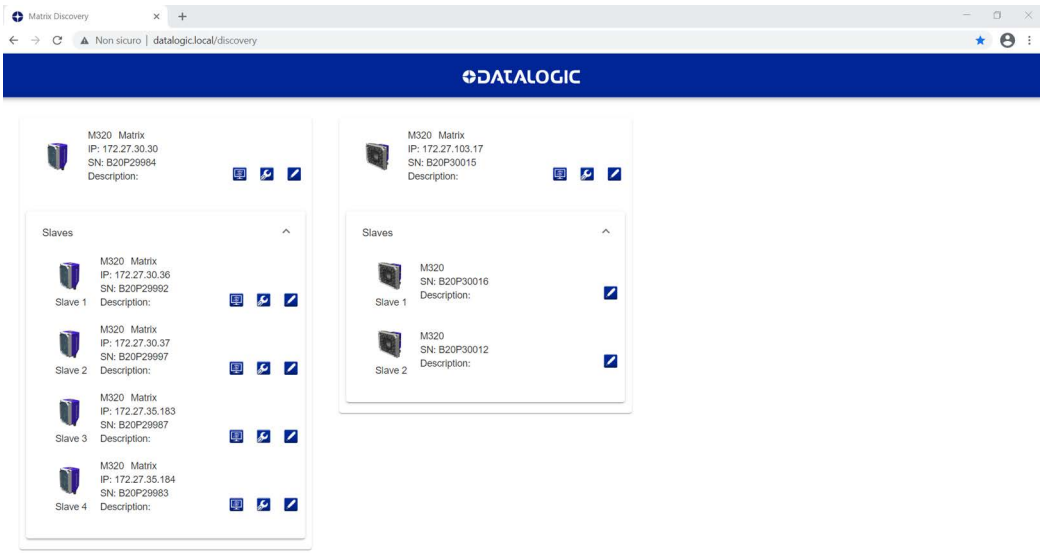
Host Mode Programming

The reader can also be partially configured from a host computer using the Host Mode programming procedure.

CONFIGURATION USING WEB DISCOVERY

Devices can be discovered via web interface. To do this, from either the Host PC or configuration PC connected to the network, open your browser and go to http://datalogic.local/.

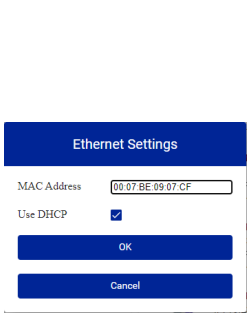
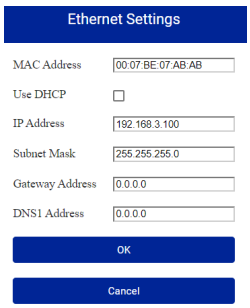
This page shows all devices available in the network:



Click on the wrench icon and input the correct IP Address settings (from network administrator) and optional Device Description for each reader.

NOTE: At least one device must be reachable from the user PC. For example, if there are several subnetworks, at least one device must be in the same subnetwork of the PC.

The following functions are available for each discovered device:

	Open the Web Monitor page of the selected device. Refer to the DL.CODE User's Manual for more information on this remote monitoring tool.
	Display and configure the Ethernet settings, as shown in the figures below (left: device in DHCP mode[1]; right: device in Static mode):  
	Set the device description. In case of Slave devices, this button is only available if the corresponding Master device is reachable. 

1. Use DHCP addressing only if the network is connected to a DHCP Server.

CHAPTER 2
INTRODUCTION

PRODUCT DESCRIPTION

Matrix 320 5mp is a Datalogic industrial compact 2D imager designed and produced to be a high performance affordable solution for both linear and two-dimensional code reading applications.

Matrix 320 5mp uses imaging technology and provides complete reading system functions by integrating image capturing, decoding and communicating in a single compact and versatile product.

Matrix 320 5mp sets a new standard in 2D imager technology offering high performance with improved reading flexibility thanks to its intrinsic modularity.

Matrix 320 5mp features excellent reading and verifying performance thanks to a superior 5.0 Mega pixel sensor (2560 x 1936 pixels) and smart proprietary decoding libraries.

The modular combination of lenses, illumination, filters, and accessories provide high flexibility in covering applications with various requirements.

Innovative X-PRESS™ interface, combined with a new aiming system, Green and Red Spots, and new 360 degree Visual Feedback through colored LEDs, enhance the ease of setup and use.

Rugged construction, IP67 and IP65 protection and max. 50°C operative temperature make the Matrix 320 5mp the ideal product for industrial applications.Matrix 320 5mp has been developed for use in numerous industries such as:

Factory Automation / Manufacturing

- Component/part traceability
- WIP traceability
- Print & Apply
- Secondary packaging traceability
- End of line traceability

Manufacturing / T&L / Retail

- Inbound/Pallet picking (fork lift)
- Print & Apply verification (re-labeling)
- Depalletizing - Part traceability
- Order fulfillment (automatic/manual)
- End of line traceability
- Small item sortation
- Manual sorting - Hands free - Presentation
- Palletizing (automatic/manual) / cage preparation
- Pallet traceability / Pallet wrapping
- Retrieval for outbound (forklift)
- Reverse logistics

Standard Application Program

A Standard Application Program is factory-loaded onto Matrix 320 5mp. This program controls code reading, data formatting, serial port and Ethernet interfacing, and many other operating and control parameters. It is completely user configurable from a Laptop or PC using the dedicated configuration software program DL.CODE, provided on the DL.CODE mini-DVD (downloaded .zip file).

There are different programmable operating modes to suit various code reading system requirements.

Quick positioning, calibration and code setting of the imager can be accomplished using the X-PRESS™ button and LEDs on top of the reader without the necessity of a PC.

The previous functions can also be performed through DL.CODE which includes visual feedback from the reader. This allows verification of the exact positioning of the reader and to maximize its reading performance.

Statistics on the reading performance can also be visualized through a dedicated window in DL.CODE.

Programmability

If your requirements are not met by the Standard Application Program, Custom Application Programs can be requested at your local Datalogic distributor.

Some of the main features of this reader are given below.

Excellent Performance

- Multi-core platform
- Superior 5 MPixel sensor (2560 x 1936 pixels)
- Frame Rate up to 25 frames/sec
- Hardware acceleration
- HDR (High Dynamic Range) imaging
- Powerful Internal Lighting Systems
- Many illuminator options (up to 72 LEDs + TIR lenses)
- Outstanding decoding capability on 1D, 2D, Stacked, Postal symbologies
- Excellent performance on DPM applications
- Omni-directional reading
- Image Cropping for higher frame rate
- Up to 100 readable codes in a single frame

Ease of Setup and Use

- Quick installation without PC by using X-PRESS interface for easy and intuitive setup
- Automatic Imager calibration
- Multi-Code settings and Autolearn
- New generation FTP image saving
- Enhanced Green/Red Spot for immediate read feedback
- New 360 degree Visual Feedback provides immediate feedback on the device status during operation
- X-PRESS™ interface LEDs provide operational and performance feedback
- Aiming system to verify exact code positioning in the Field of View and to maximize the reading performance

- Windows-based DL.CODE software to configure the reader parameters via PC Ethernet interface
- User-defined database of Image Acquisition Settings (parameter sets)
- Different operating modes to suit various application requirements
- Multi Image Acquisition Settings for higher reader flexibility
- Image saving and storage with buffering capability
- Embedded distance sensor to change image settings
- Diagnostic software tools

Flexible Solution

- Modular design
- Accessory covers for Polarized and Standard illumination
- Accessory filters: anti-YAG, color filters for 36 LEDs illuminators
- Many illuminator lights in 2 different power options (36 LEDs and 72 LEDs)
- Manual focus adjustment with C-Mount lens
- Compact dimensions and rotating connector for easy integration

Connectivity

- Main M12 17-pin male connector
- Industrial connectivity (Serial, Giga Ethernet, Embedded Fieldbus)
- Compatible with EBC network via EBC Quick Link
- Ethernet Connectivity with TCP/IP socket for reader parameter configuration, data and image transfer, FTP client, etc.
- On-board Ethernet supports EtherNet/IP (explicit messaging), PROFINET I/O, Modbus TCP, SLMP protocols, and OPC UA protocols
- 3 serial communication interfaces (Main, Auxiliary, ID-NET)
- 2 General purpose opto-coupled, polarity insensitive Inputs
- 3 General purpose, short-circuit protected Outputs (when using the CBX connection box, the first 2 outputs are opto-coupled)
- Giga Ethernet connector

Industrial Strength

- Industrial compact 2D reader
- Rugged construction
- Sealed circular M12 connectors
- IP67 and IP65 protection class
- -10 to 50 °C operating temperature
- Supply voltage: 24 Vdc

The reader is particularly suitable for industrial environments where protection against harsh external conditions is required. Electrical connection of Power, Serial interfaces and I/O signals is provided through an M12 17-pin connector. An M12 X-Coded Giga Ethernet connector is present for TCP/IP connections.

INDICATORS AND KEYPAD BUTTON

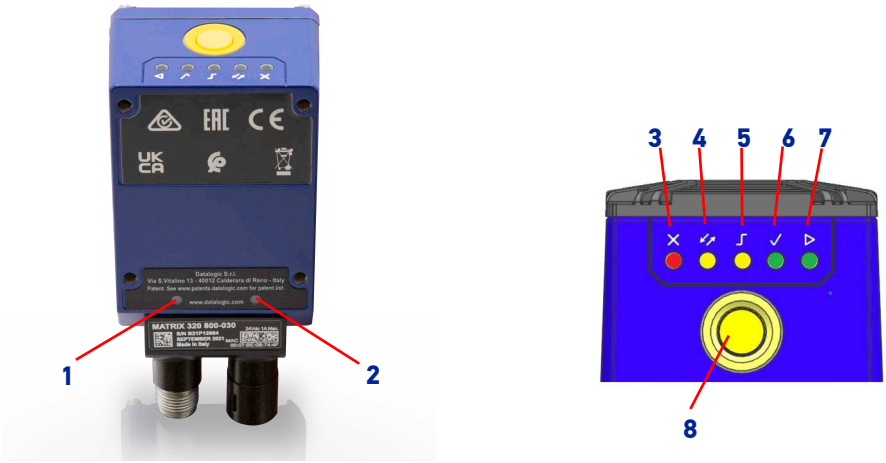


Figure 18 - Indicators

The following LED indicators are located on the reader:

PWR	blue LED indicates that the reader is connected to the power supply (Figure 18, 1)
NET	yellow LED indicates connection to the on-board Ethernet network (Figure 18, 2)

In normal operating mode the colors and meaning of the five LEDs are illustrated in the following table:

STATUS		red LED indicates a NO READ result (Figure 18, 3)
COM		yellow LED indicates active communication on the main serial port * (Figure 18, 4)
TRIGGER		yellow LED indicates the status of the reading phase (Figure 18, 5)
GOOD		green LED confirms successful reading (Figure 18, 6)
READY		green LED indicates that the reader is ready to operate (Figure 18, 7)

* When connected to a Fieldbus network through the CBX500, the COM LED is always active, even in the absence of data transmission, because of polling activity on the Fieldbus network.

During the reader startup (reset or restart phase), these five LEDs blink for one second.

In X-PRESS Configuration mode the colors and meaning of these five LEDs are described in X-PRESS Human Machine Interface.

The keypad button (Figure 18, 8) is software programmable. By default it starts the X-PRESS interface for quick installation without using a PC (see "Step 5 - Automatic Setup" on page 5).

GREEN/RED SPOT AND 360° VISUAL FEEDBACK

Matrix 320 5mp is equipped with a Green/Red Spot and 360° Visual Feedback through colored LEDs mounted around the illuminator window cover to provide immediate feedback on the device status during operation.

The available colors are activated by the following default events:

- Blue = Configuration Mode (Visual Feedback only)
- Green = Good Read
- Red = No Read

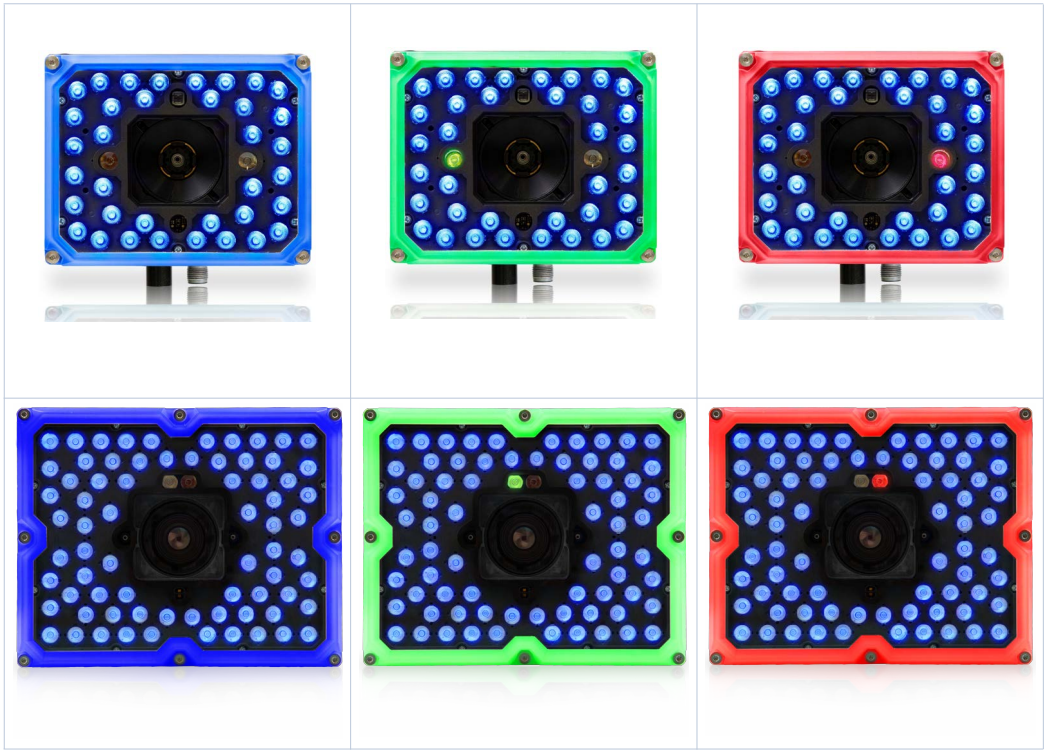
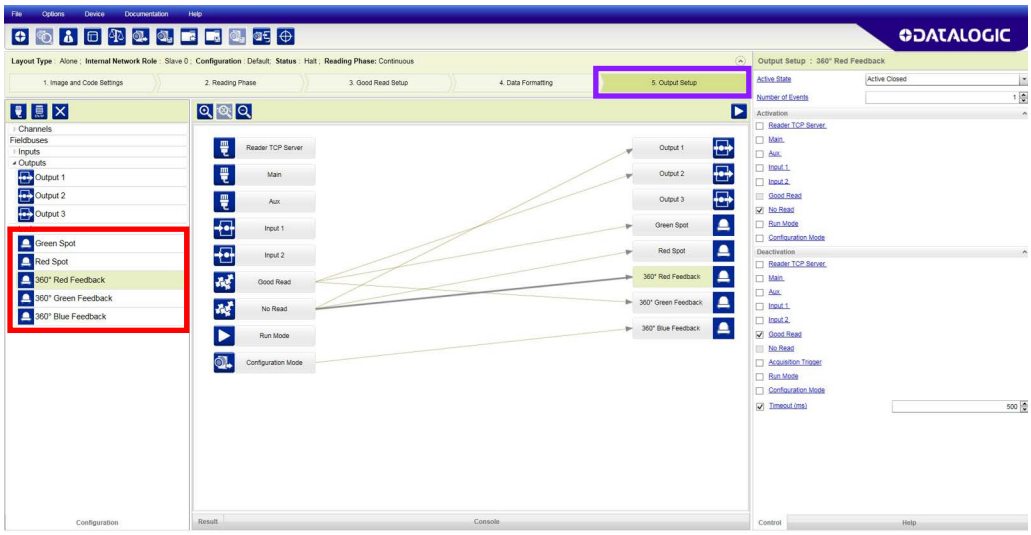


Figure 19 - 360° Visual Feedback and Green/Red Spot

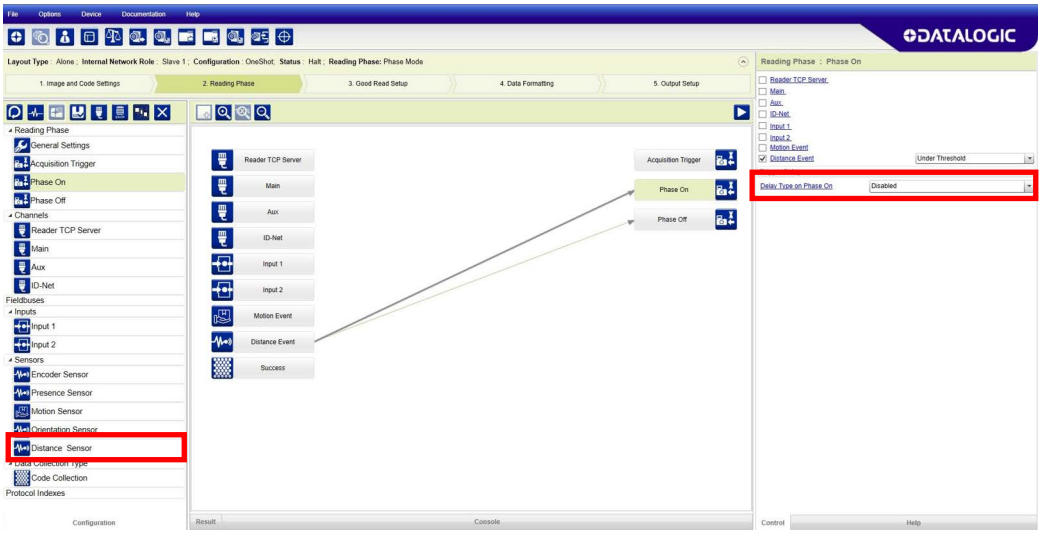
On DL.CODE it is possible to select the events that will activate each Spot and 360° Feedback (e.g. Communication Channel Strings, Inputs, Read Events, Operating Mode, Script Events). To do this, go to Output Setup > LEDs.



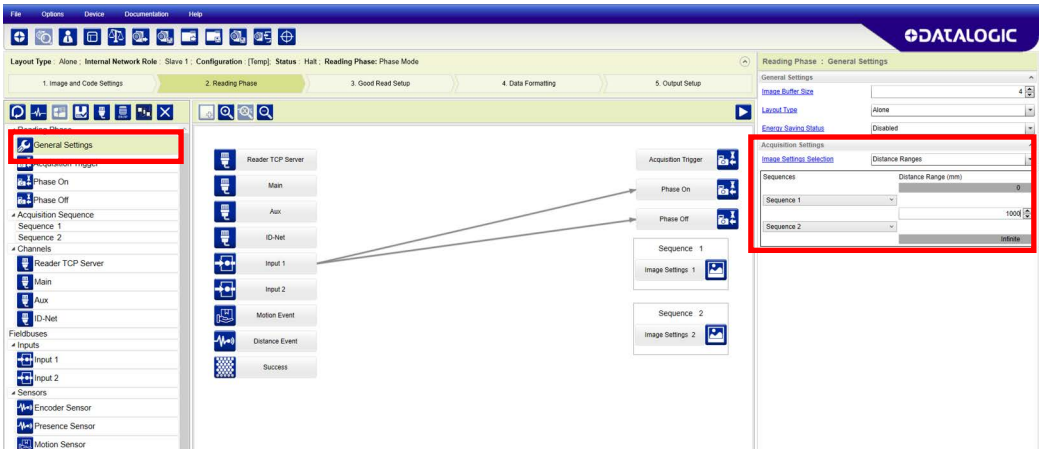
DISTANCE SENSOR

Matrix 320 5mp is equipped with a TOF Distance Sensor to detect target distance and optimize photometric parameter configuration for the best reading performance and increased depth of field.

The distance sensor can generate Distance Events to be used as triggers for phase/ acquisition. Refer to DL.CODE Help Online for more details.



The distance sensor can also be used to easily change the Image Settings of your reader. In DL.CODE, set “Distance Ranges” as Image Settings Selection value. This way, the order in which Images Settings are processed is determined based on the distance measured by the distance sensor.

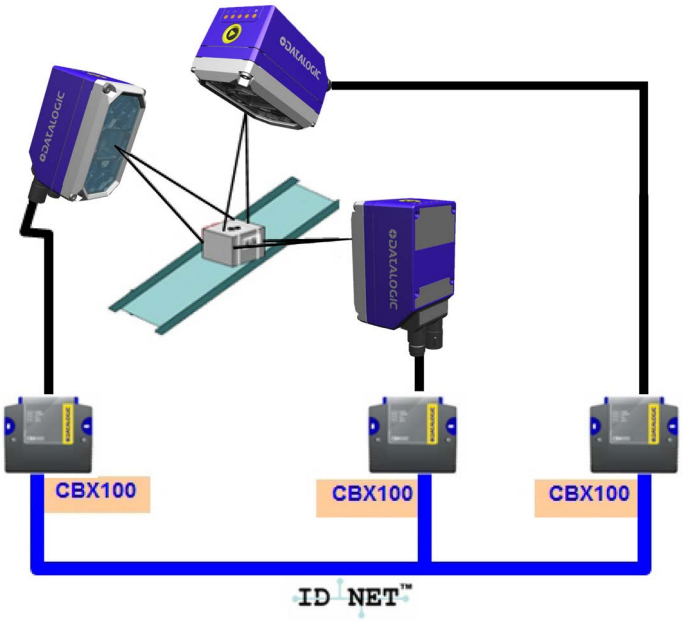


ID-NET

The ID-NET™ network is a built-in high-speed interface dedicated for high-speed reader interconnection. ID-NET is in addition to the Main and Auxiliary serial interfaces.

The following network configurations are available:

- **ID-NET Synchronized:** Single station – multiple readers

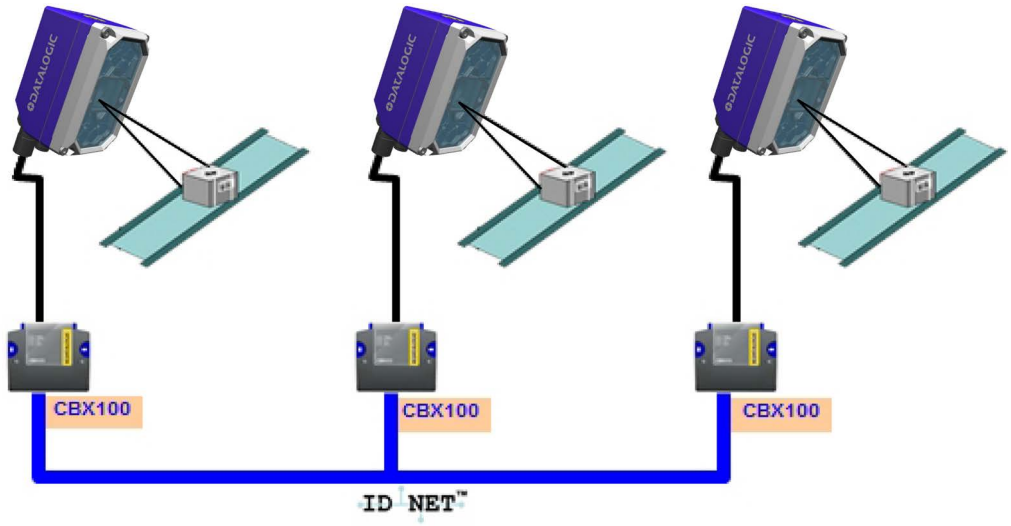


ID-NET interface allows local connection of multiple readers reading different sides of the same target. All readers share a single presence sensor and activate/deactivate simultaneously.

At the end of each reading phase a single data message is transmitted to the host. Thanks to ID-NET, data communication among readers is highly efficient so that an immediate result will be available.

See "ID-NET Interface" on page 101 for connection details and "Internal Network Configurations" on page 171 for configuration details.

- **ID-NET Multidata:** Multiple stations – single reader



ID-NET interface allows connection of readers reading objects placed on independent conveyors. All readers are typically located far away from each other and they can have different operating modes from each other.

At the end of each reading phase, each reader transmits its own data message to the host. Thanks to ID-NET, data collection among readers is accomplished at a high speed without the need of an external multiplexing device. This leads to an overall cost reduction and to simple system wiring.

See "ID-NET Interface" on page 101 for connection details and "Internal Network Configurations" on page 171 for configuration details.

X-PRESS HUMAN MACHINE INTERFACE

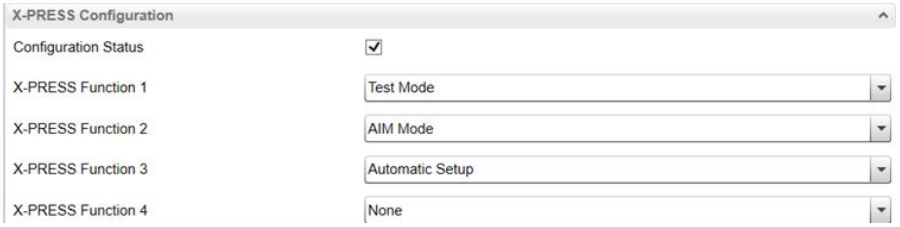
X-PRESS is the intuitive Human Machine Interface designed to improve ease of installation and maintenance.

Status information is clearly presented by means of the five colored LEDs, whereas the single push button gives immediate access to the following relevant functions:

- None
- Test Mode
- AIM Mode
- Automatic Setup
- Code Autolearn
- Match Code Autolearn
- Backup
- Restore
- Backup Erase
- Image Auto Setup

NOTE: Up to four functions can be set on the device. For more information, refer to the DL.CODE software manual.

NOTE: By default, the X-PRESS functions have the following configuration:

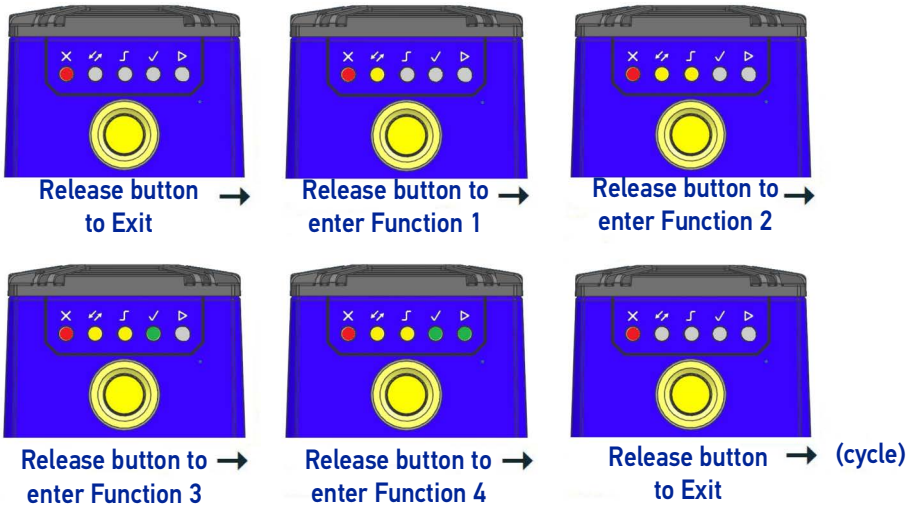


X-PRESS Functions

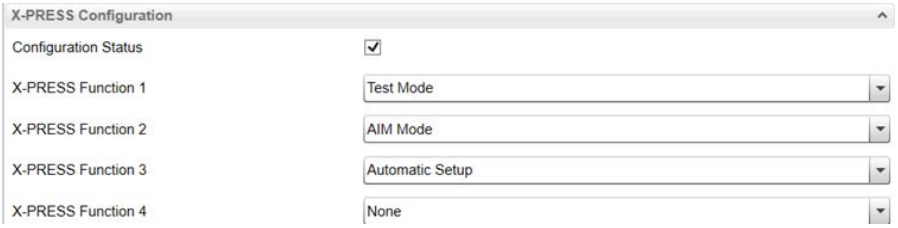
Quick access to the following functions is provided by an easy procedure using the push button:

1. **Press** the button (the Status LED will give a visual feedback).
2. **Hold** the button until the specific function LED is on (Function 1, Function 2, Function 3 or Function 4).
3. **Release** the button to enter the specific function.

Once button is pressed, the cycle of LEDs activation is as follows:

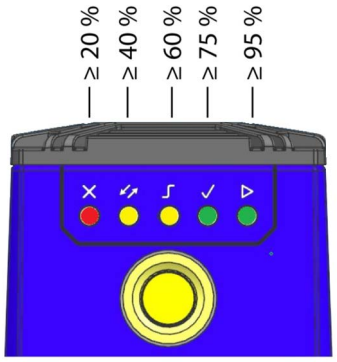


NOTE: By default, the X-PRESS functions have the following configuration:



Test Mode

Once entered, the Bar Graph on the five LEDs is activated and if the imager starts reading codes the Bar-Graph shows the Good Read Rate. The Bar Graph has the following meaning:



In case of a NO READ condition, only the Status LED is on and blinks.

To exit the Test Mode, press the X-PRESS push button once.

NOTE: By default, the Test exits automatically after three minutes.

Aim Mode

This function causes the laser pointer to turn on. The laser pointer can be used to position the imager on the code. Note that 36 LED models can have a Cross Laser pattern or a Dot Grid pattern[1] and the center of the cross is 30 mm under the optical axis, while 72 LED models are equipped with Dual Spot aiming and the two laser dots are positioned 30 mm to both sides of the optical axis.

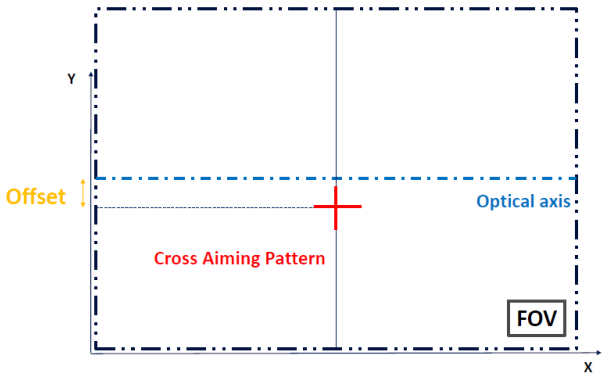


Figure 20 - Cross aiming pattern (36 LED models)

1. The Dot Grid aiming system is only available for 12mm and 16mm lenses using a 36 LED illuminator.

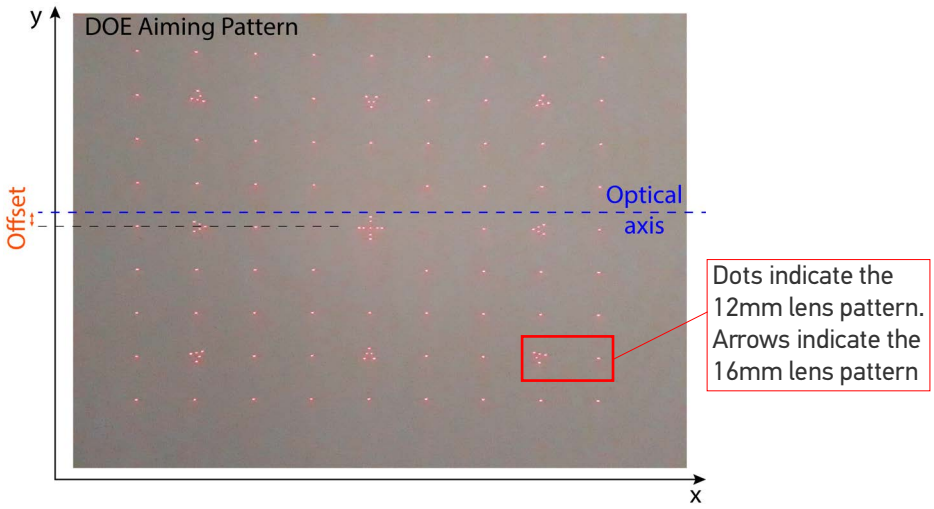


Figure 21 - Dot Grid pattern (36 LED models)

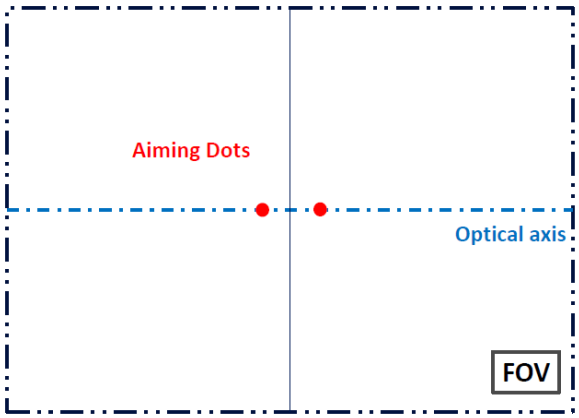


Figure 22 - Dual Spot pattern (72 LED models)

The Aim LED blinks to indicate this state.

You can exit the Aim function at any time by pressing the X-PRESS push button once. After a short delay the Aim procedure is canceled and the laser pointer turns off.

Automatic Setup

Once entered, the imager starts a procedure to automatically detect and recognize a single code presented to it. Each subsequent run replaces the currently stored code.

The LED blinks until the procedure is completed.

The automatic setup procedure ends when the Image Processing and Decoding parameters are successfully saved in the reader memory. The Green Spot is activated, the LED stops blinking, and the Matrix 320 emits three high-pitched beeps.

You can exit the function at any time by pressing the X-PRESS push button once. After a short delay, the procedure is cancelled.

NOTE: When there is ONLY ONE Image Settings configured, the result of the Autosetup JUST REPLACES the current one.
When there are MORE THAN ONE Image Settings configured, the action REPLACES the BOTTOM one in the view.

Code Autolearn

Once entered, the imager starts a procedure to automatically detect and recognize a single code presented to it. Each subsequent run replaces the currently stored code.

The LED blinks until the procedure is completed.

The Learn procedure ends when the Decoding parameters are successfully saved in the reader memory. The Green Spot is activated, the Learn LED stops blinking, and the Matrix 320 emits three high-pitched beeps.

You can exit the function at any time by pressing the X-PRESS push button once. After a short delay, the procedure is cancelled.

Unlike the Automatic Setup procedure, the Image Processing parameters are not modified.

Match Code Autolearn

This function should be used only when the device is already in “Match Code” mode.

Once activated, the imager starts a procedure to read the current code and store it as the “Match Code” string in the current configuration.

Backup

Backup to BM100 (see "Backup and Restore Through DL.CODE" on page 183 for further information).

Restore

Restore from BM100 (see "Backup and Restore Through DL.CODE" on page 183 for further information).

Backup Erase

Erase last backup performed on BM100.

Image Auto Setup

Once entered, the imager automatically performs Image Acquisition parameter calibration for the specific code presented to it.

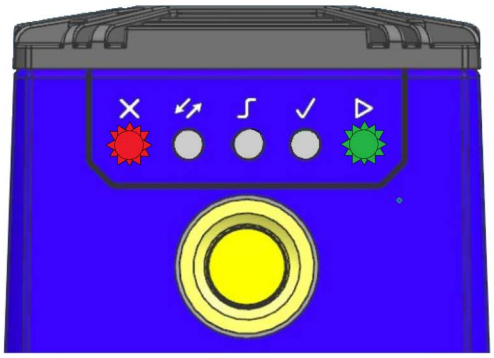
The LED will blink until the procedure is completed.

The Setup procedure ends when the Image Acquisition parameters are successfully saved in the reader memory, the LED will stop blinking and Matrix 320 emits 3 high pitched beeps.

If the calibration cannot be reached after a timeout of about 5 (five) seconds Matrix 320 will exit without saving the parameters to memory, the LED will stop blinking and in this case Matrix 320 emits a long low pitched beep.

Diagnostic Indication

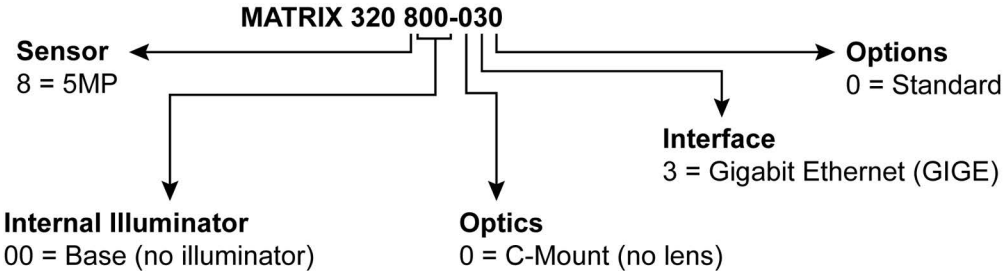
The “STATUS” (red) and “READY” LED (green) blink simultaneously to signal the presence of an error. Diagnostic message transmission on interfaces can be enabled to provide details about specific error conditions. See the Diagnostic Error Conditions chart in the Diagnostic page of the DL.CODE Monitor.



LED	STATUS
Ready	Blink
Good	
Trigger	
COM	
Status	Blink

MODEL DESCRIPTION

Matrix 320 5mp 5MP readers are described by their model number which indicates the characteristics listed in the diagram below.



AVAILABLE MODELS

Part Number	Description
938100041	Matrix 320 5mp 800-030 CM 5.0MP 1/2”
938100072	Matrix 320 5mp 800-030 CM 5.0MP 1/2” X

MATRIX 320 5MP C-MOUNT ASSEMBLY AND ACCESSORIES

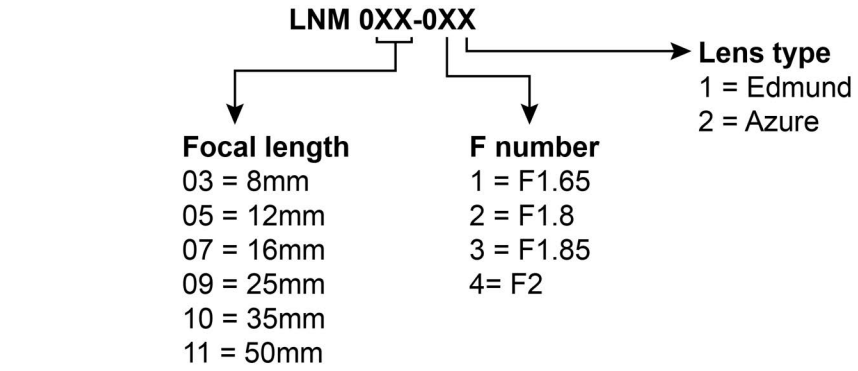
Matrix 320 5mp 800-030 can be assembled in two different configurations:

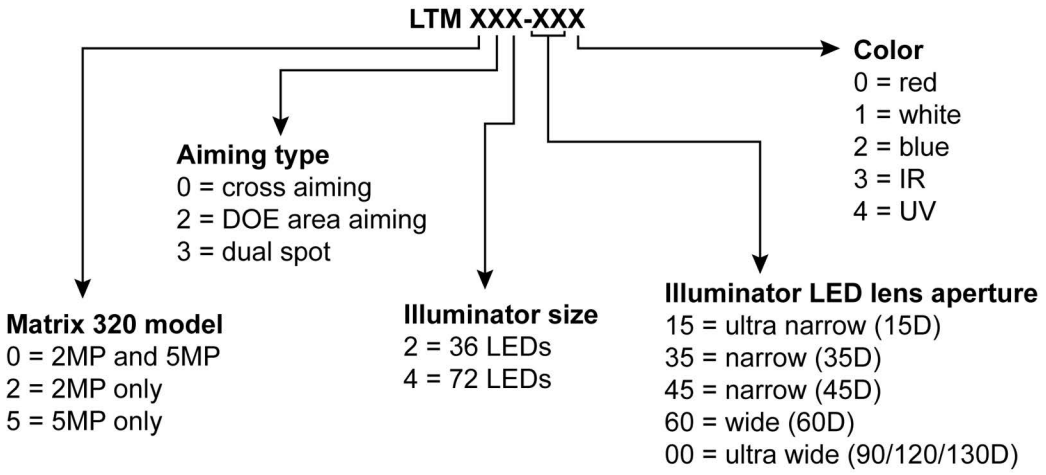
- **Embedded illumination**: base + lens + adapter + illuminator
- **External illumination**: base + lens (+ long or short lens cover)

The following table shows the possible accessories for your assembly.

For the possible combinations of illuminators and lenses, refer to "Illuminators and Lenses Combinations" on page 43.

C-Mount lenses (LNM) and illuminators (LTM) are described by their model number which indicates the characteristics listed in the diagrams below:





Accessory	Description	Order No.
C-Mount Lenses		
LNM 003-021	LNM 003-021 CM 8MM VF1.8 1/2.5" ED	93ACC0287
LNM 005-021	LNM 005-021 CM 12MM VF1.8 1/1.8" ED	93ACC0288
LNM 007-021	LNM 007-021 CM 16MM VF1.8 1/1.8" ED	93ACC0289
LNM 009-031	LNM 009-031 CM 25MM VF1.85 1/1.8" ED	93ACC0290
LNM 010-031	LNM 010-031 CM 35MM VF1.85 1/1.8" ED	93ACC0292
LNM 011-042	LNM 011-042 CM 50MM VF2 2/3" AZ	93ACC0343

Accessory	Description	Order No.
C-Mount Lens Covers		
Short Cover Lens	Cover Lens and CM Base Short M320	93ACC0279
Long Cover Lens	Cover Lens and CM Base Long M320	93ACC0280
Illuminator Kits 36 LED illuminator + illuminator adapter (93ACC0281) + mounting bracket (93ACC0283)		
KIT LTM 002-001	KIT LTM 002-001 S36L 120D WHT white NL	93ACC0391
KIT LTM 002-601	KIT LTM 002-601 S36L 60D WHT white	93ACC0356
KIT LTM 002-451	KIT LTM 002-451 S36L 45D WHT white	93ACC0357
KIT LTM 522-451	KIT LTM 522-451 SA36L 45D WHT white	93ACC0393
KIT LTM 002-351	KIT LTM 002-351 S36L 35D WHT white	93ACC0394
KIT LTM 002-151	KIT LTM 002-151 S36L 15D WHT white	93ACC0395
KIT LTM 002-000	KIT LTM 002-000 S36L 120D RED 625nm NL	93ACC0396
KIT LTM 002-600	KIT LTM 002-600 S36L 60D RED 625nm	93ACC0397
KIT LTM 002-450	KIT LTM 002-450 S36L 45D RED 625nm	93ACC0398
KIT LTM 002-350	KIT LTM 002-350 S36L 35D RED 625nm	93ACC0399
KIT LTM 002-150	KIT LTM 002-150 S36L 15D RED 625nm	93ACC0400
KIT LTM 002-002	KIT LTM 002-002 S36L 120D BLU 475nm NL	93ACC0358
KIT LTM 002-602	KIT LTM 002-602 S36L 60D BLU 475nm	93ACC0359
KIT LTM 002-452	KIT LTM 002-452 S36L 45D BLU 475nm	93ACC0360
KIT LTM 002-352	KIT LTM 002-352 S36L 35D BLU 475nm	93ACC0361
KIT LTM 002-152	KIT LTM 002-152 S36L 15D BLU 475nm	93ACC0362
KIT LTM 002-003	KIT LTM 002-003 S36L 90D IR 850nm NL	93ACC0401
KIT LTM 002-453	KIT LTM 002-453 S36L 45D IR 850nm	93ACC0363
KIT LTM 002-353	KIT LTM 002-353 S36L 35D IR 850nm	93ACC0402
KIT LTM 002-253	KIT LTM 002-253 S36L 25D IR 850nm	93ACC0403
KIT LTM 002-004	KIT LTM 002-004 S36L 130D UV 365nm NL	93ACC0364
36 LED Illuminators		
LTM 002-001	LTM 002-001 S36L 120D WHT white NL	93ACC0294
LTM 002-601	LTM 002-601 S36L 60D WHT white	93ACC0298
LTM 002-451	LTM 002-451 S36L 45D WHT white	93ACC0302
LTM 002-351	LTM 002-351 S36L 35D WHT white	93ACC0306
LTM 002-151	LTM 002-151 S36L 15D WHT white	93ACC0354
LTM 522-451	LTM 522-451 SA36L 45D WHT white	93ACC0329
LTM 002-000	LTM 002-000 S36L 120D RED 625nm NL	93ACC0293
LTM 002-600	LTM 002-600 S36L 60D RED 625nm	93ACC0297

Accessory	Description	Order No.
LTM 002-450	LTM 002-450 S36L 45D RED 625nm	93ACC0301
LTM 002-350	LTM 002-350 S36L 35D RED 625nm	93ACC0305
LTM 002-150	LTM 002-150 S36L 15D RED 325nm	93ACC0353
LTM 002-002	LTM 002-002 S36L 120D BLU 475nm NL	93ACC0295
LTM 002-602	LTM 002-602 S36L 60D BLU 475nm	93ACC0299
LTM 002-452	LTM 002-452 S36L 45D BLU 475nm	93ACC0303
LTM 002-352	LTM 002-352 S36L 35D BLU 475nm	93ACC0307
LTM 002-152	LTM 002-152 S36L 15D BLU 475nm	93ACC0355
LTM 002-003	LTM 002-003 S36L 90D IR 850nm NL	93ACC0296
LTM 002-453	LTM 002-453 S36L 45D IR 850nm	93ACC0300
LTM 002-353	LTM 002-353 S36L 35D IR 850nm	93ACC0304
LTM 002-253	LTM 002-253 S36L 25D IR 850nm	93ACC0308
LTM 002-004	LTM 002-004 S36L 130D UV 365nm NL	93ACC0309
Illuminator Kits 72 LED illuminator + illuminator adapter (93ACC0281) + mounting bracket (93ACC0284)		
KIT LTM 034-601	KIT LTM 034-601 S72L 60D WHT white	93ACC0368
KIT LTM 034-351	KIT LTM 034-351 S72L 35D WHT white	93ACC0369
KIT LTM 034-151	KIT LTM 034-151 S72L 15D WHT white	93ACC0370
KIT LTM 034-602	KIT LTM 034-602 S72L 60D BLU 475nm	93ACC0365
KIT LTM 034-352	KIT LTM 034-352 S72L 35D BLU 475nm	93ACC0366
KIT LTM 034-152	KIT LTM 034-152 S72L 15D BLU 475nm	93ACC0367
72 LED Illuminators		
LTM 034-601	LTM 034-601 S72L 60D WHT white	93ACC0332
LTM 034-351	LTM 034-351 S72L 35D WHT white	93ACC0336
LTM 034-151	LTM 034-151 S72L 15D WHT white	93ACC0340
LTM 034-602	LTM 034-602 S72L 60D BLU 475nm	93ACC0331
LTM 034-352	LTM 034-352 S72L 35D BLU 475nm	93ACC0335
LTM 034-152	LTM 034-152 S72L 15D BLU 475nm	93ACC0339
36 or 72 LED Illuminator Adapter		
Adapter	Adapter LT to CM M320	93ACC0281
Covers		
Cover Standard 36L	Cover STD LT 36L M320/P2/P3	93ACC0272
Cover Standard 72L	Cover STD LT 72L M320	93ACC0341
Cover Polarizer 36L	Cover Polarizer LT 36L M320/P2/P3	93ACC0274

Accessory	Description	Order No.
Cover Polarizer 72L	Cover Polarizer LT 72L M320	93ACC0342
Cover UV 36L	Cover UV LT 36L M320/P2/P3	93ACC0277
Filters		
Filter Yag 36L	Filter Yag Cut LT 36L M320/P2/P3	95A900022
Filter Red 36L	Filter RED Bp 635nm LT 36L M320/P2/P3	95A900019
Filter Blu 36L	Filter BLU Bp 470nm LT 36L M320/P2/P3	95A900020
Filter IR 36L	Filter IR Bp 850nm LT 36L M320/P2/P3	95A900021
Filter UV 36L	Filter UV Cut Lp 415nm LT 36L M320/P2/P3	95A900040
Filter IR Cut 36L	Filter IR Cut LT 36L M320/P2/P3	95A900065
Brackets		
BK-32-000	BK-32-000 STD FIX BRACKET M320/P2/P3	93ACC0282
BK-32-010	BK-32-010 PIVOT FIX BRACKET M320/P2/P3	93ACC0283
BK-32-020	BK-32-020 FAST REPLACEMENT BRACKET M320	93ACC0284
BK-32-030	BK-32-030 SAFETY BRACKET ROT-CON M320	93ACC0479
Cables		
CAB-DS01-S	M12-IP67 Cable To CBX or QL (1M)	93A050058
CAB-DS03-S	M12-IP67 Cable To CBX or QL (3M)	93A050059
CAB-DS05-S	M12-IP67 Cable To CBX or QL (5M)	93A050060
CAB-DS10-S	M12-IP67 Cable to CBX or QL (10M)	93A051390
CAB-GD03	CAB-GD03 M12 F/L 3M	93A050076
CAB-GD05	CAB-GD05 M12 F/L 5M	93A050077
CAB-GD10	CAB-GD10 M12 F/L 10M	93A050078
CAB-LP-03	CAB-LP-03 LIGHTING POWER 3M	93A050033
CAB-LP-05	CAB-LP-05 LIGHTING POWER 5M	93A050037
CAB-F-M12-17P01	M12-IP67 17p Flexible Cable To CBX or QL (1M)	93A050116
CAB-F-M12-17P03	M12-IP67 17p Flexible Cable To CBX or QL (3M)	93A050117
CAB-F-M12-17P05	M12-IP67 17p Flexible Cable To CBX or QL (5M)	93A050118
CAB-ETH-X-M01	M12-IP67 GIGA Ethernet Cable X-Coded (1M)	93A050122
CAB-ETH-X-M03	M12-IP67 GIGA Ethernet Cable X-Coded (3M)	93A050123
CAB-ETH-X-M05	M12-IP67 GIGA Ethernet Cable X-Coded (5M)	93A050124
CAB-ETH-X-M10	M12-IP67 GIGA Ethernet Cable X-Coded (10M)	93A050140
CAB-F-ETH-X-M01	M12-IP67 GIGA Ethernet Flexible Cable X-Coded (1M)	93A050125
CAB-F-ETH-X-M03	M12-IP67 GIGA Ethernet Flexible Cable X-Coded (3M)	93A050126
CAB-F-ETH-X-M05	M12-IP67 GIGA Ethernet Flexible Cable X-Coded (5M)	93A050127

Accessory	Description	Order No.
CAB-ETH-X-RJ	Adapter Cable Full GETH-X to RJ45	93A050141
CBL-1480-0.3	CBL-1480-0.3 M12/5P MALE/FEM. 0.3M IDNET	93A050048
CBL-1480-01	CBL-1480-01 M12/5P MALE/FEM. 1M IDNET	93A050049
CBL-1480-02	CBL-1480-02 M12/5P MALE/FEM. 2M IDNET	93A050050
CBL-1480-03	CBL-1480-03 M12/5P MALE/FEM. 3M IDNET	93A050143
CBL-1480-05	CBL-1480-05 M12/5P MALE/FEM. 5M IDNET	93A050051
CBL-1490	Term. Resist. Thin M12/5P/Male	93A050046
CBL-1496	Term. Resist. Thin M12/5P/Female	93A050047
Connectivity		
CBX100	Compact Connection Box	93A301067
CBX500	Modular Connection Box	93A301068
BM100	Backup Module for CBX100/500	93ACC1808
BM150	Display Module for CBX500	93ACC1809
EBC	EBC Connection Module [a]	93ACC0314
Various Fieldbus Host Interface Modules and All-In-One Connection Box Kits are available		
BA100	DIN Rail Adapters	93ACC1821
BA200	Bosch and 80/20 Profile Adapters	93ACC1822
Various M12 Panel Connectors for CBX Connection Boxes are available		
BA900	Two Cable Glands Panel	93ACC1847
QL100	Quick Link Slave ID-NET T-Connector	93ACC1860
QL150	Quick Link Slave ID-NET + Service T-Connector	93ACC1868
QL200	Quick Link Slave ID-NET + Power T-Connector	93ACC1861
QL300	Quick Link Master ID-NET - Serial Host Connector	93ACC1862
QLM500	Quick Link Metal Master ID-NET - Ethernet/IP Gateway	93ACC0037
QLM600	Quick Link Metal Master ID-NET - Profibus Gateway	93ACC0033
QLM700	Quick Link Metal Master ID-NET - Profinet I/O Gateway	93ACC0038
Various M12 Service Cables and Field Mount Connectors are available for Quick Link Series Connectors		
Power Supplies		
PG6002	AC/DC Power Supply Unit (US)	93ACC1718
PG6001	AC/DC Power Supply Unit (UK)	93ACC1719
PG6000	AC/DC Power Supply Unit (EU)	93ACC1720
Sensors		
MEP-593	Photocell Kit PNP (PH-1)	93ACC1791

Accessory	Description	Order No.
MEP-543	Photocell Kit-NPN	93ACC1728
S3Z-PR-5-C11-PL	Diffuse Proximity Sensor	95B010011
External Mirrors		
EMK-MTX-380	External Mirror - 380 mm	93ACC0086
EMK-TMX-600	External Mirror XRF410N - 600 mm	93ACC0116

a. Refer to Appendix C for information on the EBC Connection Module™.

Illuminators and Lenses Combinations

The following table shows the optimal combinations of illuminators and lenses for Matrix 320 5mp C-Mount imager assembly.

Illuminator Models	C-Mount Lens Focal Length					
	8mm	12mm	16mm	25mm	35mm	50mm
LTM 034-60x BLUE/WHITE	X	X				
LTM 034-35x BLUE/WHITE			X			
LTM 034-15x BLUE/WHITE				X	X	X
LTM 002-60x BLUE/WHITE/RED	X					
LTM 002-45x BLUE/WHITE/RED		X				
LTM 002-35x BLUE/WHITE/RED			X			
LTM 002-15x BLUE/WHITE/RED				X	X	X
LTM 522-451 SA36L 45D WHITE		X	X			
LTM 002-003 S36L 90D IR 850nm NL	X					
LTM 002-453 S36L 45D IR 850nm NL		X				
LTM 002-353 S36L 35D IR 850nm NL			X			
LTM 002-253 S36L 25D IR 850nm NL				X	X	X
LTM 002-004 S36L 130D UV 365nm NL	X	X	X	X	X	X

APPLICATION EXAMPLES

Document Handling

Matrix 320 5mp is profitably used in the omnidirectional reading of 2D, stacked, linear and postal codes for example in automated document handling and mail processing systems.



Figure 23 - Address Coded in Data Matrix Symbology for Automated Mail Processing

Multiple Reading in a Single Image

The Matrix 320 5mp high resolution image sensors allow the reading of many small codes in a single image.

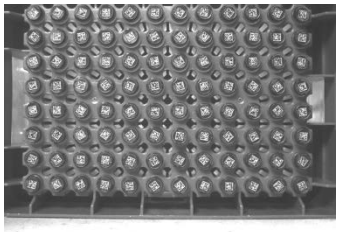


Figure 24 - 96-Vial Rack

Deformed or Overprinted Code Reading

Matrix 320 5mp assures the reading of deformed and/or overprinted codes, even though damaged or printed on high reflective surfaces.



Figure 25 - Unidose Flow-Pack with PDF417 Code



Figure 26 - Overprinted Barcode Readable by Matrix 320 5mp also Through the Envelope Window Film



Figure 27 - Barcode Printed on Curved Surface Readable by Matrix 300N in spite of Image Optical Distortion

Direct Part Marking

Matrix 320 5mp is also very powerful in reading low-contrast direct part marked codes.



Figure 28 - Dot Matrix Code Directly Marked on Metal Surface by Using Dot Peening Technology

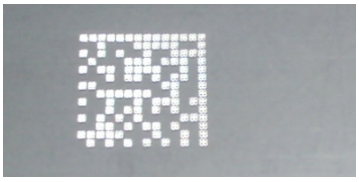


Figure 29 - Dot Peening Marking on Metal Surface with Multi-dot per Code Element



Figure 30 - Directly Marked Dot Matrix Code Characterized by Outstanding Separation Distance between Adjacent Code Elements

Ink-Jet Printing Technology

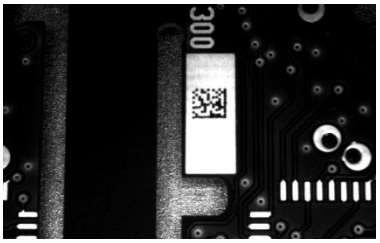


Figure 31 - Dot Matrix Code Directly Marked on PCB Copper Pad by Using Ink-Jet Technology

Laser Marking/Etching Technology



Figure 32 - Data Matrix Code Directly Marked on PCB Surface by Using Laser Etching Technology

CAUTION: If application codes must be read which are produced by Laser Marking in real time, use the correct diameter accessory YAG Cut Filter with the Matrix 320 5mp reader in order to avoid burning the sensor.

High Dynamic Range (HDR) feature

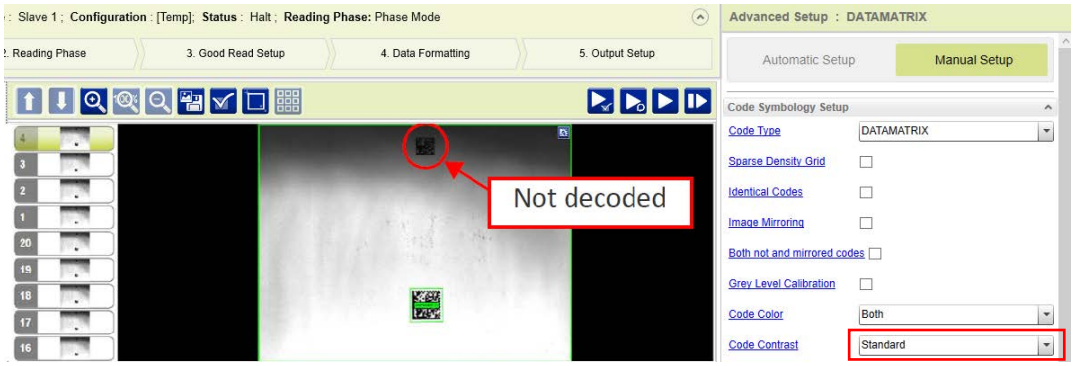
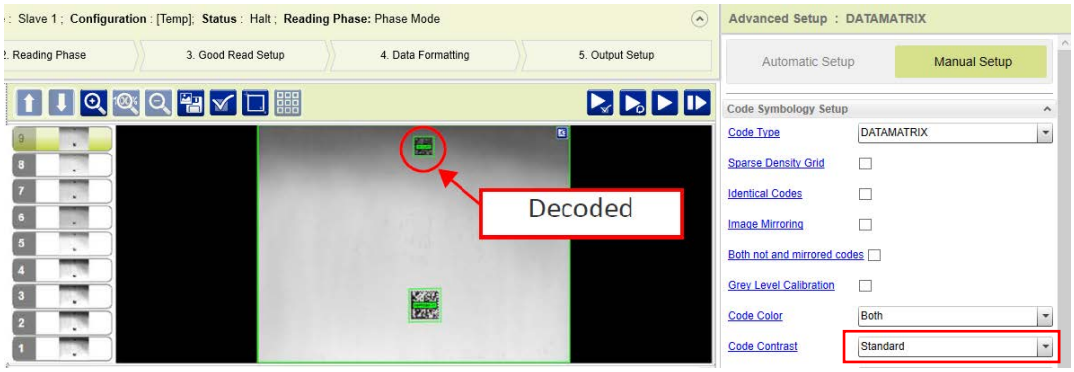
Matrix 320 5mp supports the High Dynamic Range (HDR) feature. HDR performs an image dynamic correction where low intensity pixel values are enhanced, thus improving image contrast and code readability.

This feature proves particularly useful in the following cases:

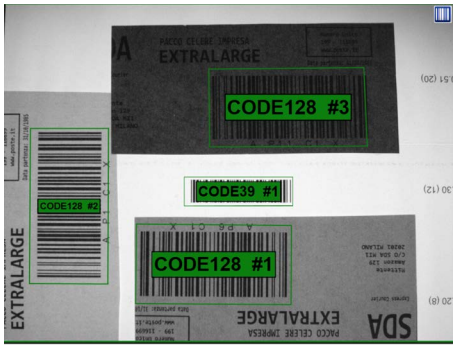
- To adjust contrast when the outer area of the image is less exposed than the central area because of a large **Skew angle**:

HDR disabled	HDR enabled
	

- To adjust contrast at the FoV edges when **illumination is not homogeneous**. The HDR feature helps normalize image contrast allowing the use of Standard Contrast decoding:

HDR disabled	
HDR enabled	

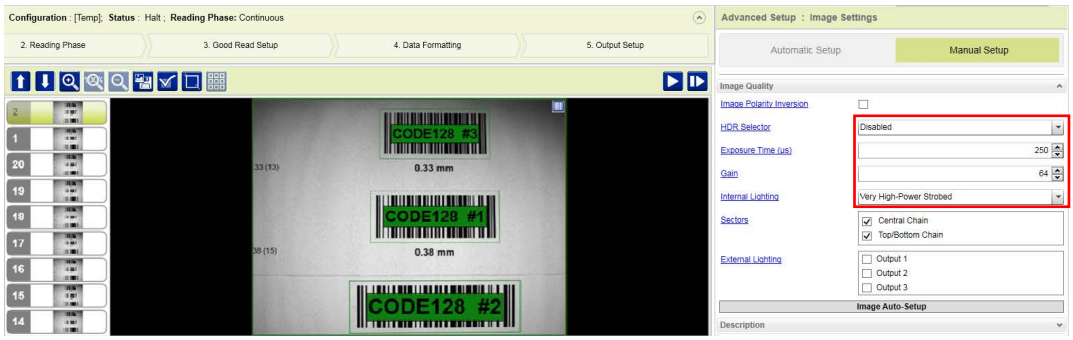
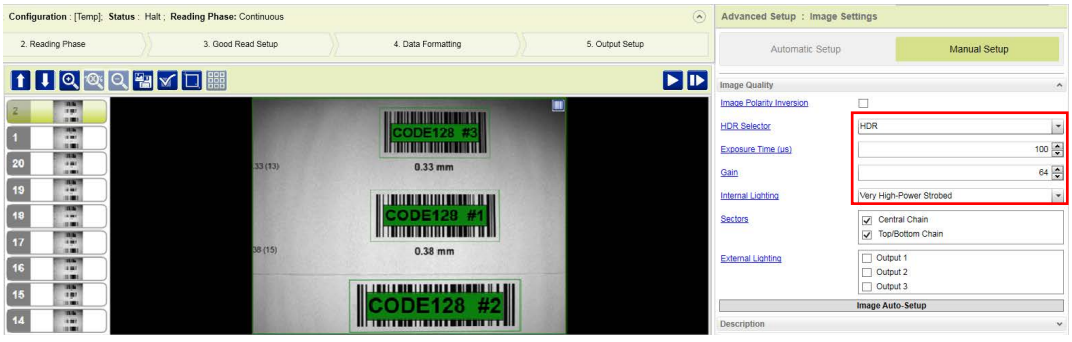
- To improve decodability when the FoV includes codes with **different levels of contrast**:

HDR disabled	HDR enabled
	

In the example above, when HDR is disabled only two out of four codes are decoded. After enabling HDR, all four codes are decoded.

- In **high speed applications**, because Exposition Time can be reduced when HDR is enabled. The allowed Exposition Time (T_{exp}) must be less than the code resolution (**X**) divided by the line speed (**LS**):

$$T_{exp} < (X/ LS)$$

HDR disabled	
HDR enabled	

In the example above, C128 13 mils (0.33 mm) codes at a distance of 200 mm must be decoded. When HDR is disabled, good image contrast is obtained with the Exposition Time set to 250 µs, which allows a theoretical maximum application speed of 1320 mm/s. When HDR is enabled, the Exposure Time can be reduced to 100 µs, which allows a theoretical maximum application speed of 3300 mm/s.

For more details on line speed and exposure time calculations, refer to "Maximum Line Speed and Exposure Time Calculations" on page 146.

To enable the HDR function on DL.CODE, go to Advanced Setup>Image Settings>Image Quality>HDR Selector, then select HDR.

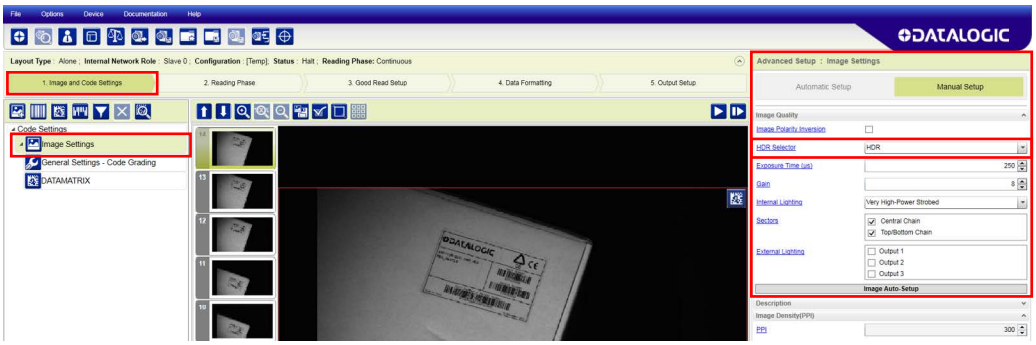


Figure 33 - Enabling HDR on DL.CODE

UV Fluorescence application

Matrix 320 can come with a UV illuminator accessory (LTM 002-004, refer to "Matrix 320 5mp C-Mount Assembly and Accessories" on page 38). This illuminator is designed for applications using UV-sensitive fluorescent inks, which re-emit in the visible spectrum.

During fluorescence imaging, the item being inspected absorbs a shorter wavelength of light (usually ultraviolet light) that excites a specific fluorophore, causing it to release photons that fluoresce and emit light at a longer wavelength.

UV fluorescence applications require a filter that blocks the UV light source, transmitting only the weaker fluorescence emission.

Please note that in UV fluorescence applications, the filter is used for passing the fluorescence emission wavelength and blocking the excitation light source.

Common fluorescent excitations include 365nm, 395nm and 400nm.

Datalogic offers filters dedicated to the fluorescence emission wavelength (typically blue or red) as well as a generic anti-UV filter. For a complete list, refer to "Matrix 320 5mp C-Mount Assembly and Accessories" on page 38.



WARNING: The UV illuminator shall only be used by skilled persons using a personal safeguard (PPE, safety goggles).

CHAPTER 3
INSTALLATION

PACKAGE CONTENTS

Verify that the Matrix 320 5mp reader and all the parts supplied with the equipment are present and intact when opening the packaging.

The list of parts for Matrix 320 5mp 800-030 includes:

- Matrix 320 5mp reader
- Matrix 320 C-Mount Quick Reference Guide
- Matrix 320 C-Mount Mounting Instructions
- Test Charts (2)
- Mounting Kit
  - Mounting Screws (4+3)
  - Washers (4+3)
  - Mounting Brackets (BK-32-000 Standard Fix Bracket for Matrix 320 without illuminator)
- Heat sink (1)

MECHANICAL DIMENSIONS

Matrix 320 5mp can be installed to operate in different positions. The four screw holes (M4 x 8 mm) on the body of the reader are for mechanical fixture.

The diagrams below give the overall dimensions of the reader and may be used for its installation.

Refer to page 62 for various mounting solutions and correct positioning, and Chapter 6, Reading Features for FOV vs. Reading Distance considerations.

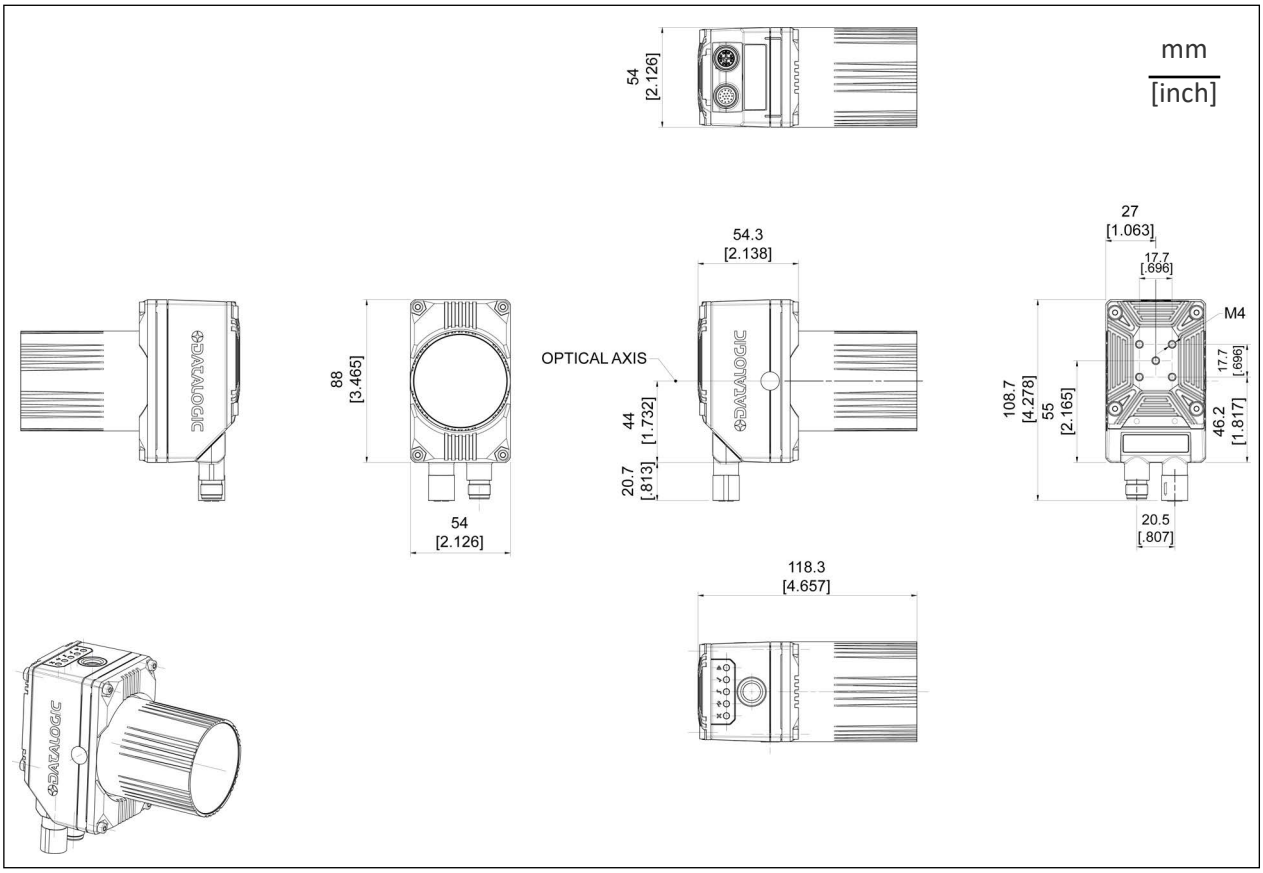


Figure 34 - Matrix 320 without illuminator (connectors 0°)

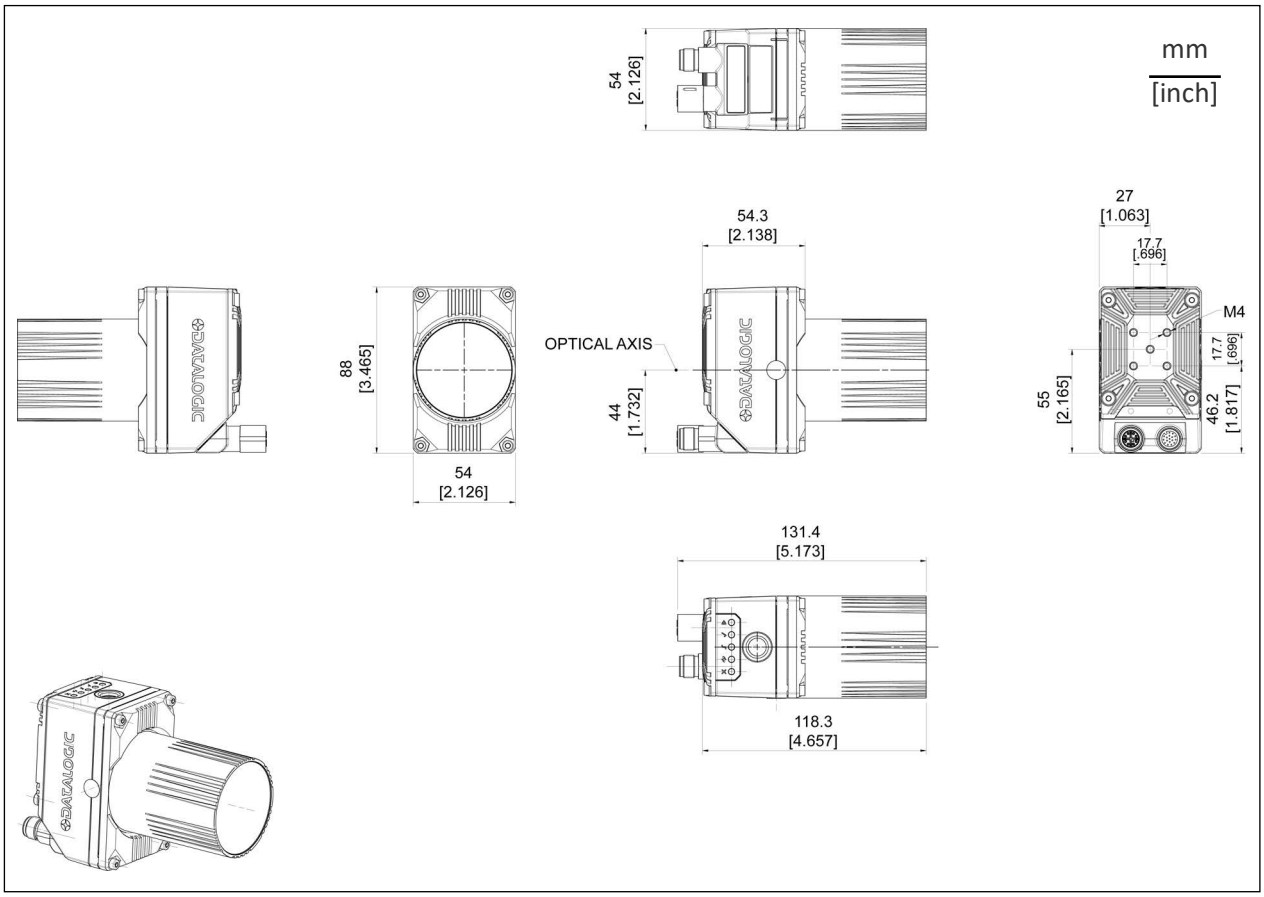


Figure 35 - Matrix 320 without illuminator (connectors 90°)

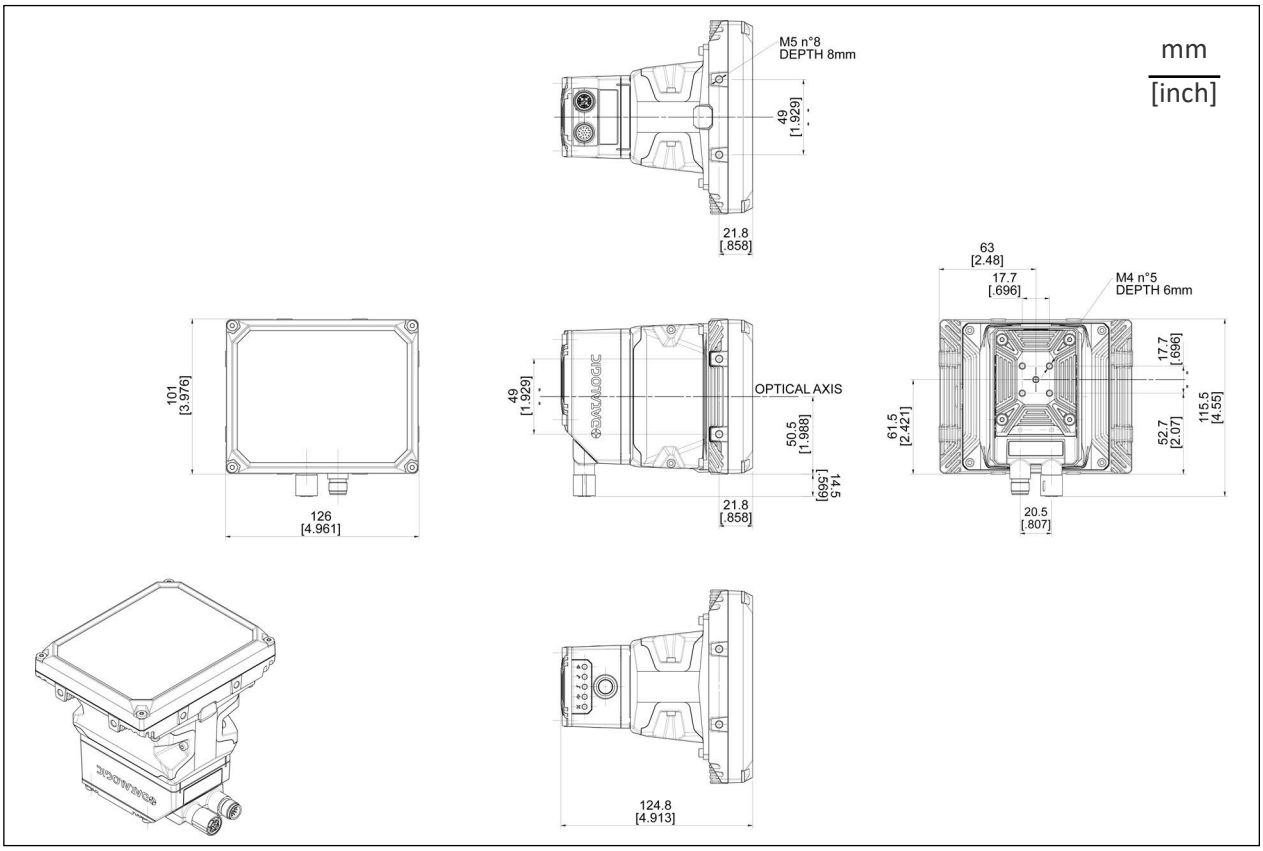


Figure 36 - Matrix 320 with 36 LEDs illuminator (connectors 0°)

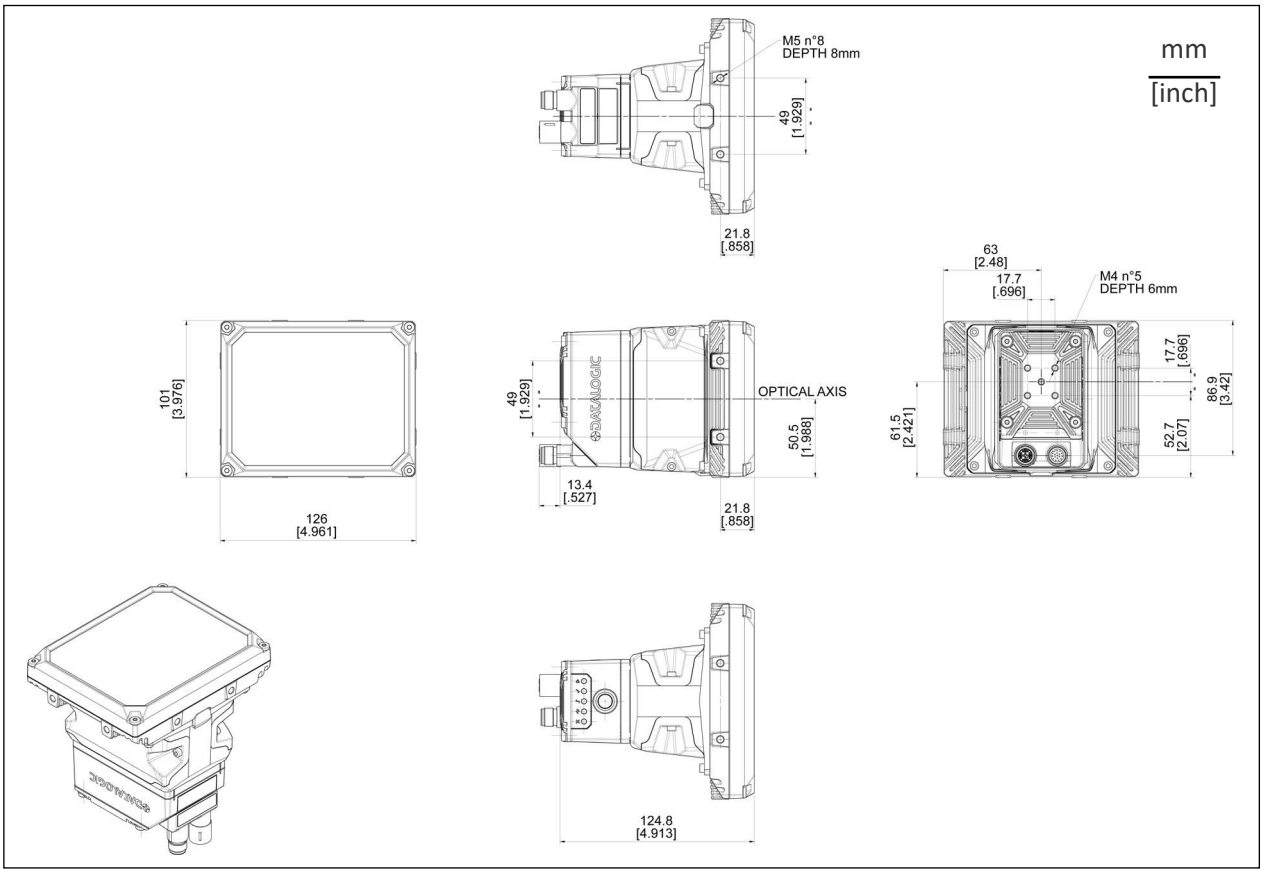


Figure 37 - Matrix 320 with 36 LEDs illuminator (connectors 90°)

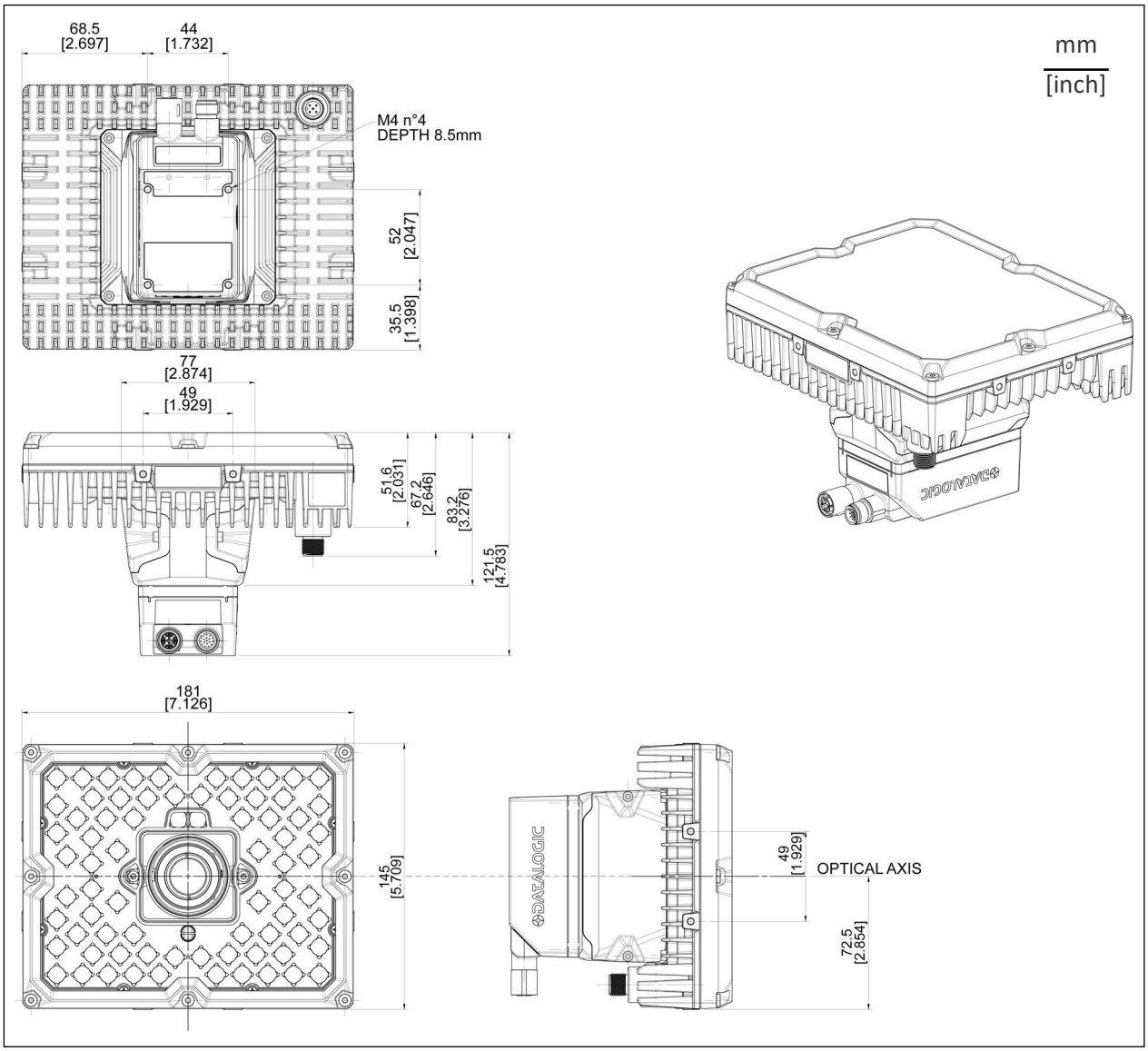


Figure 38 - Matrix 320 with 72 LEDs illuminator (connectors 0°)

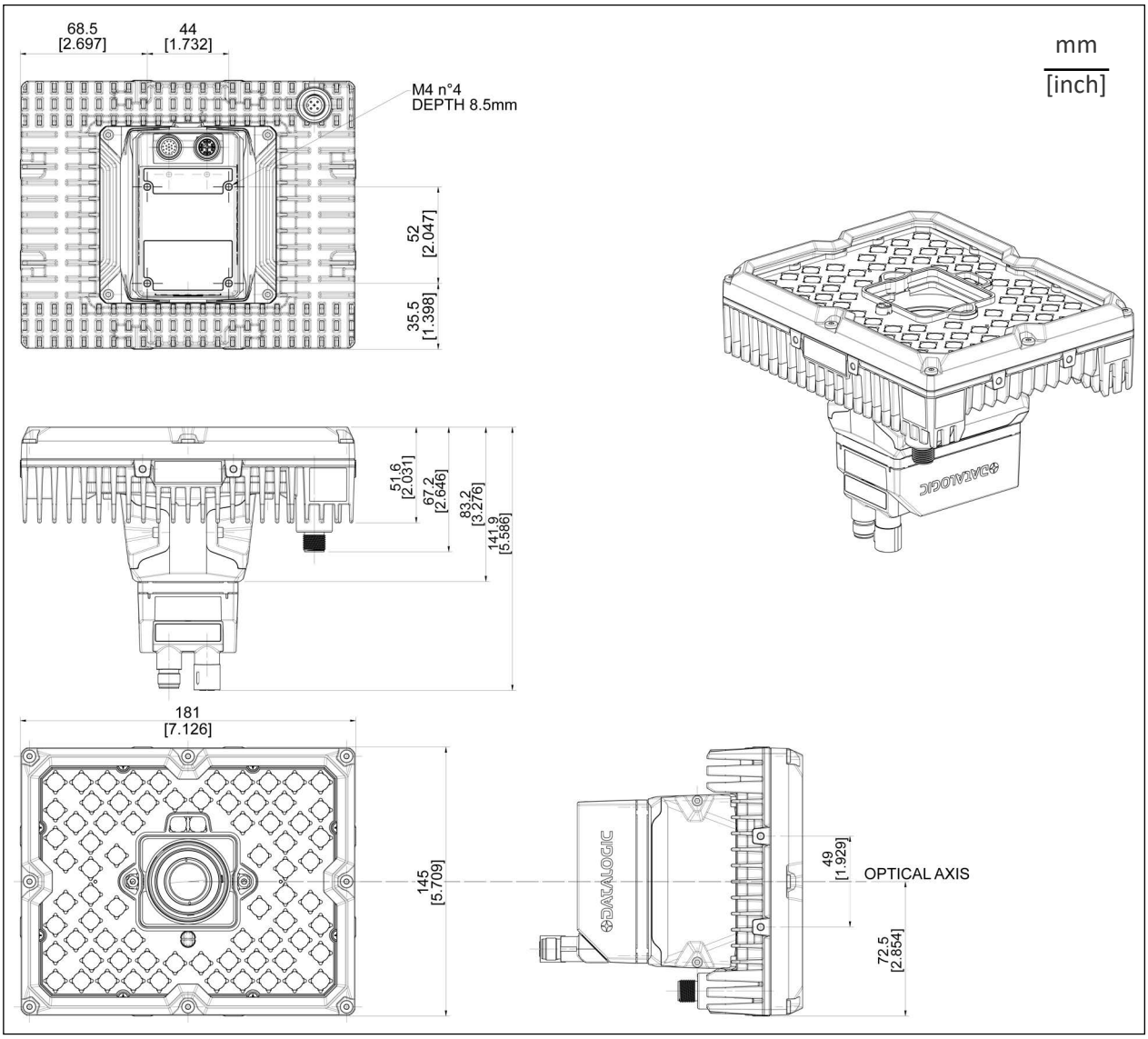


Figure 39 - Matrix 320 with 72 LEDs illuminator (connectors 90°)

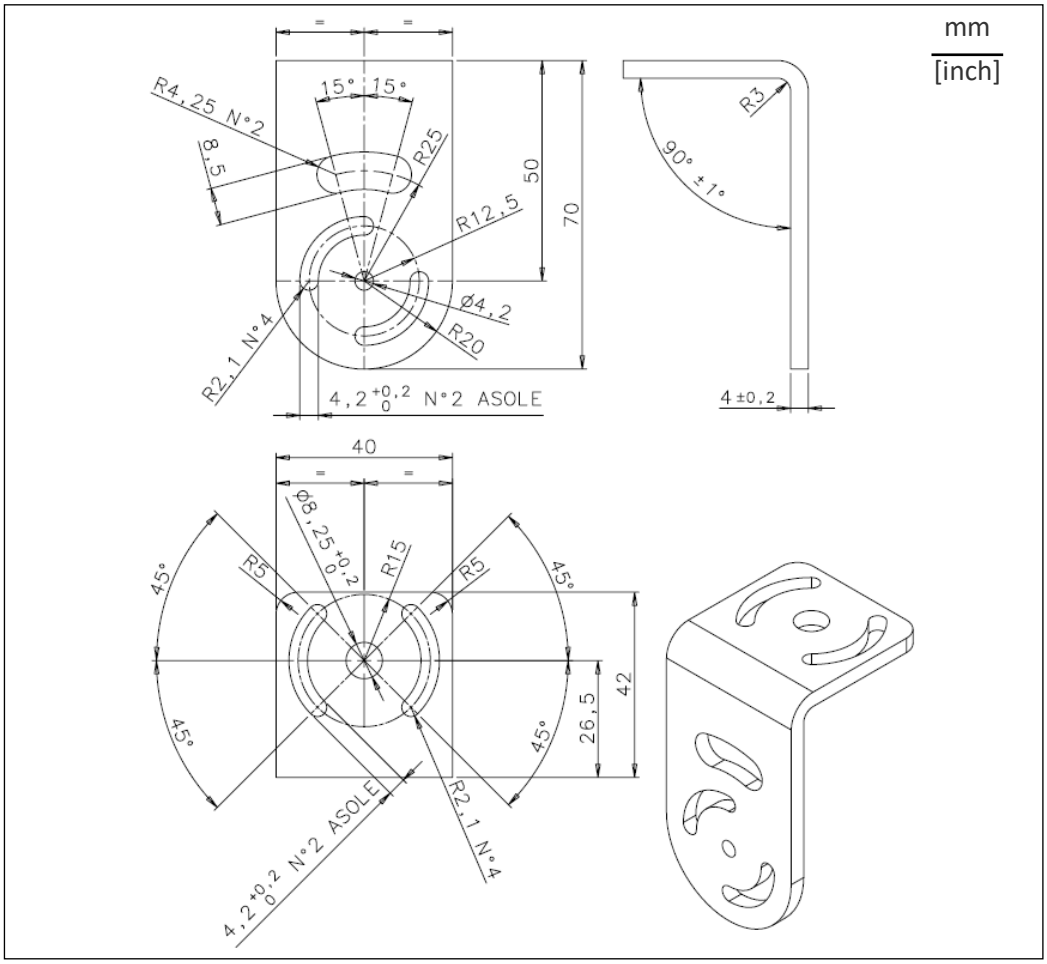


Figure 40 - Overall Dimensions: BK-32-000 Standard Fix Bracket for Matrix 320 without illuminator

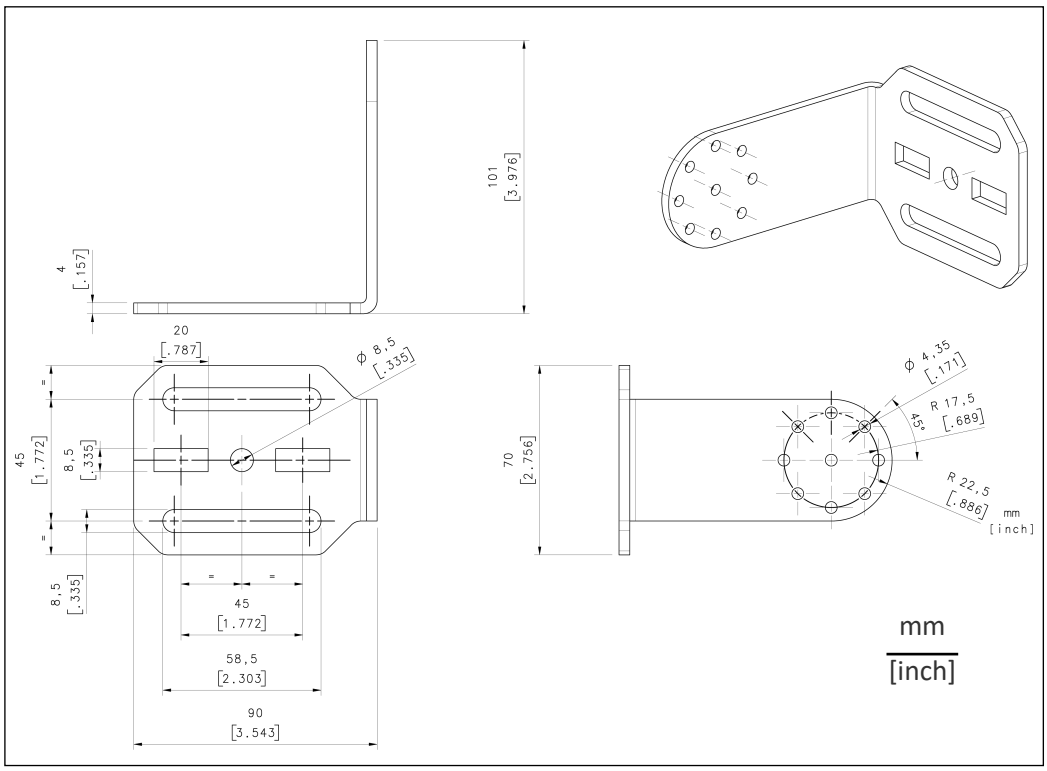


Figure 41 - Overall Dimensions: BK-32-010 Pivot Fix Bracket (1) for Matrix 320 with 36 LEDs illuminator

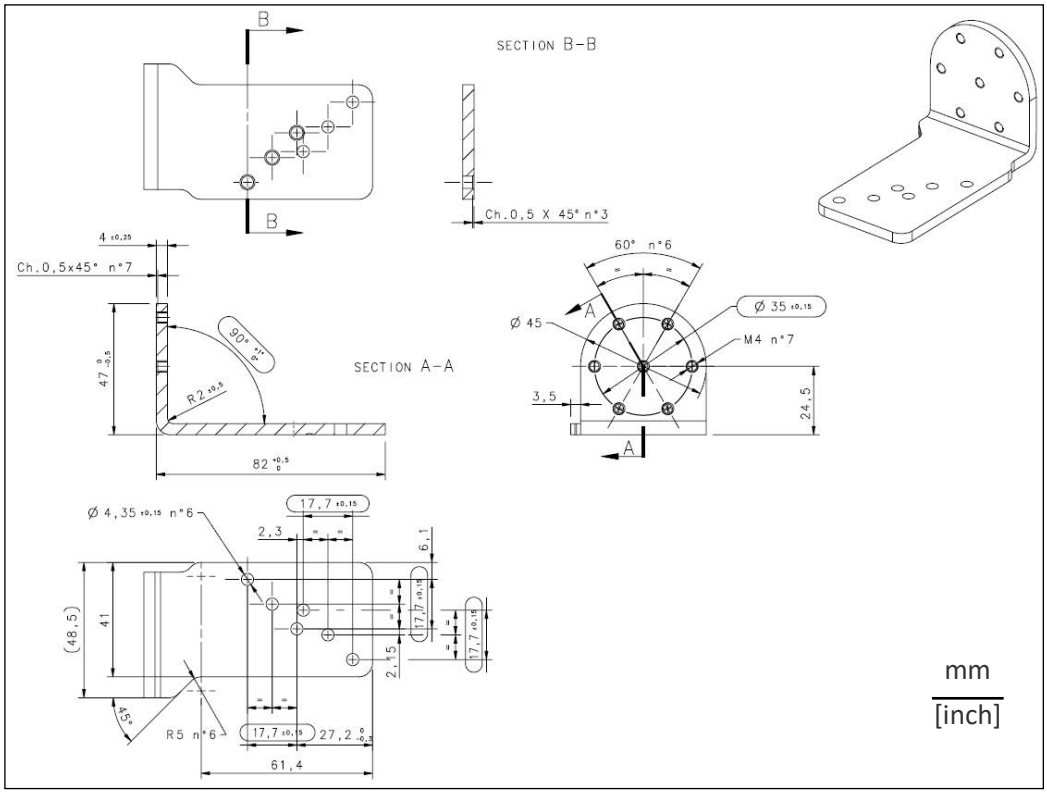


Figure 42 - Overall Dimensions: BK-32-010 Pivot Fix Bracket (2) for Matrix 320 with 36 LEDs illuminator

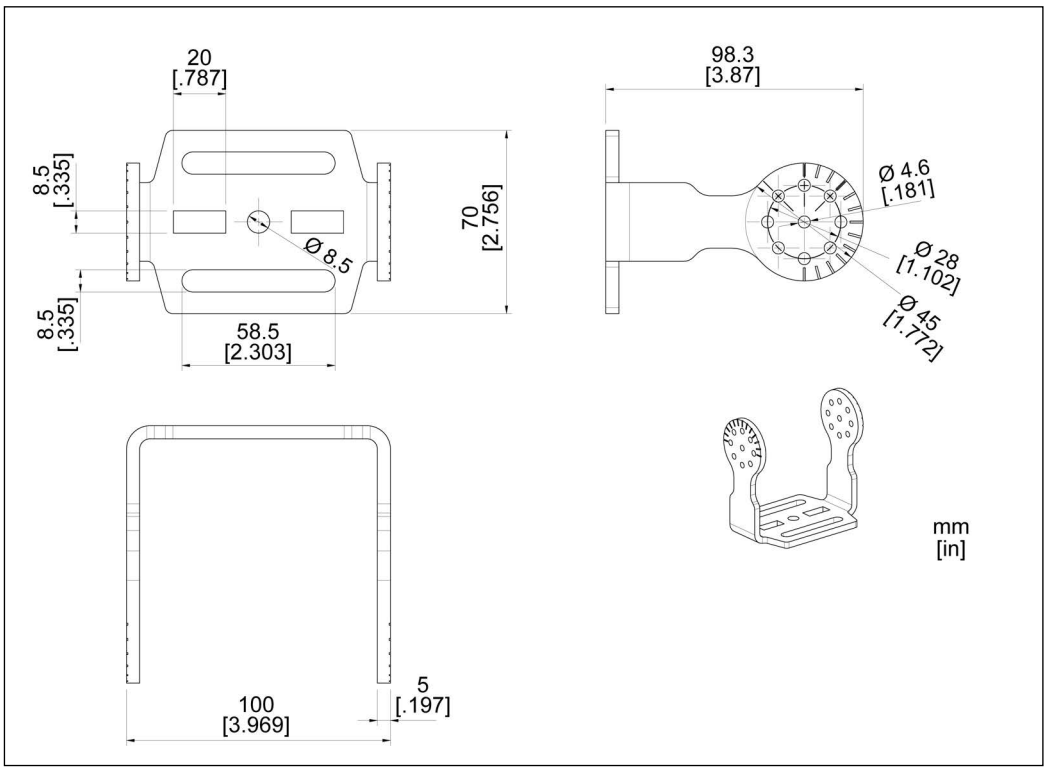


Figure 43 - Overall Dimensions: BK-32-020 Fast Replacement Bracket (1) for Matrix 320 with 72 LEDs illuminator

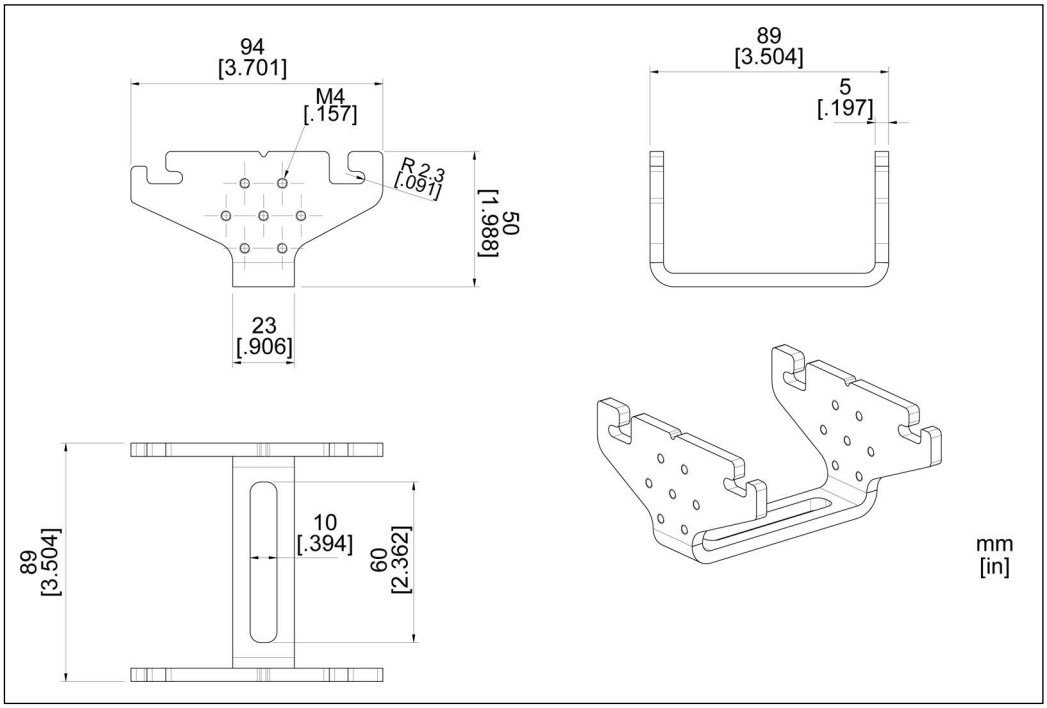


Figure 44 - Overall Dimensions: BK-32-020 Fast Replacement Bracket (2) for Matrix 320 with 72 LEDs illuminator

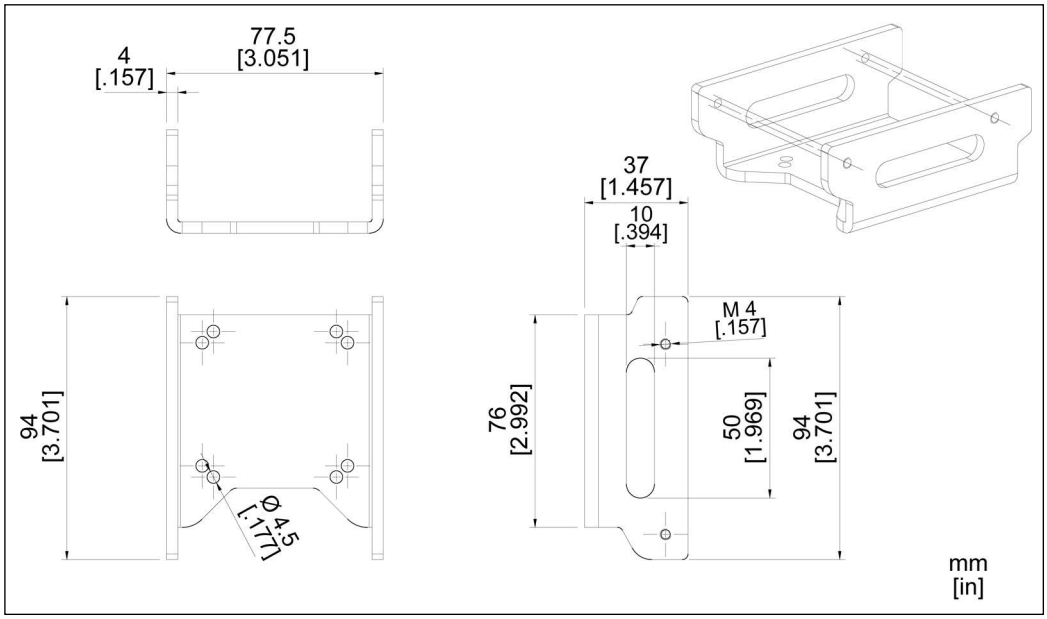


Figure 45 - Overall Dimensions: BK-32-020 Fast Replacement Bracket (3) for Matrix 320 with 72 LEDs illuminator

MOUNTING AND POSITIONING MATRIX 320 5MP

The following accessory mounting brackets are available for mounting and positioning Matrix 320 5mp:

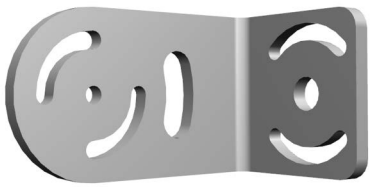


Figure 46 - BK-32-000 Standard Fix Bracket

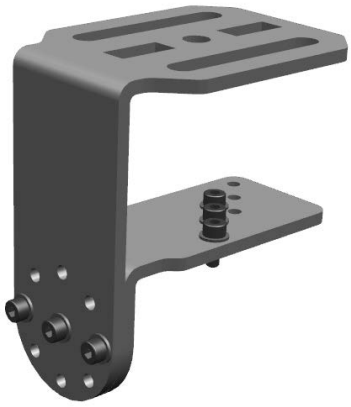


Figure 47 - BK-32-010 Pivot Fix Bracket

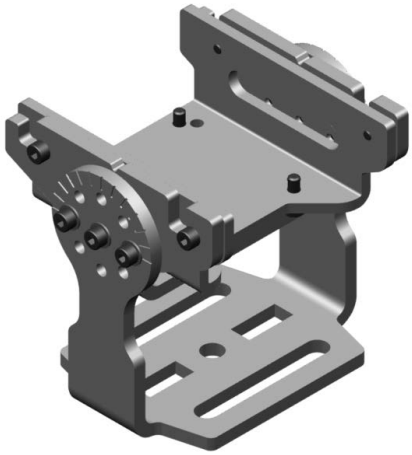


Figure 48 - BK-32-020 Fast Replacement Bracket

NOTE: BK-32-000 Standard Fix Bracket can be used with Matrix 320 without embedded illuminator.
BK-32-010 Pivot Fix Bracket can be used with any Matrix 320 model with 36 LED illuminator.
BK-32-020 Fast Replacement Bracket can be used with any Matrix 320 model with 36 or 72 LED illuminator.

Mounting the BK-32-00 Standard Fix Bracket

NOTE: BK-32-000 Standard Fix Bracket can be used with Matrix 320 models without embedded illuminator.

The package contains the following materials to mount the Standard Fix Bracket:

- 1 Standard Fix Bracket
- 3 silver screws
- 3 silver washers

NOTE: Make sure that the heat sink is already installed on the reader before mounting the bracket (refer to the Heat Sink Mounting Instructions provided in the package).

To install the bracket on the reader, follow this procedure:

1. Insert the silver screws and silver washers through the bracket and thread them loosely into the heat sink. The bracket is provided with curved slots both on the reader side and the frame side, which allow installing the bracket on various axes.

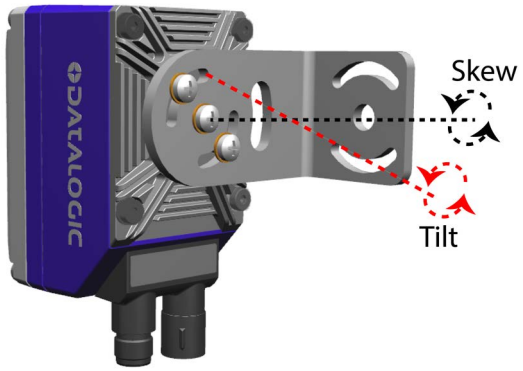


Figure 49 - Positioning with Standard Fix Bracket

2. Tighten the screws.

Mounting the BK-32-010 Pivot Fix Bracket

NOTE: BK-32-010 Pivot Fix Bracket can be used with any Matrix 320 model with 36 LED illuminator.

The package contains the following materials to mount the Pivot Fix Bracket:

- 1 Pivot Fix Bracket (body side)
- 1 Pivot Fix Bracket (frame side)
- 6 silver screws
- 6 silver washers

NOTE: Make sure that the heat sink is already installed on the reader before mounting the bracket (refer to the Heat Sink Mounting Instructions provided in the package).

The body side of the Pivot Fix Bracket has two hole sets to be used based on the desired installation. The two sets can be identified by the different machining on the holes (see Figure 50):

- SET 1 with countersunk holes, used for Compact Mounting;
- SET 2 with standard holes, used for Extended Mounting.

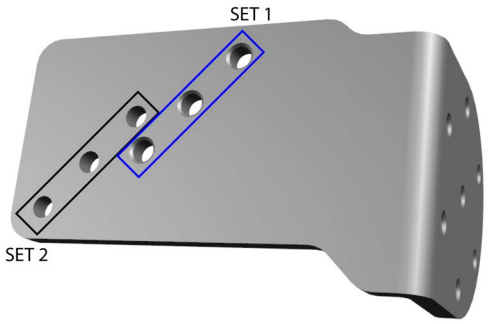


Figure 50 - Pivot Fix Bracket (body side)

Compact Mounting

Compact mounting allows installations with minimal side space and reader optical axis aligned with the bracket central hole.

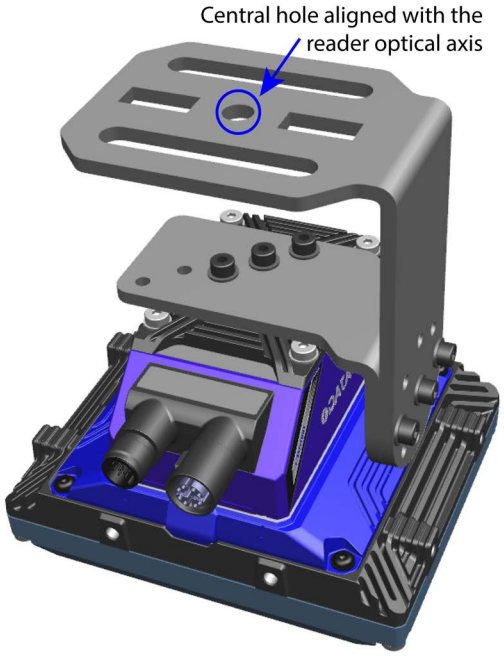


Figure 51 - Compact mounting

Extended Mounting

Extended mounting allows:

- side installations with wider range of tilt angles than compact mounting (because the side bracket frame is outside the reader volume):

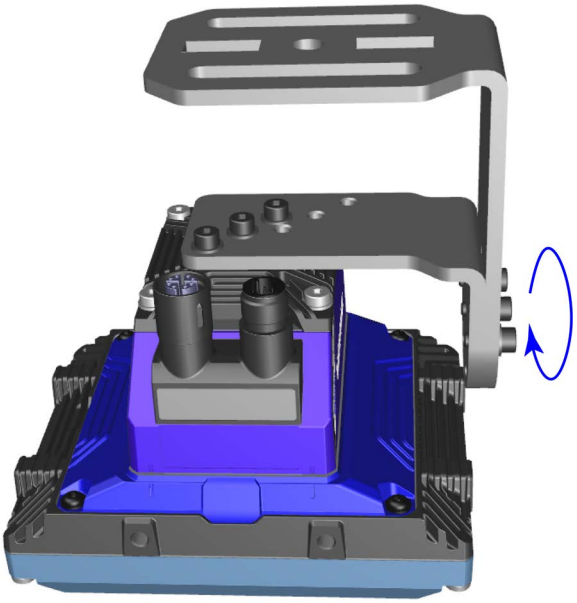


Figure 52 - Extended mounting

- frontal installations:

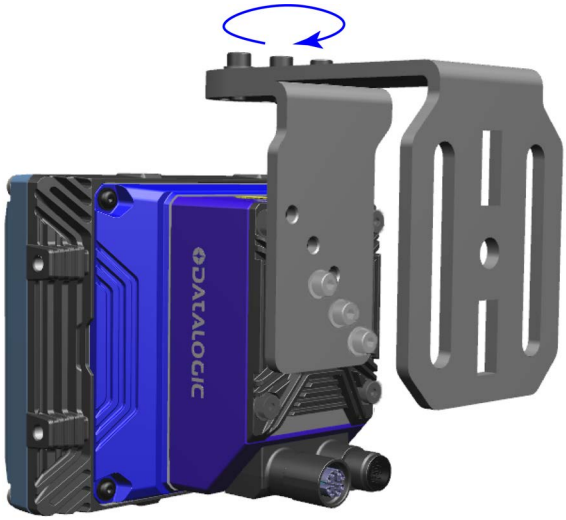


Figure 53 - Front extended mounting

Mount the body side of the Pivot Fix Bracket onto the heat sink of the reader using the proper set of holes depending on the desired mounting.

To correctly couple the body-side bracket and the frame-side bracket, follow this procedure:

1. Insert the silver screw and silver washer through the central hole of the frame bracket. Thread the screw loosely into the body-side bracket. This screw can be used as pivot to ease the rotation of the body bracket.

2. Set the desired skew angle by rotating the body-side bracket and aligning two holes (opposite to the central hole) between the body-side bracket and the frame-side bracket.

3. Tighten two silver screws and two silver washers into the aligned holes to secure the position. Finally tighten the central screw.

NOTE: The particular distribution of the holes on the two brackets allows easy adjustment of the skew angle in steps of 15°.

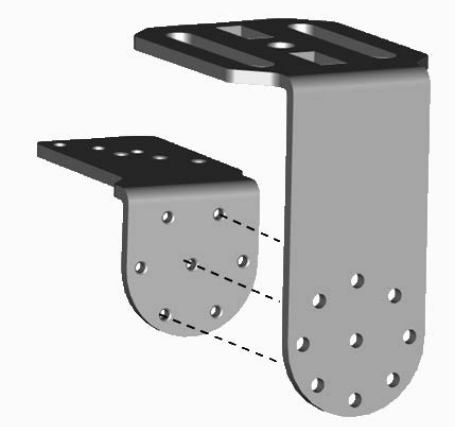
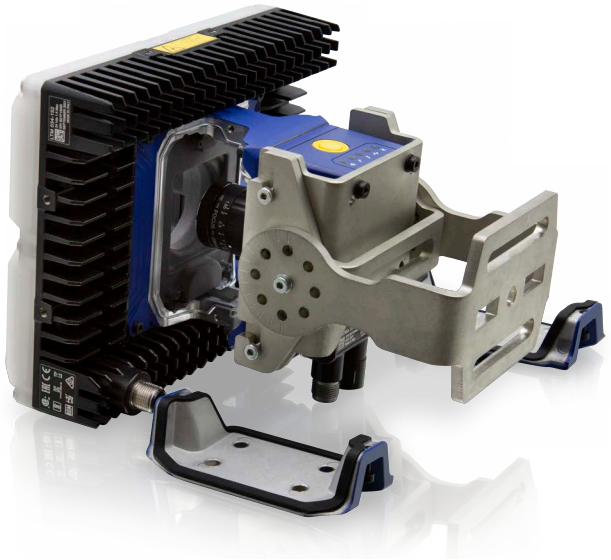


Figure 54 - Skew angle adjustment

Mounting the BK-32-020 Fast Replacement Bracket

NOTE: BK-32-020 Fast Replacement Bracket can be used with any Matrix 320 model with 36 or 72 LED illuminator.



The package contains the following materials to mount the Fast Replacement Bracket:

- 1 Fast Replacing Plate
- 1 Bracket Frame Plate
- 1 Rotating Plate
- 14 screws
- 10 washers

Follow the procedure below to mount the Fast Replacement Bracket:

1. Fix the Fast Replacing Plate to the reader body with four screws and washers on the back side, as shown in Figure 55.

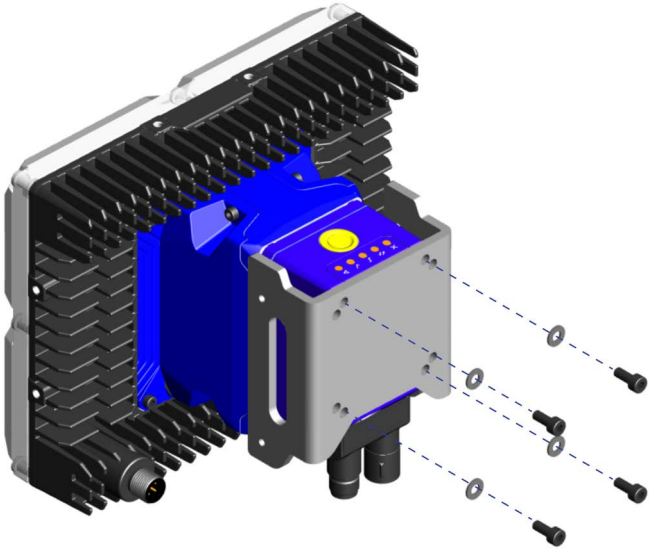


Figure 55 - Mounting the Fast Replacing Plate (1)

2. Insert, without tightening, four screws on the sides of the Fast Replacing Plate, as shown in Figure 56.

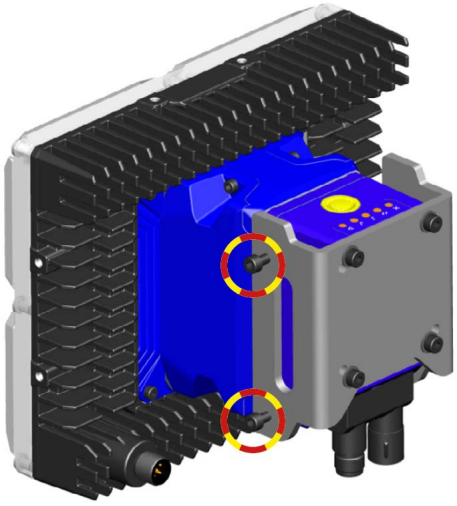
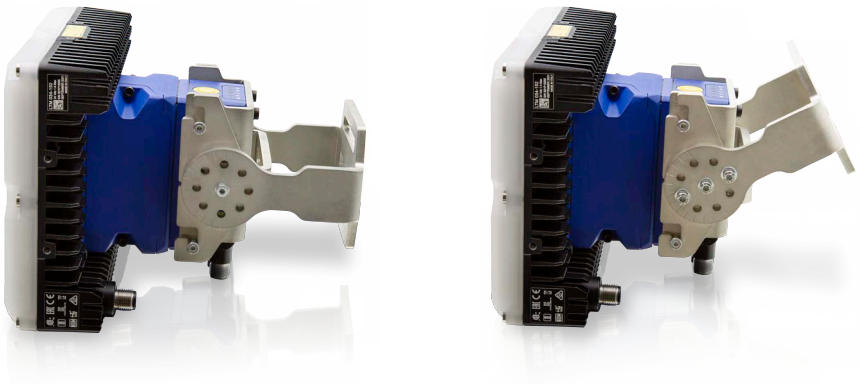


Figure 56 - Mounting the Fast Replacing Plate (2)

NOTE: Once the reader is mounted with the bracket, to disassemble it simply loosen (without removing) the four screws on both sides of the Fast Replacing Plate, as shown in Figure 56.

3. Mount the Frame Plate onto the Rotating Plate using the proper set of holes depending on the desired mounting. To correctly couple the two plates, follow these steps:
   - Align the two plates by inserting a screw and a washer through the central hole on both sides. Thread the screws loosely into the plates. These screws can be used as pivot to ease the rotation of the plates.
   - Set the desired skew angle by rotating the plates and aligning two holes (opposite to the central hole) between the Frame Plate and the Rotating Plate (both sides).
   - Tighten two screws and two washers per side into the aligned holes to secure the position. Finally tighten the central screws.

NOTE: The particular distribution of the holes on the two plates allows easy adjustment of the skew angle in steps of 15°.



4. Fix the Frame Plate + Rotating Plate assembly to the Fast Replacing Plate, as shown in Figure 57, and tighten the four screws on both sides of the Fast Replacing Plate.

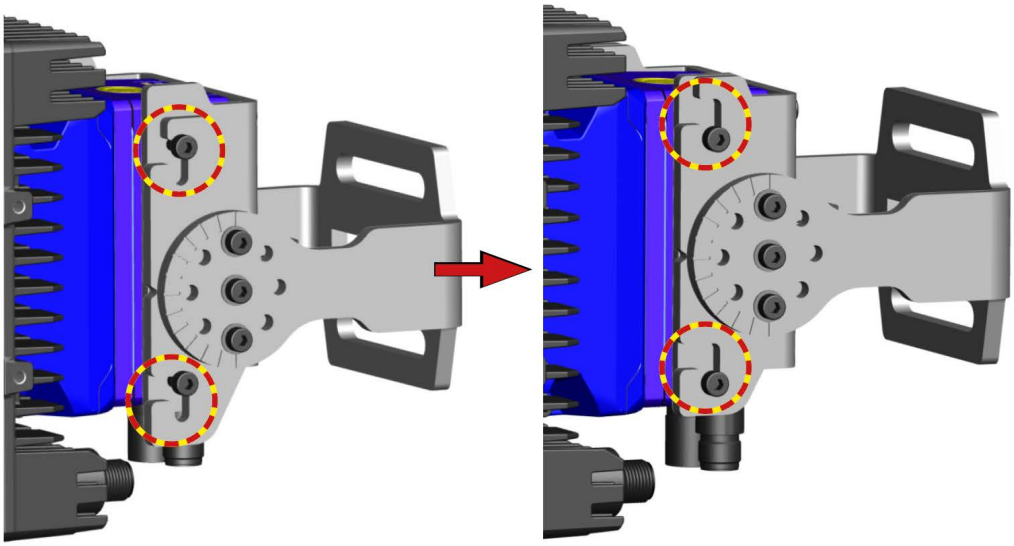


Figure 57 - Mounting the plates together

Your reader is now ready to be integrated in your application environment.

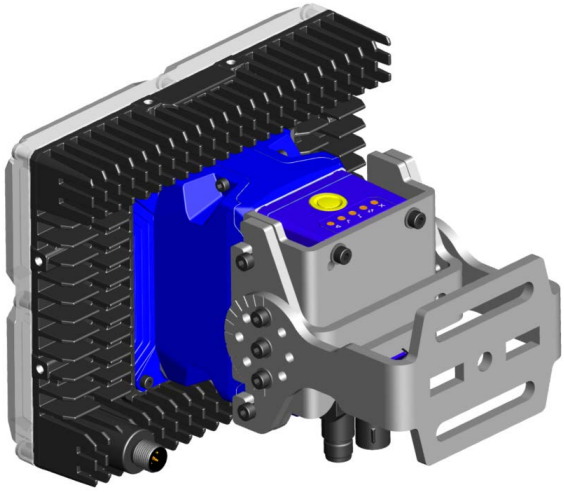


Figure 58 - Matrix 320 with Fast Replacement Bracket

Alternative Mounting

The Fast Replacement Bracket can also be mounted as shown in Figure 59.

To do this, fix the Fast Replacement Plate to the reader with four screws and washers through the right holes on the back side, as shown in Figure 60.

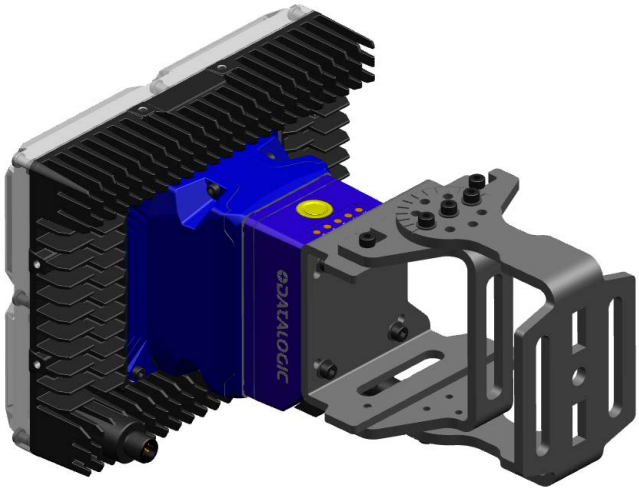
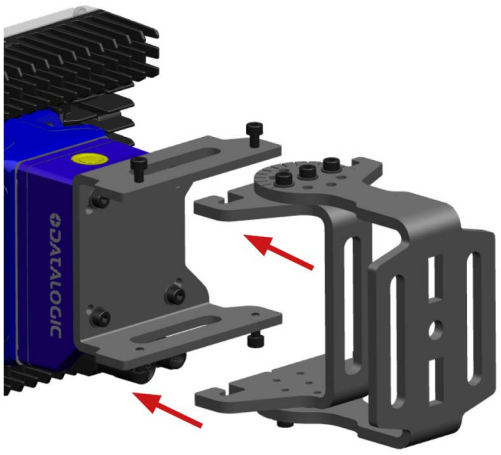


Figure 59 - Matrix 320 with Fast Replacement Bracket (alternative mounting)



Mount the Frame Plate + Rotating Plate assembly as described before.

Then fix the Frame Plate + Rotating Plate assembly to the Fast Replacing Plate, as shown in Figure 60, and tighten the four screws on both sides of the Fast Replacing Plate.

Figure 60 - Alternative mounting

Matrix 320 5mp is able to decode code labels at a variety of angles; however significant angular distortion may degrade reading performance.

When mounting Matrix 320 5mp, take into consideration these **ideal** label position angles: **Pitch or Skew 10° to 20° and Tilt 0°**.

NOTE: Since Matrix 320 5mp is omni-directional on the code plane, the Pitch and Skew angles have the same significance with respect to the code plane. However in some advanced code reading applications performance can be improved by modifying the Skew angle.

The **Pitch, Skew and Tilt** angles are represented in Figure 61. Follow the suggestions below for the best orientation:

Position the reader in order to avoid the direct reflection of the light emitted by the Matrix 320 5mp reader; it is advised to **assure at least 10°** for the Skew angle.

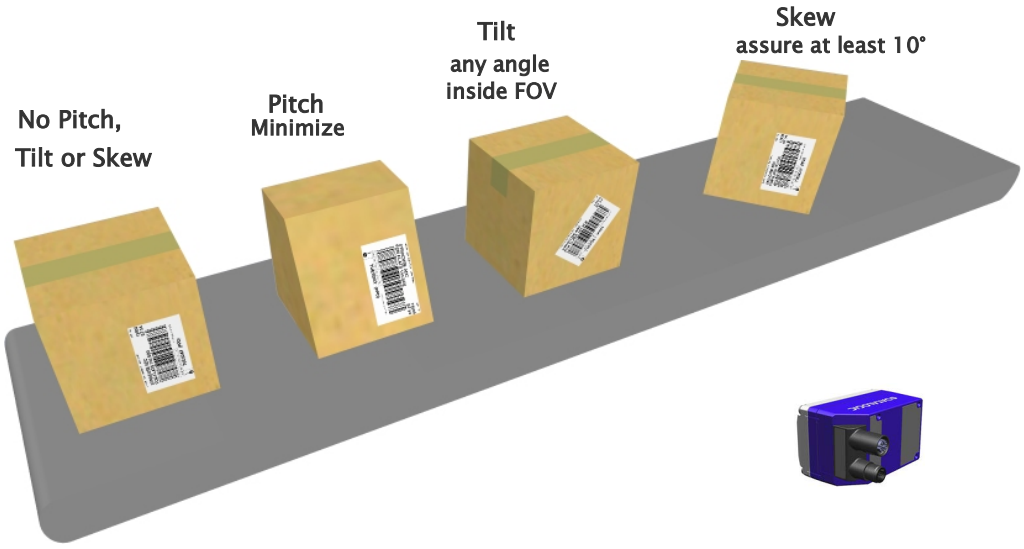


Figure 61 - Pitch, Tilt, and Skew Angles

In some cases, such as low contrast or low illumination, it can be useful to use a **Pitch or Skew** angle = 0°.

The **Tilt** angle is also represented in Figure 61. Matrix 320 5mp can read labels with any tilt angle. Keep in mind however, that since linear barcodes are rectangular, the reader should be aligned to fit them into the horizontal FOV.

See Chapter 6, Reading Features for FOV vs. Reading Distance considerations.

Mounting the BK-32-030 Safety bracket Rot-Con

NOTE: This bracket is particularly useful for applications where the Matrix 320 is mounted on moving equipment, such as robot arms or forklifts. In these scenarios, the rotating connector is exposed to stress caused by cable weight, vibrations, or impacts.

The package contains the following materials to mount the Pivot Fix Bracket:

- 1 Safety Bracket
- 2 O-Ring
- 4 M4x10 DIN 7984 screws
- 2 Elastic spacer in Poron

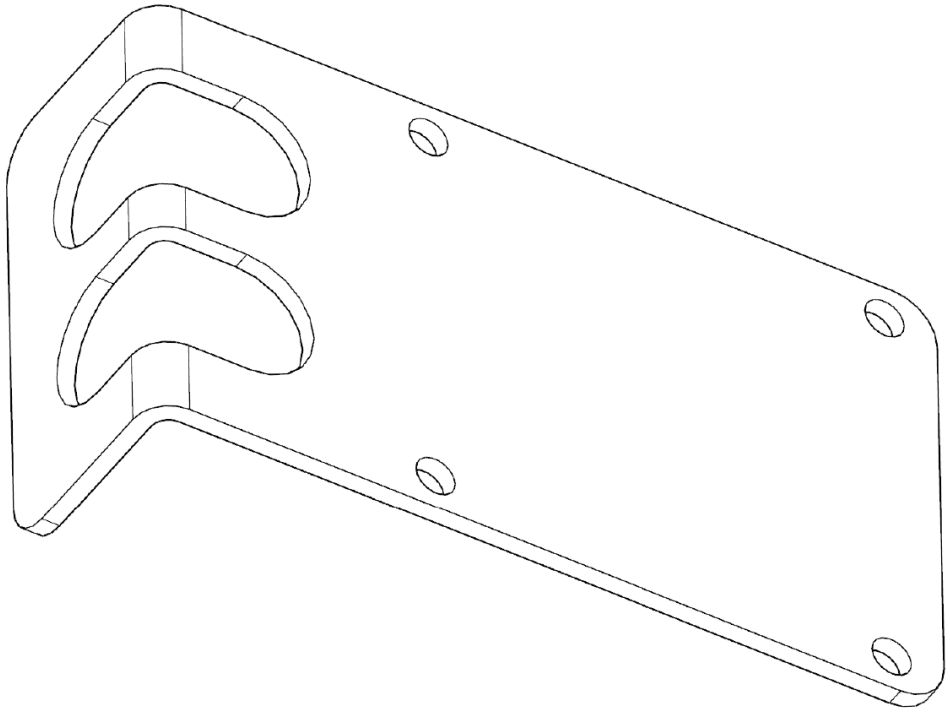


Figure 62 - BK-32-030 Safety bracket Rot-Con

This accessory may be installed with either the standard heatsink or the BK-32-020 Fast replacement bracket, depending on your configuration:

- see "Installation" on page 73 or
- see "Installation with BK-32-020 Fast replacement bracket" on page 77

NOTE: For proper use and correct installation of the BK-32-020 Fast replacement brackets accessory, please refer to the dedicated section"Mounting the BK-32-020 Fast Replacement Bracket" on page 67**.**

Installation

The bracket can be mounted in two different ways depending on the orientation of the connectors:

- with connector at 0°.
- with connector at 90°.

Preliminary operation:

Regardless of the mounting type, the first preliminary operation is to remove the Matrix 320 heatsink.

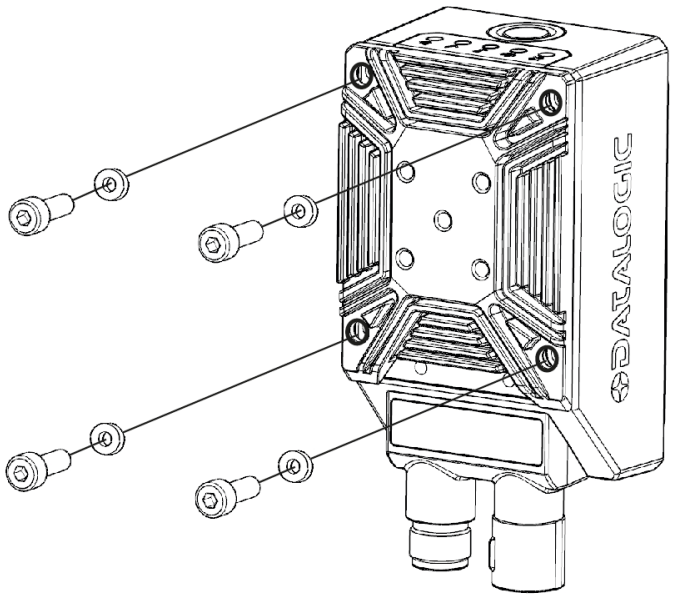


Figure 63 - Preliminary operation

NOTE: Remove the four screws and washers. Take care not to misplace the removed washers.

Connector at 0°:

1. Insert the O-rings into the connectors:

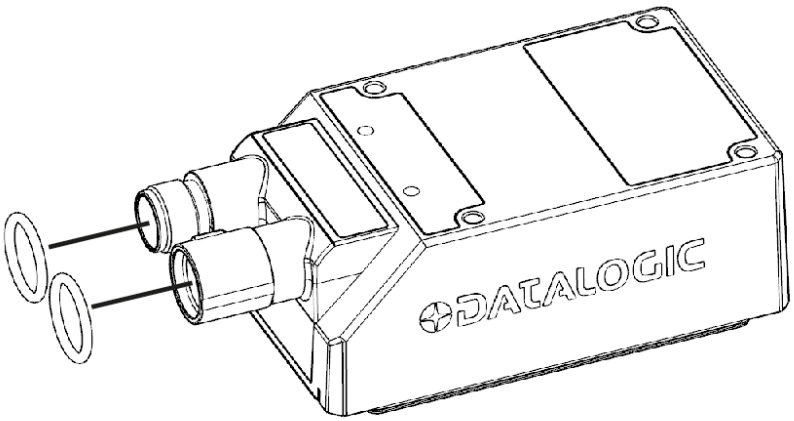


Figure 64 - O-Ring installation

2. Removing the protective film and apply the elastic spacers on the Safety bracket as shown in the figure:

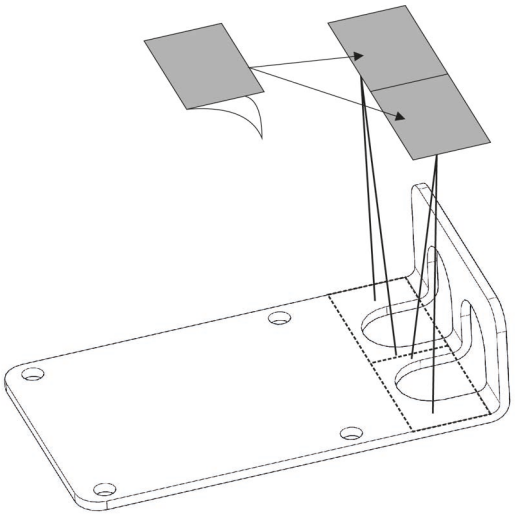


Figure 65 - Elastic spacers installation

3. Pair the BK-32-030 Safety bracket with the Matrix 320:

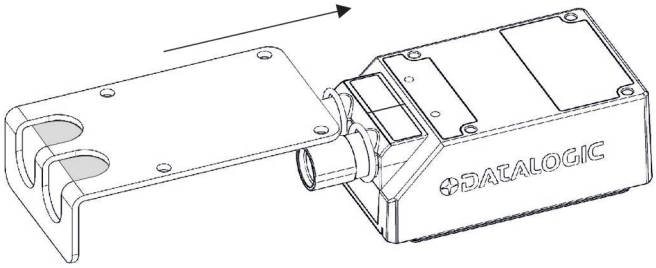


Figure 66 - BK-32-030 installation

4. Reassemble the heatsink onto the Matrix using the washers removed previously and the M4x10 DIN7984 screws provided with the bracket:

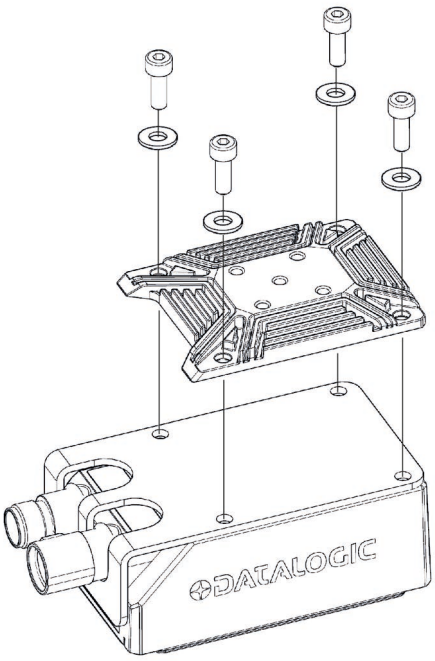


Figure 67 - Reassembly

Connector at 90°:

1. Insert the O-rings into the connectors:

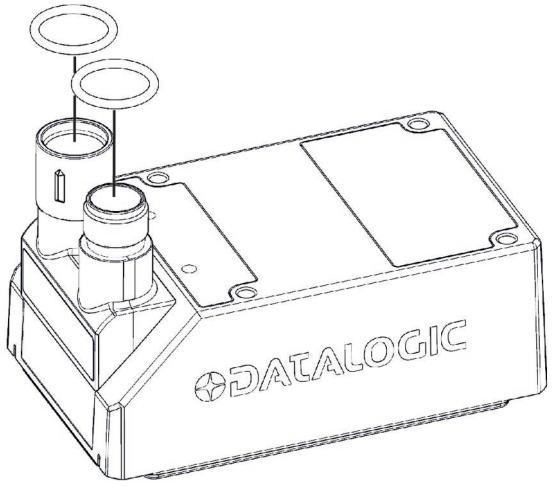


Figure 68 - O-Ring installation

2. Removing the protective film and apply the elastic spacers on the Safety bracket as shown in the figure:

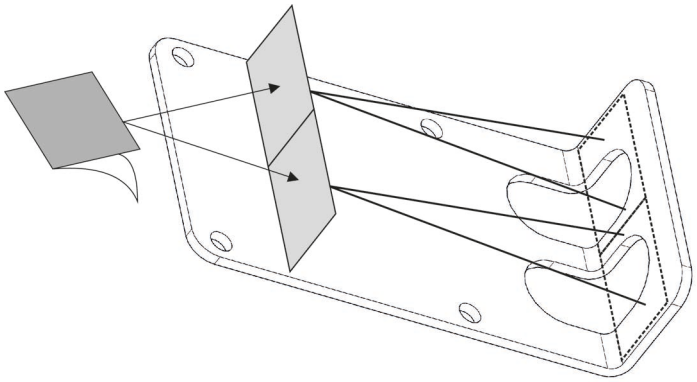


Figure 69 - Elastic spacers installation

3. Pair the BK-32-030 Safety bracket with the Matrix 320:

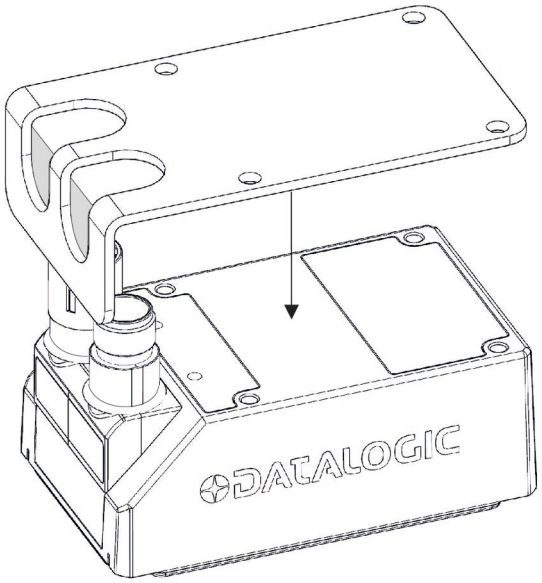


Figure 70 - BK-32-030 installation

4. Reassemble the heatsink onto the Matrix using the washers removed previously and the M4x10 DIN7984 screws provided with the bracket:

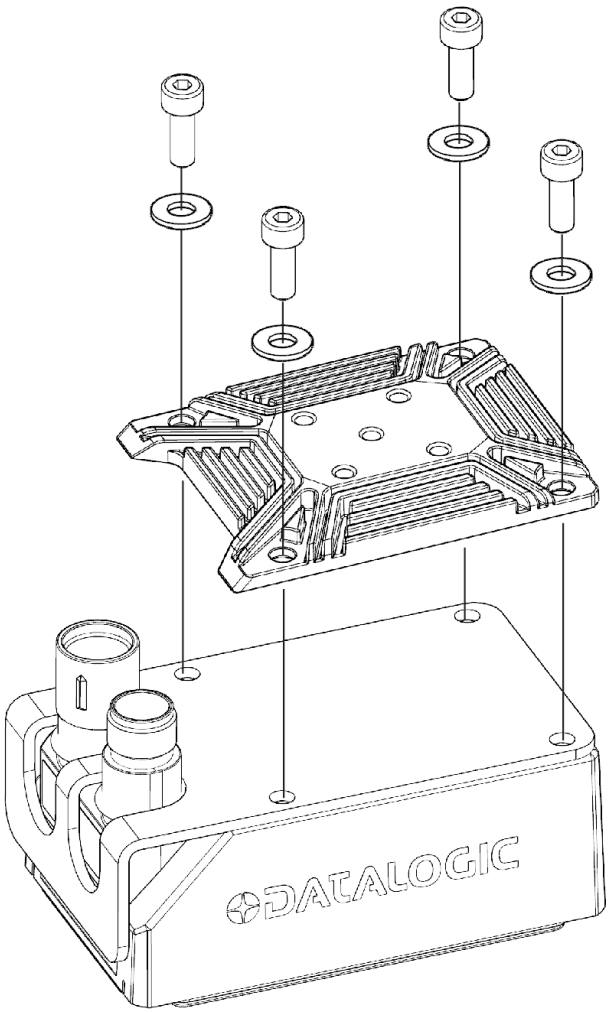


Figure 71 - Final assembly

Installation with BK-32-020 Fast replacement bracket

The bracket can be mounted in two different ways depending on the orientation of the connectors:

- with connector at 0°.
- with connector at 90°.

Preliminary operation:

Regardless of the mounting type, the first preliminary operation are:

- remove the Frame Plate with the Rotatinng plate assembly from the Mounting brackets.
- remove the Fast Replacement Plate from the Matrix 320.

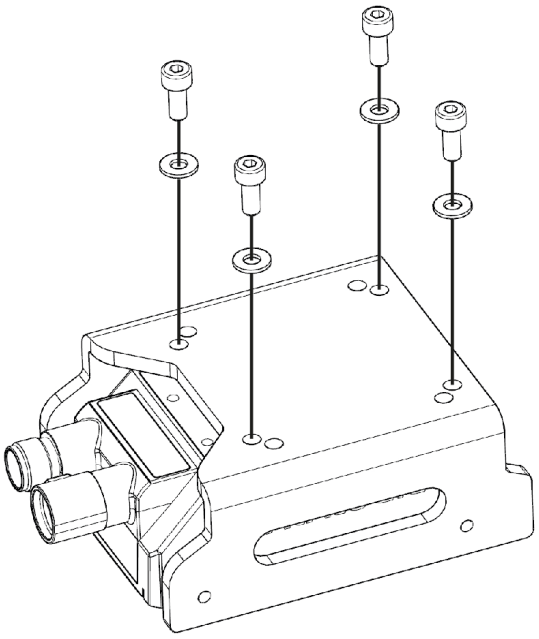


Figure 72 - Preliminary operation

NOTE: Remove the four screws and washers. Take care not to misplace the removed washers.

Connector at 0°:

1. Insert the O-rings into the connectors:

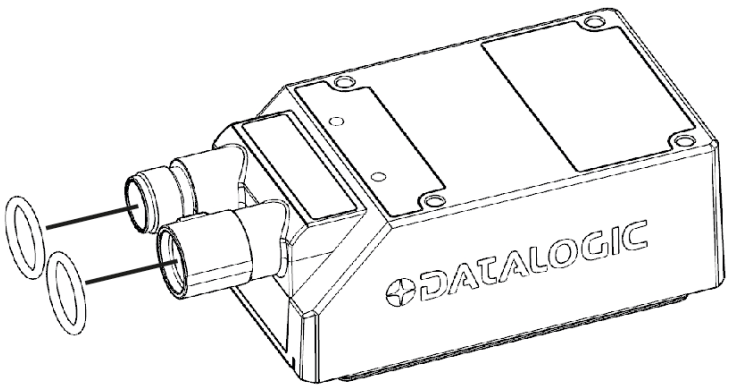


Figure 73 - O-Ring installation

2. Removing the protective film and apply the elastic spacers on the Safety bracket as shown in the figure:

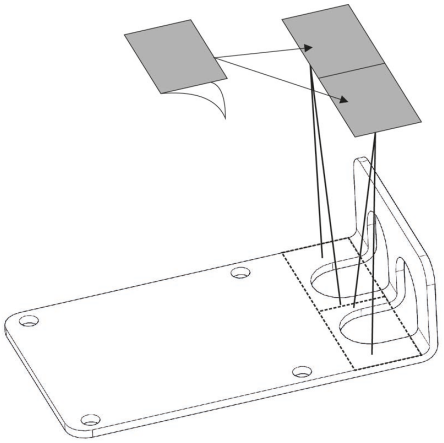


Figure 74 - Elastic spacers installation

3. Pair the BK-32-030 Safety bracket with the Matrix 320:

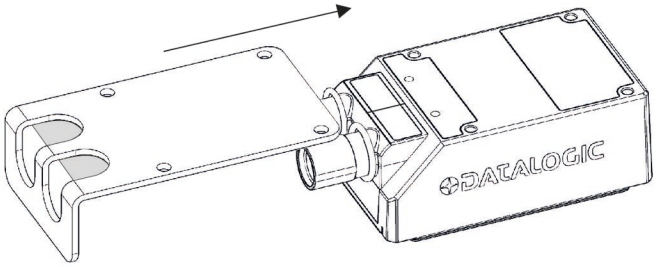


Figure 75 - BK-32-030 installation

4. Reassemble the heatsink onto the Matrix using the washers removed previously and the M4x10 DIN7984 screws provided with the bracket:

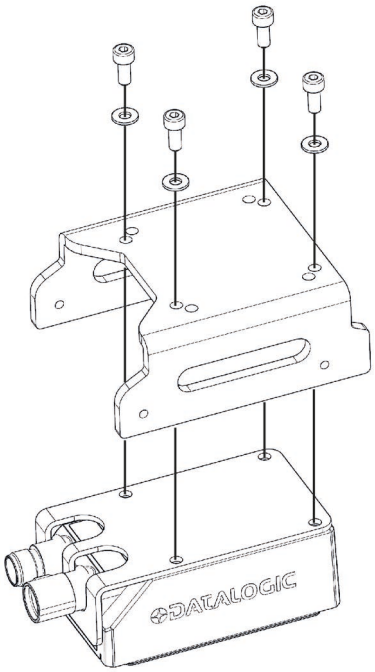


Figure 76 - Reassembly

5. Complete the mounting of the full bracket.

Connector at 90°:

1. Insert the O-rings into the connectors:

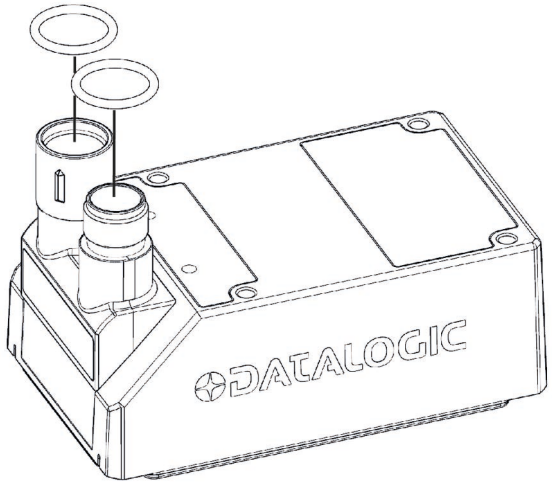


Figure 77 - O-Ring installation

2. Removing the protective film and apply the elastic spacers on the Safety bracket as shown in the figure:

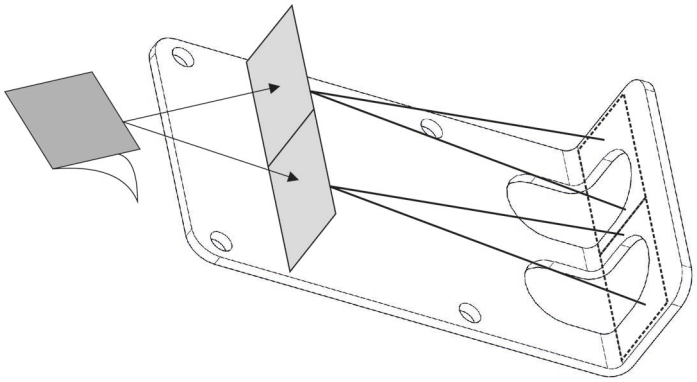


Figure 78 - Elastic spacers installation

3. Pair the BK-32-030 Safety bracket with the Matrix 320:

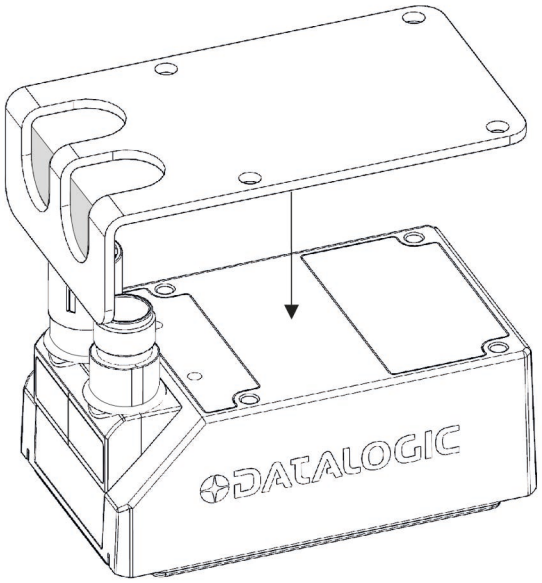


Figure 79 - BK-32-030 installation

4. Reassemble the heatsink onto the Matrix using the washers removed previously and the M4x10 DIN7984 screws provided with the bracket:

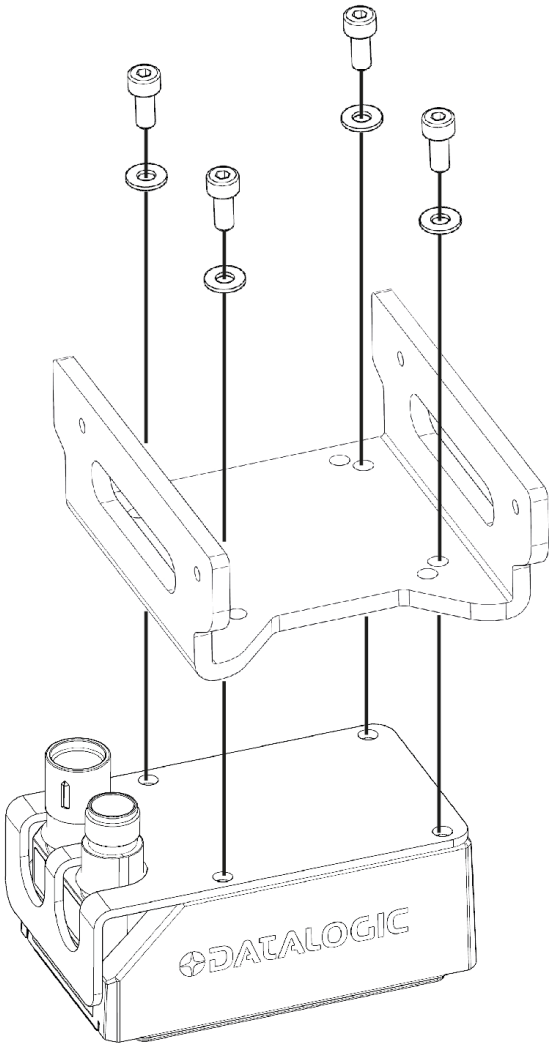


Figure 80 - Final assembly

5. Complete the mounting of the full bracket.

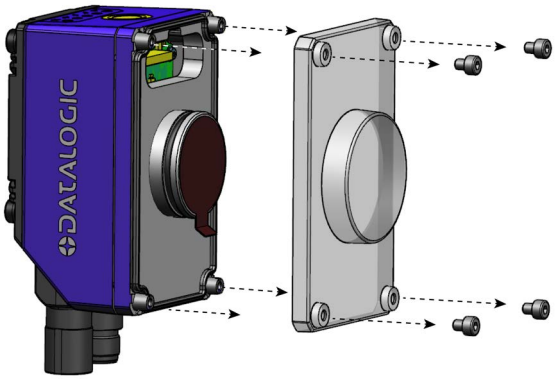
MATRIX 320 5MP C-MOUNT MOUNTING INSTRUCTIONS

Mounting instructions for Matrix 320 C-Mount without illuminator

CAUTION: Before starting the procedure, make sure the reader is powered off.

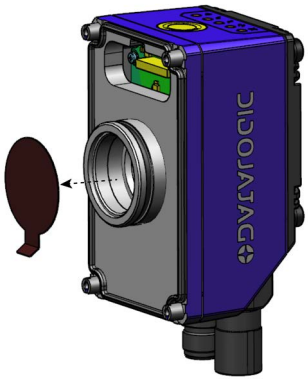
CAUTION: Do not touch the sensor aperture lens glass, or lens cover glass. These areas must be kept clean. Avoid any abrasive substances that might damage these surfaces during cleaning.

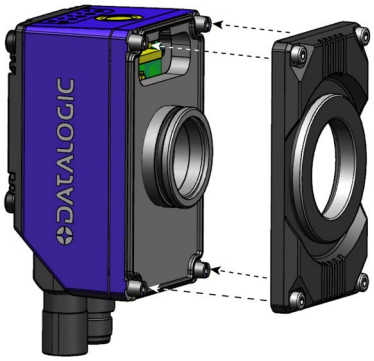
CAUTION: Observe ESD precautions when installing or removing a filter, cover, illuminator or other accessories.



1. In a dust-free environment, remove the plastic protective blister by unscrewing the four plastic screws.

2. Remove the sensor protection label by pulling it off the base.



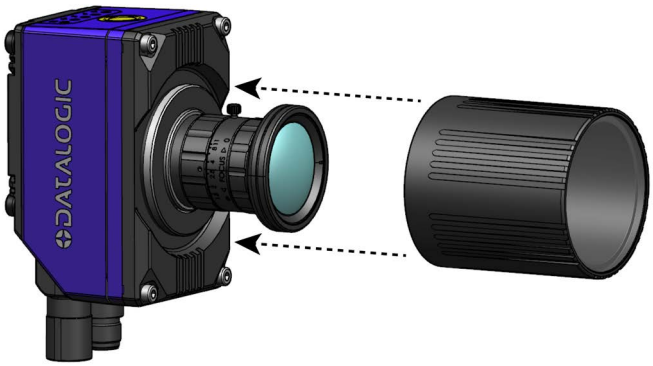


3. Mount the base cover and tighten the four screws.

4. Mount the lens by screwing it tightly onto the base.

5. Focus the reader. Refer to "Step 4 - Focus the reader" on page 5.





6. Mount the lens cover onto the base cover.

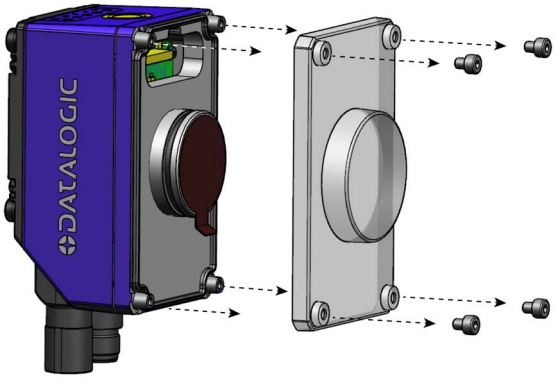
7. Mount the heat sink (see "Heat Sink mounting instructions" on page 86).

Mounting instructions for Matrix 320 C-Mount with 36 and 72 LED illuminator

CAUTION: Before starting the procedure, make sure the reader is powered off.

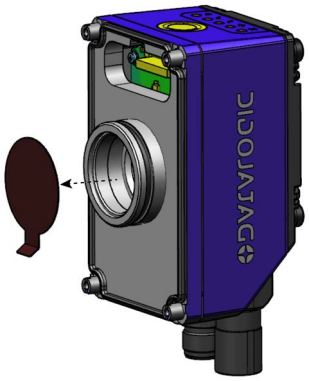
CAUTION: Do not touch the sensor aperture lens glass, or lens cover glass. These areas must be kept clean. Avoid any abrasive substances that might damage these surfaces during cleaning.

CAUTION: Observe ESD precautions when installing or removing a filter, cover, illuminator or other accessories.



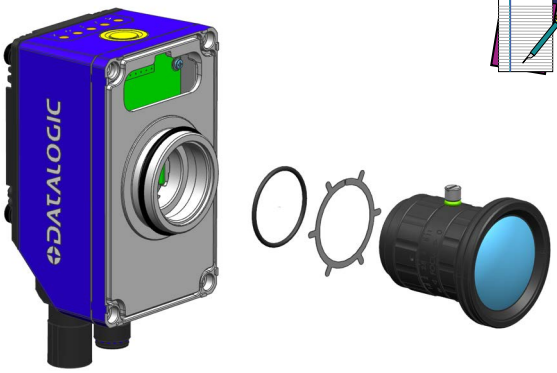
1. In a dust-free environment, remove the plastic protective blister by unscrewing the four plastic screws.

2. Remove the sensor protection label by pulling it off the base.



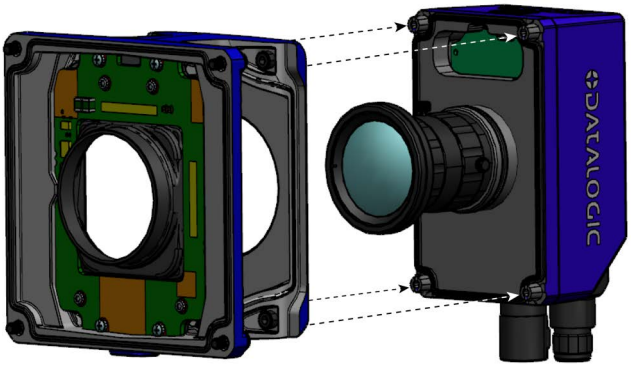


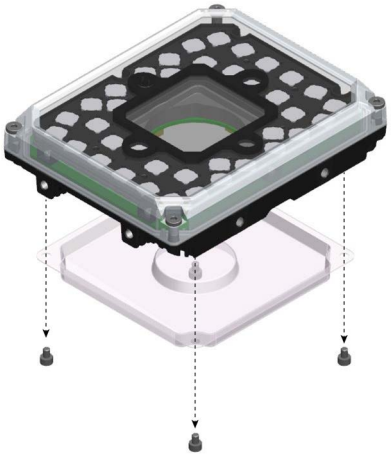
3. Mount the lens by screwing it tightly onto the base and set the lens aperture. If the lens locking knobs are pointing toward the short sides of the reader, insert the lens spacer between the anti-vibration O-ring and the lens to facilitate better access to the locking knobs later.



NOTE: If the lens locking knobs are pointing toward the short sides of the reader, remove the anti-vibration O-ring from the lens, install the lens spacer onto the threaded base of the lens, then insert the O-ring back onto the lens. This will facilitate better access to the locking knobs later.

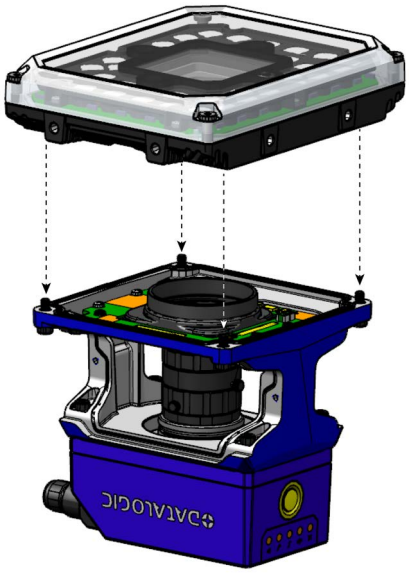
4. Mount the adapter onto the base by tightening the four captive screws.



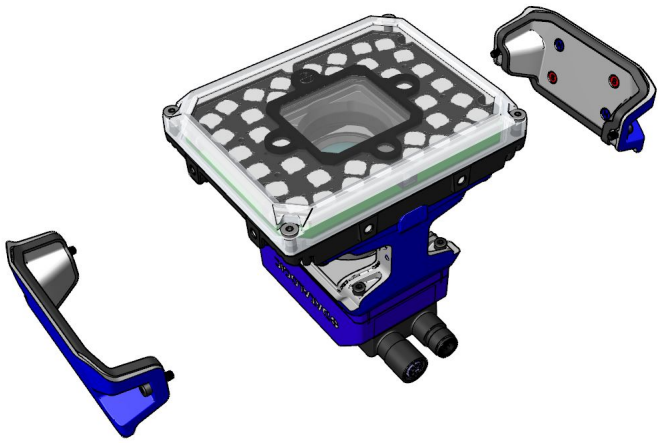


5. Remove the protective blister from the illuminator.

CAUTION: Do not touch the illuminator electrical components to avoid electrostatic charges on the PCBg.

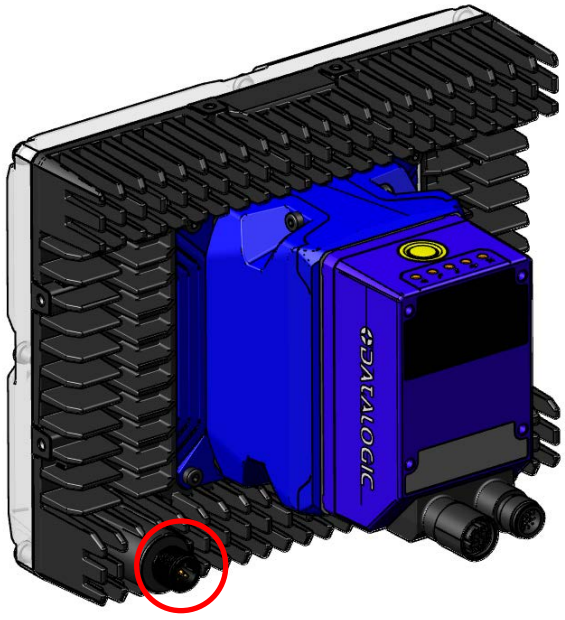


6. Mount the illuminator onto the adapter by tightening the four captive screws. The reader can now be powered on.
7. Focus the reader. Refer to "Step 4 - Focus the reader" on page 5.



8. Mount the adapter side covers. These come the magnets, so they can be attached to a metal board or to each other to keep your hands free during installation.
9. Mount the heat sink (see "Heat Sink mounting instructions" on page 86).

NOTE: 72 LED ILLUMINATOR ONLY: after completing the mounting procedure, connect the power cable (CAB-LP-0x) to the illuminator connector.



NOTE: Most lenses come with a green round sticker to identify the focus locking knob. The two knobs differ in the dimension of the O-ring, designed to fit a specific adjustment ring, and are not interchangeable. Make sure that the knob with the green O-ring is always placed in the position identified by the green sticker. Once you set the desired diaphragm and focus through the adjustment rings, fix the positions by locking the corresponding knobs.



Heat Sink mounting instructions

When to mount the heat sink

The heat sink provided in the package is to be used as an adapter for rotating brackets and for heat dissipation. Its use is recommended especially in high ambient temperature applications.

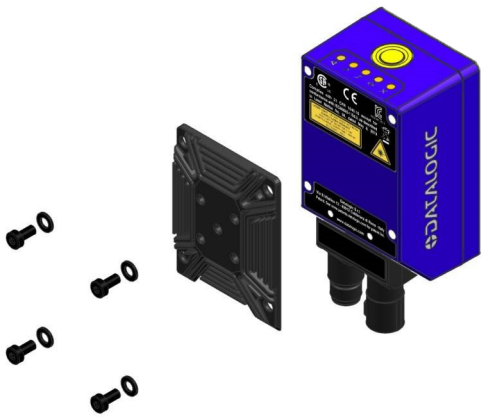
How to mount the heat sink

The Matrix 320 5mp package contains the following materials to mount the heat sink:

- 1 heat sink
- 4 black screws
- 4 black washers

To install the heat sink on the reader, please follow this procedure:

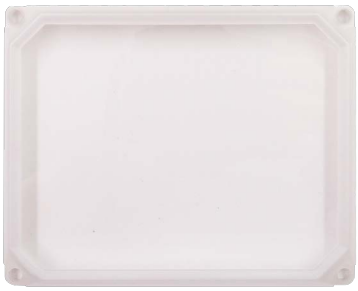
1. Insert the screws and washers through the heat sink and thread them loosely into the Matrix 320 5mp reader, as shown in the figure below.
2. Tighten the screws



ACCESSORY COVERS AND FILTERS

Covers

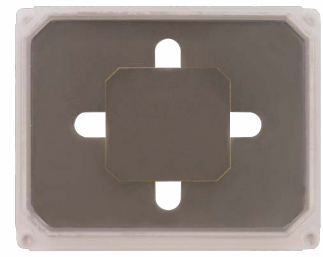
Standard Covers



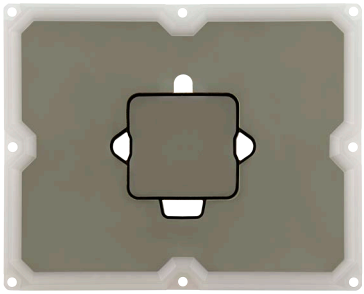
Standard Cover

DESCRIPTION	ORDER NUMBER
Cover STD LT 36L M320/P2	93ACC0272
Cover STD LT 72L M320/P2	93ACC0341

Polarizing Covers



Polarizing Cover LT 36 LEDs



Polarizing Cover LT 72 LEDs

DESCRIPTION	ORDER NUMBER
Cover Polarizer LT 36L M320/P2	93ACC0274
Cover Polarizer LT 72L M320	93ACC0342

Cover Replacement for 36 LED Illuminator

NOTE: For the 72 LED illuminator cover replacement procedure, refer to "Cover Replacement for 72 LED Illuminator" on page 90**.**

CAUTION: The reader must be disconnected from the power supply during the cover replacement procedure.

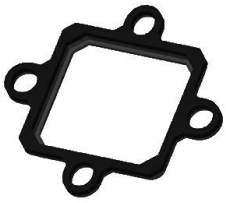
CAUTION: Make sure to operate in a dust-free environment during the cover replacement procedure.

1. Unscrew the four screws using a 2.5 mm Allen wrench.
2. Remove the cover. The cover will remain attached to the body because of the gasket. To unmount it properly, it is recommended to gently lever the cover from its corners using a flat blade screwdriver between the cover and the body of the reader. See Figure 81.



Figure 81 - Removing the cover (36 LEDs model)

CAUTION: When removing the cover to replace it, the Poron filter frame might stick to the removed window. Make sure to reassemble it.



Poron filter frame

CAUTION: All accessory covers are supplied with a mounted gasket. When replacing the cover, the gasket may remain attached to the base. Make sure to remove the old gasket, since the new cover is already supplied with its own gasket.

3. Make sure the new cover is free of dust, dirt and fingerprints. If necessary, wipe it clean using soft material and alcohol. Avoid any abrasive substances.

CAUTION: The cover has a predefined mounting direction (see Figure 82). The illuminator has one pin different from the other three: make sure to align this special pin with the correspondent cover seat.

Place the new cover on the reader and press the cover frame edges.

CAUTION: To avoid damage, do not press on the window.

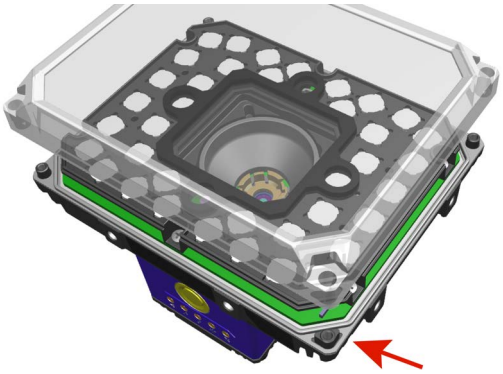


Figure 82 - Aligning the cover

4. Insert the four screws and loosely tighten them in a clockwise direction.
5. Finally tighten the screws to a torque of 0.8 N m.

Cover Replacement for 72 LED Illuminator

NOTE: For the 36 LED illuminator cover replacement procedure, refer to "Cover Replacement for 36 LED Illuminator" on page 88**.**

CAUTION: The reader must be disconnected from the power supply during the cover replacement procedure.

CAUTION: Make sure to operate in a dust-free environment during the cover replacement procedure.

1. Unscrew the eight screws using a 2.5 mm Allen wrench.
2. Remove the cover manually by gently levering it from its corners, as illustrated in Figure 83.

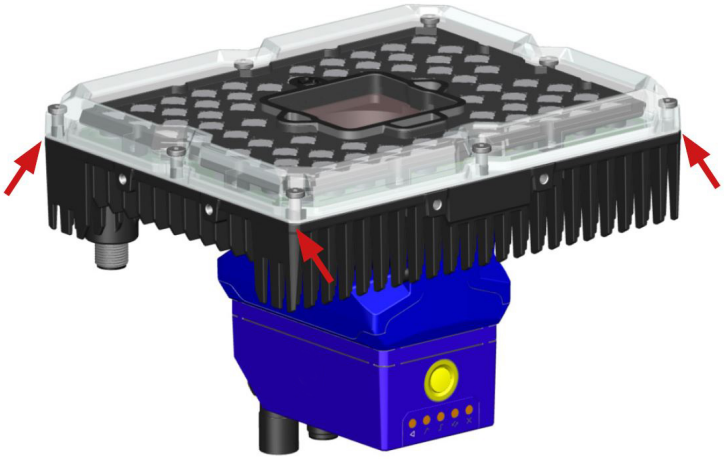


Figure 83 - Removing the cover (72 LEDs model)

CAUTION: All accessory covers are supplied with a mounted gasket. Make sure the gasket is correctly placed on the new cover.

3. Make sure the new cover is free of dust, dirt and fingerprints. If necessary, wipe it clean using soft material and alcohol. Avoid any abrasive substances.

CAUTION: The cover has a predefined mounting direction. The two top pins of the illuminator (see Figure 84) have a different shape than the others, which are cylindrical: make sure to align these special pins with the corresponding cover seats.

CAUTION: Do NOT bump/extract/tamper with the distance sensor shield (see Figure 84).

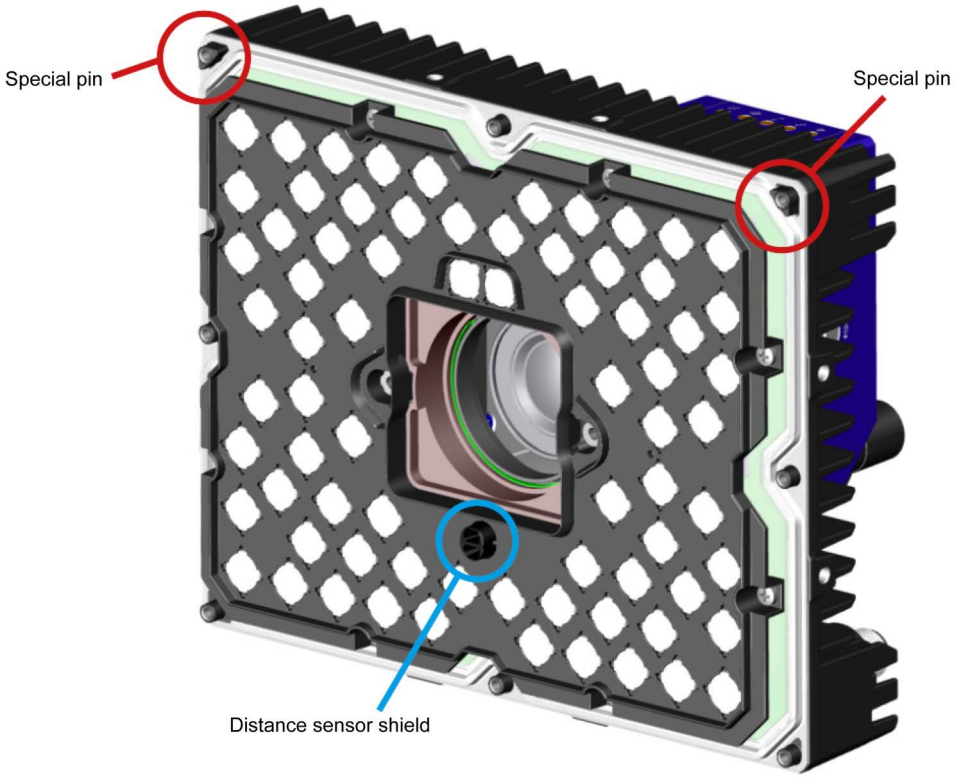


Figure 84 - Aligning the cover

4. Place the new cover on the reader.

CAUTION: To avoid damage, do not press on the window.

5. Insert the eight screws and loosely tighten them in a clockwise direction.
6. Finally tighten the screws to a torque of 0.8 N m.

Filters



YAG Cut Filter

LT 36 LEDs

DESCRIPTION	ORDER NUMBER
Filter YAG Cut LT 36L M320/P2	95A900022
Filter RED Bandpass 635nm LT 36L M320/P2	95A900019
Filter BLU Bandpass 470nm LT 36L M320/P2	95A900020
Filter IR Bandpass 850nm LT 36L M320/P2	95A900021
Filter UV Cut Longpass415 LT 36L M320/P2	95A900040

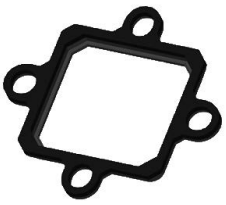
Filter Mounting Instructions

CAUTION: The reader must be disconnected from the power supply during the cover replacement procedure.

CAUTION: Make sure to operate in a dust-free environment during the cover replacement procedure.

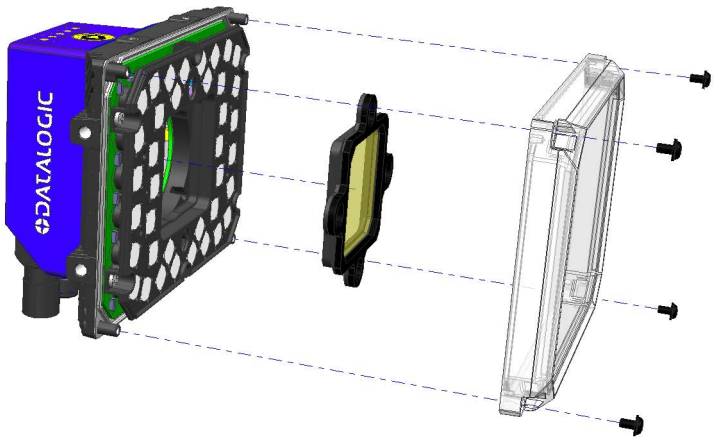
1. Temporarily remove the front cover. Refer to "Cover Replacement for 36 LED Illuminator" on page 88.

2. Unmount the original light shield (or any other filter) grabbing it from the sides and pulling it up.



3. Place the filter in the appropriate location. The filter is equipped with two pins at the bottom that guide its insertion into the product.

NOTE: You can mount the filter in two equivalent directions by rotating it 180°.



CAUTION: Make sure that the filter is correctly placed without any tilt before mounting the cover back on the reader body.

4. Finally, mount the cover back on the reader body. Refer to "Cover Replacement for 36 LED Illuminator" on page 88.

CHAPTER 4
CBX ELECTRICAL CONNECTIONS

All Matrix 320 5mp models can be connected to a CBX connection box through one of the available **CAB-DSxx-S** accessory cables. These accessory cables terminate in a 17-pin connector on the Matrix 320 5mp side and in a 25-pin male D-sub connector on the CBX side.

We recommend making system connections through one of the CBX connection boxes since they offer the advantages of easy connection, easy device replacement, opto-isolated output signals, and filtered reference signals.



NOTE: If you require direct wiring to the reader the connections are the same as shown in this chapter with the exception of the digital Outputs. Direct wiring details are indicated in Appendix A**.**



NOTE: To avoid electromagnetic interference when the reader is connected to a CBX connection box, verify the jumper positions in the CBX as indicated in its Installation Manual.

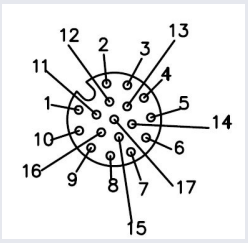
CBX CONNECTION BOX PINOUT

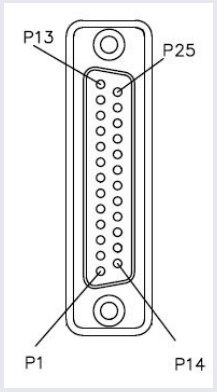
The table below gives the pinout of the CBX100/500 terminal block connectors. Use this pinout when the Matrix 320 5mp reader is connected by means of the CBX100/500:

Group	Label	Description
Input Power	Vdc	Power Supply Input Voltage +
	GND	Power Supply Input Voltage -
	Earth	Protection Earth Ground
Inputs	+V	Power Source - External Trigger
	I1A	External Trigger A (polarity insensitive)
	I1B	External Trigger B (polarity insensitive)
	-V	Power Reference - External Trigger
	+V	Power Source - Inputs
	I2A	Input 2 A (polarity insensitive)
	I2B	Input 2 B (polarity insensitive)
	-V	Power Reference - Inputs
Outputs	+V	Power Source - Outputs
	-V	Power Reference - Outputs
	O1+	Output 1 + opto-isolated and polarity sensitive
	O1-	Output 1 - opto-isolated and polarity sensitive
	O2+	Output 2 + opto-isolated and polarity sensitive
	O2-	Output 2 - opto-isolated and polarity sensitive
	O3A	Output 3 - non opto-isolated (only available through CBX500)
Auxiliary Interface	TX	Transmit Data
	RX	Receive Data
	SGND	Auxiliary Interface Signal Ground
ID-NET	REF	Network Reference
	ID+	ID-NET network data +
	ID-	ID-NET network data -
	Shield	Network Cable Shield
Main Interface	**RS232**	**RS422 Full Duplex**
	TX	TX+
	RX	*RX+
	-	TX-
	-	*RX-
	SGND	SGND

* Do not leave floating, see "RS422 Full Duplex Interface" on page 100 for connection details.

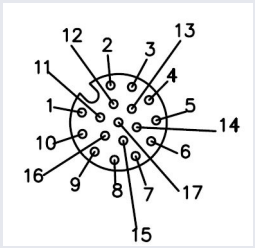
CAB-DSxx-S PINOUT

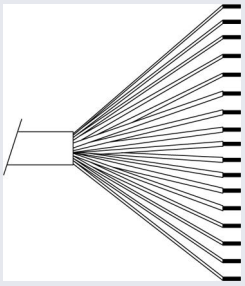




17 PINS	NAME	WIRE COLOR	25 PINS
1	VS	Red	9-13
2	GND	Black	7-25
6	XTRG_A	Orange	18
5	XTRG_B	Green/Black	19
13	IN2A	Gray	6
3	IN2B	Green/Red	10
16	OUT3	Black/White	14-16
8	OUT2	White/Red	11
9	OUT1	Purple	8
17	C0/TX	Yellow	2
11	C2/RX	Brown	3
12	C1/RTS	Pink	4
10	C3/CTS	Green	5
4	TXA	Yellow/White	21
14	RXA	Yellow/Blue	20
7	NET+	White	23
15	NET-	Blue	24
NUT	SHIELD	Both Shields	1
			12, 15, 17, 22 Not connected

CAB-GDxx-S PINOUT

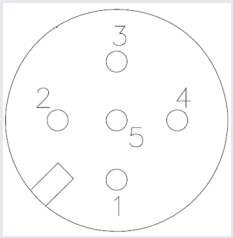




17 PINS	NAME	STRIPPED WIRE COLOR
1	VS	Brown
2	GND	Blue
6	XTRG_A	Yellow
5	XTRG_B	Pink
13	IN2A	White/Green
3	IN2B	White
16	OUT3	Yellow/Brown
8	OUT2	Gray
9	OUT1	Red
17	C0/TX	White/Gray
11	C2/RX	Gray/Pink
12	C1/RTS	Red/Blue
10	C3/CTS	Purple
4	TXA	Green
14	RXA	Brown/Green
7	NET+	Black
15	NET-	White/Yellow

CAUTION: Unused stripped wires must be insulated to prevent shorting.

CAB-LP-0x PINOUT



5 PINS	NAME	WIRE COLOR
1	Soldered +24	Brown
2		White
3	Soldered GND	Blue
4		Black
5	Not used	
NUT	Shield	

POWER SUPPLY

Power can be supplied to the reader through the CBX100/500 spring clamp terminal pins as shown in Figure 85:

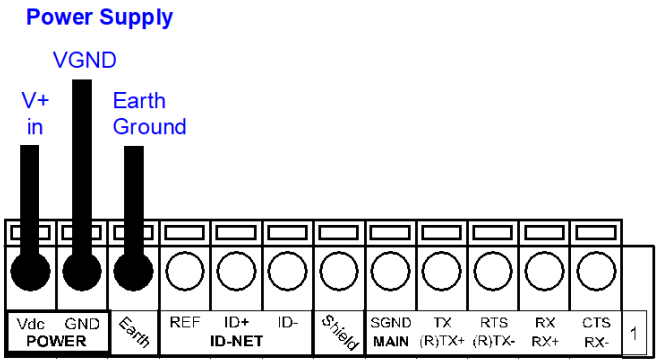


Figure 85 - Power Supply Connections

The power must be equal to 24 Vdc ± 10%.

It is recommended to connect the device CHASSIS to earth ground (Earth) by setting the appropriate jumper in the CBX connection box. See the CBX Installation Manual for details.

MAIN SERIAL INTERFACE

CAUTION: Do not connect to the Main Interface spring clamp terminals if using Host Interface Modules (Fieldbus) with the CBX500.

The signals relative to the following serial interface types are available on the CBX spring clamp terminal blocks.

The main serial interface type and its parameters (baud rate, data bits, etc.) can be defined by the user via DL.CODE software. For more details refer to the Help On Line page of the Reading Phase step (Channels) in DL.CODE.

Details regarding the connections and use of the interfaces are given in the next paragraphs.

RS232 Interface

The RS232 interface is generally used for Point-to-Point connections. When it is connected to the host computer it allows transmission of code data.

The following pins are used for RS232 interface connection:

CBX100/500	Description
TX	Transmit Data
RX	Receive Data
SGND	Signal Ground

It is always advisable to use shielded cables. The overall maximum cable length must be less than 15 m (49.2 ft).

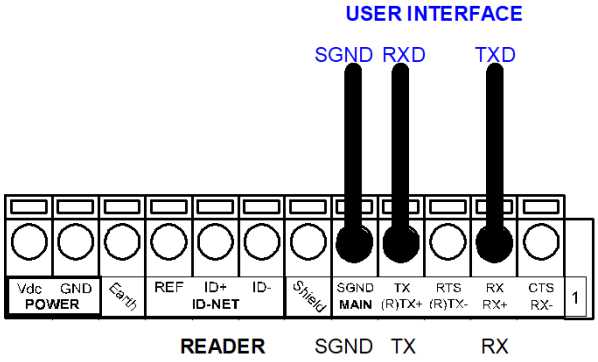


Figure 86 - RS232 Main Interface Connections

RS422 Full Duplex Interface

The RS422 full-duplex (5 wires + shield) interface is used for non-polled communication protocols in point-to-point connections over longer distances (max 1200 m / 3940 ft) than those acceptable for RS232 communications or in electrically noisy environments.

The CBX pinout follows:

CBX100/500	Description
TX+	RS422 Transmit Data +
RX+	RS422 Receive Data +
TX-	RS422 Transmit Data -
RX-	RS422 Receive Data -
SGND	Signal Ground

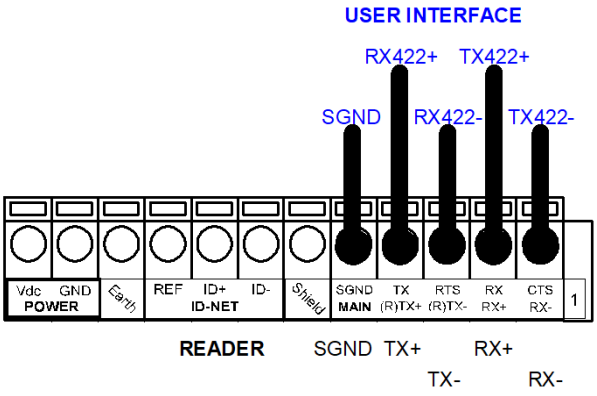


Figure 87 - RS422 Full Duplex Connections

NOTE: For applications that do not use RS422 transmission to the reader (terminal block RX+ and RX- signals), do not leave these lines floating but connect them to SGND as shown below.

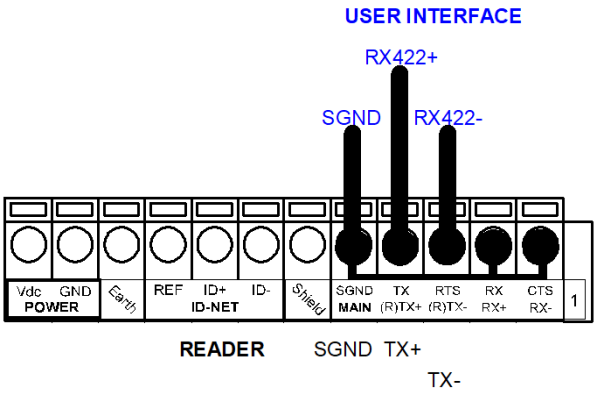


Figure 88 - RS422 Full Duplex Connections Using Only TX Signals to Host

ID-NET INTERFACE

CBX100/500	Description
Shield	Network Cable Shield
ID+	ID-NET Network Data +
ID-	ID-NET Network Data -
REF	Network Reference

ID-NET Cables

The following instructions are referred to Figure 90, Figure 91 and Figure 92.

- The general cable type specifications are: CAT5 twisted pair + additional CAT5 twisted pair, shielded cable AWG 24 (or AWG 22) stranded flexible.
  We recommend using DeviceNet cables (drop or trunk type) to the following reference standards:
  AN50325 – IEC 62026
  UL STYLE 2502 80°C 30V
- Cable Shield MUST be connected to earth ground ONLY at the Master.
- NEVER use ID-NET cable shield as common reference.
- The ID-NET max cable length depends on the baudrate used (see the Baudrate Table below).
- For Common Power Connections use only 2 wires (ID+ and ID-).
  - DC Voltage Power cable (Vdc – GND) should be handled as a signal cable (i.e. do not put it together with AC cable):
  - Wire dimensioning must be checked in order to avoid voltage drops greater than 0.8 Volts.
  - Cable should lie down as near as possible to the ID-NET cable (avoiding wide loops between them).
- Reader's chassis may be connected to earth.
- Network inside the same building.

Baudrate Table				
Baudrate	125 kbps	250 kbps	**500 kbps**	1 Mbps
Cable Length	1200 m	900 m	**700 m**	*

* Application dependent, contact your Datalogic representative for details.



NOTE: The default ID-NET baudrate is 500 kbps. Lower ID-NET baudrates allow longer cable lengths.

ID-NET Response Time

The following figure shows the response time of the ID-NET network. This time is defined as the period between the Trigger activation and the beginning of data transmission to the Host.

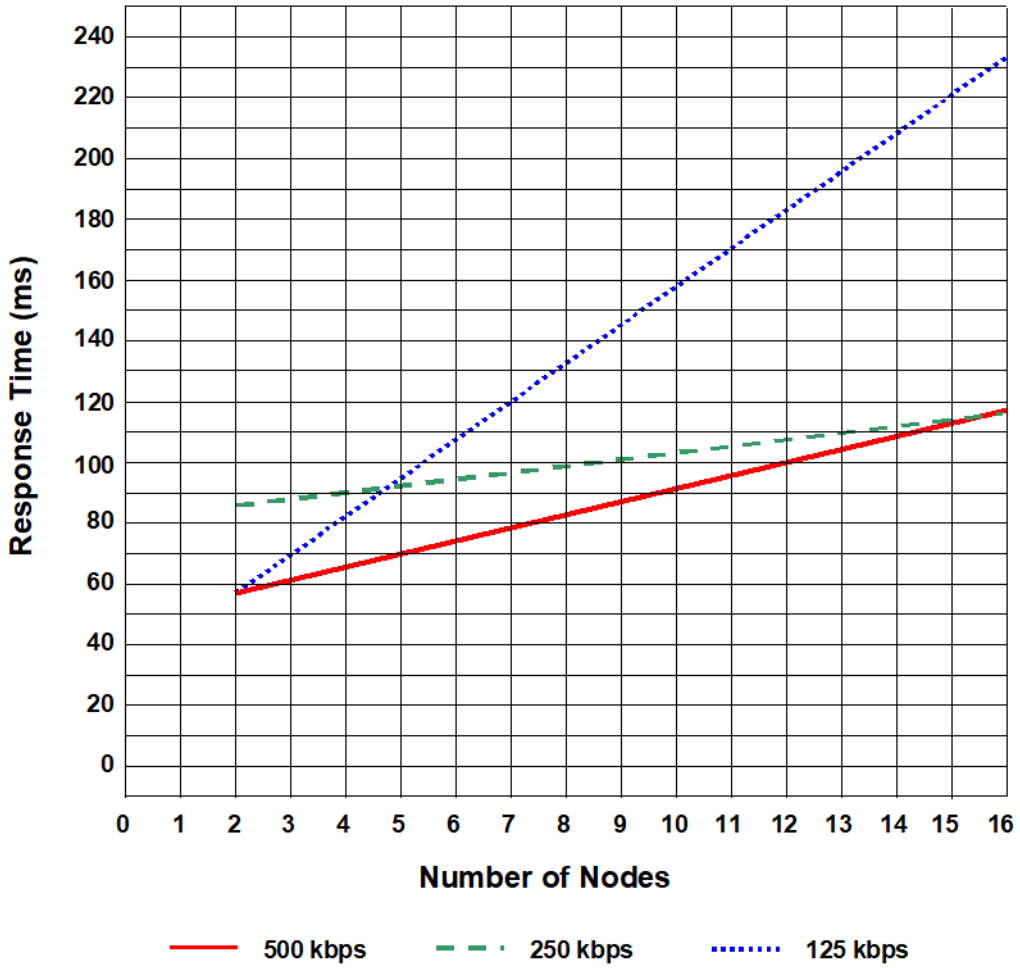


Figure 89 - ID-NET Response Time

Conditions

- ID-NET M/S Synchronized layout
- message length = 50 bytes per node

ID-NET Network Termination

The network must be properly terminated in the first and last reader of the network. This is done by setting the ID-NET Termination Resistance Switch in the CBX100/500 to ON.

ID-NET Connection Diagrams

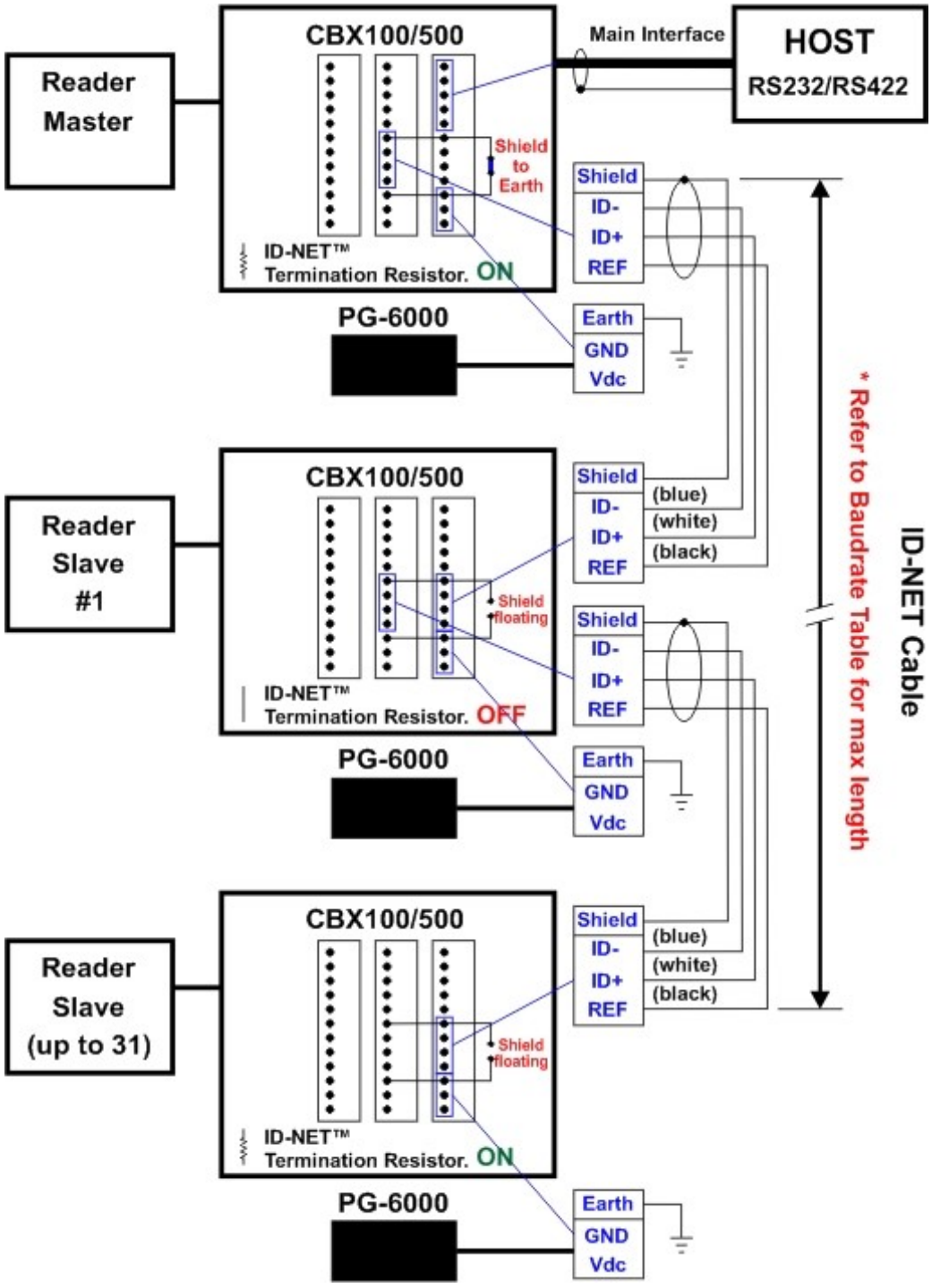


Figure 90 - ID-NET Network Connections with isolated power blocks

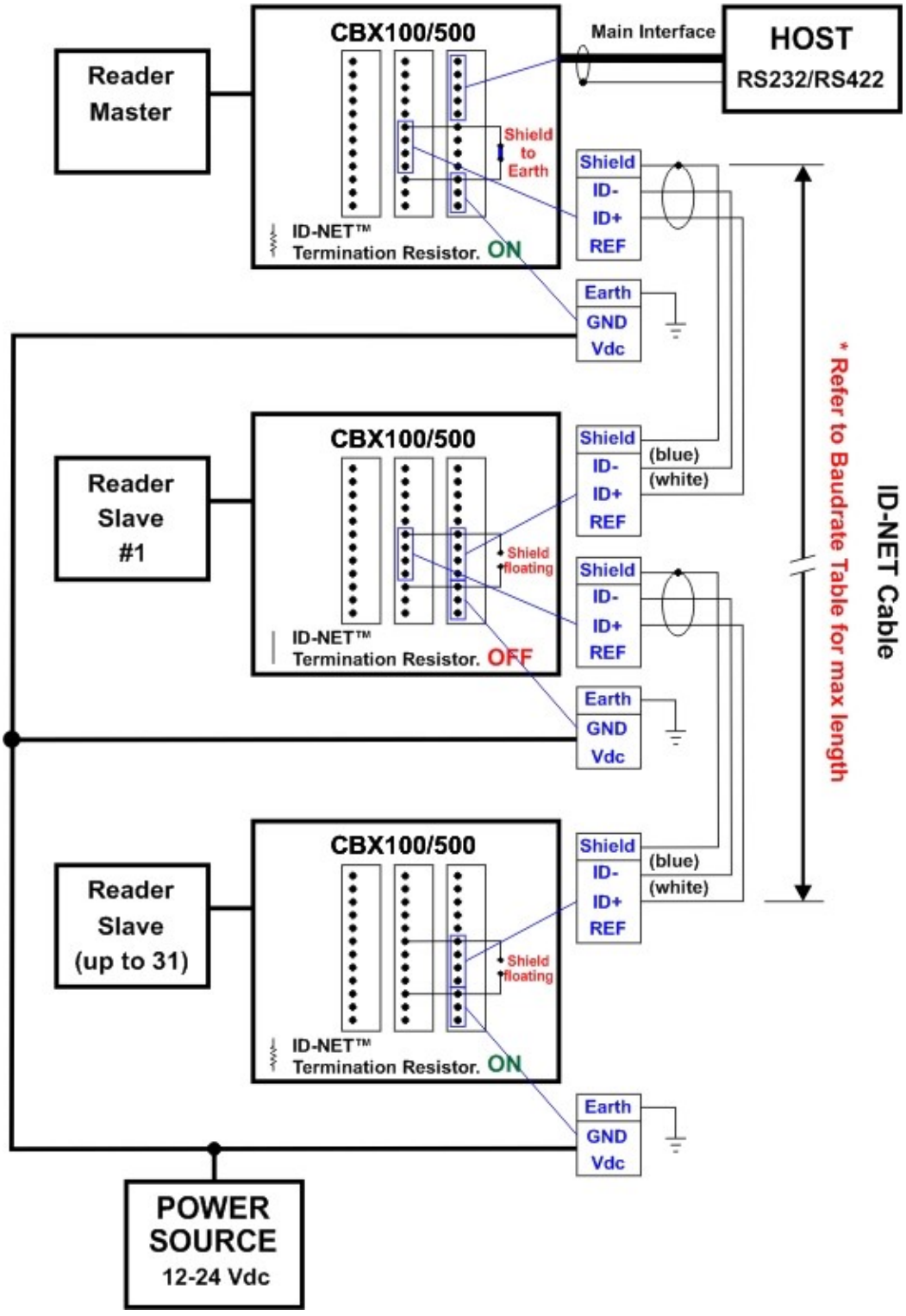


Figure 91 - ID-NET Network Connections with Common Power Branch Network

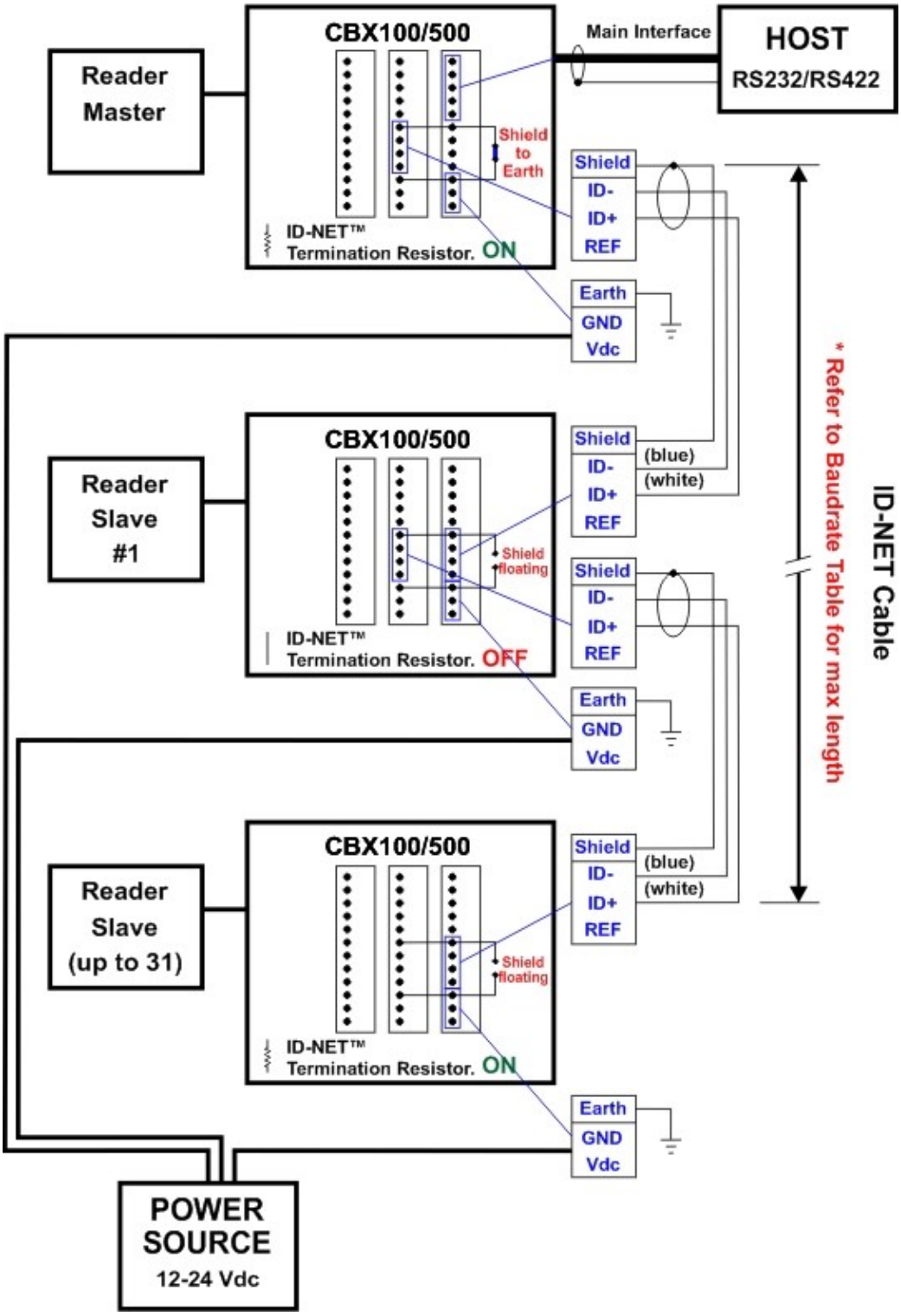


Figure 92 - ID-NET Network Connections with Common Power Star Network

AUXILIARY RS232 INTERFACE

The RS232 auxiliary interface is available for Point-to-Point connections. When it is connected to the host computer it allows transmission of code data.

The parameters relative to the aux interface (baud rate, data bits, etc.) can be defined through the Reading Phase step (Channels) in DL.CODE.

The 9-pin female Auxiliary Interface connector inside the CBX is the preferred connector for temporary communication monitoring.

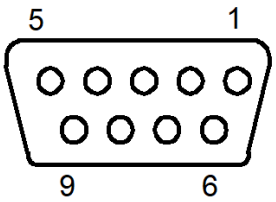


Figure 93 - 9-pin female connector

If permanent system wiring is required, the following pins are used to connect the RS232 auxiliary interface:

CBX100/500	Description
TX	Auxiliary Interface Transmit Data
RX	Auxiliary Interface Receive Data
SGND	Auxiliary Interface Reference

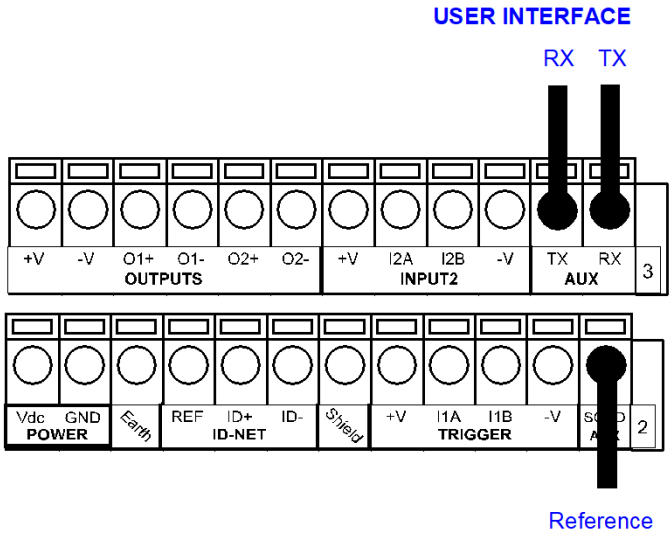


Figure 94 - RS232 Auxiliary Interface Connections

NOTE: Do not connect the Aux Interface to the CBX spring clamp connectors and the 9-pin connector simultaneously.

INPUTS

There are two optocoupled polarity insensitive inputs available on the reader: Input 1 (External Trigger) and Input 2, a generic input:

The External Trigger can be used in One Shot Mode or in Phase Mode. Its main functions are:

- acquisition trigger in One Shot Mode
- reading phase-ON/reading phase-OFF command in Phase Mode

The main functions of the general purpose Input 2 are:

- second external trigger in Phase Mode
- match code storage command when the Match Code option is enabled

The electrical features of both inputs are:

V_{AB} = 30 Vdc max.
I_{IN} = 10 mA (reader) + 12 mA (CBX) max.

The active state of these inputs are selected in software.

An anti-disturbance filter, by default, is implemented in software on both inputs. The value can be changed through the software parameter Debounce Filter. See the Help On Line page of the Reading Phase step (Inputs) in DL.CODE for further details on these parameters.

These inputs are optocoupled and can be driven by both NPN and PNP type commands.



NOTE: Polarity insensitive inputs assure full functionality even if pins A and B are exchanged.

The connections are indicated in the following diagrams:

CBX100/500	Description
+V	Power Source - External Trigger
I1A	External Trigger A (polarity insensitive)
I1B	External Trigger B (polarity insensitive)
-V	Power Reference - External Trigger

The yellow Trigger LED is on when the active state of the External Trigger corresponds to ON.

External Trigger Input Connections Using Matrix 320 5mp Power

CAUTION: Power from the Vdc/GND spring clamps is available directly to the Input Device on the +V/-V spring clamps, and does not pass through the Power Switch (ON/OFF) inside the CBX. Disconnect the power supply when working inside the CBX.

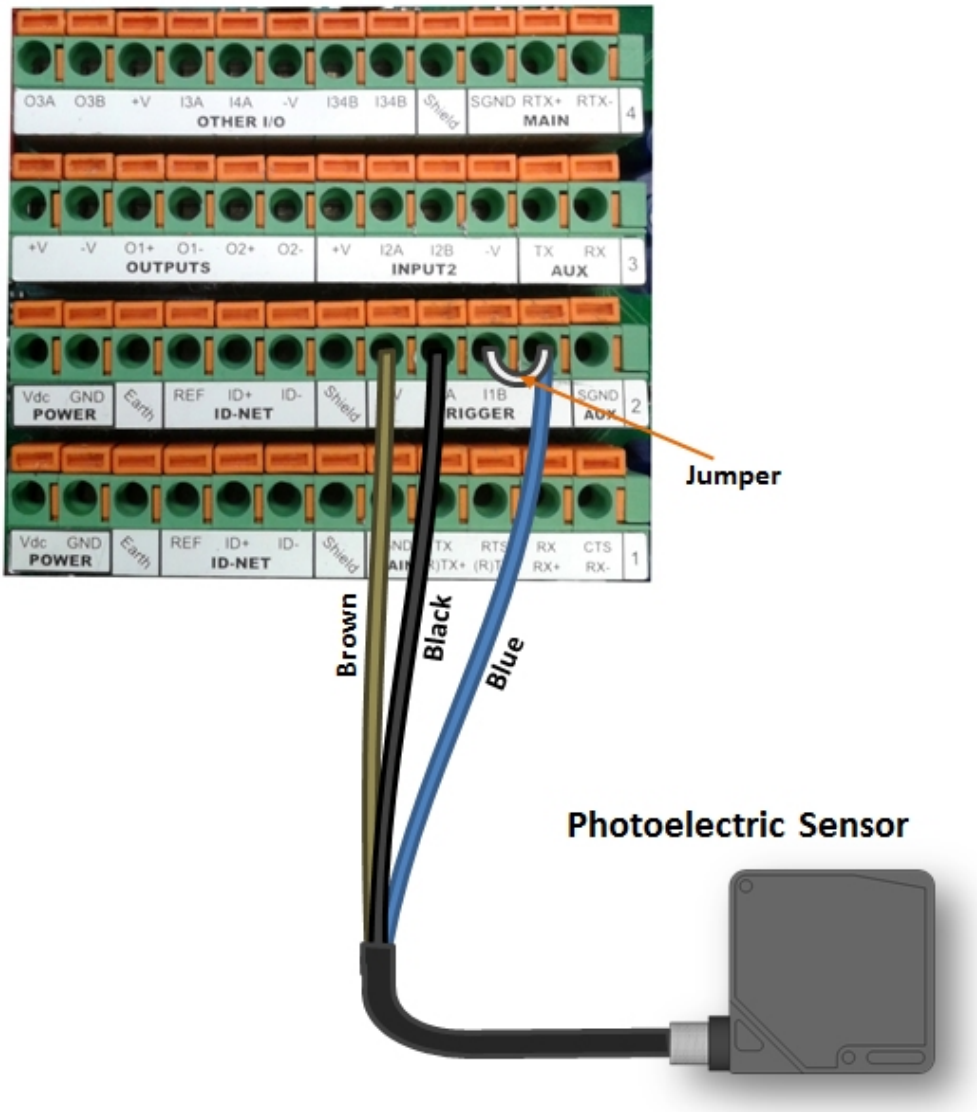


Figure 95 - PNP External Trigger Using Matrix 320 5mp Power

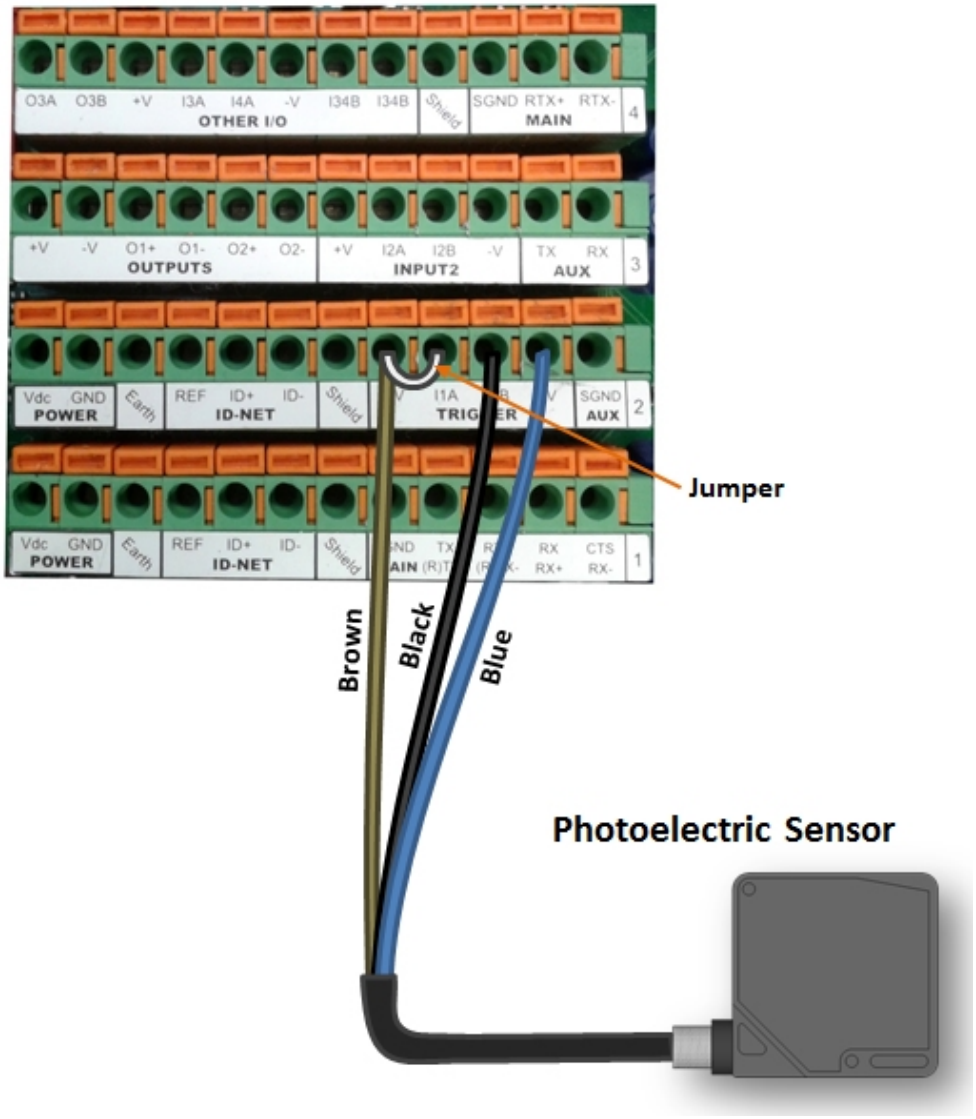


Figure 96 - NPN External Trigger Using Matrix 320 5mp Power

External Trigger Input Connections Using External Power

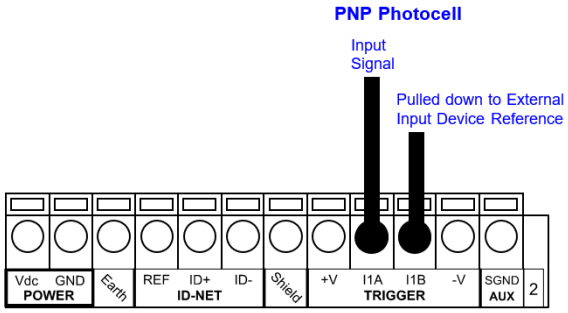


Figure 97 - PNP External Trigger Using External Power

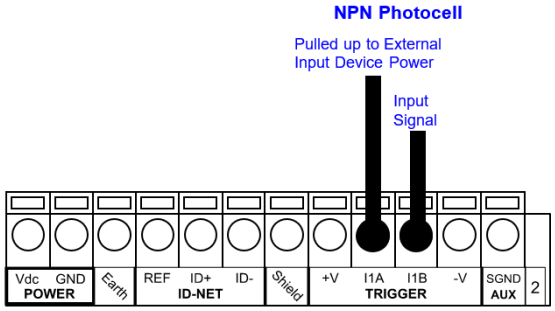


Figure 98 - NPN External Trigger Using External Power

CBX100/500	Description
+V	Power Source - External Trigger
I2A	Input 2 A (polarity insensitive)
I2B	Input 2 B (polarity insensitive)
-V	Power Reference - External Trigger

Input 2 Connections Using Matrix 320 5mp Power

CAUTION: Power from the Vdc/GND spring clamps is available directly to the Input Device on the +V/-V spring clamps, and does not pass through the Power Switch (ON/OFF) inside the CBX. Disconnect the power supply when working inside the CBX.

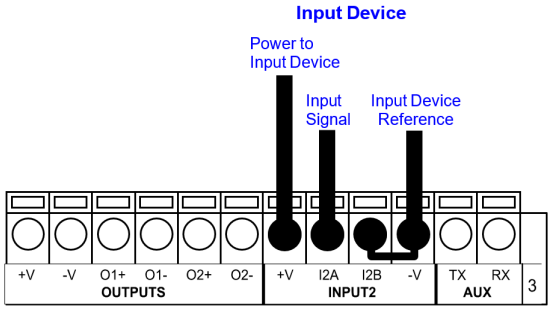


Figure 99 - PNP Input 2 Using Matrix 320 5mp Power

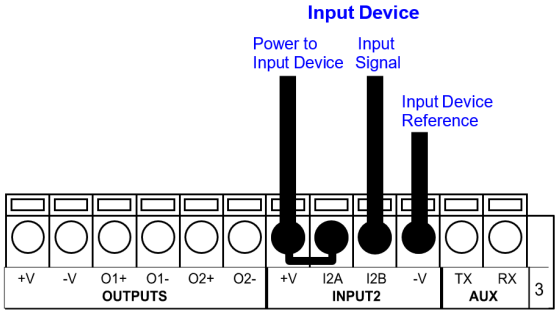


Figure 100 - NPN Input 2 Using Matrix 320 5mp Power

Input 2 Connections Using External Power

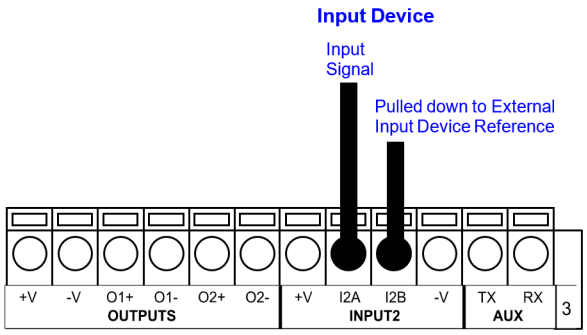


Figure 101 - PNP Input 2 Using External Power

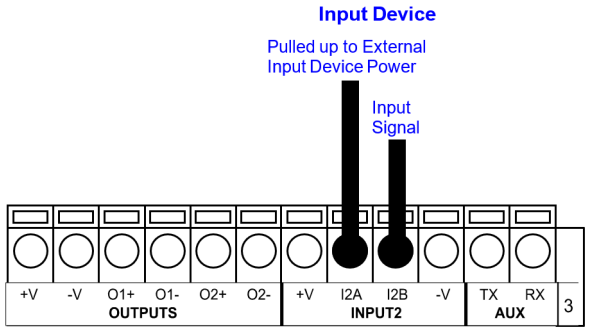


Figure 102 - NPN Input 2 Using External Power

Input 3 Connections (CBX500 Only)

RESERVED

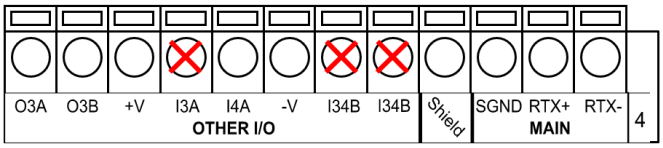


Figure 103 - Input 3 Using External Power

CAUTION: Do not connect to I3A or I34B signals, they are reserved.

OUTPUTS

CAUTION: When Outputs 1 and 2 are connected through the CBX connection box, they become opto-isolated and polarity sensitive and acquire the electrical characteristics listed below. To function correctly, they require setting the Output Line Type configuration parameters to NPN for the respective output. The hardware connection to the CBX can be either NPN or PNP.

Three general purpose outputs are available and their meaning can be defined by the user. They are typically used either to signal the data collection result or to control an external lighting system.

CBX100/500	Description
+V	Power Source - Outputs
O1+	Output 1 + opto-isolated and polarity sensitive
O1-	Output 1 - opto-isolated and polarity sensitive
O2+	Output 2 + opto-isolated and polarity sensitive
O2-	Output 2 - opto-isolated and polarity sensitive
O3A	Output 3 non opto-isolated (only available on CBX500)
-V	Power Reference - Outputs

The electrical features of the outputs are the following:

Outputs 1 and 2	Output 3
V_{CE} = 30 Vdc max.	Reverse-Polarity and Short-Circuit Protected
I_{CE} = 40 mA continuous max.; 130 mA pulsed max.	V_{OUT} (I_{LOAD} = 0 mA) max = 30 Vdc
$V_{CE\ saturation}$ = 1 Vdc max. @ 10 mA	V_{OUT} (I_{LOAD} = 100 mA) max = 3 Vdc
P_D = 90 mW Max. @ 50 °C ambient temp.	I_{LOAD} max = 100 mA

By default, Output 1 is associated with the No Read event, which activates when the code(s) signaled by the external trigger are not decoded, and Output 2 is associated with the Good Read event, which activates when all the selected codes are correctly decoded.

The output signals are fully programmable being determined by the configured Activation/Deactivation events, Deactivation Timeout or a combination of the two. Refer to the DL.CODE parameters Help On Line for further details.

Output 1 and 2 Connections Using Matrix 320 5mp Power

CAUTION: Power from the Vdc/GND spring clamps is available directly to the Output Device on the +V/-V spring clamps, and does not pass through the Power Switch (ON/OFF) inside the CBX. Disconnect the power supply when working inside the CBX.

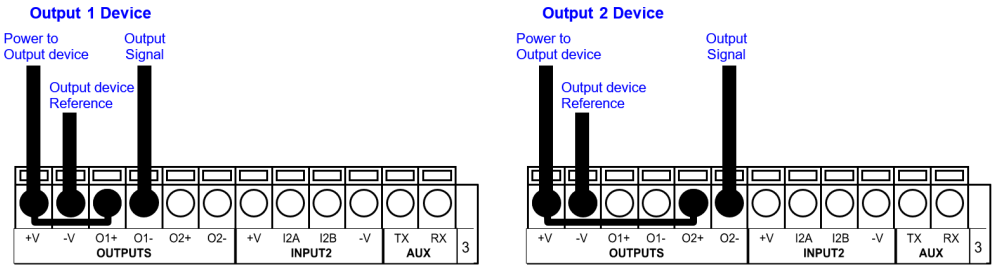


Figure 104 - PNP/Open Emitter Output Using Matrix 320 5mp Power

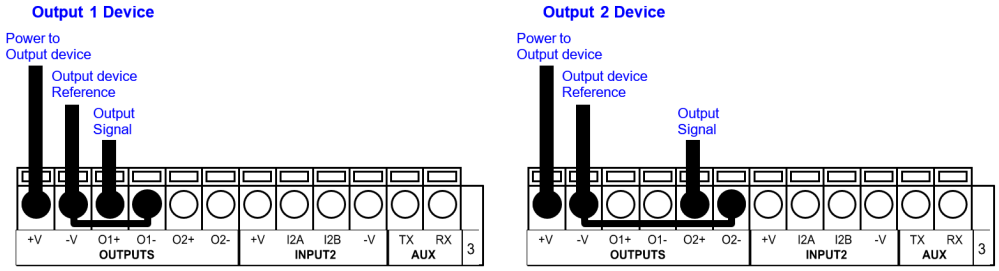


Figure 105 - NPN/Open Collector Output Using Matrix 320 5mp Power

Output 1 and 2 Connections Using External Power

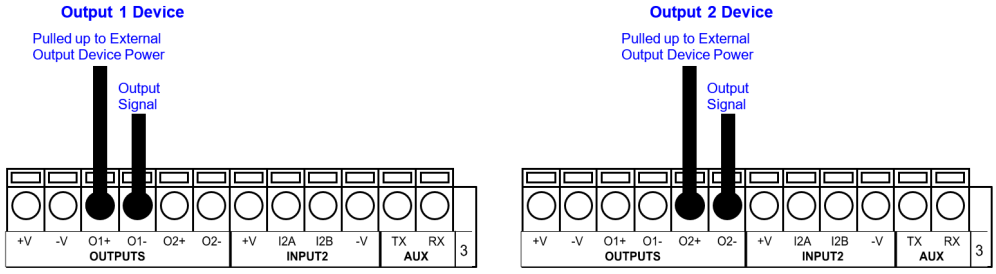


Figure 106 - PNP/Open Emitter Output Using External Power

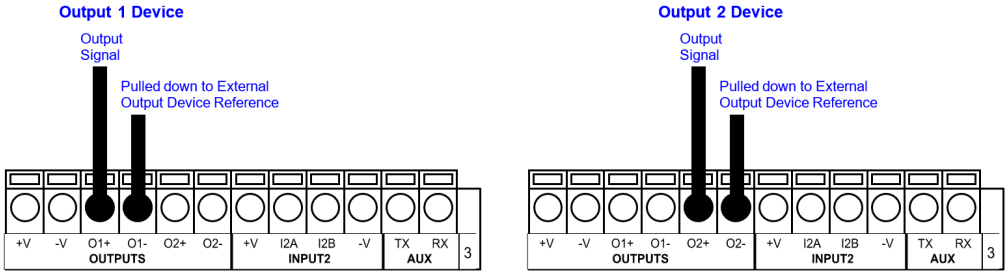


Figure 107 - NPN/Open Collector Output Using External Power

Output 3 is **not opto-isolated** but can be assigned to the same events. By default it is not assigned to any event. The CBX500 must be used to connect this output.

NOTE: For Output 3, set the Line Type configuration parameter according to the hardware connection to the CBX: NPN, PNP or Push-Pull.

Output 3 Connections Using Matrix 320 5mp Power (CBX500 Only)

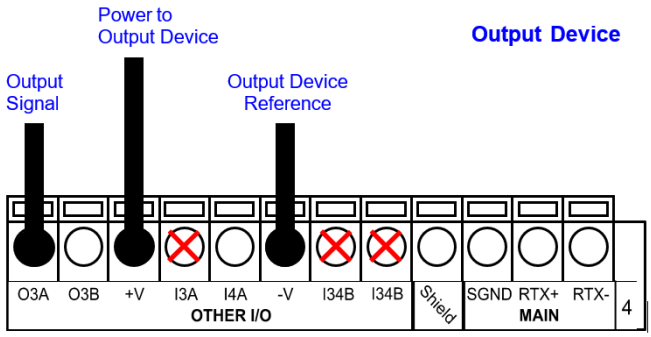


Figure 108 - Output 3 Using Matrix 320 5mp Power

Output 3 Connections Using External Power (CBX500 Only)

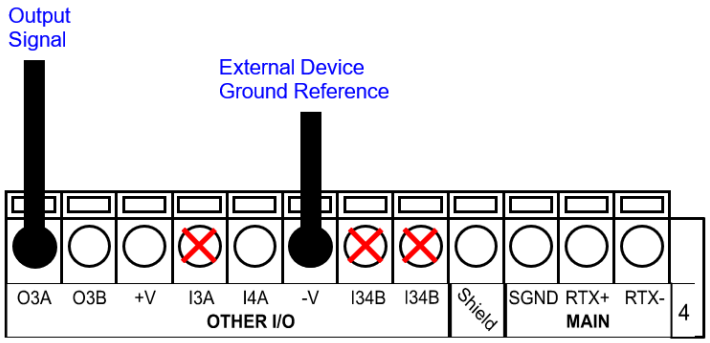


Figure 109 - Output 3 Using External Power

CAUTION: Do not connect to I3A or I34B signals, they are reserved.

ON-BOARD ETHERNET INTERFACE

The on-board Ethernet Interface can be used for TCP/IP communication with a remote or local host computer by connecting the reader to either a LAN or directly to a host PC. There is no need to use a crossover adapter since Matrix 320 5mp incorporates an auto-cross function.

A **CAB-ETH-X-M0x** cable can be used to connect to a LAN.

On the Matrix 320 5mp on-board Ethernet interface the following communication channels are available:

- TCP Client
- TCP Server
- UDP Channel
- FTP Client

The following Fieldbus protocols are also available over the on-board Ethernet interface:

- EtherNet/IP
- PROFINET IO
- Modbus TCP Client
- Modbus TCP Server
- SLMP

For further details refer to the Help On Line page of the Reading Phase step (Channels) and (Fieldbuses) in DL.CODE.

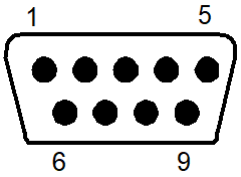
The following IoT protocol is also available over the on-board Ethernet interface:

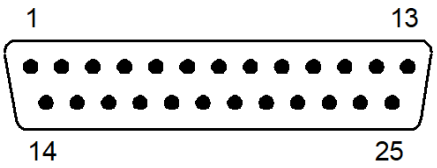
- OPC UA

For further details, refer to "OPC UA protocol" on page 119.

USER INTERFACE - SERIAL HOST

The following table contains the pinout for standard RS232 PC Host interface. For other user interface types please refer to their own manual.

<table>
<tr><th colspan="4">RS232 PC-side Connections</th></tr>
<tr><td colspan="2">

9-pin male connector</td><td colspan="2">

25-pin male connector</td></tr>
<tr><th>Pin</th><th>Name</th><th>Pin</th><th>Name</th></tr>
<tr><td>2</td><td>RX</td><td>3</td><td>RX</td></tr>
<tr><td>3</td><td>TX</td><td>2</td><td>TX</td></tr>
<tr><td>5</td><td>GND</td><td>7</td><td>GND</td></tr>
</table>

OPC UA PROTOCOL

OPC Unified Architecture is a platform-independent standard that enables different kinds of systems and devices to communicate by sending request and response messages between Clients and Servers over various types of networks. It supports secure communication that assures the identity of OPC UA Applications and resists attacks.

Being platform-independent means that it functions on any hardware platforms (traditional PC hardware, cloud-based servers, PLCs, etc.) and any operating systems (Microsoft Windows, Apple OS X, Android, or any distribution of Linux, etc.). Furthermore, OPC UA offers the necessary infrastructure for interoperability across the enterprise, from machine-to-machine, machine-to-enterprise and everything in between.

OPC UA Companion Specifications

OPC UA specifies base information models that define commonly used objects including both real-time and historical data variables and alarms.

Based on these, new information models for specific industries can be created. The specifications of these models are called Companion Specifications. A number of Companion Specifications have already been created. Datalogic implements the OPC UA for AutoID Specification and the Device Information Model Specification. For more information on the Companion Specifications, visit the OPC Foundation website.

Available commands (methods)

A complete description of the commands, or methods, is provided in the AutoID Companion Specification. The commands are also described in the OPC UA Technical Note (download it from Datalogic website).

The Matrix 320 5mp reader can perform the ScanStart and ScanStop methods in OPC UA environment:

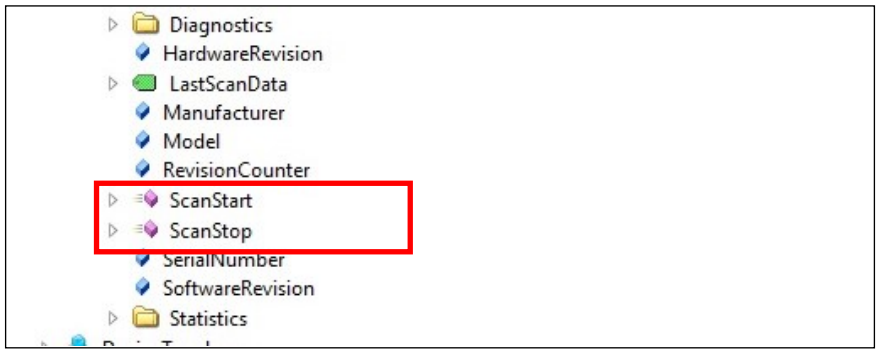


Figure 110 - OPC UA available methods on Matrix 320 5mp

Compatible OPC UA Clients

The Matrix 320 5mp reader is compatible with all OPC UA Clients working in accordance with the AutoID Companion Specification. For example, the following OPC UA Clients can be used:

- UAExpert – Unified Automation
- dataFeed OPC UA Client – Softing

A specific OPC UA Client can be programmed with the OPC UA Stack provided by the OPC Foundation. It is also possible to use the OPC UA SDKs of other manufacturers.

OPC UA on DL.CODE

The OPC UA server is disabled on DL.CODE by default. To enable it, go to Device>Settings>Settings>OPC-UA Settings.

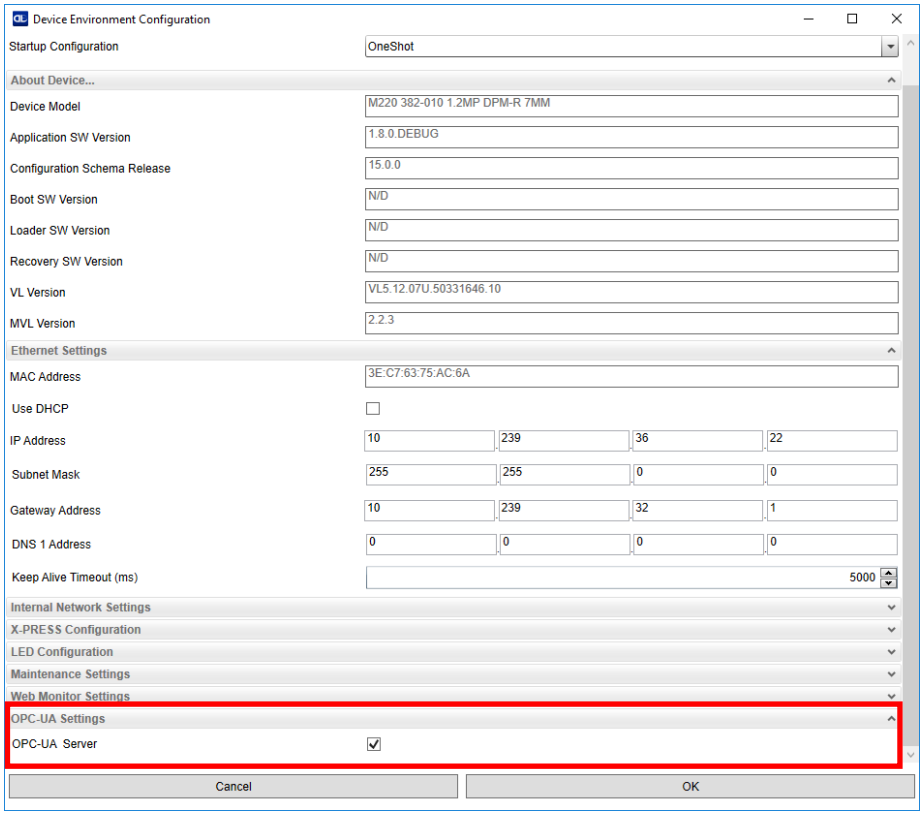


Figure 111 - Enabling OPC UA Server on DL.CODE

The user can also set a username and a password to access the OPC UA device. To enable protection, go to Device>Settings>Security Settings>OPC-UA Settings.

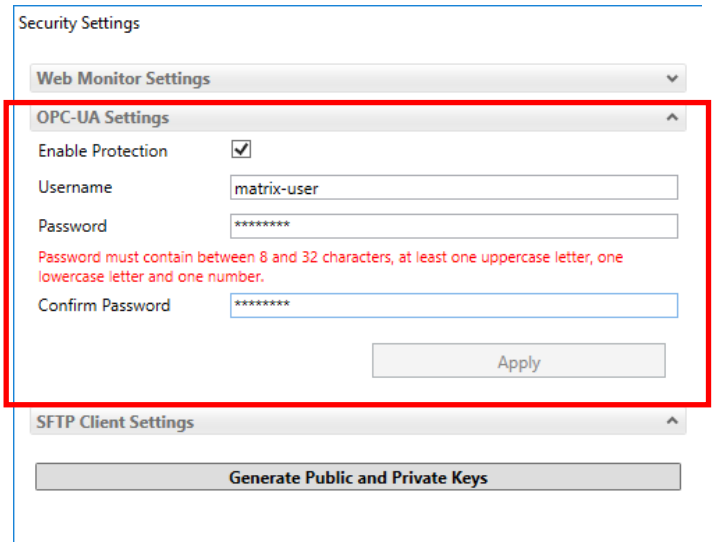


Figure 112 - OPC UA security settings

For more information on OPC UA, download the OPC UA Technical Note from Datalogic website.

CHAPTER 5
TYPICAL LAYOUTS

The following typical layouts refer to system hardware configurations. However, they also require the correct setup of the software configuration parameters. Dotted lines in the figures refer to optional hardware configurations within the particular layout.



NOTE: All software configurations are made through DL.CODE which connects to the reader through the on-board Ethernet interface.



NOTE: DL.CODE now supports several different multi device configuration types using the PASS-THROUGH configuration. In particular this feature allows MULTIDATA ID-NET network configurations to be made. Master/Slave SYNCHRONIZED ID-NET network configurations are also configurable as before.



NOTE: The Master/Slave Role is only significant for the Internal ID-NET Network. If your layout doesn't use the ID-NET network then the device's Role is not significant and can be ignored.

ETHERNET CONNECTION

The Ethernet connection is possible in two different layouts.

In a Point-to-Point layout the reader is connected to a local host by using a CAB-ETH-X-M0x cable. There is no need to use a crossover adapter since Matrix 320 5mp incorporates an autocross function.

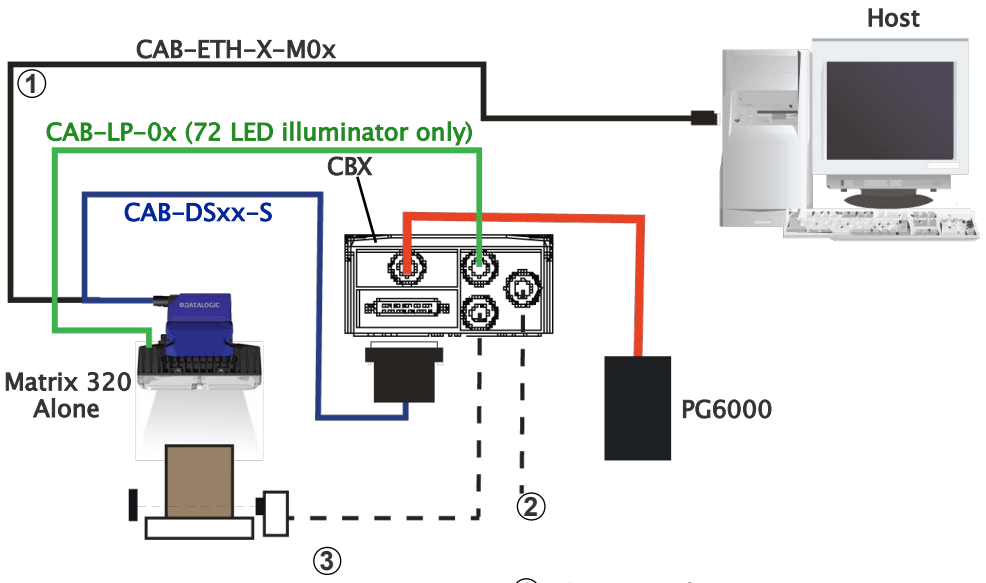
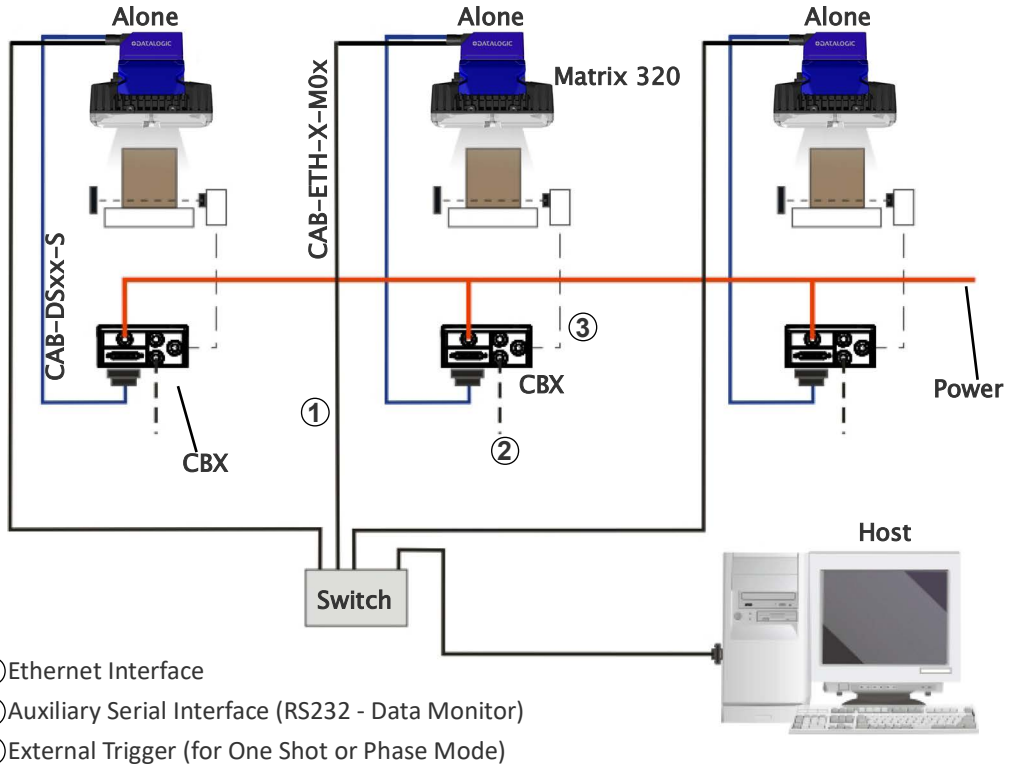


Figure 113 - Ethernet Point-to-Point Layout

All devices always support multiple output channels (i.e. for data monitoring).

NOTE: For electrical connections to the CBX box, refer to CBX Electrical Connections, starting on page 94.

When using a Local Area Network (LAN), one or more Matrix 320 5mp readers can be connected to the network by using **CAB-ETH-X-M0x** cables:



①Ethernet Interface
②Auxiliary Serial Interface (RS232 - Data Monitor)
③External Trigger (for One Shot or Phase Mode)

Figure 114 - Ethernet Network Layout

SERIAL CONNECTION

In this layout the data is transmitted to the Host on the main serial interface. The Ethernet interface can be used for reader configuration by connecting a laptop computer running DL.CODE.

Data can be transmitted on the RS232 auxiliary interface independently from the main interface selection to monitor data.

When One Shot or Phase Mode operating mode is used, the reader can be activated by an External Trigger (for example a pulse from a photoelectric sensor) when the object enters its reading zone.

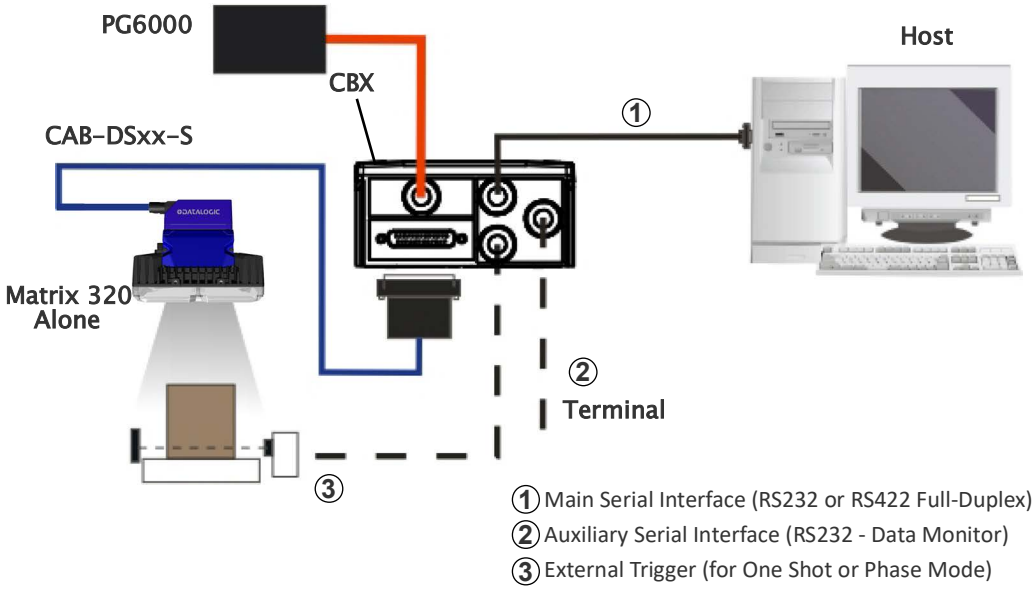


Figure 115 - Serial Interface Point-to-Point Layout

All devices always support multiple output channels (i.e. for data monitoring).

FIELDBUS CONNECTION

In this layout a single reader functions as a Slave node on a Fieldbus network. The data is transmitted to the Host through an accessory Fieldbus interface board installed inside the CBX500 connection box.

Reader configuration can be accomplished through the Ethernet interface using the DL.CODE configuration program.

Data can be transmitted on the RS232 auxiliary interface independently from the Field-bus interface selection to monitor data.

When One Shot or Phase Mode operating mode is used, the reader can be activated by an External Trigger (photoelectric sensor) when the object enters its reading zone.

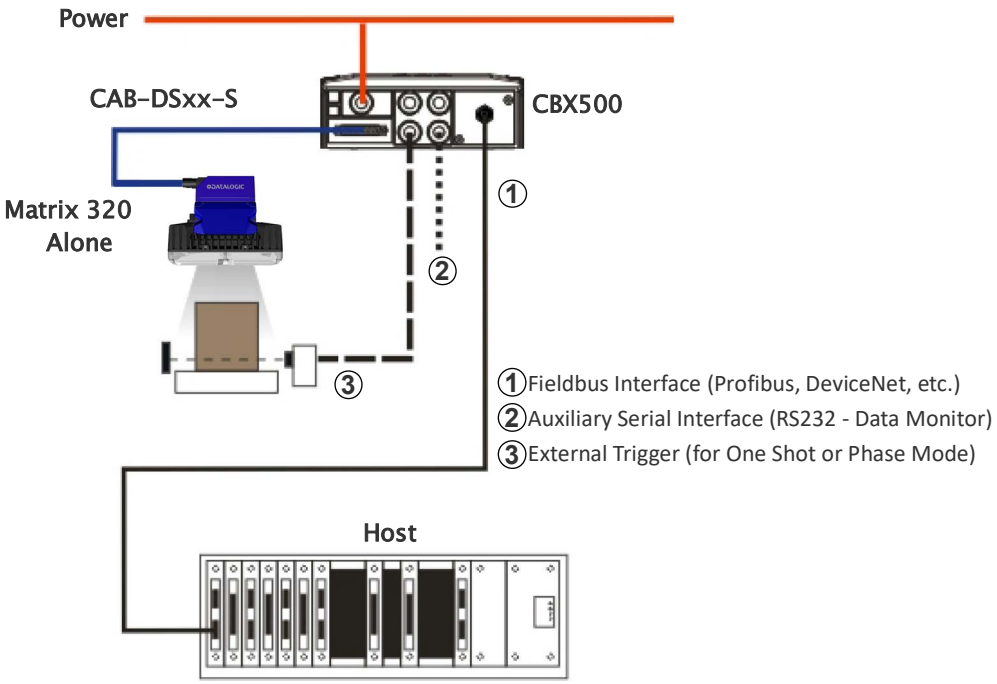


Figure 116 - Fieldbus Interface Point-to-Point Layout

All devices always support multiple output channels (i.e. for data monitoring).

PASS-THROUGH

The pass-through layout allows each device **working Alone**, to collect data from one or more pass-through input channels and send this data plus its own on one or more different output channels.

In this way independent devices can be connected together in combinations to create multi device networks. Many devices reading independently can send their messages through a common output channel which instead of being directed at a Host can be collected by another device on its pass-through input channel and sent to a Host on a different output channel.

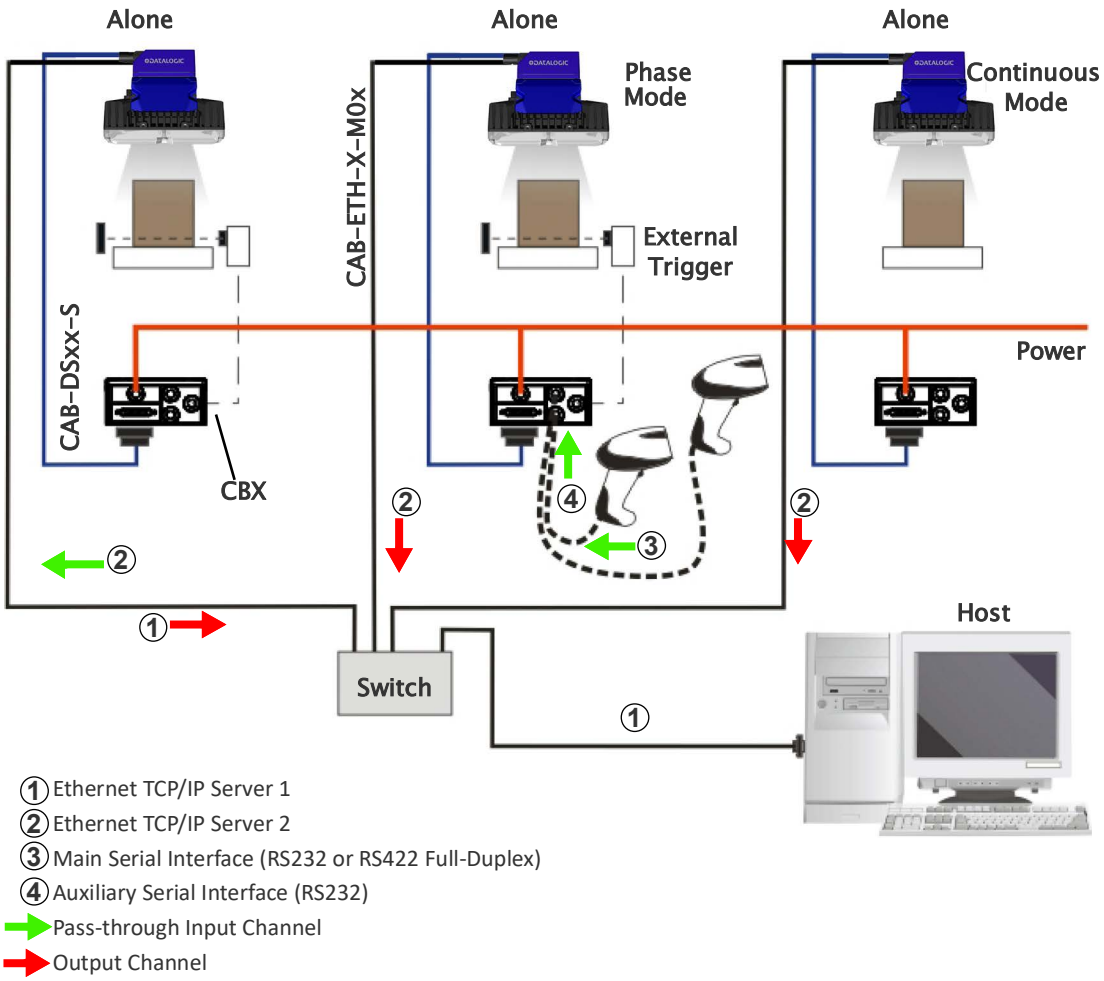


Figure 117 - Pass-Through Layout

In a Pass-through layout each device supports multiple pass-through configurations to accept input from different devices on different channels (i.e. middle reader above). However, readers are not required to have a pass-through configuration if they don't need to receive data from an input channel (i.e. right reader above). The overall data collection device always has at least one pass-through configuration to collect the input data from the other devices and send it to the Host (i.e. left reader above).

All devices always support multiple output channels (i.e. for data monitoring).

In a Pass-through layout each device can have a different operating mode: Continuous, One Shot, Phase Mode, etc.

ID-NET MULTIDATA NETWORK (PASS-THROUGH)

A special case of the pass-through layout allows each Slave device **working Alone**, to collect data from one or more pass-through input channels and send this data plus its own on the ID-NET output channel to the Master.

The Slave readers are connected together using the ID-NET interface. Every Slave reader must have an ID-NET address in the range 1-31.

The Master collects the data from its pass-through ID-NET input channel and sends it to the Host on a different output channel.

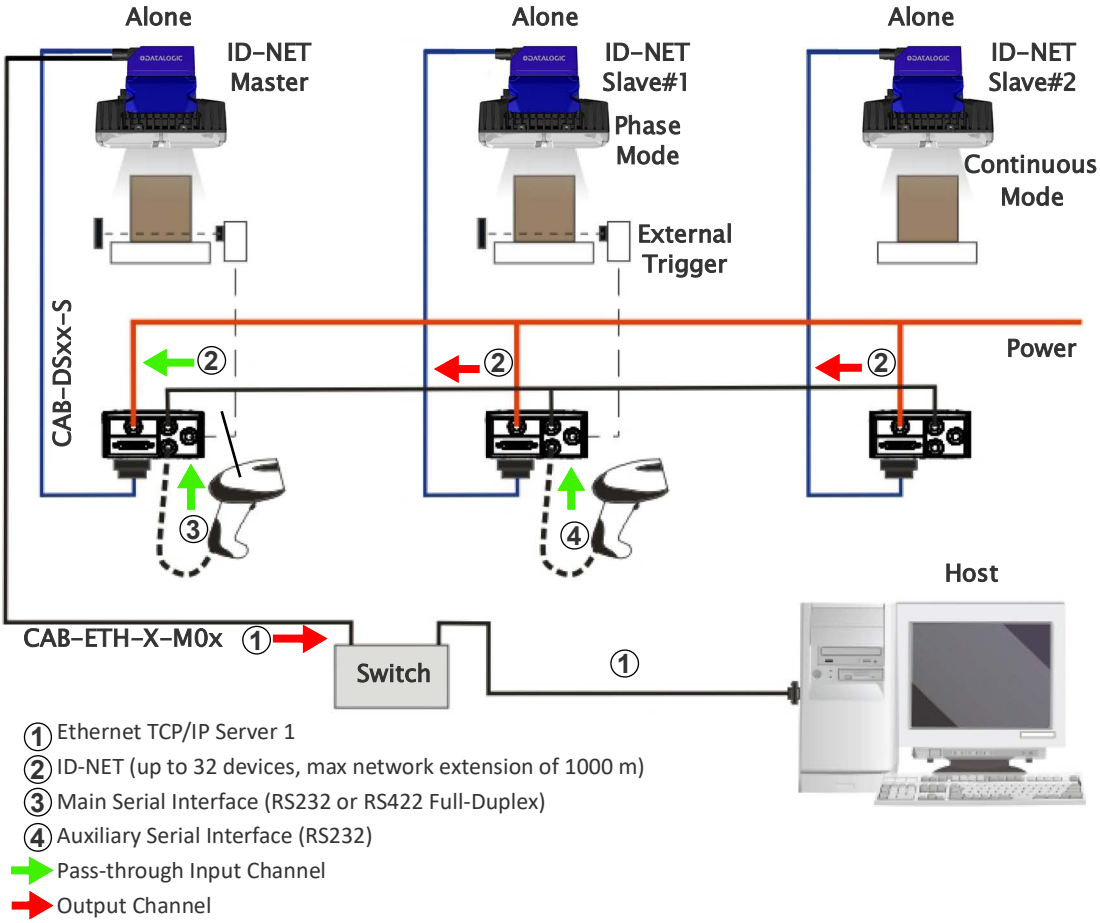


Figure 118 - ID-NET Multidata Layout (Pass-through)

In a Pass-through layout each device supports multiple pass-through configurations to accept input from different devices on different channels (i.e. Master reader above). However, ID-NET Slave readers are not required to have a pass-through configuration if they don't need to receive data from an input channel (i.e. right reader above). The ID-NET Master always has at least one pass-through configuration to collect the ID-NET Slaves data and send it to the Host.

NOTE: Slave devices cannot receive data from a pass-through ID-NET input channel and Master devices cannot send data on an ID-NET output channel.

All devices always support multiple output channels (i.e. for data monitoring).

In a Pass-through layout each device can have a different operating mode: Continuous, One Shot, Phase Mode, etc.

ID-NET SYNCHRONIZED NETWORK

When the device is **working Synchronized**, the ID-NET connection is used to collect data from several readers to build a multi-point or a multi-sided reading system; there can be one Master and up to 31 Slaves connected together.

The Slave readers are connected together using the ID-NET interface. Every slave reader must have an ID-NET address in the range 1-31.

The Master reader is also connected to the Host on one of its communication channels. In the following examples the RS232/RS422 main serial interface is used.

For a Master/Slave Synchronized layout the External Trigger signal is unique to the system; there is a single reading phase and a single message from the Master reader to the Host computer. **It is not necessary to bring the External Trigger signal to all the readers.**

In the Master/Slave Synchronized layout the Master operating mode can only be set to PackTrack or Phase Mode.

The Main and ID-NET interfaces are connected as shown in the following figures.

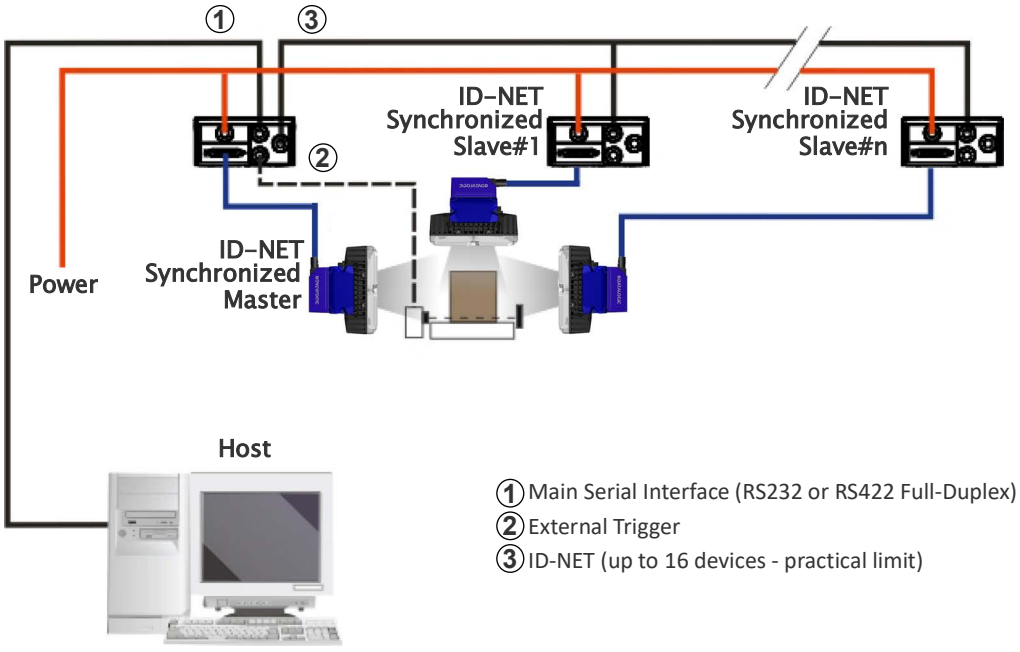


Figure 119 - ID-NET Synchronized Layout

The Master reader can be connected to the CBX series connection box with the advantage of the Backup and Restore configuration function (CBX + BM100 module).

All devices always support multiple output channels (i.e. for data monitoring).

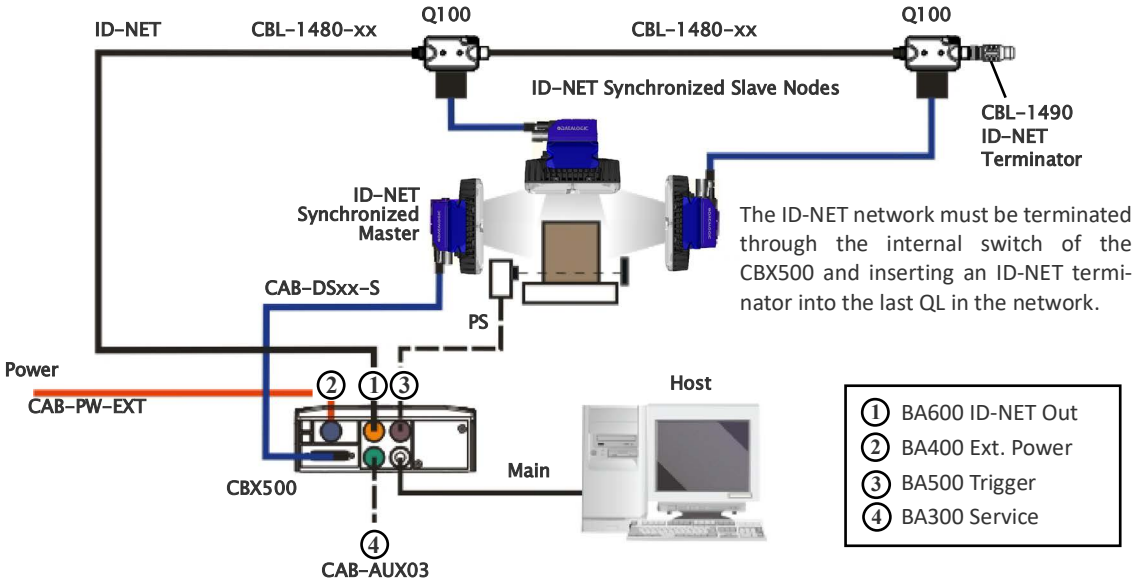


Figure 120 - ID-NET Synchronized Layout Matrix 320 5mp Master with CBX500 + Matrix 320 5mp Slaves with QL100

If the Backup and Restore function is not required, then a QL300 can be used to connect the master reader.

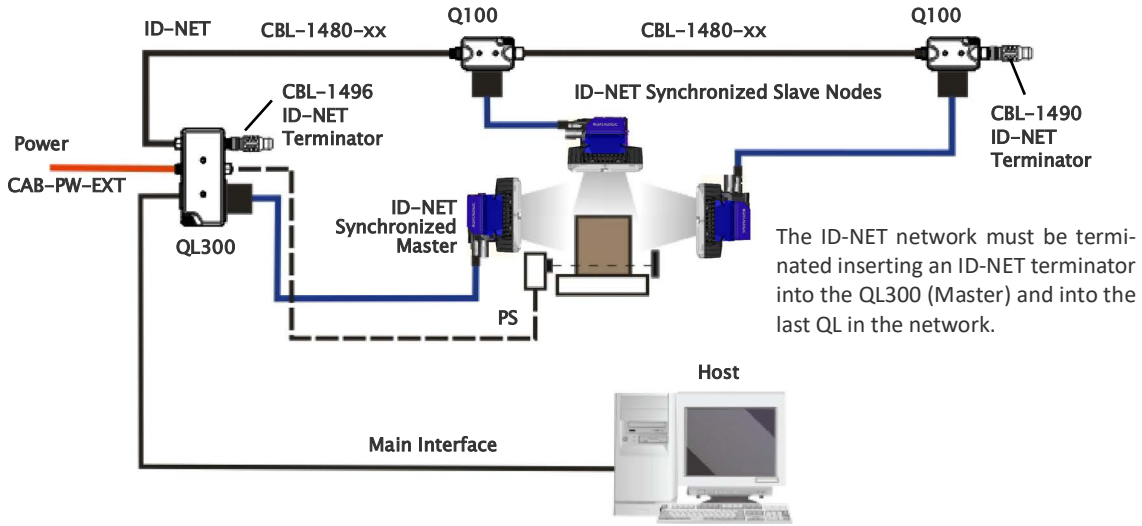


Figure 121 - ID-NET Synchronized Layout Matrix 320 5mp Master with QL300+ Matrix 320 5mp Slaves with QL100

The same configuration can be made to a Host using the on-board Ethernet interface to the Master. The TCP/IP Ethernet and ID-NET interfaces are connected as shown in the figure below.

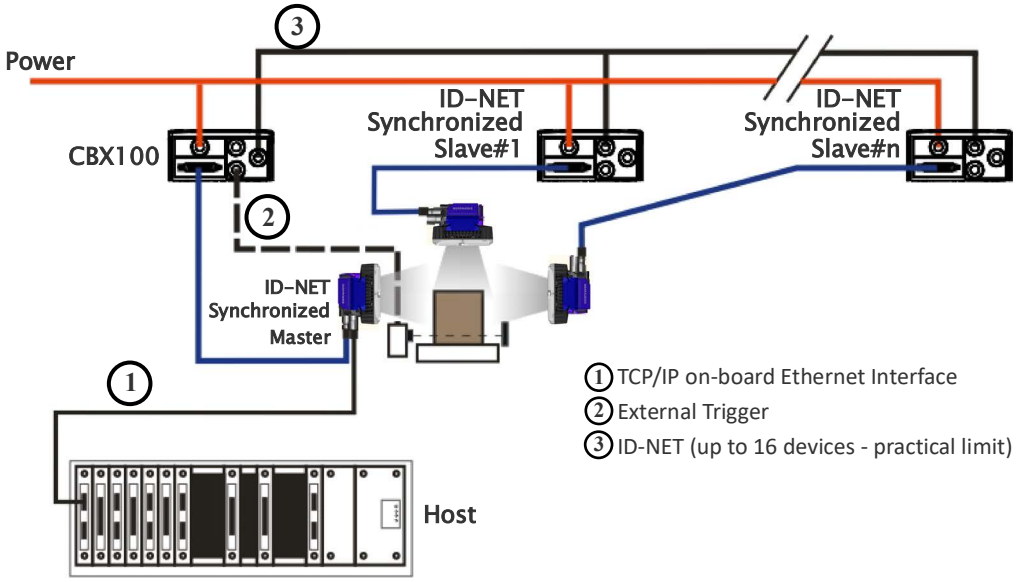


Figure 122 - ID-NET Synchronized Layout with Master on-board TCP/IP Ethernet Interface to Host

Alternatively, the Master reader can communicate to the Host as a Slave node on a Fieldbus network. This requires using an accessory Fieldbus interface board installed inside the CBX500 connection box. System configuration can be accomplished through the Ethernet interface of each individual reader using the DL.CODE configuration program.

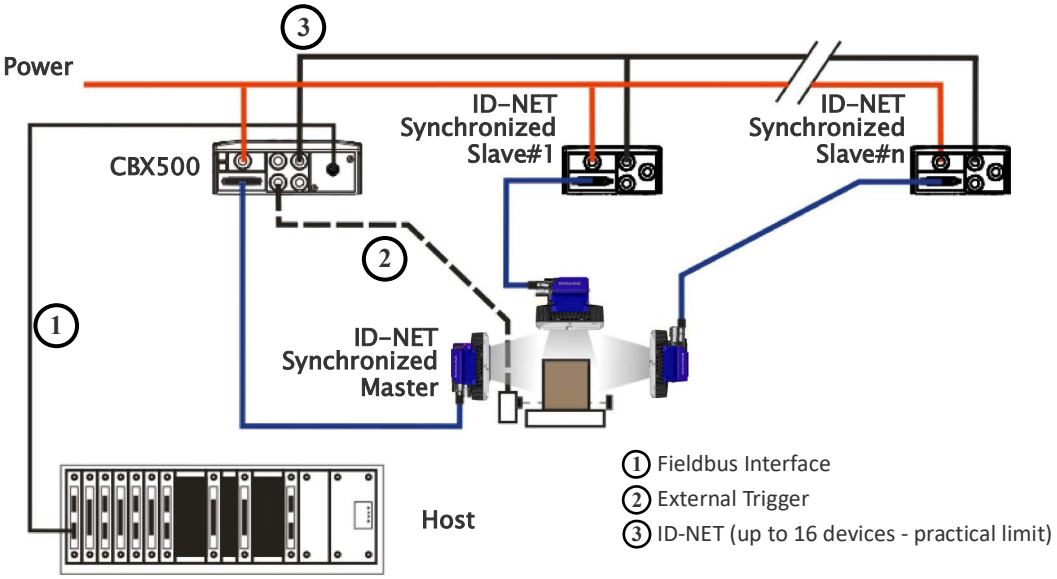


Figure 123 - ID-NET Synchronized Layout with Master CBX500 Fieldbus Interface to Host

CHAPTER 6
READING FEATURES

FOV CALCULATION

Use the data in the following table to calculate the FOV for your application, referring to Figure 124 and the formula below.

Model	F/#	d_0 Offset (mm) *	Viewing Angle Horizontal	Viewing Angle Vertical	Viewing Angle Diagonal	Min. Focus Distance (mm)
Matrix 320 C-Mount 8mm	1.8	53	49.8°	37.8°	60°	22
Matrix 320 C-Mount 12mm	1.8	57	33.7°	25.6°	42°	63
Matrix 320 C-Mount 16mm	1.8	68	25.2°	19.2°	31.4°	160
Matrix 320 C-Mount 25mm	1.85	62	16.3°	12.3°	20.3°	162
Matrix 320 C-Mount 35mm	1.85	60	11.8°	8.9°	14.8°	183
Matrix 320 C-Mount 50mm	2	61	8.2°	6.2°	10.3°	373

* Distance referred to 72 LED illuminator. For 36 LED illuminator subtract 2 mm.

The viewing angles have a tolerance of ± 2° depending on the focusing distance.

$$FOV_x = 2 [(d + d_0) * \tan (\alpha_x/2)]$$

where:

FOV_x = horizontal, vertical or diagonal FOV

α_x = horizontal, vertical or diagonal viewing angles.

d = reading distance (in mm) from window surface to code surface

d_0 = offset (in mm) from center of lens to external window surface

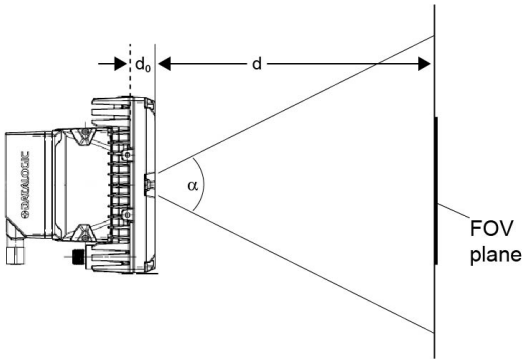


Figure 124 - Reading Distance References

Example:

The FOV for a **Matrix 320 5mp 800-030** with 16mm lens at a **reading distance of 600 mm** is:

FOV_H = 2 [(600 mm + 68 mm) * tan (25°/2)] ≅ **296 mm**

FOV_V = 2 [(600 mm + 68 mm) * tan (19°/2)] ≅ **224 mm**

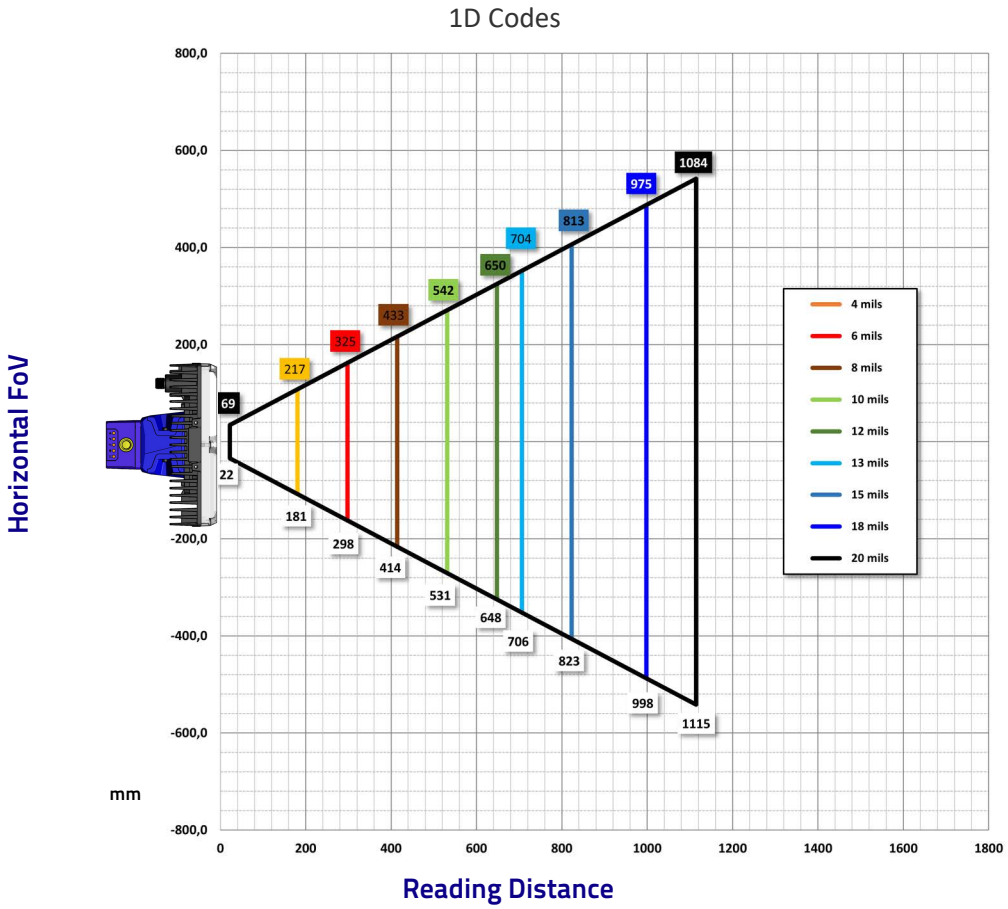
GLOBAL FOV DIAGRAMS

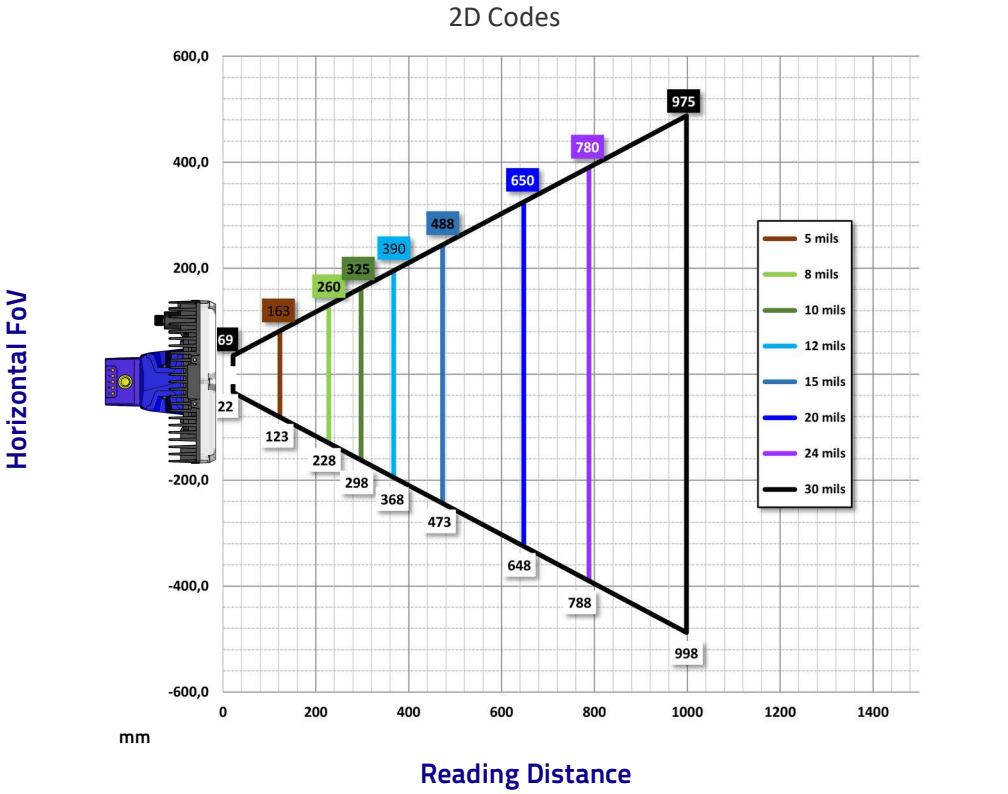
NOTE: The following diagrams are given for typical performance at 25°C using high quality grade A symbols according to ISO/IEC 15416 (1D code) and ISO/IEC 15415 (2D code) print quality test specifications. Testing should be performed with actual application codes in order to maximize the application performance.

The following diagrams show the **maximum obtainable** Field of View for 1D and 2D codes. **Depending on the code resolution, symbology, and number of characters in the code, the Reading Area can be different from the FOV**.

NOTE: The following diagrams refer to Matrix 320 with 72 LEDs illuminator. For Matrix 320 with 36 LEDs illuminator, the reference distances from the exit window should be reduced by 2 mm (internal offset difference between 72 LEDs and 36 LEDs models).

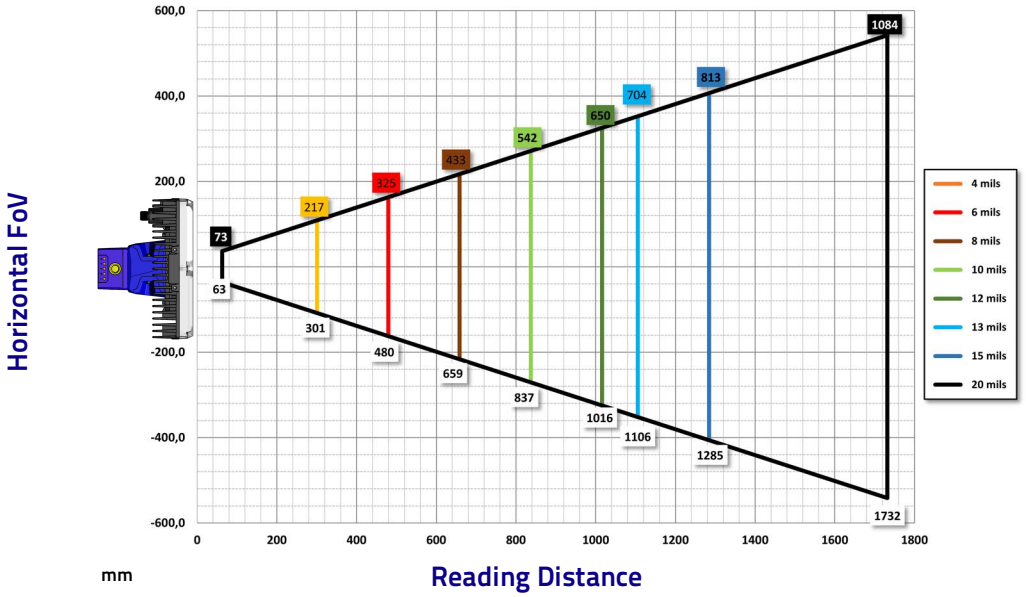
Global FOV for Matrix 320 5mp C-Mount LNS-8



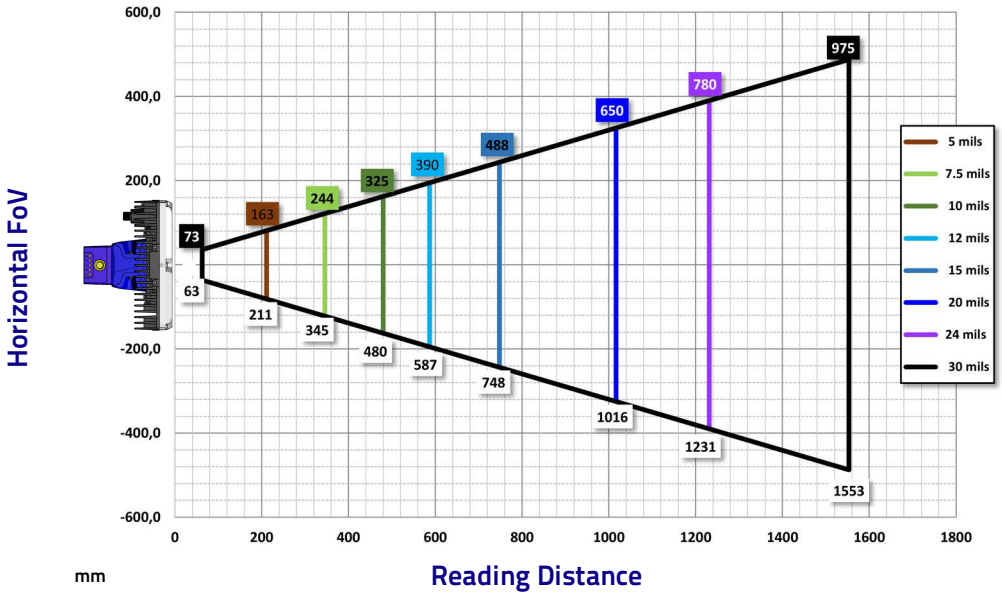


Global FOV for Matrix 320 5mp C-Mount LNS-12

1D Codes

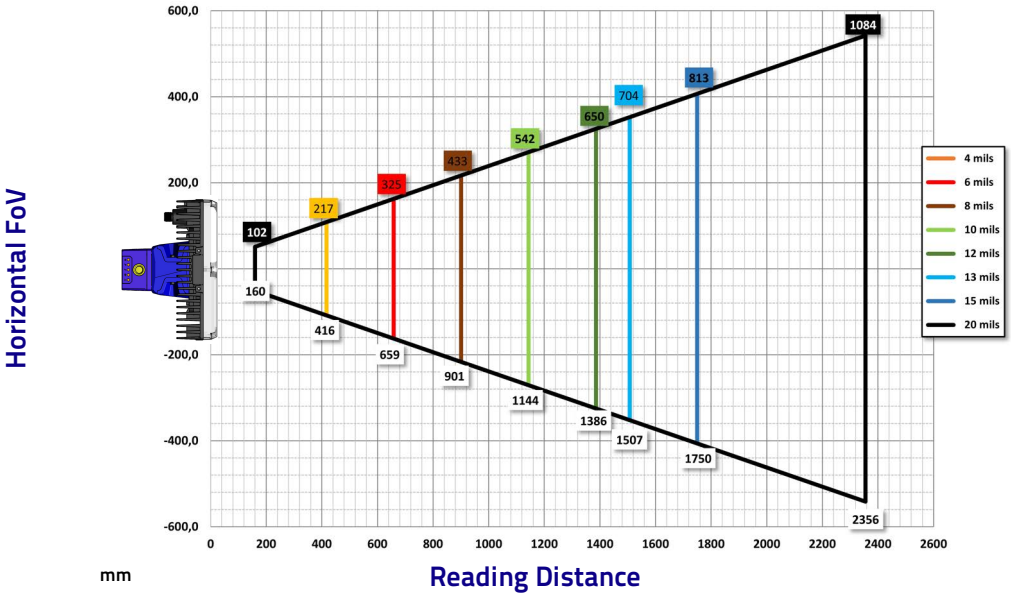


2D Codes

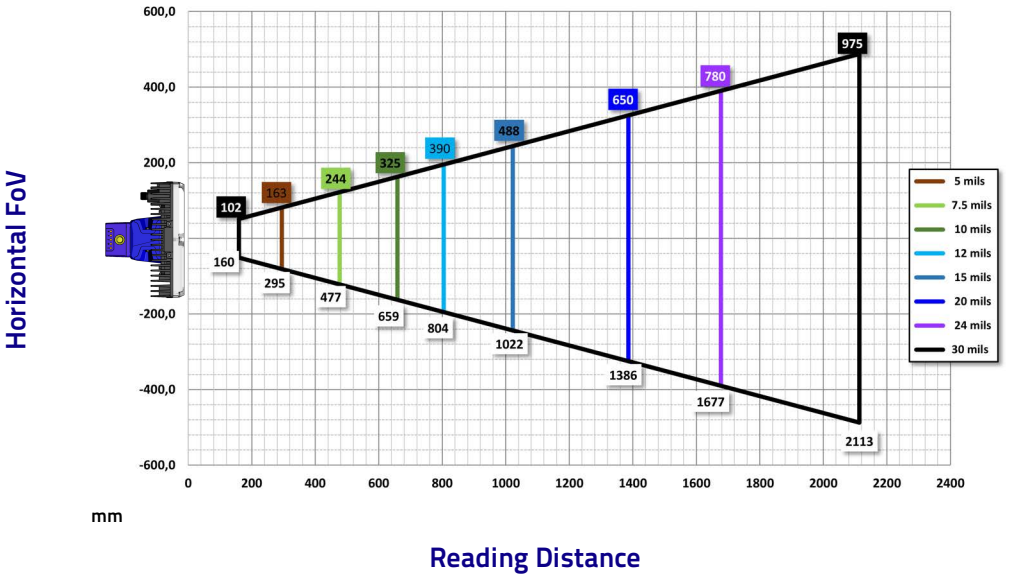


Global FOV for Matrix 320 5mp C-Mount LNS-16

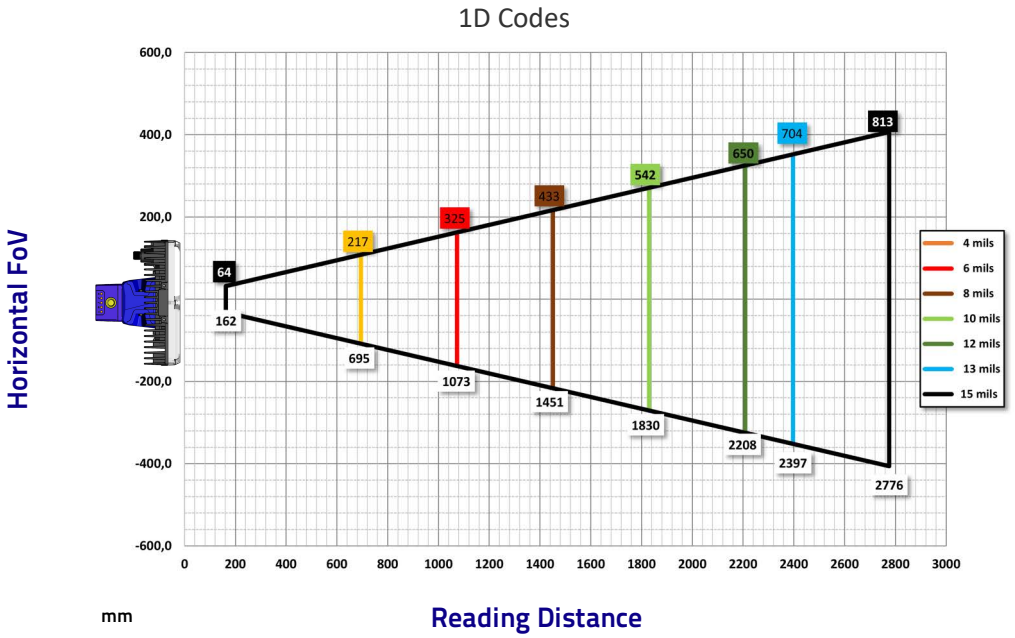
1D Codes

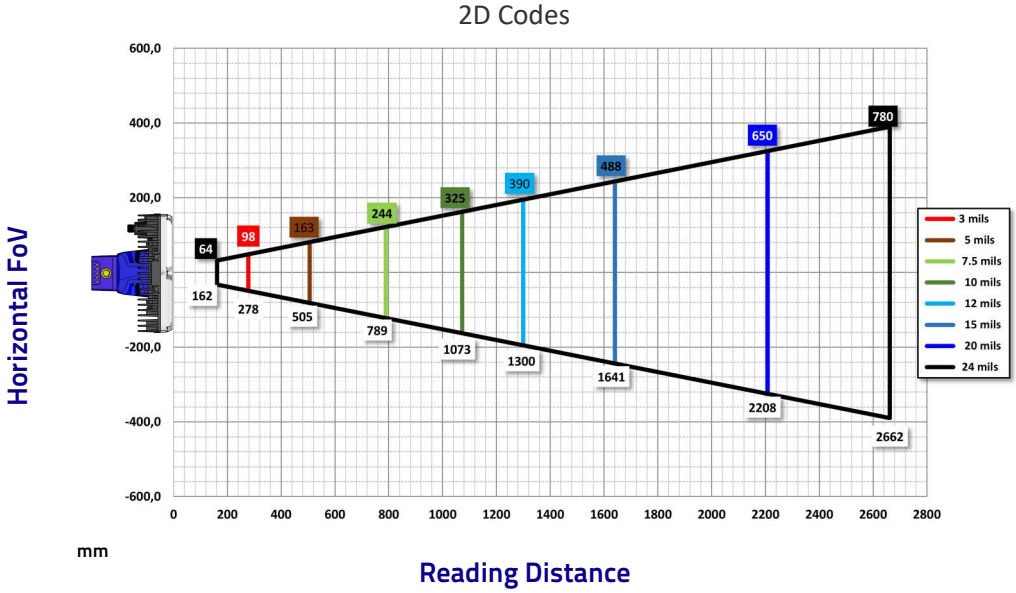


2D Codes

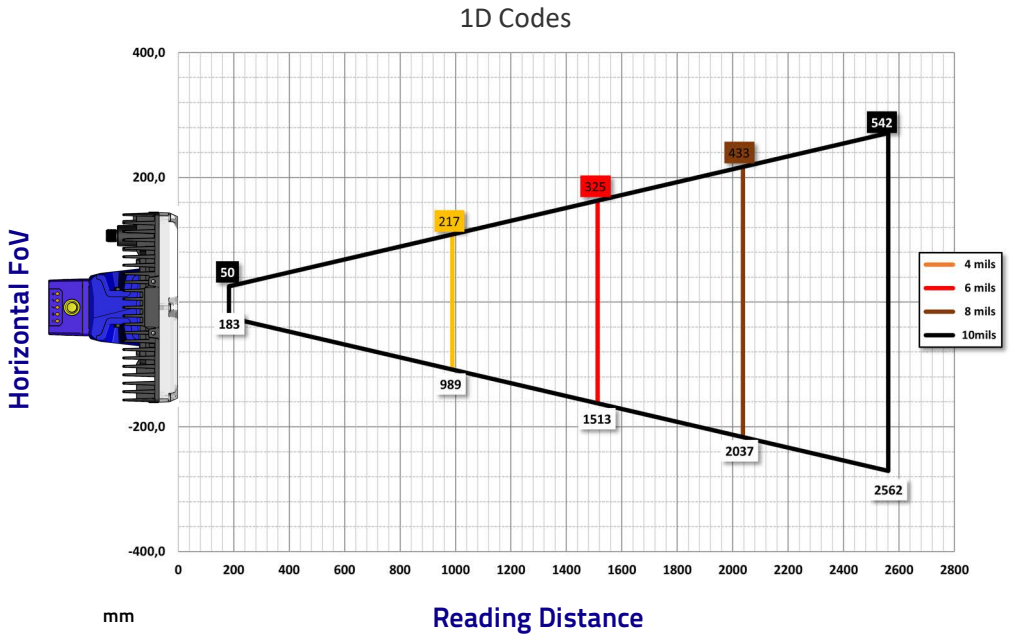


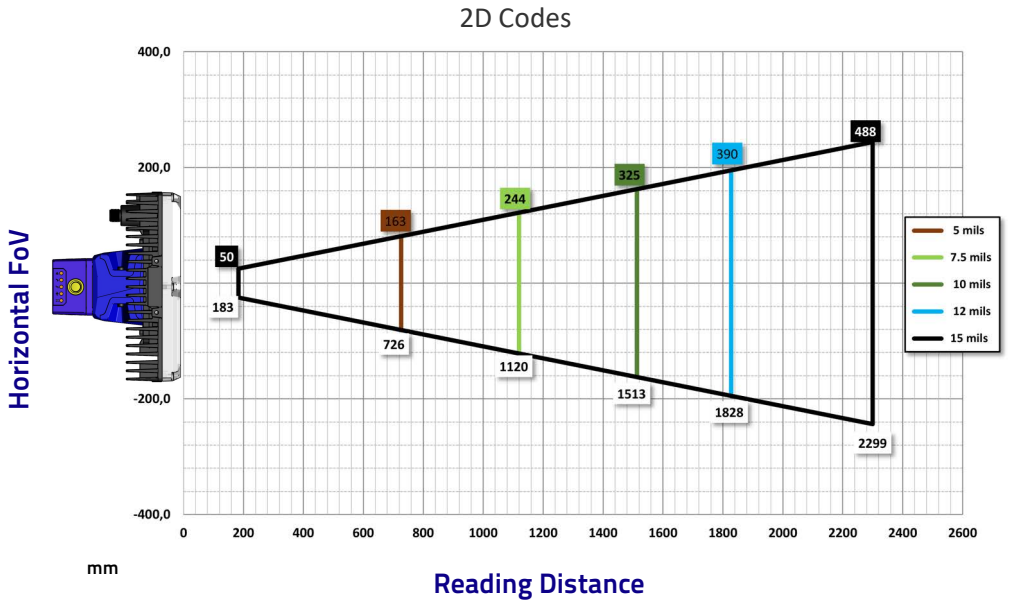
Global FOV for Matrix 320 5mp C-Mount LNS-25





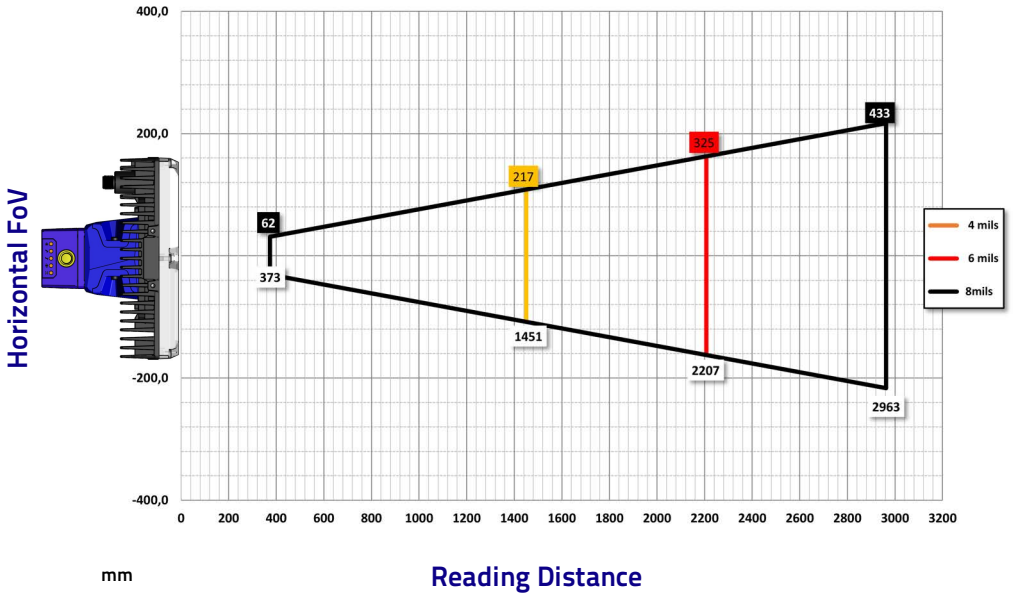
Global FOV for Matrix 320 5mp C-Mount LNS-35





Global FOV for Matrix 320 5mp C-Mount LNS-50

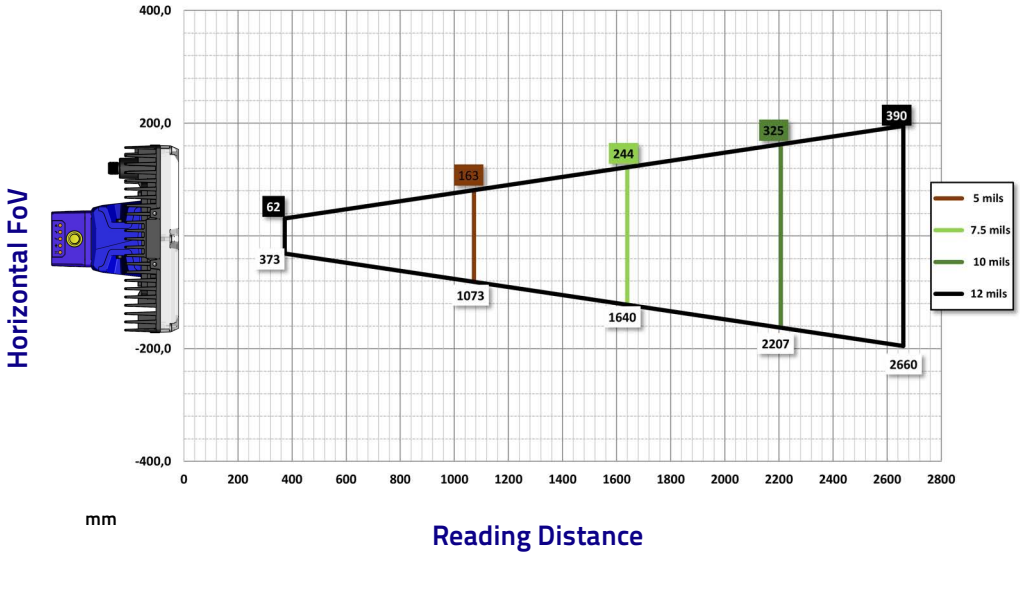
1D Codes



mm

Reading Distance

2D Codes



mm

Reading Distance

READING DIAGRAMS

The following reading diagrams are to be considered as references and are given for typical performance at 25°C using high quality grade A symbols: Code 128 (1D code) from the Test Charts provided with the reader.

Testing should be performed with the actual Matrix 320 5mp using application codes in order to evaluate whether maximizing application performance requires adjustments to the HW/SW configuration with respect to the Reference Conditions given under each diagram.

The ratio of the vertical FOV width with respect to the Horizontal FOV width in the diagram is about equal to 0.75. Specifically 2560/1936 (i.e. $Fov_V \cong FOV_H$ x 0.75).

The reading distance ranges are measured from the reading window surface.

The max. theoretical Line Speed values for each diagram can be calculated using the formula in "Maximum Line Speed and Exposure Time Calculations" on page 146.

Common software parameter settings for models reading 1D code symbologies:

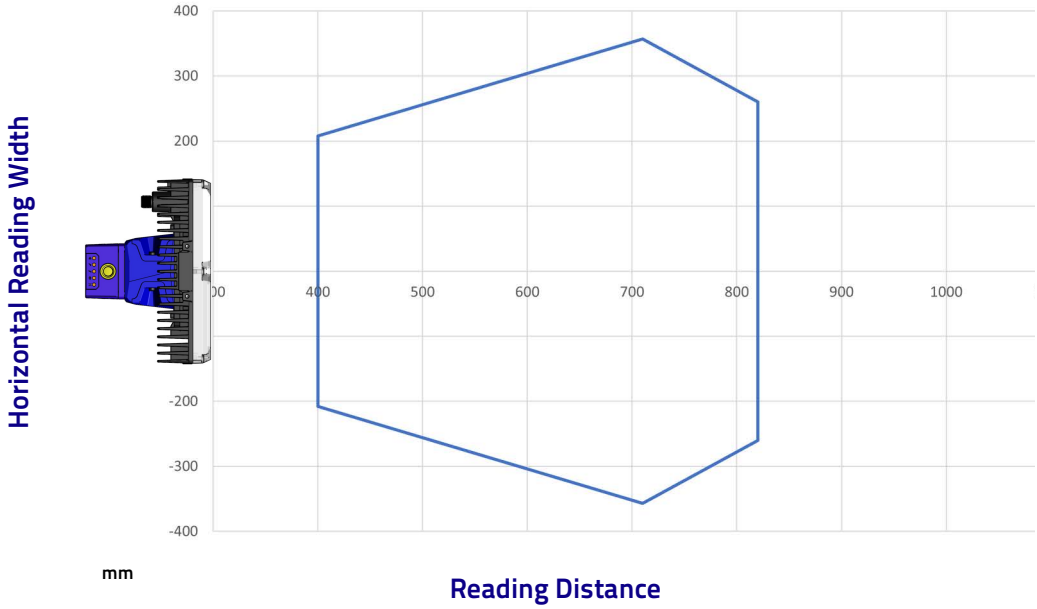
- Processing Timeout = 500 ms.

When defining HW/SW configuration for Matrix 320 5mp for conditions different from those of the reference diagrams, it is suggested to keep in mind the following rules:

- Changes in the *Exposure Time* act directly proportional to the luminosity of the image and inversely proportional to the maximum code reading movement speed. Consequently, reducing the Exposure Time by half reduces the luminosity of the image by half but doubles the theoretical code reading movement speed.
- Changes in *Gain* act directly proportional to the luminosity of the image. However, increasing the Gain value can reduce the quality of the acquired image.

Matrix 320 5mp 800-0xx (8 mm manual) 1D Codes

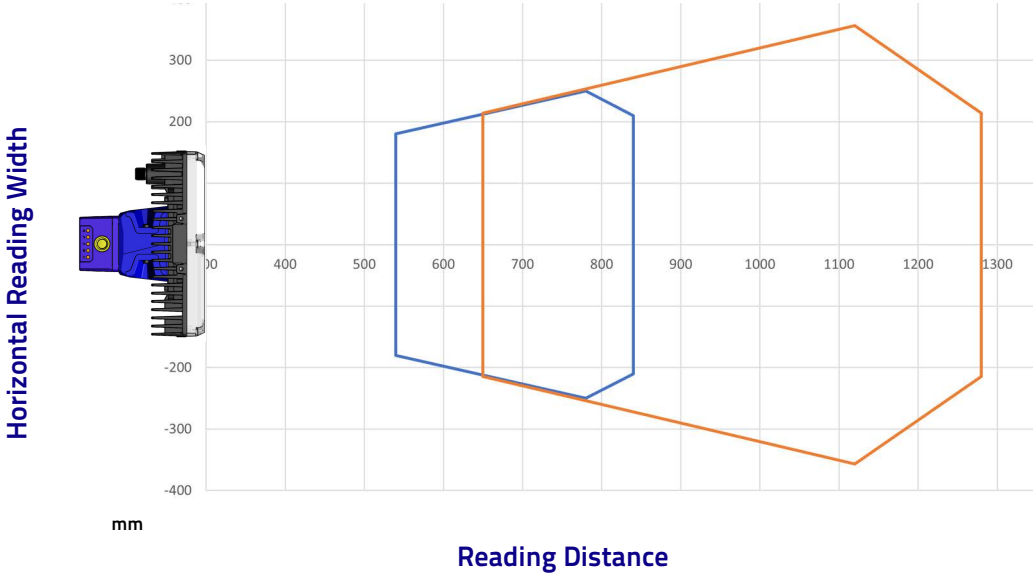
Code 128 0.38 mm (15 mils)



Conditions	
Hardware Settings	
Code Symbology	Code 128
Code Resolution	0.38 mm (15 mils)
Tilt Angle	45°
Skew Angle	15°
Focusing Distance	820 mm
Aperture Stop	F/5.6
Reading Distance Range	400 : 820 mm
Software Parameters	
Internal Lighting	Very High Power Strobed or Continuous High Power Mode
LTM 034-60x	
Exposure Time	135 µs
Gain	10

Matrix 320 5mp 800-0xx (12 mm manual) 1D Codes

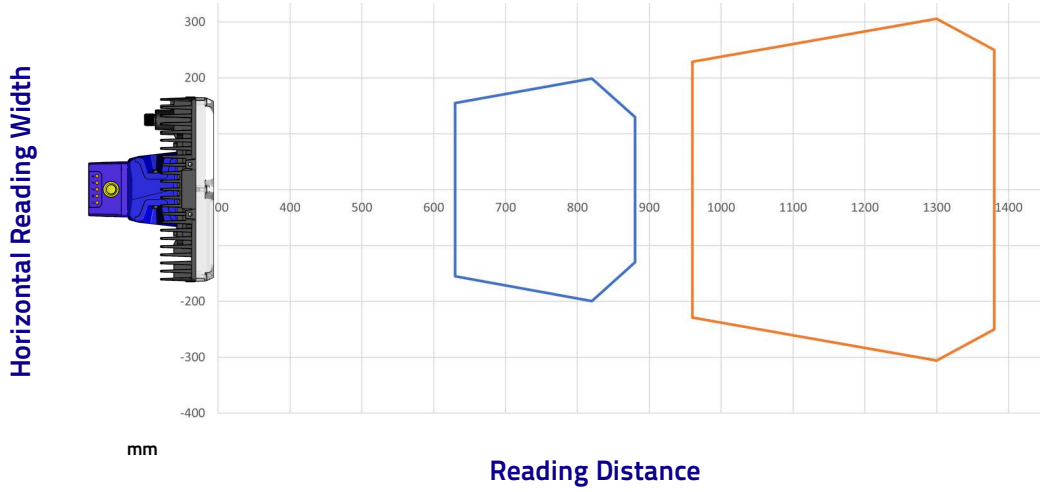
Code 128 0.25 mm (10 mils) and 0.38 mm (15 mils)



Conditions		
Hardware Settings		
Code Symbology	Code 128	
Code Resolution	0.25 mm (10 mils)	0.38 mm (15 mils)
Tilt Angle	45°	
Skew Angle	15°	
Focusing Distance	720 mm	1250 mm
Aperture Stop	F/5.6	
Reading Distance Range	540 : 840 mm	650 : 1280 mm
Software Parameters		
Internal Lighting	Very High Power Strobed or Continuous High Power Mode	
LTM 034-60x		
Exposure Time	130 µs	150 µs
Gain	14	22

Matrix 320 5mp 800-0xx (16 mm manual) 1D Codes

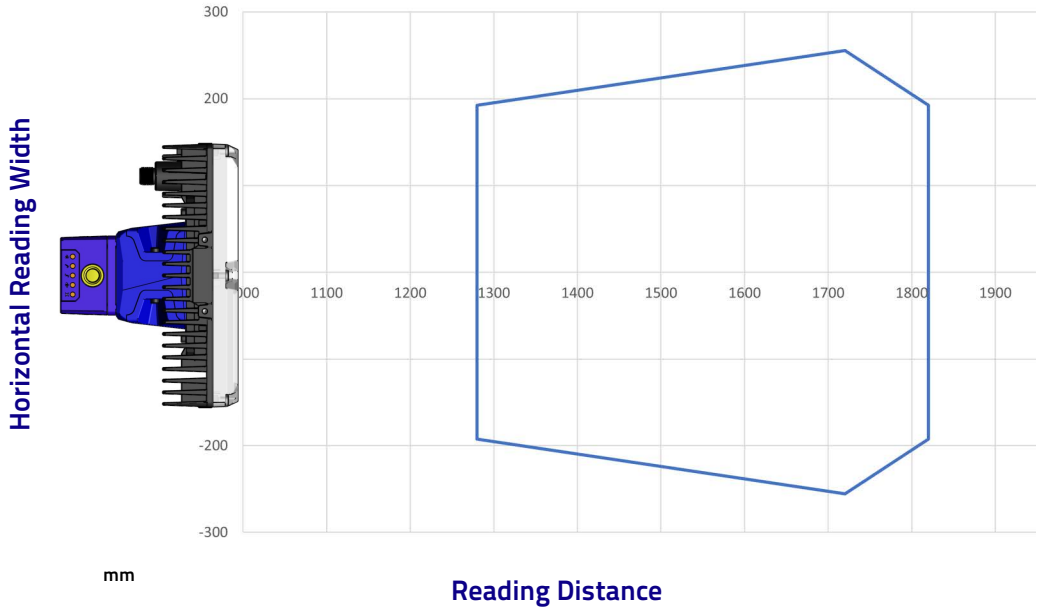
Code 128 0.20 mm (8 mils) and 0.30 mm (12 mils)



Conditions		
Hardware Settings		
Code Symbology	Code 128	
Code Resolution	0.20 mm (8 mils)	0.30 mm (12 mils)
Tilt Angle	45°	
Skew Angle	15°	
Focusing Distance	780 mm	1350 mm
Aperture Stop	F/5.6	
Reading Distance Range	630 : 880 mm	960 : 1380 mm
Software Parameters		
Internal Lighting	Very High Power Strobed or Continuous High Power Mode	
LTM 034-35x		
Exposure Time	80 µs	120 µs
Gain	12	10

Matrix 320 5mp 800-0xx (25 mm manual) 1D Codes

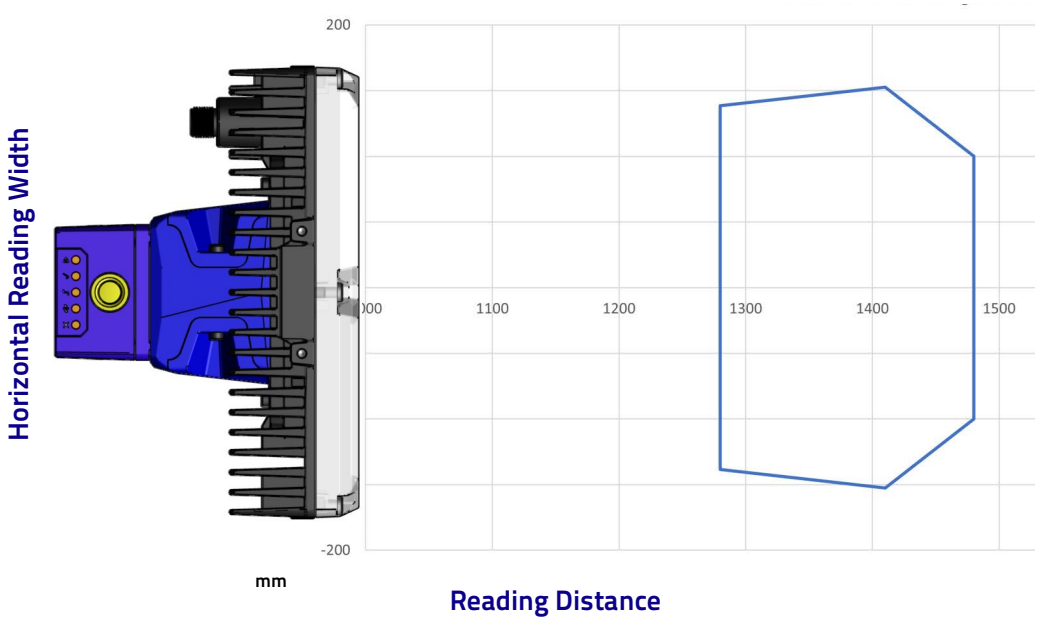
Code 128 0.25 mm (10 mils)



Conditions	
Hardware Settings	
Code Symbology	Code 128
Code Resolution	0.25 mm (10 mils)
Tilt Angle	45°
Skew Angle	15°
Focusing Distance	1730 mm
Aperture Stop	F/8
Reading Distance Range	1280 : 1820 mm
Software Parameters	
Internal Lighting	Very High Power Strobed or Continuous High Power Mode
LTM 034-15x	
Exposure Time	200 µs
Gain	8

Matrix 320 5mp 800-0xx (35 mm manual) 1D Codes

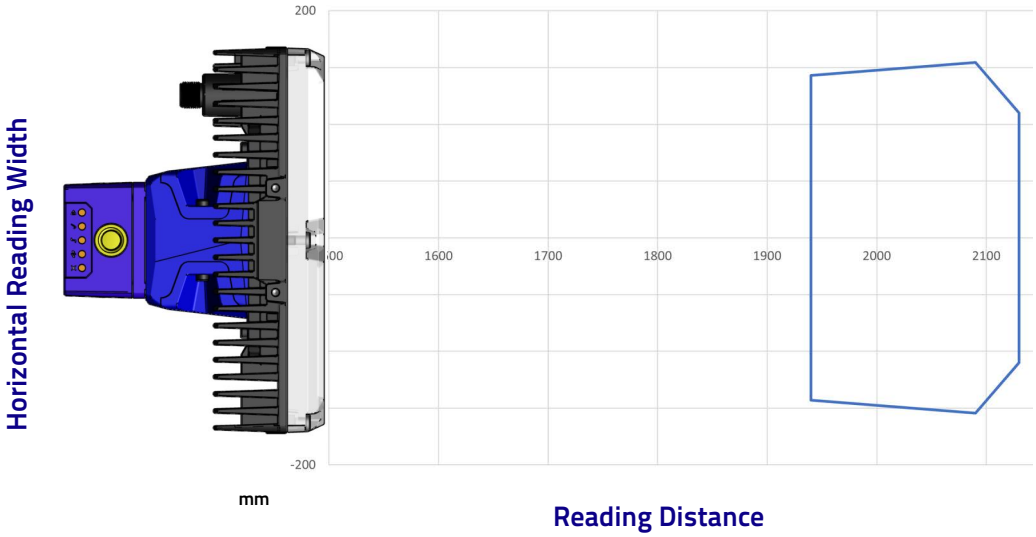
Code 128 0.15 mm (6 mils)



Conditions	
Hardware Settings	
Code Symbology	Code 128
Code Resolution	0.15 mm (6 mils)
Tilt Angle	45°
Skew Angle	15°
Focusing Distance	1350 mm
Aperture Stop	F/8
Reading Distance Range	1280 : 1480 mm
Software Parameters	
Internal Lighting	Very High Power Strobed or Continuous High Power Mode
LTM 034-15x	
Exposure Time	70 µs
Gain	24

Matrix 320 5mp 800-0xx (50 mm manual) 1D Codes

Code 128 0.15 mm (6 mils)



Conditions	
Hardware Settings	
Code Symbology	Code 128
Code Resolution	0.15 mm (6 mils)
Tilt Angle	45°
Skew Angle	15°
Focusing Distance	2070 mm
Aperture Stop	F/8
Reading Distance Range	1940 : 2130 mm
Software Parameters	
Internal Lighting	Very High Power Strobed or Continuous High Power Mode
LTM 034-15x	
Exposure Time	70 µs
Gain	40

MAXIMUM LINE SPEED AND EXPOSURE TIME CALCULATIONS

The ***Exposure Time*** (or ***Shutter***) parameter defines the time during which the image will be exposed to the reader sensor to be acquired. This parameter depends heavily on the environmental conditions (external lighting system, image contrast etc.).

In general, a longer time corresponds to a lighter image but is susceptible to blurring due to the code movement; a shorter exposure time corresponds to a darker image.



NOTE: The following considerations must be applied only when the internal lighting system and 2D codes are used. The Maximum line speed allowed for linear codes or postal code reading applications heavily depends on the direction of symbol movement. When the direction of movement is parallel to the elements of the code, the maximum speed is greater.

Assuming:

- **X**: Code Resolution (mm)
- $\mathbf{T_{exp}}$: Exposure Time (s)
- **LS**: Line Speed (mm/s)

The essential condition to avoid blurring effects between two adjacent elements in a dynamic reading application is:

$$\mathbf{LS * T_{exp} \leq X}$$

The maximum (theoretical) line speed **LS** can be calculated as follows:

$$\mathbf{X / T_{exp\ (min)} = LS_{\ (max)}}$$

$\mathbf{T_{exp\ (min)}}$ is the minimum ***Exposure Time*** value obtainable for the specific application. It can be evaluated in static reading conditions and depends on the Matrix reader model selected for the application (internal lighting system, optical lens, reading distance) and on any external lighting system. It may also depend on code printing quality, and reader position.

Example

A Matrix 320 5mp using:

Internal Lighting Mode = Very High Power Strobe

Exposure Time (μs) = 100 μs

Code Resolution (X) = 0.254 mm (10 mils)

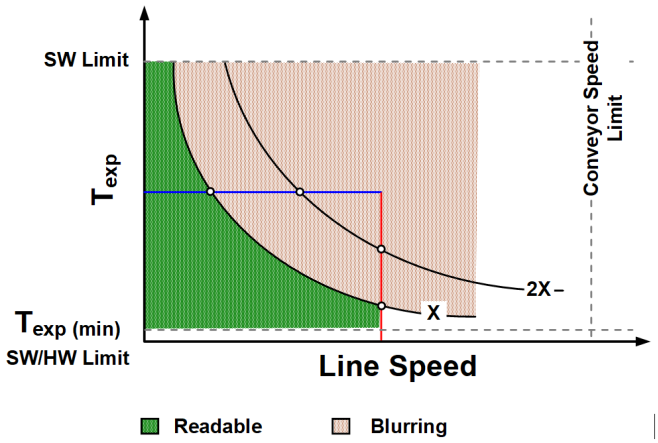
has a maximum line speed of:

0.254 (mm) / 0.0001 (s) = 2540 mm/s

Likewise, $\mathbf{T_{exp\ (max)}}$ is the maximum ***Exposure Time*** value that can be used without blurring for the given application line speed and code resolution. Therefore:

$$\mathbf{X / LS = T_{exp\ (max)}}$$

$T_{exp\ (max)}$ and $LS_{(max)}$ are represented in the graph below as the curved line for **X** (code resolution). Values above the curve result in blurring. In practice, the application values are somewhere below the theoretical line, (in the green area), due to environmental and other conditions.



For example, the maximum target speed in the application is also affected by these conditions:

- **Code/Background Contrast**: maximum speed decreases when decreasing image contrast (poor quality codes, reflective transparent coverings, different supports and printing techniques).
- **Code Resolution**: maximum speed increases when decreasing code resolution, (i.e. **2X)**. There is a decrement of overlapping effects between two adjacent elements.
- **Tilt Angle**: maximum speed decreases when increasing Tilt angle (from 0 to 45 degrees).

The ***Internal Lighting*** parameter allows setting the operating mode of the internal lighting system. The possible values are:

- *Disabled*: the built-in LED array is turned off all the time. This option can be useful if using an external lighting system;
- *Very High* or *High-Power Strobed*: the built-in LED array is on only during the image exposure time.

NOTE: To avoid LED array overheating, for Power Strobed settings, the program automatically limits the range of allowed values for the Exposure Time parameter. Therefore, after changes to Internal Lighting, recheck Exposure Time.

- *Continuous High-Power*: the internal lighting system is turned on continuously at the highest power level. This option is useful if the LED-array blinking (Strobed lighting mode) disturbs the operator.

CHAPTER 7
SOFTWARE CONFIGURATION

Software configuration of your Matrix 320 5mp for static reading or simple code reading applications can be accomplished by the Rapid Configuration procedure using the X-PRESS HMI (which requires no external configuration program). This procedure is described in Chapter 1, Rapid Configuration Steps 4-6.

For the majority of applications however you will use DL.CODE, connecting to the reader through the on-board Ethernet interface. See Chapter 1, Rapid Configuration Steps 7-8.

DL.CODE SYSTEM REQUIREMENTS



CAUTION: DL.CODE does not currently support Windows Embedded (often used in industrial PCs and/or PLCs).

To install and run DL.CODE you should have a Laptop or PC that meets or exceeds the following:

- 2.00 GHz or faster microprocessor
- 1 GB RAM
- One of the following Windows Operating Systems (32 or 64-bit):
  - Windows 8
  - Windows 10
  - Windows 11
- 2 GB hard disk for 64-bit machines; 1 GB hard disk for 32-bit machines
- 100 Base-T Ethernet
- One 19" or larger monitor (optimized for 1280x1024 resolution)



CAUTION: The Windows XP and Windows 7 operating systems are no longer supported by DL.CODE.

READER CONFIGURATION

For an example of Matrix device configuration see the example in Chapter 1, Rapid Configuration, Steps 7-8.



NOTE: Especially for lengthy configurations, it is always good practice to periodically save the configuration to permanent memory (Save on Device) to avoid losing the configuration in Temporary Memory. You must give a name to the new configuration or overwrite an existing one (except for Default which cannot be modified).

When all the configuration parameters are set correctly and saved to the device, you can perform a Backup to File and/or to an External storage device (BM100, etc.). See "Backup and Restore Through DL.CODE" on page 183.



NOTE: Datalogic guarantees that the reader's permanent memory can store at least 50 configurations without script formatting or with a script with less than 2048 characters. The actual number of configurations may be larger depending on the type of configuration and Matrix model. In addition to your application configuration(s), the Default configuration is always present on the reader and in fact it cannot be modified or deleted.

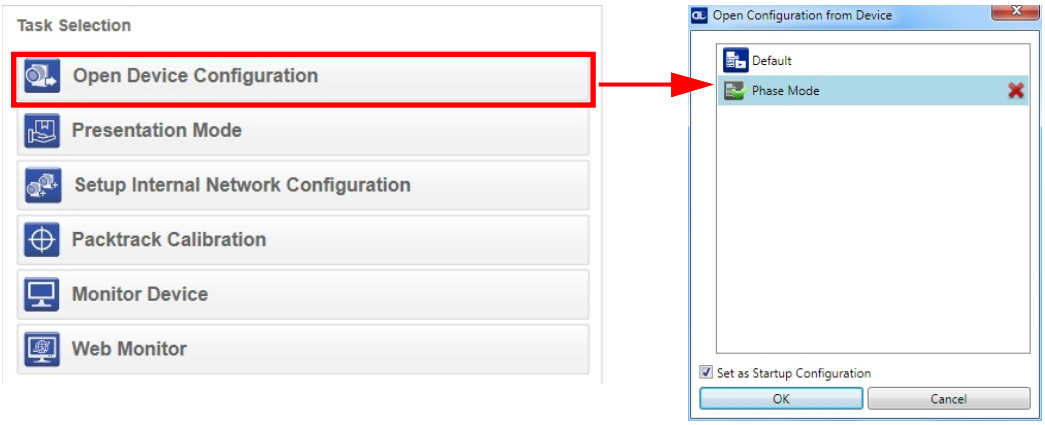


NOTE: To avoid LED array overheating, for Power Strobed settings, the program automatically limits the range of allowed values for the Exposure Time parameter. Therefore, after changes to Internal Lighting, recheck Exposure Time.

Automatic Setup Configuration

To begin configuration, the reader must be correctly mounted so that its Field of View covers the application reading area.

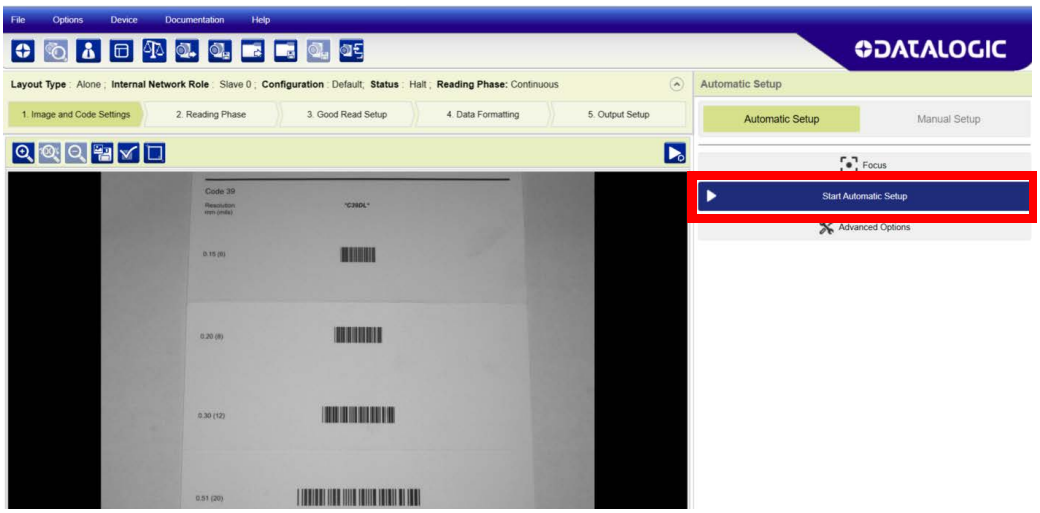
1. From the Task Area select Open Device Configuration.
2. The Open Device Configuration window opens showing the list of currently saved configurations (jobs) saved on the device. For new devices, the only saved job is the Default configuration. Click OK. The device enters run mode and begins acquiring images.



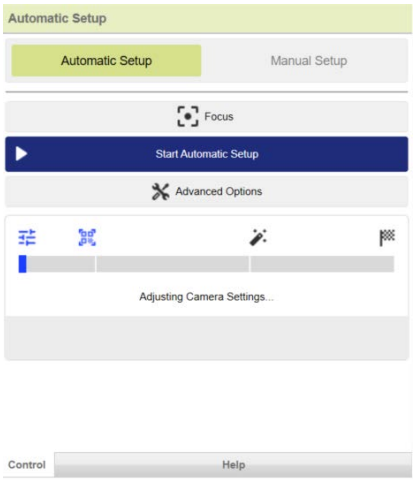
3. Place the application code in front of the reader at the correct application reading distance.
4. Click on the Pause button  to stop image acquisition.

NOTE: Step 4, Clicking on the Pause button is optional.

5. Before proceeding with the Automatic Setup, you must set the focus first. To focus the reader, refer to Manual Setup, starting on page 155.
6. Now click on the **Start Automatic Setup** button.



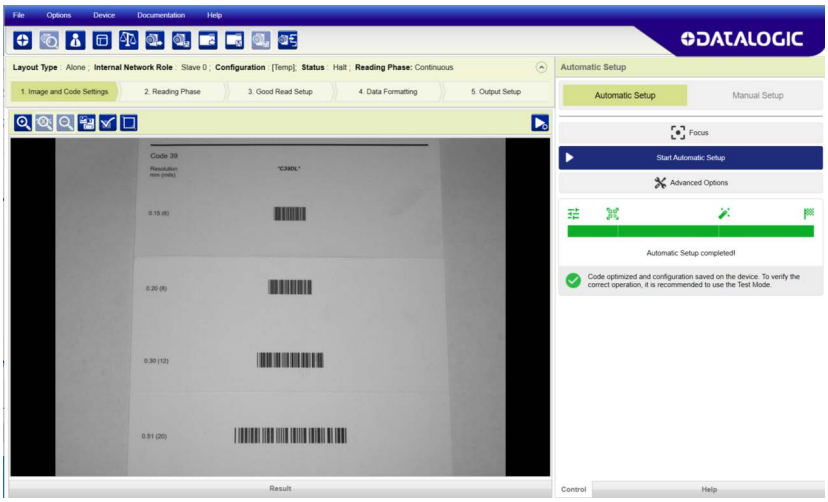
7. The following window is displayed and the reader begins acquiring images.



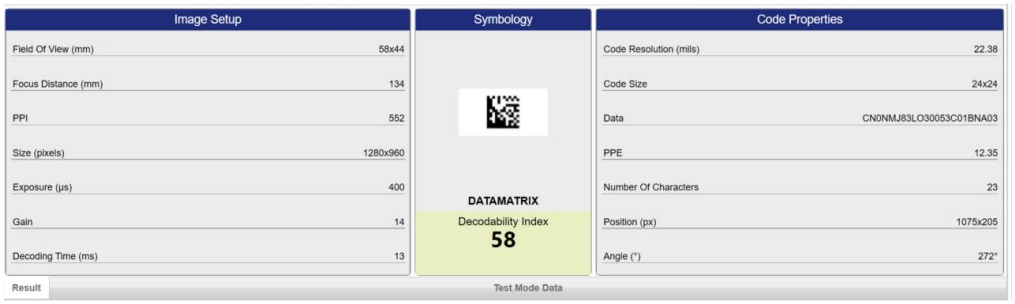
ICON	MEANING
	Initial photometric tuning
	Code Search
	Search Optimization
	End of the Search

NOTE: Depending on the algorithm, certain phases may not be displayed.

8. At the end of the procedure the **Automatic Setup Completed!** message appears.



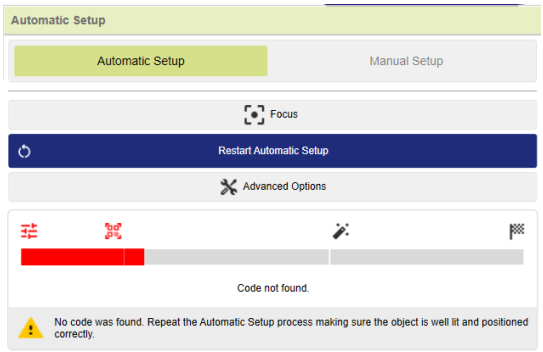
When the automatic setup is complete, a result table is displayed containing the image setup, symbology, and code properties.



Your reader is now optimized for decoding. Continue with the Operating Mode configuration.

Error during Automatic Setup

If the Automatic Setup cannot find the code, the following message appears.



Advanced Options

If you need more configuration options, click the Advanced Options button. Depending on the connected device, different configuration labels are displayed.

NOTE: The GUI shown below for Advanced Options is valid for firmware later than 1.12.8 and later than DL.Code 1.13.2.

Static vs Dynamic

The Advanced Options allows you to choose between Static and Dynamic Tuning. If your application involved moving codes, the Dynamic option must be selected to avoid a blurring effect on the image.



NOTE: If you select the Dynamic option, two parameters must be set: Max Line Speed and Code Resolution.

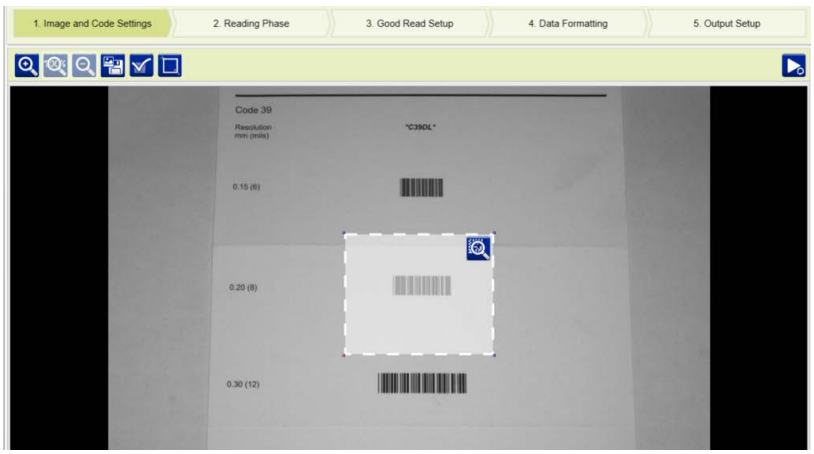
Autosetup Region

This option allows you to set an area of interest (ROI) on which the autosetup algorithm will focus exclusively to search for the barcode.

During the autosetup procedure, the area of interest will be temporarily hidden and shown again at the end.

At the end of the procedure, the system is configured to decode any barcodes present within the selected ROI.





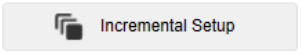
NOTE: The new settings are applied, so any other barcodes present in the image that can be decoded with the result of the procedure can also be decoded.

Incremental Setup

When enabled, running the Autosetup procedure adds a new configuration to the existing one(s) instead of replacing them.

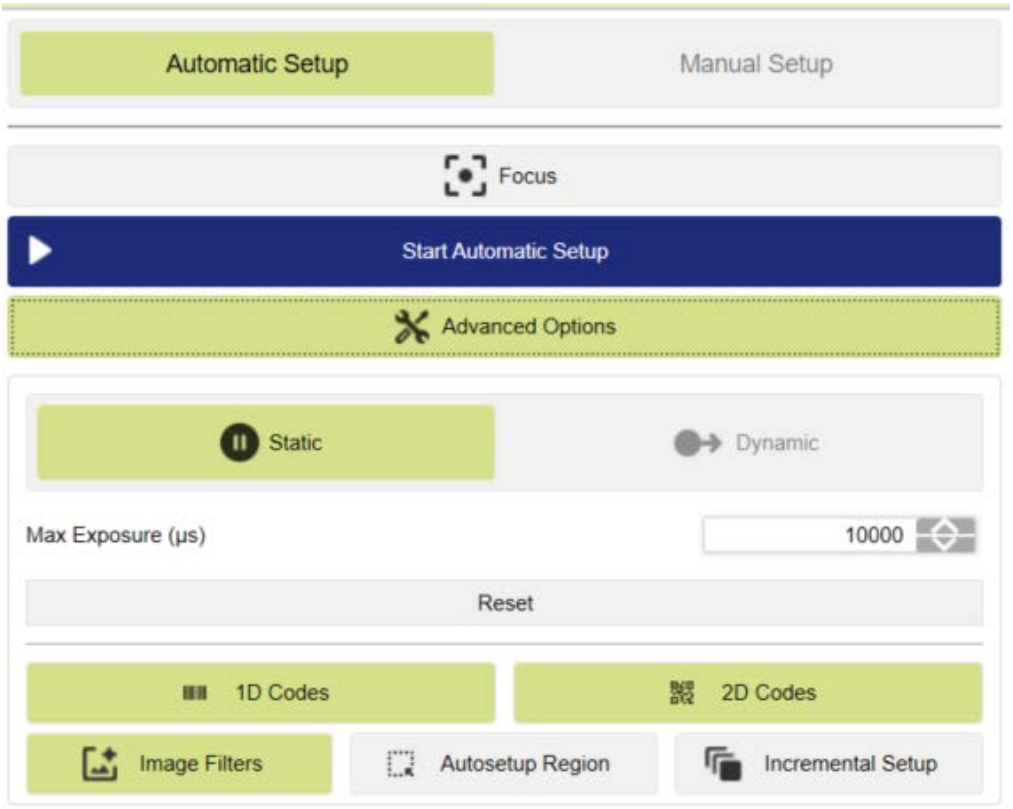
After the Autosetup procedure is completed, switching to Manual Setup allows the newly created configuration to be viewed as a new Image Setting node.

Once the procedure finishes, the option automatically returns to the disabled state (default). This can be verified by switching back to the Automatic Setup panel view.



Advanced Options

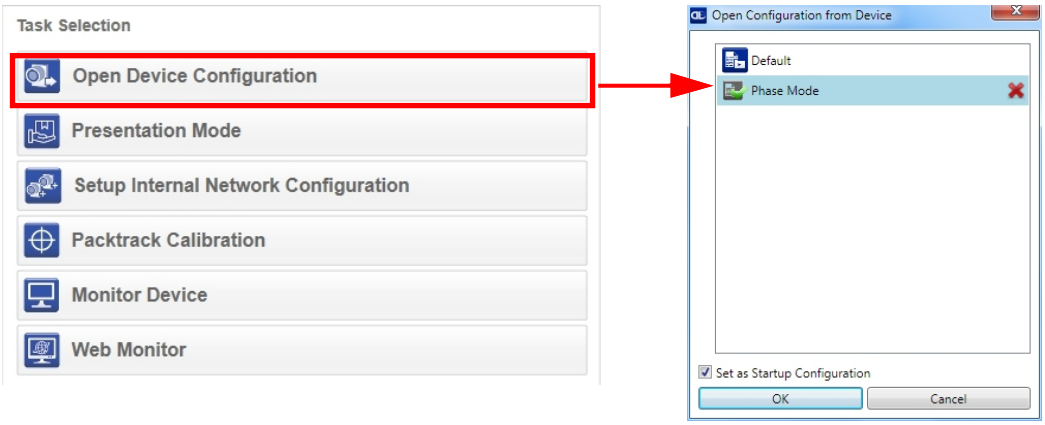
The following options are displayed.



Manual Setup

To begin configuration, the reader must be correctly mounted at the correct reading distance for your application so that its Field of View covers the application reading area.

1. Set the Diaphragm to suit your application and block the lens ring.
2. From the Task Area select Open Device Configuration.
3. The Open Device Configuration window opens showing the list of currently saved configurations (jobs) saved on the device. For new devices, the only saved job is the Default configuration. Click OK. The device enters run mode and begins acquiring images.



4. Click on the Advanced Setup button and select the **Focus Calibration** tab at the bottom of the window. Click on the Start button to start image acquisition. The oscilloscope view is shown in the bottom panel and can be used for manual focus adjustment.

How the oscilloscope works

The oscilloscope view shows the white level of the pixels correspondent to the red line on the image. Throughout the focus setup, the oscilloscope view will display a real-time focus index (computed on the red line of the image) and the peak value (correspondent to the maximum index value reached from the beginning of the procedure). The focus index must be maximized to get the best focus for the target distance.

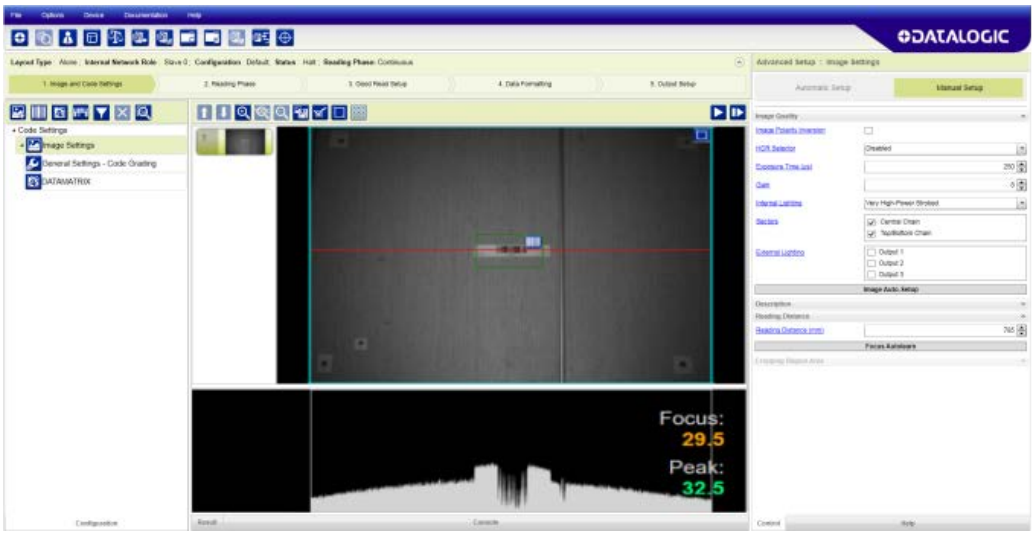
Rotate the Focus lens ring monitoring the numbers reported in DL.CODE until the focus index is set at its maximum and equal to the peak value.

Color information is added to the numbers to facilitate setup: the focus index will be colored green when close to the peak value, orange or red when far from the maximum value.

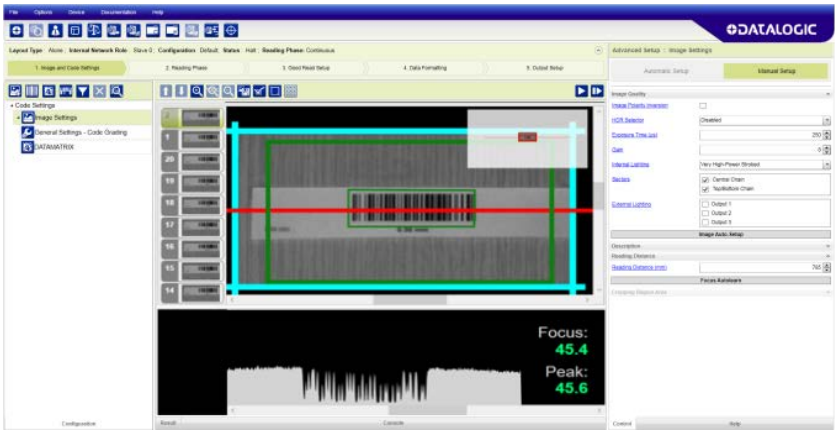
NOTE: It is suggested to first sweep the focus ring through the whole range in order to identify the peak value.

NOTE: If the peak value needs to be reset, the reader will acquire some dark images with low illumination.

5. Place the **Grade A Barcode Test Chart** in the reading area. Once positioned, stop image acquisition by clicking on the Pause button.

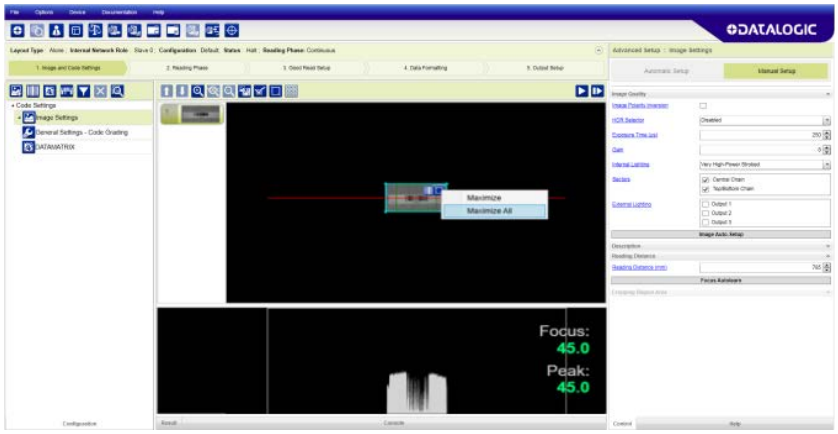


NOTE: We suggest cropping the sensor reading area around the barcode to get a higher frame rate and ease the focus setup. When cropping the image, please use the minimum possible value of Gain, increasing the Exposure Time if necessary.

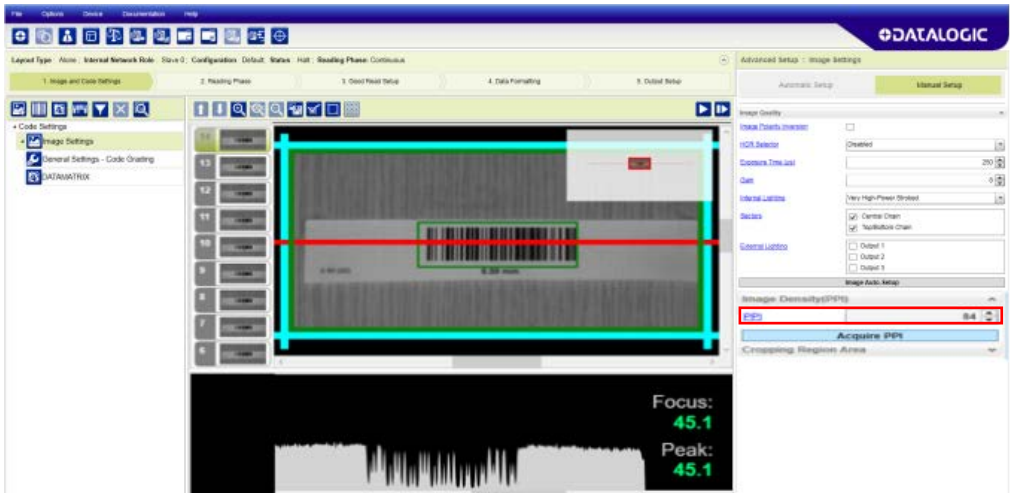


6. Rotate the Focus lens ring and monitor the number reported in DL.CODE until it reaches its maximum.

NOTE: To uncrop the sensor reading area, right click on the box on the top right corner of the cropping region and select *Maximize all*.



7. Click the **Acquire PPI** button to automatically set the Image Density so that Matrix 320 5mp will function correctly and to the fullest extent of its capabilities. This procedure is necessary for first time installation, or if the focal distance changes.



NOTE: After the Focus Calibration procedure:

- make sure that both Focus and Diaphragm lens rings are blocked;

- if using an embedded 36 LED illuminator, mount the adapter side covers.

Refer to Matrix 320 5mp C-Mount Mounting Instructions, starting on page 81 **for more details.**

8. Continue the configuration with the "Reading Phase" on page 17.

MULTI IMAGE ACQUISITION SETTINGS

When controlled variable conditions occur in the application, Multiple ***Image Acquisition Settings*** can be defined to create a database of parameter groups that handle each specific application condition. This database of pre-defined settings improves system flexibility and readiness by being applied either automatically or selectively by an activation event.

For example, an application may have several stable but different lighting conditions which require different lighting options. One Image Acquisition Setting could enable and use an internal illuminator and another setting could enable and use an external lighting system.

This feature is available for all Operating Modes.

Image Settings are found in the DL.CODE **Advanced Setup** step. Up to 10 different Image Settings can be configured by adding them with the icon.

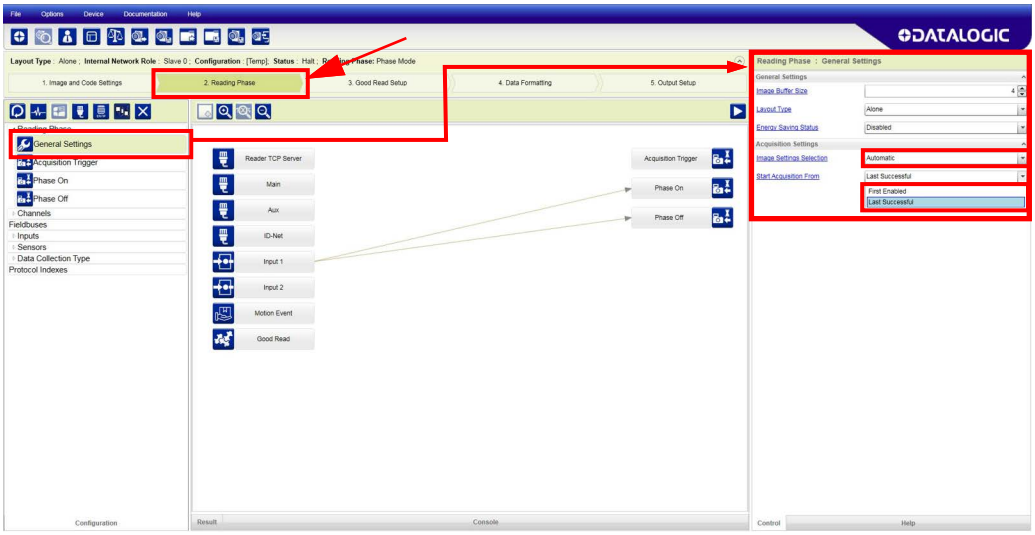


For each Image Setting condition start **Image Auto-Setup**, select the Static or Dynamic Self-Tuning option; and Apply it.

Automatic Image Settings Selection

If we don't know from one item to the next which reading condition will be presented, we will cycle through the pre-defined database of Image Settings (one per acquisition) in order to automatically capture the correctly lighted image over the course of several acquisitions. When the correct condition is matched, the result should be able to produce a Good Read.

When the Image **Settings Selection** is **Automatic** (default), then these Image Settings groups will be used cyclically.



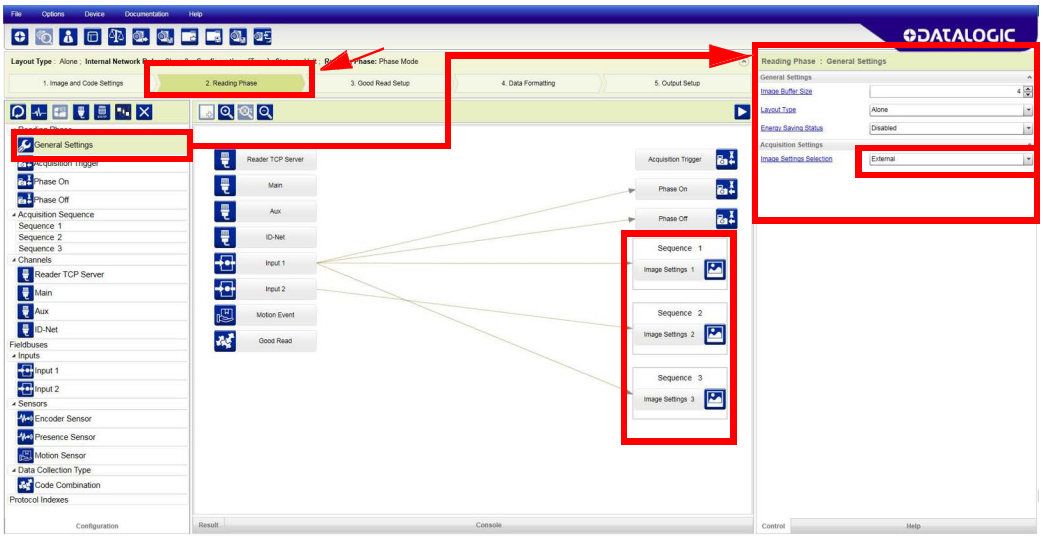
NOTE: Applications typically require more than one acquisition to obtain sufficient Good Read percentages. This means that for *N* acquisitions we will surely have captured the correct lighting condition but we will also have captured some acquisitions with the wrong lighting condition. A consequence then is that we cannot run these types of applications at the maximum speed because not all the acquisitions are useful to us. We must wait for a sufficient number of acquisitions that will guarantee a Good Read result.

If items to be read having the same lighting conditions are grouped together, then we can improve the read rate through the **Start Acquisition From** parameter. By choosing the **Last Successful** value, we will start with the Image Setting that last produced a Good Read. For this group of items the last Image Setting used will be correct for the next item and so we start each cycle with the acquisition that will potentially produce a Good Read.

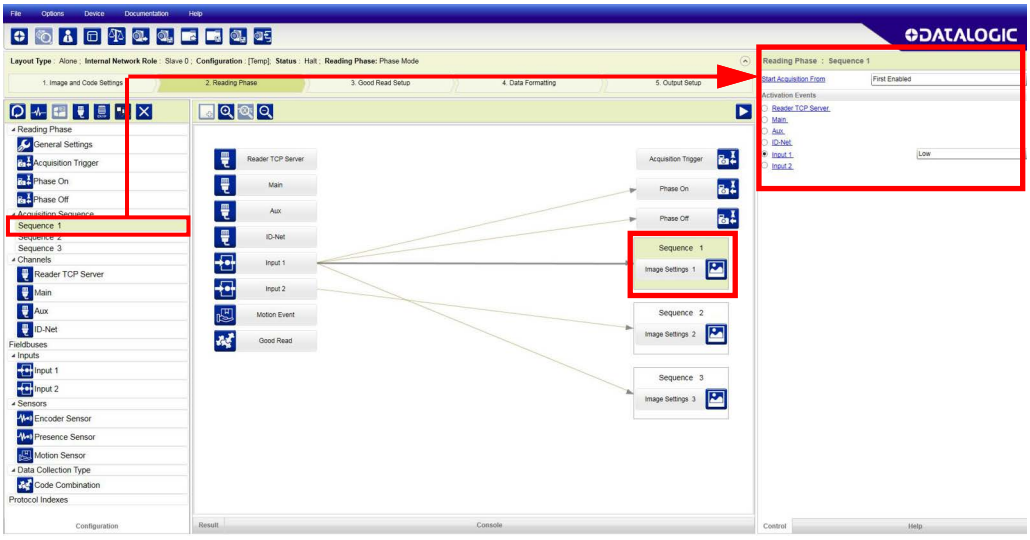
External Image Settings Selection

There are some applications where the lighting conditions are known before each item is read and therefore we can pre-select the correct Image Setting from an external source.

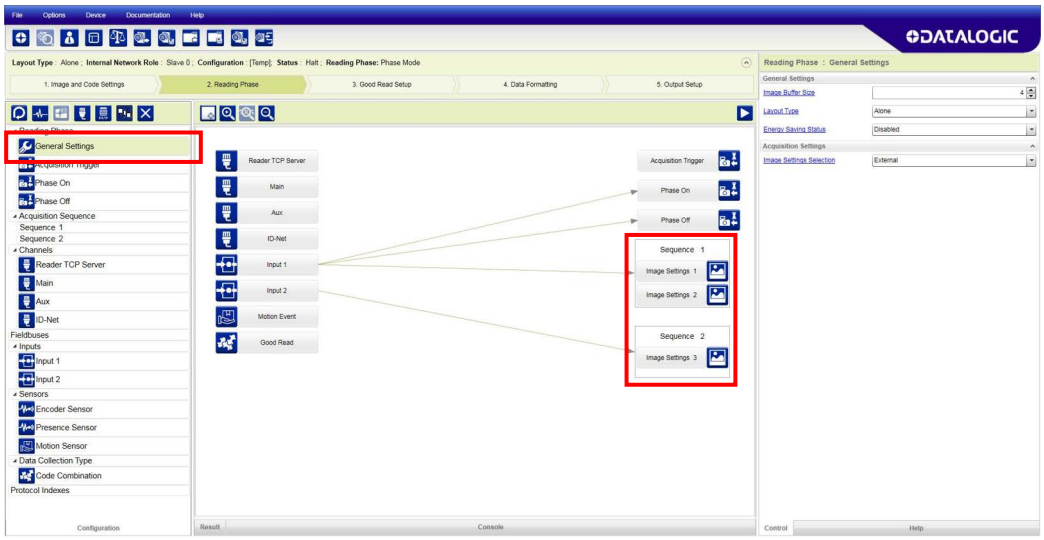
When the **Image Settings Selection** is **External**, Acquisition Sequences are created and by default each Image Setting has its own Acquisition Sequence.



Each **Acquisition Sequence** can be activated exclusively by a single event, either through a string from an available communication channel or by a digital input.



Alternatively a hybrid configuration can be made where more than one **Image Setting** can be grouped into an Acquisition Sequence by dragging it into the desired Sequence box. Select the empty Sequence box and delete it with the delete key.



Each **Acquisition Sequence** can be activated exclusively by a single event, either through a string from an available communication channel or by a digital input.

In this case the **Start Acquisition From** parameter can improve the read rate for that Sequence. It has no meaning for a Sequence containing only one Image Setting.

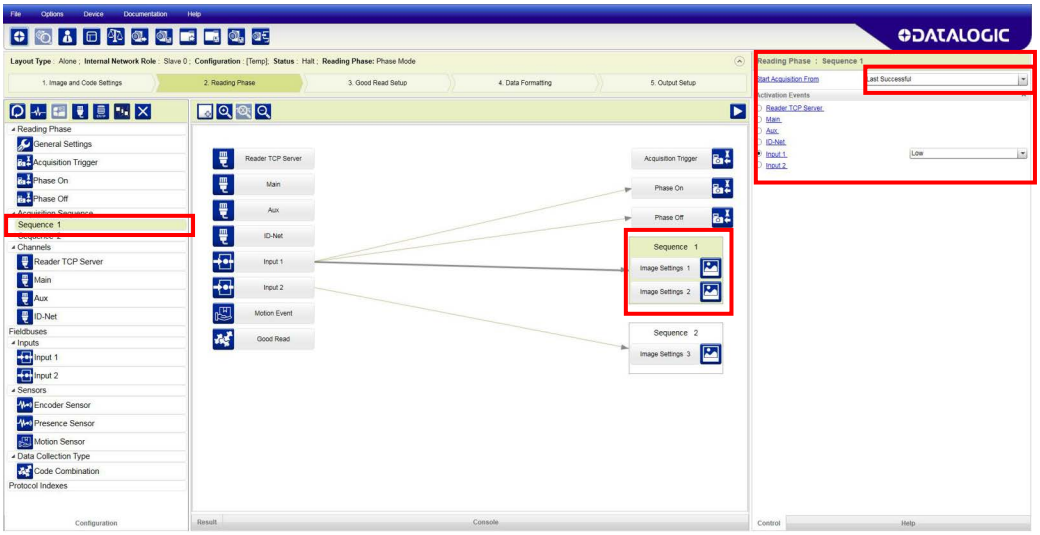
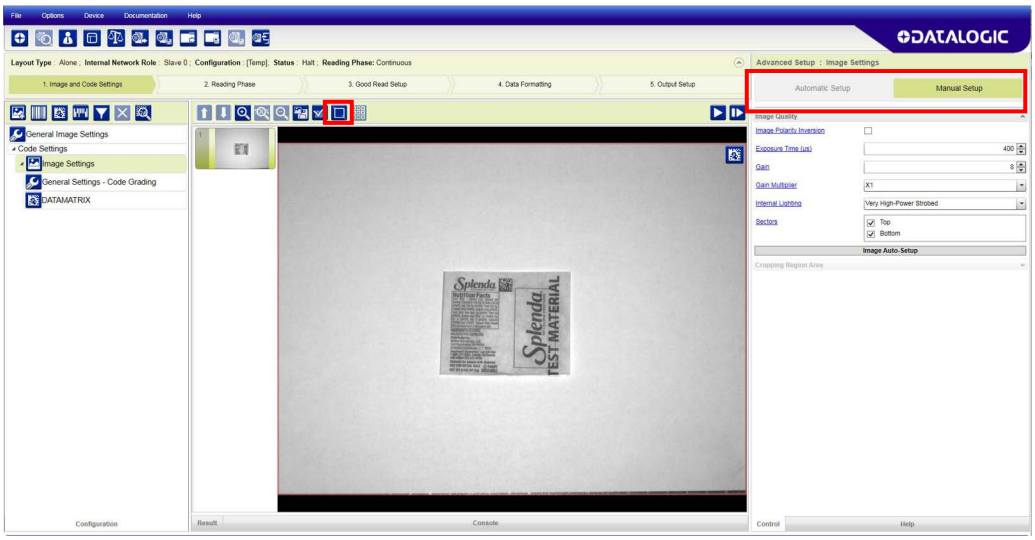


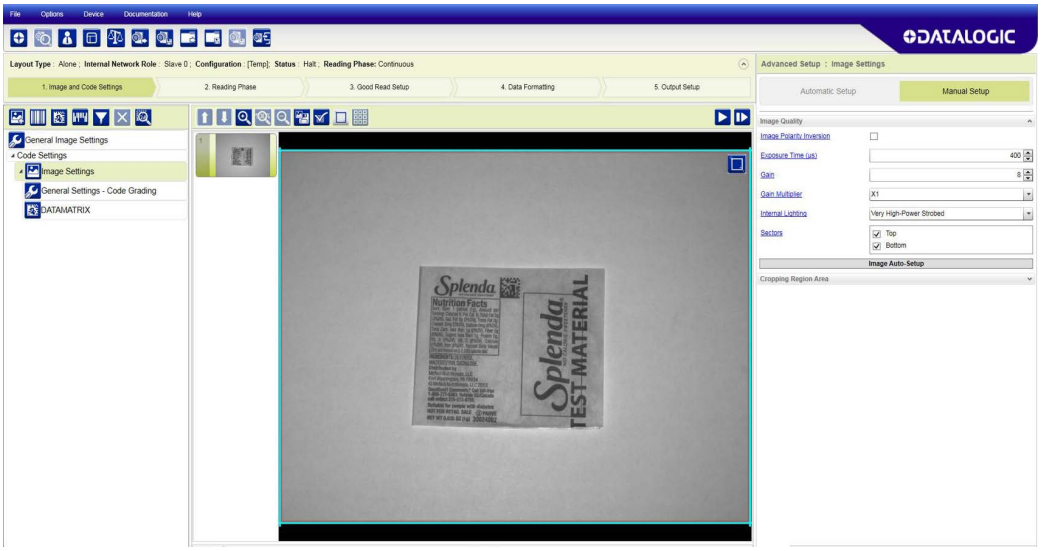
IMAGE CROPPING

In some applications, the Image Cropping feature in DL.CODE can help to increase decoding and result performance. Image cropping is performed from the Advanced Setup tab by clicking on the Add Cropping Region icon as shown below.

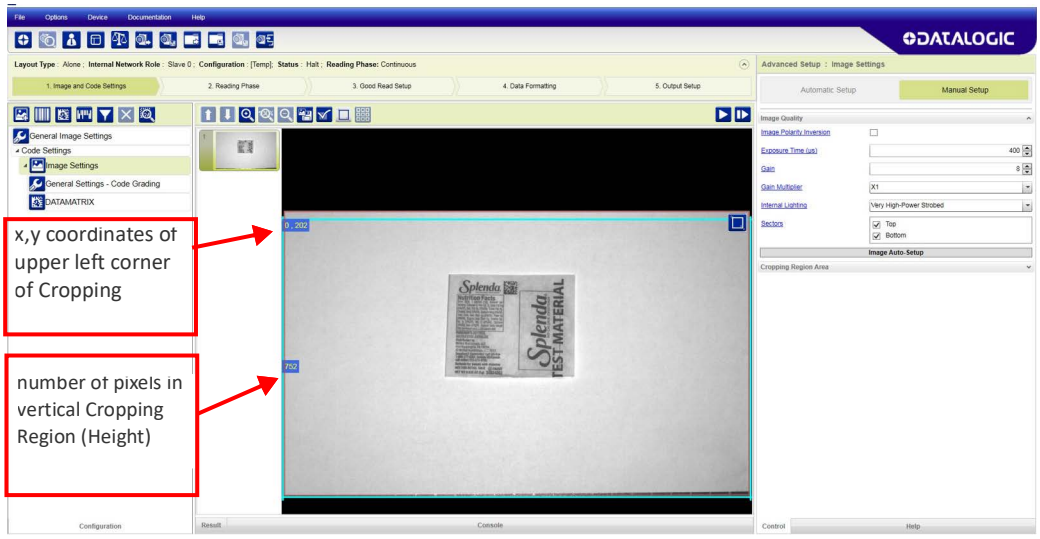
In Matrix 320 5mp the frame rate is dependent on the number of rows and columns in the defined window. Image cropping allows reducing the Image processing area from the full FoV to a smaller area where codes are present. By excluding portions of the FoV, processing time is reduced.



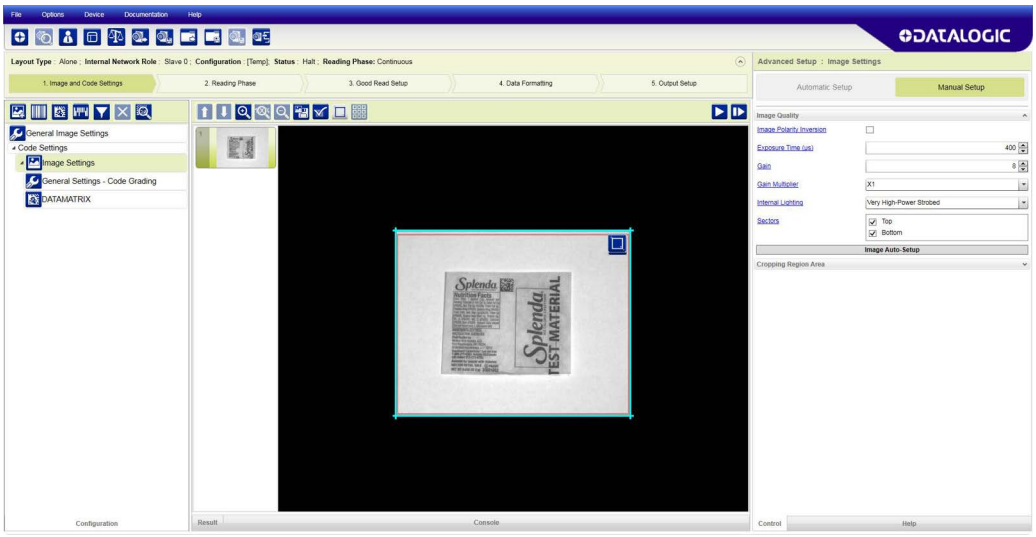
After clicking the Add Cropping Region icon, a blue border appears which by default is equal to the FoV.



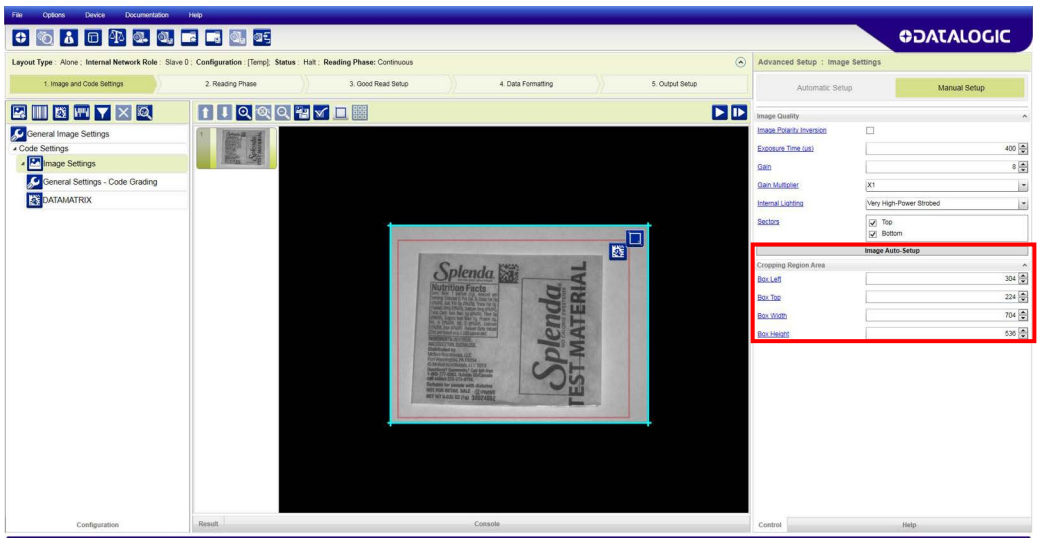
By dragging the edges with the mouse (resizing) you can crop the image to a specific location where codes are present. The numbers in the blue boxes refer to pixel references.



The cropped area can be moved by dragging the center.



You can also set the cropped image size and position through the Cropping Region Area group of parameters; size = **Width** and **Height**, position = **Left, Top** (x,y) coordinates.



DIRECT PART MARKING APPLICATIONS

For **Data Matrix** family codes the ***Decoding Complexity*** parameter is available when Processing Mode is set to Standard and selects the decoding algorithm according to the printing/marking technique used to create the symbol and on the overall printing/marking quality.

The possible selections progress from Low to Very High where Low can improve decoding time for good print/mark quality and/or relatively normal size codes. This is the default setting. Very High can improve the decode rate for low print/mark quality and/or small size codes. This algorithm is much more aggressive but in general it may have longer decoding times than the lower complexity algorithms. **To minimize decoding time it is better to select the lowest value that still guarantees good decoding.**

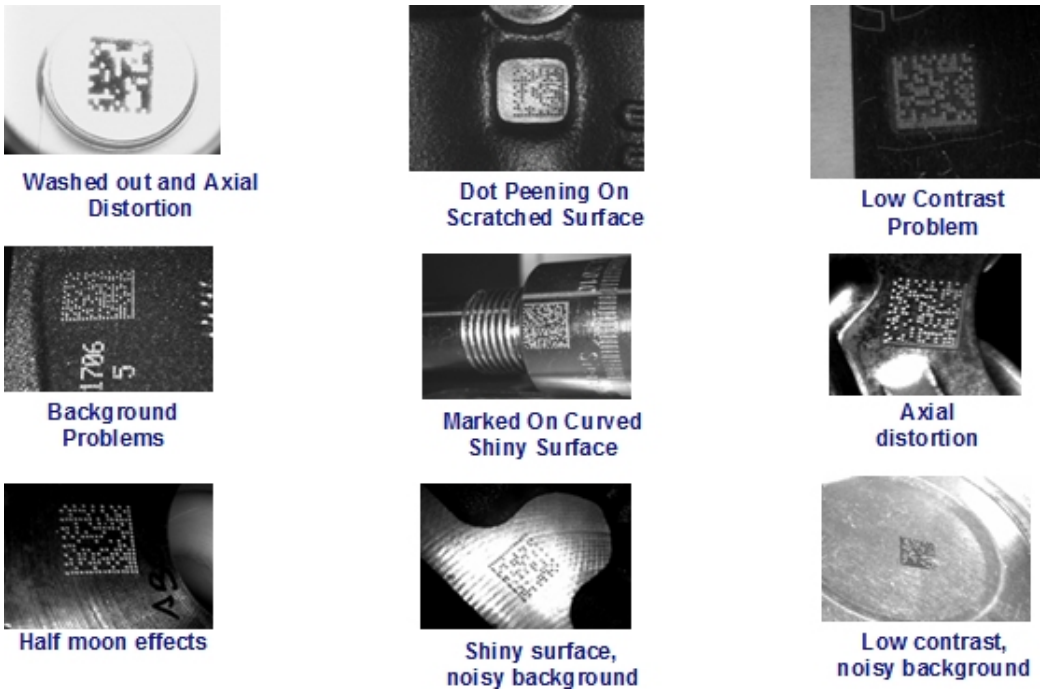


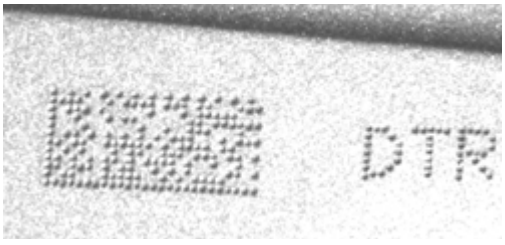
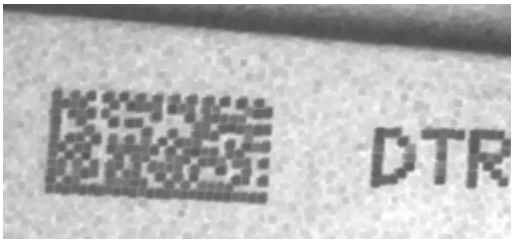
Figure 125 - Problematic Direct Part Marking Examples

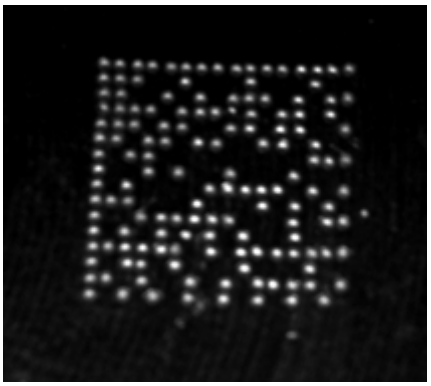
For **QR** code the ***Decoding Method*** parameter allows the Dot Peen Decoding algorithm to be selected which improves the decode rate for low quality Direct Part Mark codes and in general for Direct Part Mark codes with dot peening type module shapes.

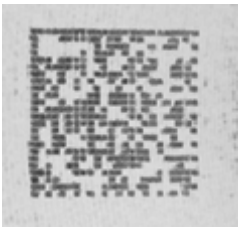
Image Filter

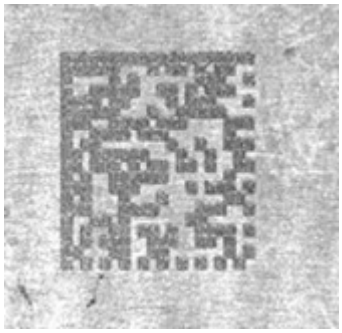
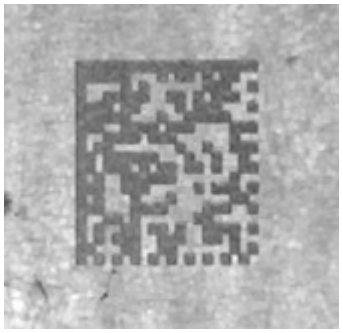
Sets the filter to be applied to the image before being processed. This parameter can be used to successfully decode particular ink-spread printed codes (e.g. direct part mark codes).

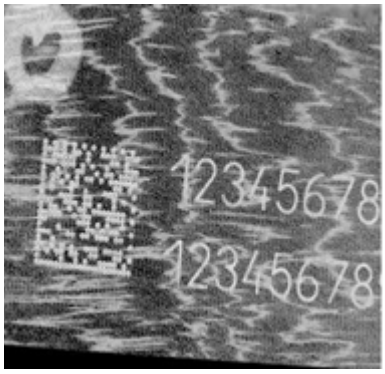
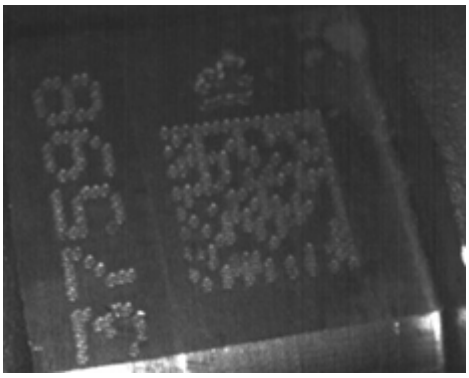
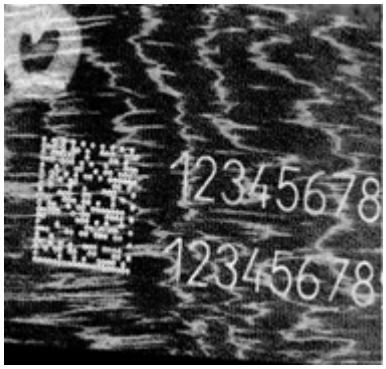
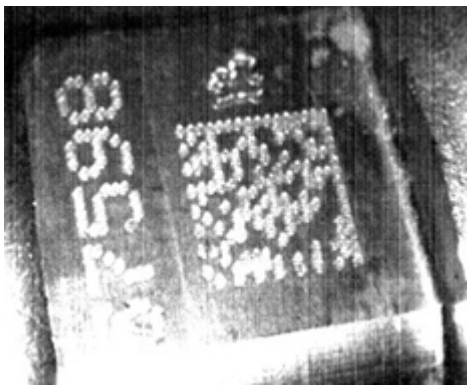
Different filters can be applied to a single code or group of codes in one or more ***Image Settings*****.** See the DL.CODE User's Manual for examples of Image Filter application.

The ***Erode*** Filter enlarges the image dark zones to increase readability.	
	
Before - No Read	After - Readable

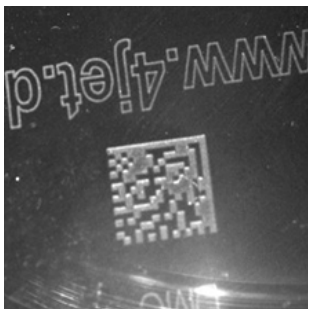
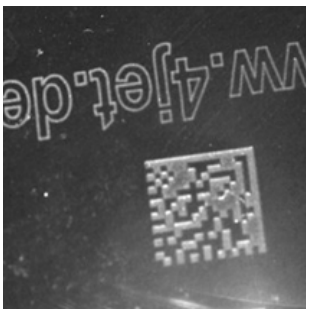
The ***Dilate*** Filter enlarges the image white zones to increase readability.	
	
Before - No Read	After - Readable

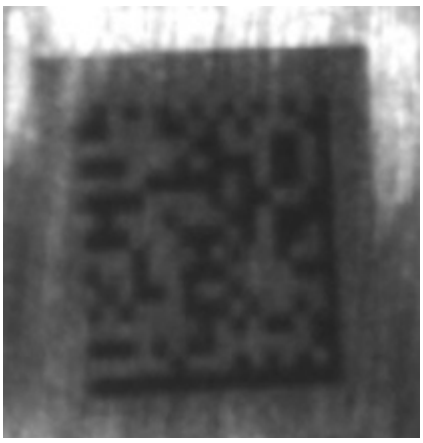
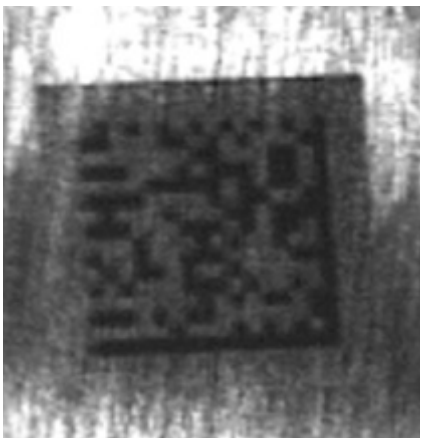
The ***Close*** filter eliminates dark areas (defects) in the white zones of the image.	
	
Before - No Read	After - Readable

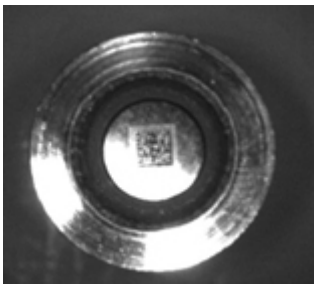
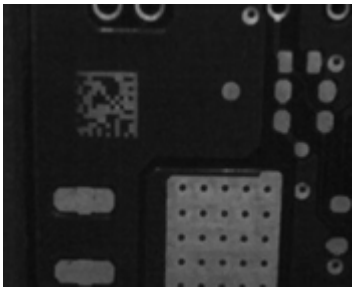
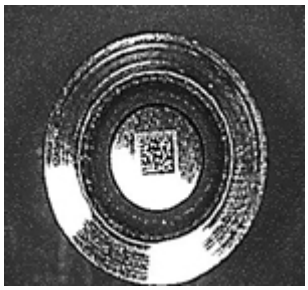
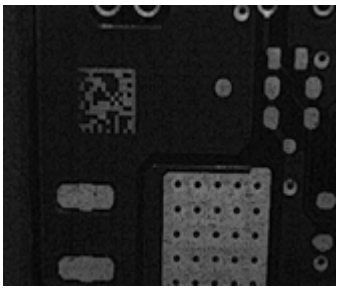
The ***Open*** filter eliminates white areas (defects) in the dark zones of the image.	
	
Before - No Read	After - Readable

The ***Contrast Stretching*** filter maximizes image contrast.	
 	 
Before - No Read	After - Readable

The ***Histogram Equalization*** filter makes the gray level distribution uniform.	
	
Before - No Read	After - Readable

The ***Smoothing*** filter deletes small (insignificant) details in the center of the image.	
	
Before - No Read	After - Readable

The ***Sharpening*** filter improves out of focus images.	
	
Before - No Read	After - Readable

The ***Deblurring*** filter improves blurred images.	
 	 
Before - No Read	After - Readable

The ***Black Enhancement*** filter produces a nonlinear increase in the black level for light images.	
	
Before - No Read	After - Readable

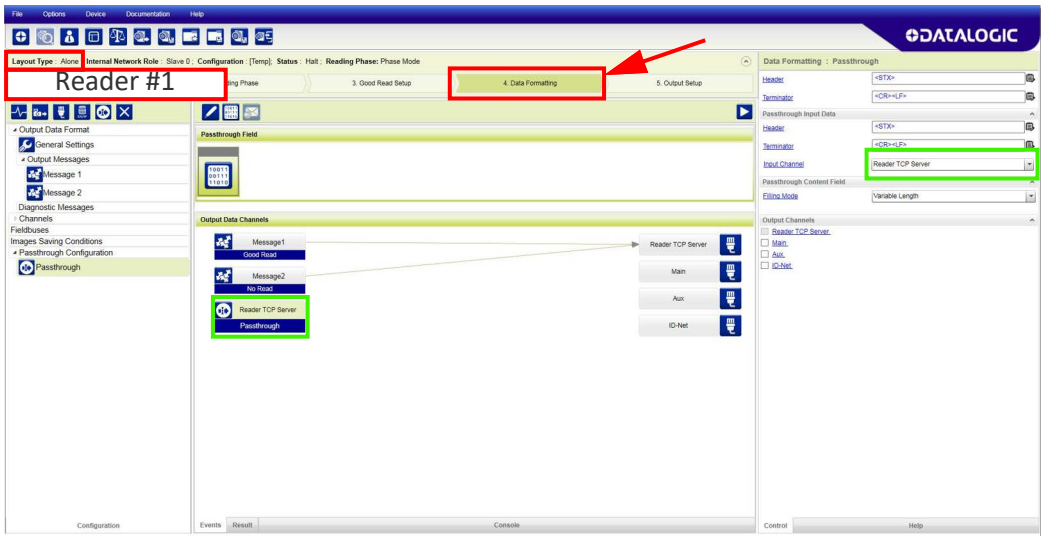
The ***White Enhancement*** filter produces a nonlinear increase in the white level for dark images.	
	
Before - No Read	After - Readable

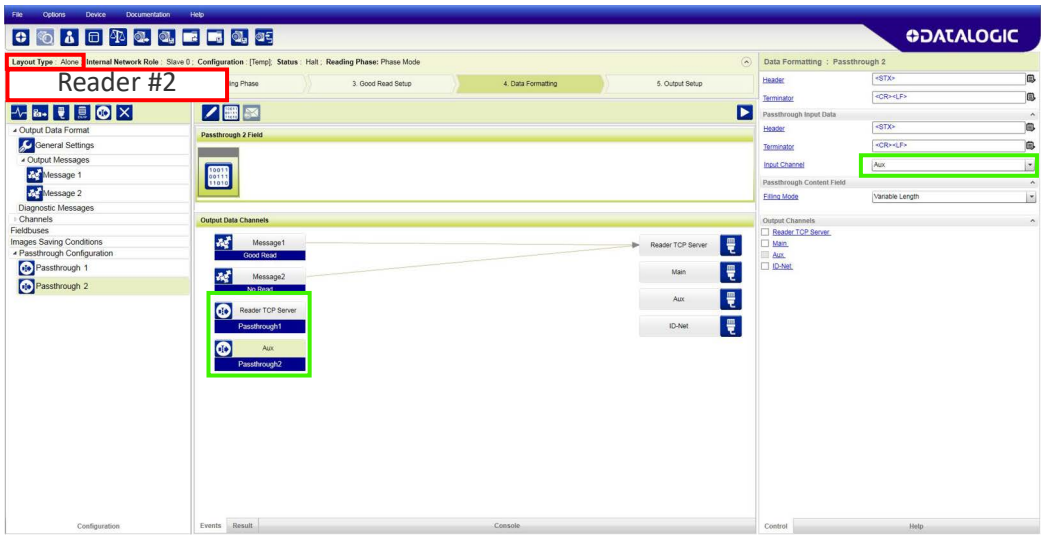
PASS-THROUGH CONFIGURATIONS

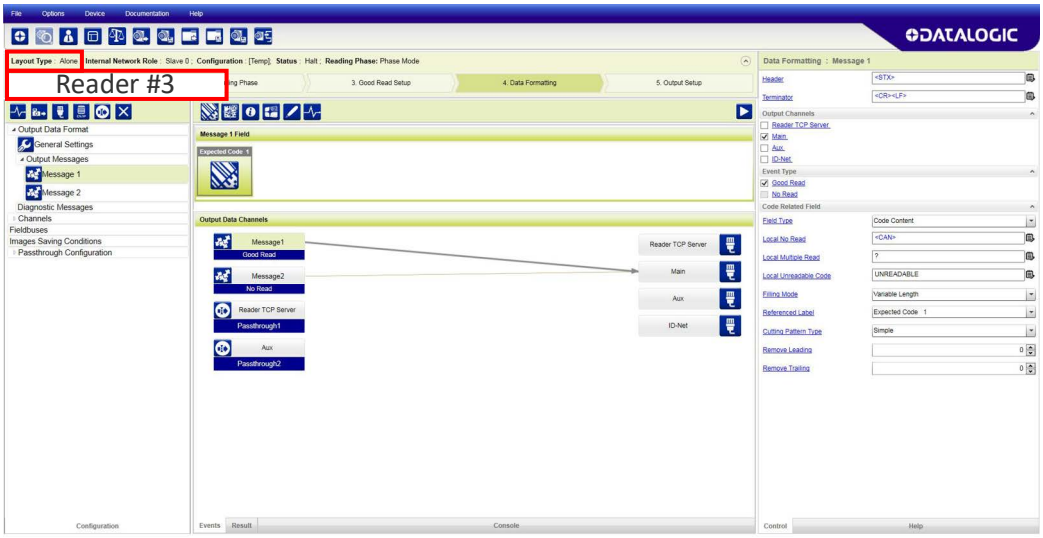
DL.CODE supports pass-through multi device configurations.

The pass-through configuration allows individually working devices (Alone), to collect data from other devices (also working Alone), and pass this data to a third device through a different communication channel.

The following screenshots show the pass-through configuration settings for the three devices in the example in "Pass-Through" on page 126.






Reader #3
Output Data Format
General Settings
Output Messages
Message 1
Message 2
Diagnostic Messages
Channels
Fieldbuses
Images Saving Conditions
Passthrough Configuration
Message 1 Field
Output Data Channels
Message1
Good Read
Message2
No Read
Reader TCP Server
Passthrough1
Aux
Passthrough2
Reader TCP Server
Main
Aux
ID-Net
Data Formatting : Message 1
Header
Terminator
Output Channels
Event Type
Code Related Field
Field Type
Code Content
Local No Read
Local Multiple Read
Local Unreadable Code
UNREADABLE
Filling Mode
Variable Length
Referenced Label
Expected Code 1
Cutting Pattern Type
Simple
Remove Leading
Remove Trailing
Configuration
Events
Result
Console
Control
Help

INTERNAL NETWORK CONFIGURATIONS

Internal Network configurations (also called Master/Slave configurations), are designed to collect data from several devices connected together in an ID-NET™ network and send data output to the Host system.

DL.CODE has a Net Autoset feature for the Internal ID-NET Network which automatically recognizes and assigns addresses to all connected Slave readers.

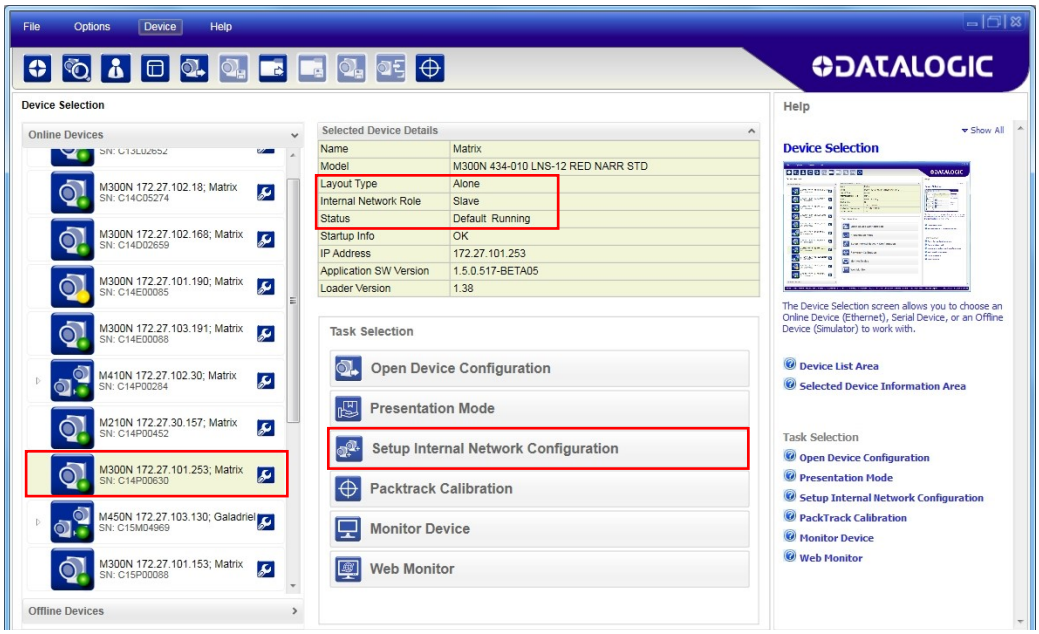
In order to automatically recognize the ID-NET Slaves, all devices must be physically installed and electrically connected (including ID-NET network wiring).

The general procedure (also detailed in the following paragraphs) is to:

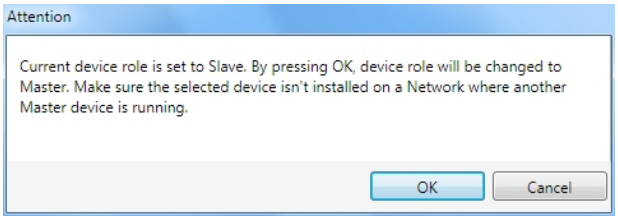
1. Mount all the readers mechanically (refer to "Mechanical Dimensions" on page 53 and "Mounting And Positioning Matrix 320 5mp" on page 62) and electrically (refer to "ID-NET Interface" on page 101) with factory default settings (Layout Type = Alone, Internal Network Role = Slave).
2. Run DL.CODE and verify that all the devices are discovered and shown in the device list area.
3. Connect to the designated Master device in DL.CODE and open the **Setup Internal Network Configuration**. You will be prompted to change the device to Master. Click OK. The Slave units will automatically be recognized. See "Master Configuration" on page 172.
4. Depending on the application, select Set Default Multidata Configuration or Set Default Synchronized Phase Mode Configuration.
5. Connect to each Slave reader via Ethernet and set the Slave specific parameters depending on the application type. Save each Slave specific configuration. See "Multidata ID-NET Network Configurations" on page 174 or "Synchronized ID-NET Network Configurations" on page 178.
6. For Synchronized networks Verify/Test network performance. See "Verify Master/Slave Synchronized Configuration" on page 181.
7. Perform the **Backup current Internal Network configurations** procedure. See "Backup" on page 184.

Master Configuration

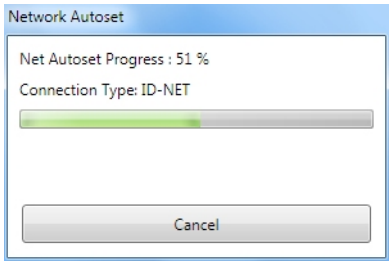
First start with the desired device to assign as ID-NET Master (current default setting is Slave). Click on Setup Internal Network Configuration from the Task area.



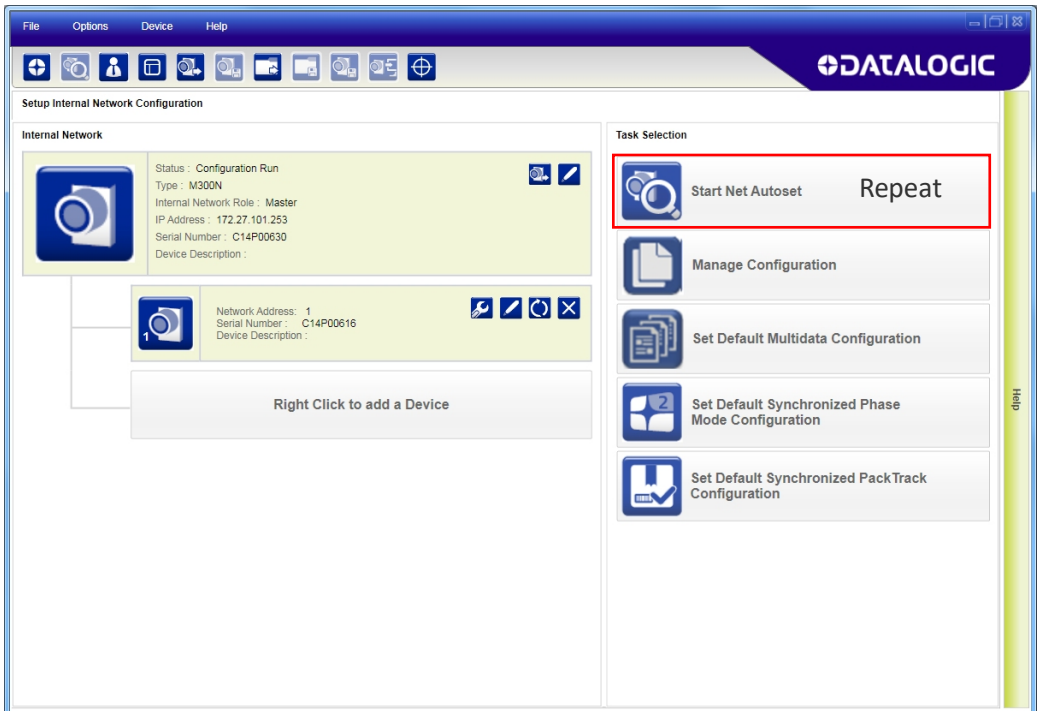
You will be advised that the device role will be changed to Master.



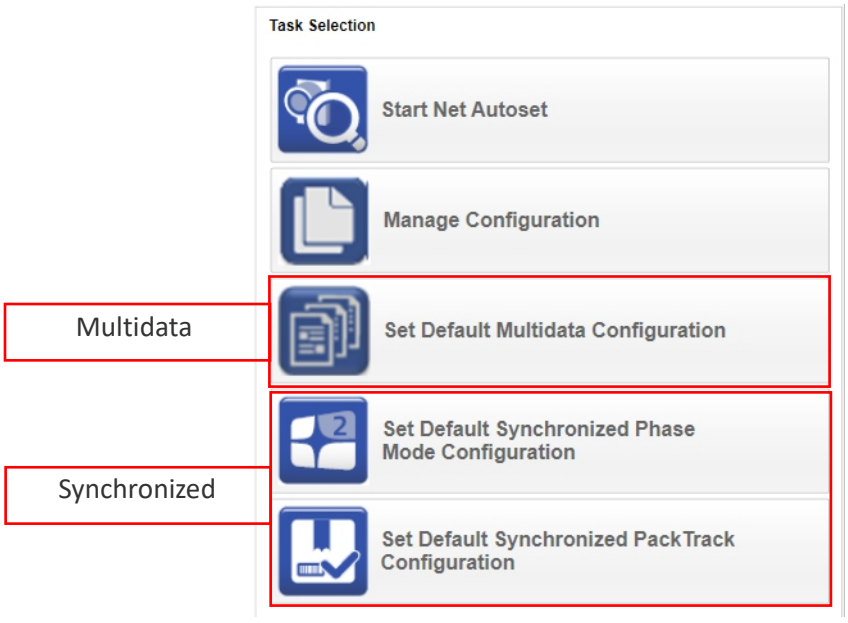
Click OK. The Net Autoset feature automatically starts to find Slave devices connected to the ID-NET network of the Master.



When finished, all the Slaves should have been correctly recognized. If not, verify all device connections and power and then repeat the operation by clicking on the Start Net Autoset button.



Depending on the application, select one of the Default Internal Network Configurations: **Multidata**, **Synchronized Phase Mode** or **Synchronized PackTrack**.



This selection will open a pre-configured job for the Master reader according to the selection. Follow the specific application instructions in the following paragraphs.

Multidata ID-NET Network Configurations

The Multidata ID-NET network communications between Master and Slave are managed by the application job (configuration) using the pass-through feature. A pre-configured job is loaded with the correct pass-through settings for both the Master and Slaves when the Default Multidata Configuration is selected from the Internal Network Setting feature.

1. Complete the configuration of all the application parameters (including Image Settings) and save them to the Master with an application specific name.

Optionally, checking the **Save on Slave Device** box can be helpful to save all the current individual Slave configurations with the new configuration *name*. This does not clone any parameters. If not checked, Slave configurations will remain as *Temp* configurations and you will be warned that changes to the Master have not been saved to the Cluster.

For Multidata configurations, the option to **Clone Master configuration on Slaves must not be checked**.

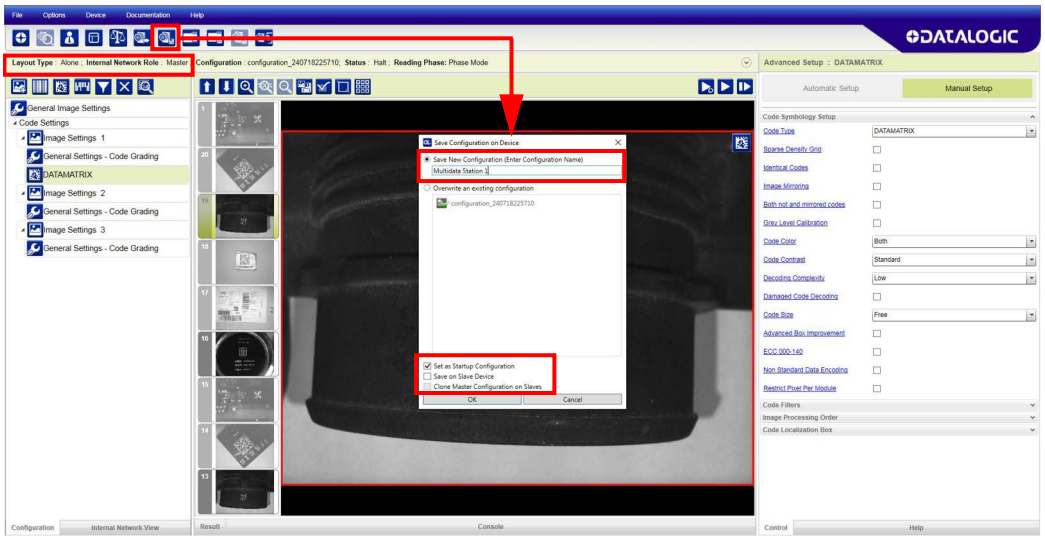
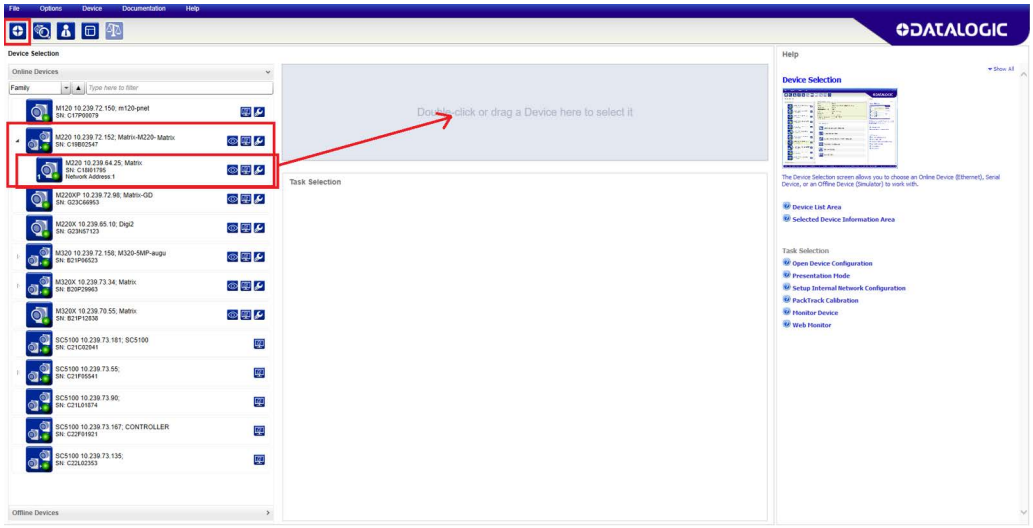


Figure 126 - Saving Multidata Configuration to Master

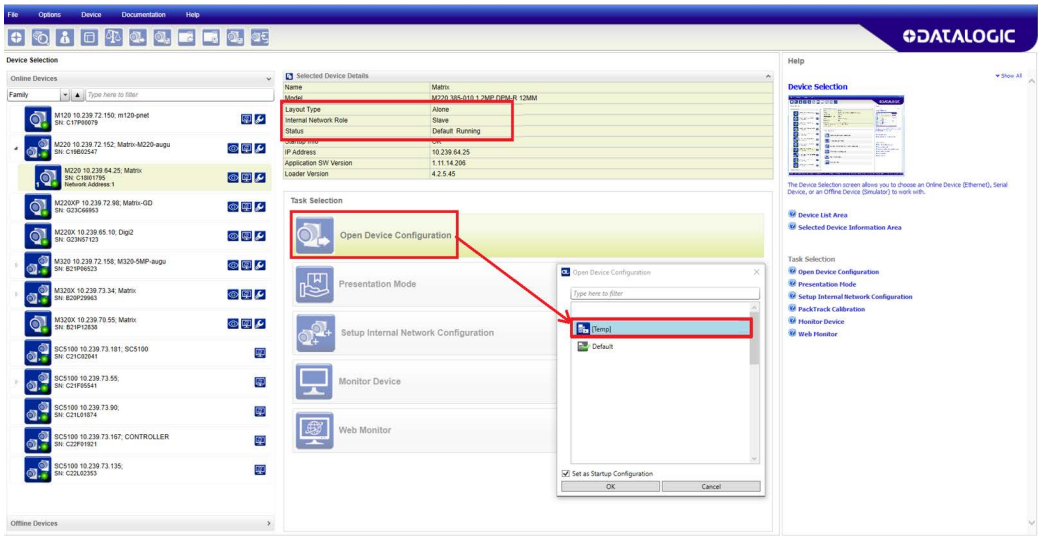
The jobs must not be cloned because the Master and Slaves have different input/output communication channels. The readers are also working independently from each other, often on separate stations with different code reading requirements, different operating modes, etc.

2. Connect to each Slave reader via Ethernet (see note below), and set all the configuration parameters of each Slave device.

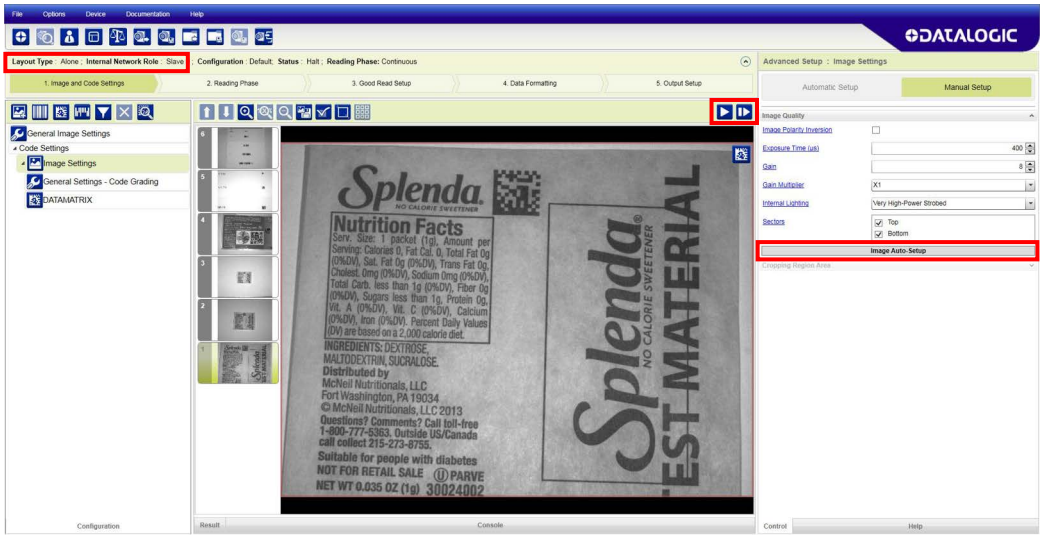
NOTE: If necessary, Slave device photometric (Image Settings) parameters must be configured separately through DL.CODE. This is preferably done through each device's Ethernet TCP/IP channel. If Slave devices are not connected to Ethernet you must temporarily (manually) connect them one by one to perform Image Settings.



Open the Slave specific application job, (it will either have the new name saved from the Master or Temp depending on the **Save on Slave Device** selection).



When the configuration opens, pause run mode and set all the application specific configuration parameters (including Image Settings).



Verify the focus and decoding with the capture image button.

3. Now save them to a new Slave specific application job[1].

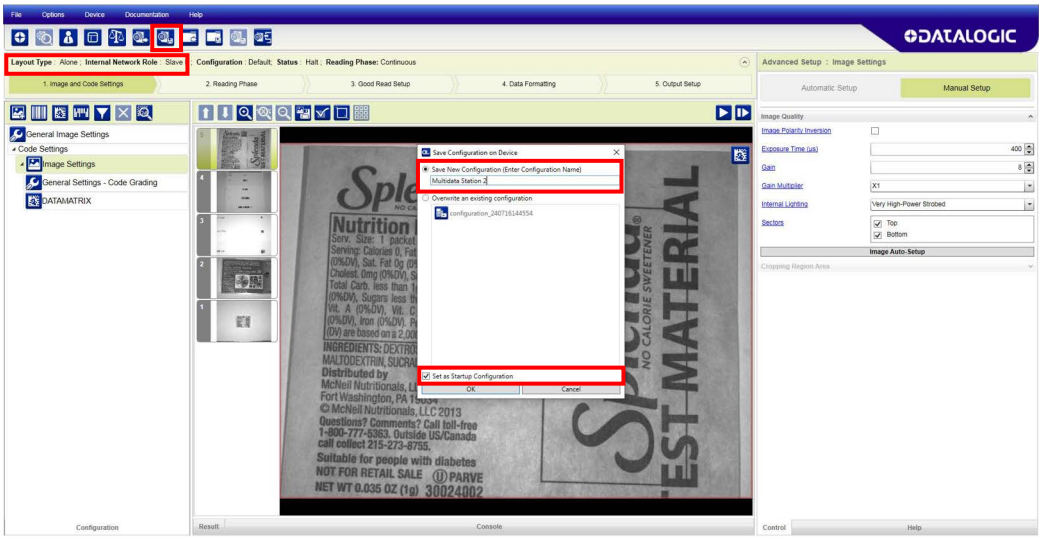
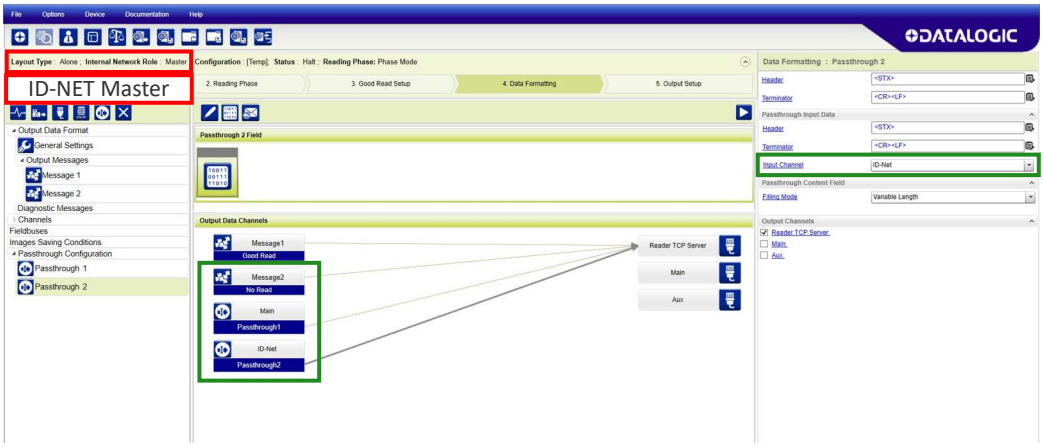


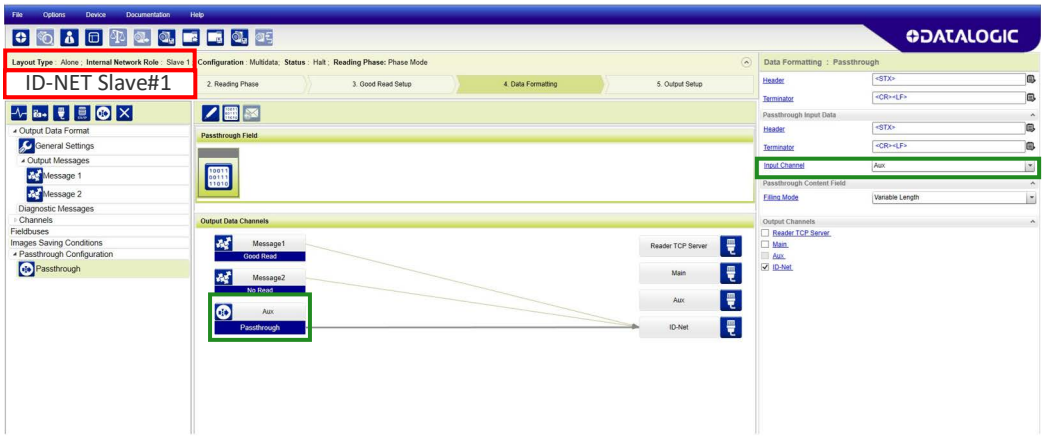
Figure 127 - Saving Multidata Configuration to Slave 1

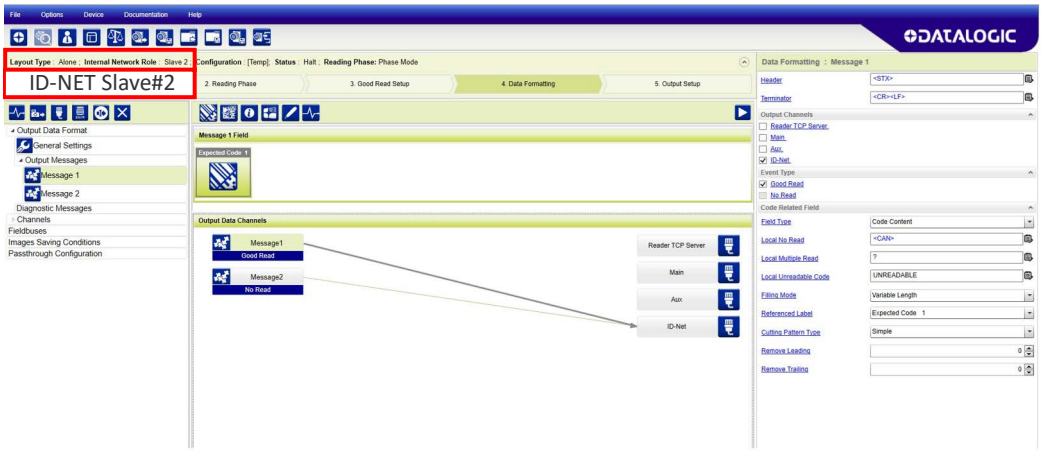
Repeat this procedure for each Slave device until the entire network is configured.

1. If **Save on Slave Device** was selected when saving the Master configuration, an application job with the same name (but with all Slave specific configuration parameters), has been saved to the Slaves. No parameters have been cloned from the Master. There are no common parameters managed by the Master for Multidata configurations.

The following screenshots show the pass-through configuration settings.







Synchronized ID-NET Network Configurations

The Synchronized ID-NET network communications between Master and Slave are internally managed by the application software. A pre-configured job is loaded with the Synchronized Layout Type and the correct Operating Mode for both the Master and Slaves when either the Phase Mode or PackTrack Configuration is selected from the Internal Network Setting feature.

1. Complete the configuration of all the application parameters (including Image Settings) and save them to the Master with an application relative name and **with** the option to **Clone Master configuration on Slaves**.

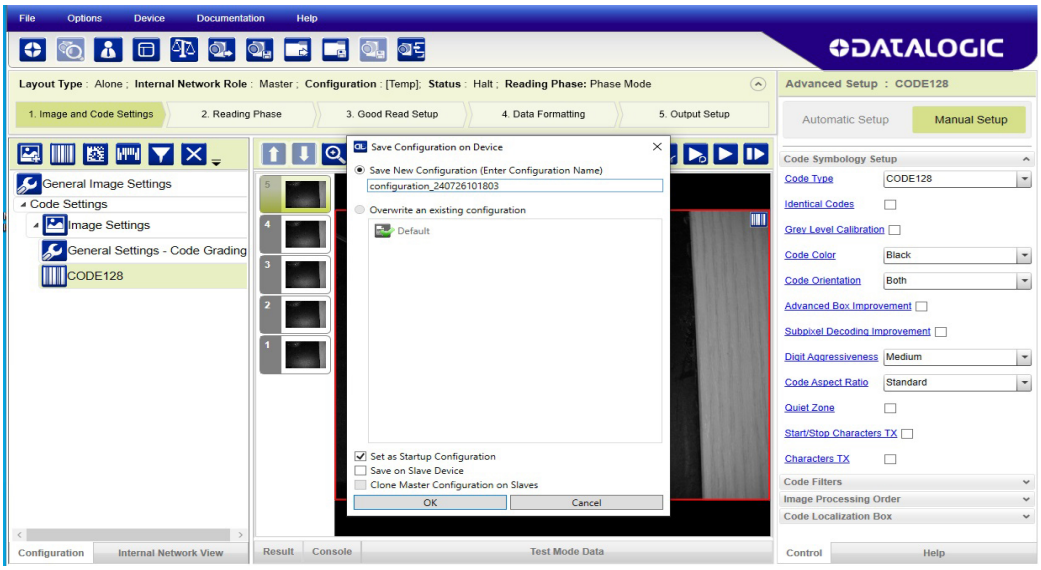
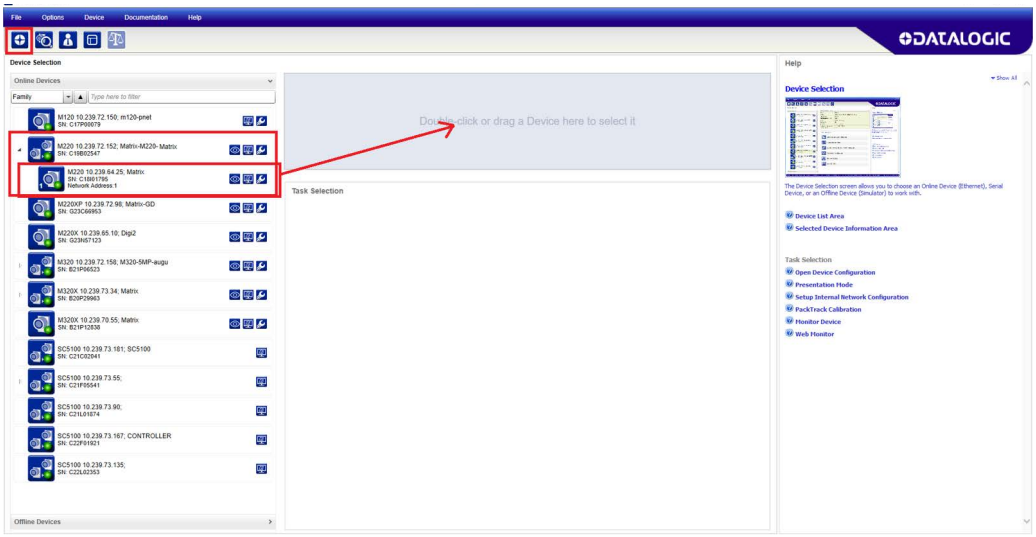


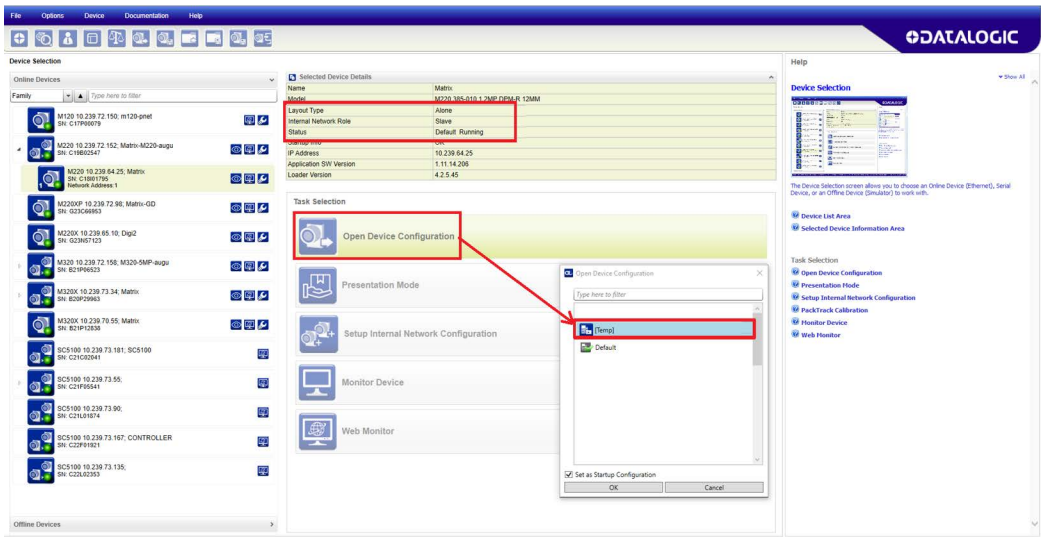
Figure 128 - Saving Synchronized Phase Mode Configuration to Master

2. Connect to each Slave reader via Ethernet (see note below), and set the Slave specific parameters.

NOTE: If necessary, Slave device photometric (Image Settings) parameters must be configured separately through DL.CODE. This is preferably done through each device's Ethernet TCP/IP channel. If Slave devices are not connected to Ethernet you must temporarily (manually) connect them one by one to perform Image Settings.

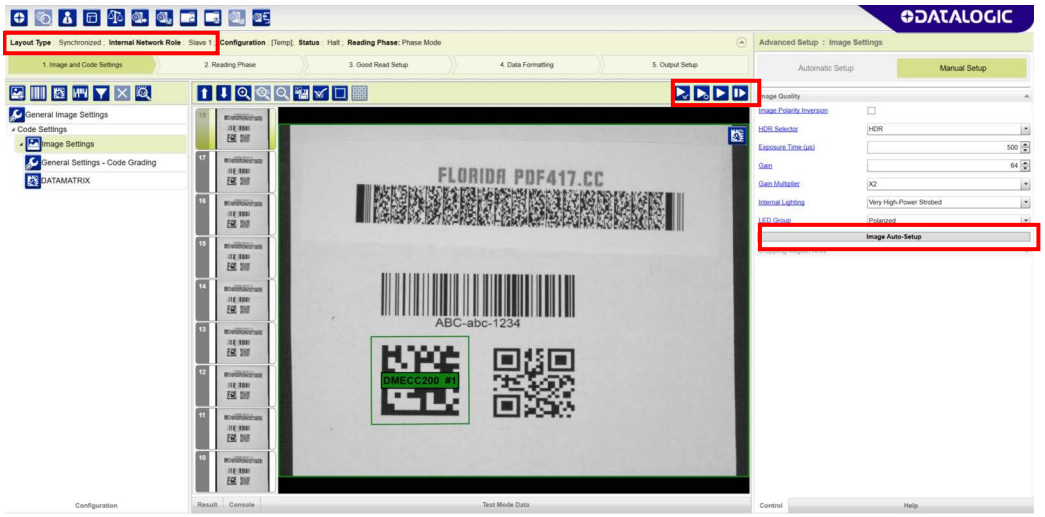


Open the cloned application job.



When the job opens, pause run mode and configure the Slave specific parameters. These depend on the application and include the following:

- photometric parameters (Image Auto-Setup feature in the Advanced Setup – Image Settings step)
- Acquisition Trigger Delays necessary to avoid lighting interference between adjacent or oppositely positioned readers (Reading Phase step)
- Images Saving if used (Data Formatting step)
- Encoder Sensor: if used, (for all Slaves, the Encoder Type must be set to **Internal**)



Verify the focus and decoding with the capture image button.

3. Now save them, overwriting the cloned application job[1].



Figure 129 - Saving Synchronized Phase Mode Configuration to Slave

Repeat this procedure for each Slave device until the entire network is configured.

See "ID-NET Synchronized Network" on page 128 for an example.

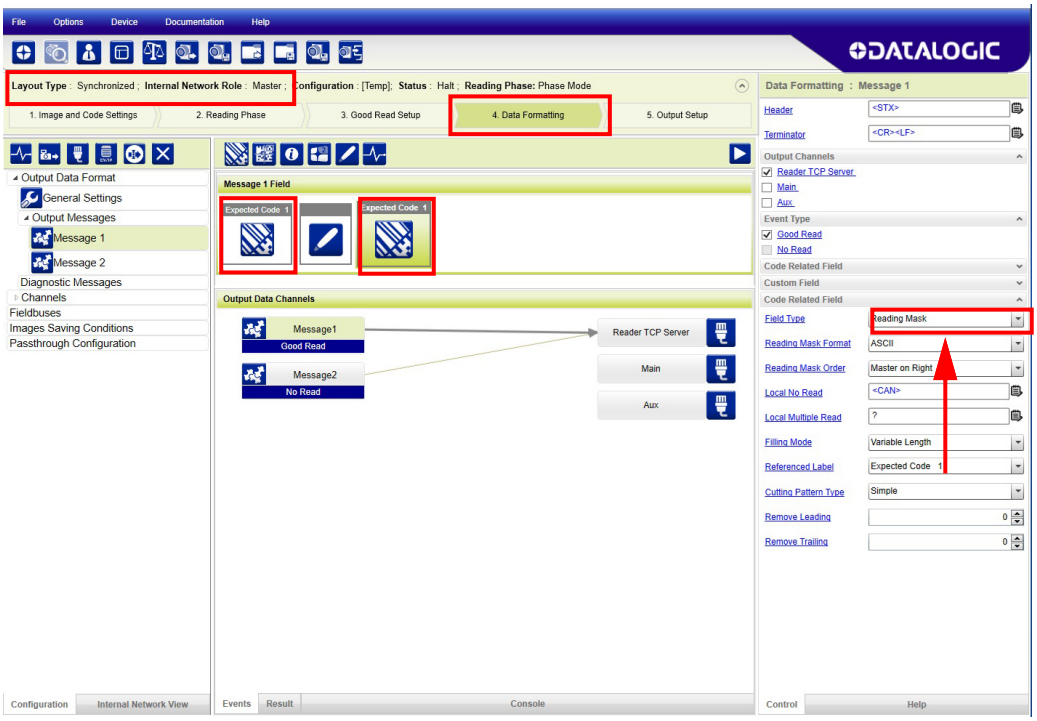
1. An application job with the same name as the Master's has been cloned to the Slaves. Each Slave can have its own Image Settings parameters saved in its own copy of the application job. Common parameters managed by the Master such as Operating Mode cannot be modified in the Slave jobs and are shown in dark gray.

Verify Master/Slave Synchronized Configuration

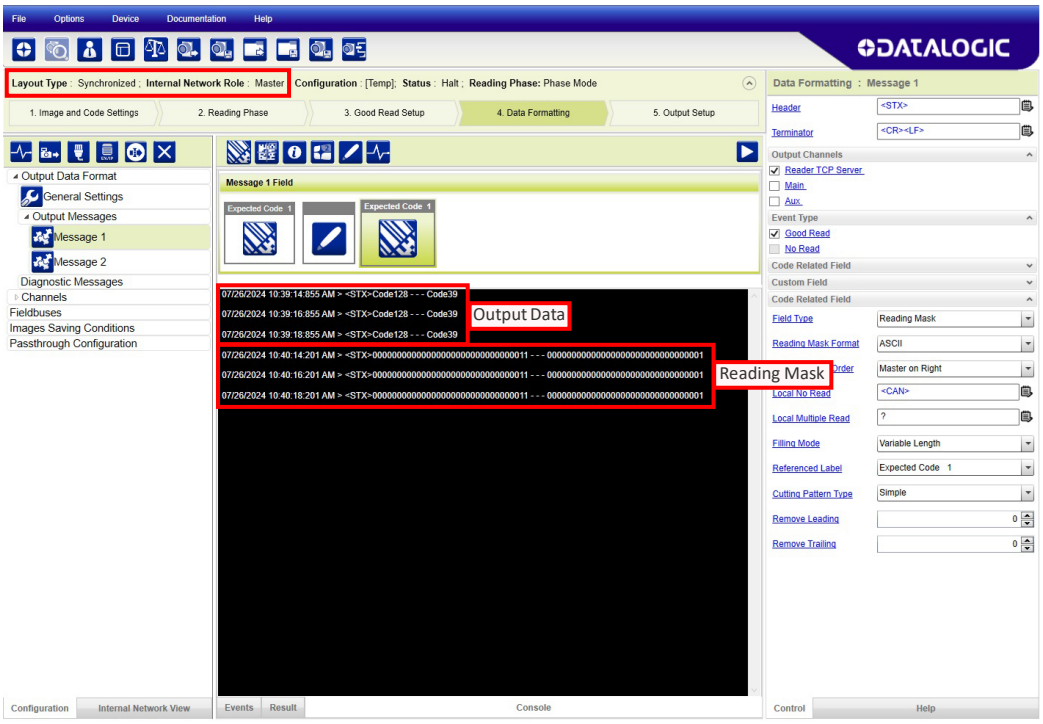
From the Master configuration, run the application and monitor the output data from the DL.CODE Console or a configured channel terminal.

If necessary, as a troubleshooting tip, you can temporarily apply the **Reading Mask** field in place of each Code Content field to verify if all devices are reading. To do this:

1. Connect to the Master device via Ethernet and from the Data Formatting step, change each Expected Code Field Type from Code Content to Reading Mask.



2. Run the application and monitor the output data from the DL.CODE Console or a configured channel terminal.



The Reading Mask shows which device reads which Expected Code. The mask is composed of a fixed 32-character string (0=No Read or 1=Read) representing the 32 possible readers in an ID-NET network. By default the Master is the last character in the string (**Master on Right**) but this can be changed. The Slaves are shown adjacent to the Master in order (1 to 31), by default from right to left.

Example: Master + Slave 1 = 00000000000000000000000000000011

The figure above shows that both the Master and Slave 1 are reading Code 128 while only the Master is reading Code 39.

3. After verifying correct functioning of the reading devices, return the Expected Code fields from Reading Mask to Code Content.

4. If you haven't made any other changes you can exit without saving. Otherwise, save the Master device configuration overwriting its previous one, making sure to save **without Clone Master Configuration on Slaves**, otherwise the Slave configurations will be overwritten.

To view the connected Slave configurations:

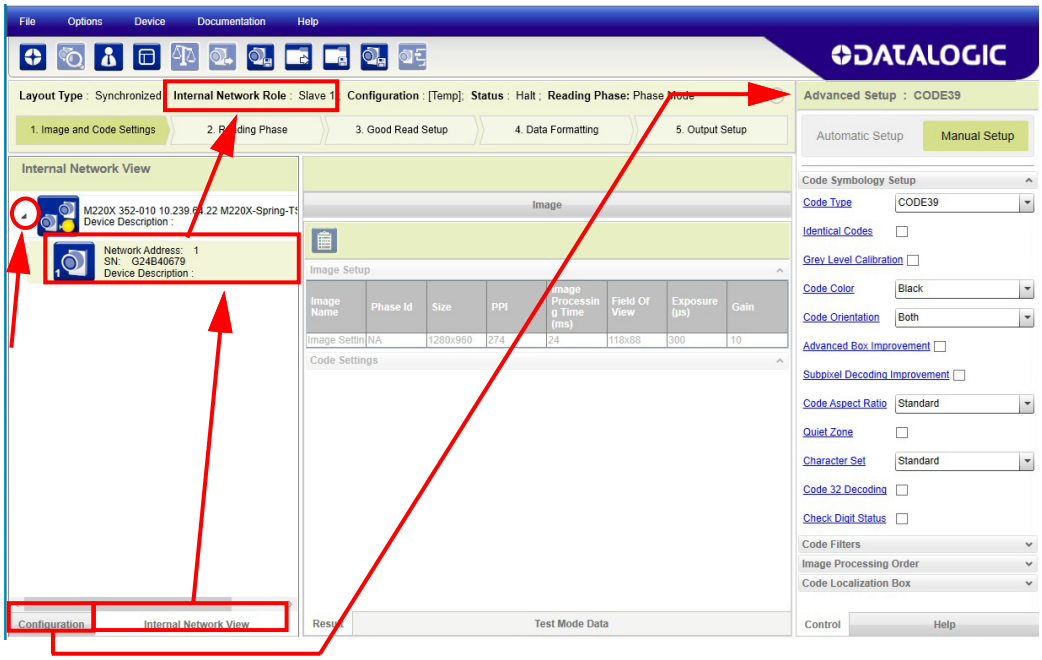
1. Click on the Internal Network View tab at the bottom of the screen.

2. Open the Master branch by clicking on the arrow to the left of the Master icon.

3. Select any slave. Wait for the configuration to load.

4. Click The Configuration tab at the bottom of the screen.

By selecting the various configuration steps above you can visualize the slave configuration.



NOTE: You can modify some Slave Synchronized parameters from this view but you cannot save them here. To save changed slave parameters here, you must click on the Master and Save the configuration overwriting it, making sure to select Save on Slave Device but without Clone Master Configuration on Slaves, otherwise all the Slave configuration parameters will be overwritten by the Master configuration.

BACKUP AND RESTORE THROUGH DL.CODE

DL.CODE allows Backup and Restore to be performed to/from the configuration PC via file or to an external storage device such as BM100/BM150.

DL.CODE provides complete backup and restore functions (Configuration and Environmental parameters) with the following difference:

For Single Readers or individual ID-NET Slaves:

- Backup and Restore functions provide parameter storage including all configuration jobs present on the reader.

For Master Readers in ID-NET Master/Slave networks:

- Backup and Restore functions provide parameter storage of only the Startup Configuration for the Master and all Slaves present in the network.

CAUTION: For Master/Slave networks any other configurations (jobs) stored in the device memory will not be backed up. Therefore, all jobs other than the startup configuration will be overwritten (erased) upon a restore. It is strongly recommended to save all configurations to backup files.

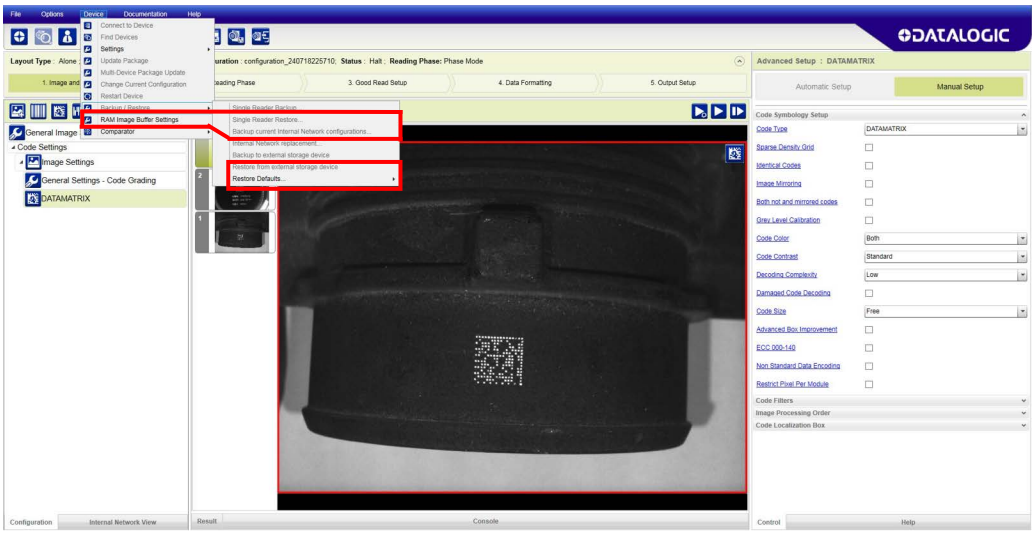
Slave devices must always be configured with the same network baudrate as the Master device for correct functioning including performing Backup and Restore procedures.

When performing Backup and Restore to/from file, device firmware can be included.

Regardless of the reader network configuration, Backup to and Restore from external device is supported by DL.CODE for all reading devices when connected to:

- CBX + BM100
- QLM-Series Gateways

NOTE: Before executing a Backup to a BM100 backup module make sure the Write Protection switch is set to Unlocked.



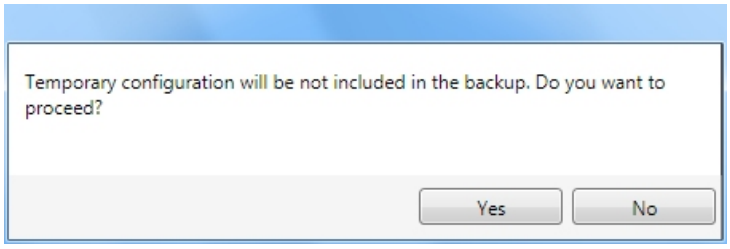
Backup

To perform a **Backup**:

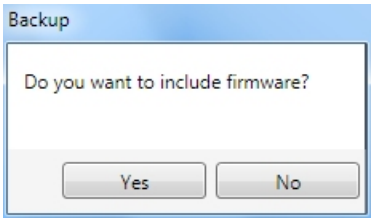
1. From the DL.CODE Device menu, select either **Single Reader Backup** (to file on PC); or **Backup to external storage device**.

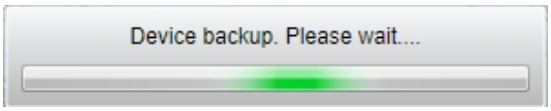
NOTE: For ID-NET network Backup, select the Backup current Internal Network configurations selection.

You will be reminded that configuration in temporary memory will not be saved so you should save the configuration to the reader before performing Backup.



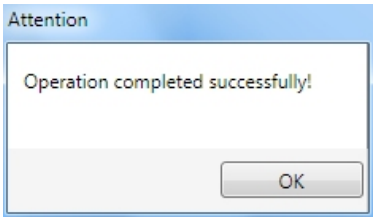
If you are performing a backup to a file you will be asked whether to include the firmware or not.







At the end of the backup, DL.CODE shows a message indicating successful completion.

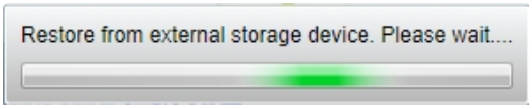


Restore

To perform a **Restore**:

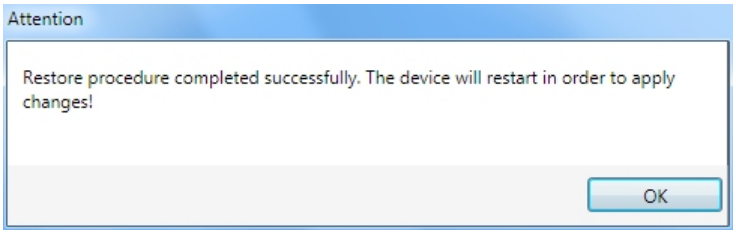
1. From the DL.CODE Device menu, select either **Single Reader Restore** (from file on PC); or **Restore from external storage device**.

NOTE: For ID-NET network Restore, select the Internal Network replacement selection.



If restoring an ID-NET network though the Master, this may take a few minutes.

At the end of the restore, DL.CODE shows a message indicating successful completion.



Replacement

CAUTION: The replacement device must be the exact same model as the device it is replacing.

The **Restore** function also provides easy and secure Single Device Replacement:

1. Remove the device to be replaced.
2. Connect the new device (make sure the new device has been previously set to factory default).
3. Run the Restore procedure by selecting either **Single Reader Restore** (from file on PC) or **Restore from external storage device** item (see: Restore procedure).

NOTE: In case of Backup or Restore operation failures, error messages will be displayed in the Monitor Diagnostic page.

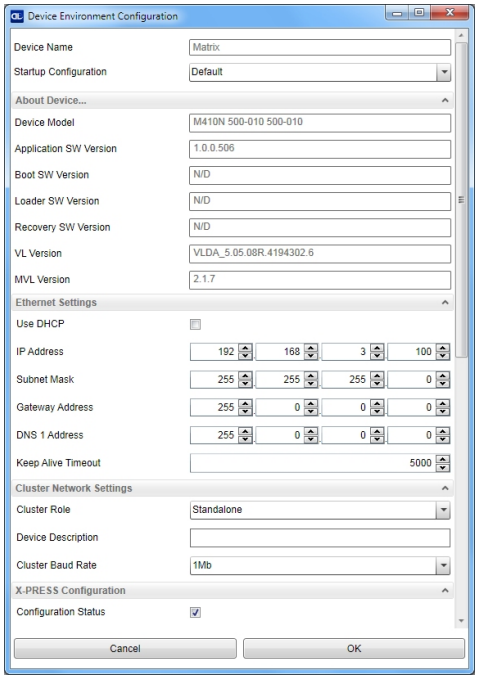
RESTORE DEFAULTS

The device parameters are divided into two main classes, Configuration and Environment which are affected differently by the Restore Defaults commands.

- The Configuration parameters are the ones set in the various steps of the configuration process and are specific to each application. When multiple configurations (jobs) are saved on a single device, these parameters can be different from one configuration to the next.
- Environment parameters regard the device Identity and Position in a Network (Ethernet, ID-NET, etc.) and are not influenced by the Default (or any other) Configuration present in memory.

Restore Default Environment

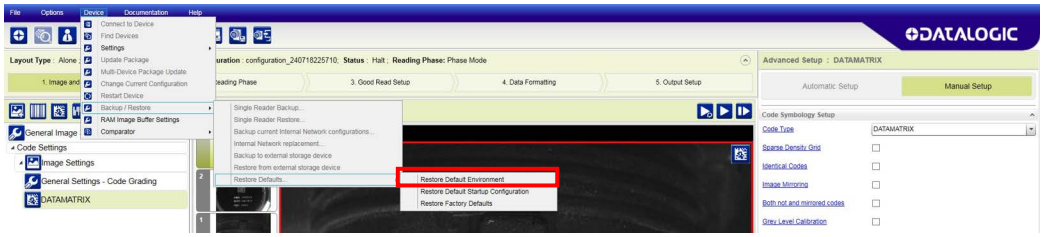
Restore Default Environment returns all Environment parameters to their factory default settings. The default IP address will be restored as well as all the parameters managed in the Device Environment Configuration window.



The Factory Default static IP address for all Matrix N Family readers is:

IP Address = 192.168.3.100

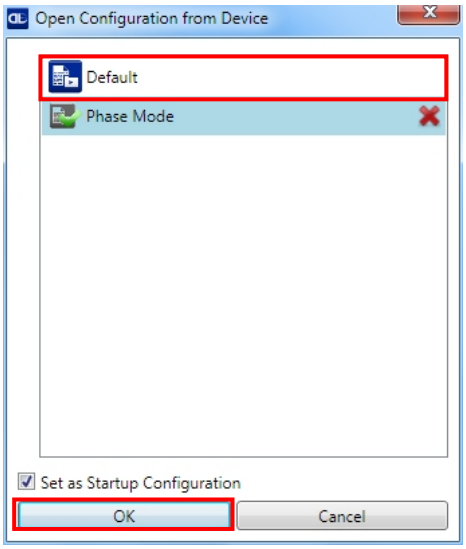
Go to the Device menu >Backup/Restore > Restore Defaults > **Restore Default Startup Configuration**.



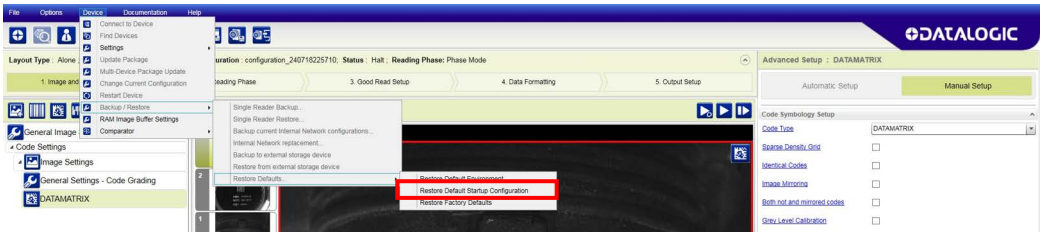
Any previously saved configurations on the device will remain in memory, but the Default configuration is set as the startup configuration.

Restore Default Startup Configuration

The Default configuration is always present on the reader and in fact it is not modifiable and cannot be deleted. It can always be restored by simply selecting it from the Open from Device configuration list.



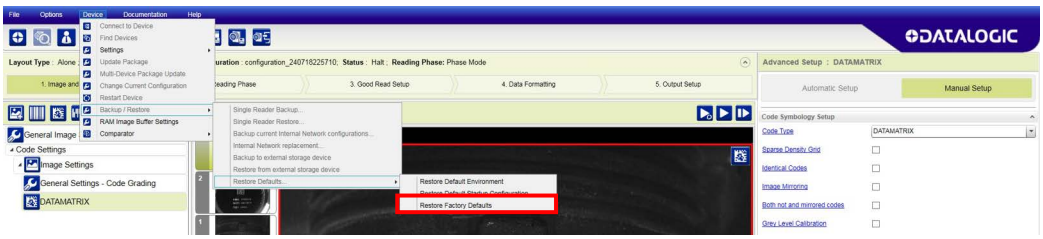
The same action can be performed from the Device menu >Backup/Restore > Restore Defaults > **Restore Default Startup Configuration**. The Default Configuration will be set to run at startup and the reader will be reset.



Any previously saved configurations on the device will remain in memory, but the Default configuration is set as the startup configuration.

Restore Factory Defaults

In order to return a device to its absolute Factory default parameters (for example device replacement) it is necessary to use the **Restore Factory Defaults** command. You will be prompted to confirm.



All Environment parameters will be restored to Factory default values and **any existing configurations stored on the device will be erased**. The device will be reset and therefore start in run mode with the factory default configuration.

DIAGNOSTIC ALARMS

By using the **DL.CODE Monitor** functions from the File menu (or Monitor icon), you can get information about diagnostic alarms. Any alarms will show up as warning lights on the alarm panel.

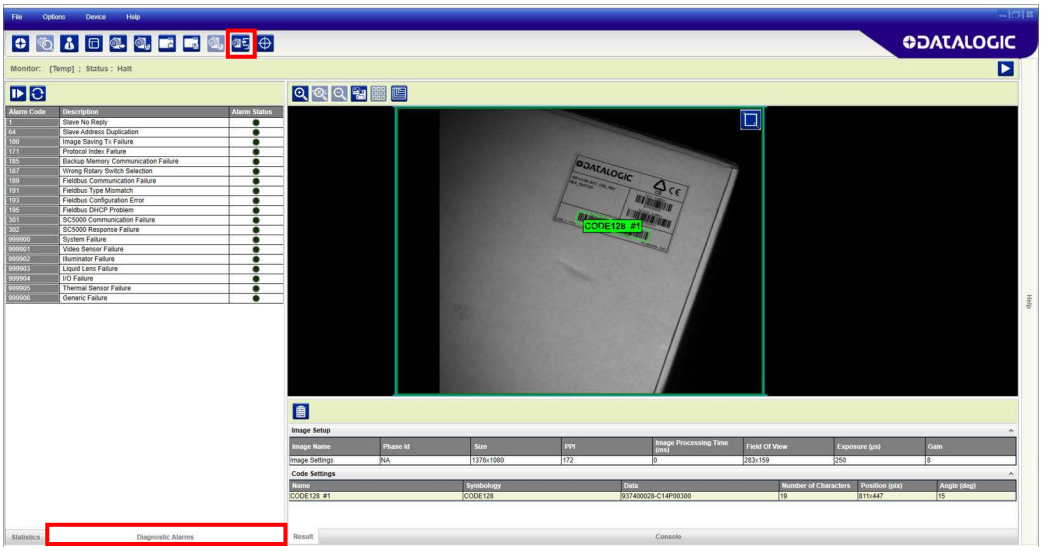


Figure 130 - Diagnostic Alarms

STATISTICS

Statistics on the reading performance can be viewed by enabling the Statistics panel from the **DL.CODE Monitor** item selected from the File menu (or Monitor icon).

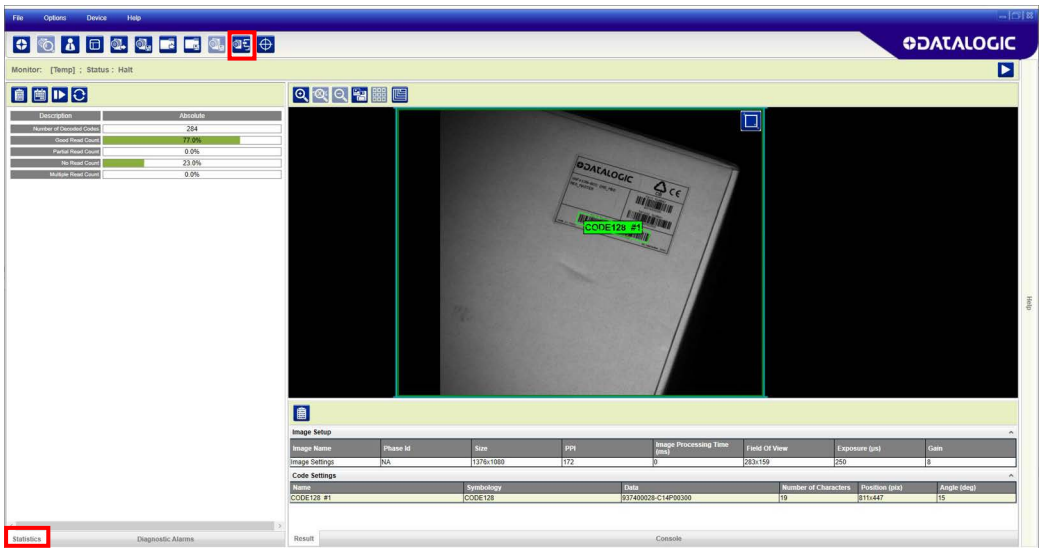
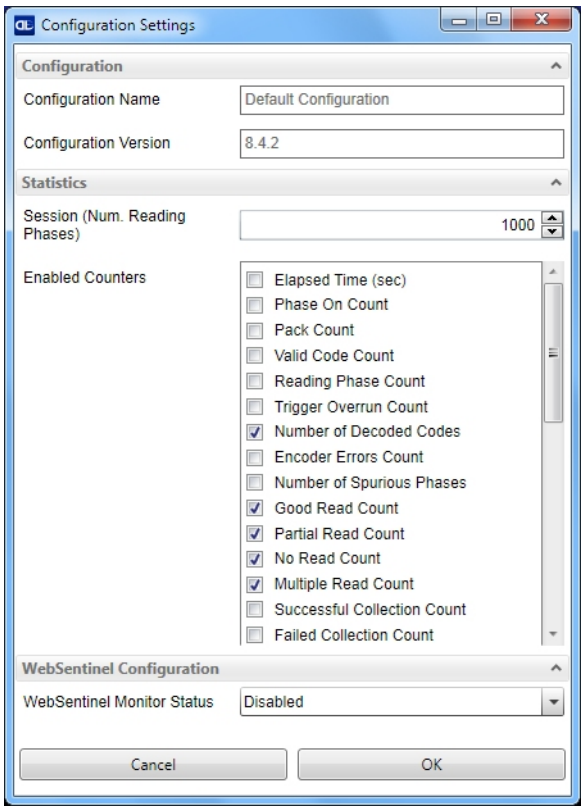


Figure 131 - Reading Statistics

The enabled Statistical Counters can be selected from the Device>Settings>Configuration Settings menu.



BM150 DISPLAY MODULE CONFIGURATION AND MESSAGES

The BM150 display module is an optional accessory for the CBX500 connection box. Although independent, it is an extension of the reader's HMI Interface, so through its keypad it provides execution of HMI features such as Test, Focus/Locate, Calibration and Code Setting. It also displays device status information, reading results, diagnostic and network messages. Since it connects through the BM100 backup memory module, it provides access to Backup and Restore features through its Extended menu.

Configuration Through DL.CODE

BM150 must be detected through the BM100 backup memory module at power-up/reset and this is done through a command setting in DL.CODE. By connecting the reader to DL.CODE the following parameters can be managed.

In the Device>Settings>Settings>Maintenance window:

- **Enable BM100 Detection**
  Checked (Enabled): the BM100 backup memory module will be detected on power-up/reset; therefore the BM150 display module (if present), will also be enabled.
  Unchecked (Disabled): the BM100 backup memory module will **not** be detected on power-up/reset; therefore the BM150 display module (if present), will also **not** be enabled.

- **BM150 Display Layout (Master Only)**
  Reading Mask Only: the Reading Mask screen is sent to the BM150 display.
  Reading Mask/Device State: the Reading Mask/Device State screen is sent to the BM150 display.

Accessing the HMI Interface Through Keypad and Display Menu

Through its keypad and display, the BM150 provides a remote extension of the reader's HMI Interface. The HMI default menu items can be accessed as well as the View menu for Master devices and the Extended menu for Backup and Restore functions.

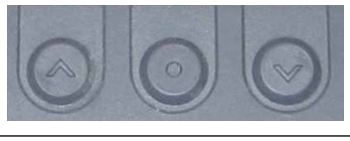


Figure 132 - BM150 Keypad

To enter the Main Menu press the **Up** and **Down** buttons simultaneously.

The menu structure is shown below.

Main Menu

- **[Exit]** (exits HMI Interface menu)
- **Test Mode** (performs Test mode)
- **Focus/Locate** (performs Focus function: turns on LED pointer)
- **Calibration** (performs Setup function)
- **Code Setting** (performs Learn function)
- **Match Code Tra...** (Training: allows to read a code and store it as the Match code)

View Menu (Master Only)

- **[Exit]** (returns to Main menu)
- **Standard** (displays the Standard Reading Results screen during run mode)
- **Reading Mask** (displays the Reading Mask or Reading Mask/Device State screen during run mode) depends on the selection in DL.CODE see par. Configuration Through DL.CODE.
- **Network State** (displays the Network State screen during run mode)

Extended Menu

- **[Exit]** (returns to Main menu)
- **Backup** (performs Backup - uninterruptible)
- **Restore** (performs Restore - uninterruptible)
- **Erase** (erases the backup configuration in external memory - uninterruptible)

To move through the list press and release the **Up** or **Down** key.

To select an item or enter a submenu, press and release the **Enter** key. After executing an HMI function the display shows a result message and then automatically exits from the menu structure.

To exit a menu manually, press and release the **Enter** key at the [Exit] item or press the **Up** and **Down** buttons simultaneously.

To exit from a running HMI function, press the **Up** and **Down** buttons simultaneously. These functions will also exit upon their configured timeout.



NOTE: When the HMI Interface is entered from either the Local Device (reader) or Remote Device (BM150), the key(s) on the other device are disabled.



NOTE: When the reader is connected to DL.CODE, access to the BM150 HMI Interface is disabled.

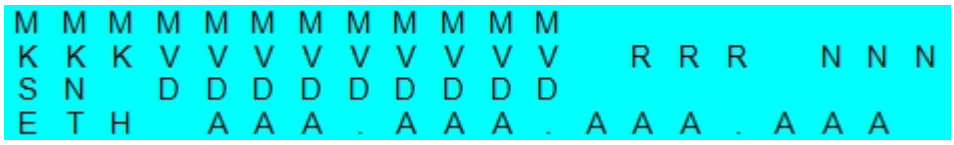


NOTE: The “Reset Reader to Factory Default Environment” function of the HMI Interface is only available on the local device (reader), and not on the BM150.

Display Messages

The following examples of Remote Display messages are given to help interpret the information reported. The content of these messages depends on the connected reader.

Welcome Message



M = scanner model

K = software – STD=Standard, SS =Special

V = software version

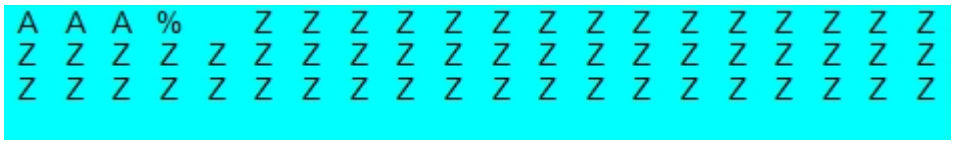
R = Device Network Type – MUL=Multidata, SYN=Synchronized, ALN=Alone

N = Device Network Setting – M00=ID-NET Network Master, Sxx= ID-NET Network Slave address, Null string= Alone (no network)

D = device serial number

A = Ethernet IP Address

Test Mode Results



A = reading percentage from 000 to 100%.

Z = code content.

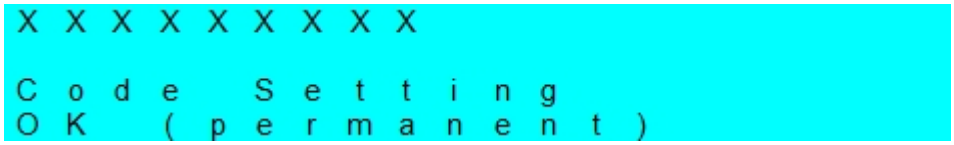
Calibration (Setup) Results



X = exposure value (in µs).

G = gain value

Code Setting (Learn) Results



X = recognized code symbology.

Diagnostic Alarms

Diagnostic error messages are sent to the BM150 display as numeric Alarm Codes (even if Failure Messages are selected for data transmission the numeric Alarm Code is sent to the display).



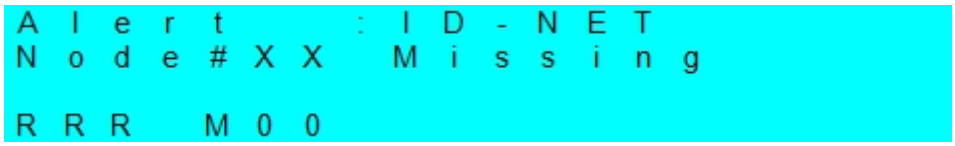
X = numeric Alarm Code (see below for the list of Alarm Codes)

R = Device Network Type – MUL=Multidata, SYN=Synchronized, ALN=Alone

N = Device Network Setting – M00=ID-NET Network Master, Sxx= ID-NET Network Slave address, Null string= Alone (no network)

Alarm Code	Description
1	Slave No Reply
64	Slave Address Duplication
171	Protocol Index Failure
185	Backup Memory Communication Failure
187	Wrong Rotary Switch Selection
189	Fieldbus Communication Failure
191	Fieldbus Type Mismatch
193	Fieldbus Configuration Error
195	Fieldbus DHCP Problem
201	No XRF Slave(s) Detected

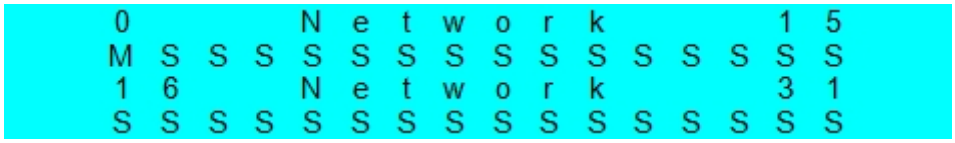
Slave Node Alarms (Master only)



X = slave node number (1-31)

R = Device Network Type – MUL=Multidata, SYN=Synchronized

Network State (Master only)



M = Master diagnostic condition; S = Slave diagnostic condition:

***** = scanner OK

- =scanner not detected at startup

? =scanner detected at startup but not responding to diagnostic polling

! = scanner diagnostic error

Standard Reading Results

```
A A A A A A A A A A A A A
X X X X X X X X X X X X X X X X X X X
X X X X X X X X X X X X X X X X X X X
Y Y C o d e s
```

A = reading result – Good Read, Partial Read, Multiple Read

X = code content

Y = number of codes read

Reading Mask Only (Master Only)

```
X X X X X X X X X X X X X X X X . . .
G Y Y Y % N Y Y Y % M Y Y Y % P Y Y Y %
S S S S S S S S S S S S S S S
T T T T T T T T T T T T T T T
```

X = code content (or "No Read" or "Multiple Read")

Y = Good Read, No Read, Multiple Read and Partial Read counters on the last 100 codes read (%)

S = Reading Mask for Stand Alone or Master plus Slave readers 1 - 15

(0 = No Read, 1 = Good Read, M = Multiple Read)

T = Reading Mask for Slave readers 16 - 31

(0 = No Read, 1 = Good Read, M = Multiple Read)

Reading Mask/Device State (Master Only)

```
X X X X X X X X X X X X X X X X . . .
P = Y Y Y Y Y Y Y   G R = Z Z Z . Z Z %
S S S S S S S S S S S S S S S
U U U U U U U U U U U U U U U
```

X = Recognized code label data (or "No Read" or "Multiple Read")

Y = Phase Counter (range: 0000000 to 9999999)

Z = Good Read or Multiple Read counters (%)

S = Reading Mask for Stand Alone or Master plus Slave readers 1 - 15

(0 = No Read, 1 = Good Read, M = Multiple Read)

U = Diagnostic condition for Stand Alone or Master plus Slave readers 1 - 15:

***** = reader OK

- = reader not detected at startup

? = reader detected at startup but not responding to diagnostic polling

! = reader diagnostic error

BM150 Backup and Restore Procedure

The Backup and Restore functions are valid for any application layout type (point-to-point, network, etc.) using CBX500 connection boxes through the BM100 Backup module (required accessory for BM150 installation).

The Backup and Restore functions are managed through the BM150 display and keypad and therefore are disabled at the BM100 Backup/Restore button.

If it ever becomes necessary to replace the reading device, it can be quickly configured through the restore procedure.

BM150 provides complete backup and restore functions (Configuration and Environmental parameters) with the following difference:

For Single Readers or individual ID-NET Slaves:

- Backup and Restore functions provide parameter storage including all configuration jobs present on the reader.

For Master Readers in ID-NET Master/Slave networks:

- Backup and Restore functions provide parameter storage of only the Startup Configuration for the Master and all Slaves present in the network.



CAUTION: For Master/Slave networks any other configurations (jobs) stored in the device memory will not be backed up. Therefore upon a restore, all jobs other than the startup configuration will be overwritten (erased). It is strongly recommended to save all configurations to backup files.

The Slaves must always be configured with the same network baudrate as the Master for correct functioning including performing Backup and Restore procedures.

Backup and Restore functions cannot be interrupted once started.

To perform *Backup*

1. Make sure the Write Protection switch on the BM100 is unlocked.
2. Select the **Backup** item from the Extended menu and press the Enter key.
3. When the procedure is complete a message appears on the display showing the results (**Backup OK 1 File Saved** or an error message).
4. Set the Write Protection switch to locked.

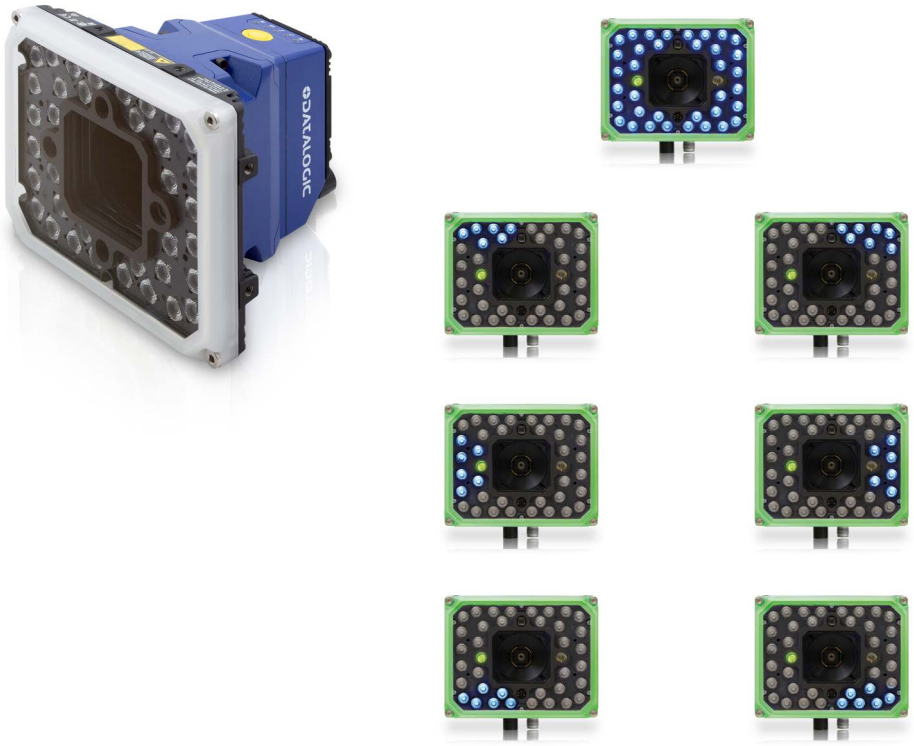
To perform *Restore*

1. Select the **Restore** item from the Extended menu and press the Enter key.
2. When the procedure is complete a message appears on the display showing the results (**Restore OK 1 File Restored** or an error message).

CHAPTER 8
ILLUMINATORS

STANDARD ILLUMINATORS

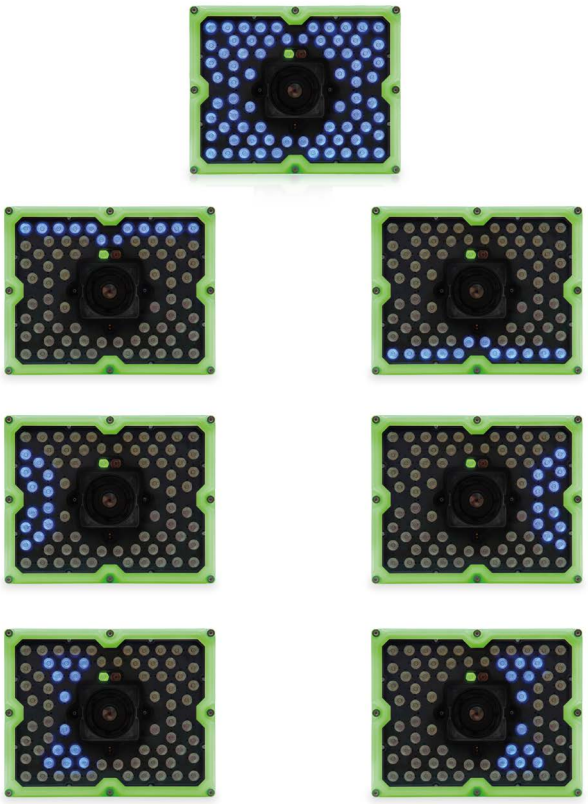
36 LEDs Illuminator



36 LEDs MODELS AND LED CHAIN CONFIGURATION	
LIGHTS ON	LEDs COLOR
All Chains	White, Blue, Red, IR (850nm), UV (365nm)
Top Left	White, Blue, Red, IR (850nm), UV (365nm)
Top Right	White, Blue, Red, IR (850nm), UV (365nm)
Left	White, Blue, Red, IR (850nm), UV (365nm)
Right	White, Blue, Red, IR (850nm), UV (365nm)
Bottom Left	White, Blue, Red, IR (850nm), UV (365nm)
Bottom Right	White, Blue, Red, IR (850nm), UV (365nm)

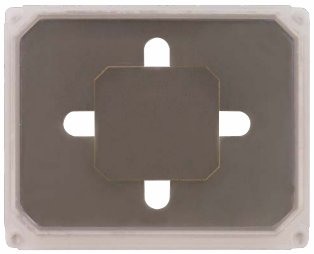
72 LEDs Illuminator



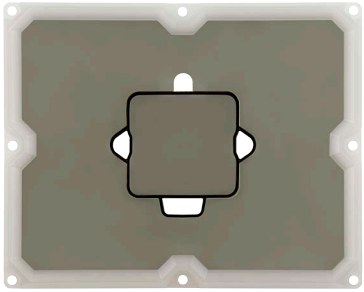


72 LEDs MODELS AND LED CHAIN CONFIGURATION	
LIGHTS ON	LEDs COLOR
All Chains	White, Blue
Left	White, Blue
Right	White, Blue
Top	White, Blue
Bottom	White, Blue
Center Left	White, Blue
Center Right	White, Blue

POLARIZER



Polarizing Cover LT 36 LEDs



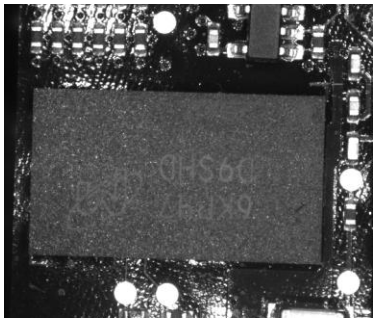
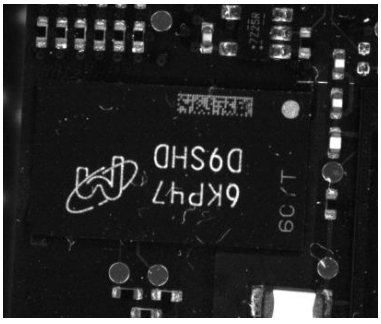
Polarizing Cover LT 72 LEDs

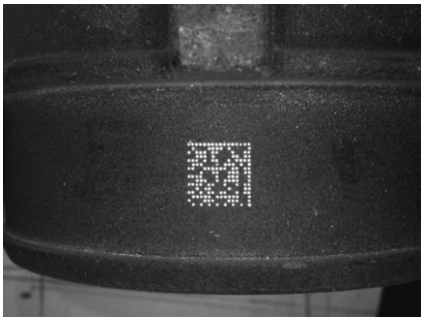
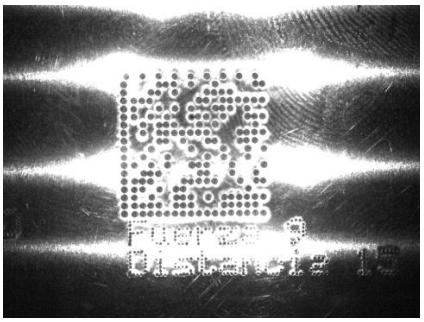
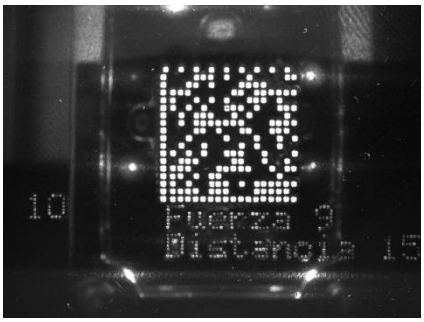
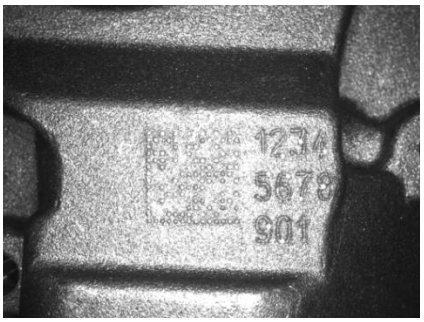
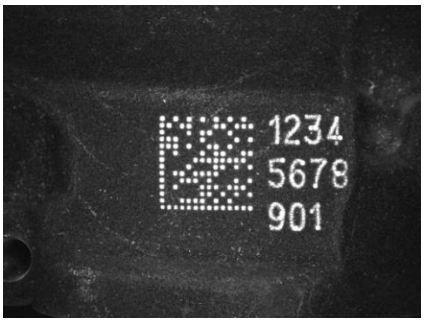
Matrix 320 5mp also comes with a polarizing cover. This is the ideal solution to reduce hot spots on reflective surface applications, such as:

- DPM on reflective metal surfaces
- DPM on non-metal reflecting surfaces
- DPM on electronic circuit boards
- Glossy labels
- Labels under plastic films

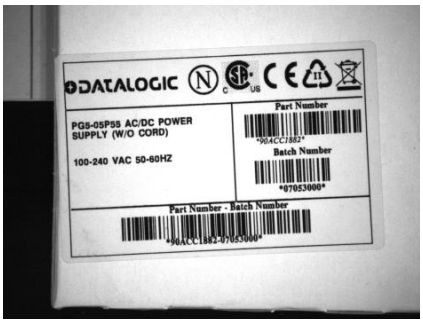
By removing LED reflection, Matrix 320 5mp with polarized illuminators features extreme mounting flexibility, as it can be mounted 90° to the target surface. This in turn avoids code distortion and allows more reliable code grading.

The following examples show the difference between codes read with and without polarizing filters:

DPM: Data Matrix on electronic components	
Non polarized	Polarized
	

DPM: Data Matrix and QR codes on metal surfaces	
Non polarized	Polarized
	
	
	

Bar Code under plastic film	
Non polarized	Polarized
	

Bar Code on glossy surfaces	
Non polarized	Polarized
	

NOTE: If no polarized illuminator is used, the user may avoid LED reflections by turning on one or more sectors according to the code position in the reader's Field of View.

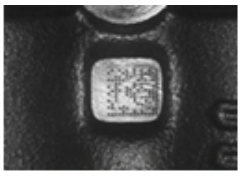
DIRECT PART MARKING APPLICATIONS

For **Data Matrix** family codes the ***Decoding Complexity*** parameter is available when Processing Mode is set to Standard and selects the decoding algorithm based on the printing/marking technique used to create the symbol and on the overall printing/marking quality.

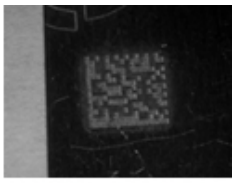
The possible selections progress from Low to Very High where Low can improve decoding time for good print/mark quality and/or relatively normal size codes. This is the default setting. Very High can improve the decode rate for low print/mark quality and/or small size codes. This algorithm is much more aggressive but in general it may have longer decoding times than the lower complexity algorithms. **To minimize decoding time it is better to select the lowest value that still guarantees good decoding.**



Washed out and Axial Distortion



Dot Peening On Scratched Surface



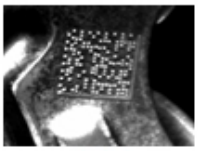
Low Contrast Problem



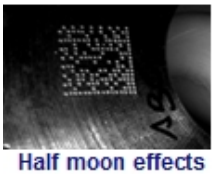
Background Problems



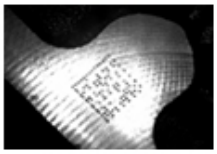
Marked On Curved Shiny Surface



Axial distortion



Half moon effects



Shiny surface, noisy background



Low contrast, noisy background

For **QR** codes the ***Decoding Method*** parameter allows the Dot Peen Decoding algorithm to be selected, which improves the decode rate for low quality Direct Part Mark codes and in general for Direct Part Mark codes with dot peening type module shapes.

MATRIX 320 5MP RECOMMENDED ILLUMINATION

In the following table these macro-cases are listed, each of them highlighting the most suitable Matrix 320 5mp lighting system used to resolve the application with a Standard cover (STD.) with white/blue/red illuminator, a polarizer (PLZ.) with white/blue/red illuminator, and the LT-51x external red illuminator.

Application Characteristics	STD. cover with white ill.	STD. cover with blue ill.	PLZ. cover with white ill.	PLZ. cover with blue ill.	LT-51x ext. red ill.
Printed codes on opaque paper or labels having a flat surface			OK	OK	OK
Laser Etching or Ink Jet code marking on an opaque, flat surface having no evident machining flaws			OK	OK	OK
Code marking on an opaque, rough surface	OK		OK	OK	OK
Code marking on a flat surface with evident machining flaws produced by machining tools			OK	OK	OK
Laser Etching or Dot Peening code marking on a flat, highly reflective surface					
Code marking on a curved background					
Red-printed code on white background					
Mixed color codes/background					
Havana background on cardboard	OK				
Code under plastic film or glossy surface with 0 skew			OK		

Legend:

 Suggested

OK Compatible

 Not recommended

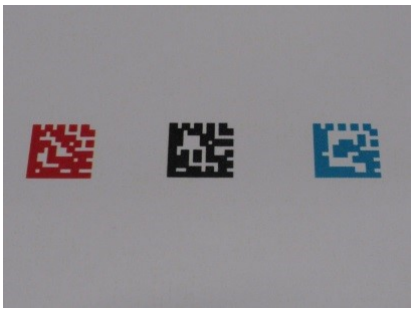
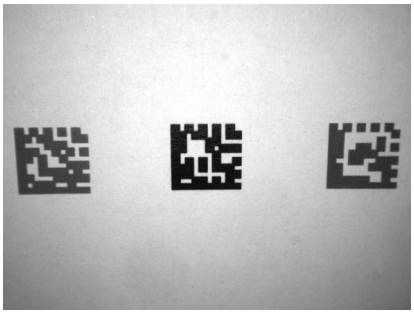
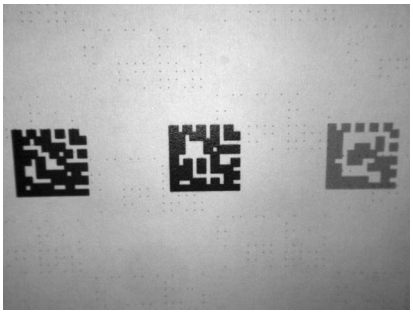
Color Contrast Considerations

Matrix 320 5mp models are available in White and Blue Light versions to help resolve applications that have colored codes and/or backgrounds.

The choice between the white or blue illuminator should be done in order to maximize the contrast between the code and its background; in general, a code illuminated with a light of the same color becomes brighter, on the other hand when illuminated with an opposite color it appears darker (see the Chromatic Circle Chart).



Consequently during the reading phase the lighting system changes the chromatic rendering of the target according to the color of the illuminator, modifying the contrast between target and background. See the examples below.

<table>
<tr><td colspan="3">Color Photo of Codes</td></tr>
<tr><td colspan="3"></td></tr>
<tr><td>Matrix 320 5mp White Illuminator</td><td colspan="2">Matrix 320 5mp Blue Illuminator</td></tr>
<tr><td></td><td colspan="2"></td></tr>
<tr><td>Good contrast on all codes</td><td>Red code (left) has good contrast</td><td>Blue code (right) has low contrast</td></tr>
</table>

Illumination Color	White	Blue
Red-printed code on light background White-printed code on red background	OK	
Red-printed code on dark background Black-printed code on red background	OK	
Blue-printed code on light background White-printed code on blue background	OK	
Blue-printed code on dark background Black-printed code on blue background	OK	

Legend:

 Suggested Lighting System

OK Compatible Lighting System

 Lighting System Not Recommended



CAUTION: The minimum and maximum DPM application distance is limited by both the lighting system working distance and the reader focus distance.
For example, the minimum application distance is limited by the reader minimum focus distance. The maximum application distance is limited by the smaller of the illuminator maximum working distance or the lens maximum focus distance. See also “Global FOV Diagrams” on page 132.

CHAPTER 9
MAINTENANCE

CLEANING

Clean the lens cover periodically for continued correct operation of the reader. See General View.

Dust, dirt, etc. on the lens cover may alter the reading performance.

Repeat the operation frequently in particularly dirty environments.

Use soft material and alcohol to clean the lens cover and avoid any abrasive substances. In particular, wipe it clean using a soft cloth and isopropyl alcohol.

CHAPTER 10
TROUBLESHOOTING

GENERAL GUIDELINES

- When wiring the device, pay careful attention to the signal name (acronym) on the CBX100/500 spring clamp connectors (Chapter 4, CBX Connection Box Pinout). If you are connecting directly to the Matrix 320 5mp M12 17-pin connector, pay attention to the pin number of the signals (Appendix A,).

- If you need information about a certain reader parameter you can refer to the DL.CODE help on line. Connect the device and click on the link to the parameter you're interested in.

- If you're unable to fix the problem and you're going to contact your local Datalogic office or Datalogic Partner or ARC, we suggest providing (if possible): Application Program version, Parameter Configuration file, Serial Number and Order Number of your reader. You can get most of this information while DL.CODE is connected to the reader.

Troubleshooting Guide	
Problem	Suggestion
DL.CODE Installation: Autorun or Start.hta doesn't run	Check Windows settings to see if Autorun is disabled. Associate the file type .hta with the Microsoft HTML Application host **mshta.exe** in Windows\System32.
Power ON: the "POWER" LED is not lit.	Is power connected? If using a power adapter (like PG6000), is it connected to wall outlet? If using rail power, does rail have power? If using CBX, does it have power (check switch and LED)? Check if you are referring to the M12 17-pin connector or to the CBX spring clamp connectors. Measure Voltage either at pin **1** and pin **2** (for 17-pin connector) or at spring clamp **Vdc** and **GND** (for CBX).

Troubleshooting Guide	
Problem	Suggestion
One Shot or Phase Mode using the Input 1 (External Trigger) or Input 2: the "TRIGGER" LED is not blinking while the External Trigger is switching.	Check if you are referring to the 17-pin connector or to the CBX spring clamp connectors. Is the sensor connected to Input 1 or Input 2? Is power supplied to the photo sensor? For NPN configuration, is power supplied to one of the two I1 or I2 signals (A or B)? For PNP configuration, is one of the two I1 or I2 signals grounded (A or B)? Are the photo sensor LEDS (if any) working correctly? Is the sensor/reflector system aligned (if present)? On the Reading Phase step check the Input 1 or Input 2 *Debouncing Time* parameter setting. On the Reading Phase step check the settings for *Acquisition Trigger, Reading Phase-ON,* and *Reading Phase-OFF* parameters.
One Shot or Phase Mode using serial trigger source: the "TRIGGER" LED is not blinking.	On the Reading Phase step check the settings for *Acquisition Trigger, Reading Phase-ON,* and *Reading Phase-OFF* parameters. Are the COM port parameters (*Baud Rate, Parity, Data Bits, Stop Bits*) correctly assigned? On the Reading Phase step check the settings of *Acquisition Trigger String, Reading Phase-ON String,* and *Reading Phase-OFF String* parameters. Is the serial trigger source correctly connected?
Phase Mode: the "TRIGGER" LED is correctly blinking but no image is displayed in the DL.CODE window.	Is the Phase frequency lower than the maximum frame rate?
Continuous Mode: the "TRIGGER" LED is not blinking.	Verify the correct software configuration settings.
Any Operating Mode: the "TRIGGER" LED is correctly blinking but no result is transmitted by the reader at the end of the reading phase collection.	Check the Code Collection parameters on the Reading Phase step and the Data Formatting parameters on the Data Formatting step.
Image not clear:	verify the Focus procedure
Image focused but not decoded:	verify the Calibrate Image Density procedure.

Troubleshooting Guide	
Problem	Suggestion
Reading: the reader always transmits the *No Read Message*	Run the Rapid Configuration procedure in Chapter 1, Rapid Configuration. Position the reader as described in "Mounting And Positioning Matrix 320 5mp" on page 62 and through DL.CODE: Tune the Acquisition Delay on Trigger, if the moving code is out of the reader field of view; Set the Continuous Operating Mode if no external trigger source is available; Tune the Image Settings to improve the code image quality; Check the parameter settings in the Advanced Setup step: 2D Codes, 1D Codes, and Postal Codes; View the full resolution code image to check the printing or marking quality.
Communication: reader is not transmitting anything to the host.	Is the serial cable wiring correct? If using CBX, be sure the RS422 termination switch is OFF. Are the host serial port settings the same as the reader serial port settings? In DL.CODE Device menu > Settings > Settings > LED Configuration, the COM LED Function can be configured to indicate Main Serial Port TX or Main Serial Port RX.
Communication: data transferred to the host are incorrect, corrupted or incomplete.	Are the host serial port settings the same as the reader serial port settings? In the DL.CODE Data Formatting step check the settings of Header and Terminator String parameters. In the DL.CODE Data Formatting step, check the various Message Field parameter settings.
Configuration: cannot access environment parameters in DL.CODE (Device>Settings>Settings menu item is gray)	Are you using the Installer - Expert User level? If not change it in the Options>Change User menu.
How do I obtain my reader Serial Number?	The reader Serial Number consists of 9 characters: one letter, 2 numbers, another letter followed by 5 numbers. The reader Serial Number is printed on a label that is affixed to the case or connector block of the reader. The Serial Number is also visible from the DL.CODE Device List Area.
How do I obtain my reader Order Number?	The reader Order Number consists of 9 numbers. The reader Order Number can be obtained by comparing the Device Model (in DL.CODE Device Menu > Settings > Settings > About Device) with the product models page on the Datalogic website.

APPENDIX A
TECHNICAL FEATURES

ELECTRICAL FEATURES			
Power	Matrix 320 without illuminator	Matrix 320 with 36 LED illuminator	Matrix 320 with 72 LED illuminator
Supply Voltage	24 Vdc ± 10%		
Peak Supply Current	0.25 A max.	0.85 A max. [1]	1.30 A max.
Average Supply Current	0.15 A	0.52 A	0.75 A
Communication Interfaces			
Main: RS232, RS422 Full-duplex	2400 to 115200 bit/s		
Auxiliary: RS232	2400 to 115200 bit/s		
ID-NET			
Ethernet (Built-in)	10/100/1000 Mbit/s		
supported application protocols	TCP/IP, UDP, FTP, SFTP, EtherNet/IP, Modbus TCP, PROFINET-IO, OPC UA		
Inputs Input 1 (External Trigger) and Input 2	Opto-coupled and polarity insensitive		
Max. Voltage	30 Vdc		
Max. Input Current	10 mA		
Outputs [2] Output 1, 2 and 3	NPN, PNP, or PP short circuit protected;		
V_{OUT} (I_{LOAD} = 0 mA) Max.	24 Vdc		
V_{OUT} (I_{LOAD} = 100 mA) Max.	3 Vdc		
I_{LOAD} Max.	100 mA		

1. Peak supply current with white illuminator. Other available illuminators have the following peak supply current:
   - Blue illuminator: 0.80 A
   - IR illuminator: 0.55 A
   - UV illuminator: 0.25 A
2. when connected to the CBX connection boxes the electrical features for Output 1 and 2 become the following:
   Opto-isolated; V_{CE} = 30 Vdc max.; I_{CE} = 40 mA continuous max.; 130 mA pulsed max.;
   $V_{CE\ saturation}$ = 1 Vdc max. @ 10 mA; P_D = 90 mW Max. @ 50 °C ambient temp.

OPTICAL FEATURES		
	Matrix 320 with 36 LED illuminator	Matrix 320 with 72 LED illuminator
Image Sensor	CMOS	
Image Format	5.0 Mpixel (2560 x 1936)	
Frame Rate	25 frames/s	
Pitch	± 35°	
Tilt	0° - 360°	
LED Safety	according to EN 62471	
Lenses	C-Mount Lenses (8mm, 12mm, 16mm, 25mm, 35mm, 50mm)	
Aperture Angle	50° (8mm), 34° (12mm), 25° (16mm), 16° (25mm), 12° (35mm), 8° (50mm)	
Lighting System	External or internal illuminator (36 LEDs or 72 LEDs)	
Reading Range (considering the lens front)	8mm: 50mm - ¥ 12mm: 100mm - ¥ 16mm, 25mm, 35mm: 200mm - ¥ 50mm: 400mm - ¥	
Illumination	White, blue, IR, UV lights	White or blue lights
Aiming System	Cross aiming (Laser Class II), Grid pattern aiming (Laser Class I)	Dual spot aiming (Laser Class II)
Embedded Distance Sensor	Distance range: 100 to 2500 mm Viewing angle: 18° horizontal, 12° vertical	
Embedded Orientation Sensor	Device orientation measurement (roll and pitch angles)	
Polarizing Filter	Polarizing cover accessory	

PHYSICAL FEATURES			
	Matrix 320 without illuminator	Matrix 320 with 36 LED illuminator	Matrix 320 with 72 LED illuminator
Dimensions (with lens cover)	H x W x L	H x W x L	H x W x L
Connector at 0°	108.7 x 54 x 54.3 mm (4.3 x 2.1 x 2.14 in)	115.5 x 126 x 124.8 mm (4.6 x 4.9 x 4.91 in)	145 x 181 x 121.5 mm (5.7 x 7.1 x 4.8 in)
Connector at 90°	88 x 54 x 54.3 mm (3.5 x 2.1 x 2.14 in)	101 x 126 x 138.2 mm (4.6 x 4.9 x 5.44 in)	145 x 181 x 141.9 mm (5.7 x 7.1 x 5.59 in)
Weight	**C-Mount base only**	**Base + Adapter + Illuminator**	
	300 g (10.6 oz)	900 g (31.7 oz)	1530 g (53.9 oz)
Material	Aluminum case and plastic protective window cover		

ENVIRONMENTAL FEATURES	
Operating Temperature [1]	-10 to 50 °C (14 to 122 °F) [2]
Storage Temperature	-20 to 70 °C (-4 to 158 °F)
Max. Humidity	90% non condensing
Vibration Resistance EN 60068-2-6	14 mm @ 2 to 10 Hz; 1.5 mm @ 13 to 55 Hz; 2 g @ 70 to 500 Hz; 2 hours on each axis
Bump Resistance EN 60068-2-29	30g; 6 ms; 5000 shocks on each axis
Shock Resistance EN 60068-2-27	30g; 11 ms; 3 shocks on each axis
Protection Class [3] EN 60529	IP65 and IP67
Sulfur Gas Resistance	According to ISO EN 60068-2-43

1. high ambient temperature applications should use metal mounting bracket and the heat sink provided in the package for heat dissipation.
2. Operating temperature is 0 to 50 °C (32 to 122 °F) for model 938100072.
3. when correctly connected to IP67 cables with seals and the Lens Cover is correctly mounted.

CODE QUALITY METRICS	
Standard	Supported Symbologies
ISO/IEC 16022 (always enabled)	Data Matrix ECC 200
ISO/IEC 18004 (always enabled)	QR Code
AIM DPM	Data Matrix ECC 200, QR Code
ISO/IEC 15415	Data Matrix ECC 200, QR Code
ISO/IEC 15416	Code 128, Code 39, Interleaved 2 of 5, Codabar, Code 93, EAN-8-13, UPC-A/E

USER INTERFACE	
LED Indicators	Power, Ready, Good; Trigger; Com, Status, (Ethernet Network); Good Read (Green Spot)
Keypad Button	Configurable via DL.CODE

SOFTWARE FEATURES		
Readable Code Symbologies		
1D and Stacked	2D	Postal
PDF417 Standard and Micro PDF417 Code 128 (GS1-128) Code 39 (Standard and Full ASCII) Code 32 MSI Standard 2 of 5 Matrix 2 of 5 Interleaved 2 of 5 Codabar Code 93 Pharmacode EAN-8/13 - UPC-A/E (including Addon 2 and Addon 5) GS1 DataBar Family Composite Symbologies	Data Matrix ECC 200 (Standard, GS1 and Direct Marking) QR Code (Standard and Direct Marking) Micro QR Code MAXICODE Aztec Code DotCode	Australia Post Royal Mail 4 State Customer Kix Code Japan Post PLANET POSTNET POSTNET (+BB) Intelligent Mail Swedish Post
Operating Mode	Continuous, One Shot, Phase Mode, PackTrack	
Configuration Methods	X-PRESS Human Machine Interface DL.CODE Windows-based SW (Ethernet or Serial interface) Serial Host Mode Programming sequences	
Parameter Storage	Permanent memory (Flash)	

APPENDIX B
ALTERNATIVE CONNECTIONS

The connector pinouts and notes given in this appendix are for custom cabling applications.

POWER, COM AND I/O CONNECTOR FOR STANDARD MODELS

The Matrix 320 5mp reader is equipped with an M12 17-pin male connector for connection to the power supply, serial interfaces, and input/output signals. The details of the connector pins are indicated in the following table:

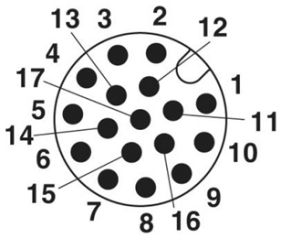


Figure 1 - M12 17-pin male Power, COM and I/O Connector

POWER, COM AND I/O CONNECTOR PINOUT			
PIN	NAME	DESCRIPTION	
1	Vdc	Power supply input voltage +	
2	GND	Power supply input voltage -	
Connector case	CHASSIS	Connector case provides electrical connection to the chassis	
6	I1A	External Trigger A (polarity insensitive)	
5	I1B	External Trigger B (polarity insensitive)	
13	I2A	Input 2 A (polarity insensitive)	
3	I2B	Input 2 B (polarity insensitive)	
9	O1	Output 1 *	(NPN, PNP or PP short circuit protected and software programmable)
8	O2	Output 2 *	
16	O3	Output 3	
14	RX	Auxiliary RS232 RX	
4	TX	Auxiliary RS232 TX	
7	ID+	ID-NET network data +	
15	ID-	ID-NET network data -	

		RS232	RS422 Full-Duplex
17	Main Interface (SW Selectable)	TX	TX+
11		RX	RX+ **
12		-	TX-
10		-	*RX-

* Output 1 and Output 2 are opto-coupled when using a CBX.

** Do not leave floating, see "RS422 Full Duplex Interface" on page 100 for connection details.

In order to meet EMC requirements:

- connect the reader chassis to the plant earth ground by means of a flat copper braid shorter than 100 mm;
- connect your cable shield to the locking ring nut of the connector.

ON-BOARD ETHERNET CONNECTOR

An M12 X-Coded female connector is provided for the on-board Ethernet connection. This interface is IEEE 802.3 10 BaseT, IEEE 802.3u 100 BaseTx, and IEEE 802.3ab 1000BaseT compliant.

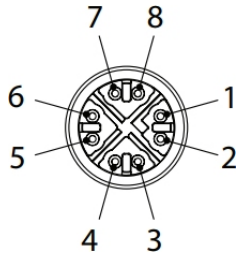


Figure 2 - M12 X-Coded Female Ethernet Network Connector

ON-BOARD ETHERNET NETWORK CONNECTOR PINOUT		
PIN	NAME	DESCRIPTION
1	DA+	Bidirectional data DA+
2	DA-	Bidirectional data DA-
3	DB+	Bidirectional data DB+
4	DB-	Bidirectional data DB-
5	DD+	Bidirectional data DD+
6	DD-	Bidirectional data DD-
7	DC-	Bidirectional data DC-
8	DC+	Bidirectional data DC+

LTM 034-xxx CONNECTOR

An M12 A-Coded, 5-pin male connector is provided for the LTM 034-xxx illuminator connection:

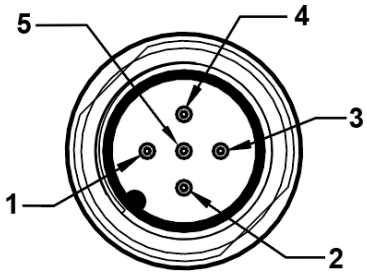


Figure 3 - M12 5-pin male Power connector

LTM 034-xxx CONNECTOR PINOUT		
PIN	NAME	DESCRIPTION
1	VIN	Input Voltage
3	GND	Ground
2, 4, 5	n.c.	not used

ID-NET NETWORK TERMINATION

The network must be properly terminated by a 120 Ohm resistor at the first and last reader of the network.

INPUTS

There are two opto-coupled polarity insensitive inputs available on the M12 17-pin connector of the reader: Input 1 (External Trigger) and Input 2, a generic input. See "Inputs" on page 107 for more details.

The electrical features of both inputs are:

INPUT	$\lvert V_{AB} \rvert$ MIN.	$\lvert V_{AB} \rvert$ MAX.	I_{IN} MAX.
Open	0 V	2 V	0 mA
Closed	4.5 V	30 V	10 mA

The relative pins on the M12 17-pin connector are:

INPUT PINOUT		
PIN	NAME	DESCRIPTION
1	Vdc	Power Supply input voltage +
6	I1A	External Trigger A (polarity insensitive)
5	I1B	External Trigger B (polarity insensitive)
13	I2A	Input 2 A (polarity insensitive)
3	I2B	Input 2 B (polarity insensitive)
2	GND	Power Supply input voltage -

OUTPUTS

Three general purpose **non opto-isolated** but short circuit protected outputs are available on the M12 17-pin connector.

The pinout is the following:

OUTPUT PINOUT		
PIN	NAME	DESCRIPTION
9	O1	Configurable digital output 1
8	O2	Configurable digital output 2
16	O3	Configurable digital output 3
2	GND	Ouptut reference signal



NOTE: Output 1 and Output 2 are opto-coupled when using a CBX.

The electrical features of the three outputs are the following:

Reverse-Polarity and Short-Circuit Protected
V_{OUT} (I_{LOAD} = 0 mA) max = 30 Vdc
V_{OUT} (I_{LOAD} = 100 mA) max = 3 Vdc
I_{LOAD} max = 100 mA

The output signals are fully programmable being determined by the configured Activation/Deactivation events, Deactivation Timeout or a combination of the two. For further details refer to the Help On Line page for the Output Setup step in DL.CODE.

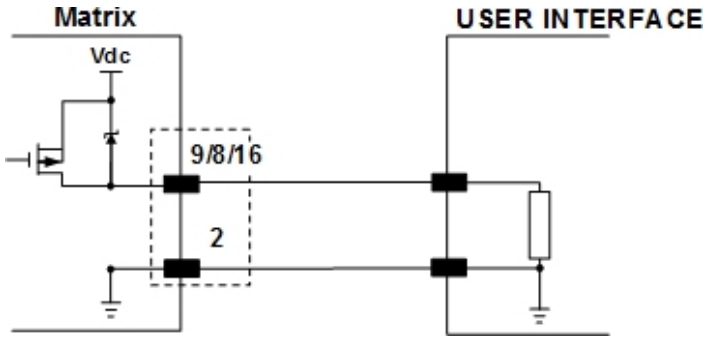


Figure 4 - PNP Output Connection

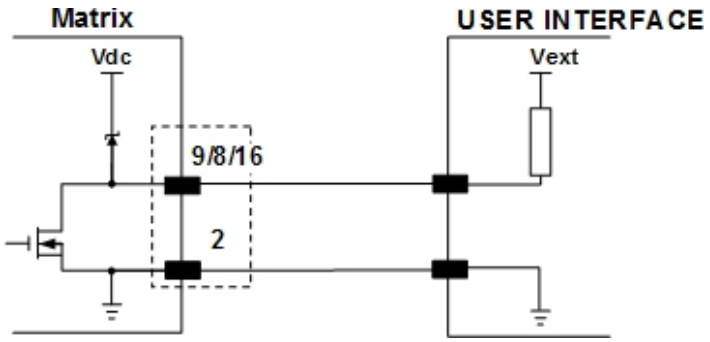


Figure 5 - NPN Output Connection

CAUTION: For NPN output connections, the external interface voltage (Vext) must not exceed the Matrix 320 5mp power supply source voltage (Vdc) otherwise correct output functioning cannot be guaranteed.

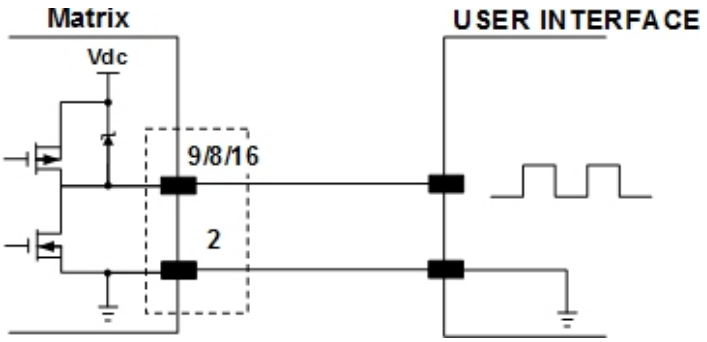
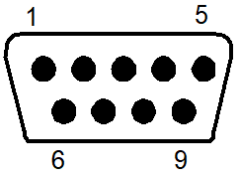
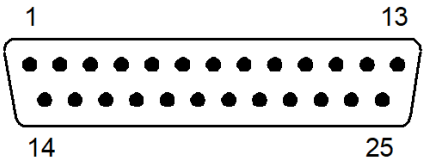


Figure 6 - Push-Pull Output Connection

USER INTERFACE - SERIAL HOST

RS232 PC-SIDE CONNECTIONS			
 9-pin male connector		 25-pin male connector	
Pin	**Name**	**Pin**	**Name**
2	RX	3	RX
3	TX	2	TX
5	GND	7	GND

How To Build A Simple Interface Test Cable

The following wiring diagram shows a simple test cable including power, external (push-button) trigger and PC RS232 COM port connections.

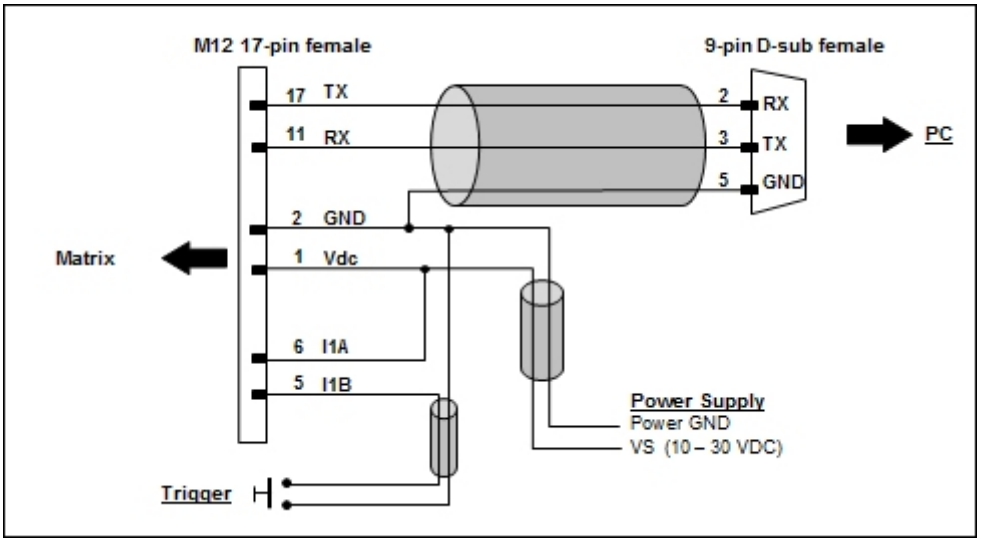


Figure 7 - Test Cable

APPENDIX C
EBC CONNECTION MODULE™



EBC (Ethernet Based Connectivity) is a network normally used for Laser Scanner interoperability.

Thanks to the EBC Connection Module™, Matrix readers and Laser Scanners can be connected to the same network as Slave devices using a SC5100 Controller as a Master.

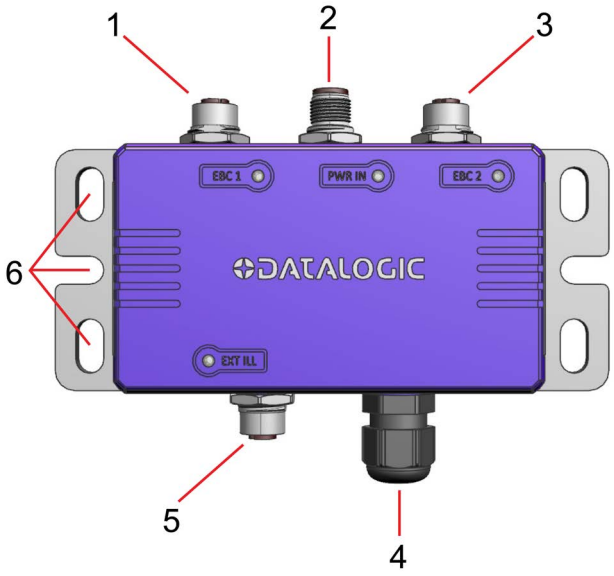
NOTE: EBC connection module is only compatible with Matrix 320 800-030 CM 5.0MP 1/2"(Part Number: 938100041).

PACKAGE CONTENT

Verify that the EBC Connection Module and all the parts supplied with the equipment are present and intact when opening the packaging. The list of parts includes:

- EBC Connection Module
- Installation Manual
- Mounting screws and washers (2)
- M12 protective caps (3)

GENERAL VIEW

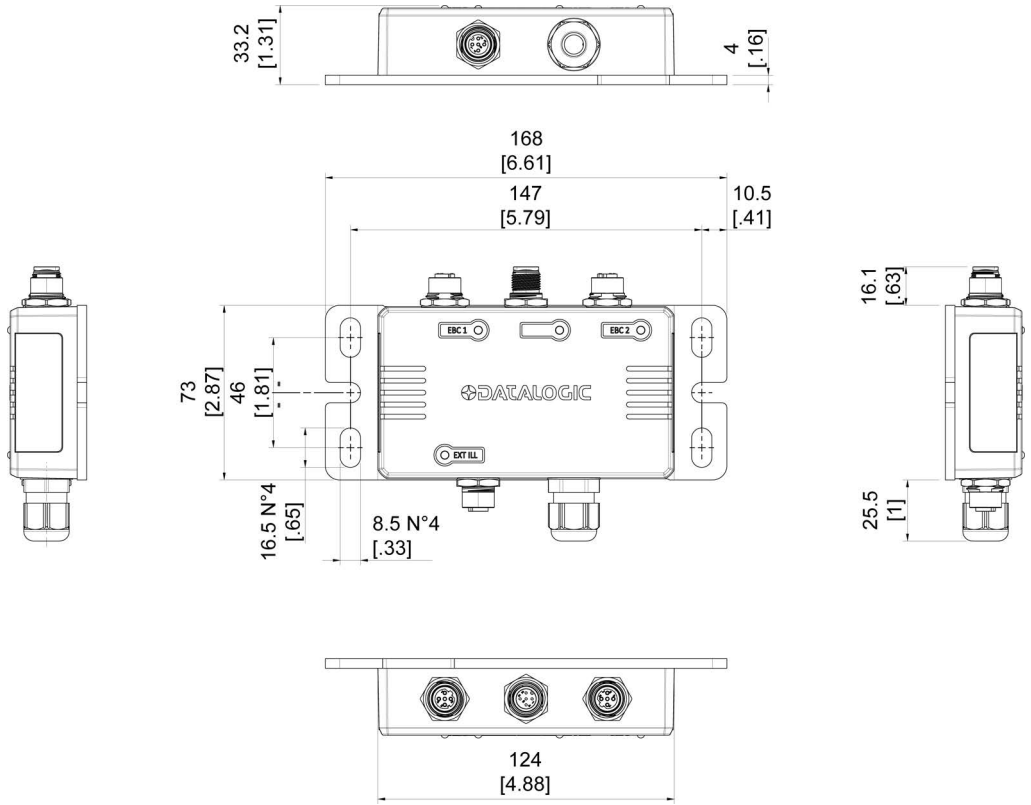


1. EBC 1 connector and LED	**4.** Pigtail connector
2. PWR IN connector and LED	**5.** EXT ILL connector and LED
3. EBC 2 connector and LED	**6.** Mounting slots (6)

MECHANICAL INSTALLATION

The EBC Connection Module is intended to be installed on Bosch frames with common T-head bolts. Alternatively, the screws and washers provided in the kit can be used.

The diagram below gives the overall dimensions of the module.



SYSTEM WIRING/CABLING

The connection and wiring procedure for the EBC Connection Module is described as follows:

1. Make sure that all EBC Connection Module M12 connectors are not connected.
2. Use the PWR Cable AS-I to M12 crimping it on the AS-I Bus as described in the instructions included in the AS-I cable package.
3. Connect the power supply cable to the PWR IN connector (with no other devices connected) and apply power. The blue LEDs of the PWR IN and EXT ILL connectors will turn on.
4. Once the proper connection to the power supply is established, disconnect the power supply.
5. Connect the M12 pigtail connector to the Matrix reader.
6. Connect the ETH ports to other devices in the EBC ring.
7. If desired, connect EXT ILL to an External Illuminator. If the connector is not used, do not remove the protective cap.
8. Power on the device.



CAUTION: To guarantee the module GND connection to Earth, the Bosch frame on which the module is mounted must be connected to Earth.

INDICATOR LEDs

There are four indicator LEDs.

PWR IN and EXT ILL

These LEDs light up blue when power is properly applied to the EBC Connection Module.

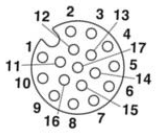
EBC 1

This LED blinks yellow when there is Link Activity on Port 1.

EBC 2

This LED blinks yellow when there is Link Activity on Port 2.

ELECTRICAL CONNECTIONS



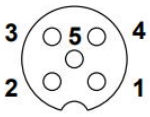
Pigtail connector - M12 17 poles female

PIN	NAME	DESCRIPTION
1	Vdc	24 V power supply input voltage + for Matrix readers
2	GND	24 V power supply input voltage - for Matrix readers
3	/	
4	RS232_RX	AUX Serial RX
5	/	
6	/	
7	/	
8	OUT2	Digital Output 2
9	/	
10	RS422_TXN	MAIN Serial TX-
11	RS422_TXP	MAIN Serial TX+
12	RS422_RXN	MAIN Serial RX-
13	/	
14	RS232_TX	AUX Serial TX
15	/	
16	OUT3	Digital Output 3
17	RS422_RXP	MAIN Serial RX+



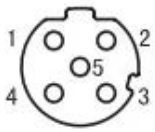
PWR IN connector - M12 5 poles male

PIN	NAME	DESCRIPTION
1	Vcc	24 V power supply input voltage + for EBC module
2	/	
3	GND	24 V power supply input voltage - for EBC module
4	/	
5	/	



EXT ILL connector - M12 5 poles female

PIN	NAME	DESCRIPTION
1	Vcc	24 V power supply input voltage + for Ext. Illuminator
2	/	
3	GND	24 V power supply input voltage - for Ext. Illuminator
4	STROBE	Strobe signal for External Illuminator
5	/	



Ethernet connector - M12 5 poles female

PIN	NAME	DESCRIPTION
1	TX+	Ethernet TX+
2	RX+	Ethernet RX+
3	TX-	Ethernet TX-
4	RX-	Ethernet RX-
5	/	

SOFTWARE CONFIGURATION

Minimum software requirements

- DL.CODE / Matrix reader: version 1.11.3 and later
- SC5100: version 1.4.10 or version 1.6.x and later
- DX8210 / DS8110: version 3.8.1 and later
- DS5100 PNET: version 6.14.4 and later

Adding new devices to the network

1. Make sure to have the latest software versions installed on all devices used in the EBC network.
2. Connect to the SC5100 web page by:
   • entering the SC5100 IP address in the browser (default 192.168.1.100), OR
   • clicking on the SC5100 icon under the Device Selection menu in DL.CODE.
   Then log on to e-Genius (refer to the SC5100 Product Reference Guide for more information).
3. From DL.CODE, click on the SC5100 icon under the Device Selection menu and connect to the device.
4. From e-Genius, go to System Info > EBC Devices.
5. Assign an ID node to the devices to be connected to the network. Note that all devices outside the EBC network appear at the bottom of the page. If the list is empty, click Discover Scanners and wait. Then add the node ID to the discovered devices.
6. Click on Update All to confirm the new configuration.

Configuration

7. From e-Genius, go to Global Settings > Operating Mode, and select the operating mode for your application.



NOTE: The Matrix reader does not support Continuous mode.

8. Go to Global Settings > Barcode Settings Table and select the symbologies to decode.
9. From DL.CODE, connect to the Matrix reader to start configuration (it will appear under the SC5100 cluster).
10. Configure the Matrix reader according to the Operating Mode selected on the SC5100.

ACCESSORIES

Accessory	Order No.
PWR IN cables	
AS-I to M12 straight - 1mt	93ACC0067
AS-I to M12 straight - 2mt	93ACC0068
Ethernet cables	
ETH Cable M12-M12 (Straight-Straight) - 1mt	93A050065
ETH Cable M12-M12 (Straight-Straight) - 3mt	93A050066
ETH Cable M12-M12 (Straight-Straight) - 5mt	93A050067
Illuminator cables	
CBL-1480-01 M12/5P MALE/FEMALE 1M IDNET	93A050049
CBL-1480-02 M12/5P MALE/FEMALE 2M IDNET	93A050050

*For a complete list of the available accessory cables, see the product page on www.data-logic.com.

TYPICAL LAYOUTS

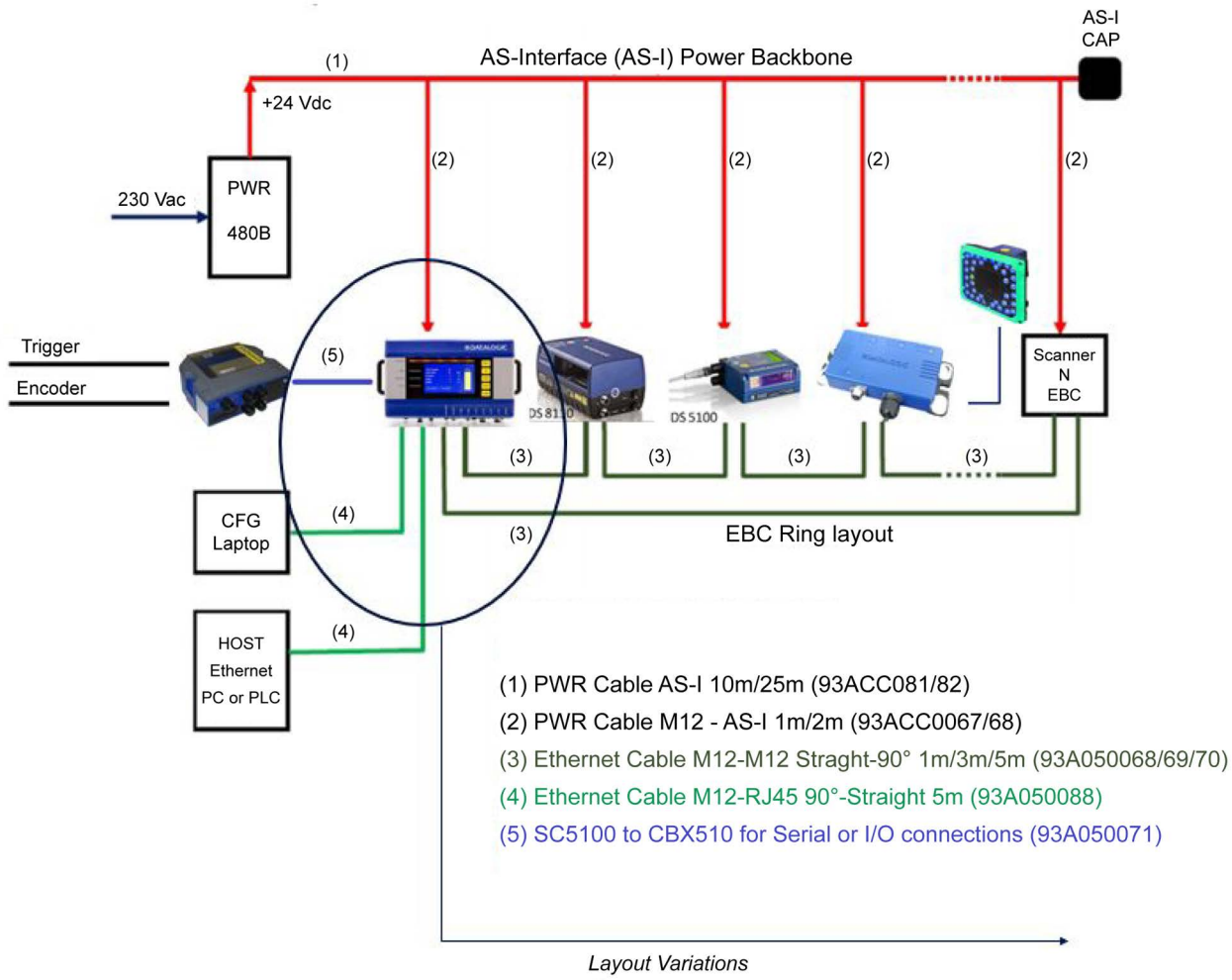
Large Synchronized Network Layout

The SC5100 controller can be connected to the host in several different layouts, depending on the controller model and host interfaces.

External devices (e.g. presence sensor, encoders) are all connected to the SC5100 through a CBX510 connection box using one of the two I/O connectors.

Ethernet TCP/IP to Host

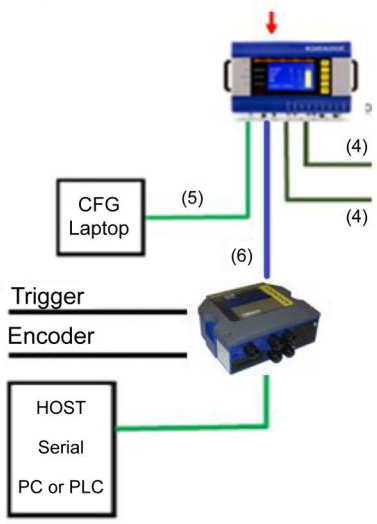
The host can be connected to the controller through an Ethernet direct cable or through a hub/switch:



Layout Variations

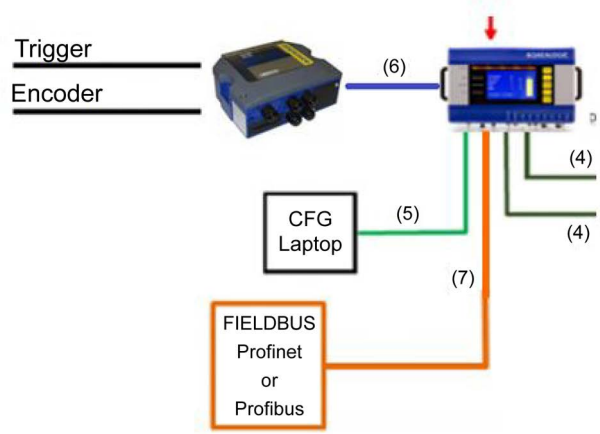
COM to Host

The host can be connected via COM (RS232 or RS422) to the controller through a CBX510.



Fieldbus to Host

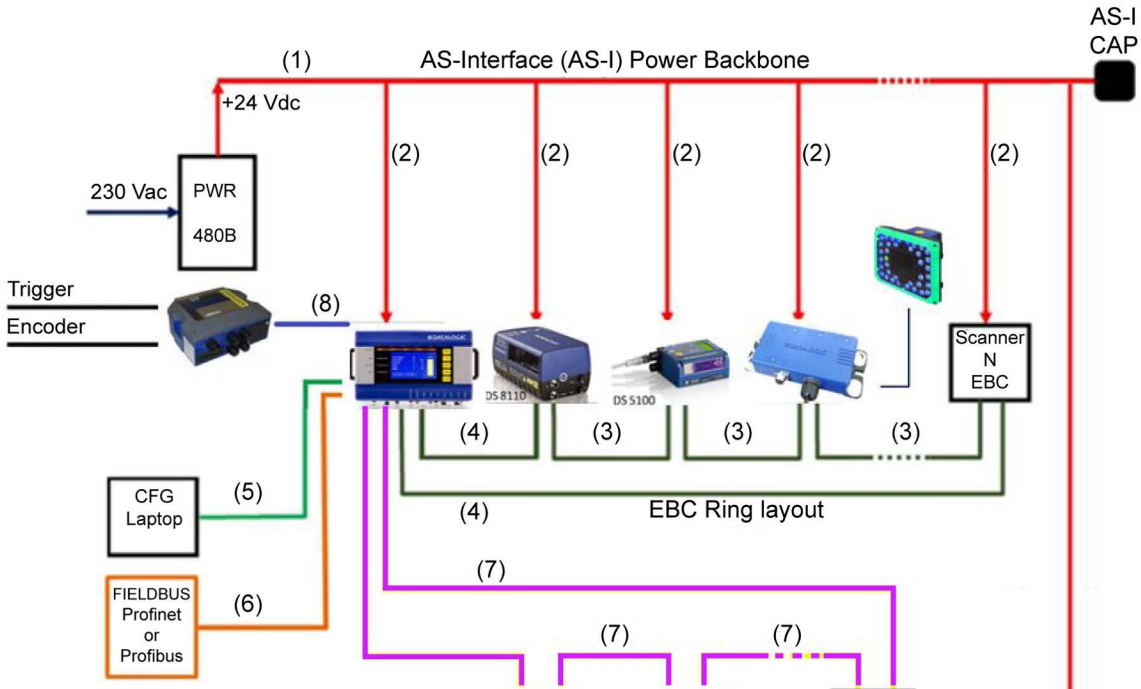
The host can be connected to a SC5100 dedicated Fieldbus model.



EBC - Syncnet Mixed Layout

The SC5100 controller allows compatible Slave devices to connect to a Syncnet Network.

The EBC controller in this layout allows communication between Laser Scanners, AV readers and Matrix readers.

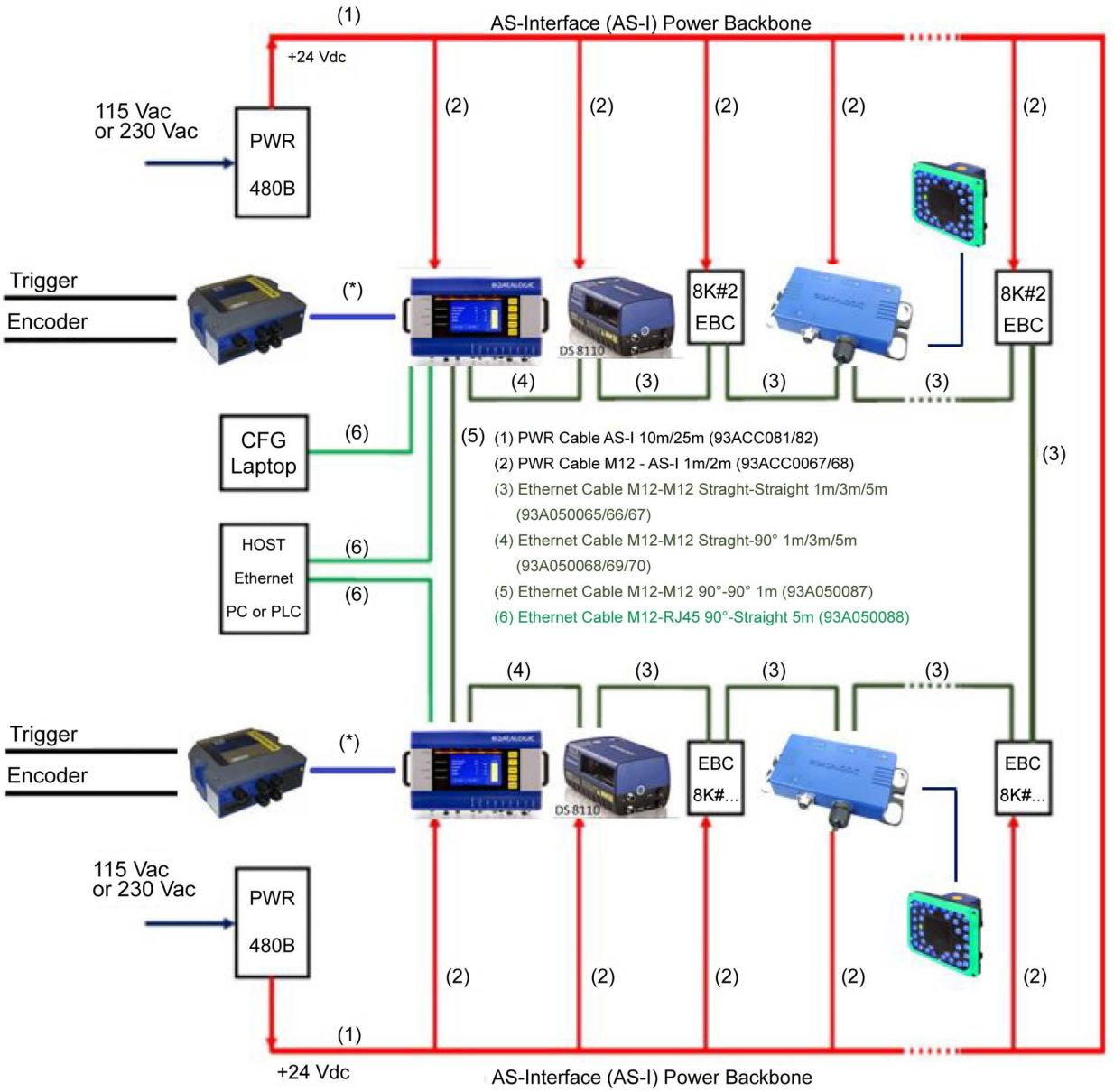


(1) PWR Cable AS-I 10m/25m (93ACC081/82)
(2) PWR Cable M12 - AS-I 1m/2m (93ACC0067/68)
(3) Ethernet Cable M12-M12 Straght-Straight 1m/3m/5m (93A050065/66/67)
(4) Ethernet Cable M12-M12 Straght-90° 1m/3m/5m (93A050068/69/70)
(5) Ethernet Cable M12-RJ45 90°-Straight 5m (93A050088)
(6) User supplied Fieldbus compatible cable
(7) Syncnet Connection Cable 2m/5m/10m (93A050070/80/01)
(8) SC5100 to CBX510 for Serial or I/O connections (93A050071)

Redundant System Layout

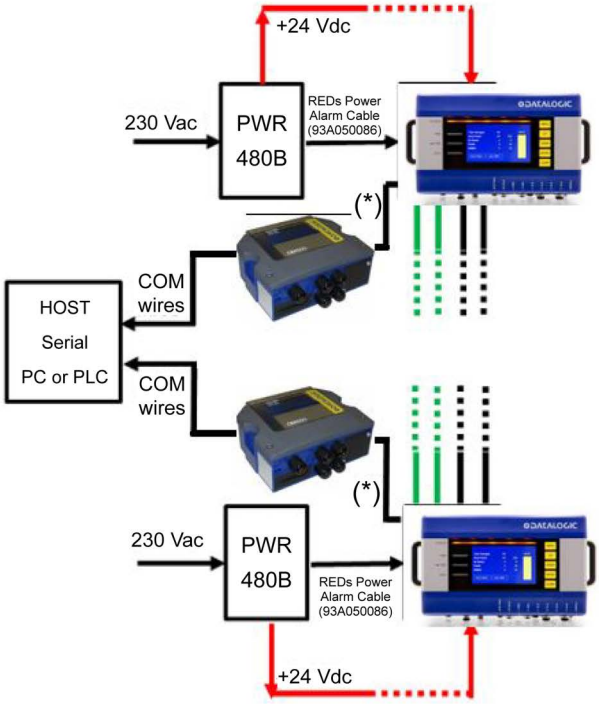
For large local EBC networks, a redundant system can be configured in which two controllers are used together with their respective PWR power supply units. The scanners are distributed equally between the PWR units.

In this case, one of the controllers acts as a Working Master or active unit, while the other serves as a Protecting Master or backup unit.



Redundant System Layout with Host supporting Serial COM Communications

A host that supports COM communications can be connected to the controller through a CBX510 (one for each controller).



(*) SC5100 to CBX510 for Serial or I/O connections (93A050071)

TECHNICAL SPECIFICATIONS

ELECTRICAL FEATURES	
Power	
Supply Voltage	24 Vdc
Consumption *	0.05 A
Overcurrent protection	2.6 A

* Consumption of the EBC Connection Module alone. Total Power Consumption is given by adding the EBC Connection Module power consumption to that of all the devices powered through the EBC Connection Module (reading device, illuminator). Refer to the manuals of the connected devices for details about their power consumption.

COMMUNICATION INTERFACES	
Ethernet	Pigtail (up to 10 Mbps) EBC (10/100 Mbps)

USER INTERFACE	
LED indicators	Power In (Blue) External Illuminator (Blue) 2 EBC Links (Orange)

PHYSICAL FEATURES	
Dimensions	H x W x L 170 x 72 x 32 mm (6.7 x 2.8 x 1.3 in)
Pigtail cable length	50 mm (2 in)
Weight	435 g (15.3 oz)
Material	Aluminum

ENVIRONMENTAL FEATURES	
Operating temperature	-10 to 50 °C (+14 to 122 °F)
Storage temperature	-20 to 70 °C (-4 to 158 °F)
Humidity max.	90% non condensing
Sinusoidal vibration resistance EN 60068-2-6	14 mm @ 2 to 10 Hz; 1.5 mm @ 13 to 55 Hz; 2 gn @ 70 to 500 Hz; 2 hours on each axis
Bump resistance EN 60068-2-29	30 g; 6 mm; 5000 shocks on each axis
Shock resistance EN 60068-2-29	30 g; 11 ms; 3 shocks on each axis
Protection class EN 60529	IP65 and IP67 **

** When all the M12 connectors and reading devices are correctly connected (or closed with proper protection caps).

APPENDIX D
WEBSENTINEL PLUS INVESTIGATOR

OVERVIEW

WebSentinel PLUS Investigator is a software add-on to Datalogic's WebSentinel PLUS tool. It provides no read classification and bar code grading for each barcode read during normal operations. No Read classification is an important feature. By post processing saved images of No Reads, WebSentinel PLUS Investigator sorts these items into categories and helps you determine No Read root causes. Bar code grading is another important feature that helps estimate trends in printing quality and determines decreasing quality before labels can become no reads.

For more information, refer to the WebSentinel PLUS Investigator Installation and Configuration Guide.

CONNECTING MATRIX USING DL.CODE



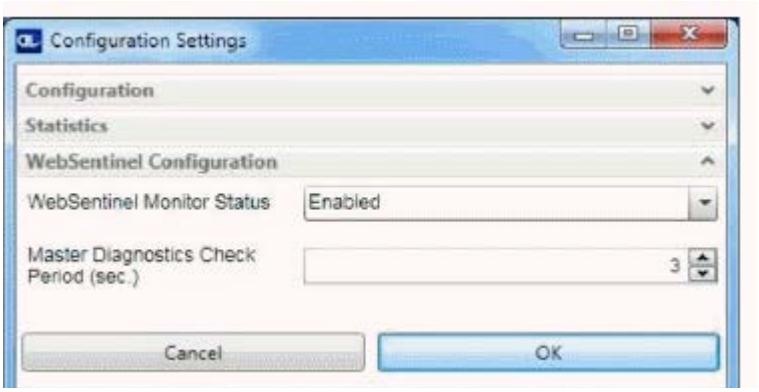
CAUTION: So that WebSentinel Investigator can successfully receive coherent information from imagers, you must set each imager within the same scanpoint to use the same Barcode Table.

The main steps to enable WebSentinelPLUS for your Matrix 320:

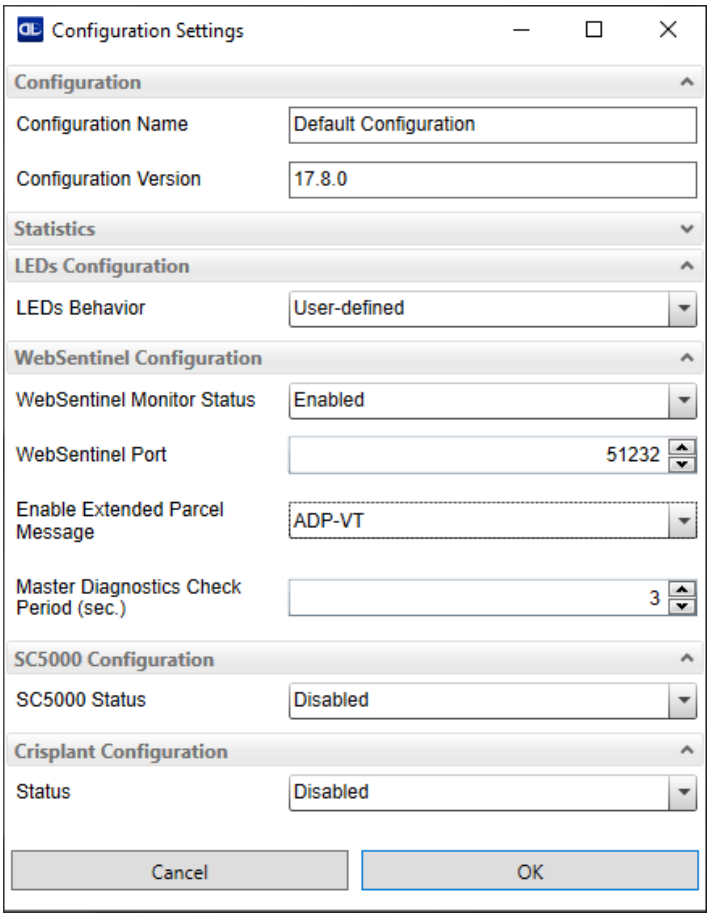
- Start the DL.Code setup software.
- Enable WebSentinelPLUS.
- Add FTP Client as a communication channel.
- Set Image Saving.

DL.Code Settings

1. Start **DL.Code,** and access the configuration parameters for the device you wish to communicate with WebSentinelPLUS.
2. Click **Device > Settings > Configuration** Settings. The following window opens.
3. Set WebSentinel Monitor Status to **Enabled**.



4. When WebSentinel is enabled a **Enable Extended Parcel Message** parameter becomes available.

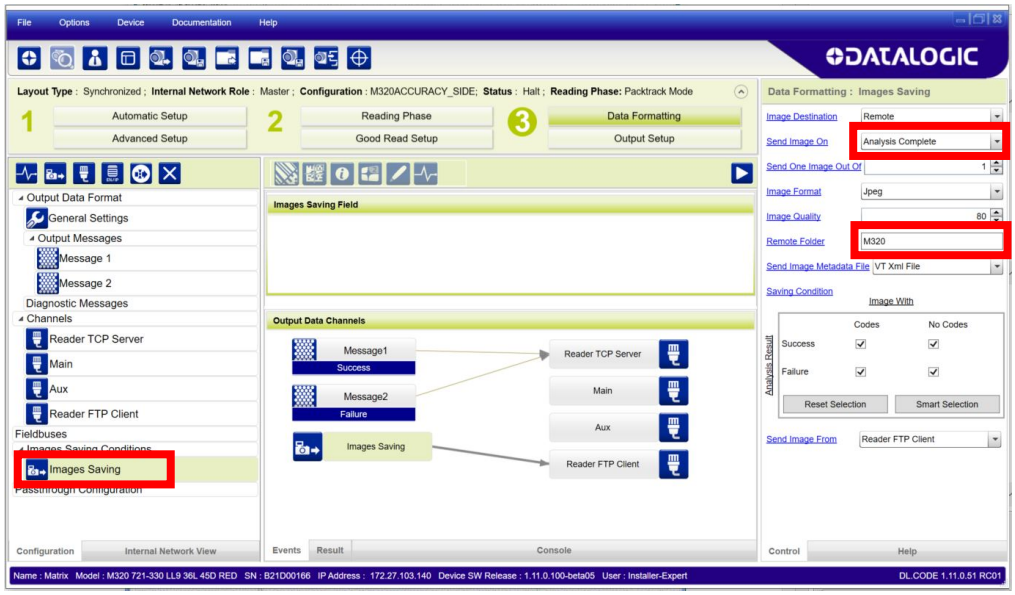


5. Click the drop-down to select ADP-VT.
6. Click **OK** to save your settings.

7. Click **3** Data Formatting.



8. Under Channels, select **Reader FTP Client**.
9. Make sure the **Server Address** matches the WebSentinel FTP Server address.
10. Enter the correct WebSentinel FTP Server Remote Address and Port.
11. Enter the Username: **ftpuser** / Password: **asiroot**
12. Click **Images Saving.**



13. Set Send Image On to **Analysis Complete**.
14. Set Send Image From to **Reader FTP Client**.
15. Enter the name of the Remote Folder on the FTP Server to which the image files must be saved.

NOTE: Enter the name of the sub-folder of the home image directory set in the FTP server. For example, in the image above the M320 sub-folder has been indicated as M320. If no sub-folder is necessary, leave this parameter blank.

WebSentinel PLUS Settings

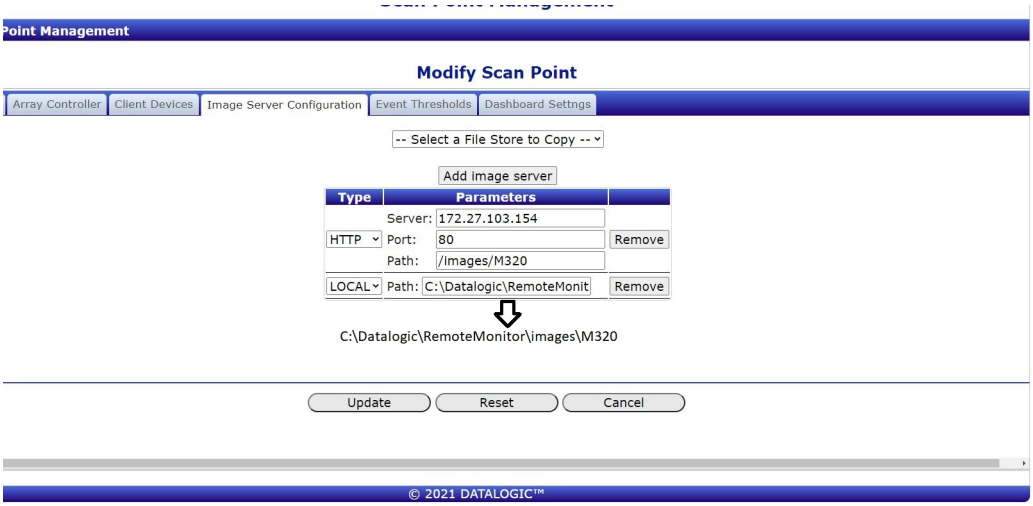
In order to read images from the ftp folder, you must edit the scan point in WebSentinel PLUS.

Set the Image Server of the Matrix 320 as follows:

1. Select **Local Settings** from the WebSentinel PLUS menu.
2. Click on **Scan Point Management**, the following window opens.



3. Select a **Scan Point** to edit and click to edit or click + in upper left corner to add a new one.
4. Click on the **Image Server Configuration** tab.
5. Click on the **Add image server** button.
6. The HTTP server should be set as the images server, click on **Type** drop-down and select HTTP.
7. Enter the server IP address, the port as 80 and the path /images/<subfolder>.
8. Click on the **Add image server** button again.
9. Click on **Type** drop-down and select **Local**.
10. Enter the COMPLETE path of the local server where images from the 320 will be saved.



11. Click **Update** to save the changes, click **Reset** to return to the fields to the previously saved values, or click **Cancel** to return the Scan Point Management window.

GLOSSARY

AIM

(Association for Automatic Identification and Mobility): AIM Global is the international trade association representing automatic identification and mobility technology solution providers.

AIM DPM Quality Guideline

Standard applicable to the symbol quality assessment of direct part marking (DPM) performed in using two-dimensional bar code symbols. It defines modifications to the measurement and grading of several symbol quality parameters.

Barcodes (1D Codes)

A pattern of variable-width bars and spaces which represents numeric or alphanumeric data in machine-readable form. The general format of a barcode symbol consists of a leading margin, start character, data or message character, check character (if any), stop character, and trailing margin. Within this framework, each recognizable symbology uses its own unique format.

BIOS

Basic Input Output System. A collection of ROM-based code with a standard API used to interface with standard PC hardware.

Bit

Binary digit. One bit is the basic unit of binary information. Generally, eight consecutive bits compose one byte of data. The pattern of 0 and 1 values within the byte determines its meaning.

Bits per Second (bps)

Number of bits transmitted or received per second.

Bright Field Illumination

Lighting of surfaces at high (narrow) angles used to provide maximum reflection of the light to the reader’s lens. This is effective on surfaces that absorb light or are not highly reflective and also on low contrast codes.

Byte

On an addressable boundary, eight adjacent binary digits (0 and 1) combined in a pattern to represent a specific character or numeric value. Bits are numbered from the right, 0 through 7, with bit 0 the low-order bit. One byte in memory can be used to store one ASCII character.

Composite Symbologies

Consist of a linear component, which encodes the item's primary data, and an adjacent 2D composite component, which encodes supplementary data to the linear component.

Dark Field Illumination

Lighting of surfaces at wide angles used to avoid direct reflection of the light into the reader's lens. Typically this type of lighting is used in DPM solutions to enhance reflectance of the uneven surface do to the symbol marking technique. It is also used with very reflective surfaces.

Decode

To recognize a barcode symbology *(e.g.,* Codabar, Code 128, Code 3 of 9, UPC/EAN, etc.) and analyze the content of the barcode scanned.

Depth of Field

The difference between the minimum and the maximum distance of the object in the field of view that appears to be in focus.

Diffused Illumination

Distributed soft lighting from a wide variety of angles used to eliminate shadows and direct reflection effects from highly reflective surfaces.

Direct Part Mark (DPM)

A symbol marked on an object using specific techniques like dot peening, laser etching, chemical etching, etc.

EEPROM

Electrically Erasable Programmable Read-Only Memory. An on-board non-volatile memory chip.

Element

The basic unit of data encoding in a 1D or 2D symbol. A single bar, space, cell, dot.

Exposure Time

For digital cameras based on image sensors equipped with an electronic shutter, it defines the time during which the image will be exposed to the sensor to be acquired.

Flash

Non-volatile memory for storing application and configuration files.

Host

A computer that serves other terminals in a network, providing services such as network control, database access, special programs, supervisory programs, or programming languages.

Image Processing

Any form of information processing for which the input is an image and the output is for instance a set of features of the image.

Image Resolution

The number of rows and columns of pixels in an image. The total number of pixels of an image sensor.

Image Sensor

Device converting a visual image to an electric signal. It is usually an array of CCD (Charge Coupled Devices) or CMOS (Complementary Metal Oxide Semiconductor) pixel sensors.

IEC

(International Electrotechnical Commission): Global organization that publishes international standards for electrical, electronic, and other technologies.

IP Address

The terminal's network address. Networks use IP addresses to determine where to send data that is being transmitted over a network. An IP address is a 32-bit number referred to as a series of 8-bit numbers in decimal dot notation *(e*.g., 130.24.34.03). The highest 8-bit number you can use is 254.

ISO

(International Organization for Standardization): A network of the national standards institutes of several countries producing world-wide industrial and commercial standards.

LED (Light Emitting Diode)

A low power electronic light source commonly used as an indicator light. It uses less power than an incandescent light bulb but more than a Liquid Crystal Display (LCD).

LED Illuminator

LED technology used as an extended lighting source in which extra optics added to the chip allow it to emit a complex radiated light pattern.

Matrix Symbologies (2D Codes)

An arrangement of regular polygon shaped cells where the center-to-center distance of adjacent elements is uniform. Matrix symbols may include recognition patterns which do not follow the same rules as the other elements within the symbol.

Multi-row (or Stacked) Symbologies

Symbologies where a long symbol is broken into sections and stacked one upon another similar to sentences in a paragraph.

RAM

Random Access Memory. Data in RAM can be accessed in random order, and quickly written and read.

Symbol Verification

The act of processing a code to determine whether or not it meets specific requirements.

Transmission Control Protocol/Internet Protocol (TCP/IP)

A suite of standard network protocols that were originally used in UNIX environments but are now used in many others. The TCP governs sequenced data; the IP governs packet forwarding. TCP/IP is the primary protocol that defines the Internet.

© 2022-2026 Datalogic S.p.A. and /or its affiliates • All rights reserved • Without limiting the rights under copyright, no part of this documentation may be reproduced, stored in or introduced into a retrieval system, or transmitted in any form or by any means, or for any purpose, without the express written permission of Datalogic S.p.A. and/or its affiliates • Datalogic and the Datalogic logo are registered trademarks of Datalogic S.p.A. in many countries, including the U.S. and the E.U.

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

801000190 (Rev F) March 2026