

# Matrix 320™ 2MP

## PRODUCT REFERENCE GUIDE



Image Based Industrial Reader

**Datalogic S.r.l.**

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

**© 2020–2026 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](http://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](http://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

---

|                                                                    |              |
|--------------------------------------------------------------------|--------------|
| <b>PREFACE</b>                                                     | <b>VIII</b>  |
| <b>About this Manual</b>                                           | <b>viii</b>  |
| Manual Conventions                                                 | viii         |
| <b>Technical Support</b>                                           | <b>viii</b>  |
| Support Through the Website                                        | viii         |
| Reseller Technical Support                                         | ix           |
| <b>Warranty</b>                                                    | <b>ix</b>    |
| <b>COMPLIANCE</b>                                                  | <b>X</b>     |
| <b>General</b>                                                     | <b>x</b>     |
| Power Supply                                                       | x            |
| EMC Compliance                                                     | x            |
| European Declaration of Conformity                                 | x            |
| UKCA Declaration of Conformity                                     | x            |
| Laser Safety                                                       | xi           |
| LED Safety                                                         | xii          |
| <b>HANDLING</b>                                                    | <b>XIII</b>  |
| <b>GENERAL VIEW</b>                                                | <b>XV</b>    |
| <b>Matrix 320 2mp (LIquid Lens) with 14 LEDs Illuminator</b>       | <b>xv</b>    |
| <b>Matrix 320 2mp (LIquid Lens) with 36 LEDs Illuminator</b>       | <b>xvi</b>   |
| <b>Matrix 320 2mp (C-Mount) without Illuminator</b>                | <b>xvii</b>  |
| <b>Matrix 320 2mp (C-Mount) with 36 LEDs Illuminator</b>           | <b>xviii</b> |
| <b>CHAPTER 1. RAPID CONFIGURATION</b>                              | <b>1</b>     |
| <b>Matrix 320 2mp with Software Adjustable Focus (Liquid Lens)</b> | <b>1</b>     |
| Step 1A - Connect the System                                       | 1            |
| CBX100/CBX500 Pinout for Matrix 320 2mp                            | 2            |
| Step 2A - Mount and Position the Reader                            | 3            |
| Step 3A - Configure the reader                                     | 4            |
| Aim Mode                                                           | 4            |
| <b>Matrix 320 2mp with Manual Adjustable Focus (C-Mount)</b>       | <b>5</b>     |
| Step 0B - Assemble the Reader                                      | 5            |
| Step 1B - Connect the System                                       | 5            |
| Step 2B - Mount and Position the Reader                            | 5            |
| Step 3B - Focus the reader                                         | 5            |
| <b>Next Steps for All Models</b>                                   | <b>6</b>     |
| Step 4 - Automatic Setup                                           | 6            |
| Restore Reader to Default Environment (Optional)                   | 7            |
| <b>Step 5 - Installing DL.CODE Configuration Program</b>           | <b>8</b>     |
| To install DL.CODE                                                 | 8            |
| Login                                                              | 9            |
| Login and Signup                                                   | 10           |
| Offline Login                                                      | 11           |
| 15-day Trial                                                       | 12           |
| Ethernet Device Discovery                                          | 13           |
| <b>Step 6 - Device Configuration</b>                               | <b>16</b>    |
| Image and Code Settings                                            | 16           |
| Operating Mode Configuration Parameters                            | 18           |

|                                                            |               |
|------------------------------------------------------------|---------------|
| Reading Phase .....                                        | 18            |
| Good Read Setup .....                                      | 19            |
| Configuration Parameters .....                             | 20            |
| Data Formatting .....                                      | 20            |
| Output Setup .....                                         | 21            |
| <b>Step 7 - Test Mode .....</b>                            | <b>22</b>     |
| <b>Advanced Reader Configuration .....</b>                 | <b>23</b>     |
| Host Mode Programming .....                                | 23            |
| <b>Configuration using Web Discovery .....</b>             | <b>24</b>     |
| <br><b>CHAPTER 2. INTRODUCTION.....</b>                    | <br><b>25</b> |
| <b>Product Description .....</b>                           | <b>25</b>     |
| Standard Application Program .....                         | 26            |
| Programmability .....                                      | 26            |
| Excellent Performance .....                                | 26            |
| Ease of Setup and Use .....                                | 26            |
| Flexible Solution .....                                    | 27            |
| Connectivity .....                                         | 27            |
| Industrial Strength .....                                  | 27            |
| <b>Indicators and Keypad Button .....</b>                  | <b>28</b>     |
| <b>Green/Red Spot and 360° Visual Feedback .....</b>       | <b>29</b>     |
| <b>Distance Sensor .....</b>                               | <b>30</b>     |
| <b>ID-NET .....</b>                                        | <b>31</b>     |
| <b>X-PRESS Human Machine Interface .....</b>               | <b>33</b>     |
| X-PRESS Functions .....                                    | 34            |
| Test Mode .....                                            | 35            |
| Aim Mode .....                                             | 35            |
| Automatic Setup .....                                      | 35            |
| Code Autolearn .....                                       | 36            |
| Match Code Autolearn .....                                 | 36            |
| Backup .....                                               | 36            |
| Restore .....                                              | 36            |
| Backup Erase .....                                         | 36            |
| Image Auto Setup .....                                     | 36            |
| Diagnostic Indication .....                                | 37            |
| <b>Model Description .....</b>                             | <b>38</b>     |
| <b>Available Liquid Lens Models .....</b>                  | <b>39</b>     |
| <b>Accessories .....</b>                                   | <b>39</b>     |
| <b>Matrix 320 2mp C-Mount Assembly .....</b>               | <b>42</b>     |
| Illuminators and Lenses Combinations .....                 | 44            |
| <b>Application Examples .....</b>                          | <b>45</b>     |
| Document Handling .....                                    | 45            |
| Multiple Reading in a Single Image .....                   | 45            |
| 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            |
| <br><b>CHAPTER 3. INSTALLATION.....</b>                    | <br><b>51</b> |
| <b>Package Contents .....</b>                              | <b>51</b>     |
| <b>Mechanical Dimensions .....</b>                         | <b>52</b>     |
| <b>Mounting And Positioning Matrix 320 2mp .....</b>       | <b>58</b>     |
| Mounting the BK-32-00 Standard Fix Bracket .....           | 59            |
| Mounting the BK-32-010 Pivot Fix Bracket .....             | 60            |
| Compact Mounting .....                                     | 61            |
| Extended Mounting .....                                    | 61            |
| Mounting the BK-32-030 Safety bracket Rot-Con .....        | 64            |
| Installation .....                                         | 65            |
| Installation with BK-32-020 Fast replacement bracket ..... | 69            |
| <b>Mounting with EMK Mirrors .....</b>                     | <b>73</b>     |

|                                                                            |            |
|----------------------------------------------------------------------------|------------|
| EMK-380 Side Mount - Standard .....                                        | 74         |
| EMK-380 Side Mount - Alternative .....                                     | 75         |
| EMK-600 Side Mount - Standard .....                                        | 76         |
| EMK-600 Side Mount - Alternative .....                                     | 77         |
| <b>Matrix 320 2mp C-Mount Mounting Instructions .....</b>                  | <b>78</b>  |
| Mounting Instructions for Matrix 320 2mp C-Mount without illuminator ..... | 78         |
| Mounting instructions for Matrix 320 2mp with 36 LED illuminator .....     | 80         |
| Heat Sink mounting instructions .....                                      | 83         |
| When to mount the heat sink .....                                          | 83         |
| How to mount the heat sink .....                                           | 83         |
| <b>Accessory Covers and Filters .....</b>                                  | <b>84</b>  |
| Covers .....                                                               | 84         |
| Standard and ESD Covers .....                                              | 84         |
| Polarizing Covers .....                                                    | 84         |
| Cover Replacement .....                                                    | 85         |
| Filters .....                                                              | 87         |
| Filter Mounting Instructions .....                                         | 87         |
| <b>CHAPTER 4. CBX ELECTRICAL CONNECTIONS.....</b>                          | <b>89</b>  |
| <b>CBX Connection Box Pinout .....</b>                                     | <b>90</b>  |
| <b>CAB-DS0x-S Pinout .....</b>                                             | <b>91</b>  |
| <b>CAB-GD0x-S Pinout .....</b>                                             | <b>92</b>  |
| <b>Power Supply .....</b>                                                  | <b>93</b>  |
| <b>Main Serial Interface .....</b>                                         | <b>94</b>  |
| RS232 Interface .....                                                      | 94         |
| RS422 Full Duplex Interface .....                                          | 95         |
| <b>ID-NET Interface .....</b>                                              | <b>96</b>  |
| ID-NET Cables .....                                                        | 96         |
| ID-NET Response Time .....                                                 | 97         |
| ID-NET Network Termination .....                                           | 98         |
| ID-NET Connection Diagrams .....                                           | 98         |
| <b>Auxiliary RS232 Interface .....</b>                                     | <b>101</b> |
| <b>Inputs .....</b>                                                        | <b>102</b> |
| External Trigger Input Connections Using Matrix 320 2mp Power .....        | 103        |
| External Trigger Input Connections Using External Power .....              | 105        |
| Input 2 Connections Using Matrix 320 2mp Power .....                       | 106        |
| Input 2 Connections Using External Power .....                             | 107        |
| Input 3 Connections (CBX500 Only) .....                                    | 107        |
| <b>Outputs .....</b>                                                       | <b>108</b> |
| Output 1 and 2 Connections Using Matrix 320 2mp Power .....                | 109        |
| Output 1 and 2 Connections Using External Power .....                      | 110        |
| Output 3 Connections Using Matrix 320 2mp Power (CBX500 Only) .....        | 111        |
| Output 3 Connections Using External Power (CBX500 Only) .....              | 111        |
| <b>On-Board Ethernet Interface .....</b>                                   | <b>112</b> |
| <b>User Interface - Serial Host .....</b>                                  | <b>113</b> |
| <b>OPC UA protocol .....</b>                                               | <b>114</b> |
| OPC UA Companion Specifications .....                                      | 114        |
| Available commands (methods) .....                                         | 114        |
| Compatible OPC UA Clients .....                                            | 114        |
| OPC UA on DL.CODE .....                                                    | 115        |
| <b>CHAPTER 5. TYPICAL LAYOUTS.....</b>                                     | <b>116</b> |
| <b>Ethernet Connection .....</b>                                           | <b>117</b> |
| <b>Serial Connection .....</b>                                             | <b>118</b> |
| <b>Fieldbus Connection .....</b>                                           | <b>119</b> |
| <b>Pass-Through .....</b>                                                  | <b>120</b> |
| <b>ID-NET Multidata Network (Pass-Through) .....</b>                       | <b>121</b> |
| <b>ID-NET Synchronized Network .....</b>                                   | <b>122</b> |
| <b>CHAPTER 6. READING FEATURES.....</b>                                    | <b>125</b> |
| <b>FOV Calculation .....</b>                                               | <b>125</b> |

|                                                                                                                     |                |
|---------------------------------------------------------------------------------------------------------------------|----------------|
| <b>Global FOV Diagrams .....</b>                                                                                    | <b>126</b>     |
| Global FOV for Matrix 320 2mp LQL-6 .....                                                                           | 127            |
| Global FOV for Matrix 320 2mp LQL-9 .....                                                                           | 128            |
| Global FOV for Matrix 320 2mp LQL-16 .....                                                                          | 129            |
| Global FOV for Matrix 320 2mp C-Mount LNS-4 .....                                                                   | 130            |
| Global FOV for Matrix 320 2mp C-Mount LNS-6 .....                                                                   | 131            |
| Global FOV for Matrix 320 2mp C-Mount LNS-8 .....                                                                   | 132            |
| Global FOV for Matrix 320 2mp C-Mount LNS-12 .....                                                                  | 133            |
| Global FOV for Matrix 320 2mp C-Mount LNS-16 .....                                                                  | 134            |
| Global FOV for Matrix 320 2mp C-Mount LNS-25 .....                                                                  | 135            |
| Global FOV for Matrix 320 2mp C-Mount LNS-35 .....                                                                  | 136            |
| <b>Maximum Line Speed and Exposure Time Calculations .....</b>                                                      | <b>137</b>     |
| <br><b>CHAPTER 7. SOFTWARE CONFIGURATION .....</b>                                                                  | <br><b>139</b> |
| <b>DL.CODE System Requirements .....</b>                                                                            | <b>139</b>     |
| <b>Reader Configuration .....</b>                                                                                   | <b>140</b>     |
| Automatic Setup Configuration .....                                                                                 | 141            |
| Error during Automatic Setup .....                                                                                  | 143            |
| Manual Setup Configuration .....                                                                                    | 147            |
| Manual Setup for Software Adjustable Focus Models (Liquid Lens) .....                                               | 150            |
| Manual Setup for Manual Adjustable Focus Models (C-Mount) .....                                                     | 155            |
| <b>Multi Image Acquisition Settings .....</b>                                                                       | <b>158</b>     |
| Automatic Image Settings Selection .....                                                                            | 159            |
| External Image Settings Selection .....                                                                             | 160            |
| <b>Extending DOF with Automatic Image Settings Selection (Cycle All In Same Phase) for Liquid Lens Models .....</b> | <b>162</b>     |
| <b>Extending DOF with Automatic Image Settings Selection Sequence (Input Select) for Liquid Lens Models .....</b>   | <b>163</b>     |
| <b>Image Cropping .....</b>                                                                                         | <b>165</b>     |
| <b>Direct Part Marking Applications .....</b>                                                                       | <b>167</b>     |
| Image Filter .....                                                                                                  | 168            |
| <b>Pass-Through Configurations .....</b>                                                                            | <b>172</b>     |
| <b>Internal Network Configurations .....</b>                                                                        | <b>174</b>     |
| Master Configuration .....                                                                                          | 175            |
| Multidata ID-NET Network Configurations .....                                                                       | 177            |
| Synchronized ID-NET Network Configurations .....                                                                    | 181            |
| Verify Master/Slave Synchronized Configuration .....                                                                | 184            |
| <b>Backup and Restore Through DL.CODE .....</b>                                                                     | <b>186</b>     |
| Backup .....                                                                                                        | 187            |
| Restore .....                                                                                                       | 188            |
| Replacement .....                                                                                                   | 188            |
| <b>Restore Defaults .....</b>                                                                                       | <b>189</b>     |
| Restore Default Environment .....                                                                                   | 189            |
| Restore Default Startup Configuration .....                                                                         | 190            |
| Restore Factory Defaults .....                                                                                      | 190            |
| <b>Diagnostic Alarms .....</b>                                                                                      | <b>191</b>     |
| <b>Statistics .....</b>                                                                                             | <b>192</b>     |
| <b>BM150 Display Module Configuration and Messages .....</b>                                                        | <b>193</b>     |
| Configuration Through DL.CODE .....                                                                                 | 193            |
| Accessing the HMI Interface Through Keypad and Display Menu .....                                                   | 194            |
| Display Messages .....                                                                                              | 196            |
| BM150 Backup and Restore Procedure .....                                                                            | 199            |
| <br><b>CHAPTER 8. ILLUMINATORS .....</b>                                                                            | <br><b>200</b> |
| <b>Standard Illuminators for Software Adjustable Focus Models (Liquid Lens) .....</b>                               | <b>200</b>     |
| 14 LEDs Illuminator .....                                                                                           | 200            |
| 36 LEDs Illuminator .....                                                                                           | 201            |
| <b>Standard Illuminators for Manual Adjustable Focus Models (C-Mount) .....</b>                                     | <b>202</b>     |
| 36 LEDs Illuminator .....                                                                                           | 202            |
| <b>Polarizer .....</b>                                                                                              | <b>203</b>     |
| <b>Direct Part Marking Applications .....</b>                                                                       | <b>206</b>     |

|                                                                              |            |
|------------------------------------------------------------------------------|------------|
| Matrix 320 2mp Recommended Illumination .....                                | 207        |
| Color Contrast Considerations .....                                          | 208        |
| <b>CHAPTER 9. MAINTENANCE .....</b>                                          | <b>210</b> |
| Cleaning .....                                                               | 210        |
| <b>CHAPTER 10. TROUBLESHOOTING .....</b>                                     | <b>211</b> |
| General Guidelines .....                                                     | 211        |
| <b>TECHNICAL FEATURES .....</b>                                              | <b>214</b> |
| <b>ALTERNATIVE CONNECTIONS .....</b>                                         | <b>218</b> |
| Power, Com and I/O Connector for Standard Models .....                       | 219        |
| On-Board Ethernet Connector .....                                            | 220        |
| ID-NET Network Termination .....                                             | 220        |
| Inputs .....                                                                 | 221        |
| Outputs .....                                                                | 221        |
| User Interface - Serial Host .....                                           | 223        |
| <b>EBC CONNECTION MODULE™ .....</b>                                          | <b>224</b> |
| Package Content .....                                                        | 225        |
| General View .....                                                           | 225        |
| Mechanical Installation .....                                                | 225        |
| System Wiring/Cabling .....                                                  | 226        |
| Indicator LEDs .....                                                         | 226        |
| Electrical Connections .....                                                 | 227        |
| Software Configuration .....                                                 | 229        |
| Minimum software requirements .....                                          | 229        |
| Adding new devices to the network .....                                      | 229        |
| Configuration .....                                                          | 229        |
| <b>Accessories .....</b>                                                     | <b>230</b> |
| <b>Typical Layouts .....</b>                                                 | <b>230</b> |
| Large Synchronized Network Layout .....                                      | 230        |
| Ethernet TCP/IP to Host .....                                                | 231        |
| COM to Host .....                                                            | 231        |
| Fieldbus to Host .....                                                       | 232        |
| EBC - Syncnet Mixed Layout .....                                             | 232        |
| Redundant System Layout .....                                                | 234        |
| Redundant System Layout with Host supporting Serial COM Communications ..... | 235        |
| <b>Technical Specifications .....</b>                                        | <b>236</b> |
| <b>GLOSSARY .....</b>                                                        | <b>237</b> |

# 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](http://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.

## WARRANTY

Datalogic warrants that the Products shall be free from defects in materials and workmanship under normal and proper use during the Warranty Period. Products are sold on the basis of specifications applicable at the time of manufacture and Datalogic has no obligation to modify or update Products once sold. The Warranty Period shall be **two years** from the date of shipment by Datalogic, unless otherwise agreed in an applicable writing by Datalogic.

Datalogic will not be liable under the warranty if the Product has been exposed or subjected to any: (1) maintenance, repair, installation, handling, packaging, transportation, storage, operation or use that is improper or otherwise not in compliance with Datalogic's instruction; (2) Product alteration, modification or repair by anyone other than Datalogic or those specifically authorized by Datalogic; (3) accident, contamination, foreign object damage, abuse, neglect or negligence after shipment to Buyer; (4) damage caused by failure of a Datalogic-supplied product not under warranty or by any hardware or software not supplied by Datalogic; (5) any device on which the warranty void seal has been altered, tampered with, or is missing; (6) any defect or damage caused by natural or man-made disaster such as but not limited to fire, water damage, floods, other natural disasters, vandalism or abusive events that would cause internal and external component damage or destruction of the whole unit, consumable items; (7) use of counterfeit or replacement parts that are neither manufactured nor approved by Datalogic for use in Datalogic-manufactured Products; (8) any damage or malfunctioning caused by non-restoring action as for example firmware or software upgrades, software or hardware reconfigurations etc.; (9) loss of data; (10) any consumable or equivalent (e.g. cables, power supply, batteries, etc.); or (11) any device on which the serial number is missing or not recognizable.

THE DATALOGIC WARRANTIES ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, WHETHER WRITTEN, EXPRESS, IMPLIED, STATUTORY OR OTHERWISE, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR PARTICULAR PURPOSE. DATALOGIC SHALL NOT BE LIABLE FOR ANY DAMAGES SUSTAINED BY BUYER ARISING FROM DELAYS IN THE REPLACEMENT OR REPAIR OF PRODUCTS UNDER THE ABOVE. THE REMEDY SET FORTH IN THE WARRANTY STATEMENT IS THE BUYER'S SOLE AND EXCLUSIVE REMEDY FOR WARRANTY CLAIMS. NO EXTENSION OF THIS WARRANTY WILL BE BINDING UPON DATALOGIC UNLESS SET FORTH IN WRITING AND SIGNED BY DATALOGIC'S AUTHORIZED REPRESENTATIVE. DATALOGIC'S LIABILITY FOR DAMAGES ON ACCOUNT OF A CLAIMED DEFECT IN ANY PRODUCT DELIVERED BY DATALOGIC SHALL IN NO EVENT EXCEED THE PURCHASE PRICE OF THE PRODUCT ON WHICH THE CLAIM IS BASED. DATALOGIC SHALL NOT BE LIABLE FOR DAMAGES RELATING TO ANY INSTRUMENT, EQUIPMENT, OR APPARATUS WITH WHICH THE PRODUCT SOLD UNDER THIS AGREEMENT IS USED. Further details on warranty coverage, rights and conditions are addressed under and regulated by the Terms and Conditions of Sales of Datalogic available at [https://www.datalogic.com/terms\\_conditions\\_sales](https://www.datalogic.com/terms_conditions_sales).

# 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](http://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](http://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 illustration (Figure 1).



**Example Laser Warning Labels for Matrix 320 2mp Liquid Lens models**



**Example Laser Warning Labels for Matrix 320 2mp  
C-Mount models with 36 LED illuminator**



**Example Laser Warning Labels for Matrix 320 2mp  
C-Mount models 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*



*Exemple d'étiquettes d'avertissement de laser pour Matrix 320 modèles à monture C avec illuminateur DOE LTM x2x-xxx*

## 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).**

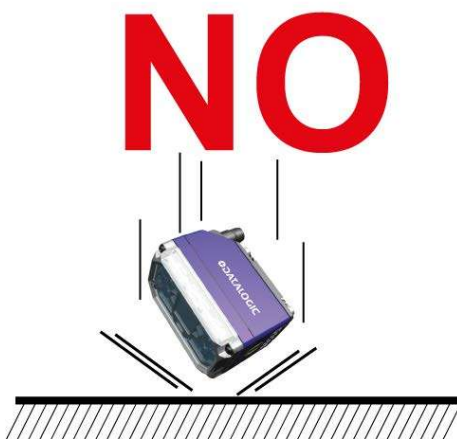


# HANDLING

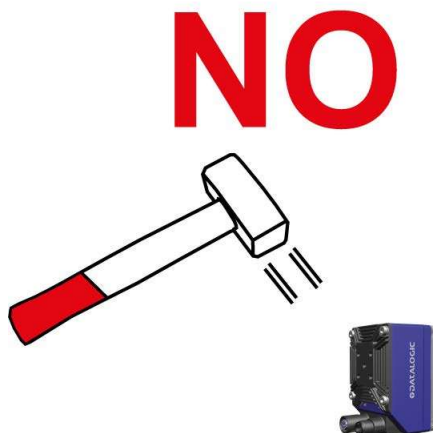
---

Matrix 320 2mp 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)

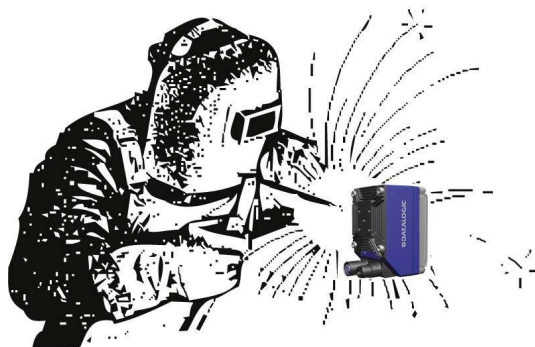


- do not fine tune the positioning by striking the reader or bracket.



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

# NO



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

# NO



**CAUTION:** Products using liquid lens technology are sensitive to UV light and will be damaged if exposed to UV illumination. Avoid exposing the product to UV light or direct sunlight. If it is not possible to remove UV light sources, the use of anti-UV receiving filter is mandatory to minimize the probability of damage.

# GENERAL VIEW

## MATRIX 320 2MP (LIQUID LENS) WITH 14 LEDs ILLUMINATOR

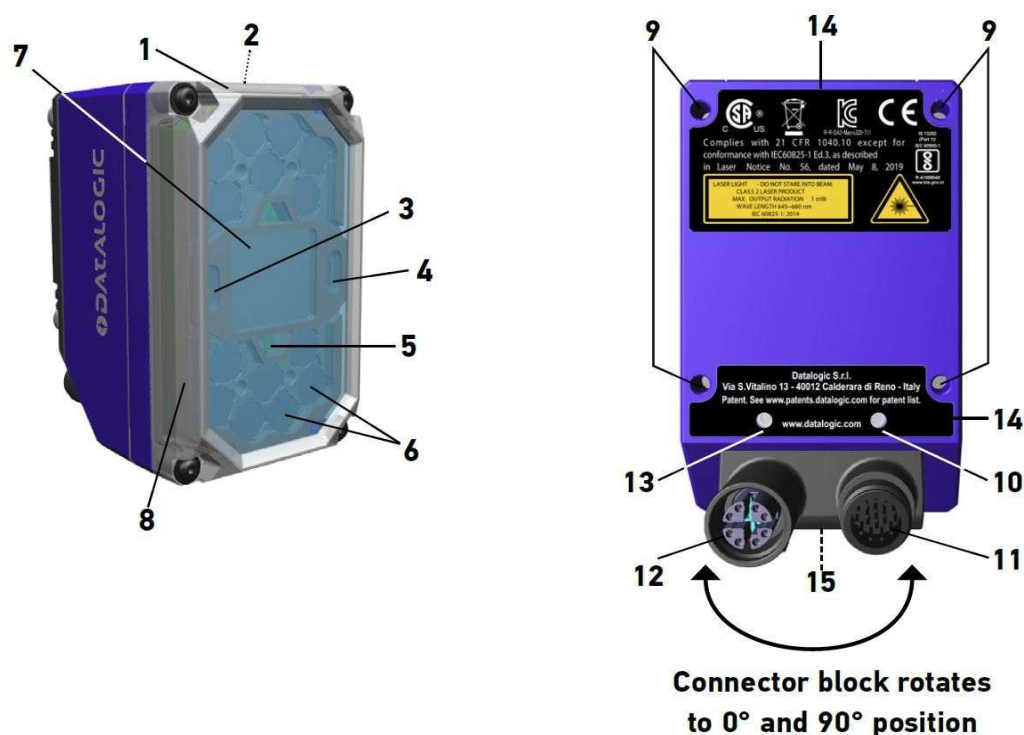


Figure 1 - Matrix 320 2mp with 14 LEDs illuminator

|                                 |                                     |
|---------------------------------|-------------------------------------|
| 1. Lens Cover                   | 9. Bracket Mounting Holes (4)       |
| 2. HMI X-PRESS Interface        | 10. Ethernet Connection LED         |
| 3. Green Spot                   | 11. Power - COM - I/O Connector     |
| 4. Red Spot                     | 12. Ethernet Connector              |
| 5. Aiming System Laser Pointers | 13. Power On LED                    |
| 6. Internal Illuminator         | 14. Device Class and Warning Labels |
| 7. Lens                         | 15. Avoid Laser Exit Point Label    |
| 8. 360° Feedback                |                                     |

# MATRIX 320 2MP (LIQUID LENS) WITH 36 LED<sub>s</sub> ILLUMINATOR

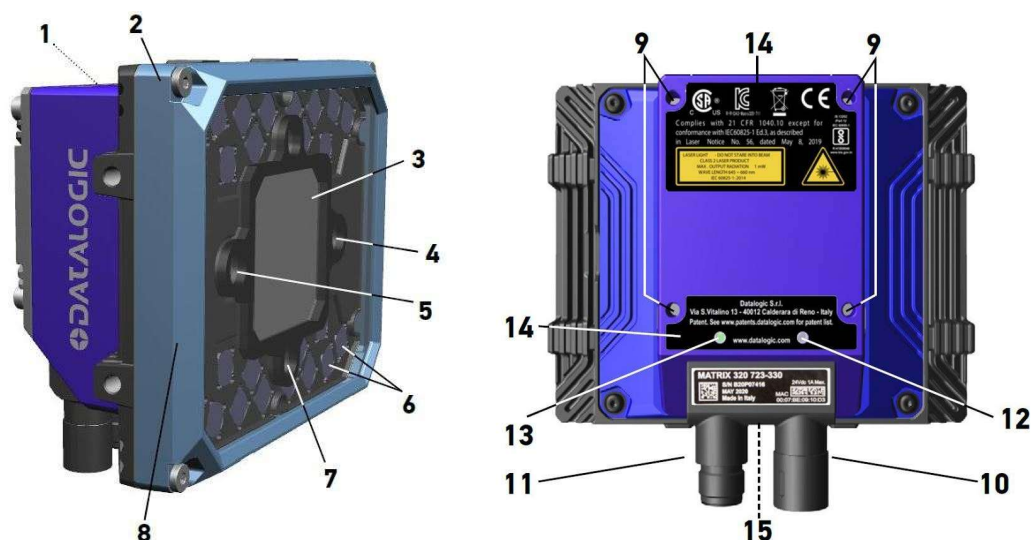


Figure 2 - Matrix 320 2mp with 36 LEDs illuminator

|                                |                                     |
|--------------------------------|-------------------------------------|
| 1. HMI X-PRESS Interface       | 9. Bracket Mounting Holes (4)       |
| 2. Lens Cover                  | 10. Ethernet Connector              |
| 3. Lens                        | 11. Power - COM - I/O Connector     |
| 4. Red Spot                    | 12. Ethernet Connection LED         |
| 5. Green Spot                  | 13. Power On LED                    |
| 6. Internal Illuminator        | 14. Device Class and Warning Labels |
| 7. Aiming System Laser Pointer | 15. Avoid Laser Exit Point Label    |
| 8. 360° Feedback               |                                     |

# MATRIX 320 2MP (C-MOUNT) WITHOUT ILLUMINATOR

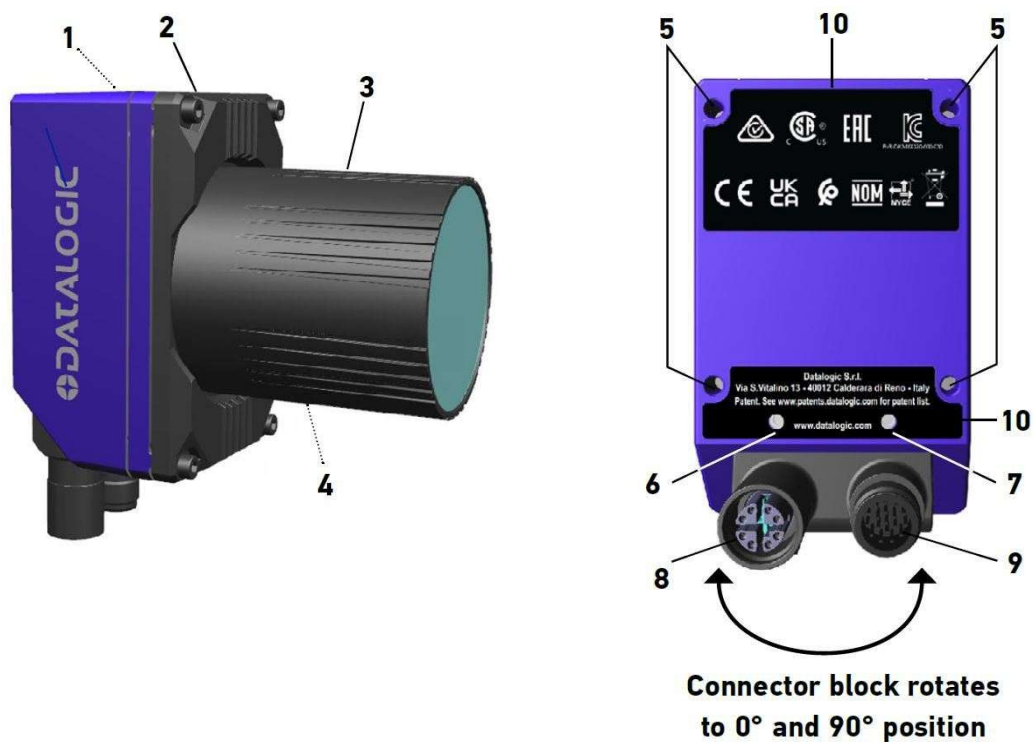
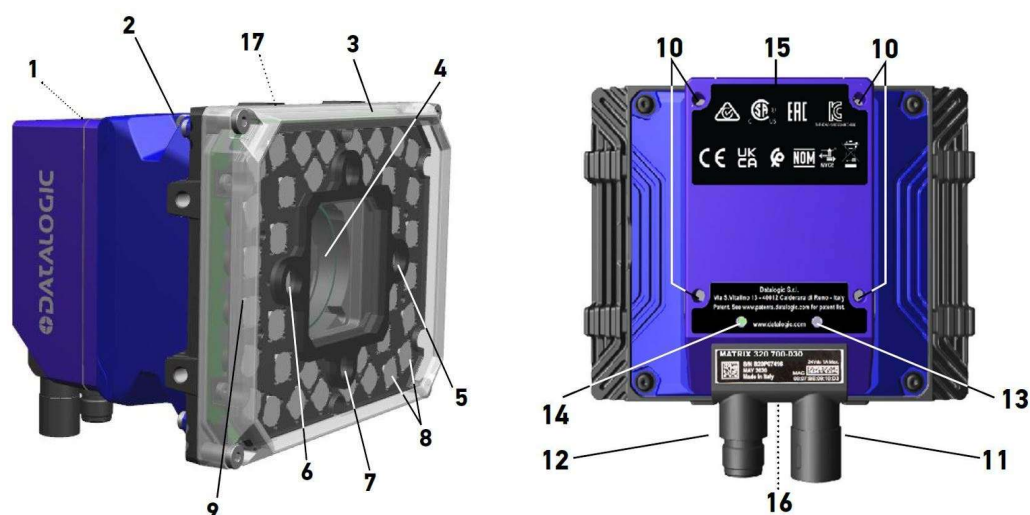


Figure 3 - Matrix 320 2mp without illuminator

|                               |                                |
|-------------------------------|--------------------------------|
| 1. HMI X-PRESS Interface      | 6. Power On LED                |
| 2. Base Cover                 | 7. Ethernet Connection LED     |
| 3. Lens Cover                 | 8. Ethernet Connector          |
| 4. Lens                       | 9. Power - COM - I/O Connector |
| 5. Bracket Mounting Holes (4) | 10. Compliance Label           |

# MATRIX 320 2MP (C-MOUNT) WITH 36 LED<sub>s</sub> ILLUMINATOR



**Figure 4 - Matrix 320 2mp C-Mount with 36 LEDs illuminator**

|                                       |                                            |
|---------------------------------------|--------------------------------------------|
| <b>1.</b> HMI X-PRESS Interface       | <b>10.</b> Bracket Mounting Holes (4)      |
| <b>2.</b> Adapter                     | <b>11.</b> Ethernet Connector              |
| <b>3.</b> Lens Cover                  | <b>12.</b> Power - COM - I/O Connector     |
| <b>4.</b> Lens                        | <b>13.</b> Ethernet Connection LED         |
| <b>5.</b> Red Spot                    | <b>14.</b> Power On LED                    |
| <b>6.</b> Green Spot                  | <b>15.</b> Compliance Label                |
| <b>7.</b> Aiming System Laser Pointer | <b>16.</b> Avoid Laser Exit Point Label    |
| <b>8.</b> Internal Illuminator        | <b>17.</b> Device Class and Warning Labels |
| <b>9.</b> 360° Feedback               |                                            |

# CHAPTER 1

## RAPID CONFIGURATION

For the rapid configuration of Matrix 320 2mp models with Liquid Lens, refer to [Matrix 320 2mp with Software Adjustable Focus \(Liquid Lens\)](#), starting on page 1

For the rapid configuration of Matrix 320 2mp C-Mount models, refer to [Matrix 320 2mp with Manual Adjustable Focus \(C-Mount\)](#), starting on page 5.

### MATRIX 320 2MP WITH SOFTWARE ADJUSTABLE FOCUS (LIQUID LENS)

#### Step 1A - 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.

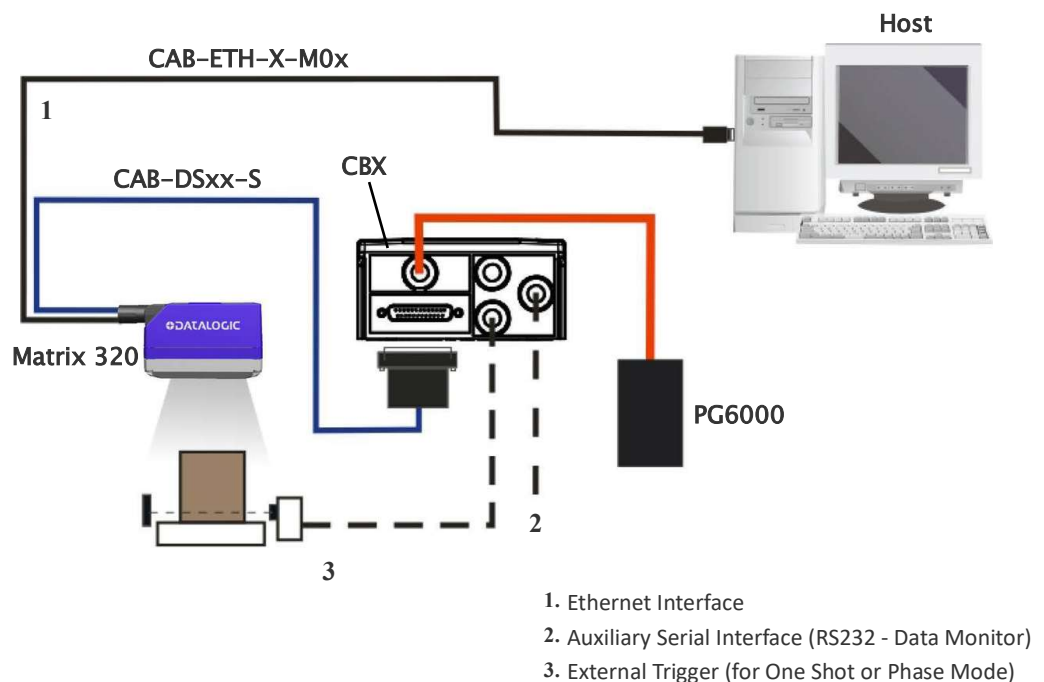


Figure 5 - Matrix 320 2mp in Stand Alone Layout

## CBX100/CBX500 Pinout for Matrix 320 2mp

The table below gives the pinout of the CBX100/CBX500 terminal block connectors. Use this pinout when the Matrix 320 2mp 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 95 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 2A - Mount and Position the Reader

1. To mount the Matrix 320 2mp, use the mounting brackets to obtain the most suitable position for the reader. The mounting solutions are provided in "[Mounting And Positioning Matrix 320 2mp](#)" on page 58.
2. When mounting the Matrix 320 2mp 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).

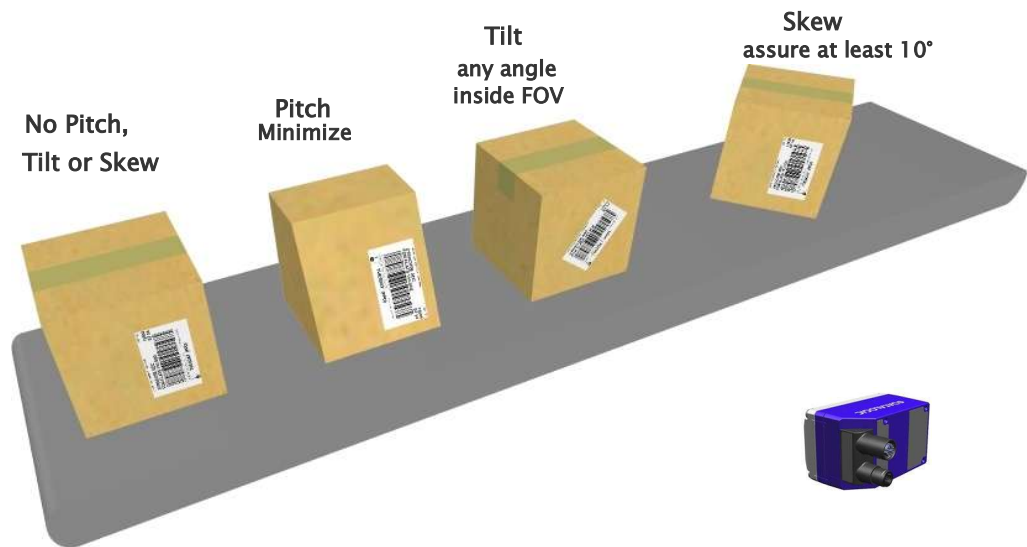


Figure 6 - Pitch, Skew and Tilt Angles

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 2mp 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 3A - Configure the reader

### Aim Mode

Matrix 320 2mp provides a built-in laser pointer aiming system to aid reader positioning. For Liquid Lens models, the autofocus feature is also incorporated into this function. The aiming system is accessed through the X-PRESS Interface.

1. Power the reader on. During the reader startup (reset or restart phase), all the LEDs blink for one second. On the reverse side of the reader near the bracket, the "POWER ON" LED (blue) indicates the reader is correctly powered.
2. Place a **single code** in front of the reader at the correct reading distance for your application (see the [Global FOV Diagrams, starting on page 126](#) for reference). **The center of the cross is 16 mm (14 LEDs model) or 30 mm (36 LEDs model) under the optical axis**, as shown in Figure 8.
3. Enter the Aim Mode function by pressing and holding the X-PRESS push button until the Aim LED is on.
4. Release the button to enter the Aim Mode. The aiming turns on, and the Autofocus procedure begins. The Aim LED will blink until the procedure is completed.



Within 3 seconds (before the reader flashes), center one of the larger codes between the aiming system indicators (the code must not move during this procedure).

The Autofocus procedure ends when the Reading Distance is successfully saved in the reader memory, the Aim LED will stop blinking and Matrix 320 2mp emits 3 high pitched beeps.

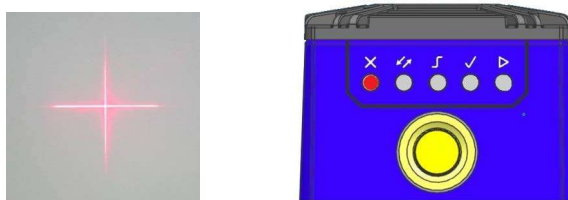


Figure 7 - X-PRESS Interface; Aim/Autofocus Function

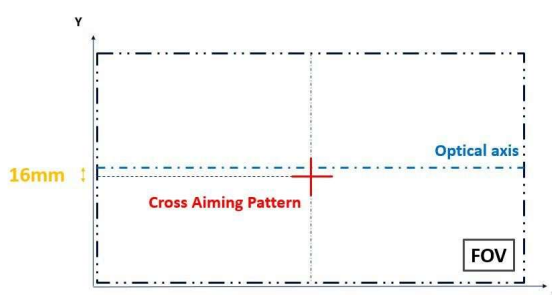


Figure 8 - Cross Laser Pattern



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

Now skip to [Next Steps for All Models, starting on page 6.](#)

# MATRIX 320 2MP WITH MANUAL ADJUSTABLE FOCUS (C-MOUNT)

## Step 0B - Assemble the Reader

For Matrix 320 2mp 7xx-0x0 (C-Mount), the first step to perform is to assemble the accessories that make up the reader. Refer to [Matrix 320 2mp C-Mount Assembly](#), starting on page 42 and [Matrix 320 2mp C-Mount Mounting Instructions](#), starting on page 78.

## Step 1B - Connect the System

Refer to "Step 1A - Connect the System" on page 1.

## Step 2B - Mount and Position the Reader

Refer to "Step 2A - Mount and Position the Reader" on page 3.

## Step 3B - Focus the reader

To focus the reader, refer to [Manual Setup for Manual Adjustable Focus Models \(C-Mount\)](#), starting on page 155, then place the reader at the factory focused Reading Distance and go to "Step 4 - Automatic Setup" on page 6.

## NEXT STEPS FOR ALL MODELS

### Step 4 - Automatic Setup



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



Figure 9 - 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 2mp emits 3 high pitched beeps.  
If the autolearning cannot be reached, Matrix 320 2mp will exit without saving the parameters to memory, the Setup LED will stop blinking and in this case Matrix 320 2mp emits a long low pitched beep<sup>1</sup>.



**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 2mp, 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 2mp 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 5 - 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 10 - Login Popup



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

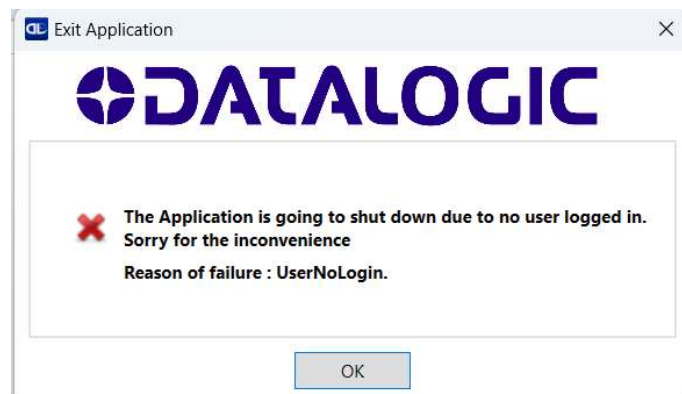
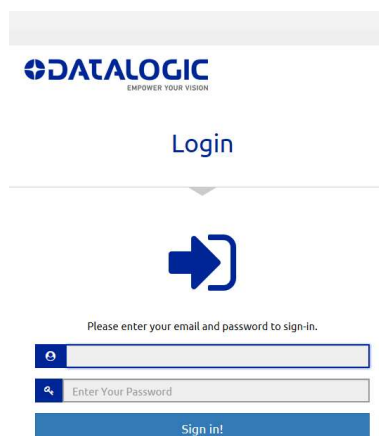


Figure 11 - Shut Down Message

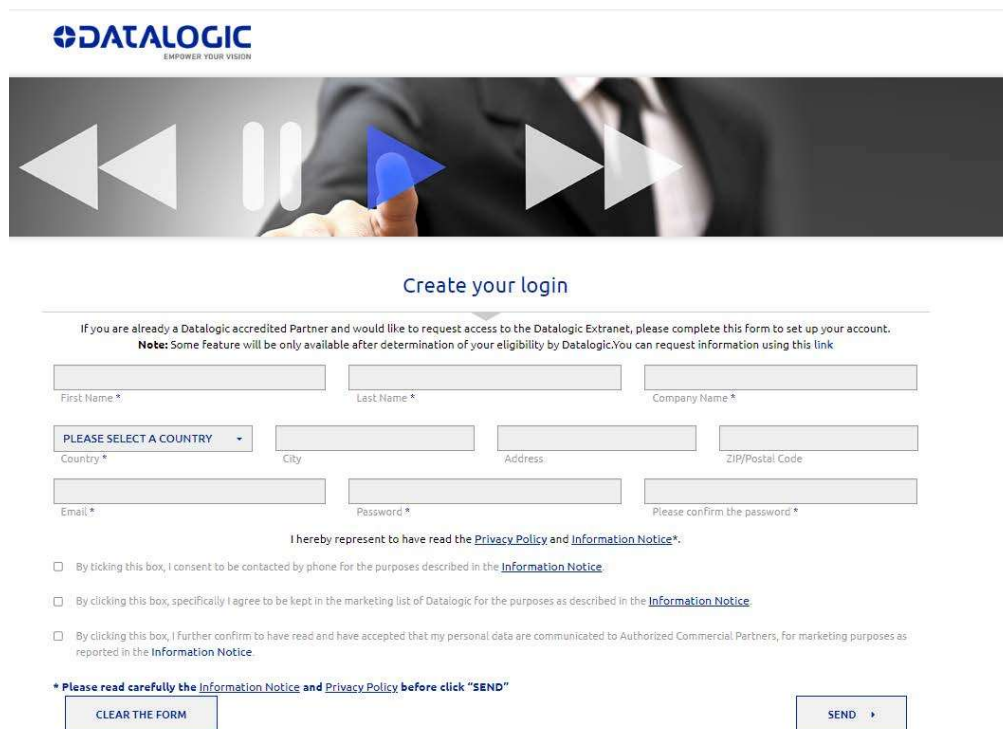
## Login and Signup

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.



The login form features the Datalogic logo at the top, followed by a 'Login' button. Below this is a large blue arrow icon pointing right. A text prompt asks the user to enter their email and password. There are two input fields: one for email (with an '@' icon) and one for password (with a key icon and the placeholder text 'Enter Your Password'). A 'Sign in!' button is located at the bottom of the form.

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.



The 'Create your login' form includes the Datalogic logo and a background image of a hand using a fingerprint scanner. The form contains several input fields: First Name, Last Name, Company Name, Country (a dropdown menu), City, Address, ZIP/Postal Code, Email, Password, and a confirmation password field. Below the fields, there is a statement: 'I hereby represent to have read the [Privacy Policy](#) and [Information Notice](#)\*.' followed by three checkboxes for consent to contact, marketing, and data communication. At the bottom, there is a note: '\* Please read carefully the [Information Notice](#) and [Privacy Policy](#) before click "SEND"', along with 'CLEAR THE FORM' and 'SEND' buttons.

Figure 12 – 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.

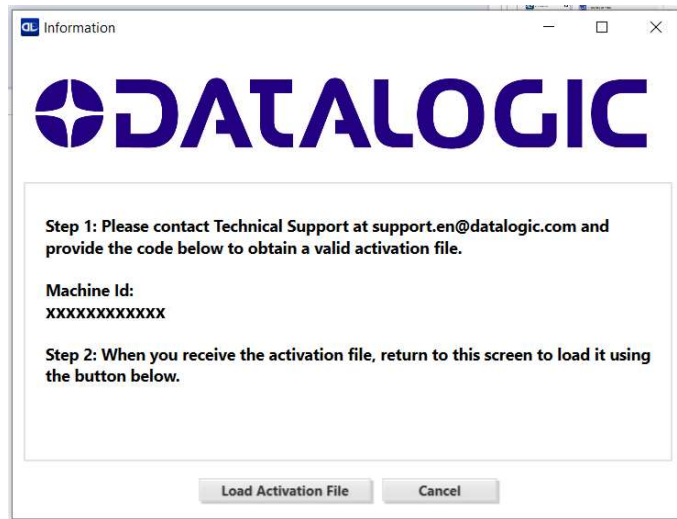


Figure 13 - Activation File Procedure

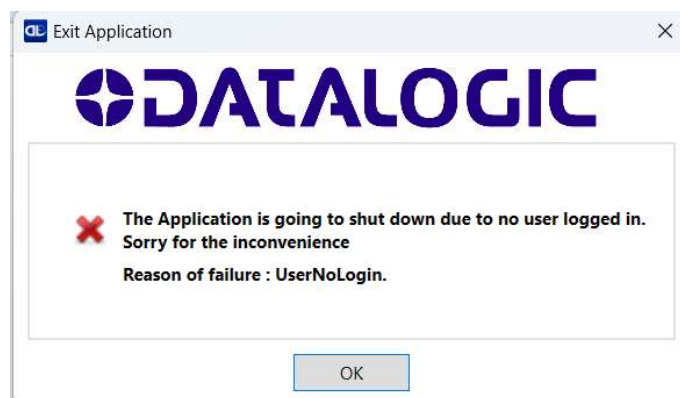
2. Contact the Technical Support and provide the Machine Id shown in your version of DL.CODE to obtain an activation file.
3. Once the Technical Support sends you the activation file, please load it using the “Load Activation File” button.



**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.

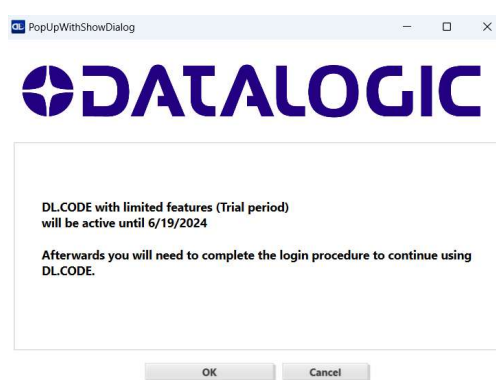


Figure 14 - 15-Day Trial

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.**

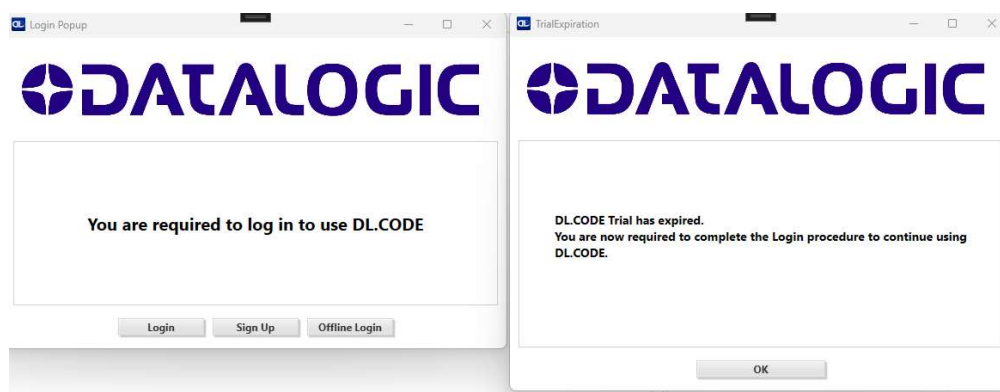


Figure 15 - End of Trial

## Ethernet Device Discovery

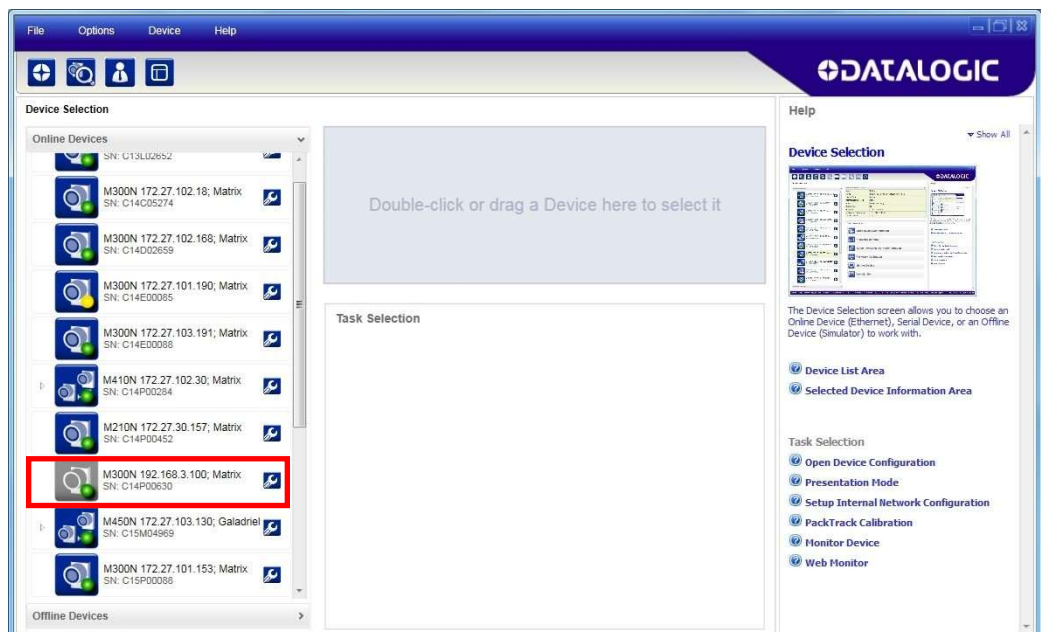


**NOTE:** To discover models through serial communication instead of Ethernet communication, refer to the DL.CODE User's Manual (par. "Serial Device Discovery").



**NOTE:** To discover models via web interface, refer to Configuration using Web Discovery, starting on page 24.

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 16 - Device Discovery**

The discovery feature will also show devices not belonging to the LAN and display them in gray (see Figure 16).

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.

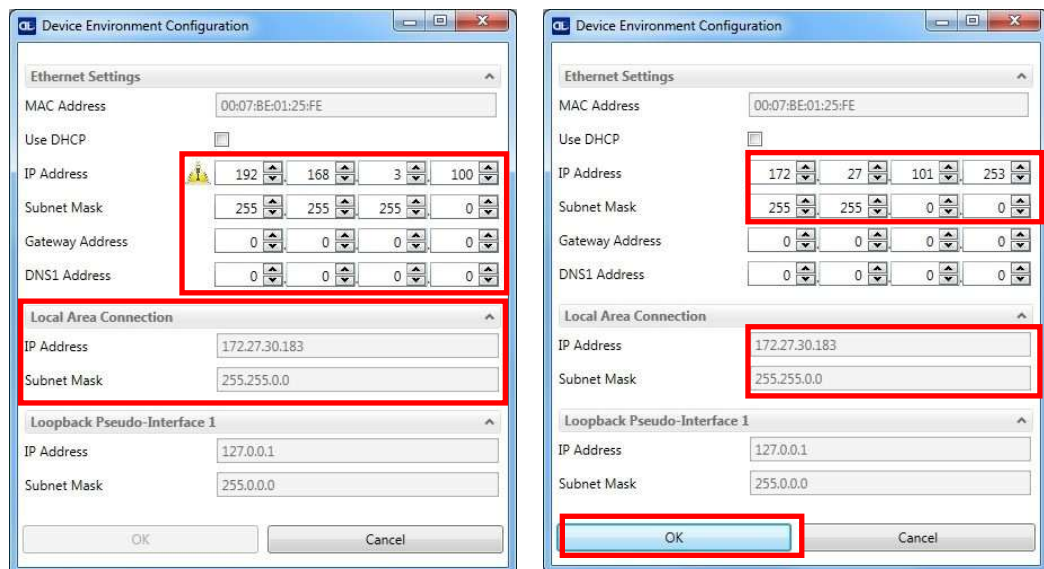
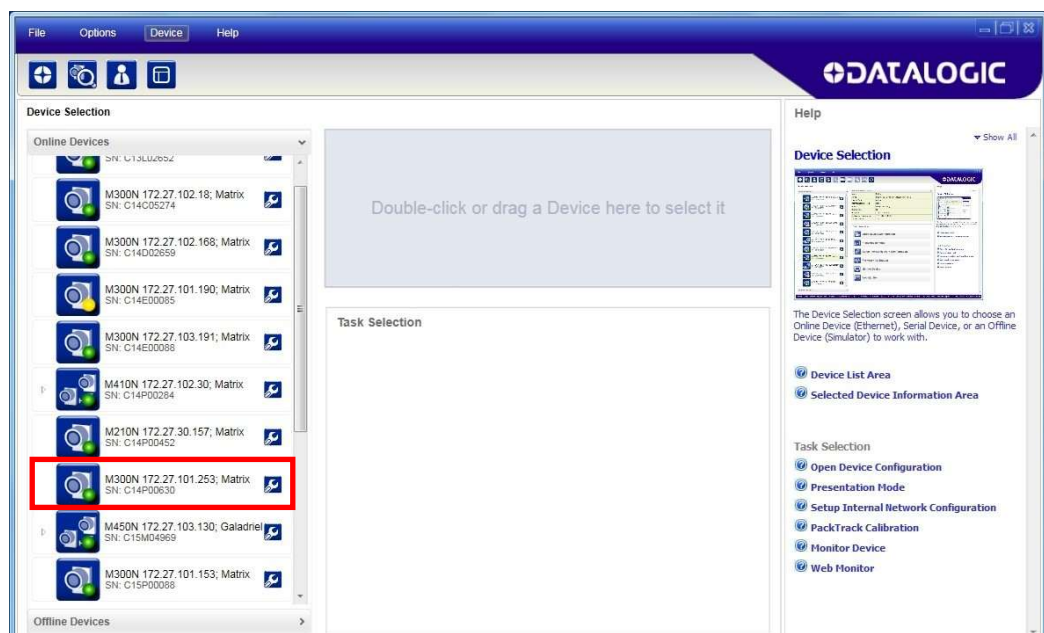


Figure 17 - Device Environment Configuration Window

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.

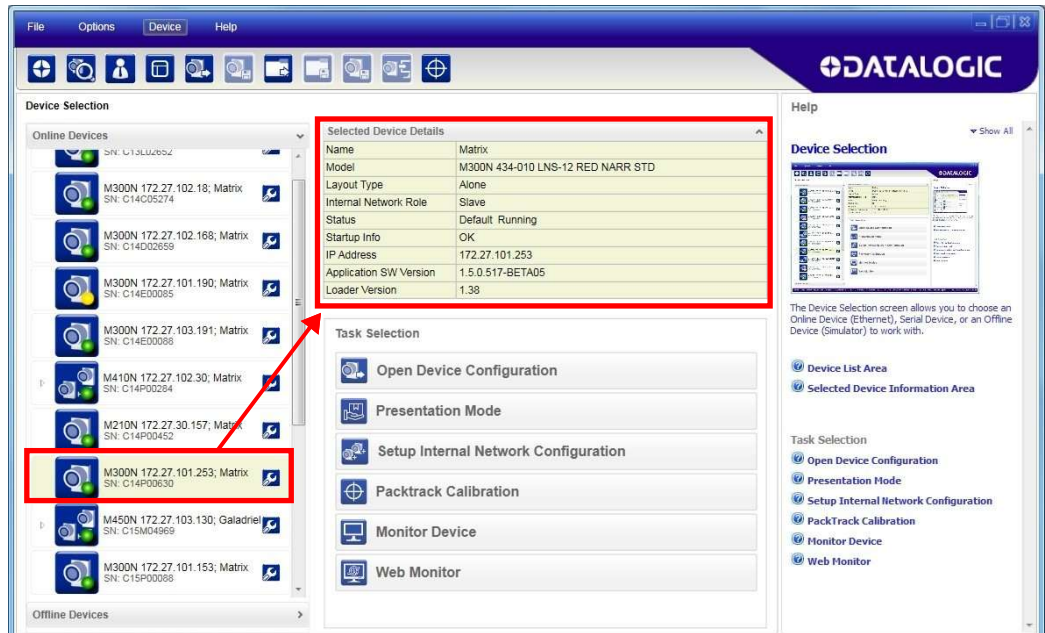


Figure 18 - DL.CODE Opening Window

## STEP 6 - 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<br>EAN 128<br>CODE 39<br>CODE 93<br>CODABAR<br>PDF417<br>MICRO PDF417<br>GS1 DATABAR<br>GS1 DATABAR STACKED<br>GS1 DATABAR LIMITED<br>GS1 DATABAR EXPANDED<br>GS1 DATABAR EXPANDED STACKED<br>UPCEAN FAMILY EAN13<br>UPCEAN FAMILY EAN8<br>UPCEAN FAMILY UPCA<br>UPCEAN FAMILY UPCE | DATAMATRIX ECC 200<br>QR<br>MICRO QR<br>AZTEC<br>MAXICODE<br>DOTCODE | ERODE 3x3, 5x5 and 7x7<br>DILATE 3x3, 5x5 and 7x7<br>SMOOTHING |



**NOTE:** Refer to paragraph “Automatic Setup Configuration” on page 141 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 Configuration” on page 147 for more details on using the Manual Setup.



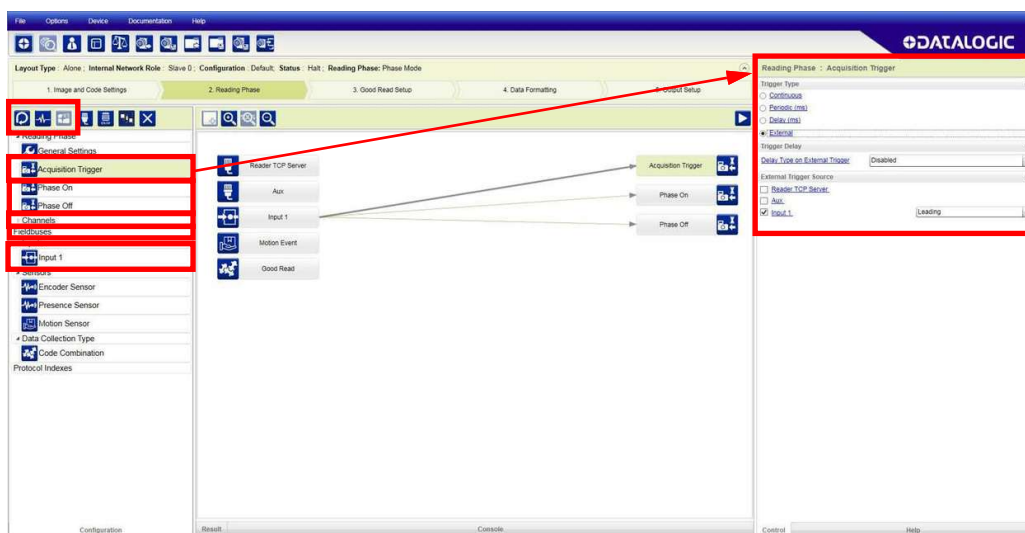
**NOTE:** If your application requires multiple code symbologies, multiple image settings, Code Grading or other parameter settings for decoding, then use the Manual Setup.

# 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, or Phase Mode.



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.

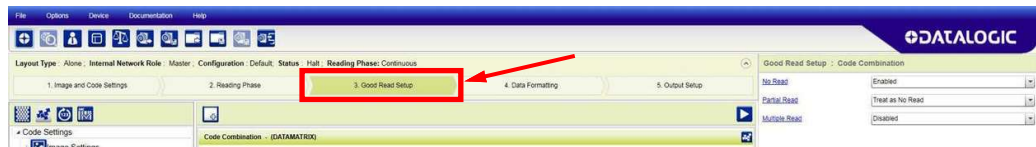


**CAUTION:** If the same signal activates multiple events with the same edge, those events are fired in a random order.

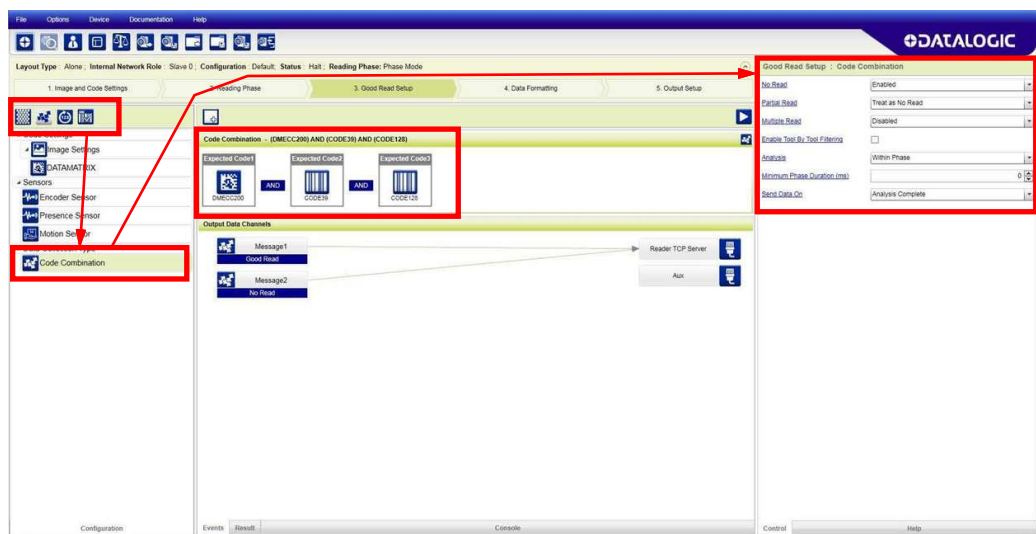
If the same channel activates multiple events with the same string, those events are fired in a random order.

**AVOID** doing this action. The reader may not work properly, the result is not predictable!

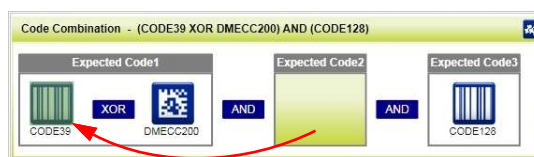
## Good Read Setup



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.

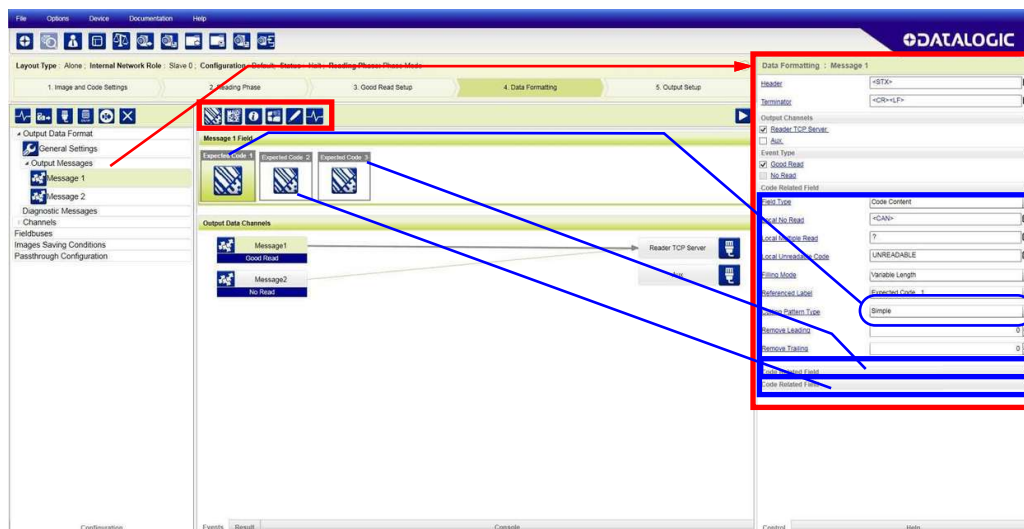


# Configuration Parameters

## Data Formatting



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



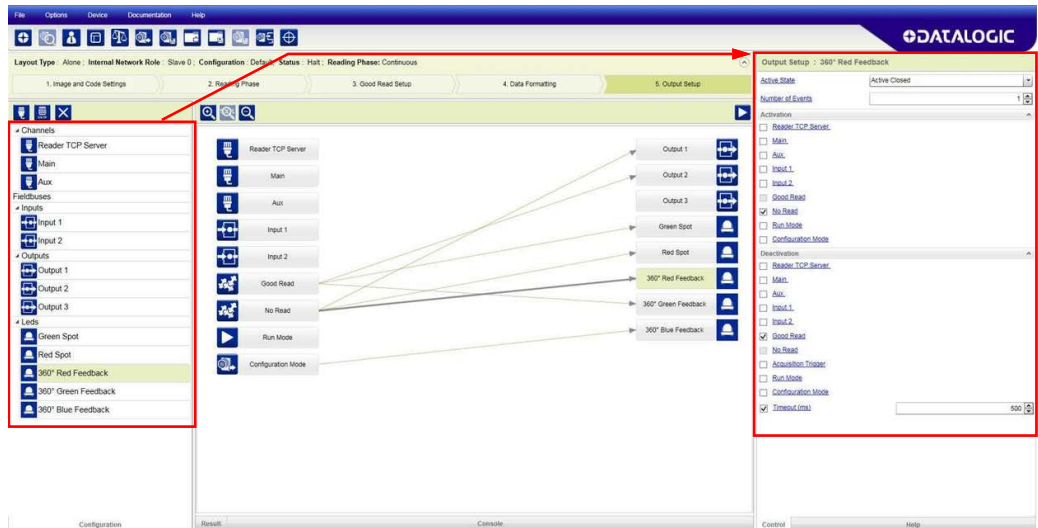
You can add fields to the output message by clicking on the icons above the Message Field area. They will be appended to the message. You can drag them to position them between other fields in the message so that the output message is ordered according to your application requirements.

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 7 - 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.

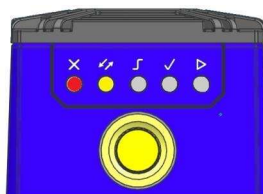


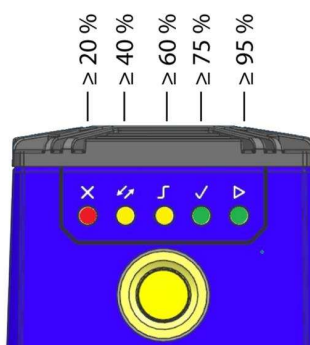
Figure 19 - X-PRESS Interface: Test Function

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.

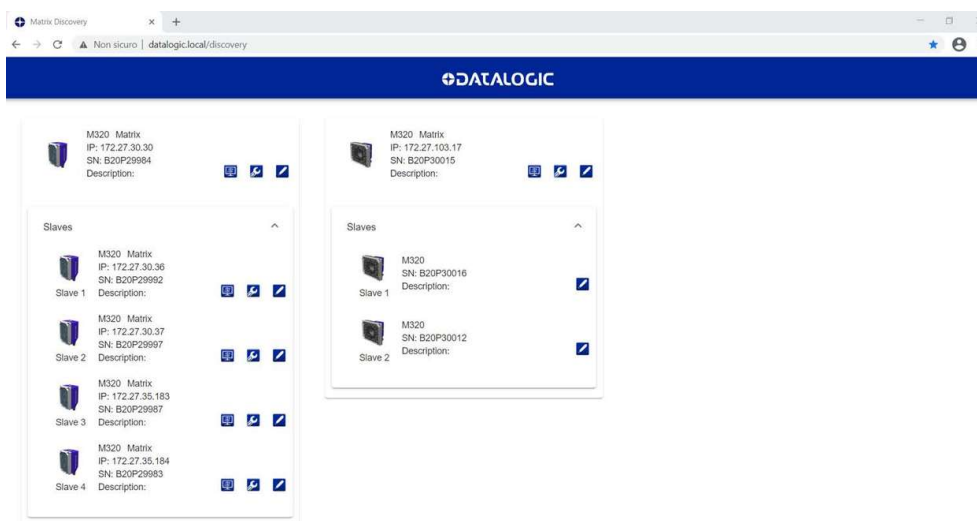
### Host Mode Programming

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://data-logic.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.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|  | <p>Display and configure the Ethernet settings, as shown in the figures below (left: device in DHCP mode<sup>1</sup>; right: device in Static mode):</p> <div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="border: 1px solid #ccc; padding: 10px; width: 45%;"> <p style="text-align: center; background-color: #0056b3; color: white; margin: -10px -10px 10px -10px;">Ethernet Settings</p> <p>MAC Address <input type="text" value="00:07:BE:09:07:CF"/></p> <p>Use DHCP <input checked="" type="checkbox"/></p> <p style="text-align: center;">OK</p> <p style="text-align: center;">Cancel</p> </div> <div style="border: 1px solid #ccc; padding: 10px; width: 45%;"> <p style="text-align: center; background-color: #0056b3; color: white; margin: -10px -10px 10px -10px;">Ethernet Settings</p> <p>MAC Address <input type="text" value="00:07:BE:07:AB:AB"/></p> <p>Use DHCP <input type="checkbox"/></p> <p>IP Address <input type="text" value="192.168.3.100"/></p> <p>Subnet Mask <input type="text" value="255.255.255.0"/></p> <p>Gateway Address <input type="text" value="0.0.0.0"/></p> <p>DNS1 Address <input type="text" value="0.0.0.0"/></p> <p style="text-align: center;">OK</p> <p style="text-align: center;">Cancel</p> </div> </div> |
|  | <p>Set the device description. In case of Slave devices, this button is only available if the corresponding Master device is reachable.</p> <div style="border: 1px solid #ccc; padding: 10px; width: 40%; margin: 0 auto;"> <p style="text-align: center; background-color: #0056b3; color: white; margin: -10px -10px 10px -10px;">Device Description</p> <p>Device Description: <input type="text"/></p> <p style="text-align: center;">OK</p> <p style="text-align: center;">Cancel</p> </div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

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

# CHAPTER 2

## INTRODUCTION

---

### PRODUCT DESCRIPTION

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

Matrix 320 2mp features excellent reading and verifying performance thanks to a superior 2.0 Mega pixel sensor (1920 x 1080 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. 45°C operative temperature make the Matrix 320 2mp the ideal product for industrial applications. Matrix 320 2mp has been developed for use in numerous industries such as:

#### Factory Automation

- End of line traceability
- Secondary packaging traceability
- Print & Apply
- WIP traceability (automatic)
- Component/part traceability
- Direct Part Marking (DPM) reading

#### Intralogistic Automation / Automated Warehouses / Distribution Centers

- Reverse Logistics
- Retrieval for outbound (forklift)
- Pallet traceability / pallet wrapping
- Palletizing (automatic or manual) / cage preparation
- Order fulfillment (automatic or manual)
- Depalletizing - Part traceability
- Print & Apply verification (re-labeling)
- Inbound/pallet picking (forklift)

This technology intrinsically provides omni-directional reading.

## Standard Application Program

A Standard Application Program is factory-loaded onto Matrix 320 2mp. 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, focus, 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 2 MPixel sensor (1920 x 1080 pixels)
- Frame Rate up to 60 frames/sec
- Hardware acceleration
- HDR (High Dynamic Range) imaging
- Powerful Internal Lighting Systems
- Electronic focus adjustment with Liquid Lenses
- Many illuminator options (up to 36 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 with cross projection 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
- Diagnostic software tools

## Flexible Solution

- Modular design
- Accessory covers for Polarized and Standard illumination
- Accessory filters: anti-YAG, color filters
- Many illuminator lights in 2 different power options (14 LEDs and 36 LEDs)
- 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
- 0 to 45 °C (Liquid Lens models) operating temperature
- Supply voltage: 24 Vdc

The reader is particularly suitable for industrial environments where protection against harsh external conditions is required.

The reader is contained in an aluminum housing; with its internal illuminator, Liquid Lens and protective cover, the mechanical dimensions are 109 x 54 x 56 mm for the 14 LEDs model and 116 x 126 x 70 mm for the 36 LEDs model.

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

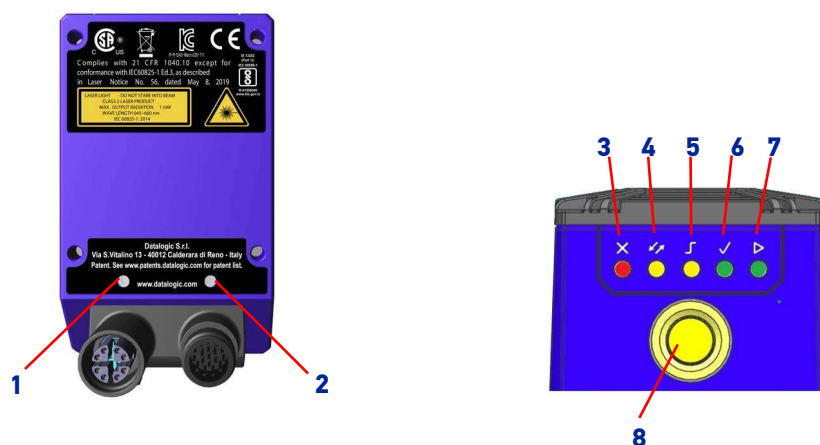


Figure 20 - Indicators

The following LED indicators are located on the reader:

|            |                                                                                    |
|------------|------------------------------------------------------------------------------------|
| <b>PWR</b> | blue LED indicates that the reader is connected to the power supply (Figure 20, 1) |
| <b>NET</b> | yellow LED indicates connection to the on-board Ethernet network (Figure 20, 2)    |

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

|                |                                                                                     |                                                                                    |
|----------------|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
| <b>STATUS</b>  |  | red LED indicates a NO READ result (Figure 20, 3)                                  |
| <b>COM</b>     |  | yellow LED indicates active communication on the main serial port * (Figure 20, 4) |
| <b>TRIGGER</b> |  | yellow LED indicates the status of the reading phase (Figure 20, 5)                |
| <b>GOOD</b>    |  | green LED confirms successful reading (Figure 20, 6)                               |
| <b>READY</b>   |  | green LED indicates that the reader is ready to operate (Figure 20, 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 20, 8) is software programmable. By default it starts the X-PRESS interface for quick installation without using a PC (see "[Step 3A - Configure the reader](#)" on page 4).

## GREEN/RED SPOT AND 360° VISUAL FEEDBACK

Matrix 320 2mp 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.

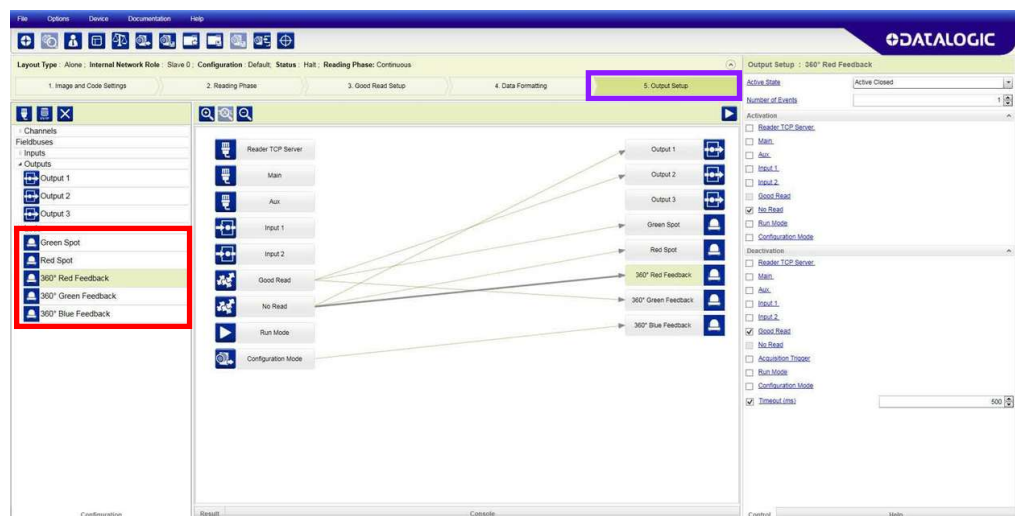
The available colors are activated by the following default events:

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



Figure 21 – 360° Visual Feedback and Green/Red Spot

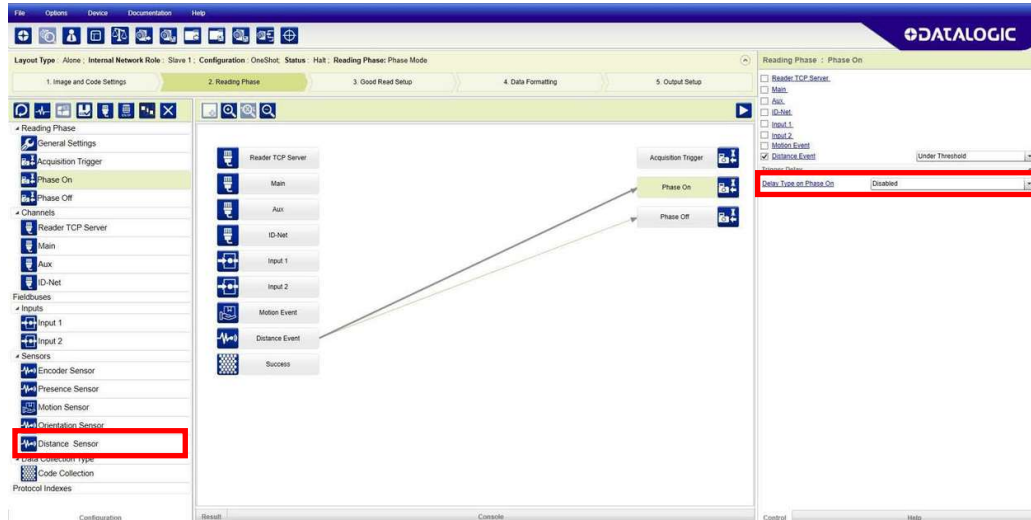
On DL.CODE it is possible to select the events that will activate each Spot and 360° Feedback (e.g. Communication Channel Strings, Inputs, Read Events, Operating Mode, Script Events). To do this, go to Output Setup > LEDs.



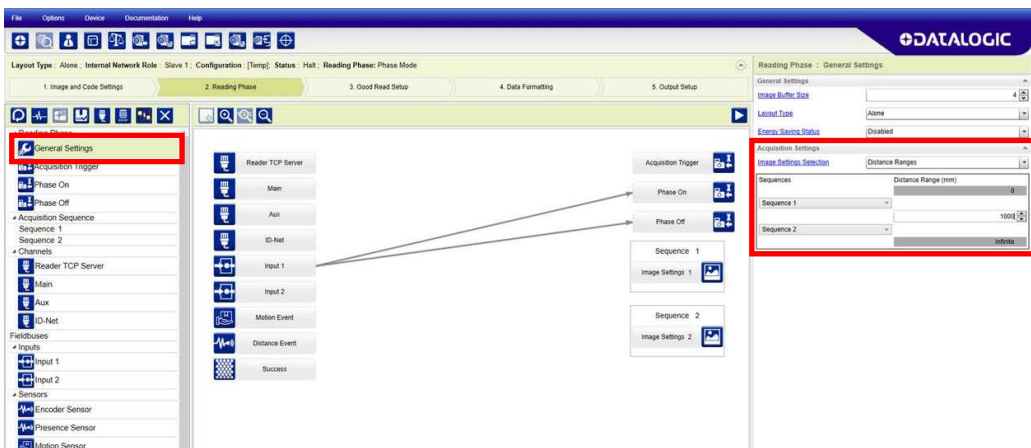
# DISTANCE SENSOR

Matrix 320 2mp C-Mount with 36 LEDs illuminator 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.

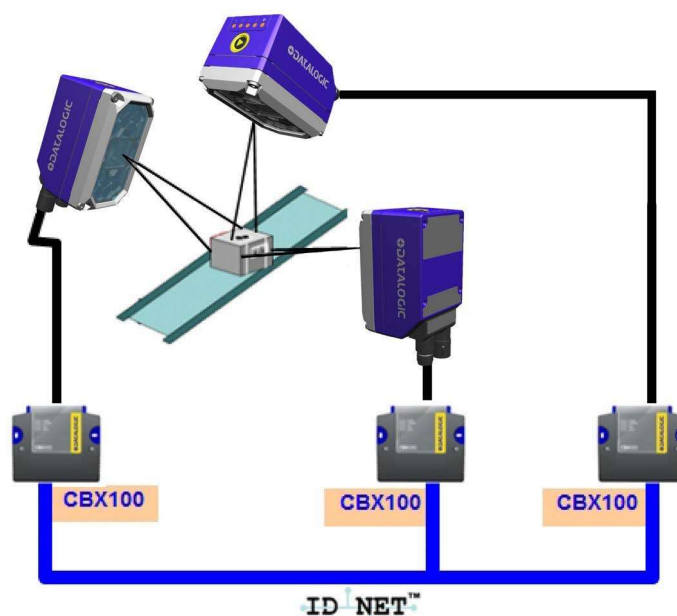


## ID-NET

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

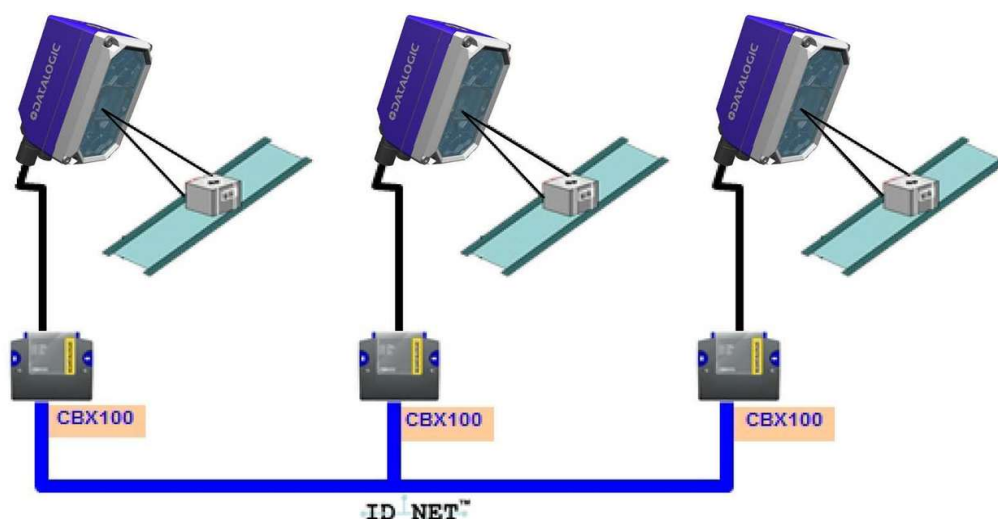


ID-NET interface allows local connection of multiple readers reading different sides of the same target. All readers share a single presence sensor and activate/deactivate simultaneously.

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 96 for connection details and "[Internal Network Configurations](#)" on page 174 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 96 for connection details and "[Internal Network Configurations](#)" on page 174 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.

S



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

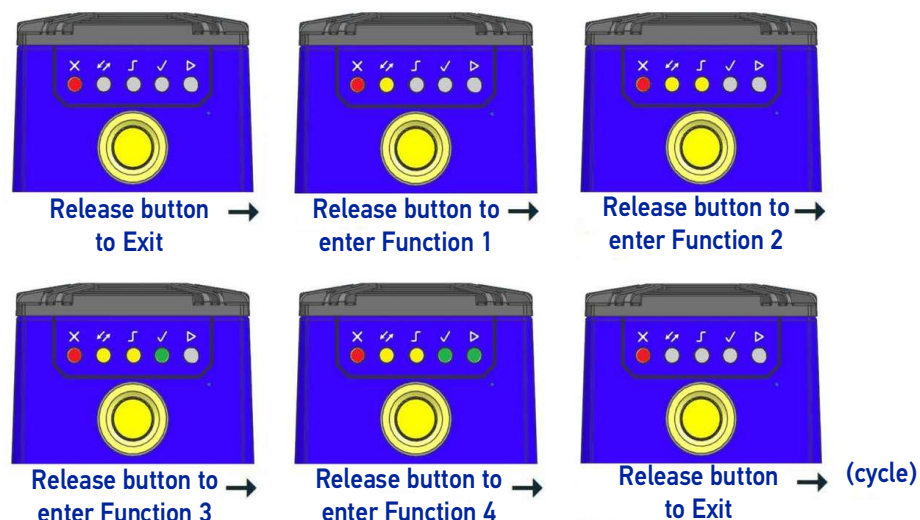
| X-PRESS Configuration |                                     |
|-----------------------|-------------------------------------|
| Configuration Status  | <input checked="" type="checkbox"/> |
| X-PRESS Function 1    | Test Mode                           |
| X-PRESS Function 2    | AIM Mode                            |
| X-PRESS Function 3    | Automatic Setup                     |
| X-PRESS Function 4    | None                                |

## 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:

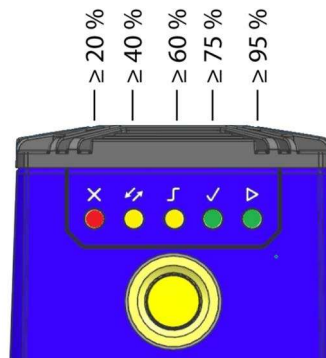


**NOTE: By default, the X-PRESS functions have the following configuration:**

| X-PRESS Configuration |                                     |
|-----------------------|-------------------------------------|
| Configuration Status  | <input checked="" type="checkbox"/> |
| X-PRESS Function 1    | Test Mode                           |
| X-PRESS Function 2    | AIM Mode                            |
| X-PRESS Function 3    | Automatic Setup                     |
| X-PRESS Function 4    | None                                |

## 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: y default, the Test exits automatically after three minutes.**

## Aim Mode

This function causes the LED indicators to turn on. The aiming pattern is centered on the FOV vertically and horizontally. It can be used to position the imager on the code. The Aim LED blinks to indicate this state.

You can exit the Focus/Aim function at any time by pressing the X-PRESS push button once. After a short delay the aiming LED indicators turn 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 186](#) for further information).

## Restore

Restore from BM100 (see ["Backup and Restore Through DL.CODE" on page 186](#) 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.

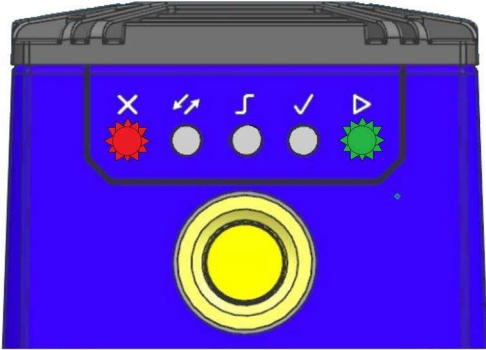
The LED will blink until the procedure is completed.

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.

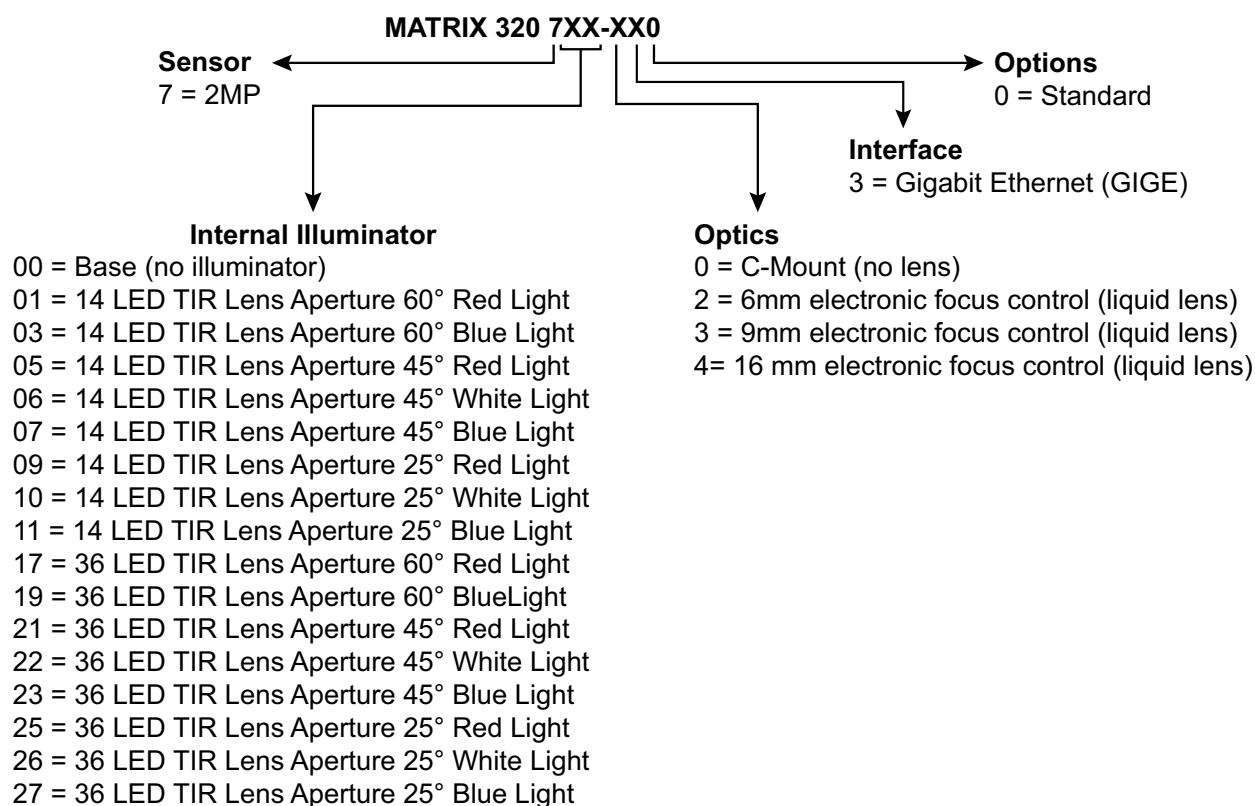
## Diagnostic Indication

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 2mp readers are described by their model number which indicates the characteristics listed in the diagram below. Not all combinations are available. For a complete list of combinations see "[Available Liquid Lens Models](#)" on page 39.



## AVAILABLE LIQUID LENS MODELS

| Part Number | Description                               |
|-------------|-------------------------------------------|
| 938100053   | Matrix 320 701-230 LL6 14L 60D RED X      |
| 938100055   | Matrix 320 703-230 LL6 14L 60D BLU X      |
| 938100056   | Matrix 320 2mp 705-330 LL9 14L 45D RED X  |
| 938100057   | Matrix 320 2mp 706-330 LL9 14L 45D WHT X  |
| 938100058   | Matrix 320 2mp 707-330 LL9 14L 45D BLU X  |
| 938100059   | Matrix 320 2mp 709-430 LL16 14L 25D RED X |
| 938100060   | Matrix 320 2mp 710-430 LL16 14L 25D WHT X |
| 938100061   | Matrix 320 2mp 711-430 LL16 14L 25D BLU X |
| 938100062   | Matrix 320 717-230 LL6 36L 60D RED X      |
| 938100064   | Matrix 320 719-230 LL6 36L 60D BLU X      |
| 938100065   | Matrix 320 2mp 721-330 LL9 36L 45D RED X  |
| 938100066   | Matrix 320 2mp 722-330 LL9 36L 45D WHT X  |
| 938100068   | Matrix 320 2mp 725-430 LL16 36L 25D RED X |
| 938100069   | Matrix 320 2mp 726-430 LL16 36L 25D WHT X |
| 938100070   | Matrix 320 2mp 727-430 LL16 36L 25D BLU X |

## ACCESSORIES

The following accessories can be used with the Matrix 320 2mp reader.

| Accessory       | Description                                   | Order No. |
|-----------------|-----------------------------------------------|-----------|
| <b>Cables</b>   |                                               |           |
| 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-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 |

| Accessory           | Description                                                                       | Order No. |
|---------------------|-----------------------------------------------------------------------------------|-----------|
| CAB-ETH-X-M10       | M12-IP67 GIGA Ethernet Cable X-Coded (10M)                                        | 93A050140 |
| CV-N1-48-F-05       | M12-IP67 Flexible Ethernet Cable (5M) for linear and torsion moving applications  | 95A900058 |
| CV-N1-48-F-10       | M12-IP67 Flexible Ethernet Cable (10M) for linear and torsion moving applications | 95A900059 |
| CV-N1-48-F-15       | M12-IP67 Flexible Ethernet Cable (15M) for linear and torsion moving applications | 95A900060 |
| 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 |
| <b>Covers</b>       |                                                                                   |           |
| Cover Standard 14L  | Cover STD LT 14L M320/P2/P3                                                       | 93ACC0271 |
| Cover Standard 36L  | Cover STD LT 36L M320/P2/P3                                                       | 93ACC0272 |
| Cover Polarizer 14L | Cover Polarizer LT 14L M320/P2/P3                                                 | 93ACC0273 |
| Cover Polarizer 36L | Cover Polarizer LT 36L M320/P2/P3                                                 | 93ACC0274 |
| Cover ESD 14L       | Cover ESD LT 14L M320/P2/P3                                                       | 93ACC0278 |
| Cover UV 36L        | Cover UV LT 36L M320/P2/P3                                                        | 93ACC0277 |
| <b>Filters</b>      |                                                                                   |           |
| Filter Yag 14L      | Filter Yag Cut LT 14L M320/P2/P3                                                  | 95A900018 |
| Filter Yag 36L      | Filter Yag Cut LT 36L M320/P2/P3                                                  | 95A900022 |
| Half Polarizer 14L  | Half Polarizer Filter LT 14L M320                                                 | 93ACC0275 |
| Filter Red 14L      | Filter RED Bp 635nm LT 14L M320/P2/P3                                             | 95A900015 |
| Filter Blu 14L      | Filter BLU Bp 470nm LT 14L M320/P2/P3                                             | 95A900016 |
| Filter IR 14L       | Filter IR Bp 850nm LT 14L M320/P2/P3                                              | 95A900017 |
| 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 14L       | Filter UV Cut Lp 415nm LT 14L M320/P2/P3                                          | 95A900039 |
| Filter UV 36L       | Filter UV Cut Lp 415nm LT 36L M320/P2/P3                                          | 95A900040 |
| Filter IR Cut 14L   | Filter IR Cut LT 14L M320/P2/P3                                                   | 95A900064 |
| Filter IR Cut 36L   | Filter IR Cut LT 36L M320/P2/P3                                                   | 95A900065 |

| Accessory           | Description                             | Order No. |
|---------------------|-----------------------------------------|-----------|
| <b>Brackets</b>     |                                         |           |
| 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-32-020 SAFETY BRACKET ROT-CON M320   | 93ACC0479 |
| USX-60              | Adjustable Bracket                      | 93ACC1729 |
| <b>Connectivity</b> |                                         |           |
| CBX100              | Compact Connection Box                  | 93A301067 |
| CBX500              | Modular Connection Box                  | 93A301068 |
| BM100               | Backup Module for CBX100/500            | 93ACC1808 |
| BM150               | Display Module for CBX500               | 93ACC1809 |

|                                                                                                             |                                                       |           |
|-------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|-----------|
| <b>Various Fieldbus Host Interface Modules and All-In-One Connection Box Kits are available</b>             |                                                       |           |
| BA100                                                                                                       | DIN Rail Adapters                                     | 93ACC1821 |
| BA200                                                                                                       | Bosch and 80/20 Profile Adapters                      | 93ACC1822 |
| <b>Various M12 Panel Connectors for CBX Connection Boxes are available</b>                                  |                                                       |           |
| 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 |
| <b>Various M12 Service Cables and Field Mount Connectors are available for Quick Link Series Connectors</b> |                                                       |           |
| <b>Power Supplies</b>                                                                                       |                                                       |           |
| PG6002                                                                                                      | AC/DC Power Supply Unit (US)                          | 93ACC1718 |
| PG6001                                                                                                      | AC/DC Power Supply Unit (UK)                          | 93ACC1719 |
| PG6000                                                                                                      | AC/DC Power Supply Unit (EU)                          | 93ACC1720 |
| <b>Sensors</b>                                                                                              |                                                       |           |
| MEP-593                                                                                                     | Photocell Kit PNP (PH-1)                              | 93ACC1791 |
| MEP-543                                                                                                     | Photocell Kit-NPN                                     | 93ACC1728 |
| S3Z-PR-5-C11-PL                                                                                             | Diffuse Proximity Sensor                              | 95B010011 |
| <b>External Mirrors</b>                                                                                     |                                                       |           |
| EMK-MTX-380                                                                                                 | External Mirror - 380 mm                              | 93ACC0086 |
| EMK-TMX-600                                                                                                 | External Mirror XRF410N - 600 mm                      | 93ACC0116 |

## MATRIX 320 2MP C-MOUNT ASSEMBLY

Matrix 320 2mp 7xx-0x0 (C-Mount) can be assembled in two different configurations:

- **Embedded illumination:** base + lens + adapter + 36 LED illuminator
- **External illumination:** base + lens (+ long or short lens cover)

The following table shows the possible accessories for your assembly<sup>1</sup>.

For the possible combinations of illuminators and lenses, refer to "[Illuminators and Lenses Combinations](#)" on page 44.

| Accessory                                                                                                    | Description                            | Order No. |
|--------------------------------------------------------------------------------------------------------------|----------------------------------------|-----------|
| <b>C-Mount Base</b>                                                                                          |                                        |           |
| Base 700-030 X                                                                                               | Matrix 320 2mp 700-030 CM 2MP 1/3" X   | 938100071 |
| <b>C-Mount Lenses</b>                                                                                        |                                        |           |
| LNM 000-021                                                                                                  | LNM 000-021 CM 4MM VF1.8 1/2" ED       | 93ACC0285 |
| LNM 001-031                                                                                                  | LNM 001-031 CM 6MM VF1.85 1/2" ED      | 93ACC0286 |
| 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 |
| <b>C-Mount Lens Covers</b>                                                                                   |                                        |           |
| Short Cover Lens                                                                                             | Cover Lens and CM Base Short M320      | 93ACC0279 |
| Long Cover Lens                                                                                              | Cover Lens and CM Base Long M320       | 93ACC0280 |
| <b>Illuminator Kits: 36 LED illuminator + illuminator adapter (93ACC0281) + mounting bracket (93ACC0283)</b> |                                        |           |
| 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 222-451                                                                                              | KIT LTM 222-451 SA36L 45D WHT white    | 93ACC0392 |
| 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 |

1. Refer to [Accessories, starting on page 39](#) for other accessories such as cables, filters, etc.

| Accessory                         | Description                           | Order No. |
|-----------------------------------|---------------------------------------|-----------|
| 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 |
| <b>36 LED Illuminators</b>        |                                       |           |
| 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 002-001                       | LTM 002-001 S36L 120D WHT white NL    | 93ACC0294 |
| LTM 222-451                       | LTM 222-451SA36L 45D WHT white        | 93ACC0330 |
| 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 002-000                       | LTM 002-000 S36L 120D RED 625nm NL    | 93ACC0293 |
| LTM 002-600                       | LTM 002-600 S36L 60D RED 625nm        | 93ACC0297 |
| 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 002-004                       | LTM 002-004 S36L 130D UV 365nm NL     | 93ACC0309 |
| 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 |
| <b>36 LED Illuminator Adapter</b> |                                       |           |
| Adapter 36L                       | Adapter LT to CM M320                 | 93ACC0281 |

## Illuminators and Lenses Combinations

The following table shows the optimal combinations of illuminators and lenses for Matrix 320 2mp C-Mount imager assembly.

| Illuminator Models                 |           | C-Mount Lens Focal Lengths (mm) |   |   |    |    |    |    |
|------------------------------------|-----------|---------------------------------|---|---|----|----|----|----|
| Description                        | Order No. | 4                               | 6 | 8 | 12 | 16 | 25 | 35 |
| LTM 002-001 S36L 120D WHT white    | 93ACC0294 | x                               | x |   |    |    |    |    |
| LTM 002-601 S36L 60D WHT white     | 93ACC0298 |                                 |   | x |    |    |    |    |
| LTM 002-451 S36L 45D WHT white     | 93ACC0302 |                                 |   |   | x  |    |    |    |
| LTM 002-351 S36L 35D WHT white     | 93ACC0306 |                                 |   |   |    | x  | x  |    |
| LTM 222-451 SA36L 45D WHT white    | 93ACC0330 |                                 |   |   | x  | x  |    |    |
| LTM 002-151 S36L 15D WHT white     | 93ACC0354 |                                 |   |   |    |    |    | x  |
| LTM 002-000 S36L 120D RED 625nm NL | 93ACC0293 | x                               | x |   |    |    |    |    |
| LTM 002-600 S36L 60D RED 625nm     | 93ACC0297 |                                 |   | x |    |    |    |    |
| LTM 002-450 S36L 45D RED 625nm     | 93ACC0301 |                                 |   |   | x  |    |    |    |
| LTM 002-350 S36L 35D RED 625nm     | 93ACC0305 |                                 |   |   |    | x  | x  |    |
| LTM 002-150 S36L 15D RED 625nm     | 93ACC0353 |                                 |   |   |    |    |    | x  |
| LTM 002-002 S36L 120D BLU 475nm NL | 93ACC0295 | x                               | x |   |    |    |    |    |
| LTM 002-602 S36L 60D BLU 475nm     | 93ACC0299 |                                 |   | x |    |    |    |    |
| LTM 002-452 S36L 45D BLU 475nm     | 93ACC0303 |                                 |   |   | x  |    |    |    |
| LTM 002-352 S36L 35D BLU 475nm     | 93ACC0307 |                                 |   |   |    | x  | x  |    |
| LTM 002-152 S36L 15D BLU 475nm     | 93ACC0355 |                                 |   |   |    |    |    | x  |
| LTM 002-004 S36L 130D UV 365nm NL  | 93ACC0309 | x                               | x | x | x  | x  | x  | x  |
| LTM 002-003 S36L 90D IR 850nm NL   | 93ACC0296 | x                               | x | x |    |    |    |    |
| LTM 002-453 S36L 45D IR 850nm      | 93ACC0300 |                                 |   |   | x  |    |    |    |
| LTM 002-353 S36L 35D IR 850nm      | 93ACC0304 |                                 |   |   |    | x  | x  |    |
| LTM 002-253 S36L 25D IR 850nm      | 93ACC0308 |                                 |   |   |    |    |    | x  |

## APPLICATION EXAMPLES

### Document Handling

Matrix 320 2mp 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 22 - Address Coded in Data Matrix Symbology for Automated Mail Processing

### Multiple Reading in a Single Image

The Matrix 320 2mp high resolution image sensors allow the reading of many small codes in a single image.

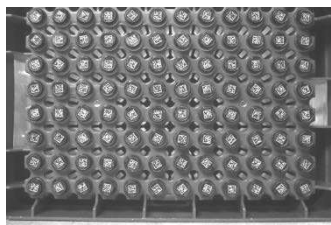


Figure 23 - 96-Vial Rack

### Deformed or Overprinted Code Reading

Matrix 320 2mp assures the reading of deformed and/or overprinted codes, even though damaged or printed on high reflective surfaces.



Figure 24 - Unidose Flow-Pack with PDF417 Code



Figure 25 - Overprinted Barcode Readable by Matrix 320 2mp also Through the Envelope Window Film



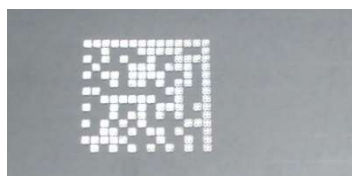
**Figure 26 – Barcode Printed on Curved Surface Readable by Matrix 300N in spite of Image Optical Distortion**

## Direct Part Marking

Matrix 320 2mp is also very powerful in reading low-contrast direct part marked codes.



**Figure 27 – Dot Matrix Code Directly Marked on Metal Surface by Using Dot Peening Technology**



**Figure 28 – Dot Peening Marking on Metal Surface with Multi-dot per Code Element**



**Figure 29 – Directly Marked Dot Matrix Code Characterized by Outstanding Separation Distance between Adjacent Code Elements**

## Ink-Jet Printing Technology

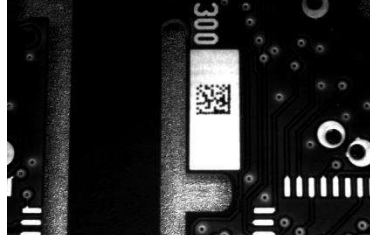


Figure 30 - Dot Matrix Code Directly Marked on PCB Copper Pad by Using Ink-Jet Technology

## Laser Marking/Etching Technology



Figure 31 - Data Matrix Code Directly Marked on PCB Surface by Using Laser Etching Technology



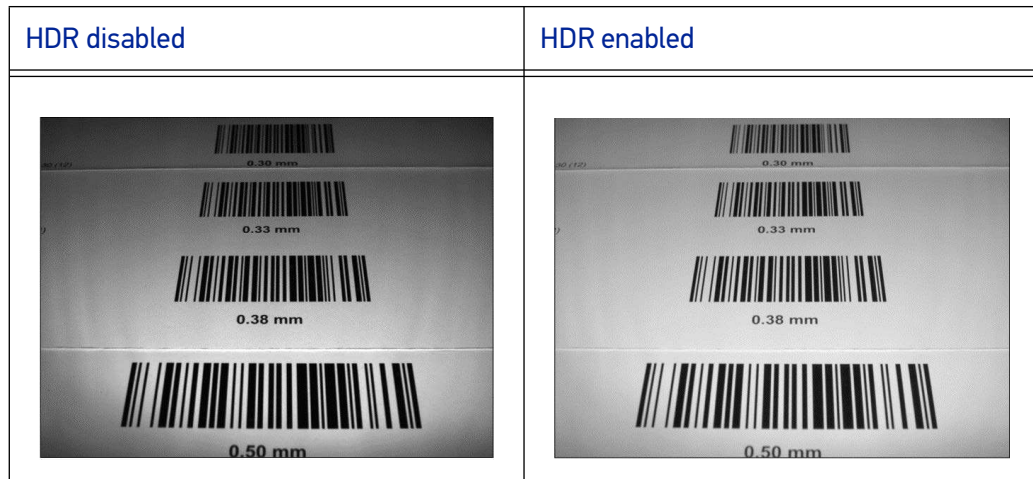
**CAUTION:** If application codes must be read which are produced by Laser Marking in real time, use the correct diameter accessory YAG Cut Filter with the Matrix 320 2mp reader in order to avoid burning the sensor.

## High Dynamic Range (HDR) feature

Matrix 320 2mp 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**:



- 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:



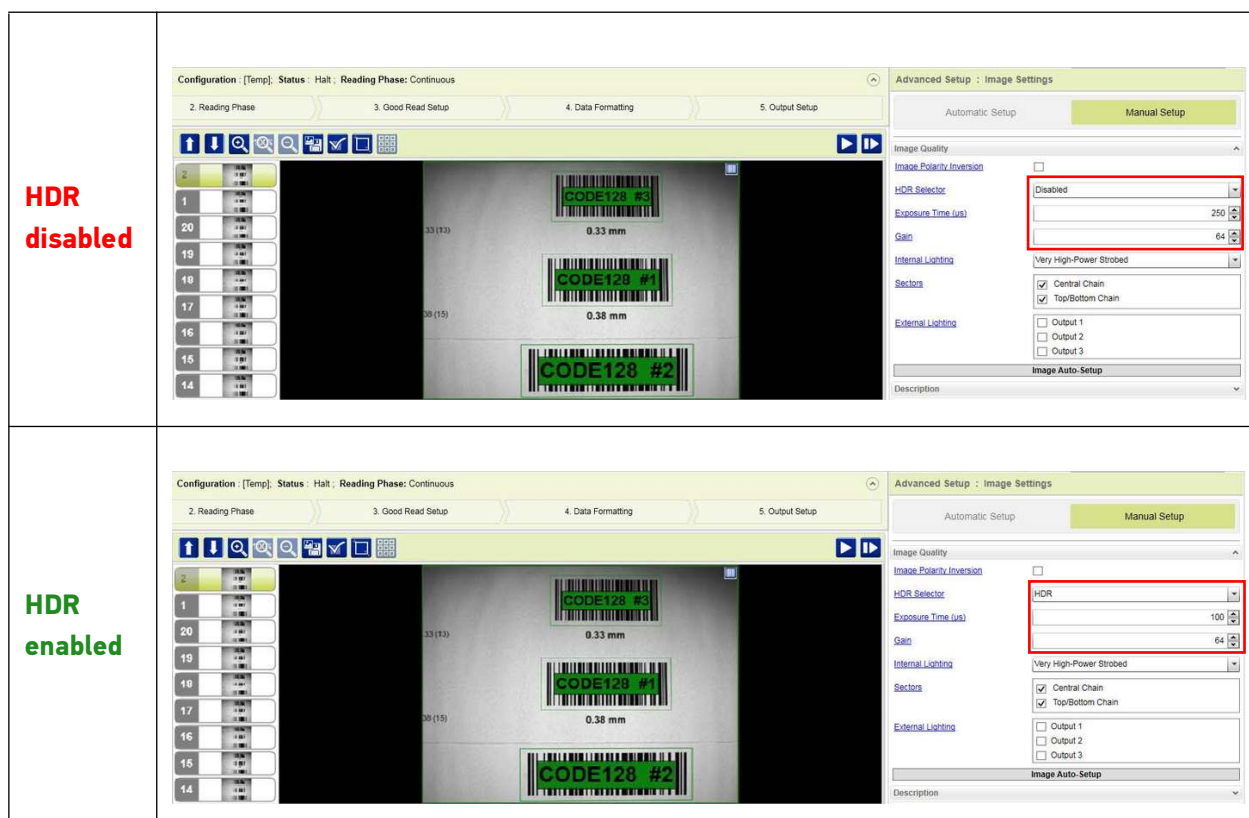
- To improve decodability when the FoV includes codes with **different levels of contrast**:



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 ( $LS$ ):

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



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 Exposure 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 137.

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

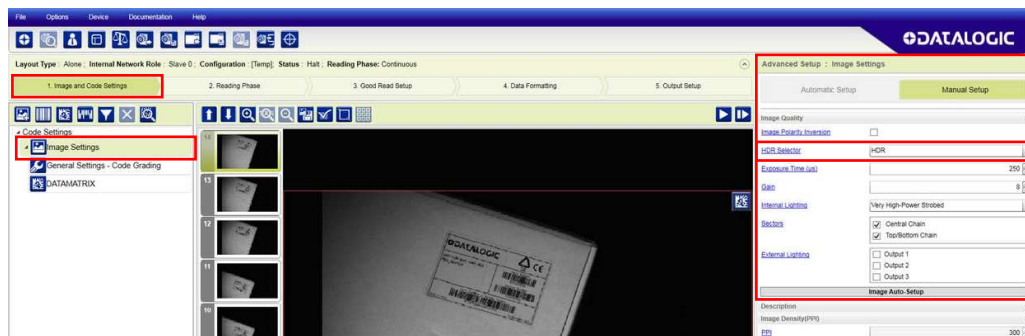


Figure 32 – Enabling HDR on DL.CODE

# CHAPTER 3

## INSTALLATION

---

### PACKAGE CONTENTS

Verify that the Matrix 320 2mp reader and all the parts supplied with the equipment are present and intact when opening the packaging.

The list of parts for Matrix 320 2mp 7xx-330 and 7xx-430 includes:

- Matrix 320 2mp reader
- Matrix 320 Quick Reference Guide
- Matrix 320 Heat Sink 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 with 14 LEDs illuminator, BK-32-010 Pivot Fix Bracket for Matrix 320 with 36 LEDs illuminator)
- Heat sink (1)

The list of parts for Matrix 320 2mp 7xx-0x0 includes:

- Matrix 320 2mp 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<sup>1</sup>)
- Heat sink (1)

---

1. The BK-32-000 Standard Fix Bracket is meant to be used with Matrix 320 without illuminator. In case of a Matrix 320 with 36 LEDs illuminator, a BK-32-010 Pivot Fix Bracket or a BK-32-020 Fast Replacement Bracket should be ordered (refer to "[Accessories](#)" on page 39).

# MECHANICAL DIMENSIONS

Matrix 320 2mp 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 58 for various mounting solutions and correct positioning, and [Chapter 6, Reading Features](#) for FOV vs. Reading Distance considerations.

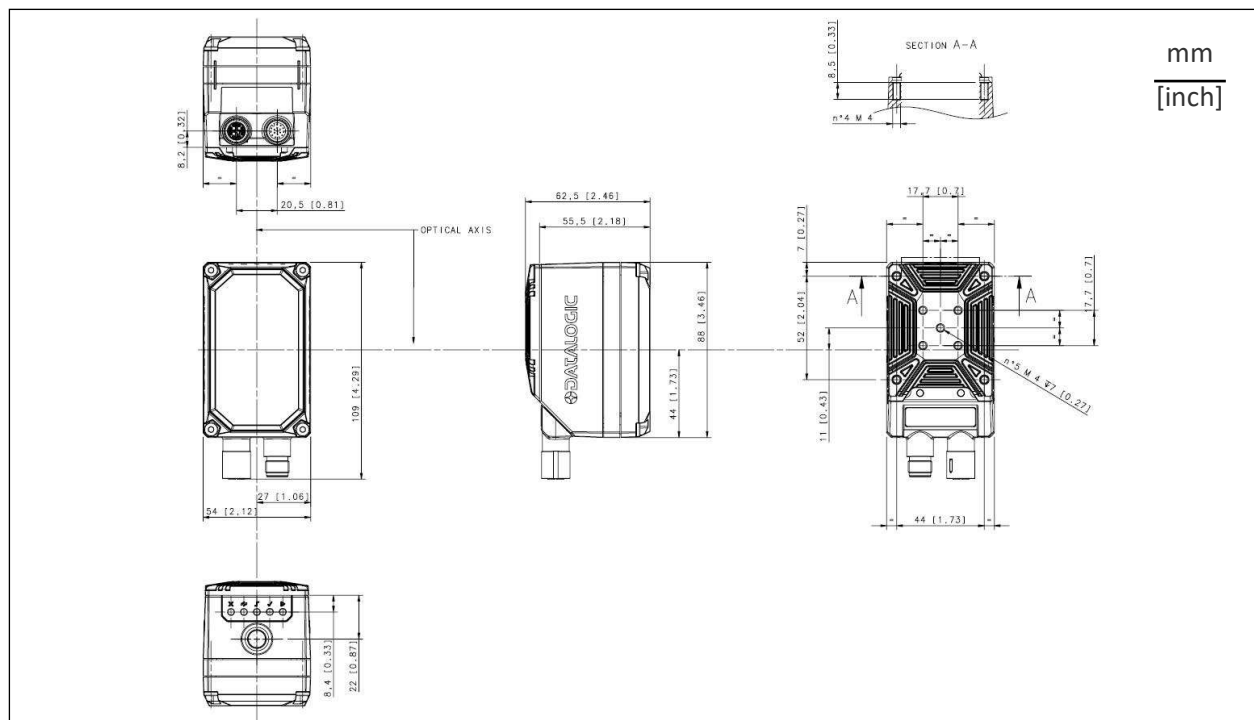


Figure 33 - Matrix 320 (Liquid Lens) with 14 LEDs illuminator (connectors 0°)

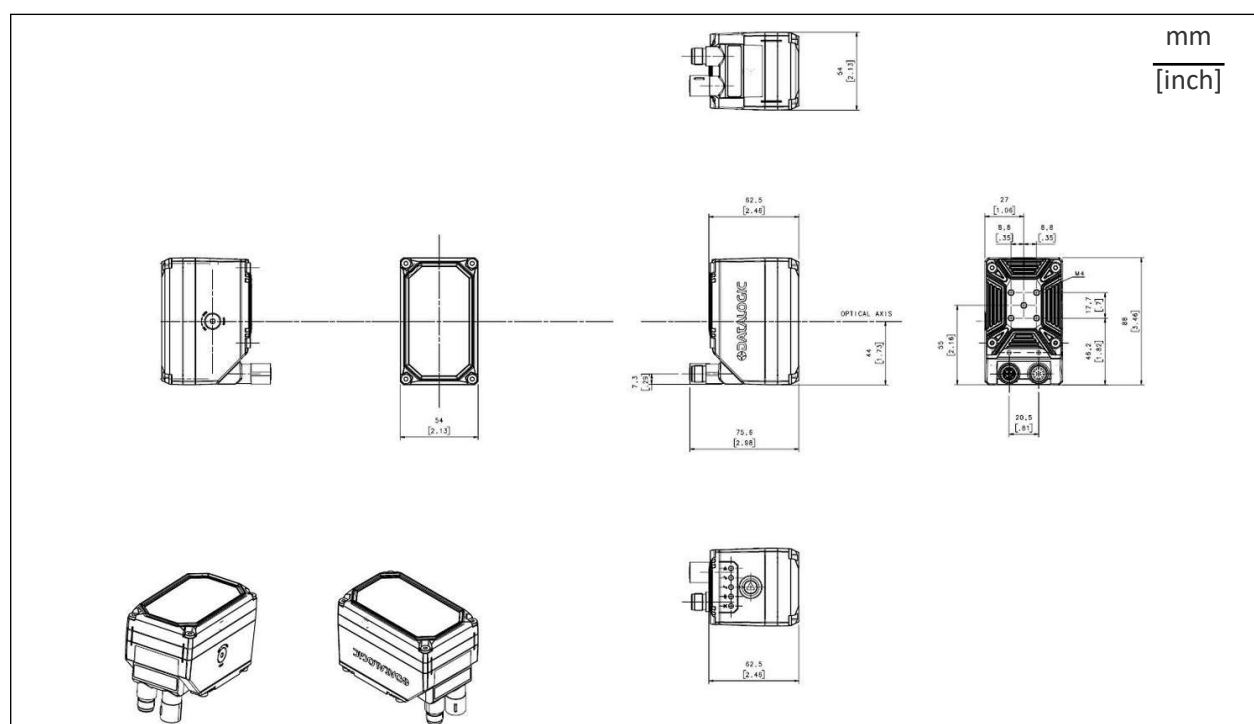


Figure 34 - Matrix 320 (Liquid Lens) with 14 LEDs illuminator (connectors 90°)

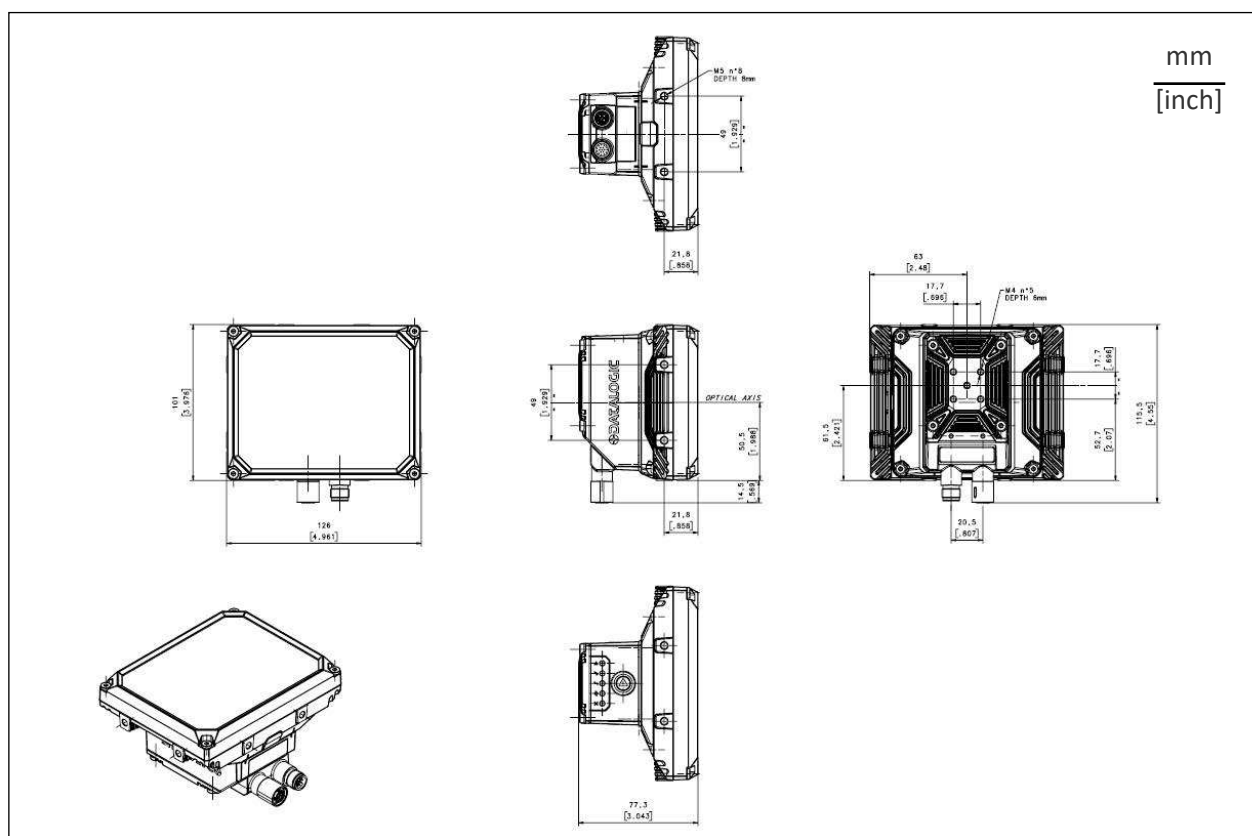


Figure 35 - Matrix 320 (Liquid Lens) with 36 LEDs illuminator (connectors 0°)

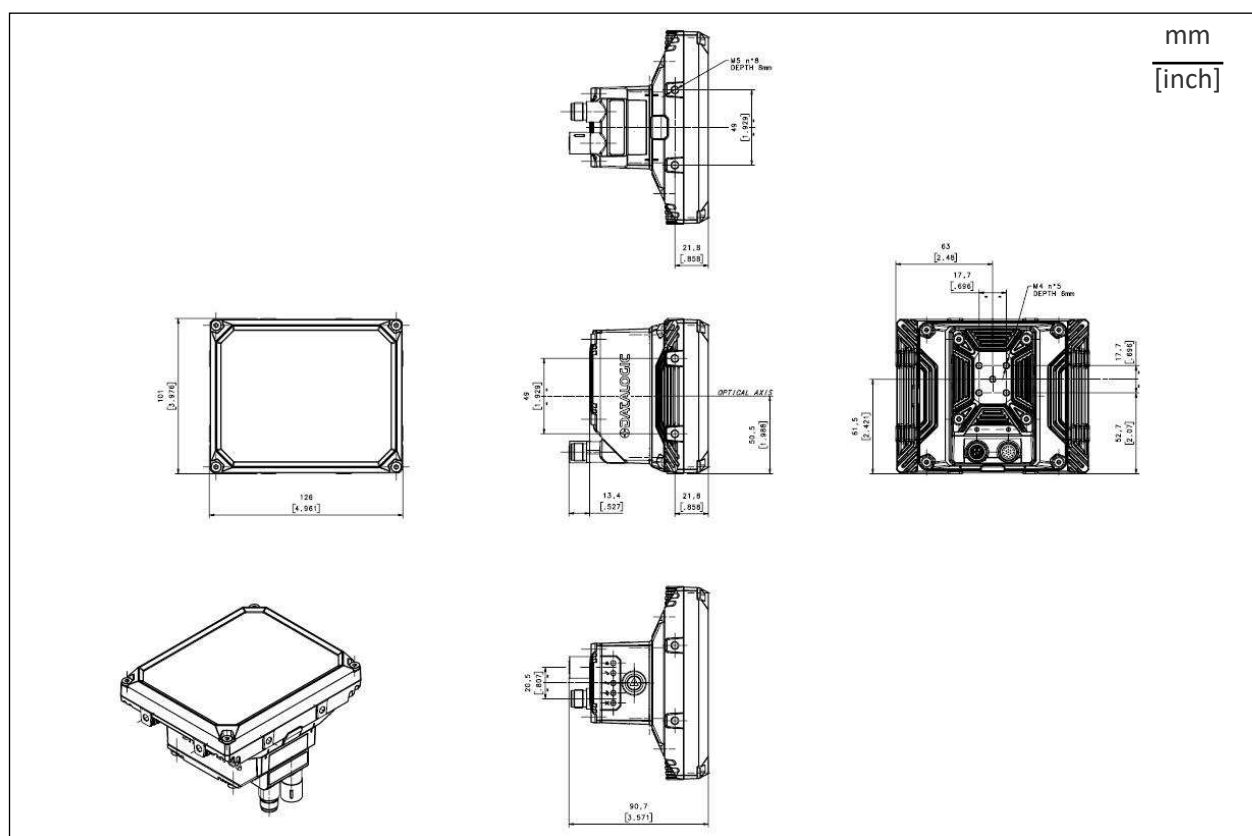


Figure 36 - Matrix 320 (Liquid Lens) with 36 LEDs illuminator (connectors 90°)

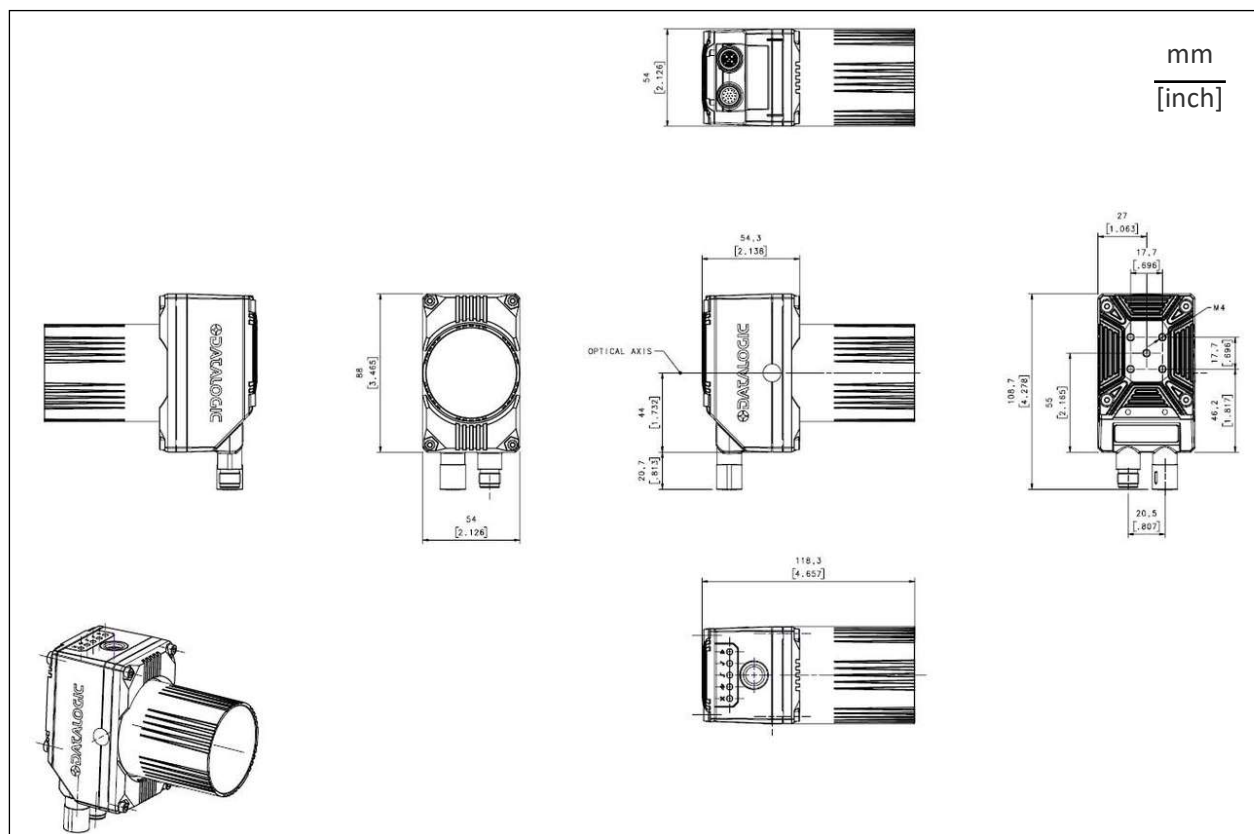


Figure 37 - Matrix 320 (C-Mount) without illuminator (connectors 0°)

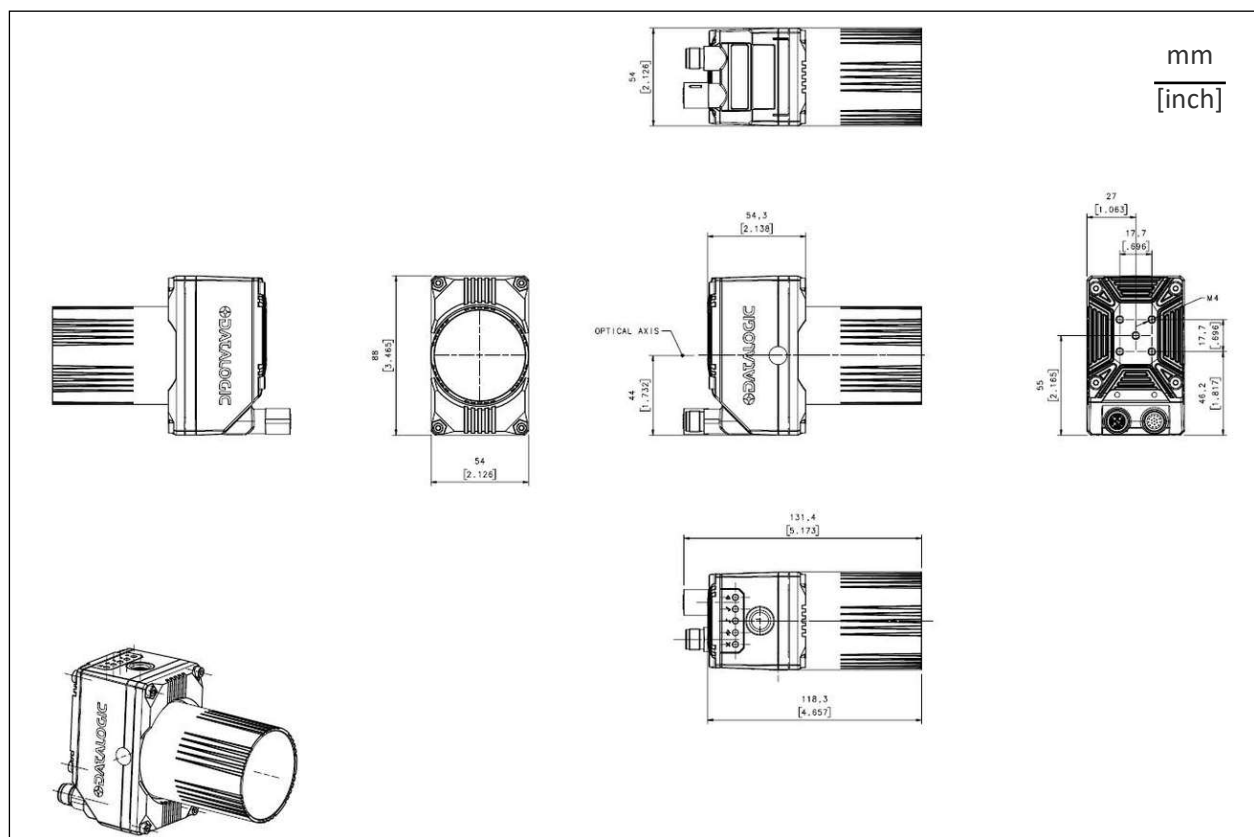


Figure 38 - Matrix 320 (C-Mount) without illuminator (connectors 90°)

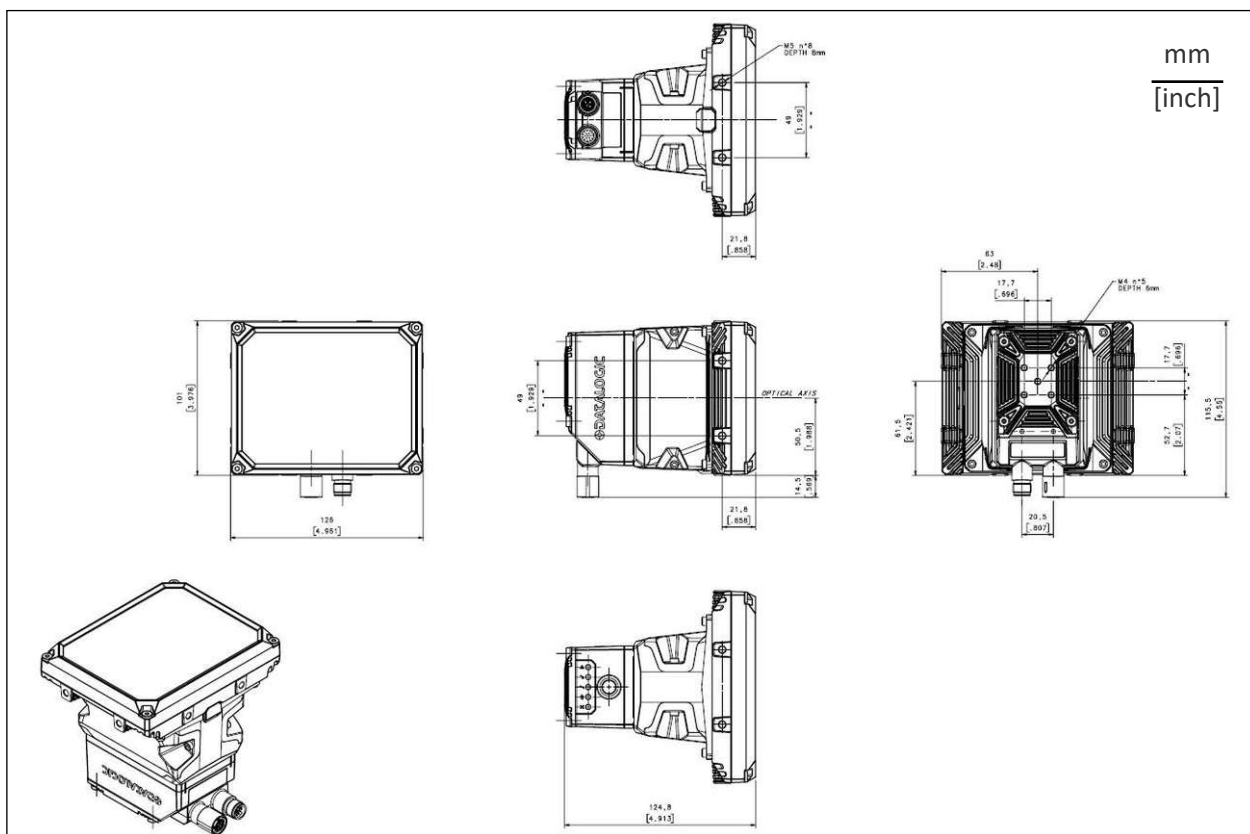


Figure 39 - Matrix 320 (C-Mount) with 36 LEDs illuminator (connectors 0°)

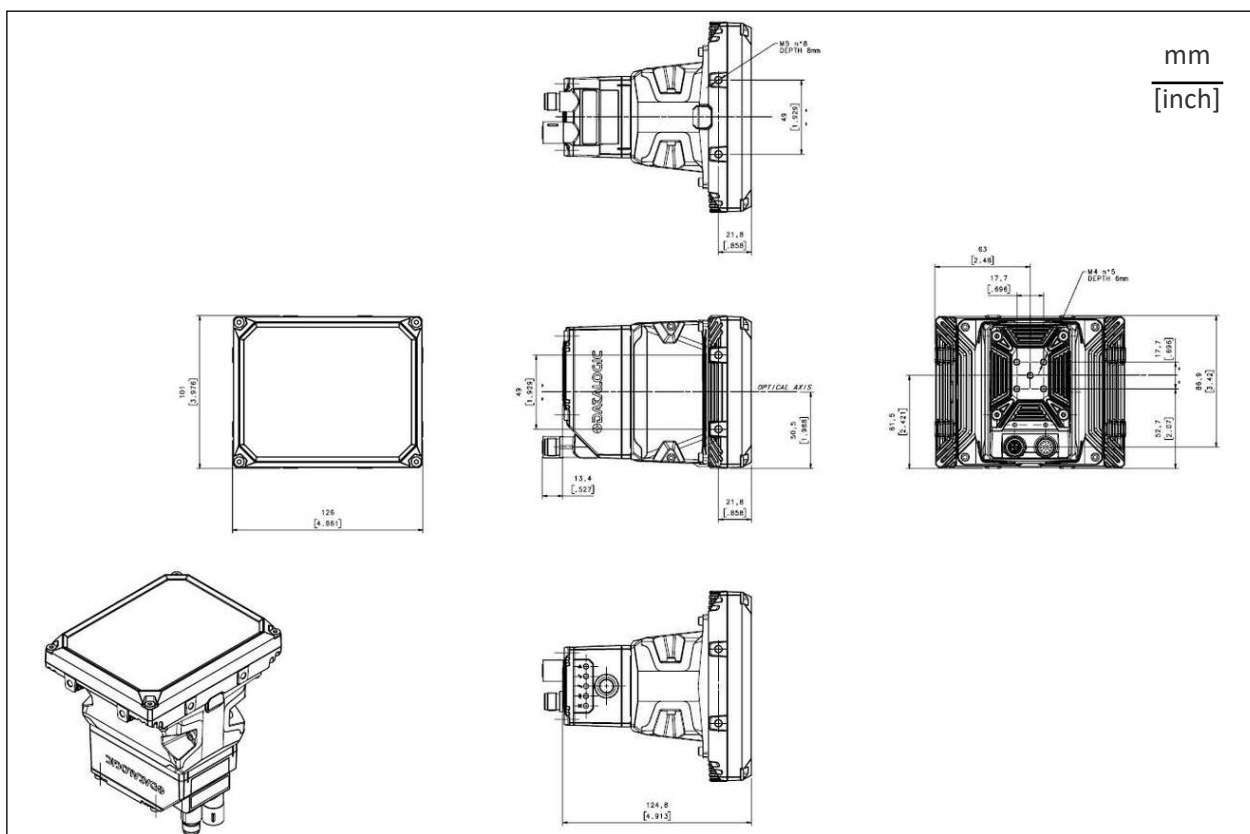


Figure 40 - Matrix 320 (C-Mount) with 36 LEDs illuminator (connectors 90°)

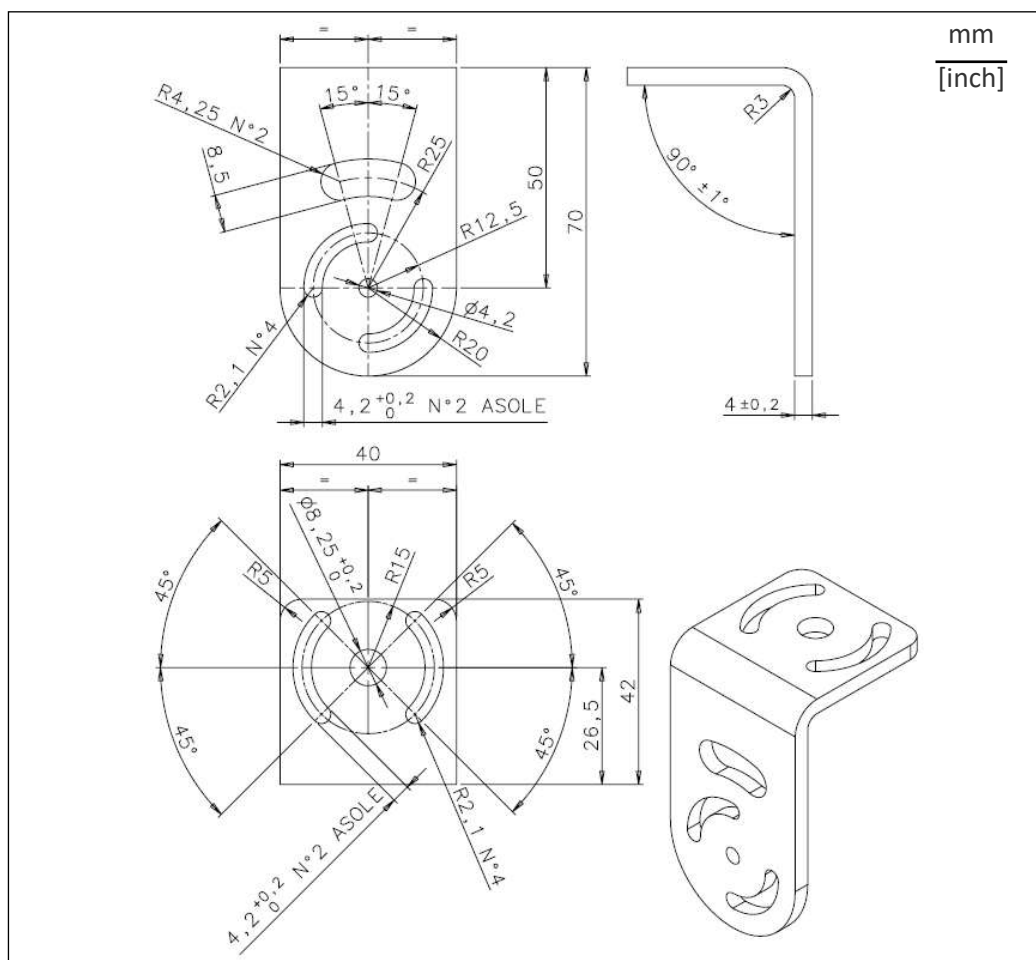


Figure 41 - Overall Dimensions: BK-32-000 Standard Fix Bracket for Matrix 320 with 14 LEDs illuminator



Figure 42 - Overall Dimensions: BK-32-010 Pivot Fix Bracket (1) for Matrix 320 with 36 LEDs illuminator

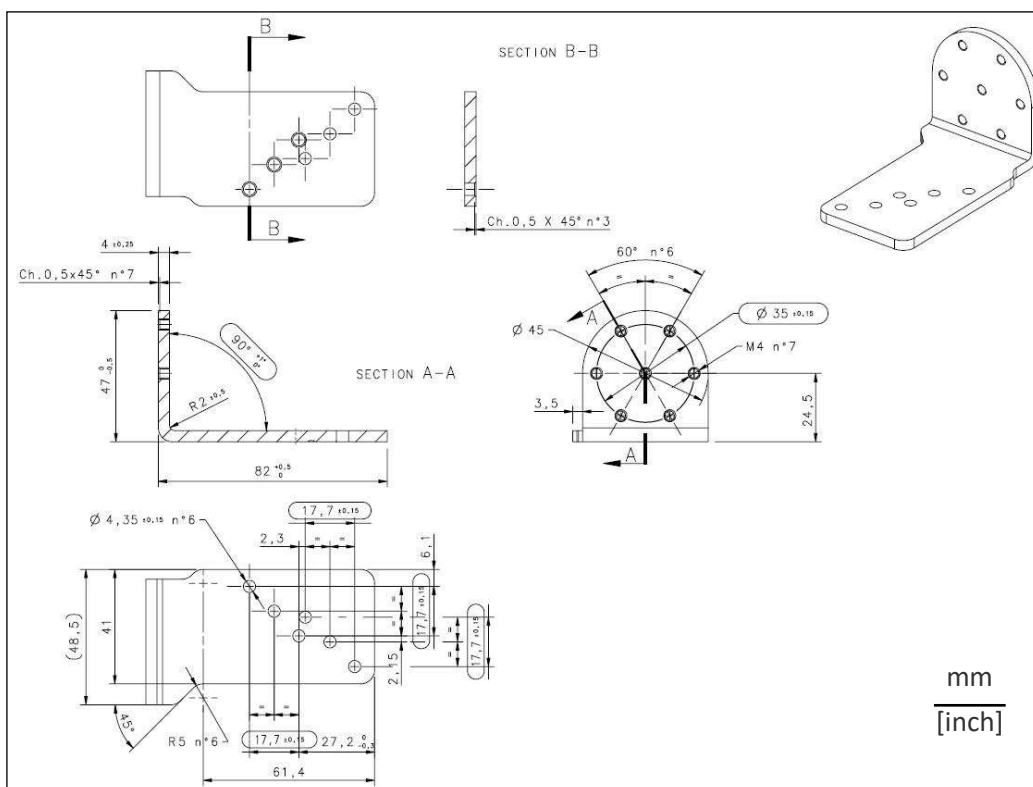


Figure 43 - Overall Dimensions: BK-32-010 Pivot Fix Bracket (2) for Matrix 320 with 36 LEDs illuminator

## MOUNTING AND POSITIONING MATRIX 320 2MP

The following accessory mounting brackets are available for mounting and positioning Matrix 320 2mp:

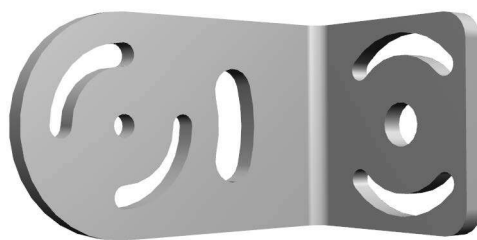


Figure 44 - BK-32-000 Standard Fix Bracket



Figure 45 - BK-32-010 Pivot Fix Bracket



**NOTE:** BK-32-000 Standard Fix Bracket can be used with Matrix 320 Liquid Lens models with 14 LED illuminator and C-Mount models without embedded illuminator.

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

## Mounting the BK-32-00 Standard Fix Bracket



**NOTE:** BK-32-000 Standard Fix Bracket can be used with Matrix 320 Liquid Lens models with 14 LED illuminator and C-Mount models without embedded illuminator.

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

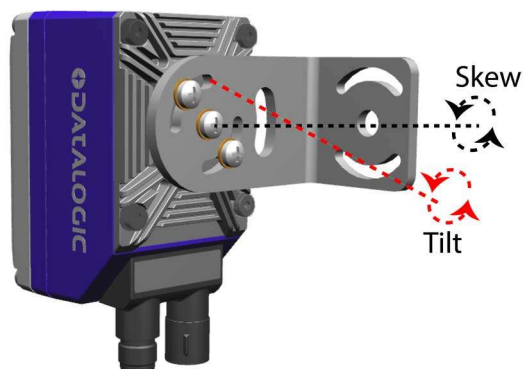
- 1 Standard Fix Bracket
- 3 silver screws
- 3 silver washers



**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 46 - 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:

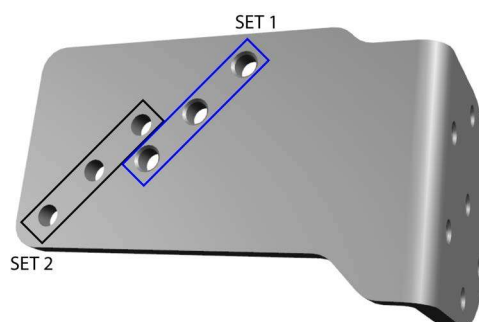
- 1 Pivot Fix Bracket (body side)
- 1 Pivot Fix Bracket (frame side)
- 6 silver screws
- 6 silver washers



**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 47):

- SET 1 with countersunk holes, used for [Compact Mounting](#);
- SET 2 with standard holes, used for [Extended Mounting](#).



**Figure 47 - 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.

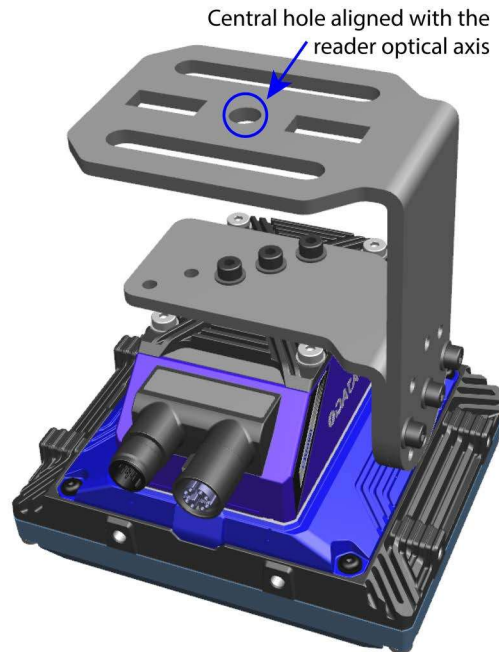


Figure 48 - Compact mounting

## 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):

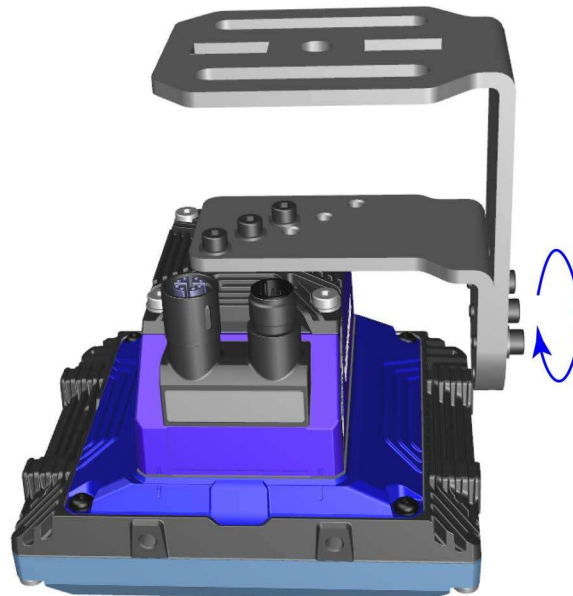
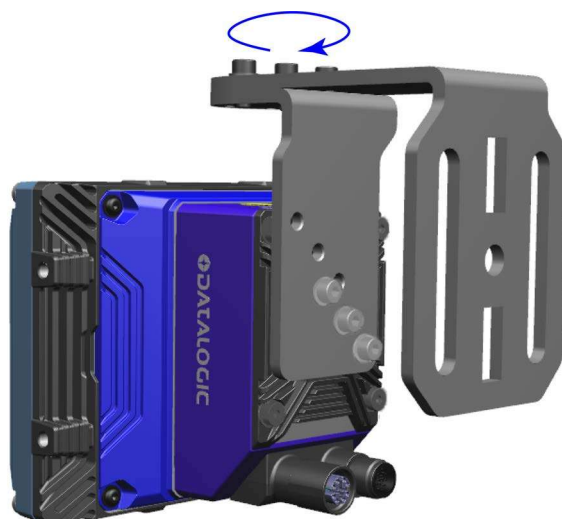


Figure 49 - Extended mounting

- frontal installations:



**Figure 50 - 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 51 - Skew angle adjustment**

Matrix 320 2mp is able to decode code labels at a variety of angles; however significant angular distortion may degrade reading performance.

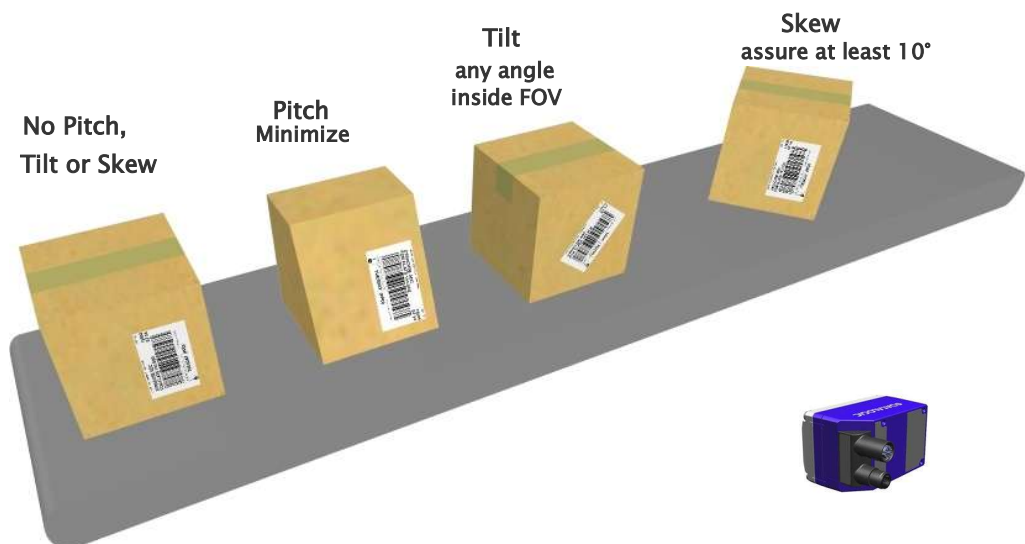
When mounting Matrix 320 2mp, take into consideration these **ideal** label position angles: **Pitch or Skew 10° to 20° and Tilt 0°**.



**NOTE:** Since Matrix 320 2mp 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 52. 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 2mp reader; it is advised to **assure at least 10°** for the Skew angle.



**Figure 52 - 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 52. Matrix 320 2mp 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.

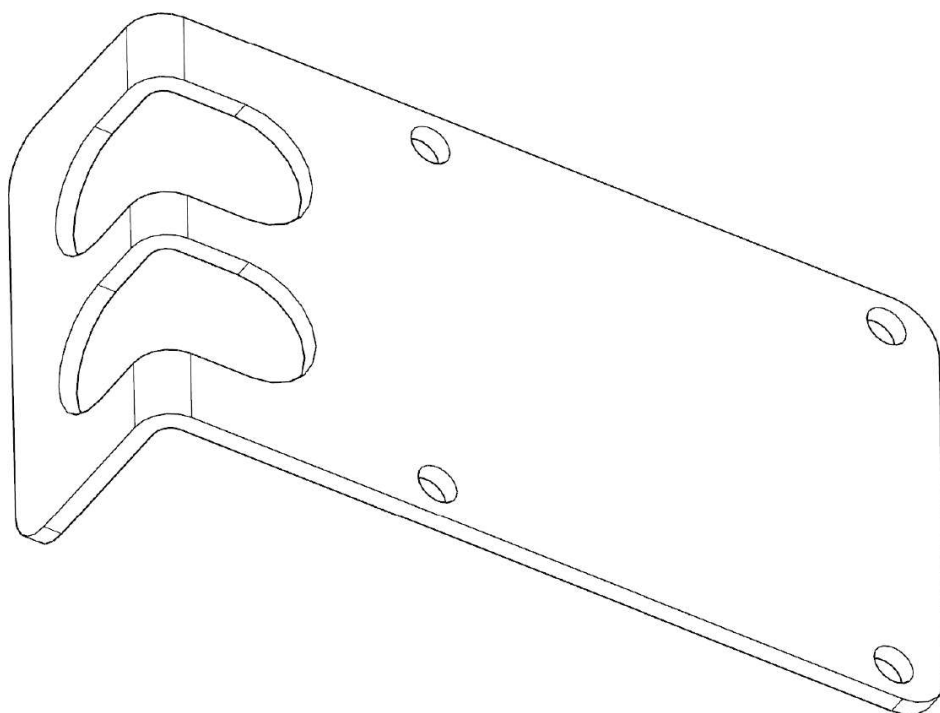
## Mounting the BK-32-030 Safety bracket Rot-Con



**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 53 - 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 65 or
- see "Installation with BK-32-020 Fast replacement bracket" on page 69



**NOTE:** For proper use and correct installation of the BK-32-020 Fast replacement brackets accessory, please refer to the dedicated installation manual.

## 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.

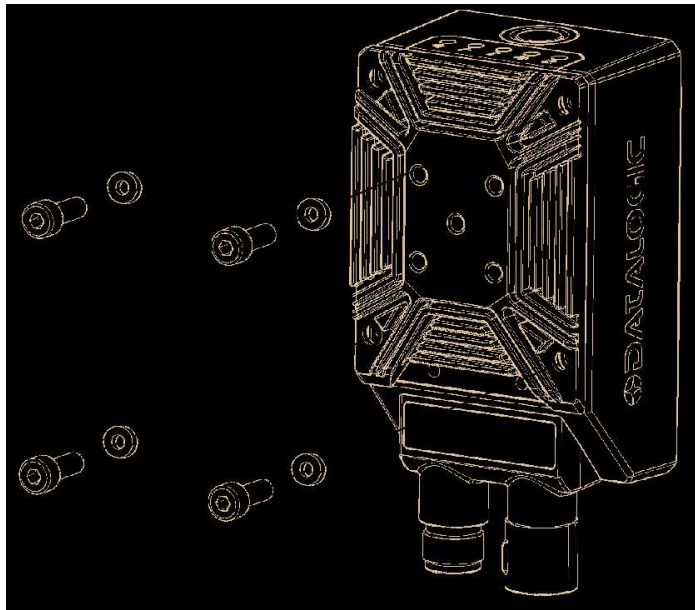


Figure 54 - Preliminary operation



**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:

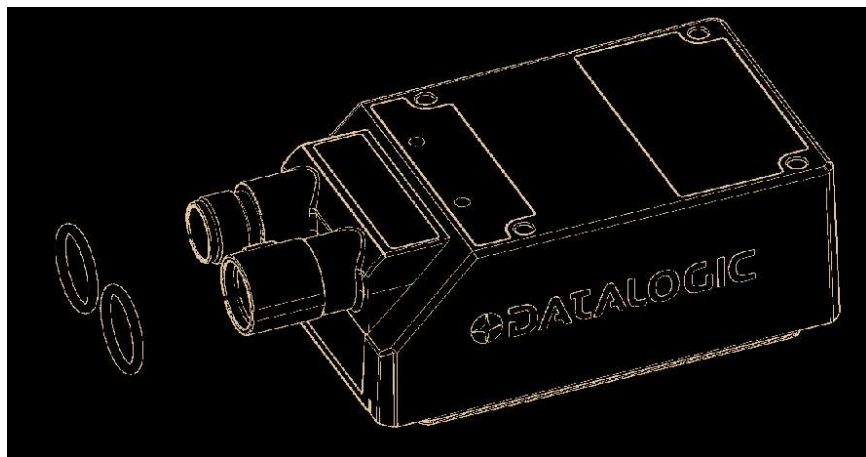
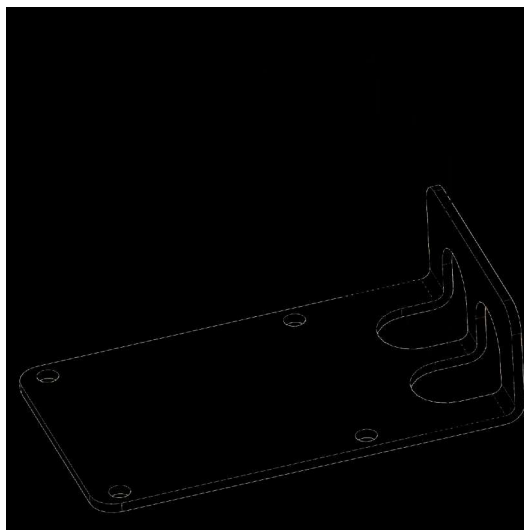


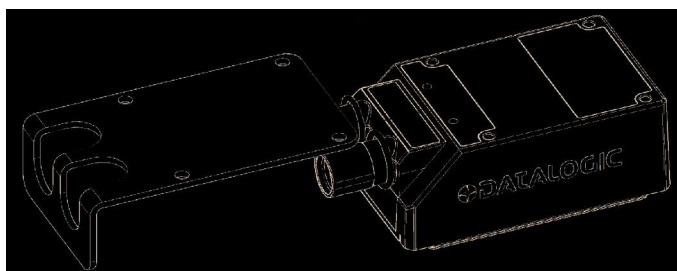
Figure 55 - O-Ring installation

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



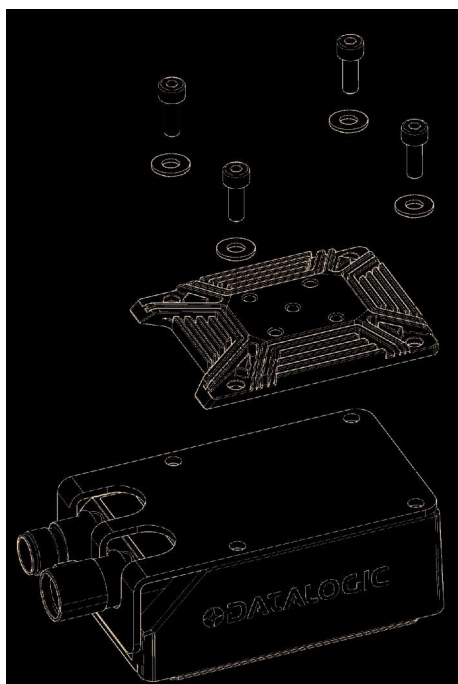
**Figure 56 - Elastic spacers installation**

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



**Figure 57 - BK-32-030 installation**

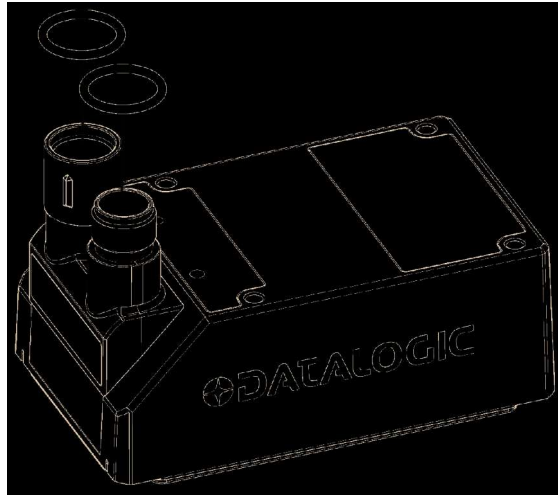
4. Reassemble the heatsink onto the Matrix using the washers removed previously and the M4x10 DIN7984 screws provided with the bracket:



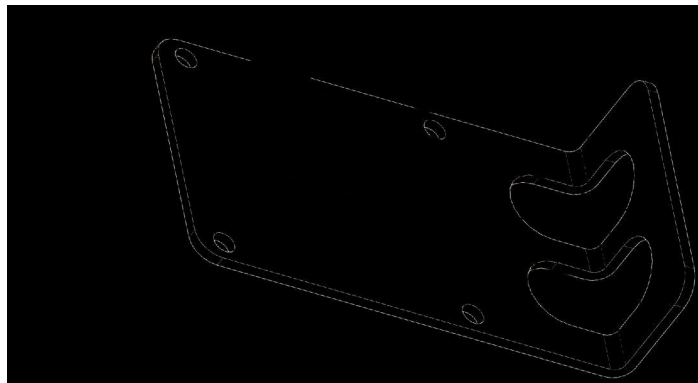
**Figure 58 - Reassembly**

**Connector at 90°:**

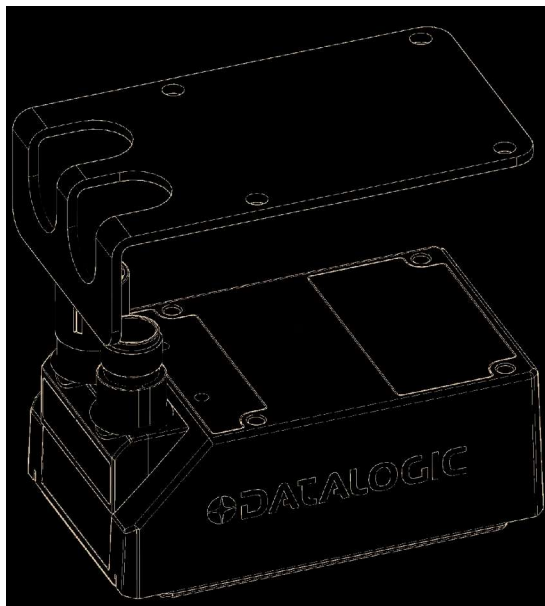
1. Insert the O-rings into the connectors:

**Figure 59 - O-Ring installation**

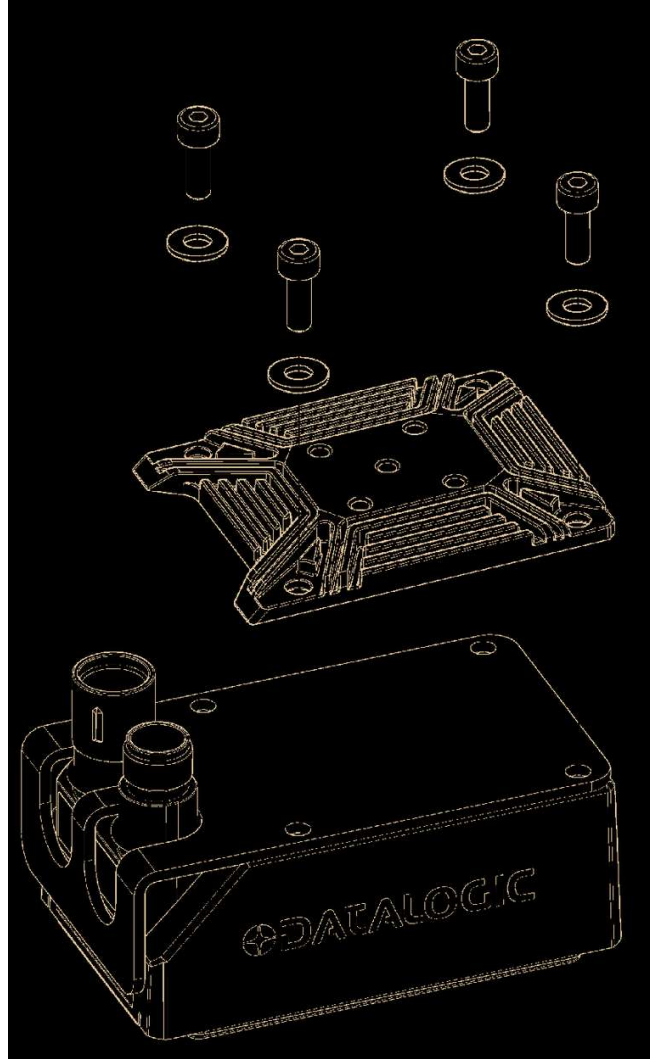
2. Removing the protective film and apply the elastic spacers on the Safety bracket as shown in the figure:

**Figure 60 - Elastic spacers installation**

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

**Figure 61 - 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 62 - 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 Rotating plate assembly from the Mounting brackets.
- remove the Fast Replacement Plate from the Matrix 320.

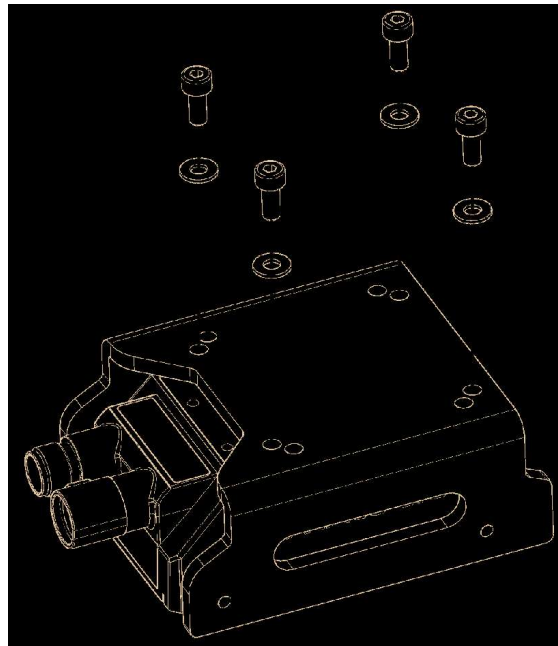


Figure 63 - Preliminary operation



**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:

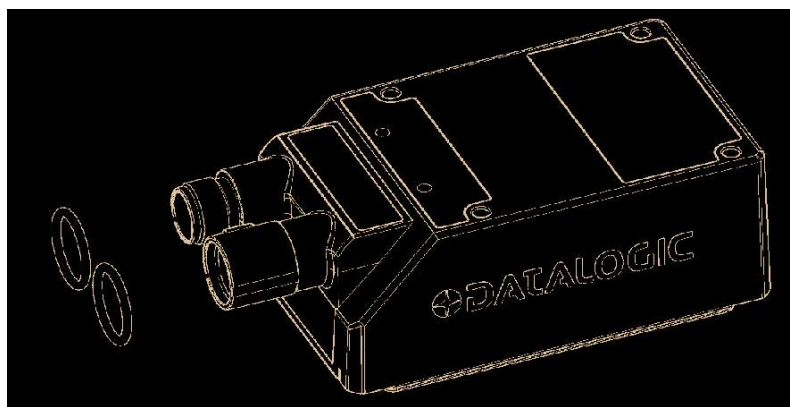
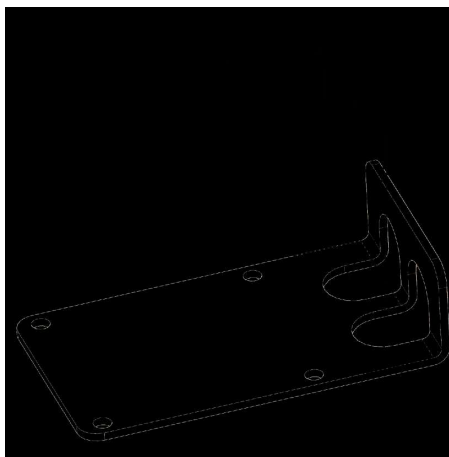


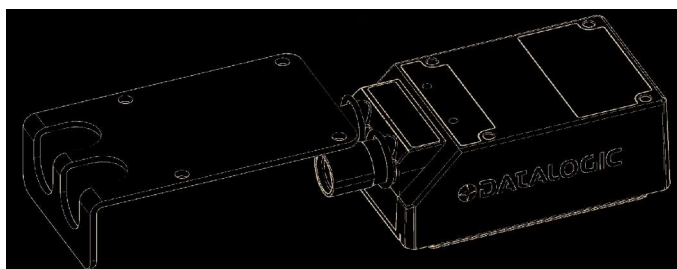
Figure 64 - O-Ring installation

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



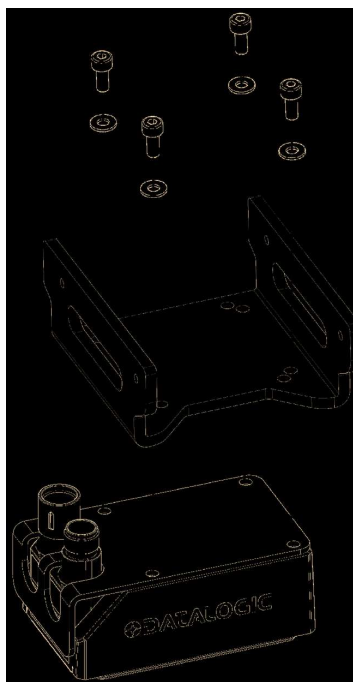
**Figure 65 - Elastic spacers installation**

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:

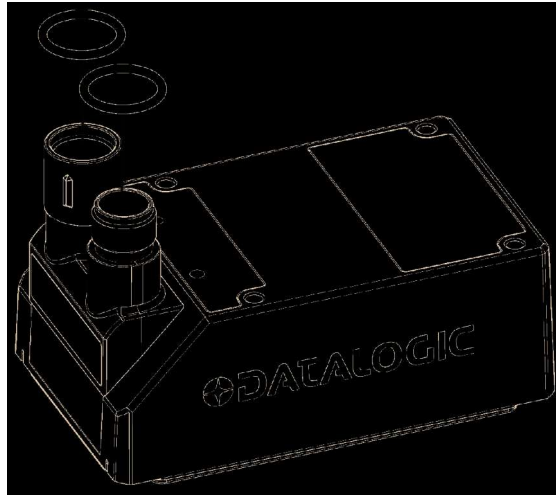


**Figure 67 - Reassembly**

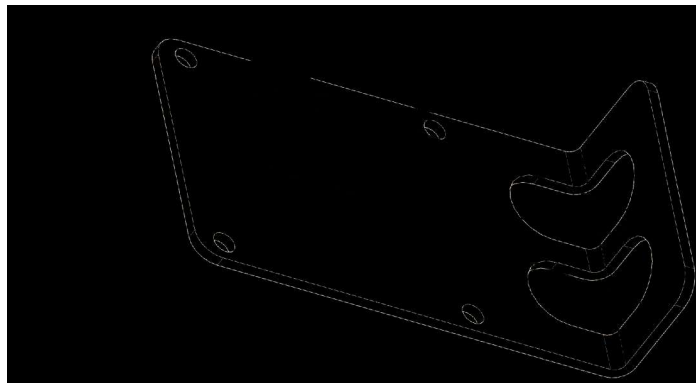
5. Complete the mounting of the full bracket.

**Connector at 90°:**

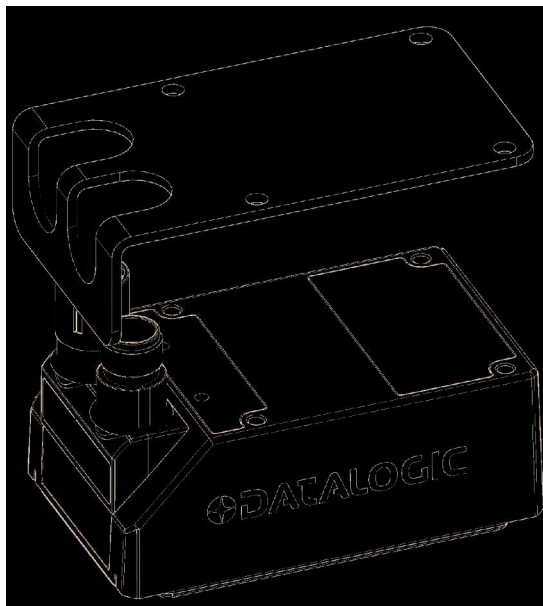
1. Insert the O-rings into the connectors:

**Figure 68 - O-Ring installation**

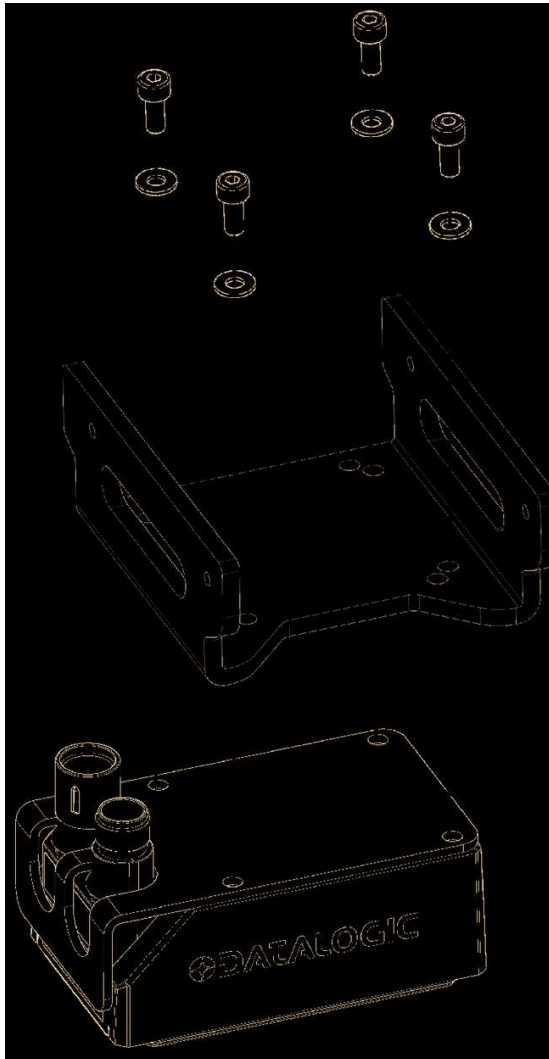
2. Removing the protective film and apply the elastic spacers on the Safety bracket as shown in the figure:

**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**

5. Complete the mounting of the full bracket.

## MOUNTING WITH EMK MIRRORS

Accessory EMK series External Deflection Mirrors can be mounted in all applications where it is not practical to use the full DOF of the reader. In these cases a more compact reading station can be constructed. This is particularly useful in side reading applications.

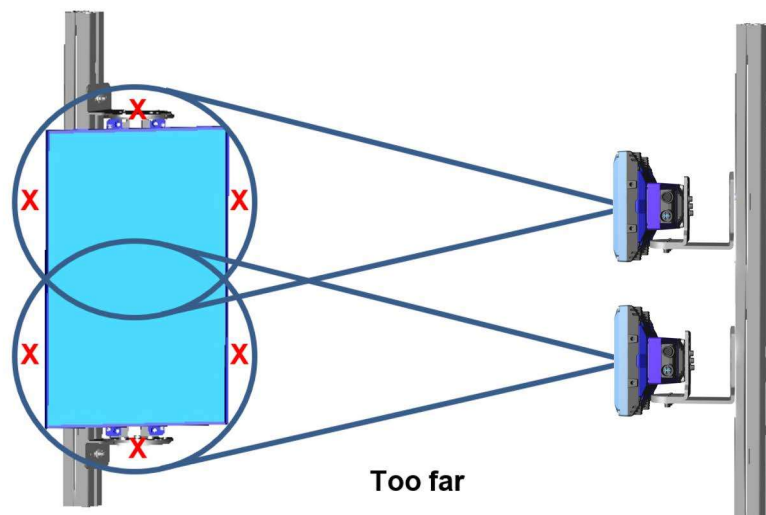
The following paragraphs describe common mounting positions which help maintain reader to mirror alignment, however many variations can be constructed.



**NOTE:** For all of the following mounting examples, the positioning distances are not given since they depend on the application and characteristics of the reader, (lens, focus, etc.). Follow your application drawings for this information.



**CAUTION:** Do not mount the reader so far from the mirror that the reading area extends outside of the mirror surface.



The EMK Mirror Bracket has some pre-defined skew angle slots to facilitate mounting. These are the angles that will be projected onto the conveyor surface (reflection angles).

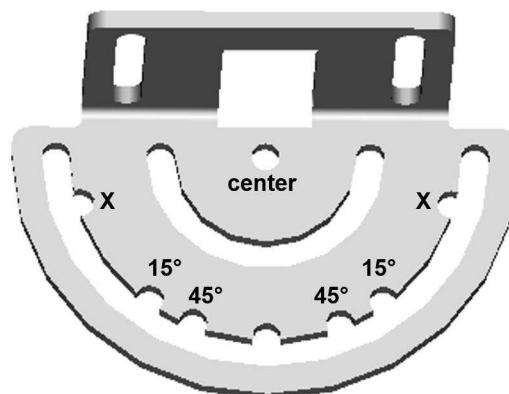
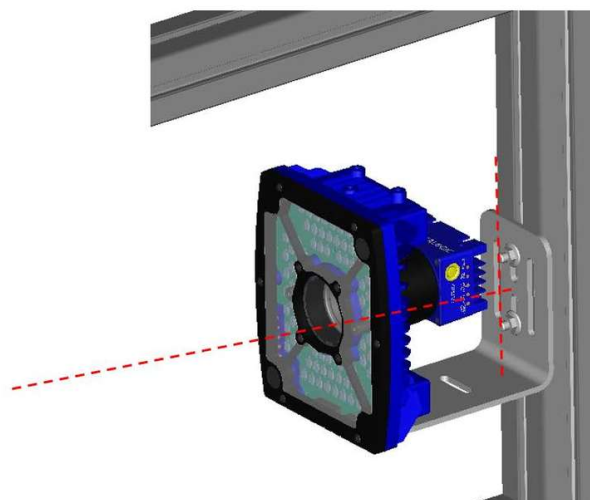
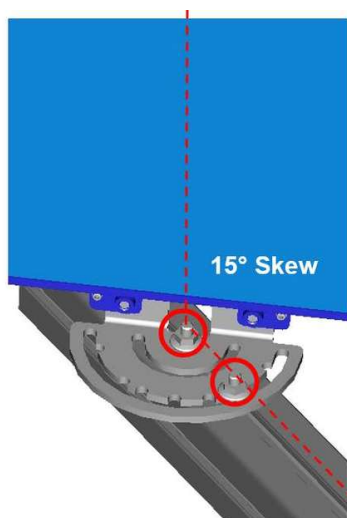
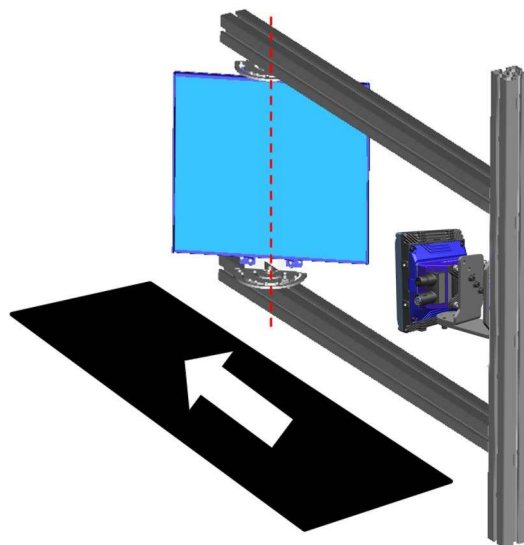


Figure 72 - Mirror Mounting Bracket

## EMK-380 Side Mount - Standard

Matrix 320 2mp and EMK-380 Mirror alignment is maintained when the EMK is mounted directly to the frame profiles. The skew angle is made at the mirror instead of at the reader.

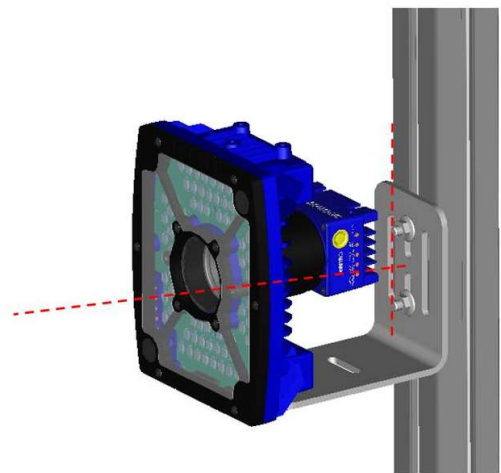
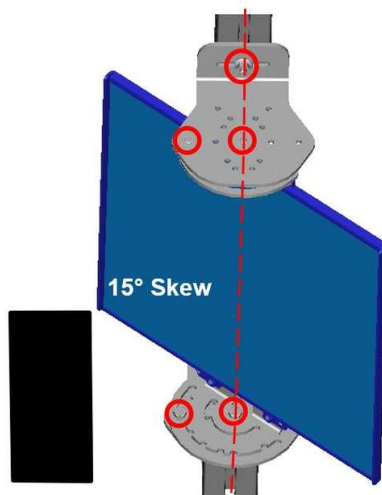
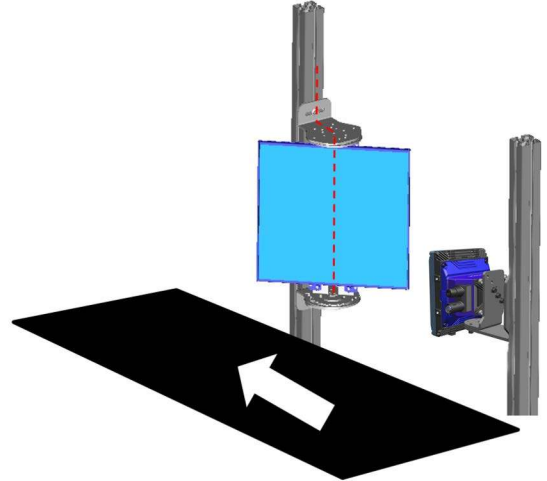
1. Mount the mirror brackets to the profiles with one bolt in the center position and one bolt in the outer ring.
2. Rotate the mirror brackets so that the 15° skew angle slot is aligned with the profile channel (see figure below).
3. Mount the Matrix reader through the center slots of the L-bracket to the profile.
4. Move the mirror assembly to the correct distance from the reader according to your application.
5. Move the Matrix reader vertically to center it on the mirror.
6. Tighten the bolts.



## EMK-380 Side Mount - Alternative

An alternative mounting solution is to use the BK-90-040 brackets included in the package. Matrix 320 2mp and EMK-380 Mirror alignment is obtained when the EMK is centered to the frame profiles as shown in the figures below. These brackets also provide the freedom of applying offsets to the mirror where necessary.

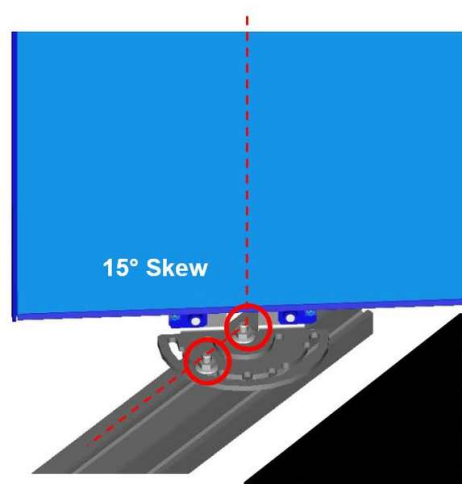
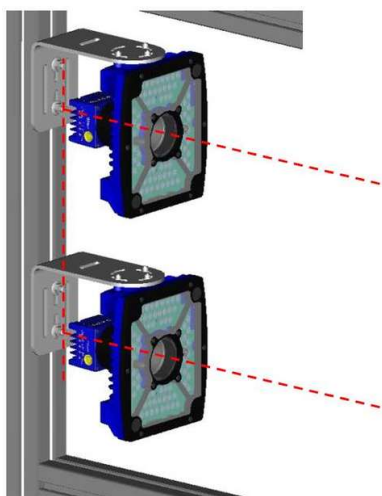
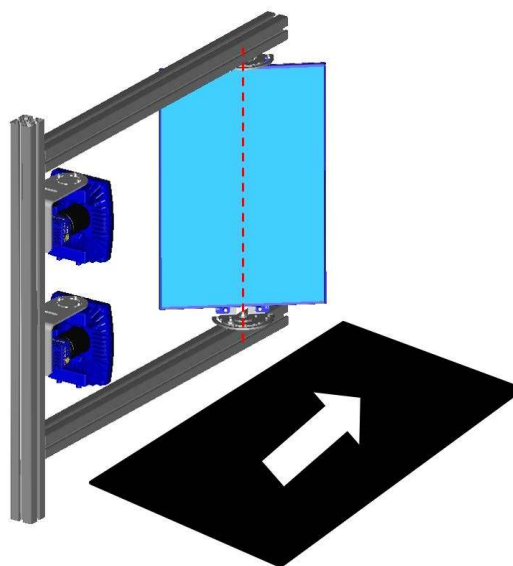
1. Mount and center the BK-90-040 brackets on the vertical profile.
2. Mount the mirror brackets to the BK-90-040 brackets with one bolt in the center position and one bolt in the outer ring.
3. Rotate the mirror brackets so that the 15° skew angle slot is aligned with the profile channel (see figure below).
4. Mount the Matrix reader through the center slots of the L-bracket to the profile.
5. Move the mirror assembly to the correct distance from the reader according to your application.
6. Position the Matrix reader vertically to center it on the mirror.
7. Tighten the bolts.



## EMK-600 Side Mount - Standard

The EMK-600 mirror can be used together with two Matrix 320 2mp readers in applications where a larger Field of View (FoV) is required. Matrix 320 2mp and EMK-600 Mirror alignment is maintained when the EMK is mounted directly to the frame profiles. The skew angle is made at the mirror instead of at the reader.

1. Mount the mirror brackets to the profiles with one bolt in the center position and one bolt in the outer ring.
2. Rotate the mirror brackets so that the 15° skew angle slot is aligned with the profile channel (see figure below).
3. Mount the Matrix readers through the center slots of the L-bracket to the profile.
4. Move the mirror assembly to the correct distance from the readers according to your application.
5. Position the Matrix readers vertically to center them on the mirror.
6. Tighten the bolts.



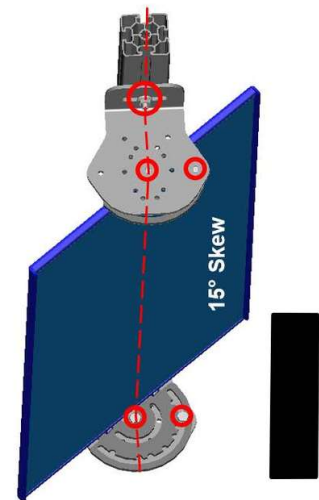
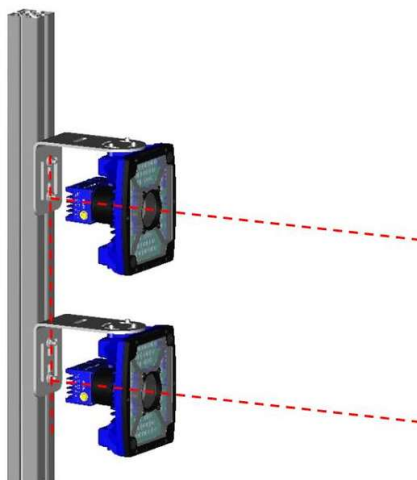
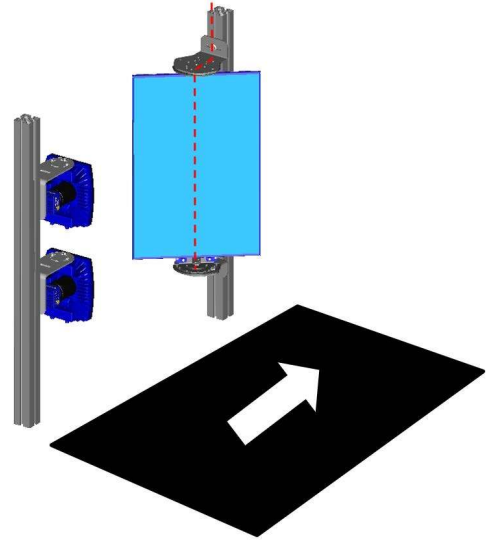
## EMK-600 Side Mount - Alternative

An alternative mounting solution is to use the BK-90-040 brackets (separate accessory). Matrix 320 2mp readers and EMK-600 Mirror alignment is obtained when the EMK is centered to the frame profiles as shown in the figures below. These brackets also provide the freedom of applying offsets to the mirror where necessary.



**NOTE: The BK-90-040 brackets are a separate accessory for alternative mounting of the EMK-600 Deflection Mirror.**

1. Mount and center the BK-90-040 brackets on the vertical profile.
2. Mount the mirror brackets to the BK-90-040 brackets with one bolt in the center position and one bolt in the outer ring.
3. Rotate the mirror brackets so that the 15° skew angle slot is aligned with the profile channel (see figure below).
4. Mount the Matrix readers through the center slots of the L-bracket to the profile.
5. Move the mirror assembly to the correct distance from the readers according to your application.
6. Position the Matrix readers vertically to center them according to your application drawings.
7. Tighten the bolts.



## MATRIX 320 2MP C-MOUNT MOUNTING INSTRUCTIONS

### Mounting Instructions for Matrix 320 2mp C-Mount without illuminator



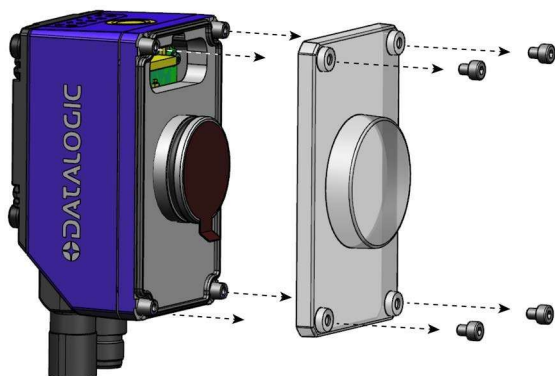
**CAUTION:** Before starting the procedure, make sure the reader is powered off.



**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.

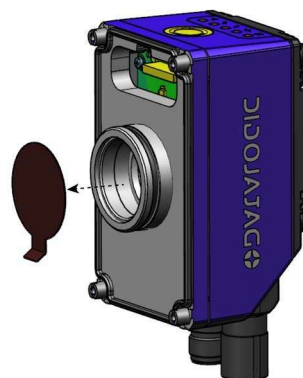


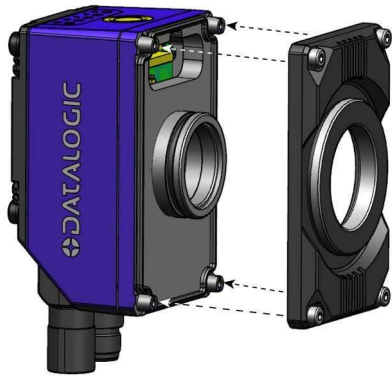
**CAUTION:** Observe ESD precautions when installing or removing a filter, cover, illuminator or other accessories.



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 3B - 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 83).

## Mounting instructions for Matrix 320 2mp with 36 LED illuminator



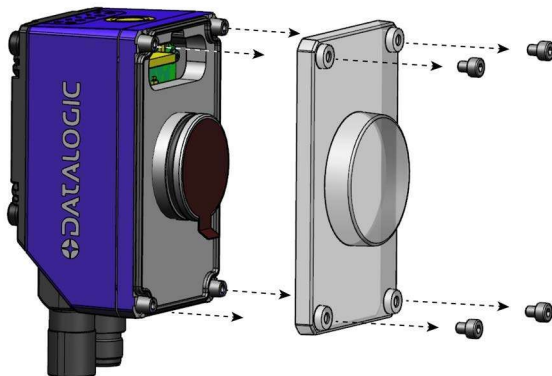
**CAUTION:** Before starting the procedure, make sure the reader is powered off.



**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.

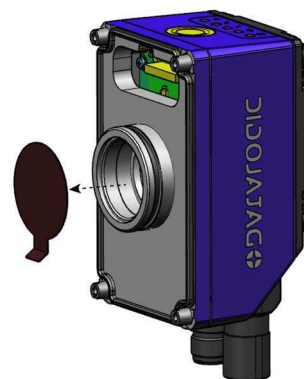


**CAUTION:** Observe ESD precautions when installing or removing a filter, cover, illuminator or other accessories.



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.





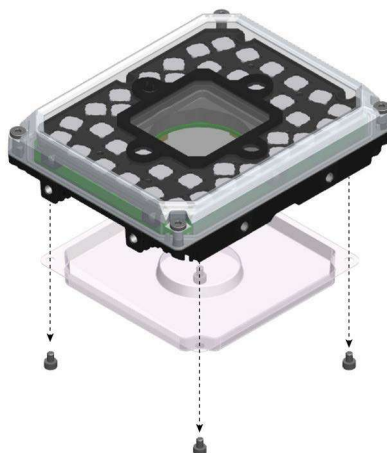
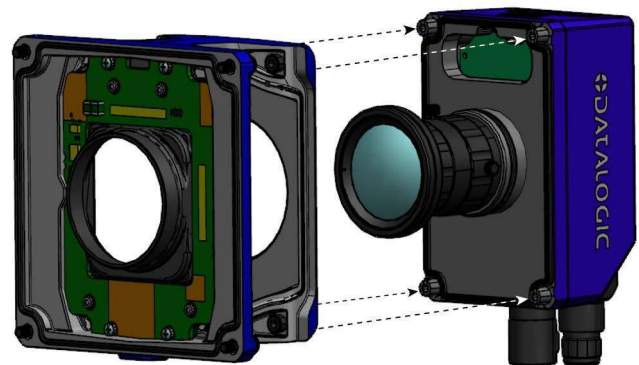
3. Mount the lens by screwing it tightly onto the base and set the lens aperture. If the lens locking knobs are pointing toward the short sides of the reader, insert the lens spacer between the anti-vibration O-ring and the lens to facilitate better access to the locking knobs later.



**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.

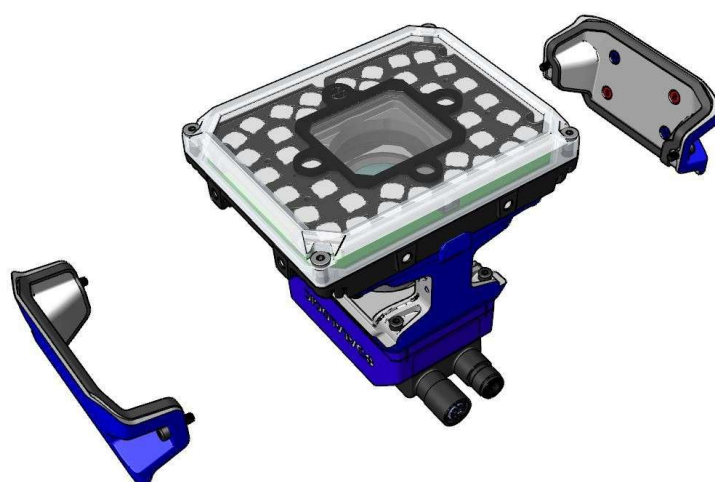
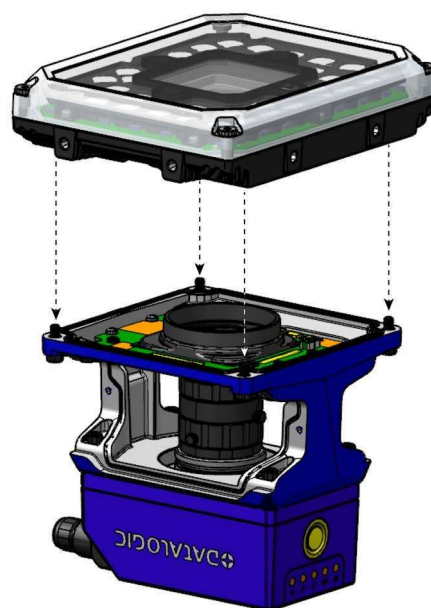


5. Remove the protective blister from the illuminator.



**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 3B - Focus the reader" on page 5.



8. Mount the adapter side covers. These come with 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 83).



**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 2mp 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 2mp reader, as shown in the figure below.
2. Tighten the screws



**CAUTION:** When the heat sink is installed on a Matrix 320 Liquid Lens model with 14 LEDs illuminator, the **Laser Class and Warning labels** applied to the device are no longer visible. Make sure to apply one of the **Laser Class labels** (in the relevant language) provided in the package on the Matrix 320 reader side.



**CAUTION:** For the Americas, please also apply the IEC certification label.

Complies with 21 CFR 1040.10 except for conformance with IEC 60825-1 Ed. 3, as described in Laser Notice No. 56, dated May 8, 2019



## ACCESSORY COVERS AND FILTERS

### Covers

#### Standard and ESD Covers



**Standard Cover LT 14 LEDs**



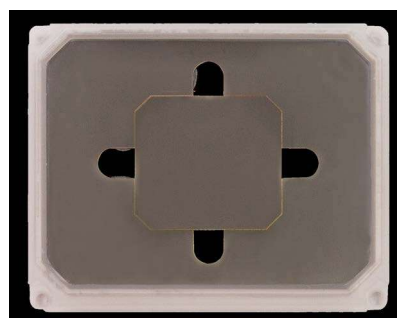
**Standard Cover LT 36 LEDs**

| DESCRIPTION              | ORDER NUMBER |
|--------------------------|--------------|
| Cover STD LT 14L M320/P2 | 93ACC0271    |
| Cover STD LT 36L M320/P2 | 93ACC0272    |
| Cover ESD LT 14L M320/P2 | 93ACC0278    |

#### Polarizing Covers



**Polarizing Cover LT 14 LEDs**



**Polarizing Cover LT 36 LEDs**

| DESCRIPTION                    | ORDER NUMBER |
|--------------------------------|--------------|
| Cover Polarizer LT 14L M320/P2 | 93ACC0273    |
| Cover Polarizer LT 36L M320/P2 | 93ACC0274    |

## Cover Replacement



**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 gas-ket. 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 73 and Figure 74.



Figure 73 - Removing the cover (14 LEDs model)



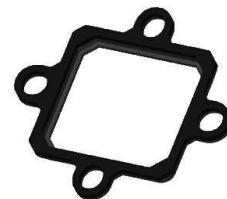
Figure 74 - Removing the cover (36 LEDs model)



**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  
(14 LEDs illuminator model)



Poron filter frame  
(36 LEDs illuminator model)



**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 75 and Figure 76). For the 14 LEDs model (Figure 75), make sure to align the identification grooves to the right side. For the 36 LEDs model (Figure 76), the illuminator has one pin different from the other three: make sure to align this special pin with the correspondent cover seat.

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



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

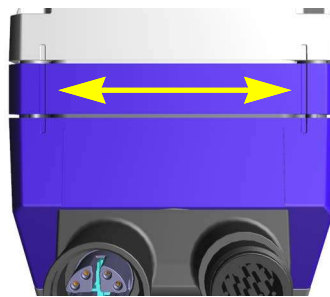


Figure 75 - Aligning the cover (14 LEDs model)

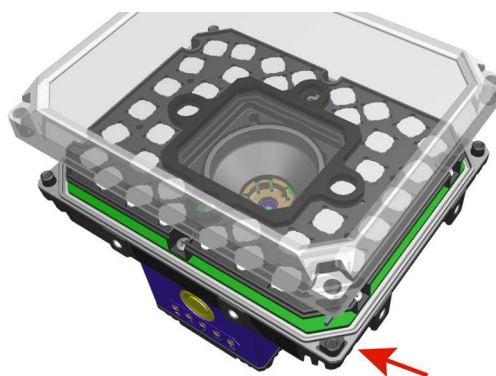


Figure 76 - Aligning the cover (36 LEDs model)

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

## Filters



| DESCRIPTION                               | ORDER NUMBER |
|-------------------------------------------|--------------|
| Filter YAG Cut LT 14L M320/P2             | 95A900018    |
| Filter YAG Cut LT 36L M320/P2             | 95A900022    |
| Half Polarizer Kit LT 14L M320/P2         | 93ACC0275    |
| Filter RED Bandpass 635nm LT 14L M320/P2  | 95A900015    |
| Filter BLU Bandpass 470nm LT 14L M320/P2  | 95A900016    |
| Filter IR Bandpass 850nm LT 14L M320/P2   | 95A900017    |
| 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 Longpass 415 LT 14L M320/P2 | 95A900039    |
| Filter UV Cut Longpass 415 LT 36L M320/P2 | 95A900040    |

### Filter Mounting Instructions



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

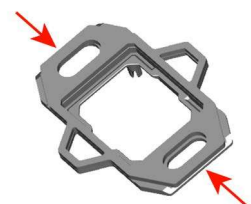


**CAUTION:** Make sure to operate in a dust-free environment during the cover replacement procedure.



**NOTE:** For correct use of the Half Polarizer, use DL.CODE software release 1.9.2 and later.

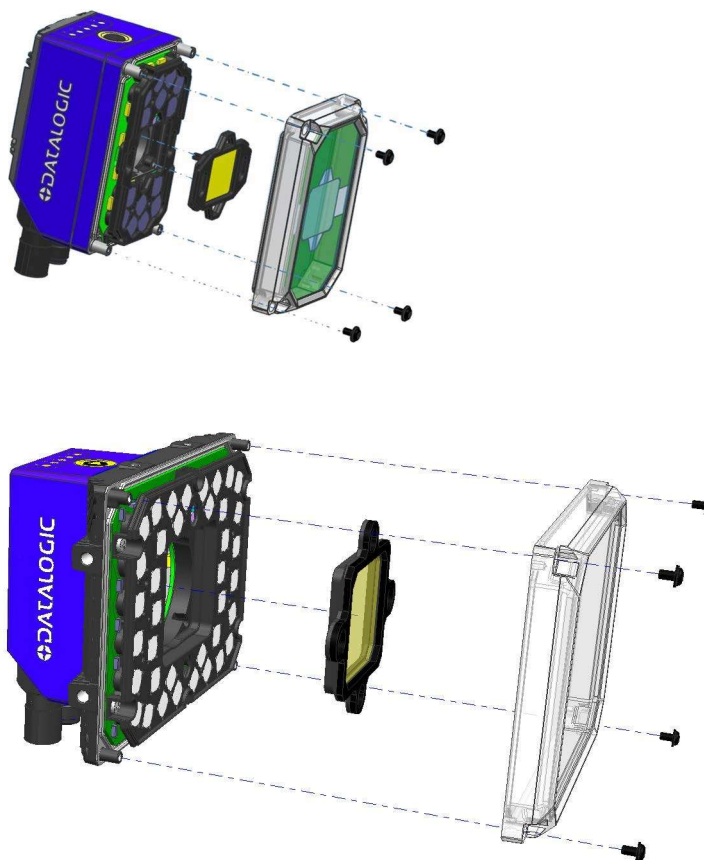
1. Temporarily remove the front cover. Refer to "[Cover Replacement](#)" on page 85.
2. Unmount the original light shield (or any other filter) grabbing it from the sides and pulling it up.



- 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.

- Finally, mount the cover back on the reader body. Refer to "Cover Replacement" on page 85.

# CHAPTER 4

## CBX ELECTRICAL CONNECTIONS

---

All Matrix 320 2mp 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 2mp 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.

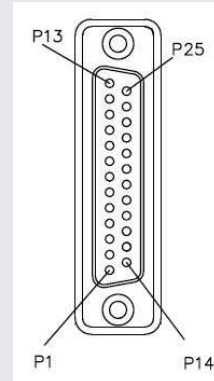
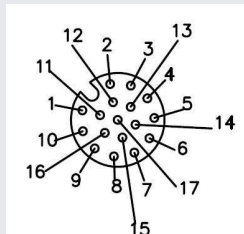
## CBX CONNECTION BOX PINOUT

The table below gives the pinout of the CBX100/500 terminal block connectors. Use this pinout when the Matrix 320 2mp 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      | <b>RS232</b> | <b>RS422 Full Duplex</b>                                     |
|                     | TX           | TX+                                                          |
|                     | RX           | *RX+                                                         |
|                     | -            | TX-                                                          |
|                     | -            | *RX-                                                         |
|                     | SGND         | SGND                                                         |

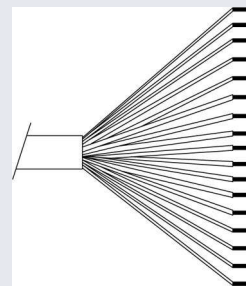
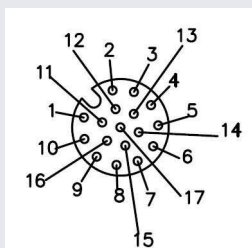
\* Do not leave floating, see ["RS422 Full Duplex Interface"](#) on page 95 for connection details.

## CAB-DS0x-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<br>Not connected |

## CAB-GD0x-S PINOUT



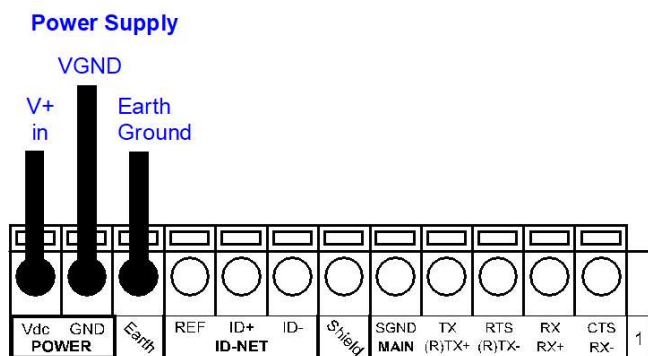
| 17 PINS | NAME   | STRIPPED WIRE COLOR |
|---------|--------|---------------------|
| 1       | VS     | Brown               |
| 2       | GND    | Blue                |
| 6       | XTRG_A | Yellow              |
| 5       | XTRG_B | Pink                |
| 13      | IN2A   | White/Green         |
| 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.

## POWER SUPPLY

Power can be supplied to the reader through the CBX100/500 spring clamp terminal pins as shown in Figure 77:



**Figure 77 - Power Supply Connections**

The power must be equal to 24 Vdc  $\pm$  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).

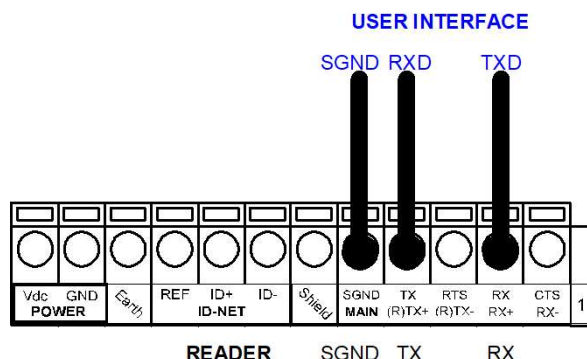


Figure 78 - RS232 Main Interface Connections

## RS422 Full Duplex Interface

The RS422 full-duplex (5 wires + shield) interface is used for non-pollled 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         |

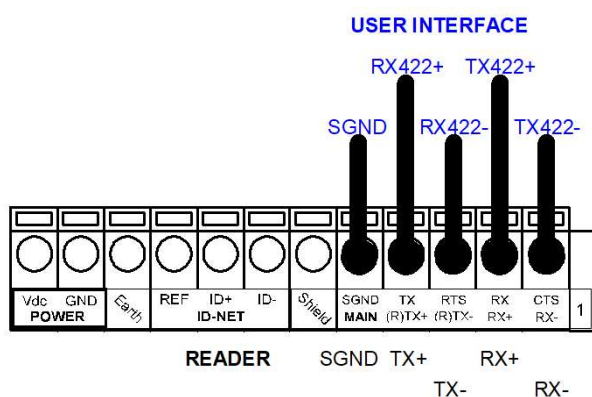


Figure 79 - RS422 Full Duplex Connections



**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.

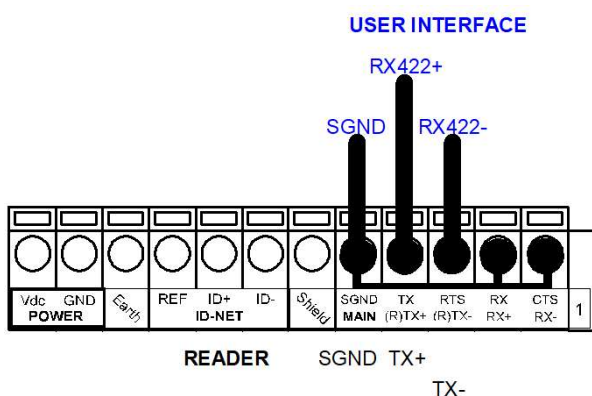


Figure 80 - RS422 Full Duplex Connections Using Only TX Signals to Host

## 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 82, Figure 83 and Figure 84.

- 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 | <b>500 kbps</b> | 1 Mbps |
| Cable Length   | 1200 m   | 900 m    | <b>700 m</b>    | *      |

\* 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.

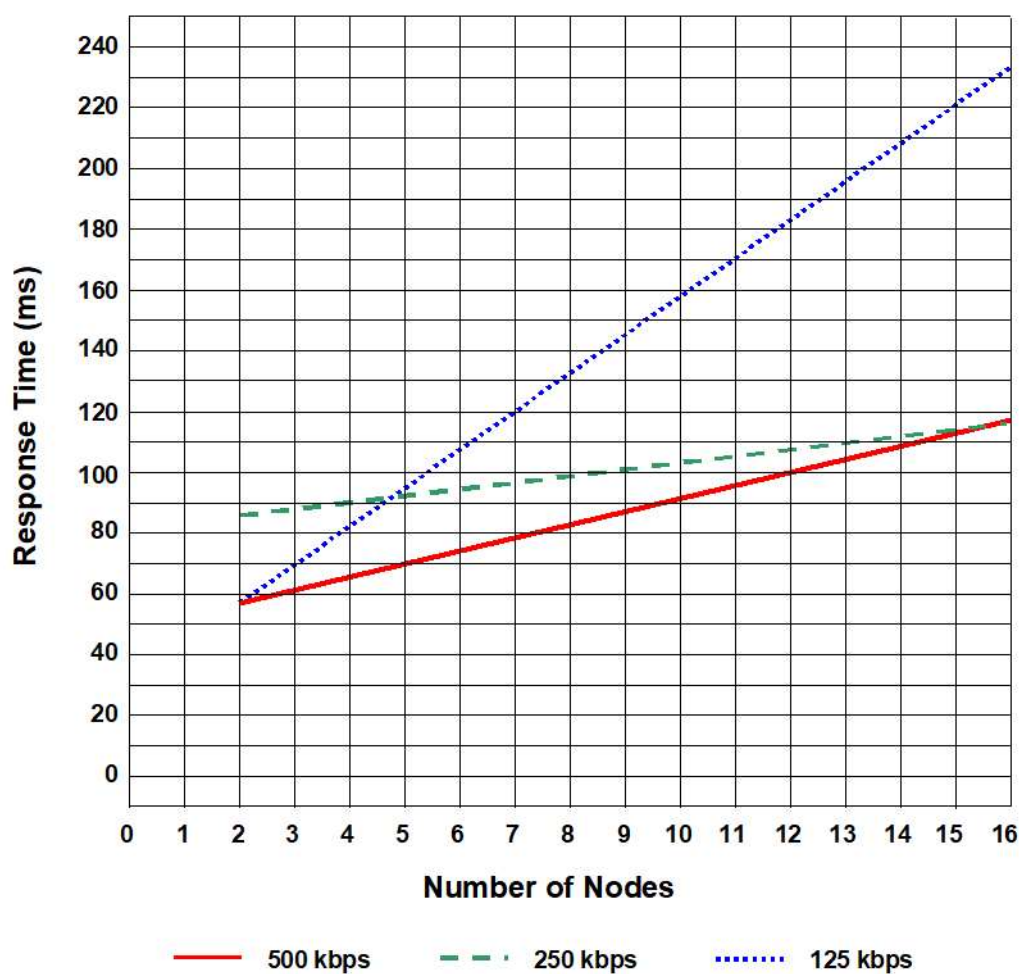


Figure 81 - ID-NET Response Time

### 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

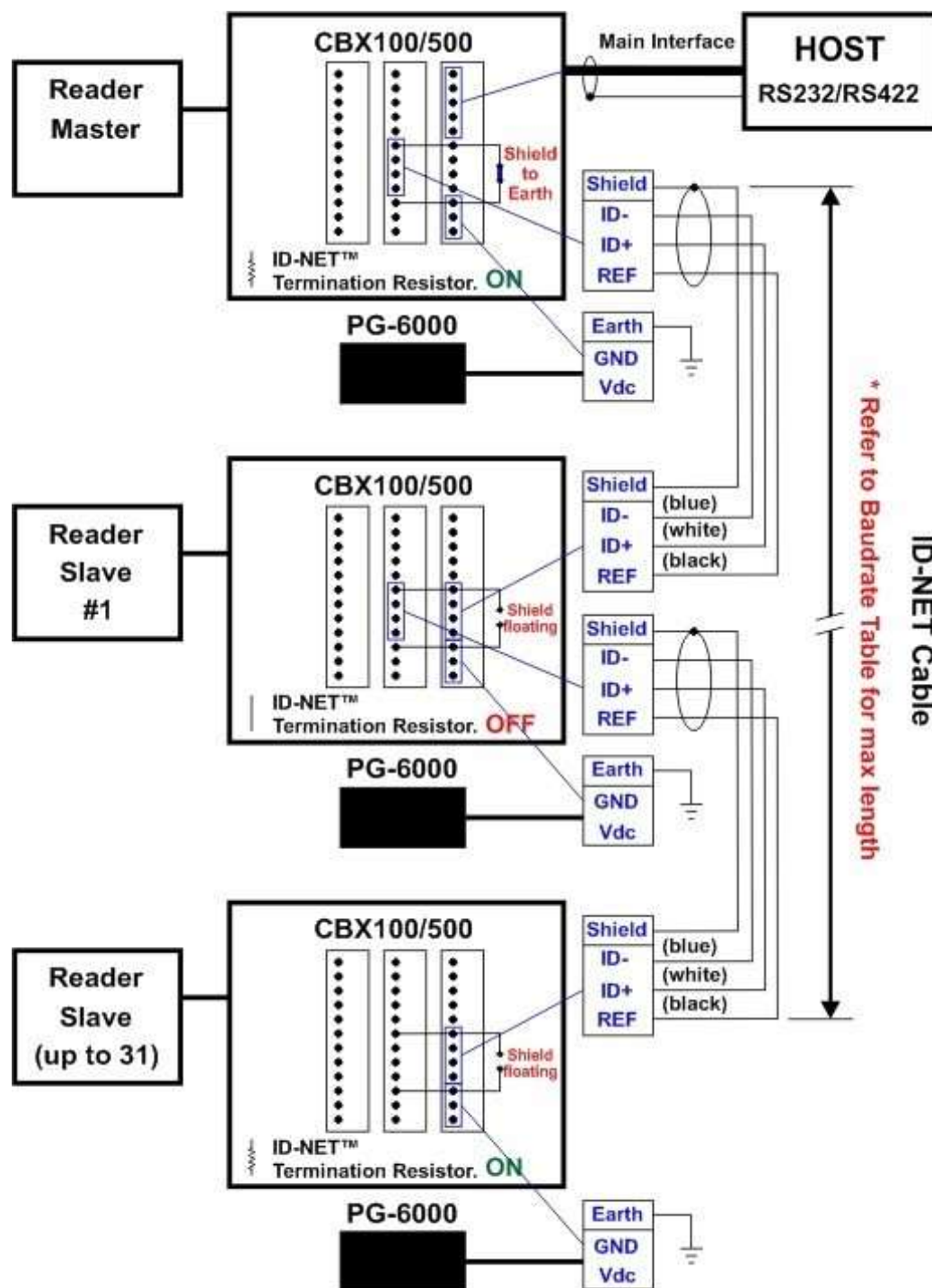


Figure 82 - ID-NET Network Connections with isolated power blocks

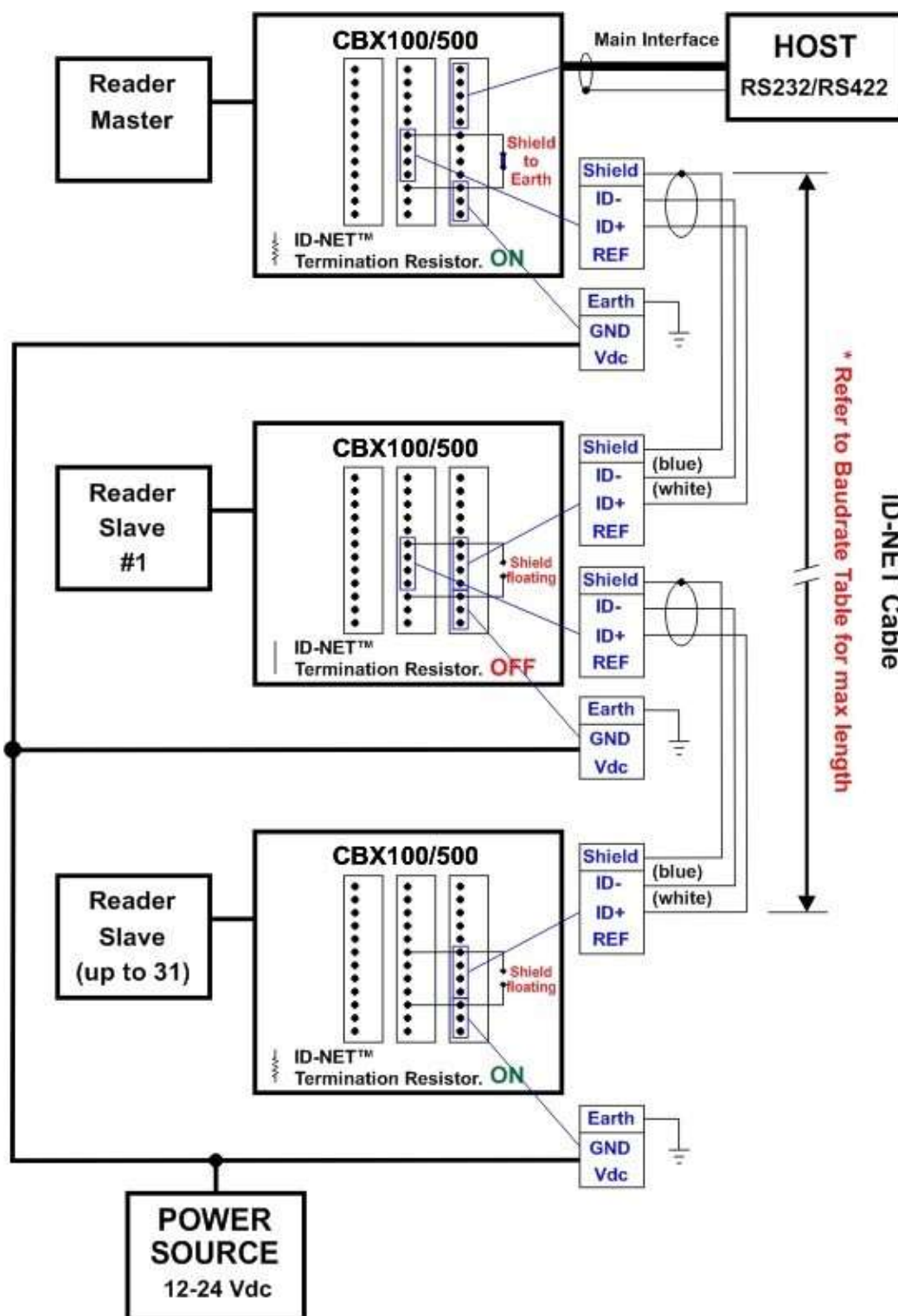


Figure 83 - ID-NET Network Connections with Common Power Branch Network

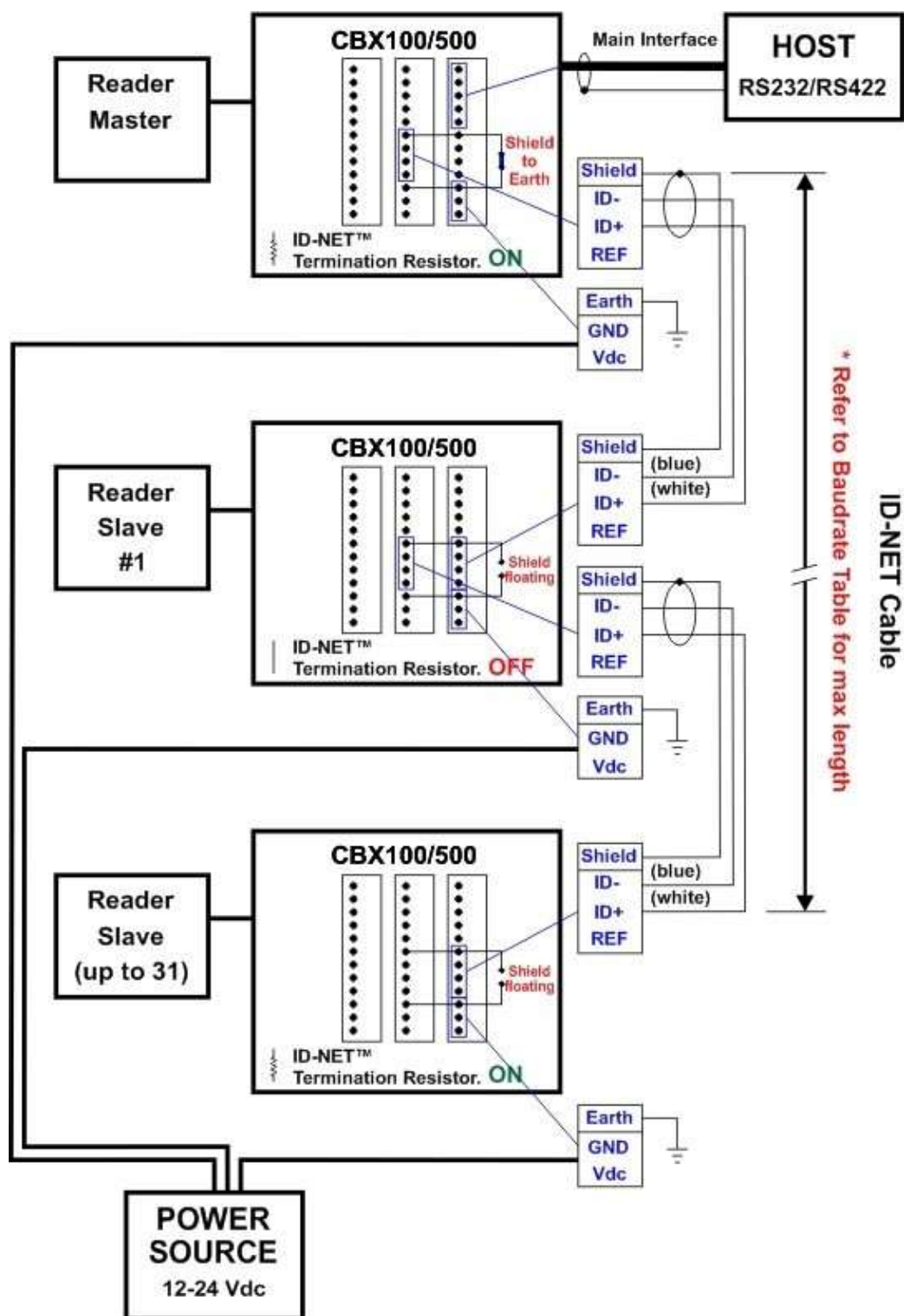


Figure 84 - ID-NET Network Connections with Common Power Star Network

# 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.

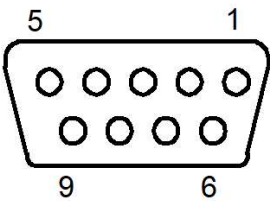


Figure 85 - 9-pin female connector

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     |

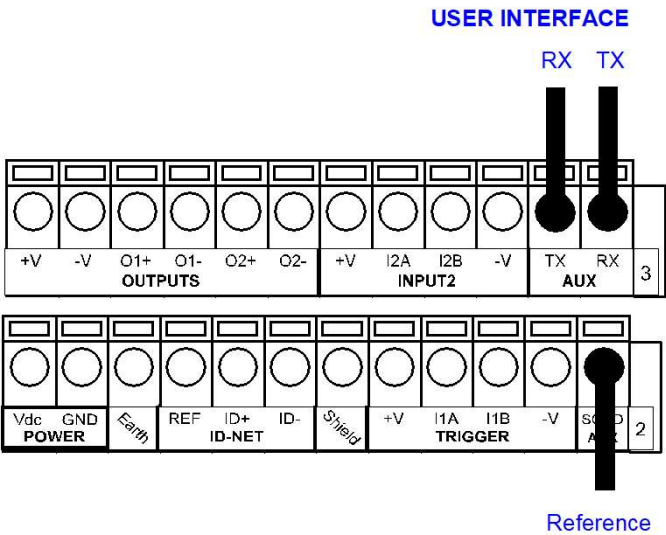


Figure 86 - RS232 Auxiliary Interface Connections



**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:

$$V_{AB} = 30 \text{ Vdc max.}$$

$$I_{IN} = 10 \text{ mA (reader) + 12 mA (CBX) max.}$$

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 2mp 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.

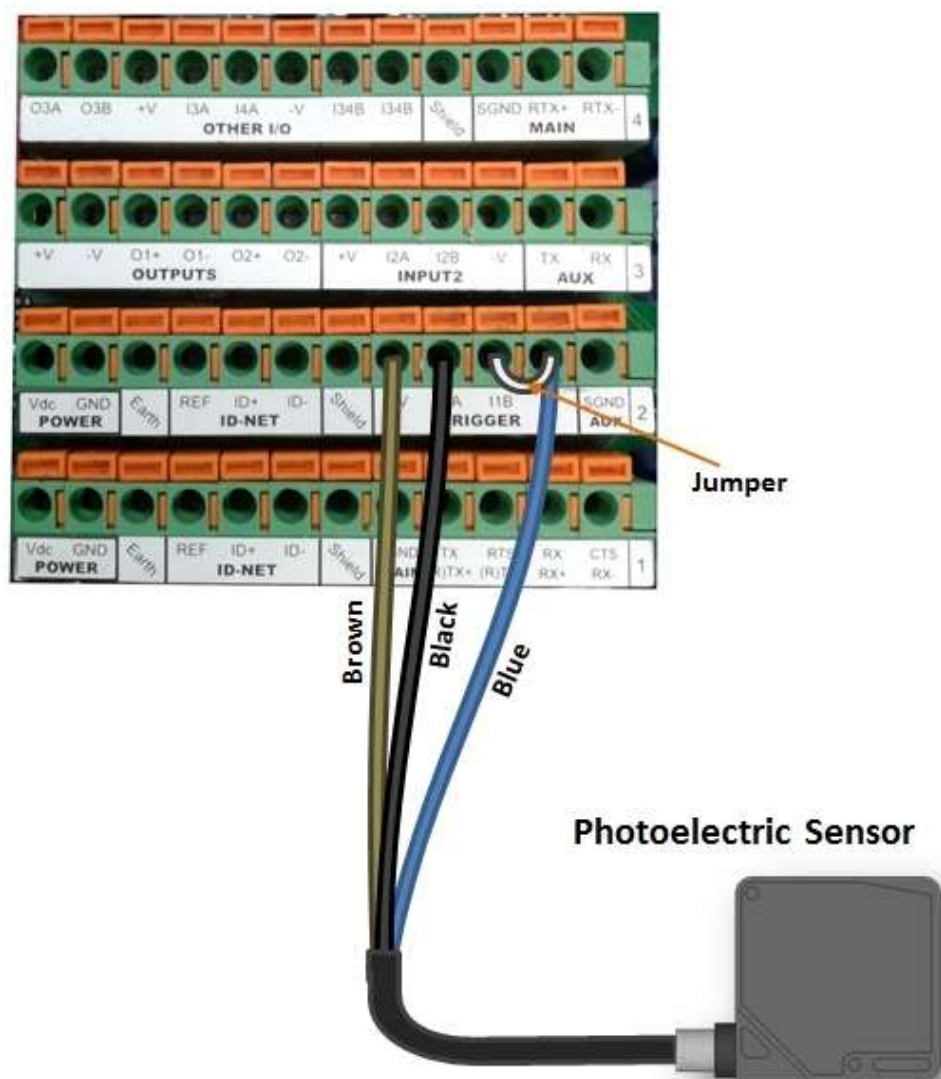


Figure 87 - PNP External Trigger Using Matrix 320 2mp Power

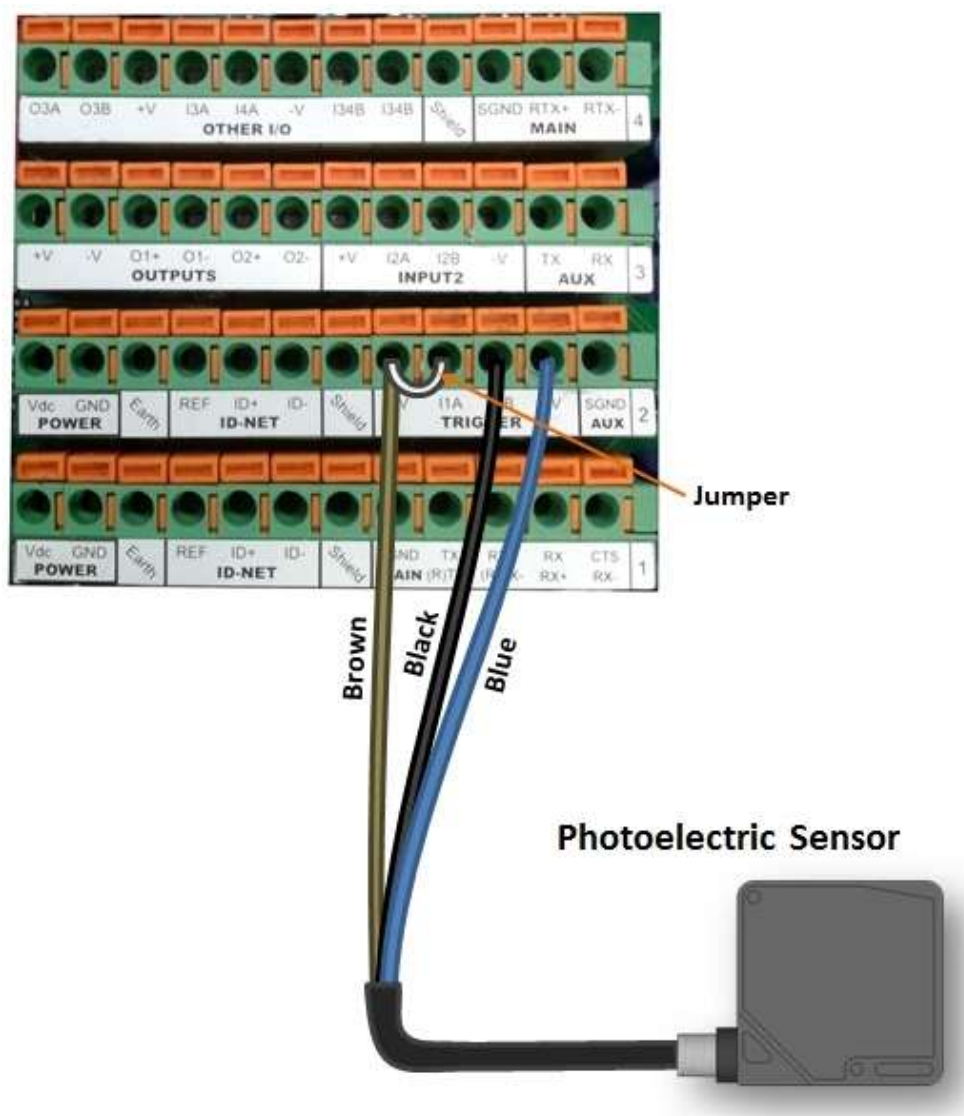


Figure 88 - NPN External Trigger Using Matrix 320 2mp Power

## External Trigger Input Connections Using External Power

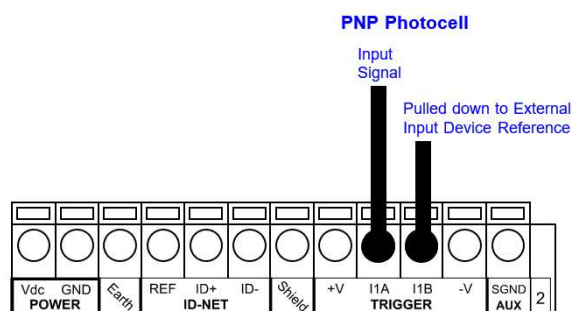


Figure 89 - PNP External Trigger Using External Power

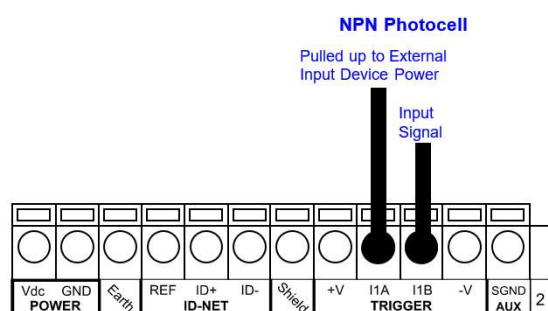


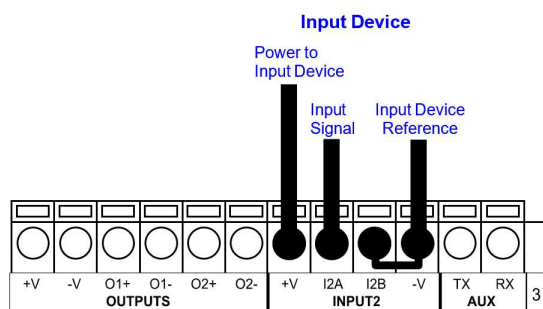
Figure 90 - NPN External Trigger Using External Power

| 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 |

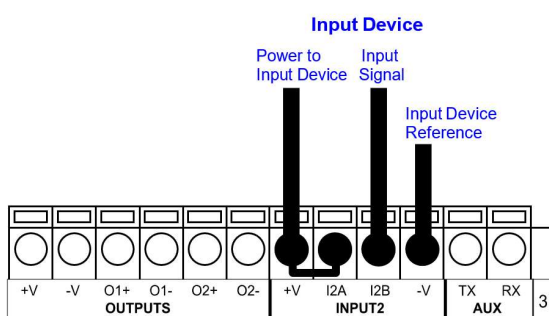
## Input 2 Connections Using Matrix 320 2mp Power



**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 91 - PNP Input 2 Using Matrix 320 2mp Power**



**Figure 92 - NPN Input 2 Using Matrix 320 2mp Power**

## Input 2 Connections Using External Power

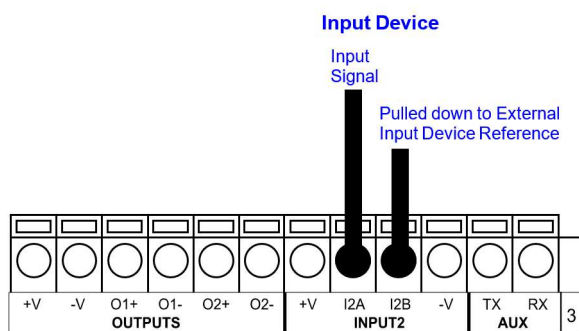


Figure 93 - PNP Input 2 Using External Power

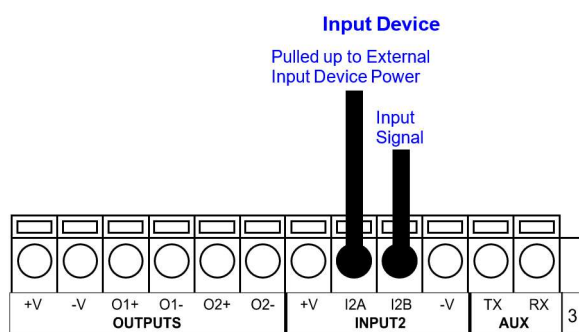


Figure 94 - NPN Input 2 Using External Power

## Input 3 Connections (CBX500 Only)

**RESERVED**

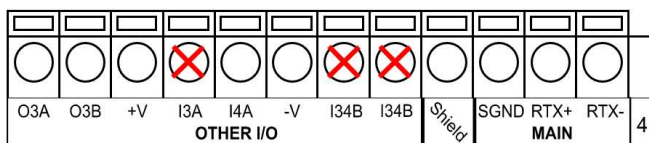


Figure 95 - Input 3 Using External Power



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

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 2mp 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.

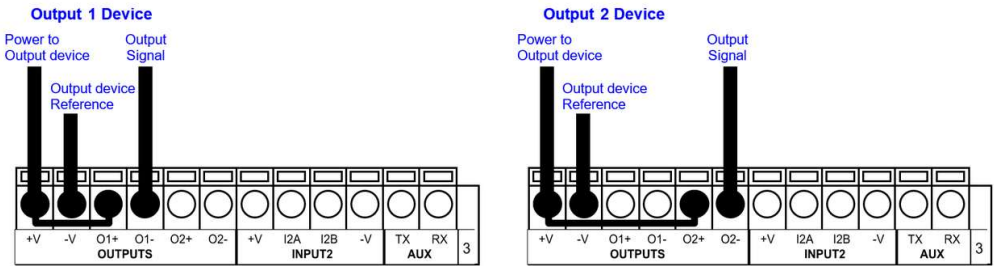


Figure 96 - PNP/Open Emitter Output Using Matrix 320 2mp Power

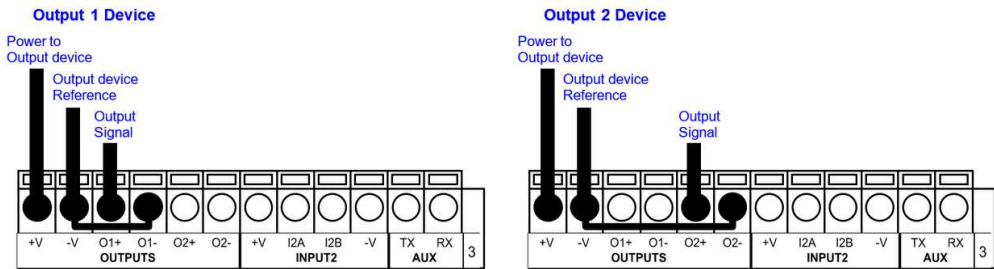


Figure 97 - NPN/Open Collector Output Using Matrix 320 2mp Power

## Output 1 and 2 Connections Using External Power

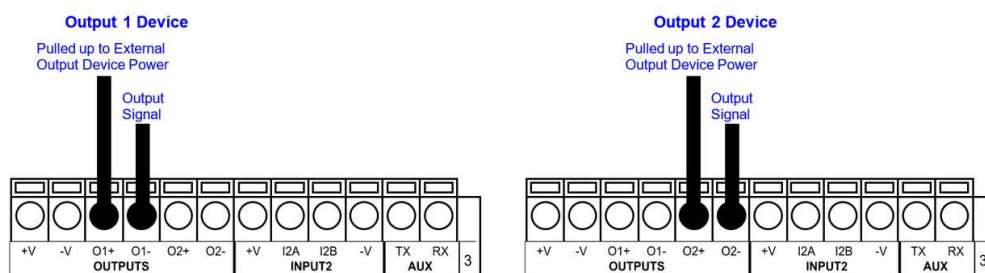


Figure 98 - PNP/Open Emitter Output Using External Power

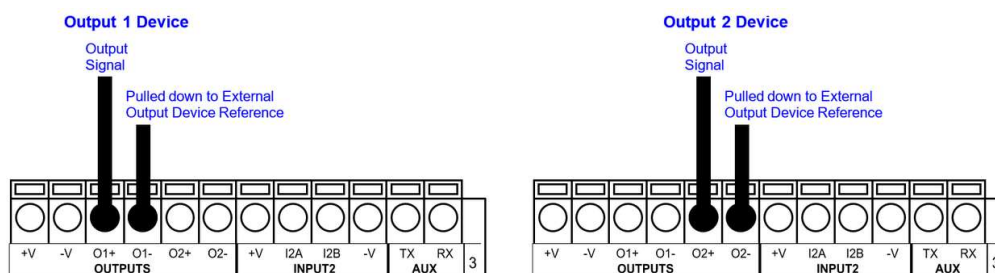


Figure 99 - NPN/Open Collector Output Using External Power

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 2mp Power (CBX500 Only)

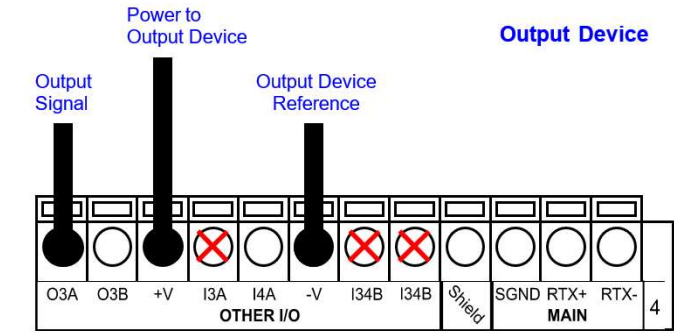


Figure 100 - Output 3 Using Matrix 320 2mp Power

# Output 3 Connections Using External Power (CBX500 Only)

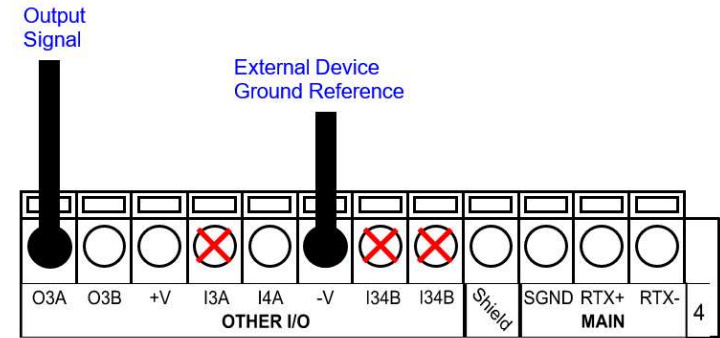


Figure 101 - Output 3 Using External Power



**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 2mp incorporates an auto-cross function.

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

On the Matrix 320 2mp 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.

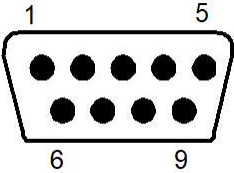
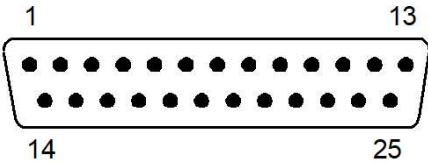
The following IoT protocol is also available over the on-board Ethernet interface:

- OPC UA

For further details, refer to "[OPC UA protocol](#)" on page 114.

# 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.

| RS232 PC-side Connections                                                                                 |      |                                                                                                             |      |
|-----------------------------------------------------------------------------------------------------------|------|-------------------------------------------------------------------------------------------------------------|------|
| <br>9-pin male connector |      | <br>25-pin male connector |      |
| Pin                                                                                                       | Name | Pin                                                                                                         | Name |
| 2                                                                                                         | RX   | 3                                                                                                           | RX   |
| 3                                                                                                         | TX   | 2                                                                                                           | TX   |
| 5                                                                                                         | GND  | 7                                                                                                           | GND  |

## 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 2mp reader can perform the ScanStart and ScanStop methods in OPC UA environment:

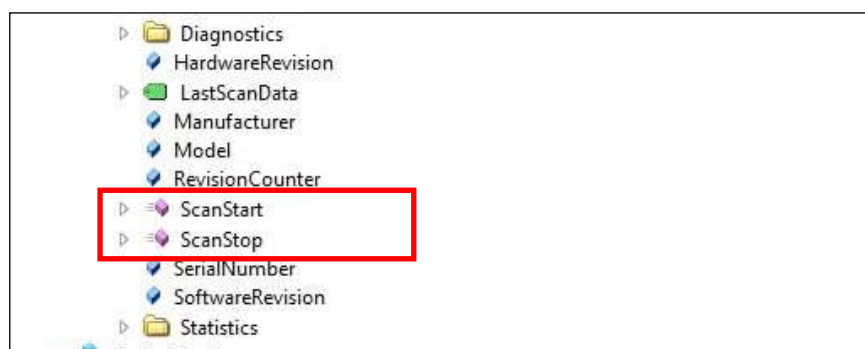


Figure 102 - OPC UA available methods on Matrix 320 2mp

### Compatible OPC UA Clients

The Matrix 320 2mp 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.

The screenshot shows the 'Device Environment Configuration' window. The 'Startup Configuration' dropdown is set to 'OneShot'. The 'About Device...' section lists various software versions. The 'Ethernet Settings' section includes fields for MAC Address, IP Address, Subnet Mask, Gateway Address, and DNS 1 Address. The 'Internal Network Settings' section is expanded, showing 'X-PRESS Configuration', 'LED Configuration', 'Maintenance Settings', 'Web Monitor Settings', and 'OPC-UA Settings'. The 'OPC-UA Settings' section is highlighted with a red box and contains a checkbox labeled 'OPC-UA Server' which is checked. At the bottom are 'Cancel' and 'OK' buttons.

Figure 103 - 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.

The screenshot shows the 'Security Settings' window. The 'Web Monitor Settings' dropdown is selected. The 'OPC-UA Settings' section is highlighted with a red box and contains the following fields: 'Enable Protection' (checked), 'Username' (matrix-user), 'Password' (masked with asterisks), and 'Confirm Password' (masked with asterisks). A red text note below the password fields states: 'Password must contain between 8 and 32 characters, at least one uppercase letter, one lowercase letter and one number.' An 'Apply' button is located at the bottom right of the red box. Below the 'OPC-UA Settings' section is the 'SFTP Client Settings' section, which is currently collapsed. At the very bottom is a 'Generate Public and Private Keys' button.

Figure 104 - 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.

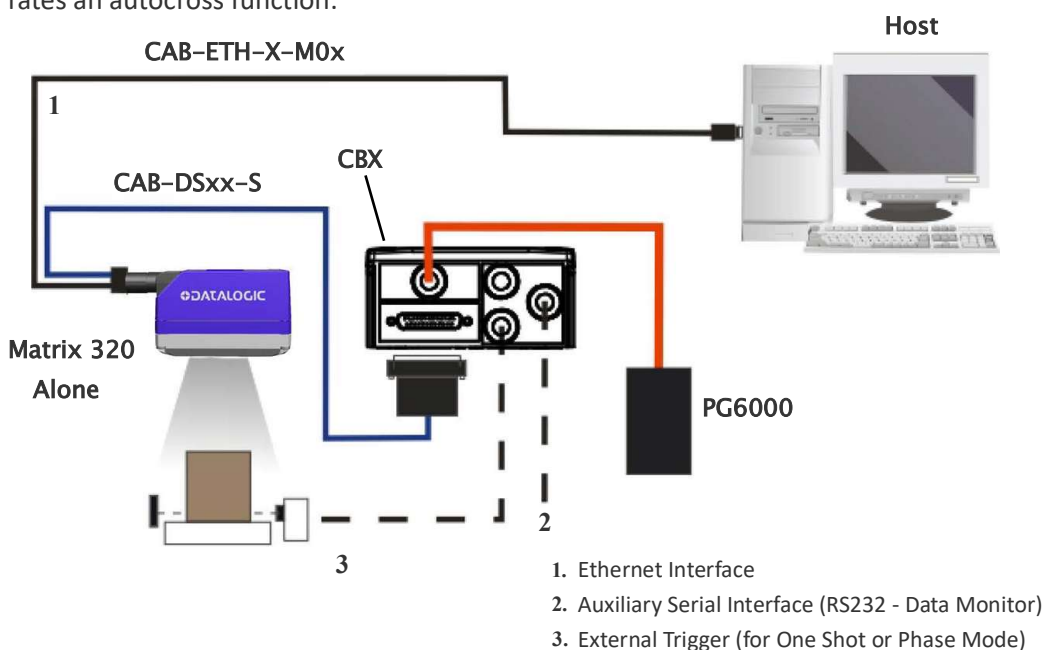


**NOTE:** The Master/Slave Role is only significant for the Internal ID-NET Network. If your layout doesn't use the ID-NET network then the device's Role is not significant and can be ignored.

## ETHERNET CONNECTION

The Ethernet connection is possible in two different layouts.

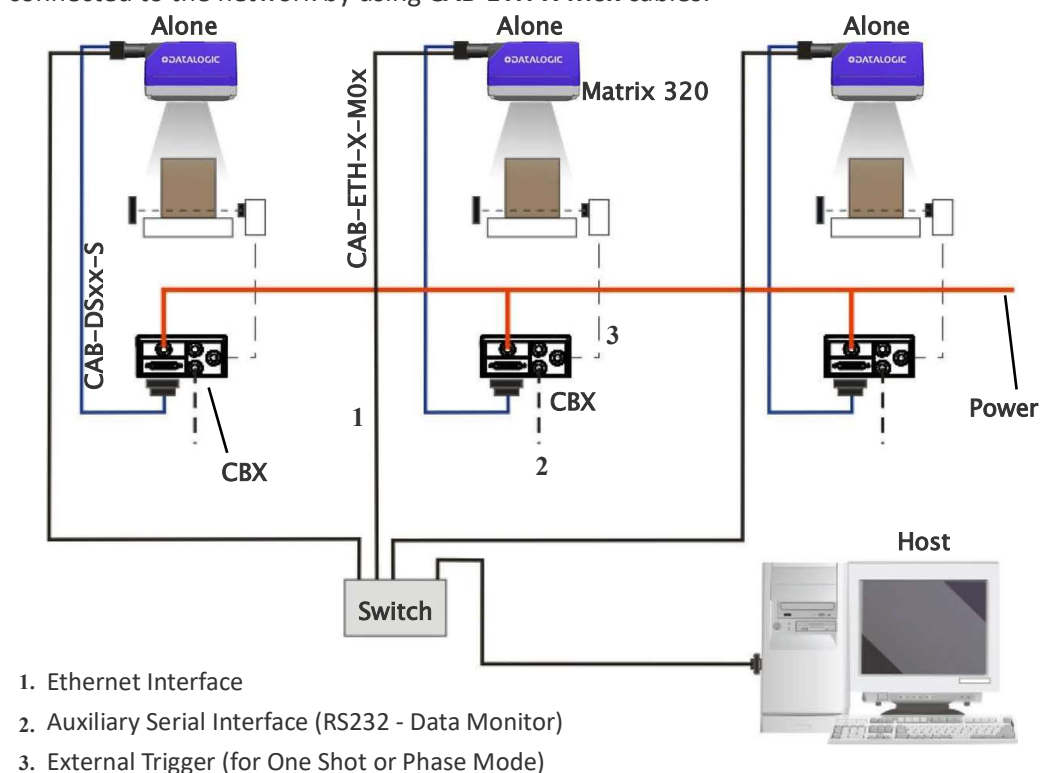
In a Point-to-Point layout the reader is connected to a local host by using a CAB-ETH-X-M0x cable. There is no need to use a crossover adapter since Matrix 320 2mp incorporates an autocross function.



**Figure 105 - Ethernet Point-to-Point Layout**

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

When using a Local Area Network (LAN), one or more Matrix 320 2mp readers can be connected to the network by using CAB-ETH-X-M0x cables:



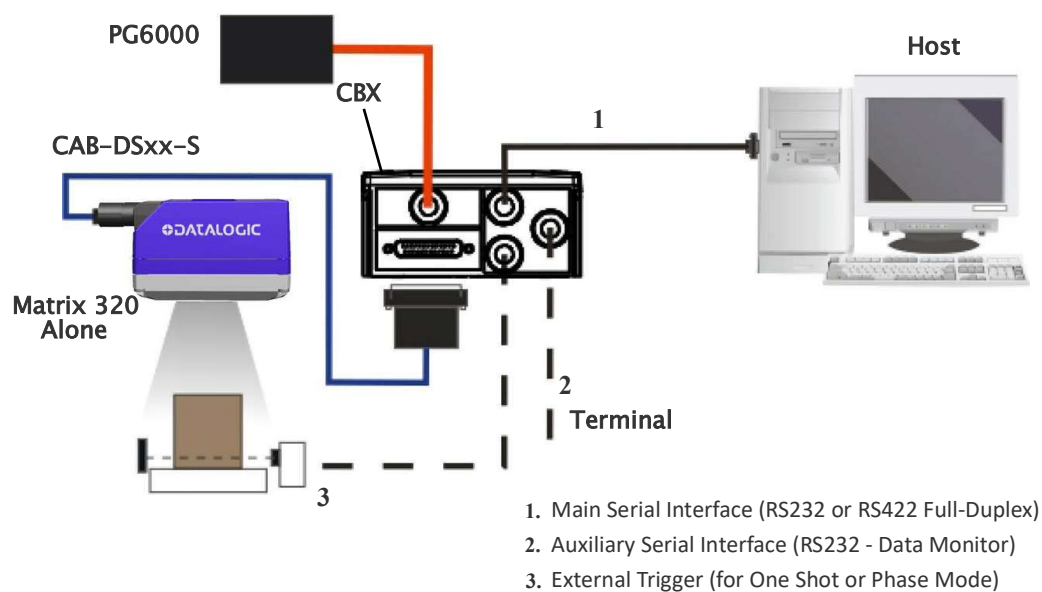
**Figure 106 - Ethernet Network Layout**

## 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 107 - Serial Interface Point-to-Point Layout**

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

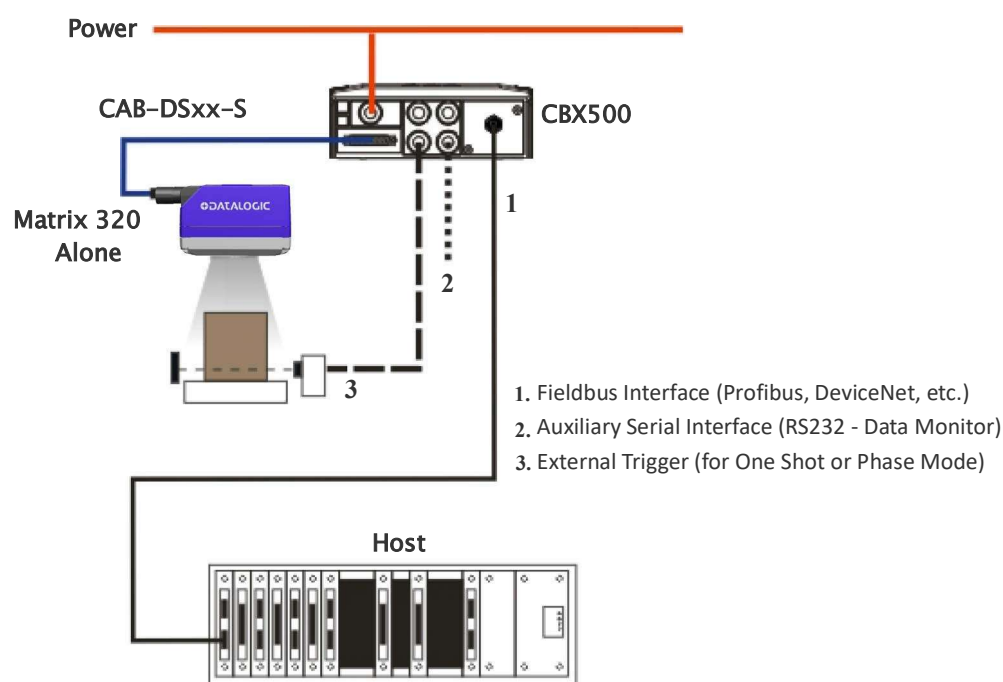
# FIELD BUS CONNECTION

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 Fieldbus 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.



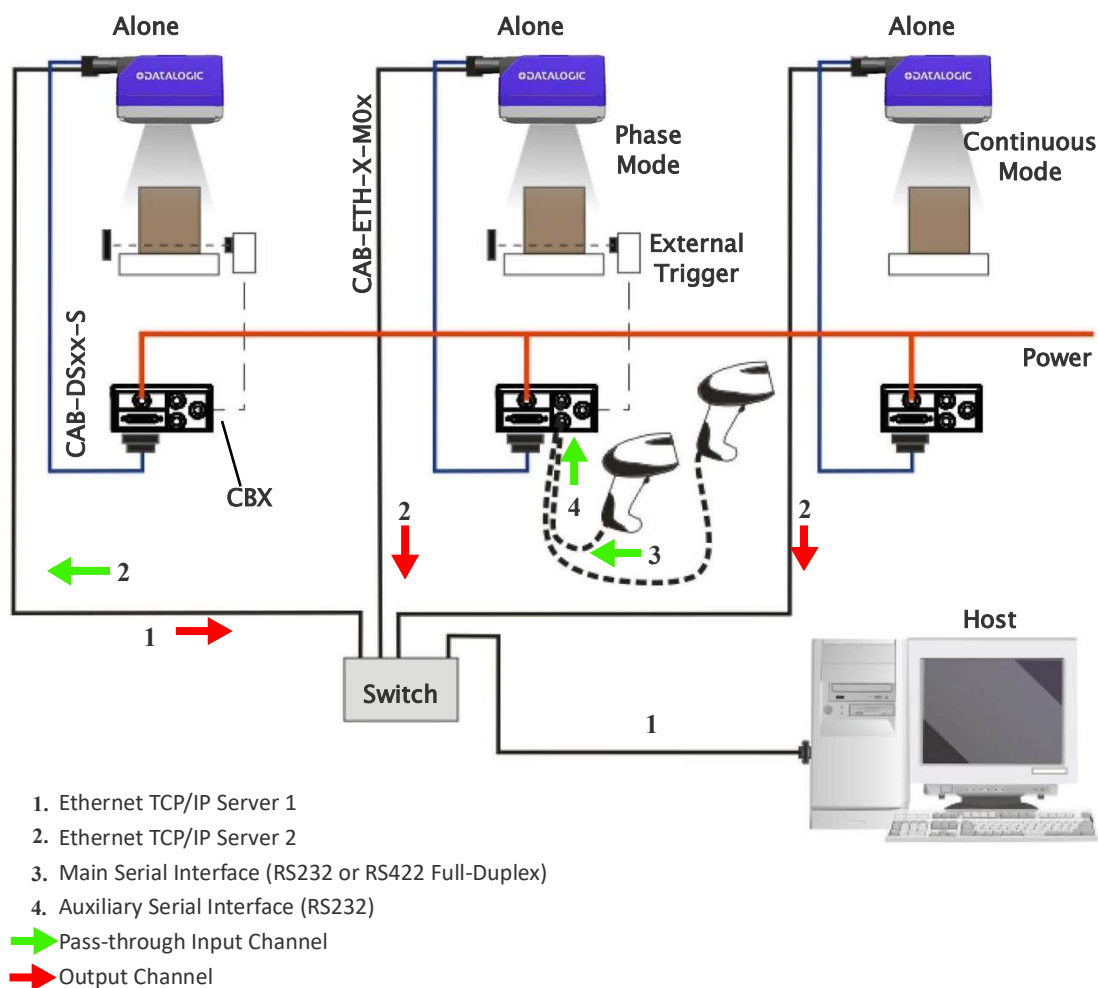
**Figure 108 - Fieldbus Interface Point-to-Point Layout**

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 109 - 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).

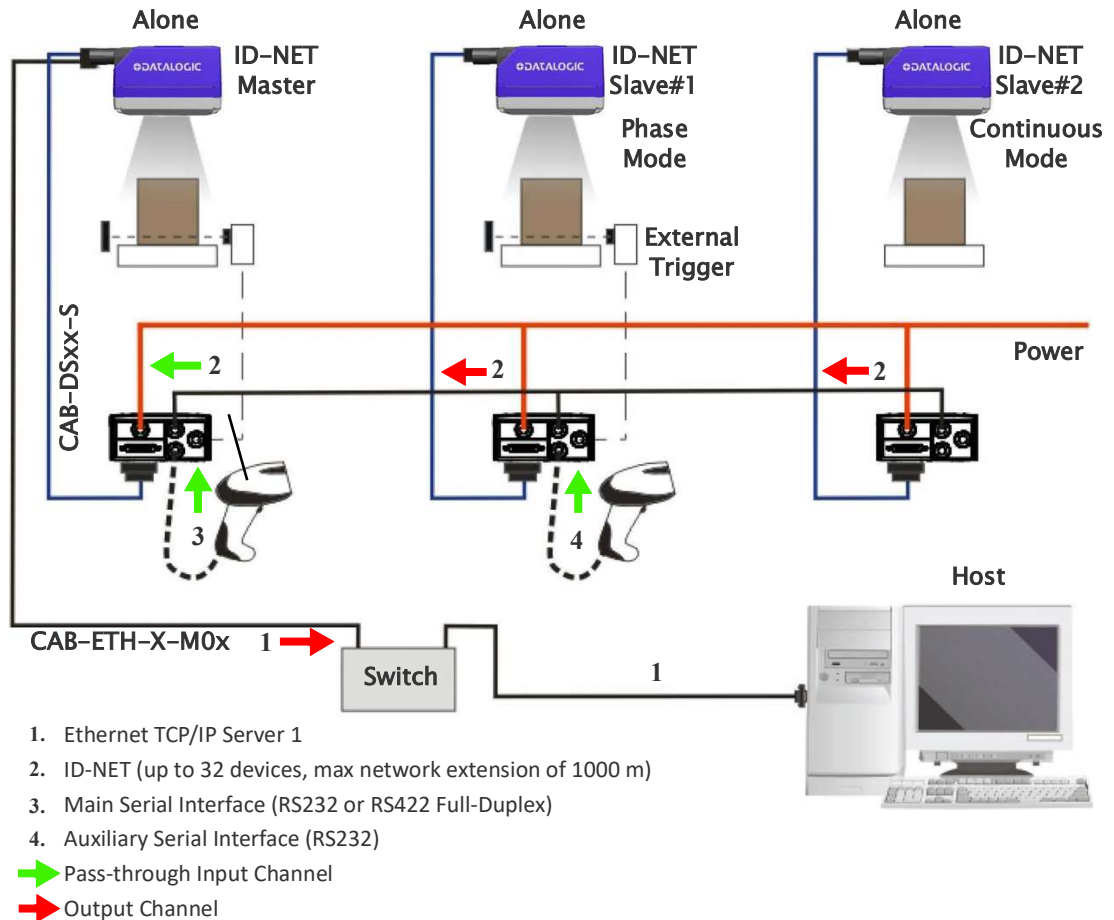
In a Pass-through layout each device can have a different operating mode: Continuous, One Shot, Phase Mode, etc.

## 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 110 - 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.

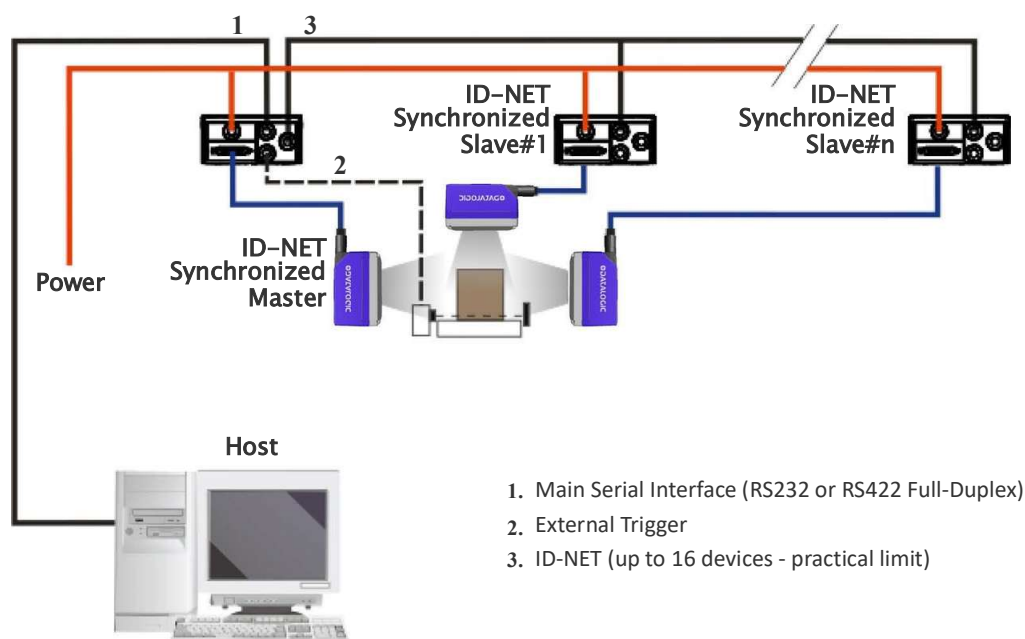
The Slave readers are connected together using the ID-NET interface. Every slave reader must have an ID-NET address in the range 1-31.

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.

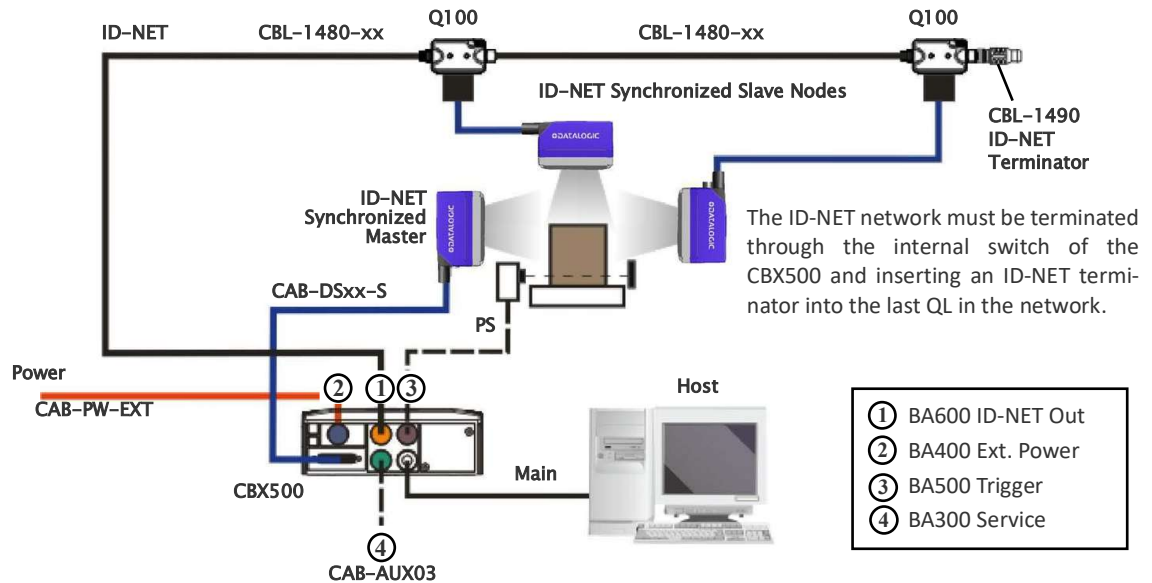
The Main and ID-NET interfaces are connected as shown in the following figures.



**Figure 111 - ID-NET Synchronized Layout**

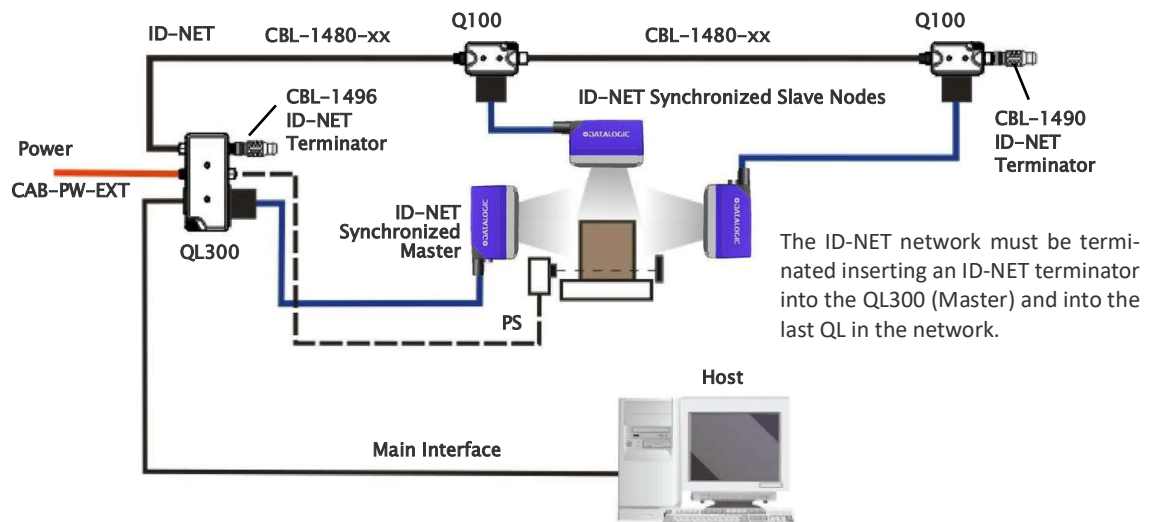
The Master reader can be connected to the CBX series connection box with the advantage of the Backup and Restore configuration function (CBX + BM100 module).

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



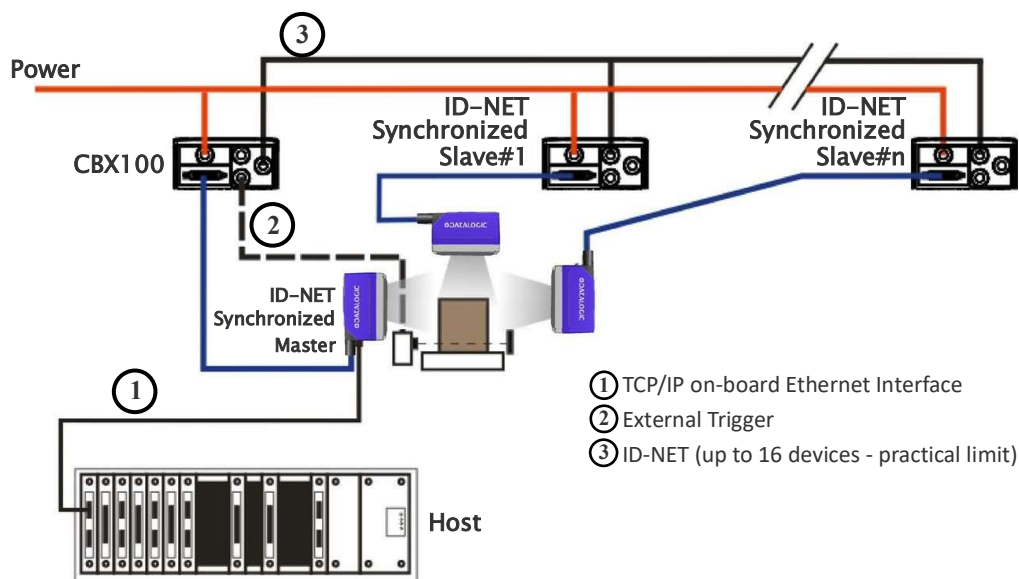
**Figure 112 - ID-NET Synchronized Layout Matrix 320 2mp Master with CBX500 + Matrix 320 2mp Slaves with QL100**

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



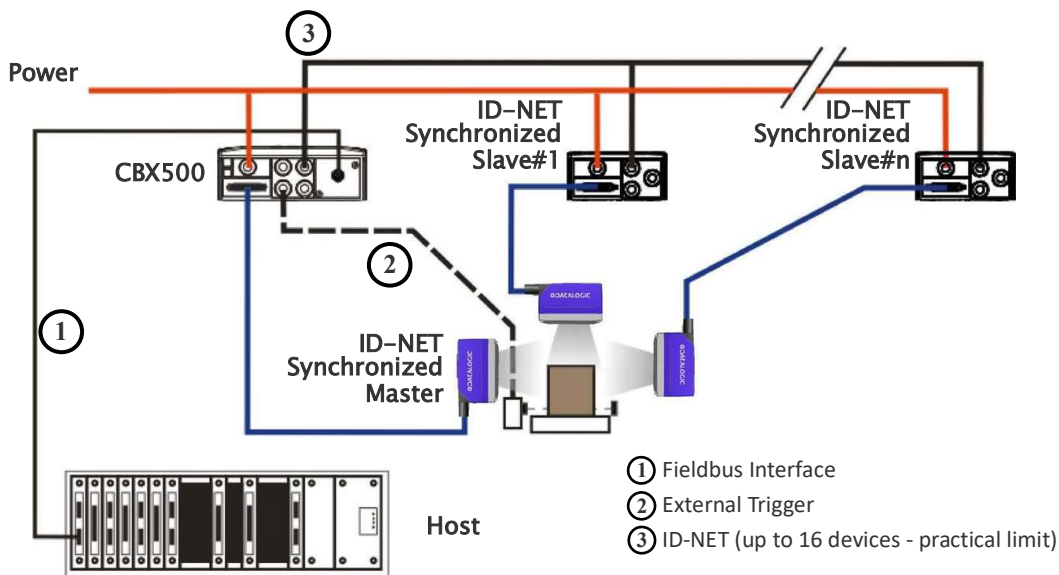
**Figure 113 - ID-NET Synchronized Layout Matrix 320 2mp Master with QL300+ Matrix 320 2mp Slaves with QL100**

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 114 - 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 115 - 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 116 and the formula below.

| Model                       | F/#  | d <sub>0</sub><br>Offset<br>(mm) | Viewing<br>Angle<br>Horizontal | Viewing<br>Angle<br>Vertical | Viewing<br>Angle<br>Diagonal | Min Focus<br>Distance<br>(mm) | Max Focus<br>Distance<br>(mm) |
|-----------------------------|------|----------------------------------|--------------------------------|------------------------------|------------------------------|-------------------------------|-------------------------------|
| Matrix 320 14L<br>LQL 6 mm  | 5.6  | 17                               | 48°                            | 28°                          | 54°                          | 50                            | 536                           |
| Matrix 320 14L<br>LQL 9 mm  | 6.1* | 22                               | 34°                            | 19°                          | 39°                          | 35                            | 1000                          |
| Matrix 320 14L<br>LQL 16 mm | 6.5  | 21                               | 20°                            | 11°                          | 23°                          | 70                            | 1500                          |
| Matrix 320 36L<br>LQL 6 mm  | 5.6  | 32                               | 48°                            | 28°                          | 54°                          | 50                            | 536                           |
| Matrix 320 36L<br>LQL 9 mm  | 6.1* | 37                               | 34°                            | 19°                          | 39°                          | 35                            | 1000                          |
| Matrix 320 36L<br>LQL 16 mm | 6.5  | 36                               | 20°                            | 11°                          | 23°                          | 70                            | 1500                          |
| Matrix 320<br>C-Mount 4mm   | 1.8  | 40.4                             | 67.8°                          | 41.4°                        | 75.3°                        | 0                             | ∞                             |
| Matrix 320<br>C-Mount 6mm   | 1.8  | 41.1                             | 48.3°                          | 28.3°                        | 54.4°                        | 24                            | ∞                             |
| Matrix 320<br>C-Mount 8mm   | 1.8  | 49.6                             | 37.1°                          | 21.4°                        | 42.2°                        | 24                            | ∞                             |
| Matrix 320 C-<br>Mount 12mm | 1.8  | 54.8                             | 25.3°                          | 14.4°                        | 28.8°                        | 65                            | ∞                             |
| Matrix 320 C-<br>Mount 16mm | 1.8  | 66                               | 19.1°                          | 10.8°                        | 21.8°                        | 162                           | ∞                             |
| Matrix 320 C-<br>Mount 25mm | 1.85 | 59                               | 12.3°                          | 6.9°                         | 14.1°                        | 164                           | ∞                             |
| Matrix 320 C-<br>Mount 35mm | 1.85 | 55                               | 8.8°                           | 4.9°                         | 10.1°                        | 185                           | ∞                             |

\* F/# = 6.1 for Red/Blue illuminator. For White illuminator, F/# = 6.5.

The viewing angle has a tolerance of  $\pm 1^\circ$  depending on the reading distance.

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

where:

$FOV_x$  = horizontal, vertical or diagonal FOV

$\alpha_x$  = 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

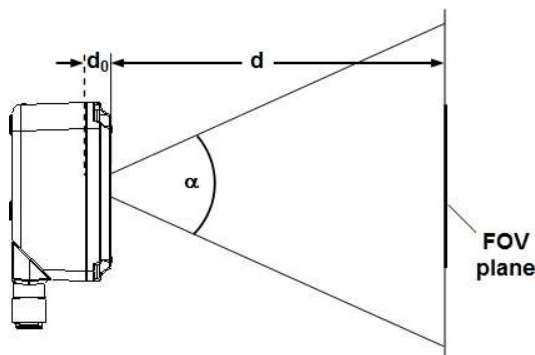


Figure 116 - Reading Distance References

Example:

The FOV for a **Matrix 320 2mp 7xx-330** at a reading distance of 600 mm is:

$$FOV_H = 2 [(600 \text{ mm} + 22 \text{ mm}) * \tan (34^\circ/2)] \cong 380 \text{ mm}$$

$$FOV_V = 2 [(600 \text{ mm} + 22 \text{ mm}) * \tan (19^\circ/2)] \cong 208 \text{ mm}$$

## GLOBAL FOV DIAGRAMS



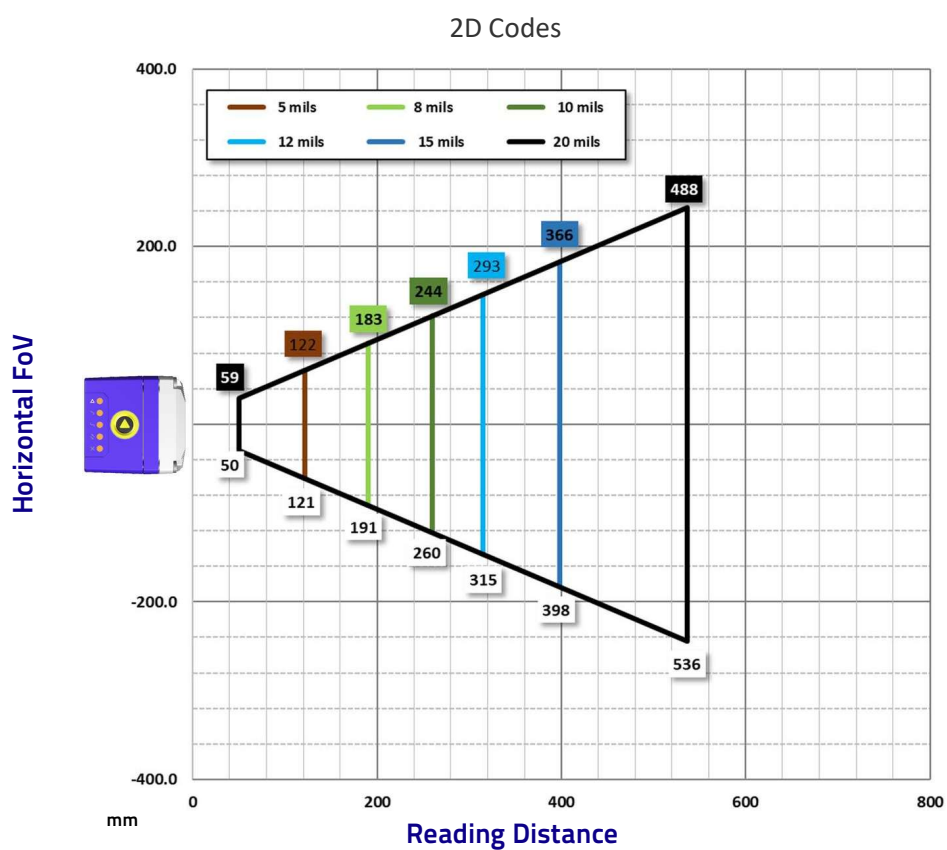
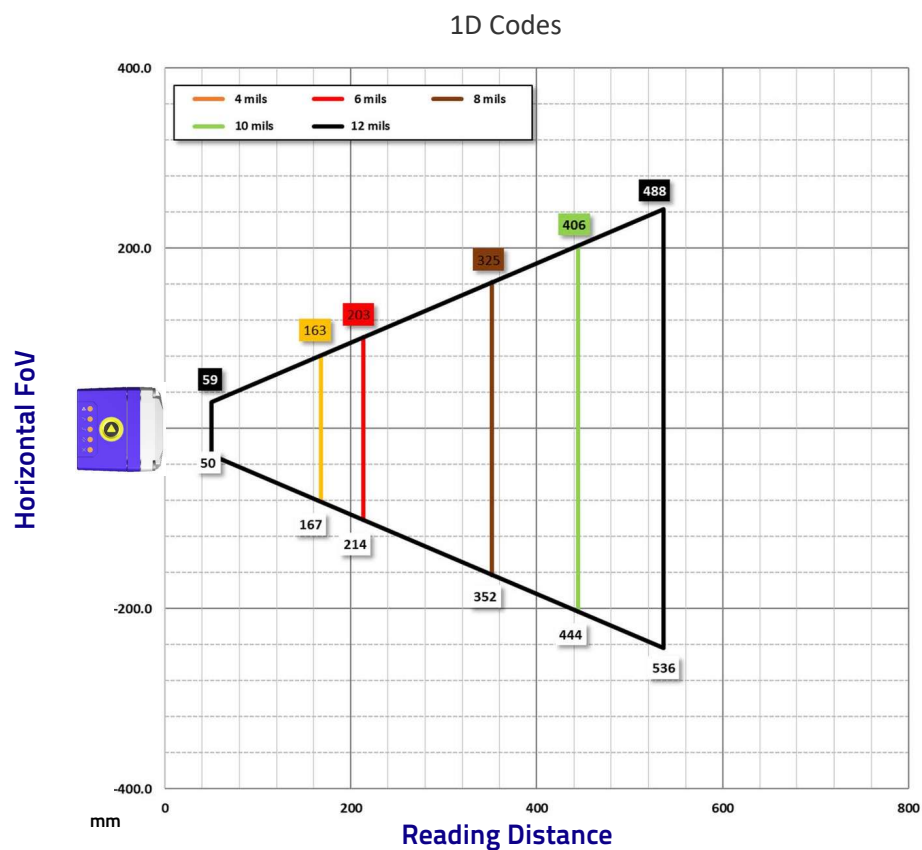
**NOTE:** The following diagrams are given for typical performance at 25°C using high quality grade A symbols according to ISO/IEC 15416 (1D code) and ISO/IEC 15415 (2D code) print quality test specifications. Testing should be performed with actual application codes in order to maximize the application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

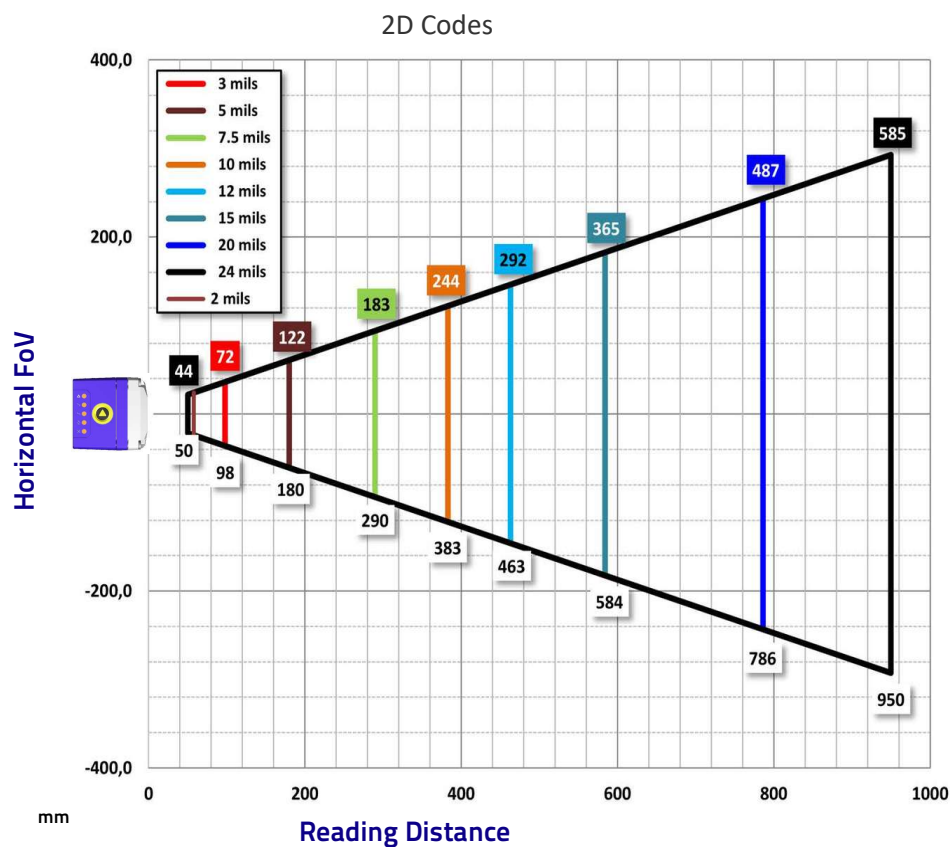
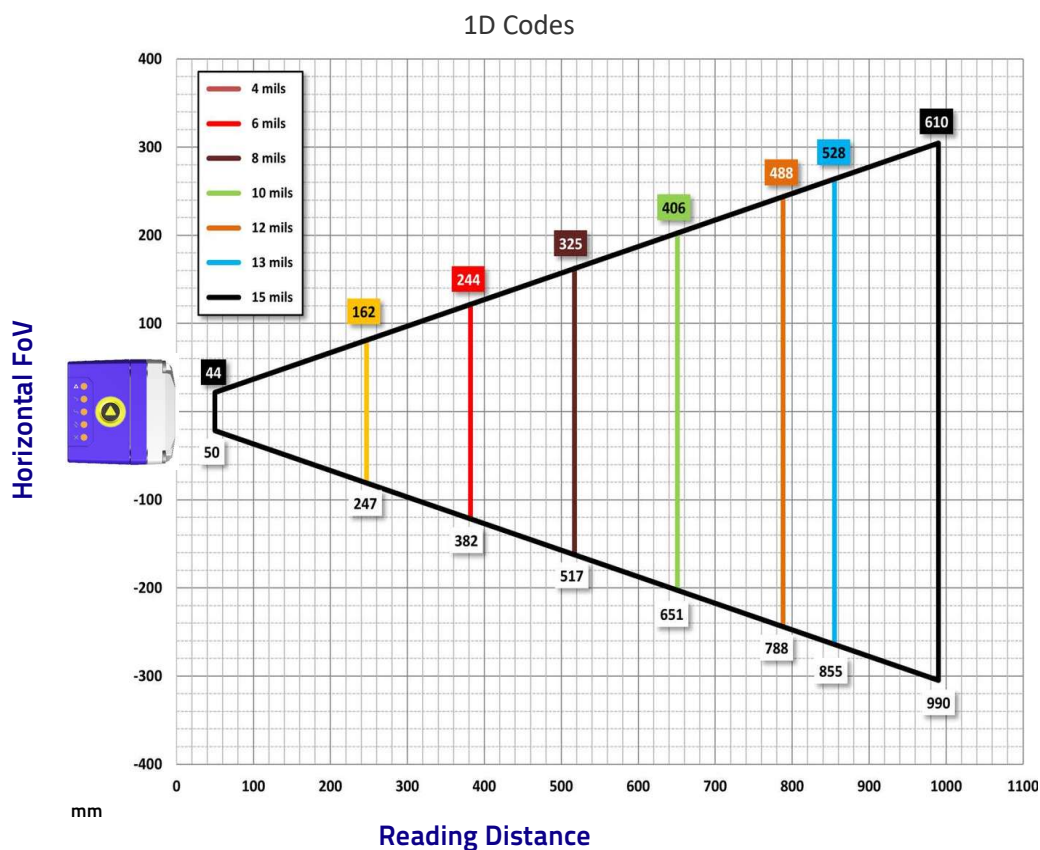


**NOTE:** The following diagrams refer to Matrix 320 with 14 LEDs illuminator. For Matrix 320 C-Mount models with 36 LEDs illuminator, the reference distances from the exit window should be reduced by 15 mm (internal offset difference between 14 LEDs and 36 LEDs Liquid Lens models).

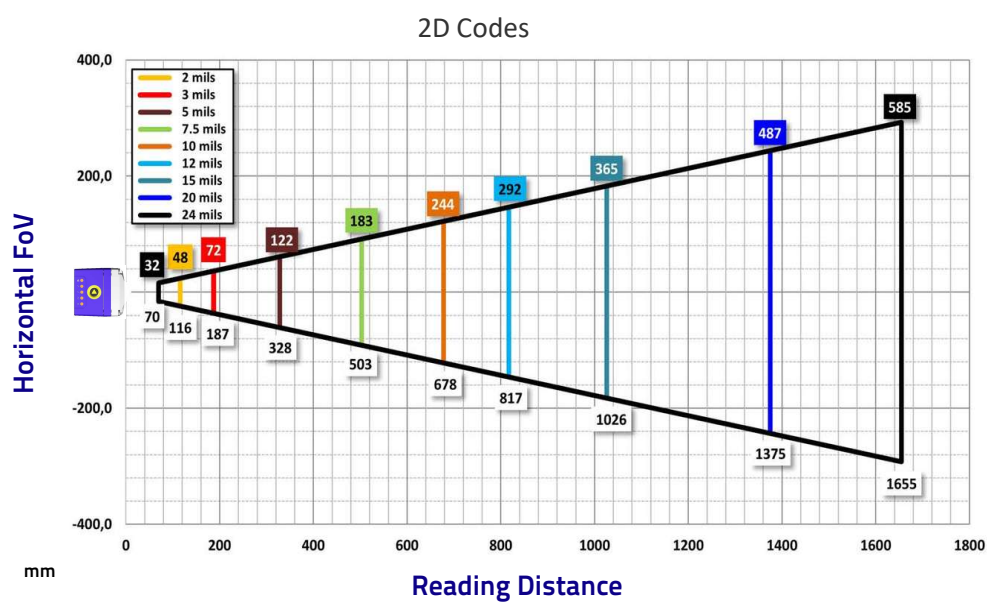
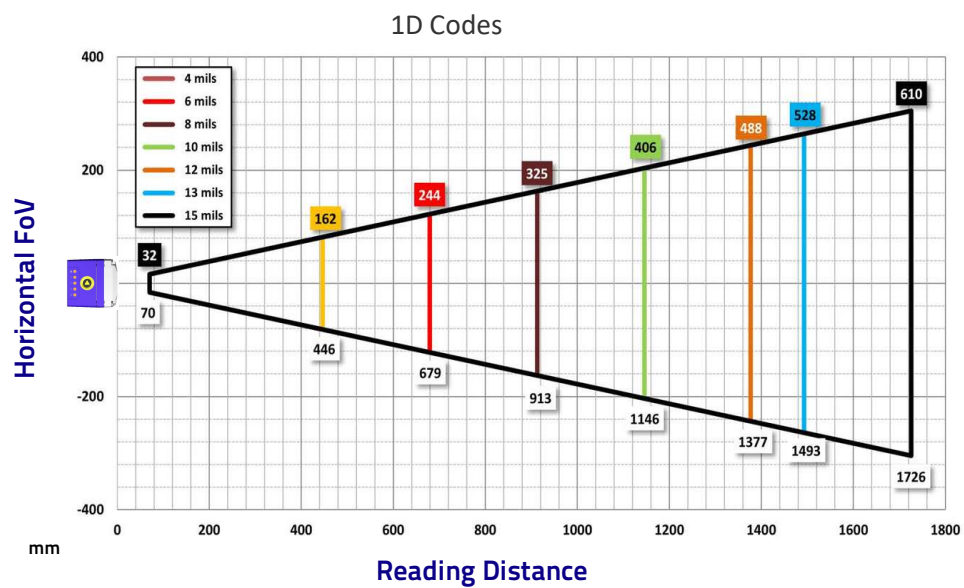
## Global FOV for Matrix 320 2mp LQL-6



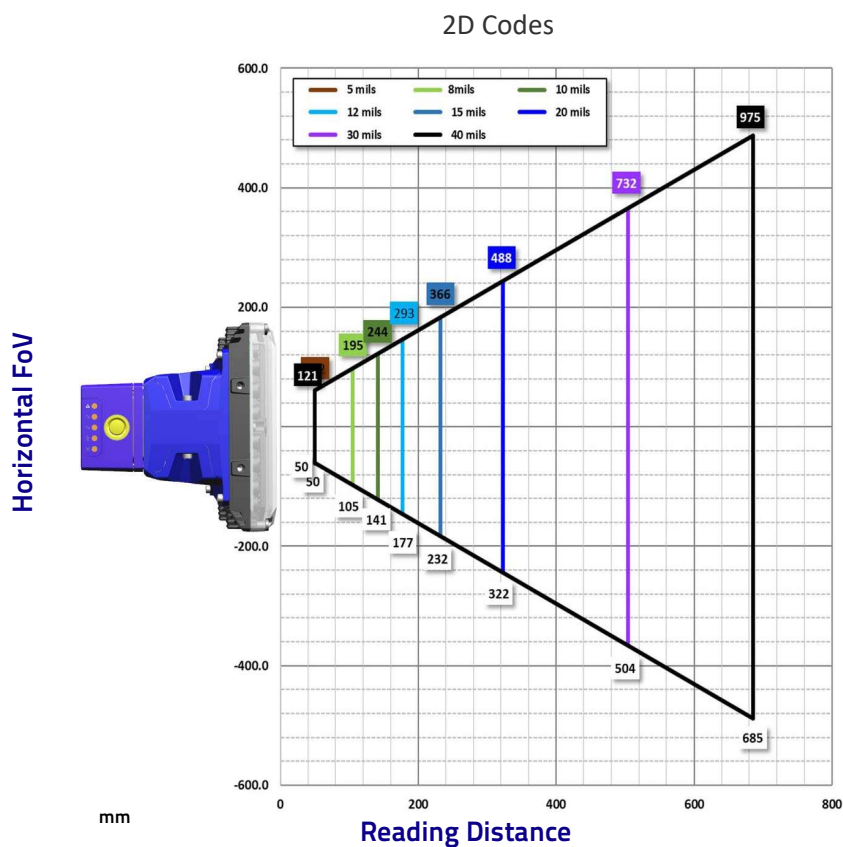
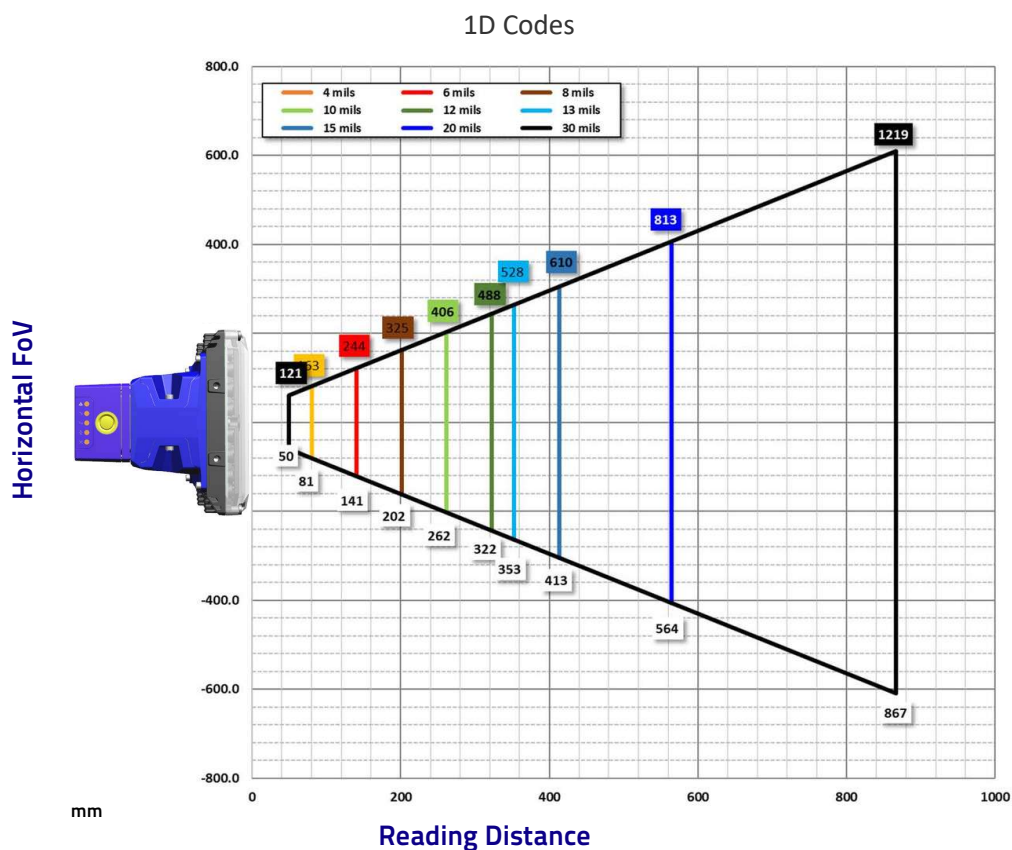
# Global FOV for Matrix 320 2mp LQL-9



## Global FOV for Matrix 320 2mp LQL-16

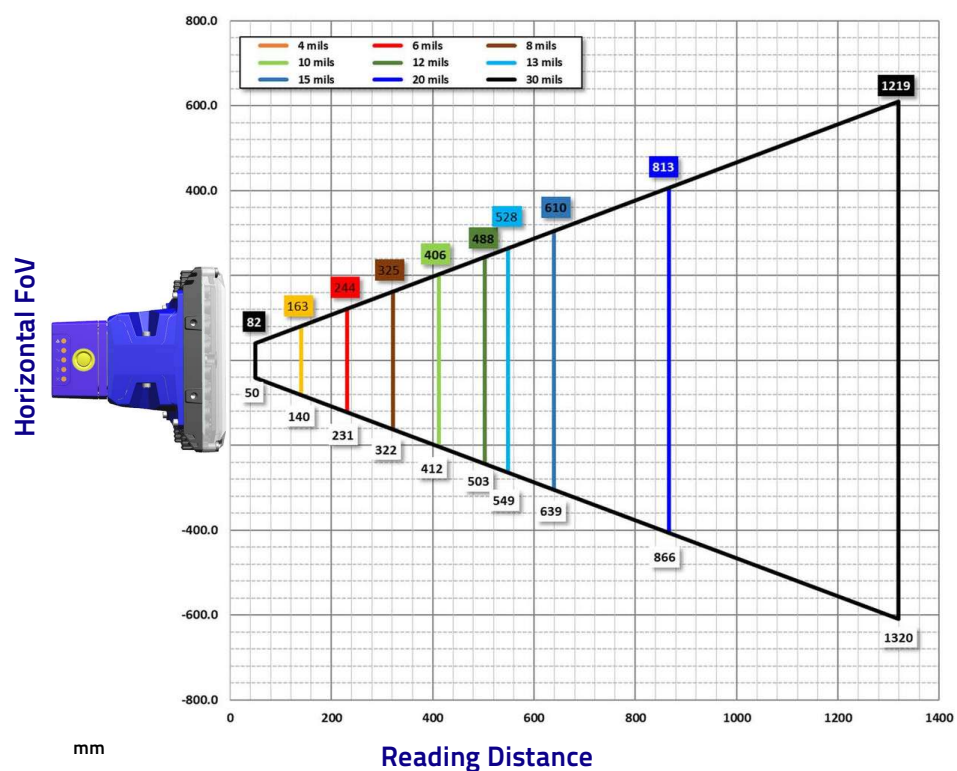


# Global FOV for Matrix 320 2mp C-Mount LNS-4

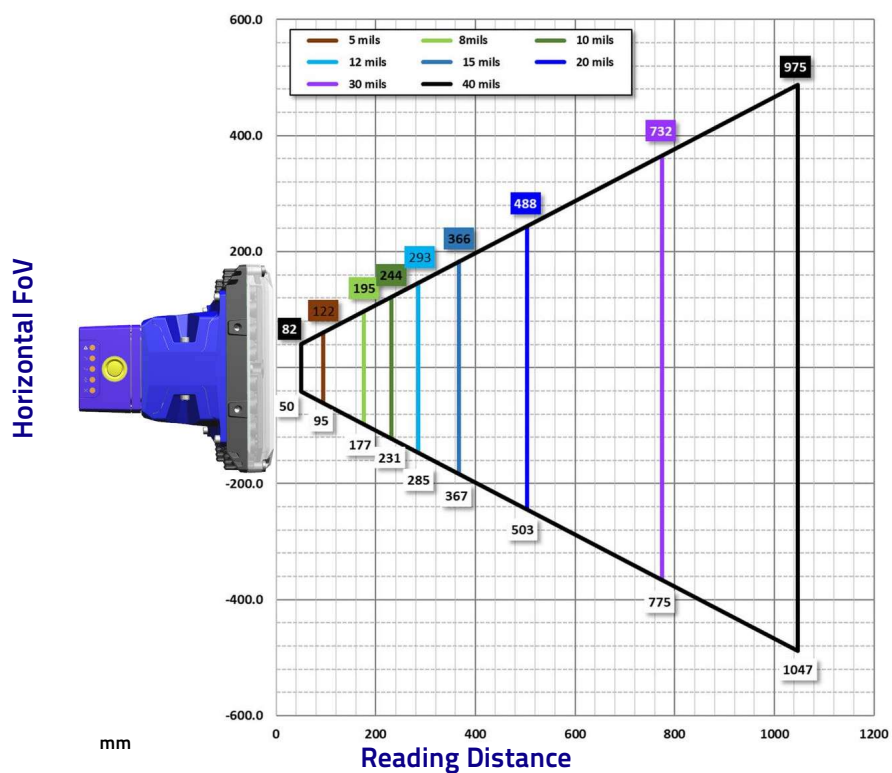


# Global FOV for Matrix 320 2mp C-Mount LNS-6

1D Codes

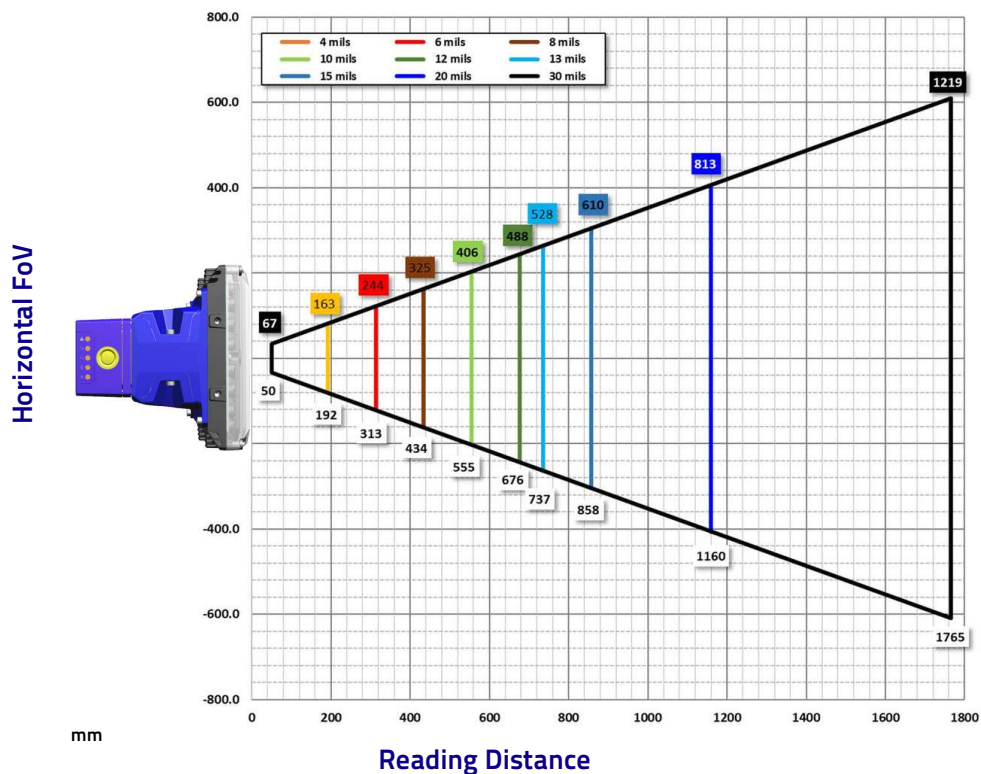


2D Codes

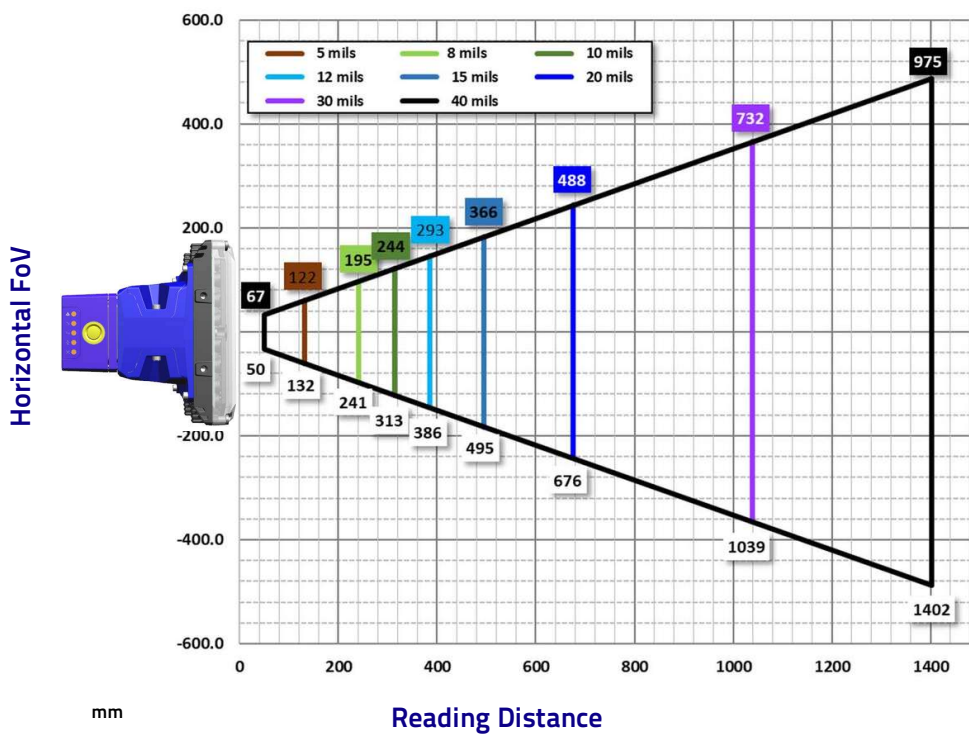


# Global FOV for Matrix 320 2mp C-Mount LNS-8

1D Codes

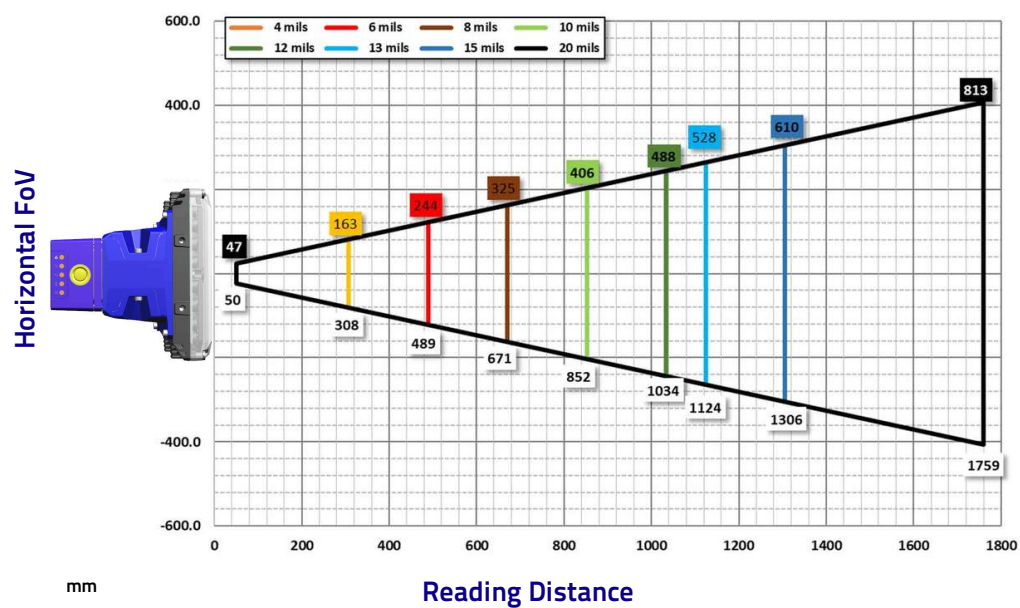


2D Codes

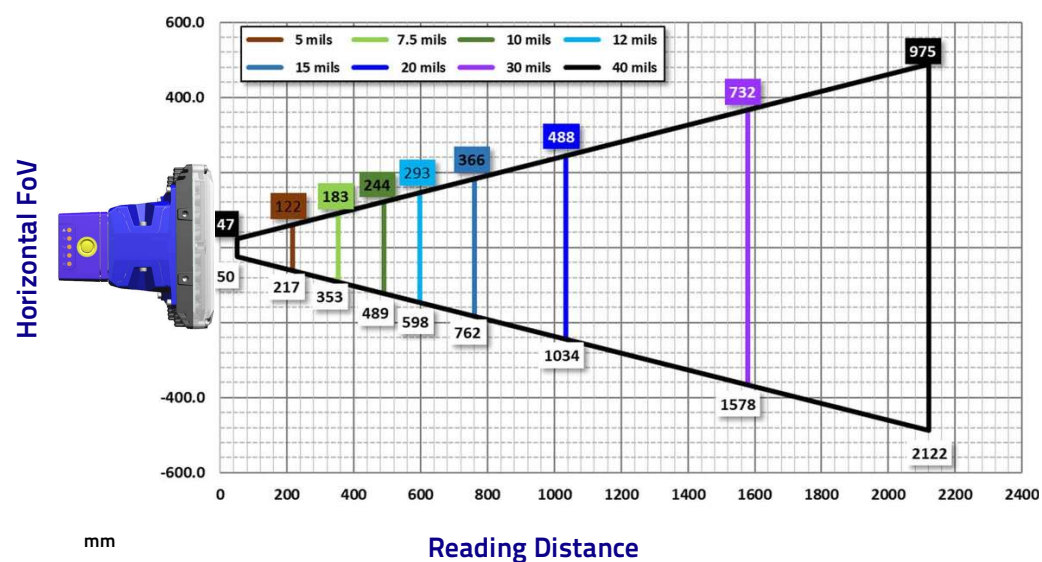


# Global FOV for Matrix 320 2mp C-Mount LNS-12

## 1D Codes

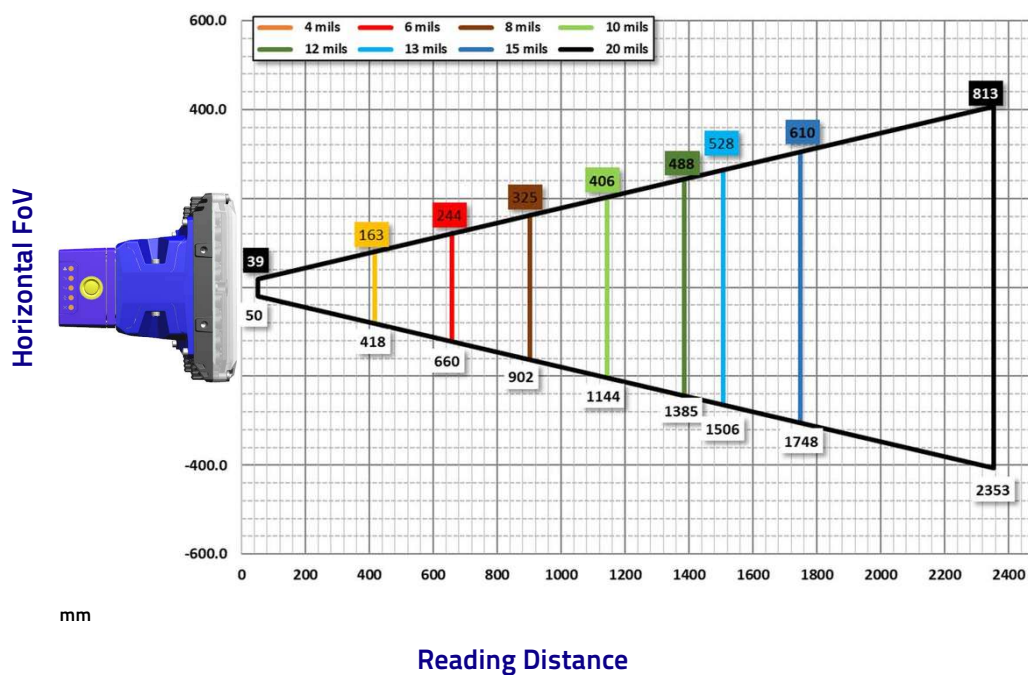


## 2D Codes

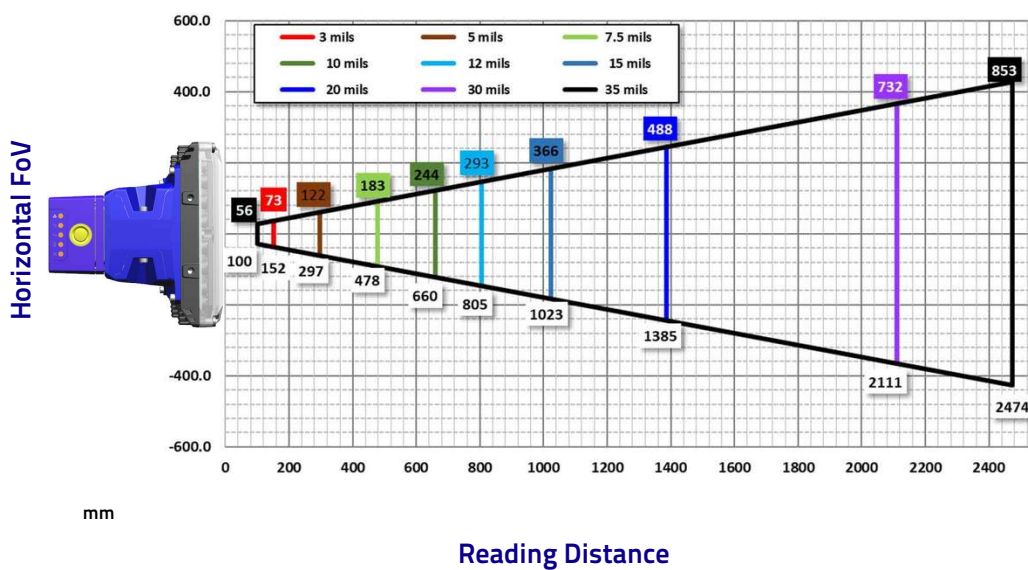


# Global FOV for Matrix 320 2mp C-Mount LNS-16

1D Codes

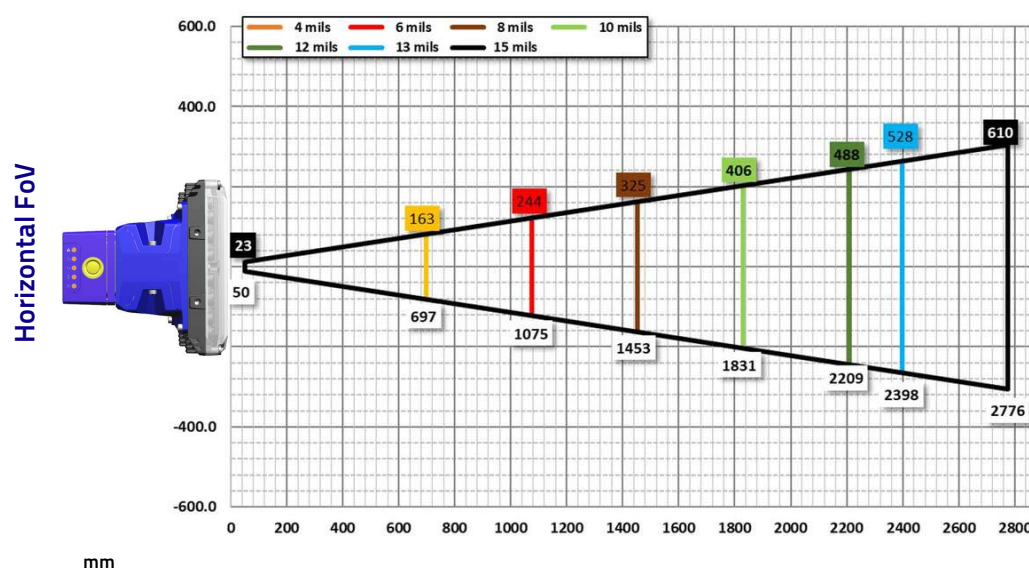


2D Codes



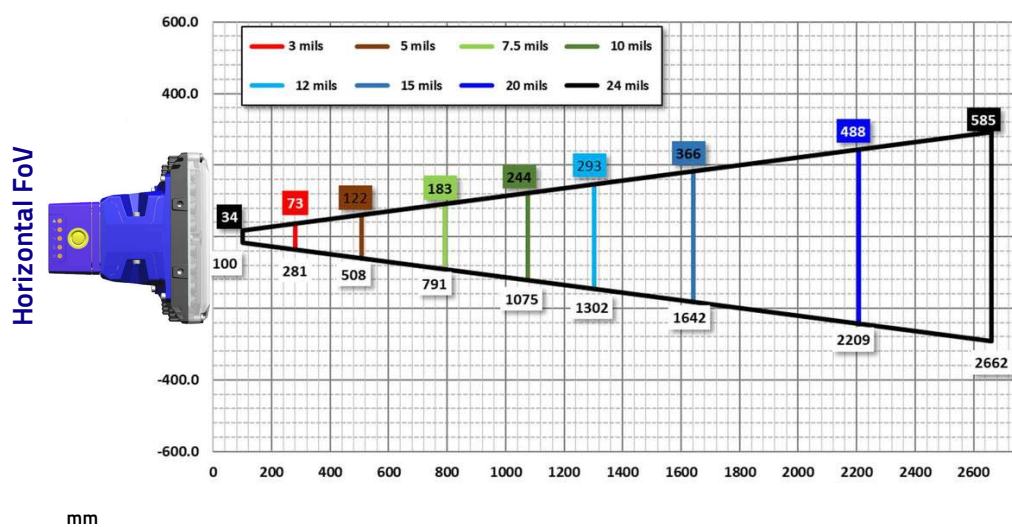
# Global FOV for Matrix 320 2mp C-Mount LNS-25

## 1D Codes



## Reading Distance

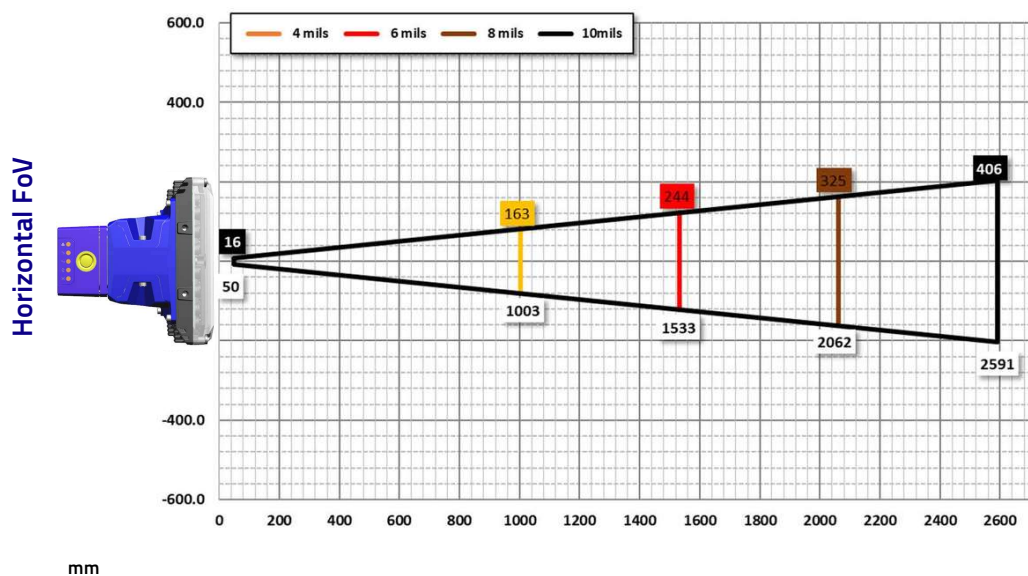
## 2D Codes



## Reading Distance

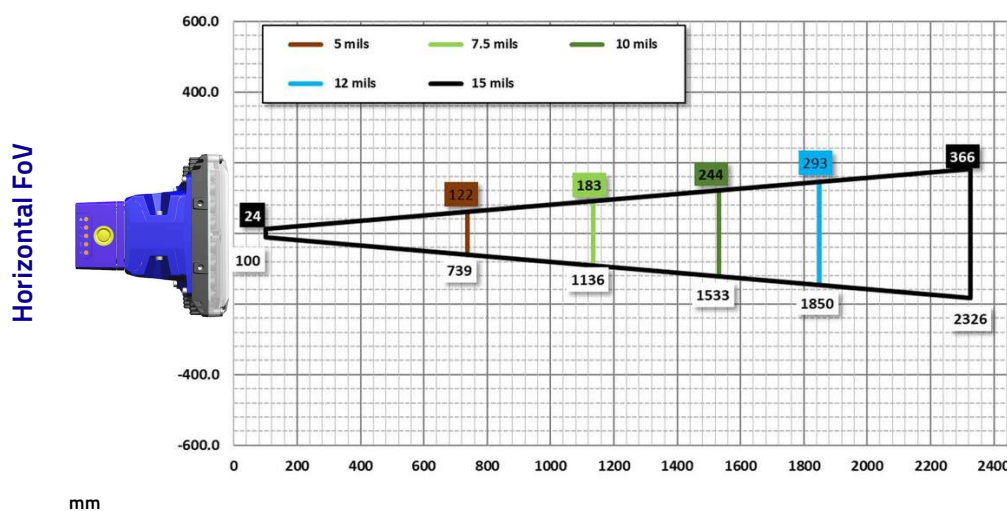
# Global FOV for Matrix 320 2mp C-Mount LNS-35

1D Codes



Reading Distance

2D Codes



Reading Distance

# 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)
- **T<sub>exp</sub>**: 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:

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

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

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

**T<sub>exp (min)</sub>** 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 2mp using:

*Internal Lighting Mode = Very High Power Strobe*

*Exposure Time (μs) = 100 μs*

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

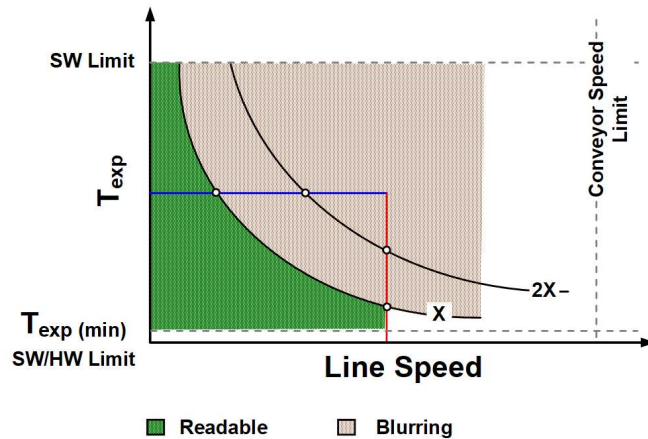
has a maximum line speed of:

$$0.254 \text{ (mm)} / 0.0001 \text{ (s)} = 2540 \text{ mm/s}$$

Likewise, **T<sub>exp (max)</sub>** is the maximum **Exposure Time** value that can be used without blurring for the given application line speed and code resolution. Therefore:

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

$T_{exp(max)}$  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;
- **Always ON:** the built-in LED array is turned on all the time at the lowest power level. This option is useful if the LED-array blinking (Strobed operating mode) disturbs the operator.
- **-Power Strobed:** the built-in LED array is on only during the image exposure time. Different Power Strobed lighting levels can be set.



**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 2mp 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
- Windows: 8 or 10
- 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 186.

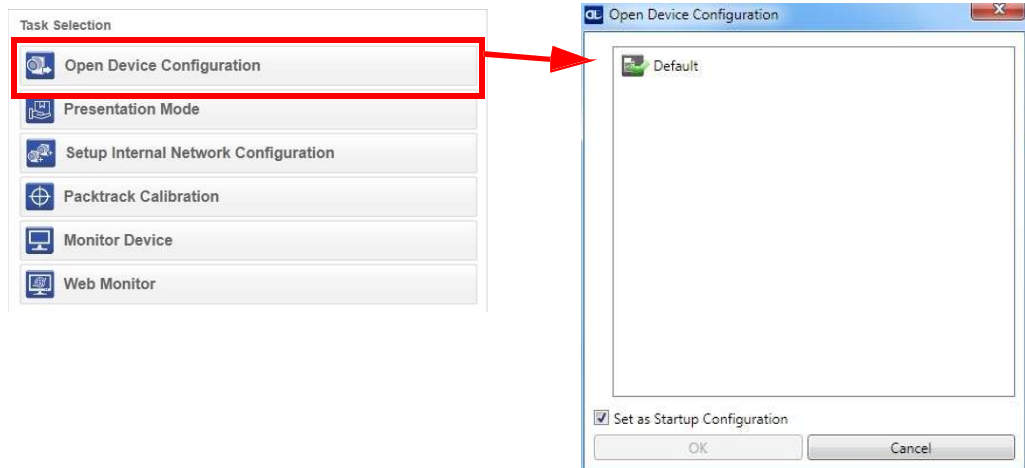


**NOTE:** Datalogic guarantees that the reader's permanent memory can store at least 50 configurations without script formatting or with a script with less than 2048 characters. The actual number of configurations may be larger depending on the type of configuration and Matrix model. In addition to your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

## 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.

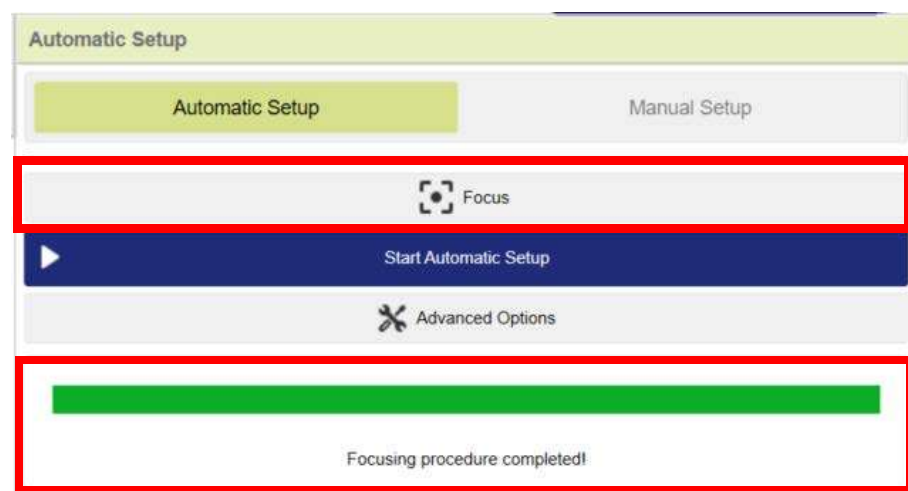


**NOTE: Step 4, Clicking on the Pause button is optional.**

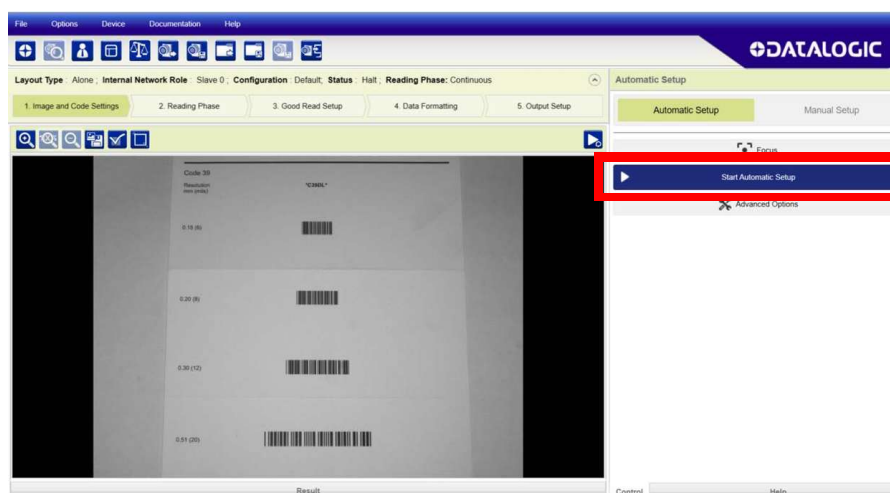
5. Before proceeding with the Automatic Setup, you must set the focus first. Click on the Focus button. A green line alerts you when the procedure is complete.



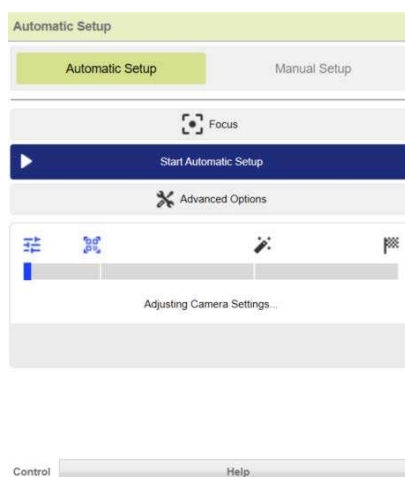
**NOTE: For Matrix 320 7xx-0x0 models only, refer to “Manual Setup for Manual Adjustable Focus Models (C-Mount)” on page 155 to focus the reader.**



6. Now click on the **Start Automatic Setup** button.



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

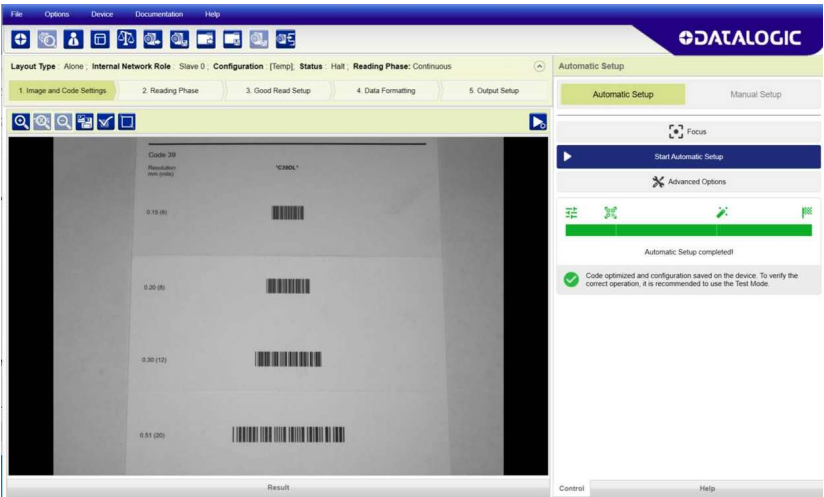


| ICON | MEANING                    |
|------|----------------------------|
|      | Initial photometric tuning |
|      | Code Search                |
|      | Search Optimization        |
|      | End of the Search          |



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

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



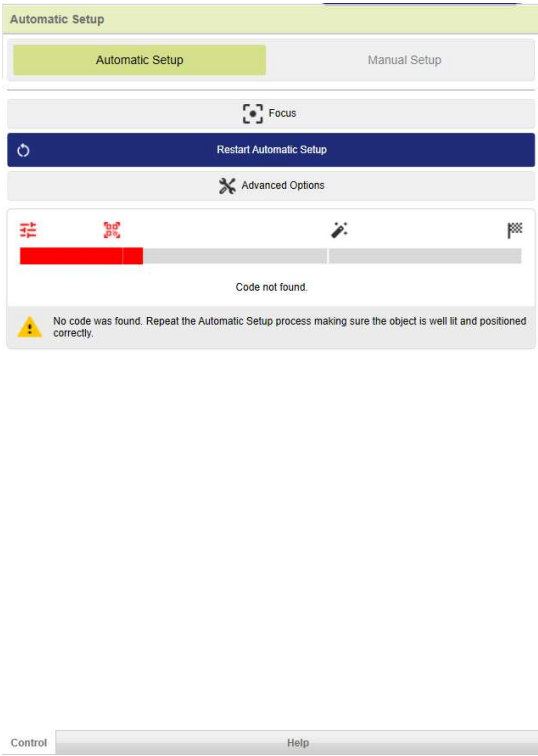
When the automatic setup is complete, a result table is displayed containing the image setup, symbology, and code properties.

| Image Setup             | Symbology                                                                                                                                 | Code Properties              |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|
| Field Of View (mm)58x44 | <br><b>DATAMATRIX</b><br>Decodability Index<br><b>58</b> | Code Resolution (mils)22.38  |
| Focus Distance (mm)134  |                                                                                                                                           | Code Size24x24               |
| PPI552                  |                                                                                                                                           | DataC0N0NMJ83LO30053C01BNA03 |
| Size (pixels)1280x960   |                                                                                                                                           | PPE12.35                     |
| Exposure (µs)400        |                                                                                                                                           | Number Of Characters23       |
| Gain14                  | Test Mode Data                                                                                                                            | Position (px)1075x205        |
| Decoding Time (ms)13    |                                                                                                                                           | Angle (°)272°                |

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.

The screenshot shows a configuration window with two tabs: 'Static' and 'Dynamic'. The 'Dynamic' tab is selected and highlighted in green. Below the tabs, there are two input fields: 'Line Speed (mm/sec)' with a value of 1000 and 'Code Resolution (mm)' with a value of 0.3. A 'Reset' button is located at the bottom of the window.



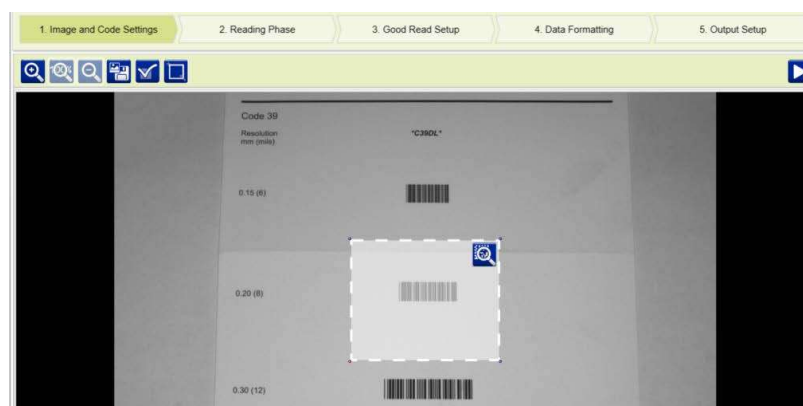
**NOTE: If you select the Dynamic option, two parameters must be set: Max Line Speed and Code Resolution.**

## 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.



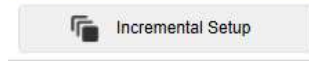
**NOTE: The new settings are applied, so any other barcodes present in the image that can be decoded with the result of the procedure can also be decoded.**

### Incremental Setup

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

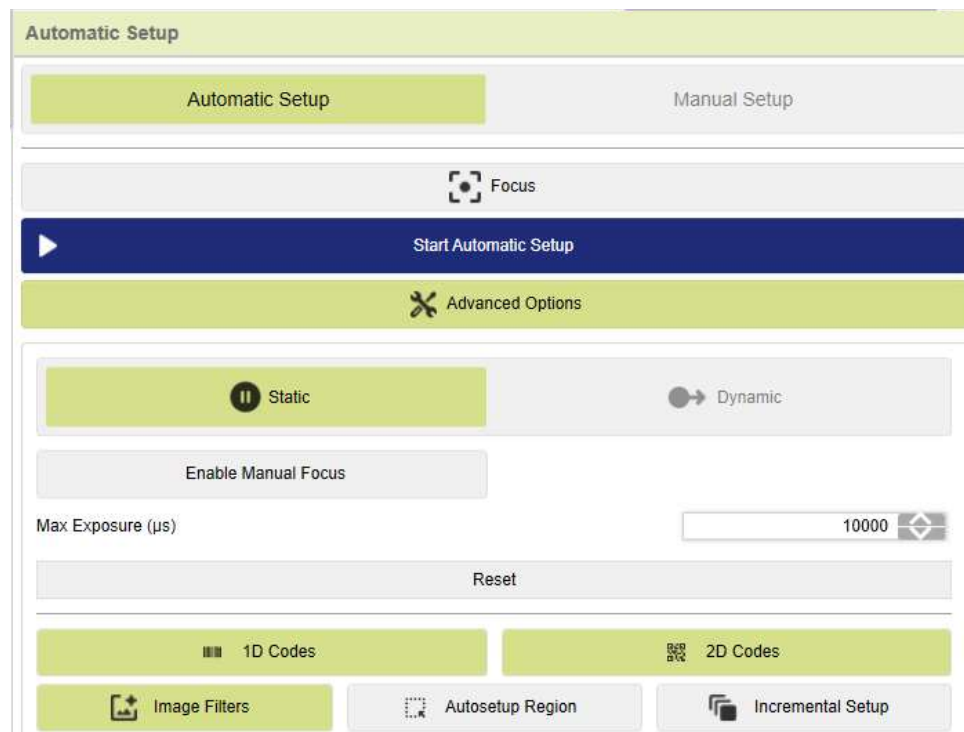
After the Autosetup procedure is completed, switching to Manual Setup allows the newly created configuration to be viewed as a new Image Setting node.

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 for Matrix 320 7xx-2x0, 7xx-3x0 and 7xx-4x0 models (Liquid lens)

**Enable Manual Focus:** allows to enter a specific focus distance [mm] for the device to use for calculations and algorithm proceedings.



### Advanced Options for Matrix 320 7xx-0x0 models (C-Mount)

The following options are displayed.

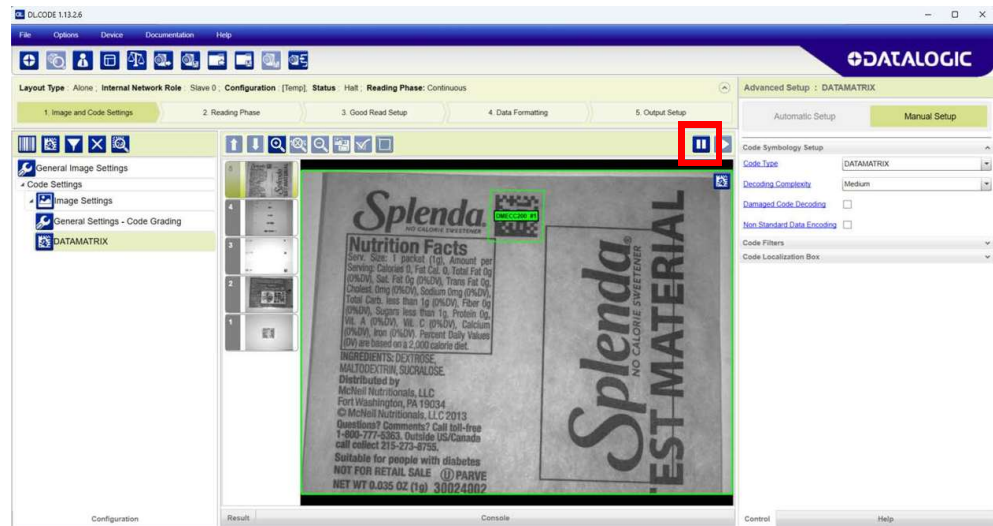
The screenshot displays the 'Advanced Options' menu for Matrix 320 7xx-0x0 models (C-Mount). The interface is organized into several sections:

- Setup Mode:** Two buttons at the top: 'Automatic Setup' (highlighted in green) and 'Manual Setup' (grey).
- Focus:** A button with a focus icon and the label 'Focus'.
- Start Automatic Setup:** A large blue button with a play icon and the text 'Start Automatic Setup'.
- Advanced Options:** A green button with a wrench icon and the text 'Advanced Options'.
- Mode Selection:** Two buttons: 'Static' (highlighted in green with a pause icon) and 'Dynamic' (grey with a play icon).
- Max Exposure (µs):** A slider control showing a value of 10000.
- Reset:** A grey button labeled 'Reset'.
- Code Types:** Two buttons: '1D Codes' (highlighted in green with a barcode icon) and '2D Codes' (grey with a QR code icon).
- Advanced Options Sub-menu:** Three buttons at the bottom: 'Image Filters' (highlighted in green with a plus icon), 'Autosetup Region' (grey with a dashed box icon), and 'Incremental Setup' (grey with a document icon).

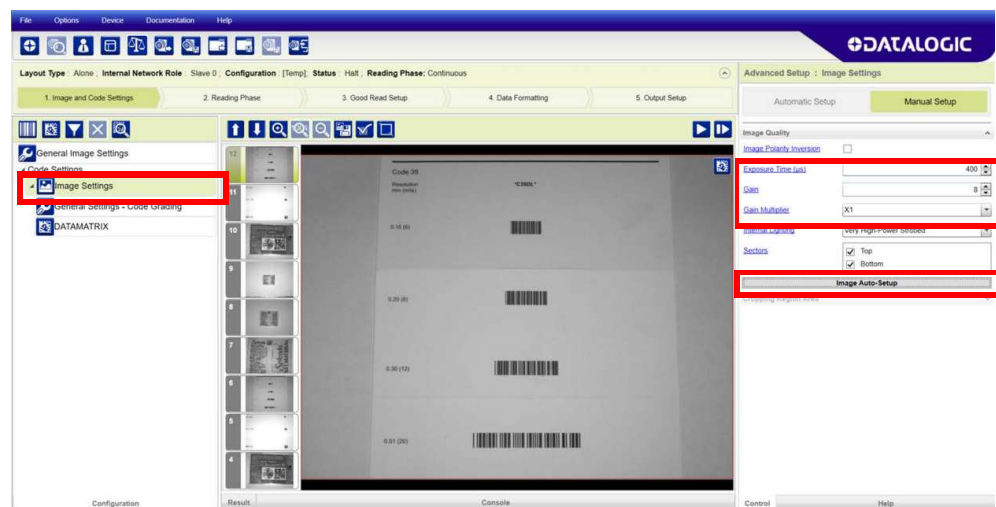
## Manual Setup Configuration

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

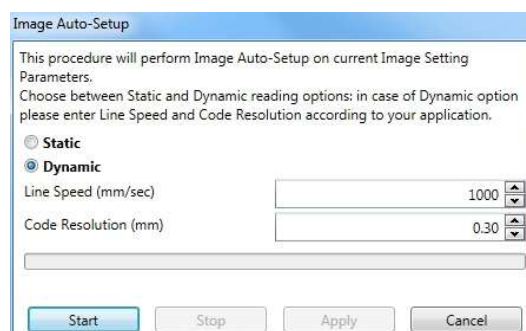
1. Click on the Manual Setup button and press the Play icon .
2. Place the **Grade A Barcode Test Chart** in the reading area. Once positioned, stop image acquisition by clicking on the Pause button .

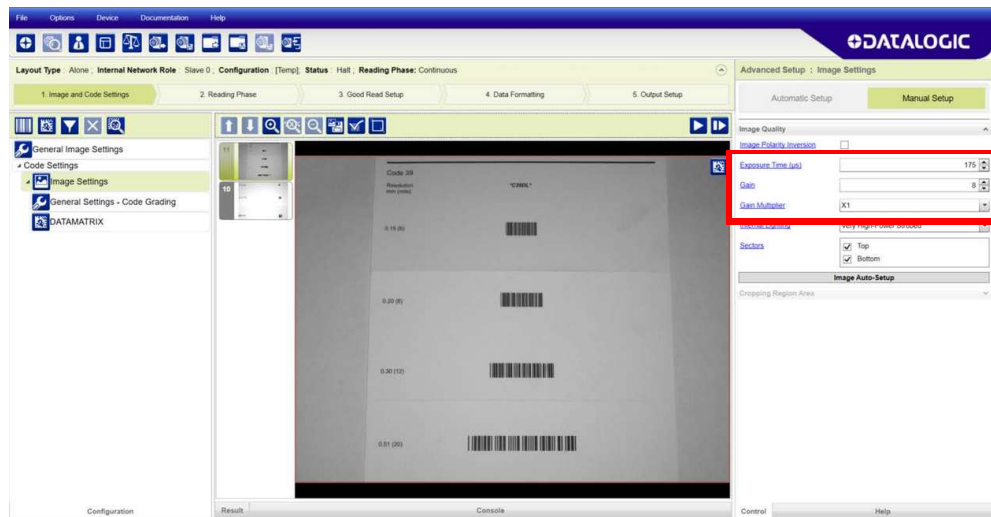


3. Click the Image Settings branch and then click the Image Auto-Setup button to automatically acquire the best exposure time and gain values.



4. Select the Static or Dynamic Self-Tuning option; Start the Image Auto Setup and Apply to the Image Settings.

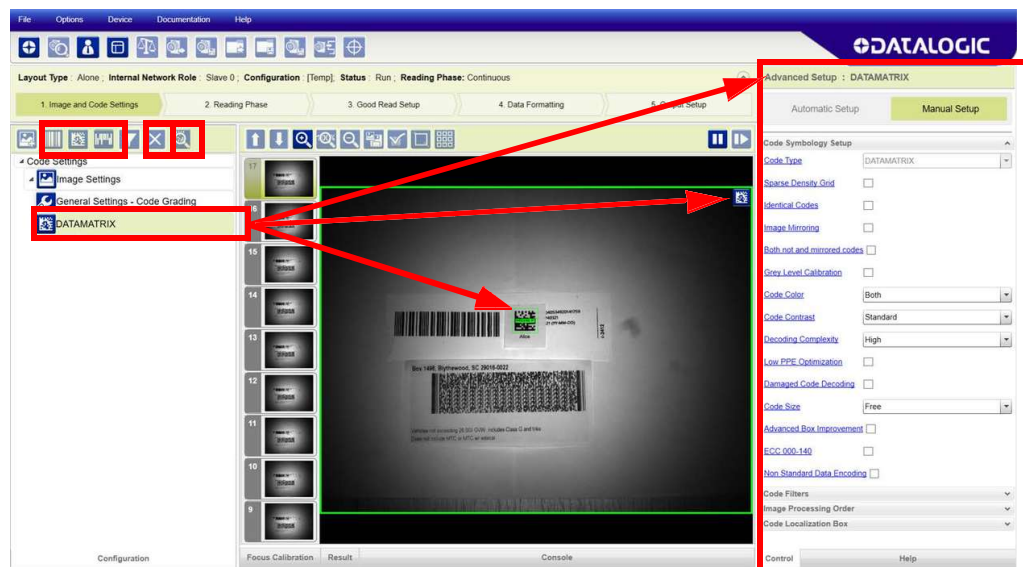




**NOTE:** For applications having multiple lighting or code reading conditions, up to 10 different.

Image Settings can be configured by adding them with the  icon.

- Now place an **application specific code** in front of the reader and **only** click the **Image Auto-Setup** button to register any changes in lighting or code surface contrast.
- Click on the Datamatrix symbology under the Image Settings branch (enabled by default). If this symbology is among those in your application it will be shown in the image display with its code symbology name and a green box around it indicating it is decoded.



**NOTE:** The large green box for each symbol indicates the code localization area which by default is equal to the maximum FoV. It can be resized and moved by dragging its borders with the mouse. The code must be found within this area in order to be decoded.

7. Add your application specific codes to the Code Settings by selecting them from the icons over the Configuration Parameters tree area. If the Data Matrix symbology is not used, then delete it from the Code Settings with the Delete icon.



If you don't know the code type, you can use the Code Autolearn feature by clicking on the Autolearn icon.



**NOTE: Refer to DL.Code User's Manual for more details about the Code Autolearn feature.**

8. For each symbology set the relative parameters according to your application.

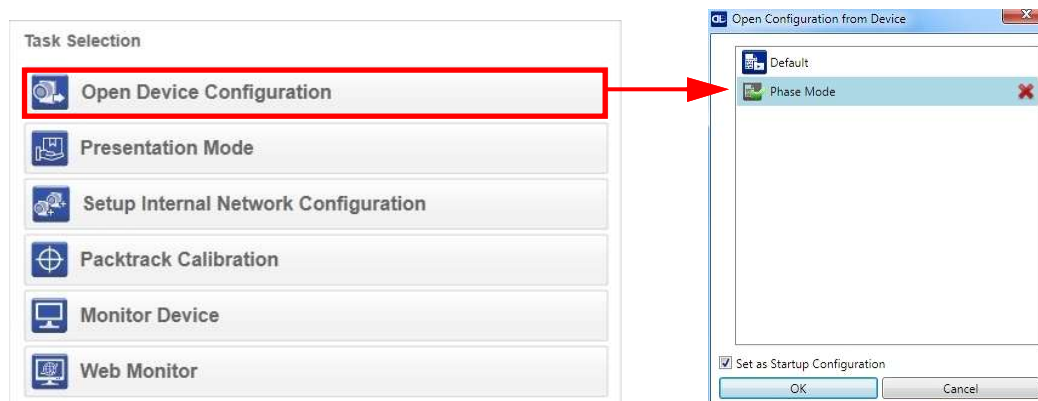
## Manual Setup for Software Adjustable Focus Models (Liquid Lens)



**NOTE: For Manual Adjustable Focus models, go to "Manual Setup for Manual Adjustable Focus Models (C-Mount)" on page 155 then continue the configuration with the "Reading Phase" on page 18.**

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.

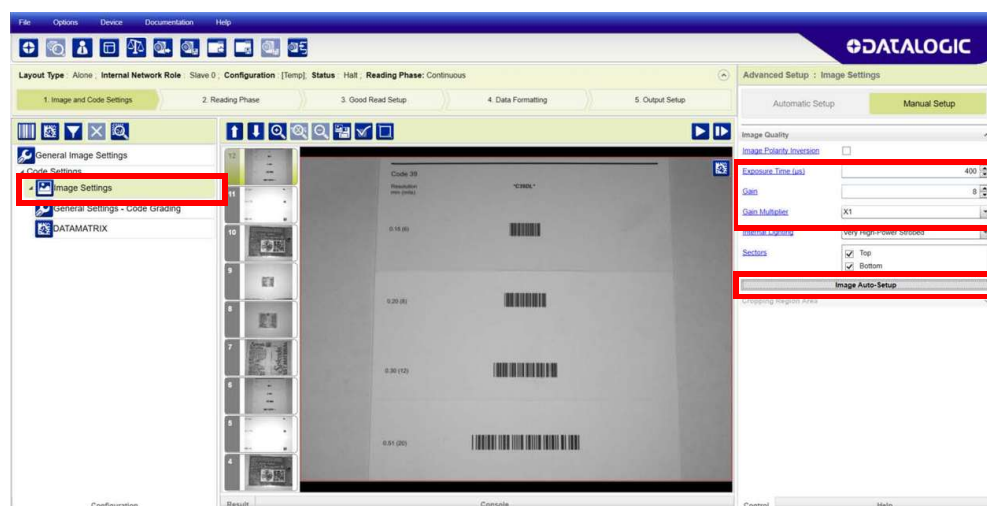
1. From the Task Area select Open Device Configuration.
2. The Open Device Configuration window opens showing the list of currently saved configurations (jobs) saved on the device. For new devices, the only saved job is the Default configuration. Click OK. The device enters run mode and begins acquiring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



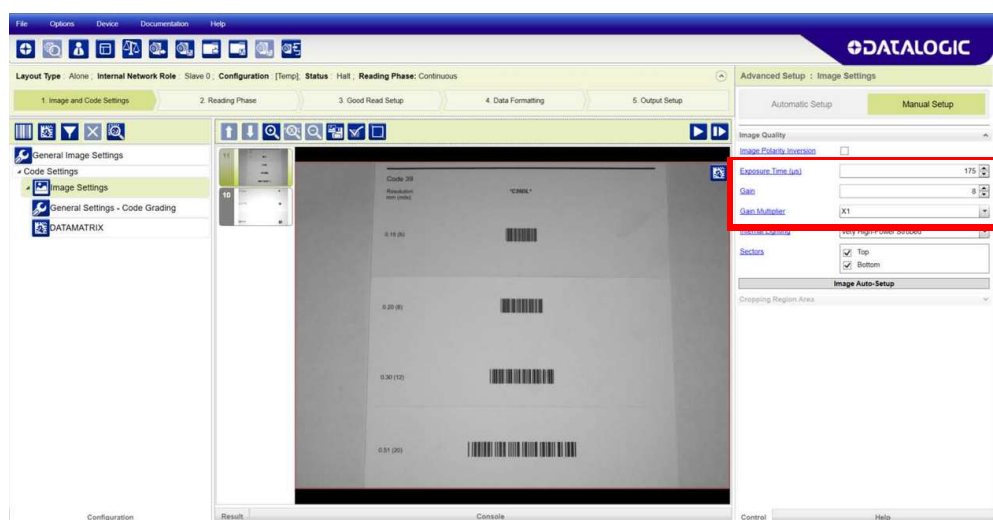
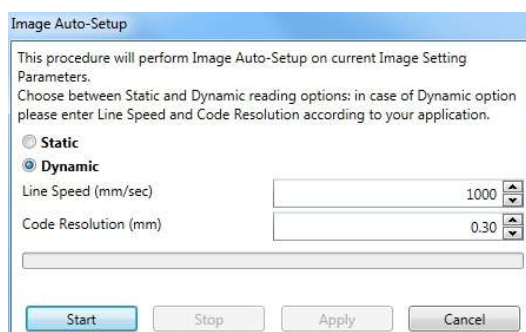
1. Click on the Manual Setup button and press the Play icon .
2. Place the **Grade A Barcode Test Chart** in the reading area. Once positioned, stop image acquisition by clicking on the Pause button .



- Click the Image Settings branch and then click the Image Auto-Setup button to automatically acquire the best exposure time and gain values.



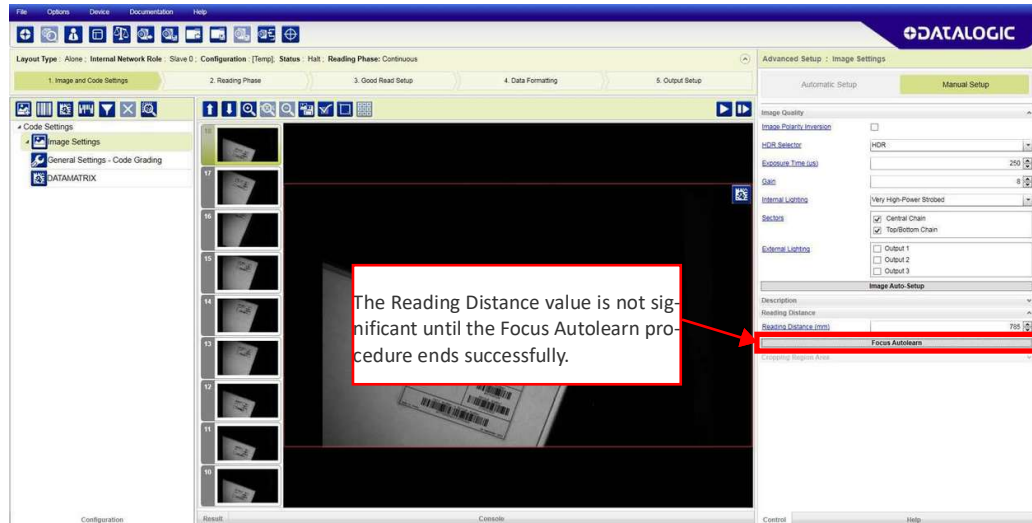
- Select the Static or Dynamic Self-Tuning option; Start the Image Auto Setup and Apply to the Image Settings.



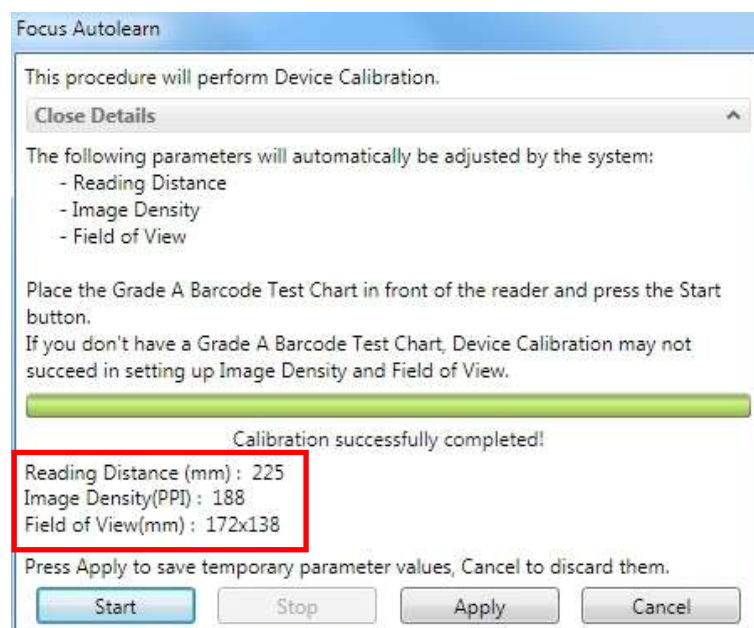
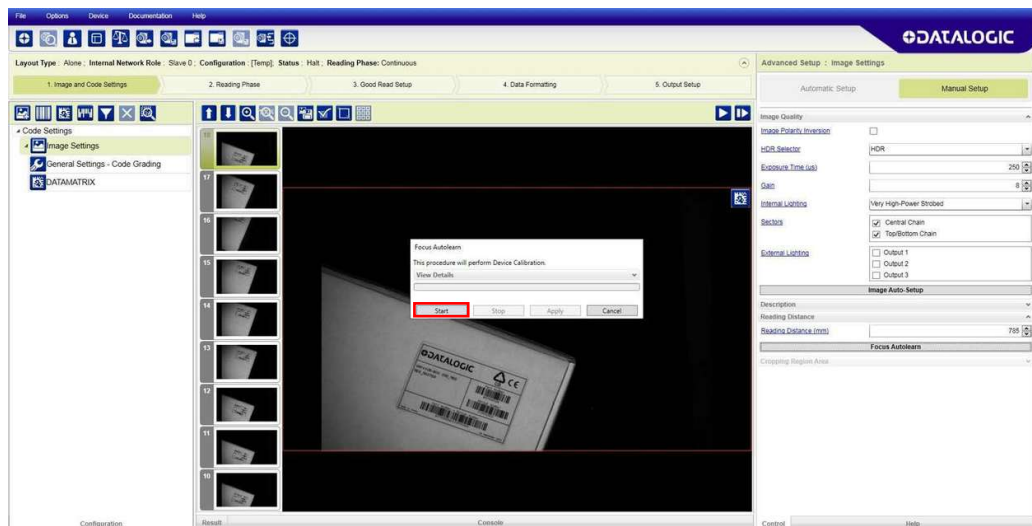
**NOTE:** For applications having multiple lighting or code reading conditions, up to 10 different.

Image Settings can be configured by adding them with the  icon.

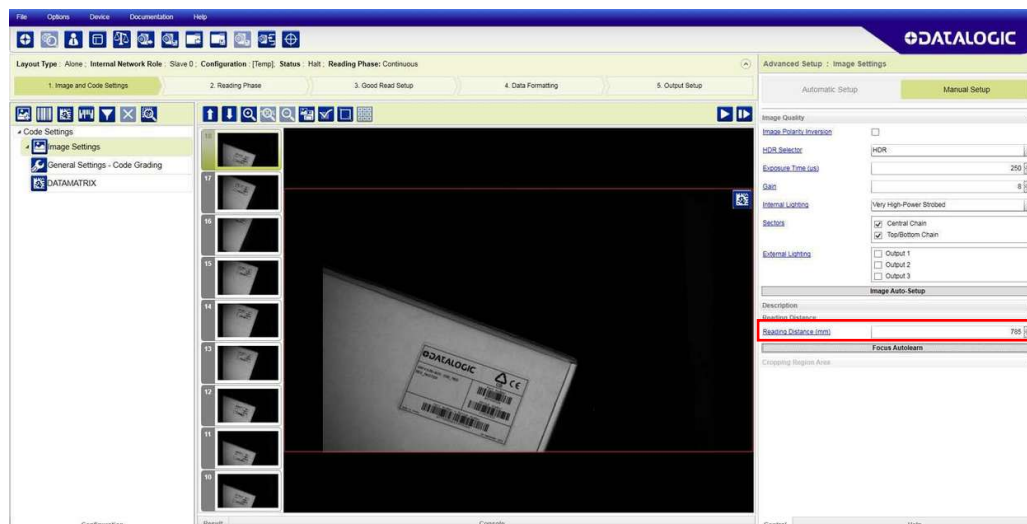
- Now select the General Image Settings branch and click on the Focus Autolearn button.



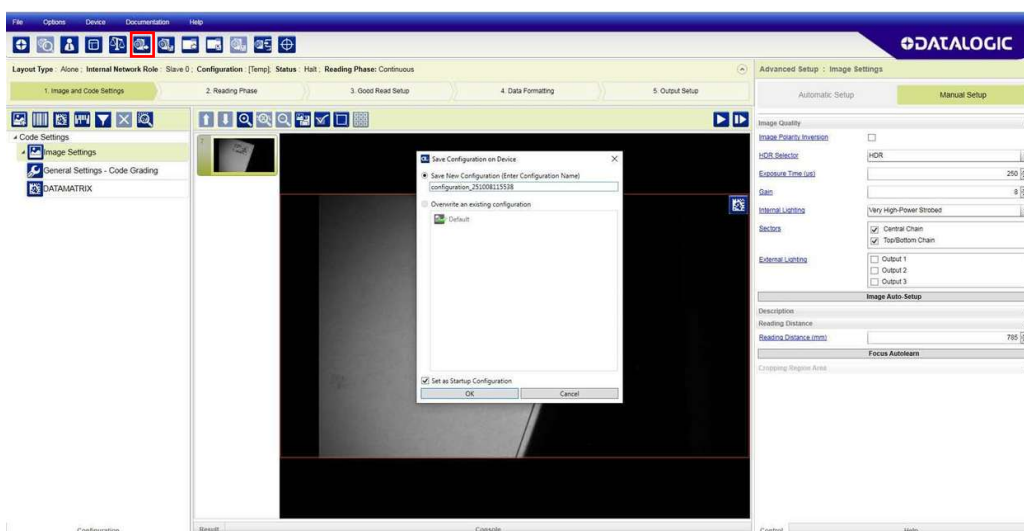
- The Calibrate dialog box opens allowing you to start the procedure. Click Start.



At the end of the calibration you can see the new Reading Distance. Click Apply.

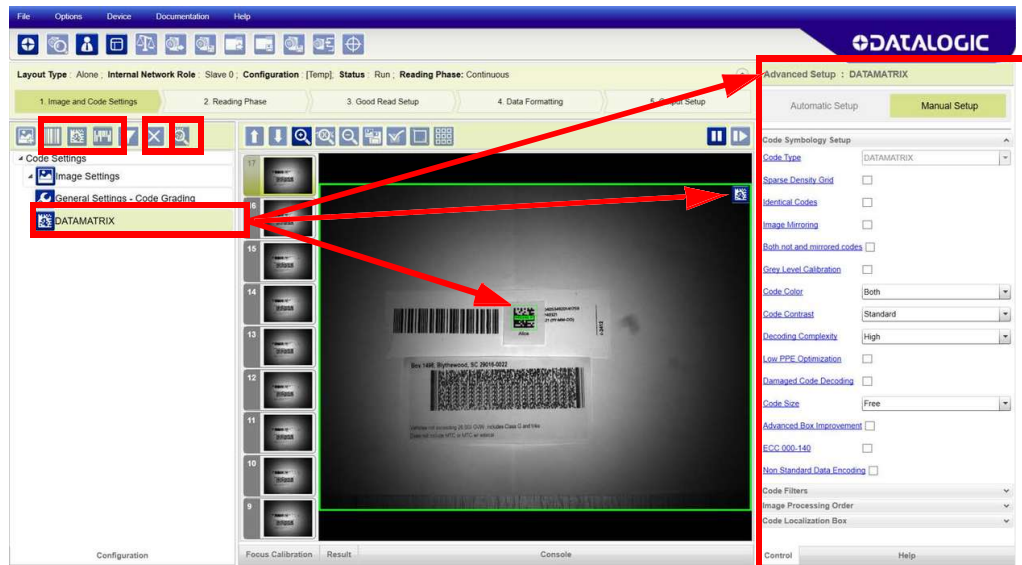


**NOTE:** At this point it is probably a good idea to save the configuration from temporary memory to permanent memory giving it a specific name.



7. Now place an **application specific code** in front of the reader and repeat **only** the **Image Auto-Setup** to register any changes in lighting or code surface contrast. **Do not repeat Focus Calibration or PPI.**
8. Click on the Datamatrix symbology under the Image Settings branch (enabled by default). If this symbology is among those in your application it will be shown in

the image display with its code symbology name and a green box around it indicating it is decoded.



**NOTE:** The large green box for each symbol indicates the code localization area which by default is equal to the maximum FoV. It can be resized and moved by dragging its borders with the mouse. The code must be found within this area in order to be decoded.

9. Add your application specific codes to the Code Settings by selecting them from the icons over the Configuration Parameters tree area. If the Data Matrix symbology is not used, then delete it from the Code Settings with the Delete icon.



If you don't know the code type, you can use the Code Autolearn feature by clicking on the Autolearn icon.



**NOTE:** Refer to DL.Code User's Manual for more details about the Code Autolearn feature.

10. For each symbology set the relative parameters according to your application.

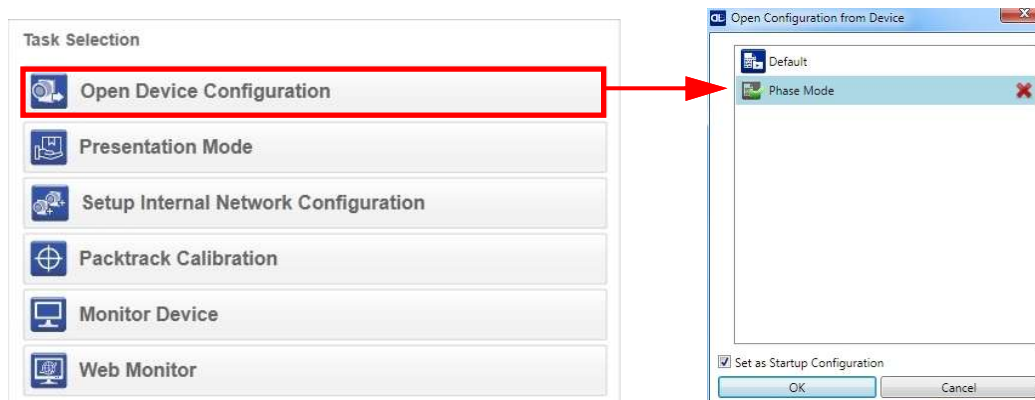
## Manual Setup for Manual Adjustable Focus Models (C-Mount)



**NOTE: For Software Adjustable Focus models, go to "Manual Setup for Software Adjustable Focus Models (Liquid Lens)" on page 150 then continue the configuration with the "Reading Phase" on page 18.**

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.

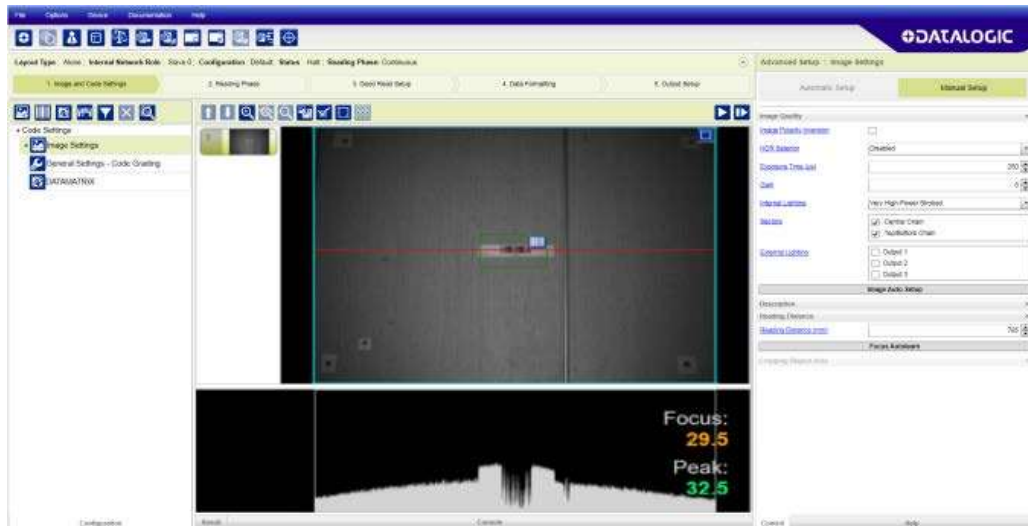


**NOTE: It is suggested to first sweep the focus ring through the whole range in order to identify the peak value.**



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

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



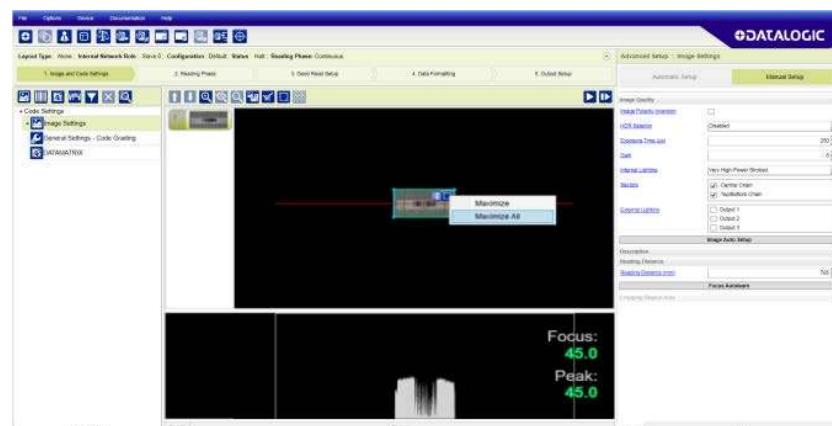
**NOTE:** We suggest cropping the sensor reading area around the barcode to get a higher frame rate and ease the focus setup. When cropping the image, please use the minimum possible value of Gain, increasing the Exposure Time if necessary.



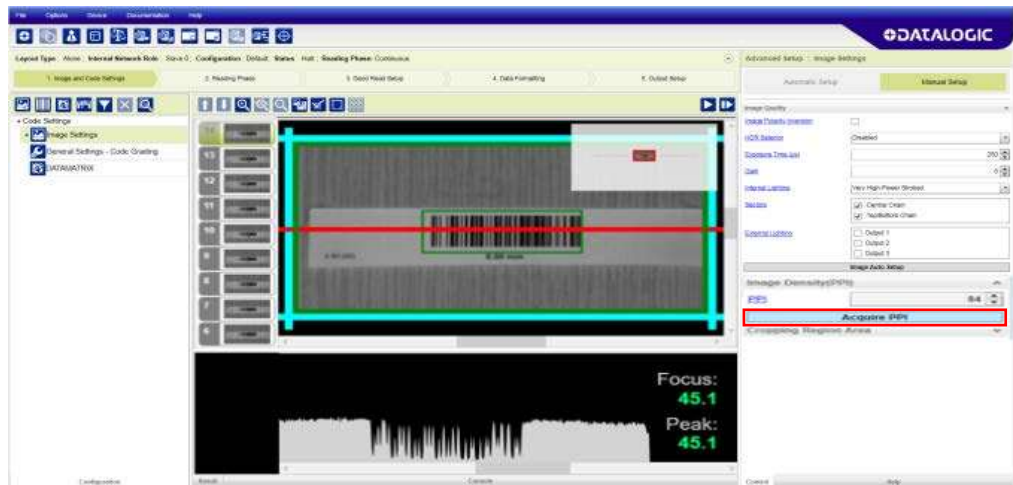
- Rotate the Focus lens ring and monitor the number reported in DL.CODE until it reaches its maximum.



**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 2mp 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:**

1. make sure that both Focus and Diaphragm lens rings are blocked;
2. if using an embedded 36 LED illuminator, mount the adapter side covers.

**Refer to** Matrix 320 2mp C-Mount Mounting Instructions, starting on page 78 **for more details.**

## 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 **Manual Setup** step. Up to 10 different Image Settings can be configured by adding them with the Add icon.



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



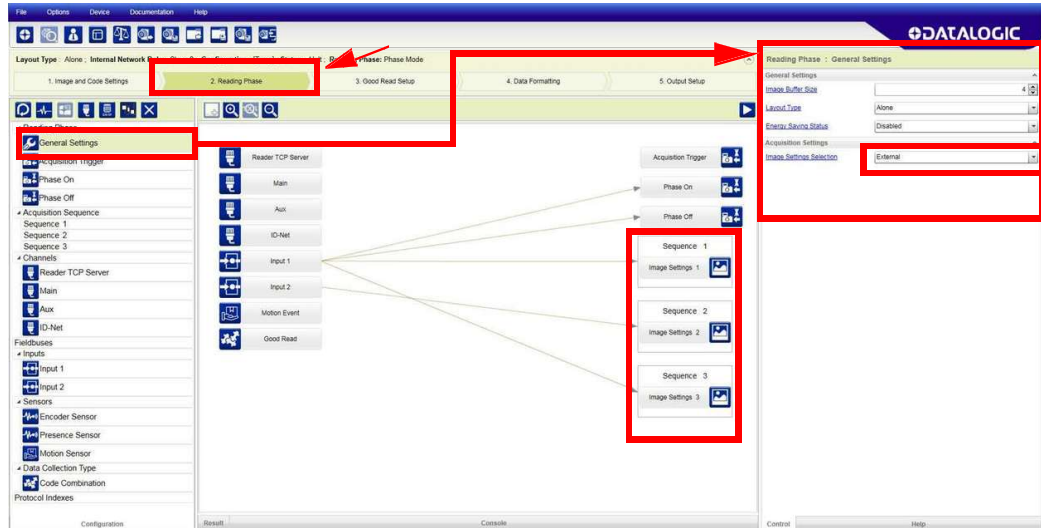
**NOTE:** The Automatic Setup procedure can be used for each Image Setting that is added through the Manual Setup group, however only one code will be associated with each Image Setting.



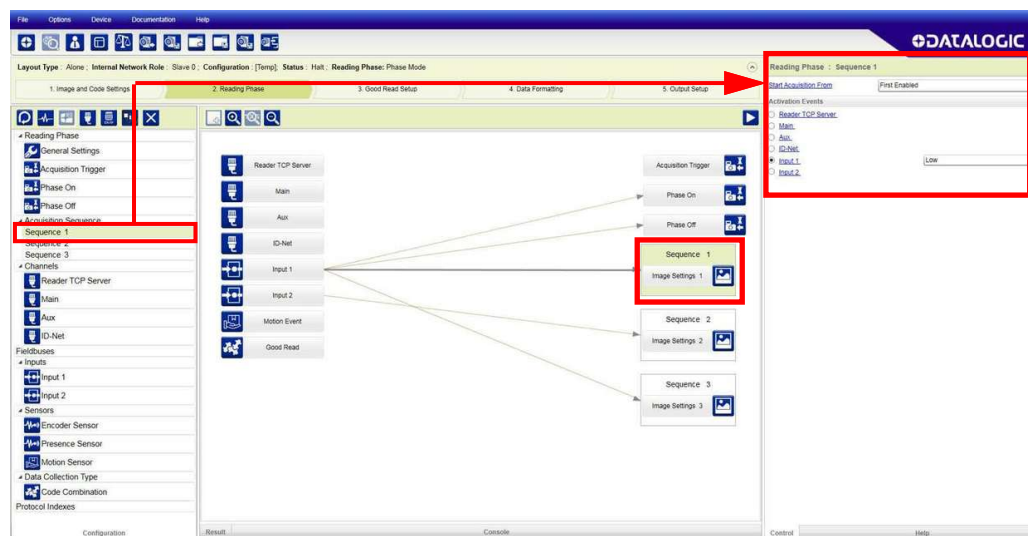
## External Image Settings Selection

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.

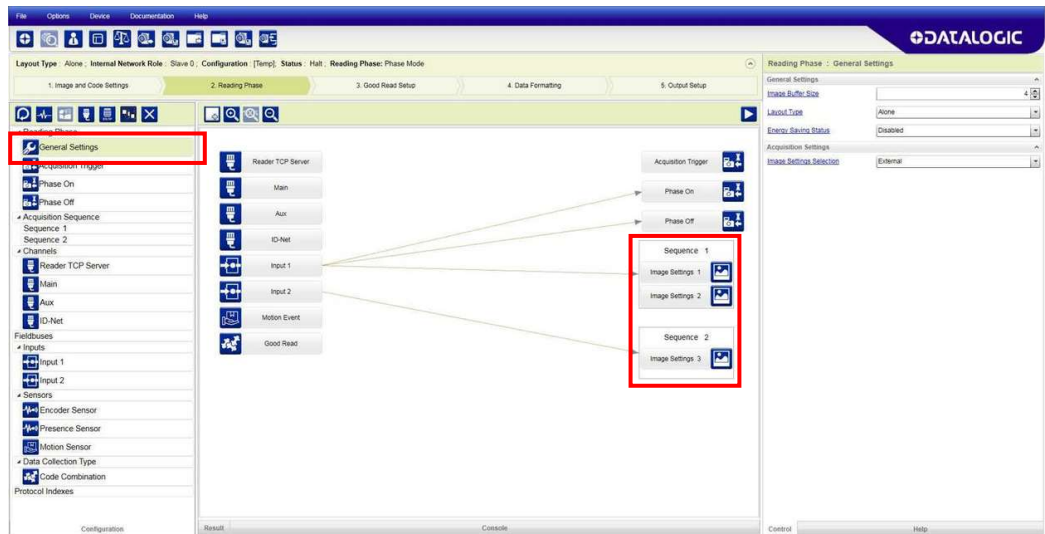
When the **Image Settings Selection** is **External**, Acquisition Sequences are created and by default each Image Setting has its own Acquisition Sequence.



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.

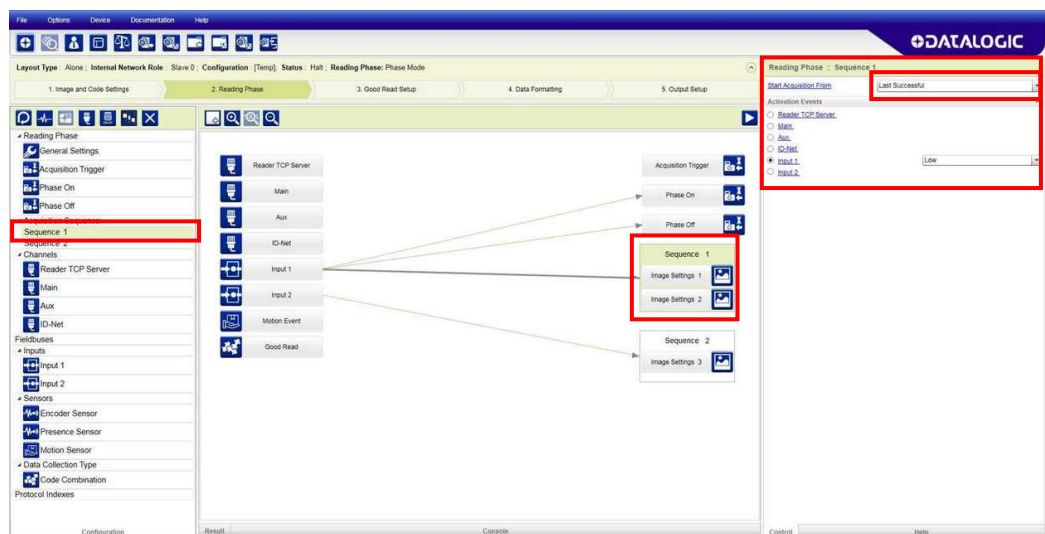


Alternatively a hybrid configuration can be made where more than one **Image Setting** can be grouped into an Acquisition Sequence by dragging it into the desired Sequence box. Select the empty Sequence box and delete it with the delete key.



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.



## EXTENDING DOF WITH AUTOMATIC IMAGE SETTINGS SELECTION (CYCLE ALL IN SAME PHASE) FOR LIQUID LENS MODELS

For Liquid Lens models, multiple Image Acquisition Settings can be configured and enabled internally through the application software to extend the reader's depth of field. During each reading phase, decoding will be attempted by applying each enabled Image Acquisition Setting (cyclically).

### Example

Read a 15 mil Data Matrix ECC 200 code covering a range from 140 to 320 mm. The reading distance range is too long to be covered by a single acquisition setting, so two acquisition settings could be used in which the first has a *Reading Distance of 195 mm* and the second has a *Reading Distance of 300 mm*. When both are enabled, the reader cycles through the two settings effectively producing the extended DOF.



**NOTE: Cycling through Image Acquisition Settings that require changing the Reading Distance parameter (for liquid lens models), drastically reduces the frame rate due to the liquid lens refocusing delay as well as by the number of settings simultaneously enabled. Therefore this may not be the best solution for high speed applications. For high speed applications it is best to use the External Image Settings Selection (Input Select) feature described on page 163. Otherwise use multiple readers set to different reading distances.**

Since many factors and parameters contribute to maximizing the reading process, it is suggested to use the DL.CODE Image Auto-Setup and Focus Autolearn tools to set the different acquisitions settings.



**NOTE: By default the Image Settings Selection parameter is set to Automatic.**

Multi Image Acquisition Settings Procedure using Automatic Image Settings Selection:

1. Using the DL.CODE Image Auto-Setup and Focus Autolearn tools, set the first acquisition setting (default) for the 195 mm Reading Distance. Then Save on Device.
2. Add another Image Setting, and using the DL.CODE Image Auto-Setup and Focus Autolearn tools, set the second acquisition setting for the 300 mm Reading Distance. Then **Save on Device**.
3. On the Reading Phase step > General Settings > Acquisition Settings, set the **Image Settings Selection** to **Automatic** (default). Then **Save on Device**.
4. Verify that the reader decodes at both distances with the DL.CODE Monitor.

## EXTENDING DOF WITH AUTOMATIC IMAGE SETTINGS SELECTION SEQUENCE (INPUT SELECT) FOR LIQUID LENS MODELS

For Liquid Lens models, multiple Image Acquisition Settings can be configured and enabled externally through a distance sensor to extend the reader's depth of field. The specific Image Acquisition Setting Sequence is selected prior to the reading phase so that only the correct setting (or group of settings) will be applied to the entire reading phase.

When only two Image Acquisition Settings are used to extend DOF (one in each sequence), this effectively allows switching DOF while keeping the lens refocusing delay outside the reading phase.

This feature is recommended for high speed applications.



**NOTE: Within each sequence, if more than one Image Acquisition Setting is enabled, they will be cycled as in the case where Image Settings Selection is Automatic.**

### Example

Read a 15 mil Data Matrix ECC 200 code covering a range from 140 to 320 mm at an application speed of 1 m/s. The reading distance range is too long to be covered by a single acquisition setting, so two acquisition settings could be used in which the first has a *Reading Distance of 195 mm* and is assigned to **Image Settings #1**, and the second has a *Reading Distance of 300 mm* and is assigned to **Image Settings #2**.

By assigning the **Image Settings Selection** to **External**, a proximity sensor (i.e. S3Z) mounted at least 150 ms before the **Acquisition Trigger** and connected to an input (i.e. Input 2), the correct DOF can be selected by enabling the correct sequence.

As an example, for a conveyor speed of 1 meter/second the **Activation Event Trigger** (Input 2 sensor) must be placed at least 150 mm before the reading phase start (Ext. Trigger).

The proximity sensor must be calibrated to trigger on packs in the near zone (140-215 mm) and therefore select the Sequence with **Image Settings #1** (the Image Acquisition Setting relative to the 195 mm Reading Distance). Packs farther away do not trigger the proximity sensor and so the Sequence with **Image Settings #2** is selected with the Image Acquisition Setting relative to the 300 mm Reading Distance.

The settings overlap in the range 210-220 mm and can be read by either one.

In this way the effective reading DOF covers the 140 -320 mm distance.



**Figure 117 - Example Extending DOF Using External Image Settings Selection**

Since many factors and parameters contribute to maximizing the reading process, it is suggested to use the DL.CODE Image Auto-Setup and Focus Autolearn tools to set the different acquisitions settings.

**Multi Image Acquisition Settings Procedure using External Image Settings Selection:**

1. Using the DL.CODE Image Auto-Setup and Focus Autolearn tools, set the first acquisition setting (default) for the 195 mm Reading Distance. Then **Save on Device**.
2. Add another Image Setting, and using the DL.CODE Image Auto-Setup and Focus Autolearn tools, set the second acquisition setting for the 300 mm Reading Distance. Then **Save on Device**.
3. On the Reading Phase step > General Settings > Acquisition Settings, set the **Image Settings Selection** to **External**.
4. You will now see the Sequences appear in the DL.CODE display area. Click on the sequence with **Image Settings #1** and select the **Input 2** Activation Event to **High**. Then **Save on Device**.
5. Verify that the reader decodes at both distances with the DL.CODE Monitor.



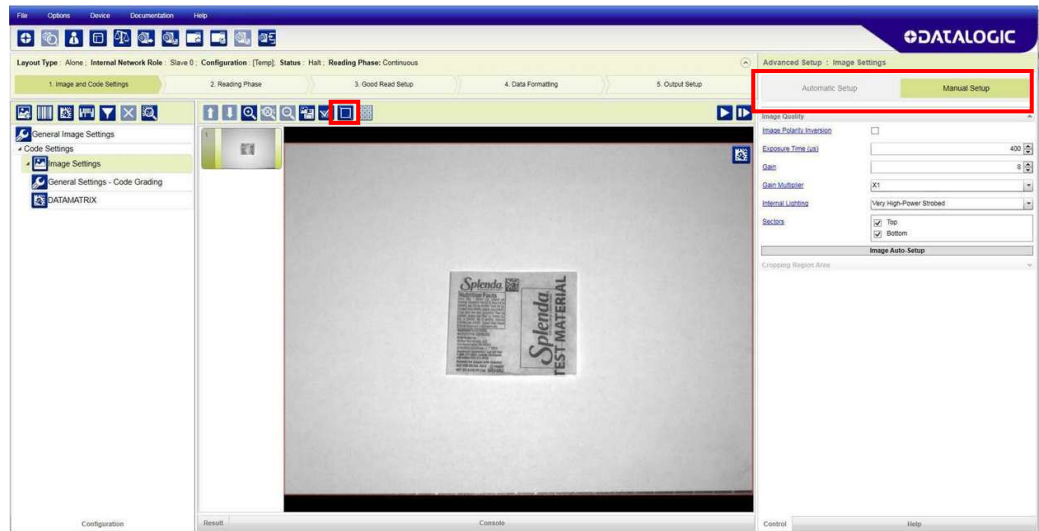
**NOTE: The Acquisition Sequences (and therefore Image Settings) can alternatively be preselected by a string from an available communication channel instead of a digital input. In any case the activation event is exclusive (only one).**

# IMAGE CROPPING

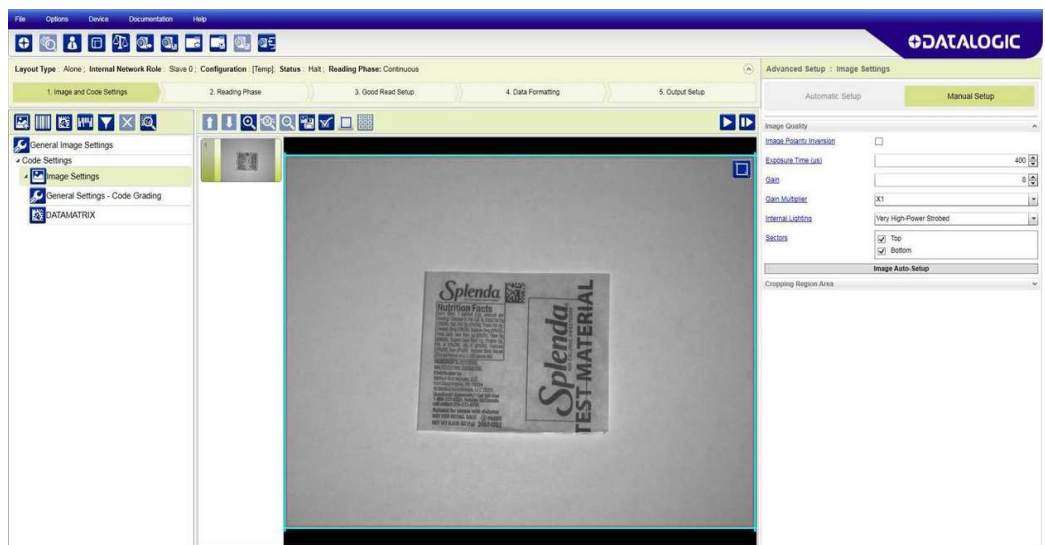
In some applications, the Image Cropping feature in DL.CODE can help to increase decoding and result performance. Image cropping is performed from the Advanced Setup tab by clicking on the Add Cropping Region icon as shown below.



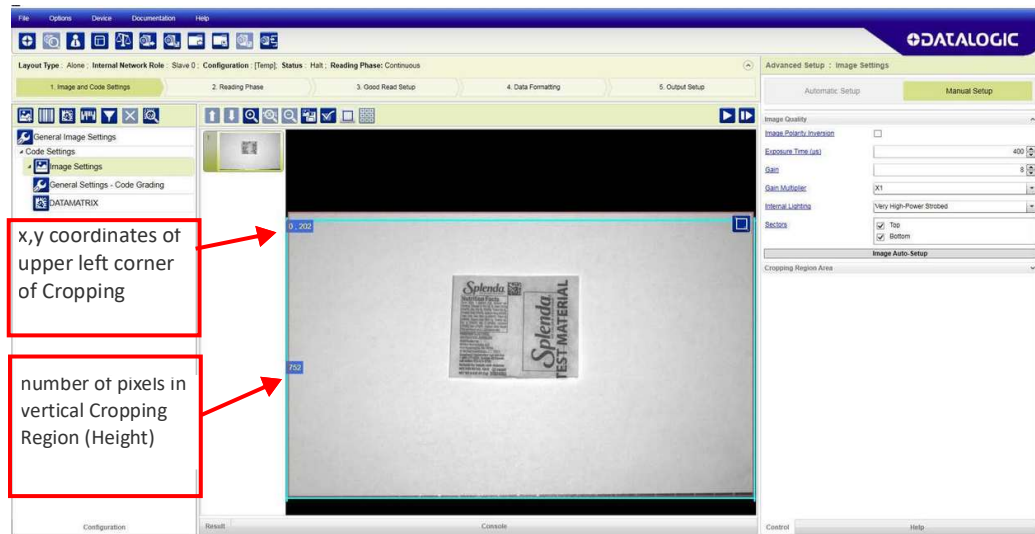
In Matrix 320 2mp the frame rate is dependent on the number of rows and columns in the defined window. Image cropping allows reducing the Image processing area from the full FoV to a smaller area where codes are present. By excluding portions of the FoV, processing time is reduced.



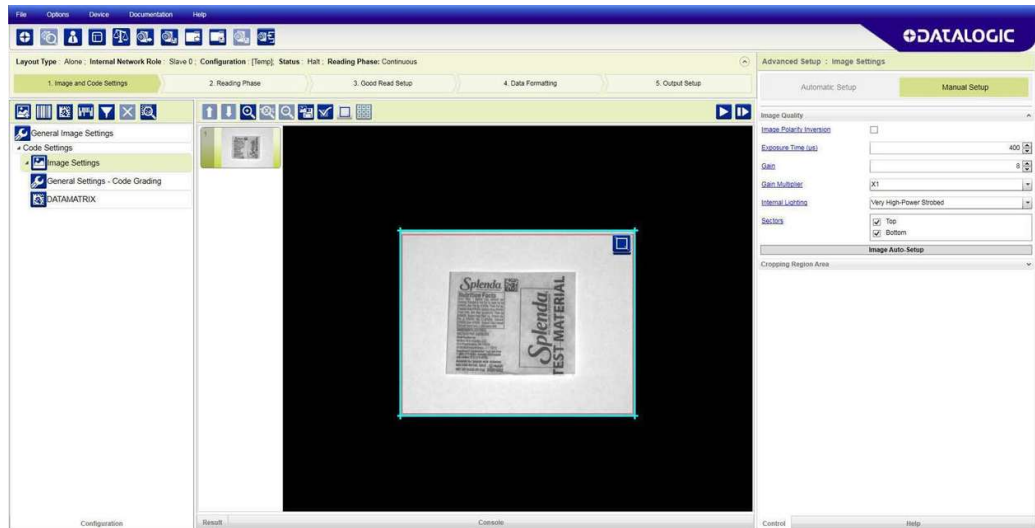
After clicking the Add Cropping Region icon, a blue border appears which by default is equal to the FoV.



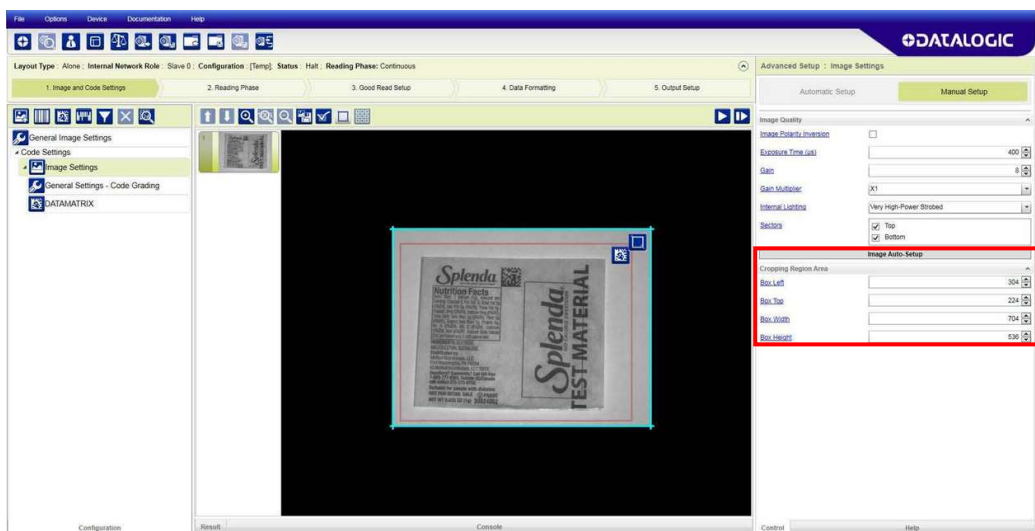
By dragging the edges with the mouse (resizing) you can crop the image to a specific location where codes are present. The numbers in the blue boxes refer to pixel references.



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/marketing technique used to create the symbol and on the overall printing/marketing 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.**



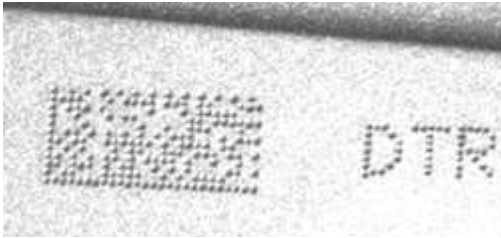
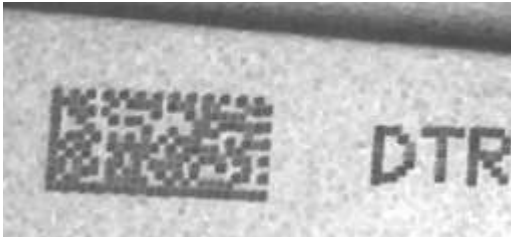
Figure 118 - Problematic Direct Part Marking Examples

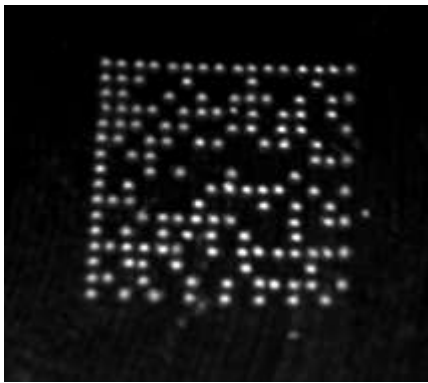
For **QR** code the **Decoding Method** parameter allows the Dot Peen Decoding algorithm to be selected which improves the decode rate for low quality Direct Part Mark codes and in general for Direct Part Mark codes with dot peening type module shapes.

## 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).

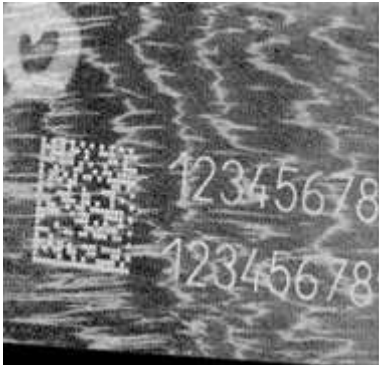
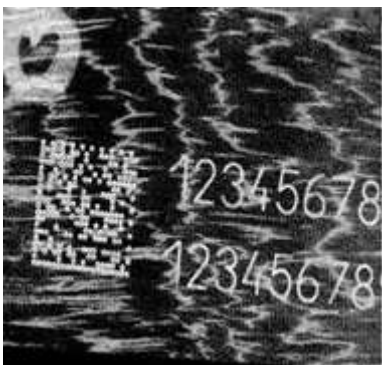
Different filters can be applied to a single code or group of codes in one or more **Image Settings**. See the DL.CODE User's Manual for examples of Image Filter application.

|                                                                                   |                                                                                    |
|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
| The <b>Erode</b> Filter enlarges the image dark zones to increase readability.    |                                                                                    |
|  |  |
| Before - No Read                                                                  | After - Readable                                                                   |

|                                                                                     |                                                                                      |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| The <b>Dilate</b> Filter enlarges the image white zones to increase readability.    |                                                                                      |
|  |  |
| Before - No Read                                                                    | After - Readable                                                                     |

|                                                                                          |                                                                                       |
|------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| The <b>Close</b> filter eliminates dark areas (defects) in the white zones of the image. |                                                                                       |
|       |  |
| Before - No Read                                                                         | After - Readable                                                                      |

|                                                                                         |                                                                                     |
|-----------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| The <b>Open</b> filter eliminates white areas (defects) in the dark zones of the image. |                                                                                     |
|        |  |
| Before - No Read                                                                        | After - Readable                                                                    |

|                                                                                     |                                                                                      |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| The <b>Contrast Stretching</b> 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.

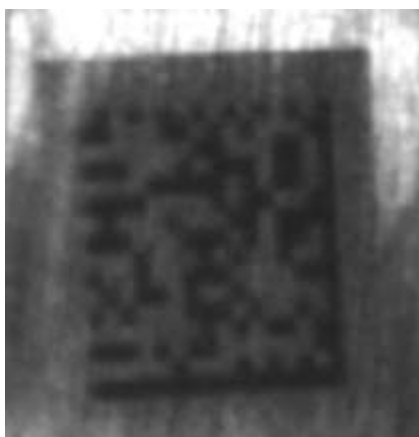


Before - No Read



After - Readable

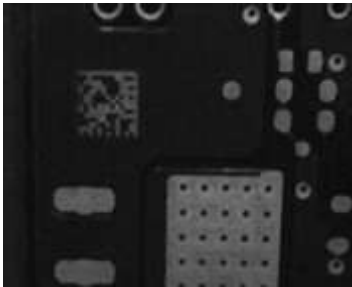
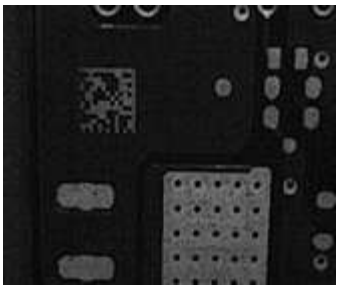
The **Sharpening** filter improves out of focus images.



Before - No Read



After - Readable

|                                                                                   |                                                                                     |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| The <b>Deblurring</b> filter improves blurred images.                             |                                                                                     |
|  |  |
|  |  |
| Before - No Read                                                                  | After - Readable                                                                    |

|                                                                                                        |                                                                                       |
|--------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| The <b>Black Enhancement</b> filter produces a nonlinear increase in the black level for light images. |                                                                                       |
|                     |  |
| Before - No Read                                                                                       | After - Readable                                                                      |

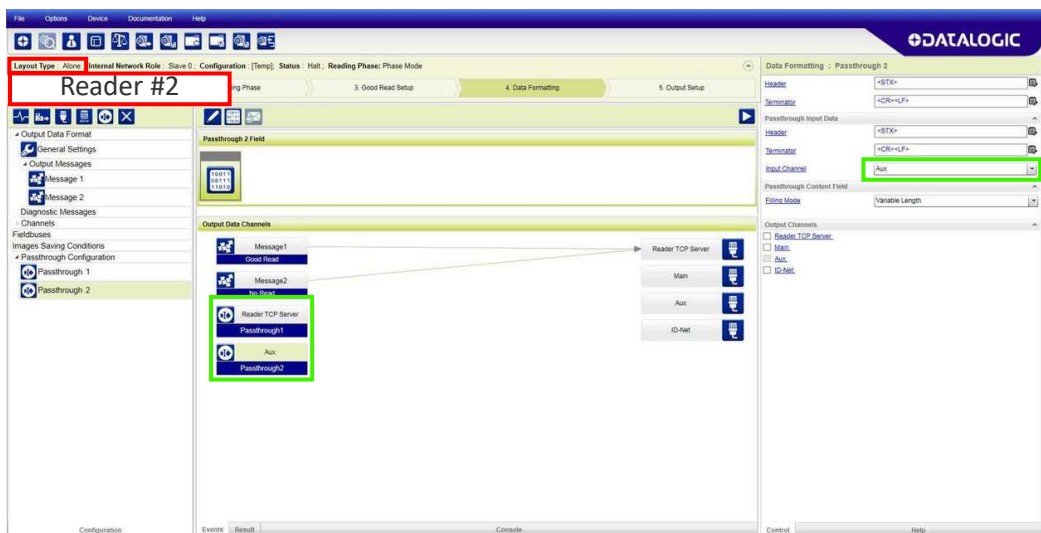
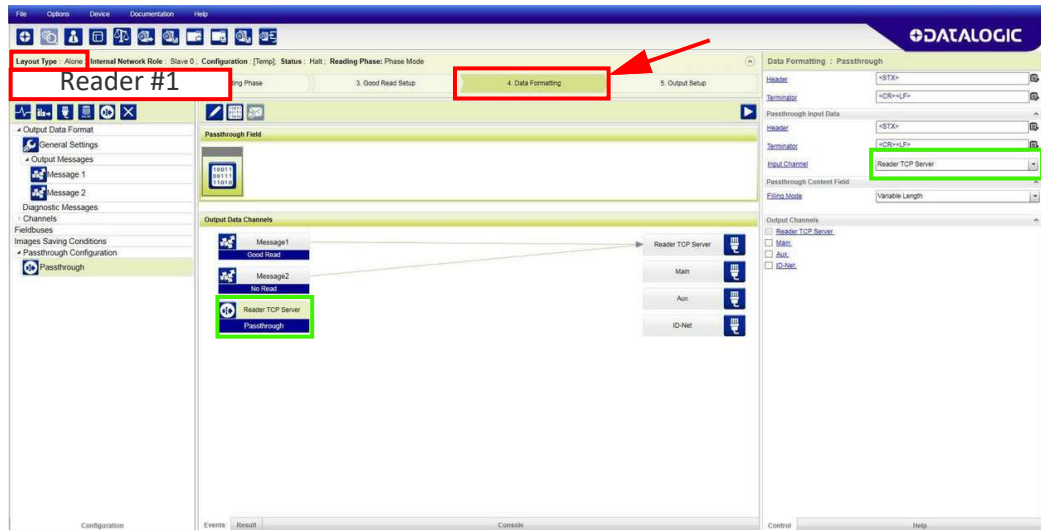
|                                                                                                       |                                                                                       |
|-------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| The <b>White Enhancement</b> filter produces a nonlinear increase in the white level for dark images. |                                                                                       |
|                    |  |
| Before - No Read                                                                                      | After - Readable                                                                      |

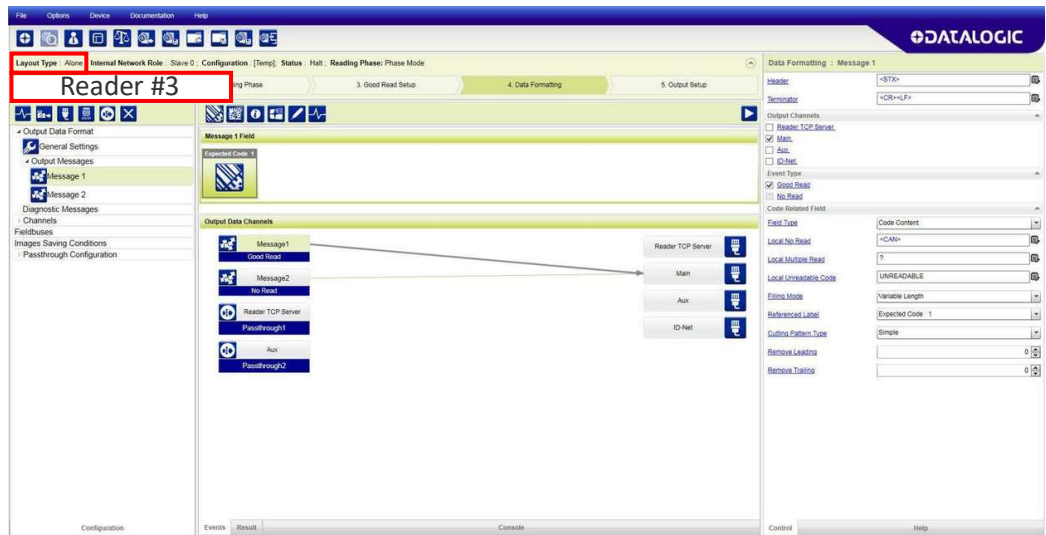
# PASS-THROUGH CONFIGURATIONS

DL.CODE and Matrix 320 2mp supports pass-through multi device configurations.

The pass-through configuration allows individually working devices, to collect data from other devices 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 120.





## 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.

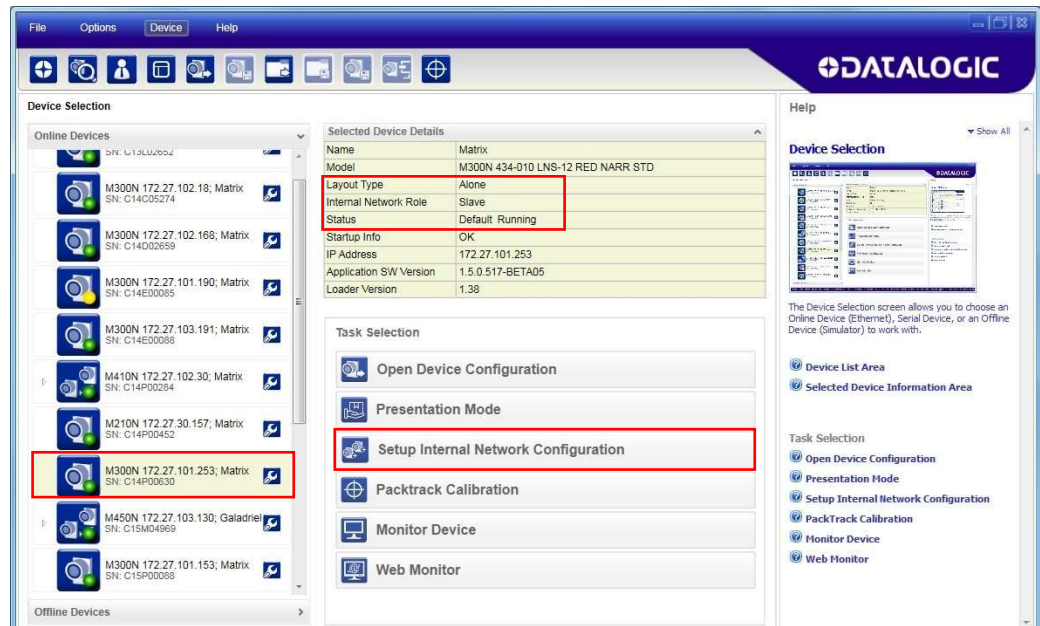
In order to automatically recognize the ID-NET Slaves, all devices must be physically installed and electrically connected (including ID-NET network wiring).

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

1. Mount all the readers mechanically (refer to "[Mechanical Dimensions](#)" on page 52 and "[Mounting And Positioning Matrix 320 2mp](#)" on page 58) and electrically (refer to "[ID-NET Interface](#)" on page 96) 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 175.
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 177 or "[Synchronized ID-NET Network Configurations](#)" on page 181.
6. For Synchronized networks Verify/Test network performance. See "[Verify Master/ Slave Synchronized Configuration](#)" on page 184.
7. Perform the **Backup current Internal Network configurations** procedure. See "[Backup](#)" on page 187.

## Master Configuration

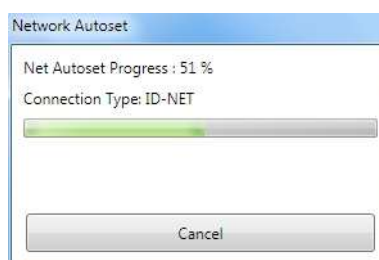
First start with the desired device to assign as ID-NET Master (current default setting is Slave). Click on Setup Internal Network Configuration from the Task area.



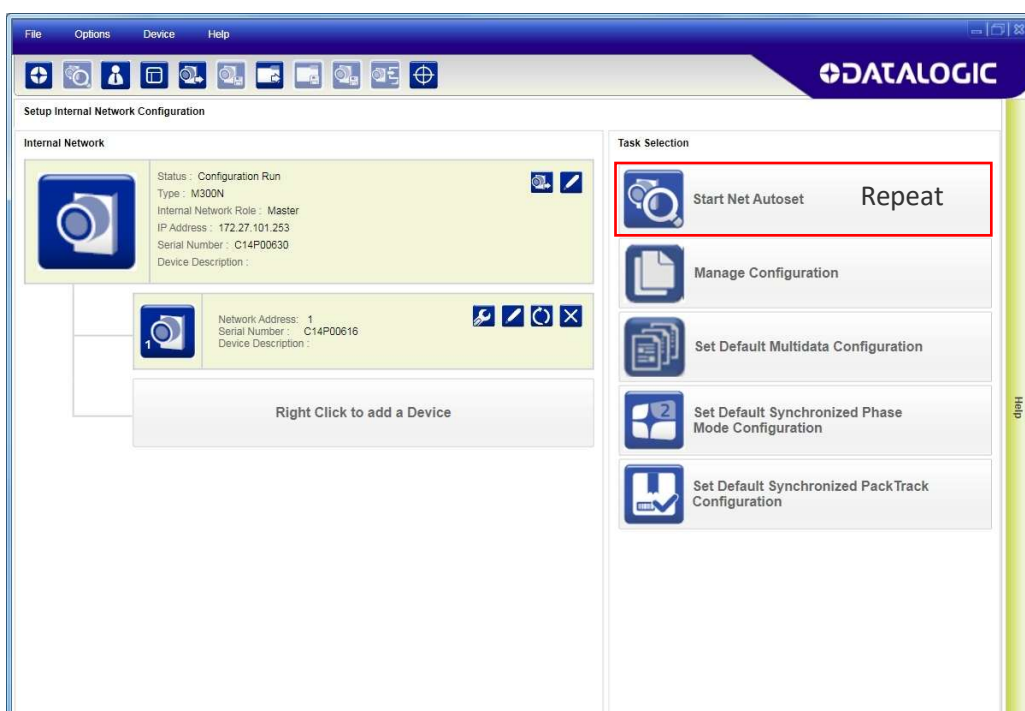
You will be advised that the device role will be changed to Master.



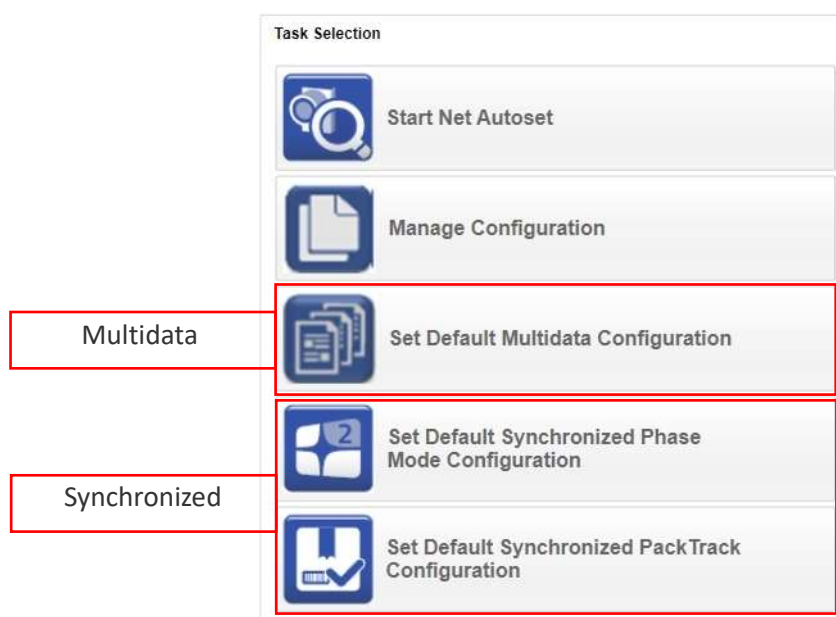
Click OK. The Net Autoset feature automatically starts to find Slave devices connected to the ID-NET network of the Master.



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 Autoselect 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**.

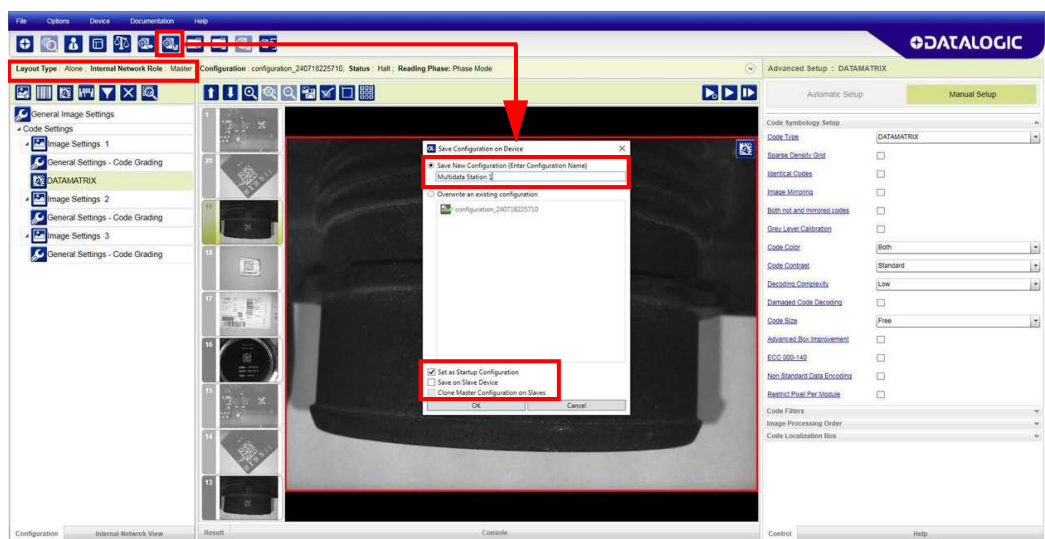


Figure 119 - Saving Multidata Configuration to Master

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.

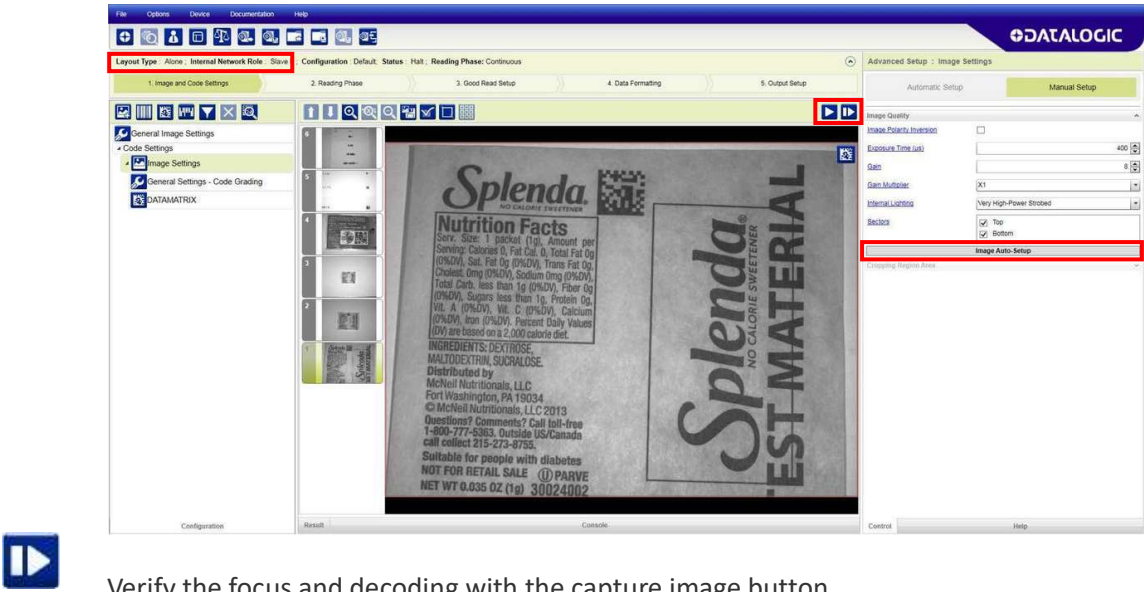


**NOTE: If necessary, Slave device photometric (Image Settings) parameters must be configured separately through DL.CODE. This is preferably done through each device's Ethernet TCP/IP channel. If Slave devices are not connected to Ethernet you must temporarily (manually) connect them one by one to perform 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<sup>1</sup>.

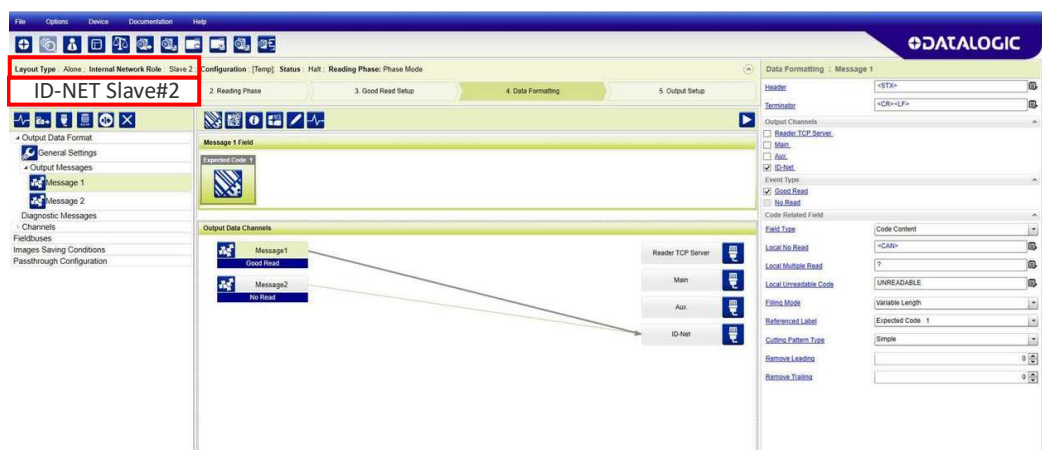
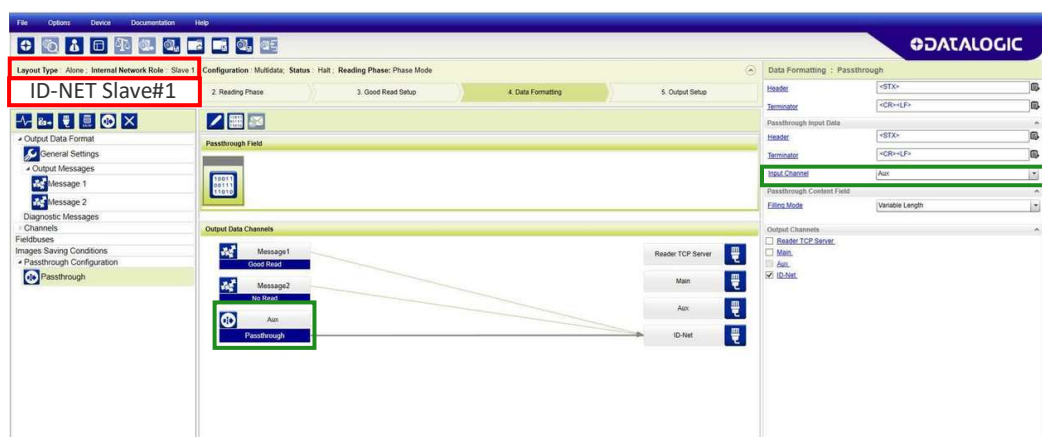
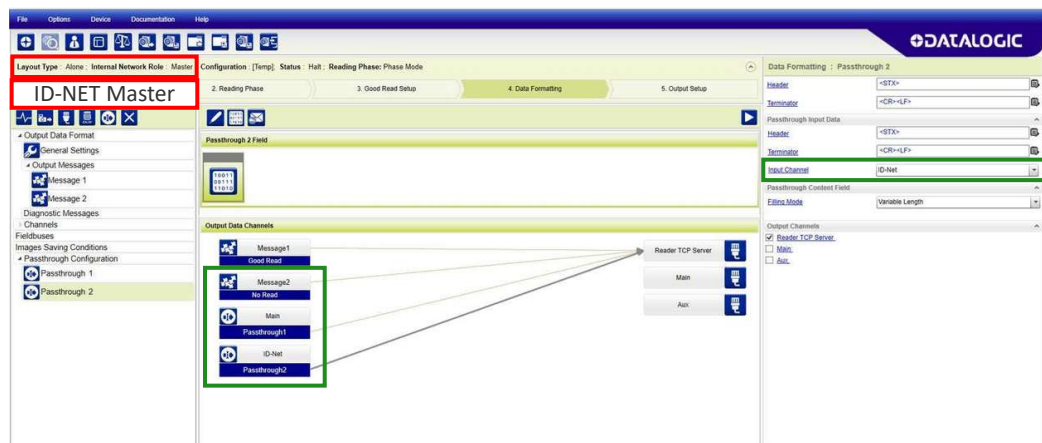


Figure 120 - Saving Multidata Configuration to Slave 1

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**.

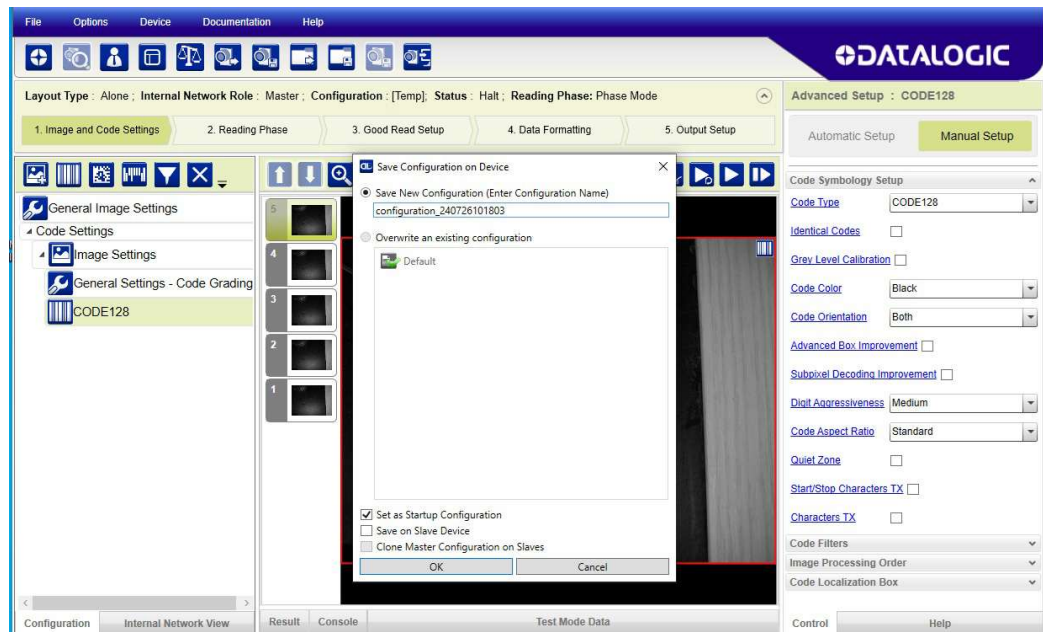
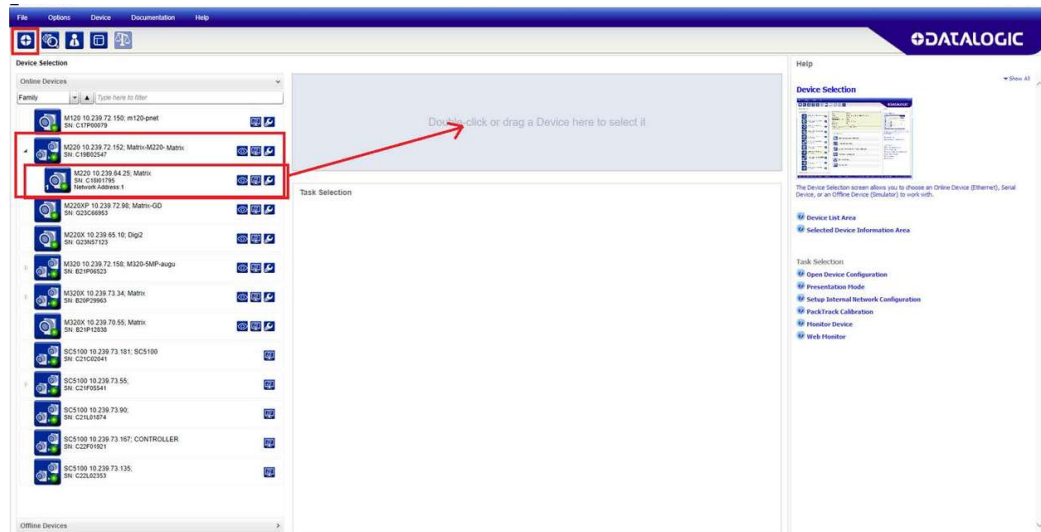


Figure 121 – Saving Synchronized Phase Mode Configuration to Master

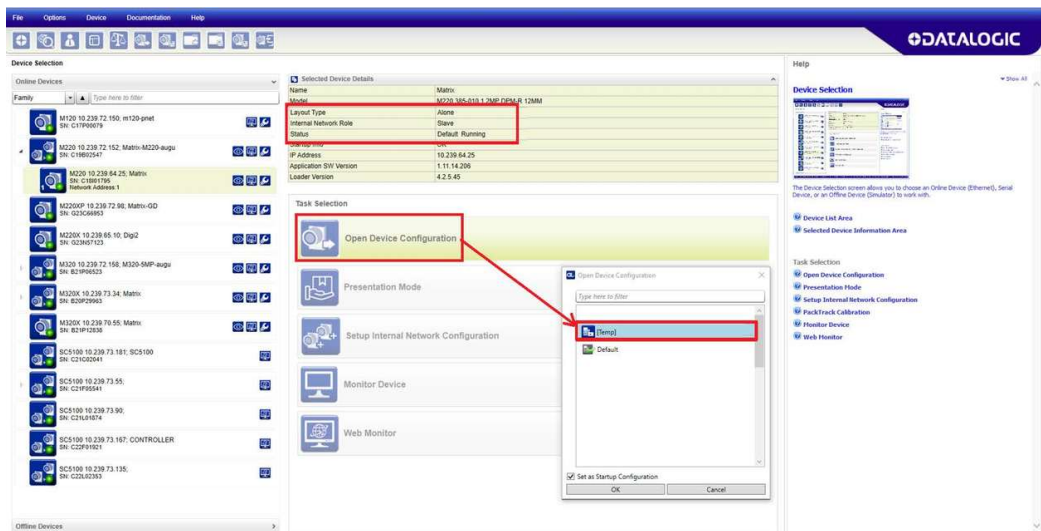
2. Connect to each Slave reader via Ethernet (see note below), and set the Slave specific parameters.



**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.

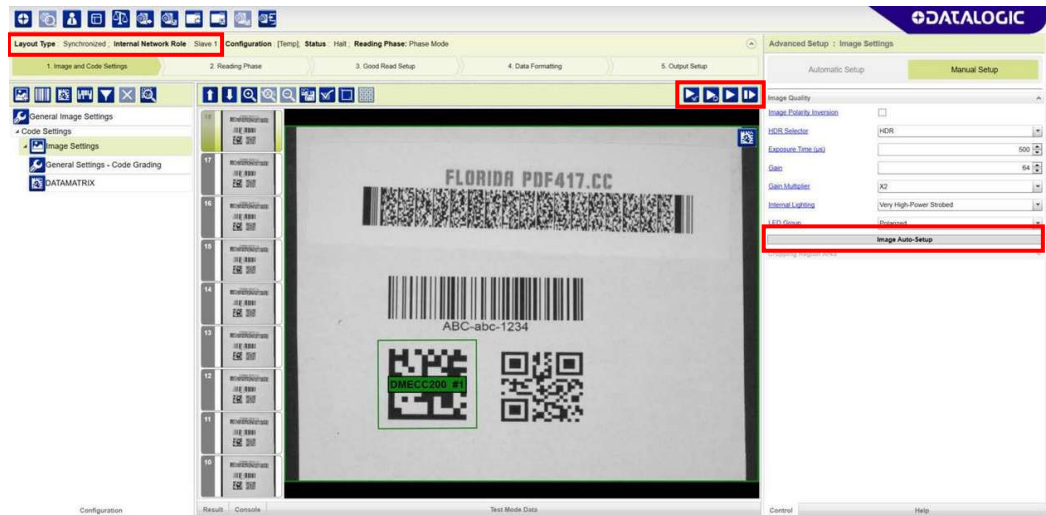


Open the cloned application job.



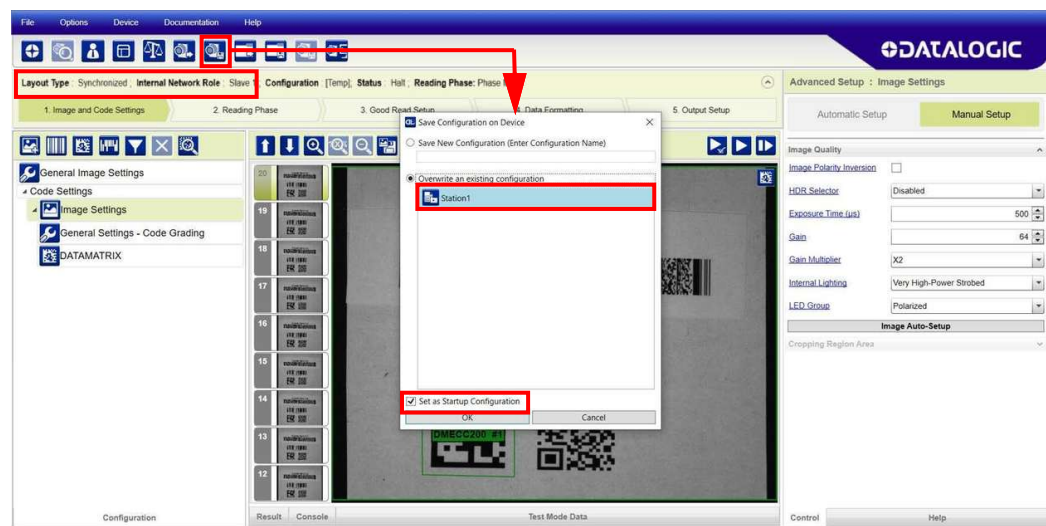
When the job opens, pause run mode and configure the Slave specific parameters. These depend on the application and include the following:

- 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<sup>1</sup>.



**Figure 122 - 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 122 for an example.

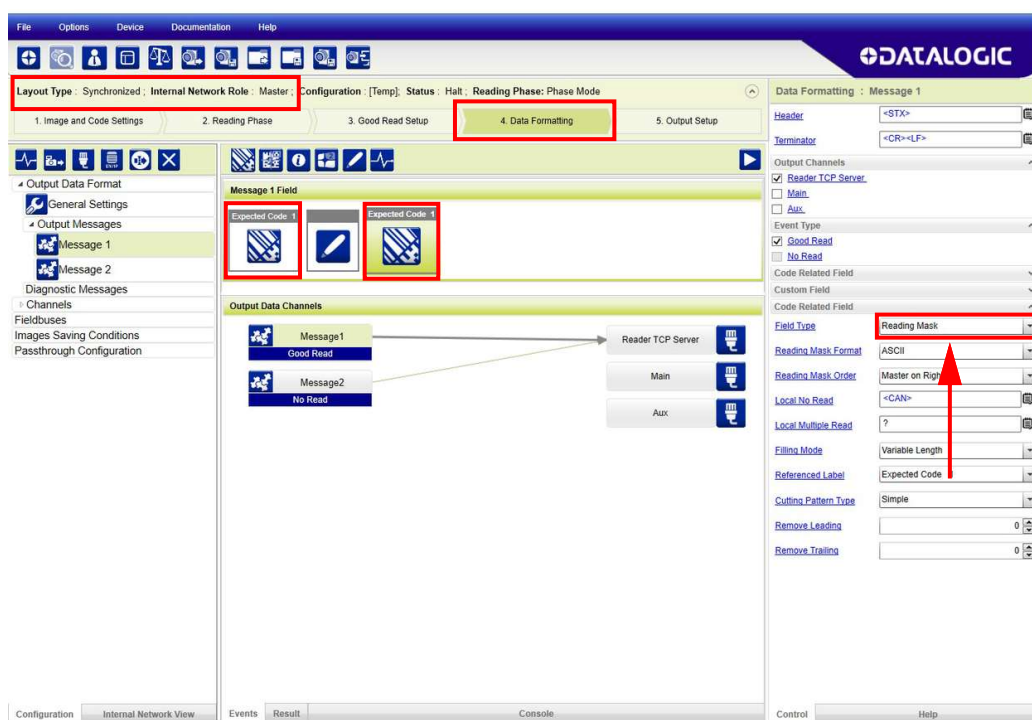
1. An application job with the same name as the Master's has been cloned to the Slaves. Each Slave can have its own Image Settings parameters saved in its own copy of the application job. Common parameters managed by the Master such as Operating Mode cannot be modified in the Slave jobs and are shown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

## Verify Master/Slave Synchronized Configuration

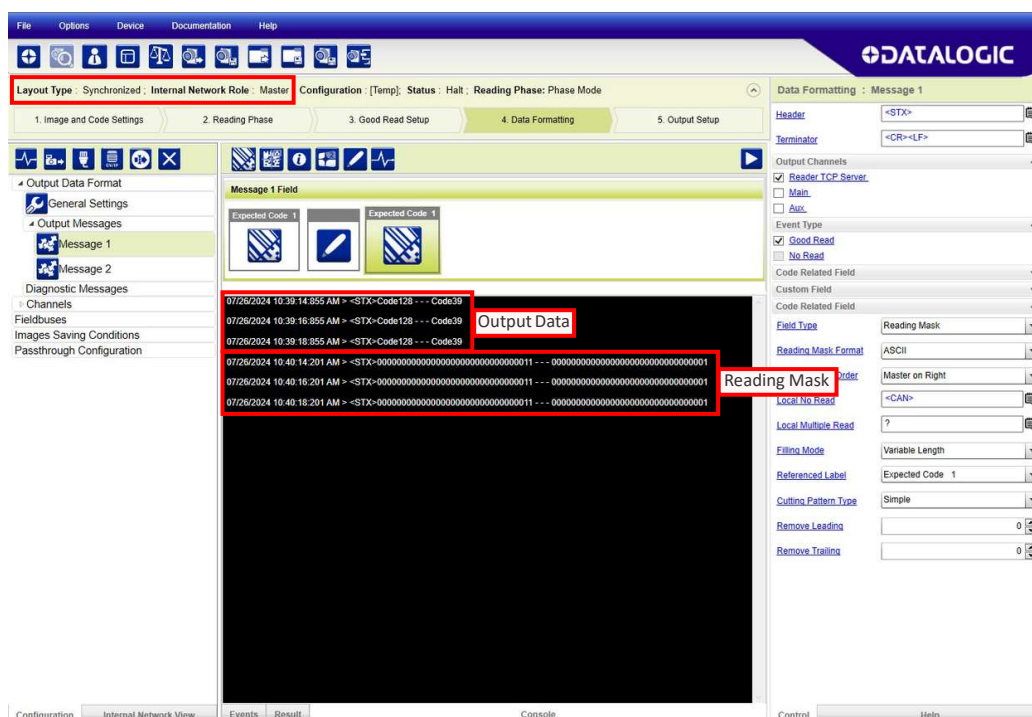
From the Master configuration, run the application and monitor the output data from the DL.CODE Console or a configured channel terminal.

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

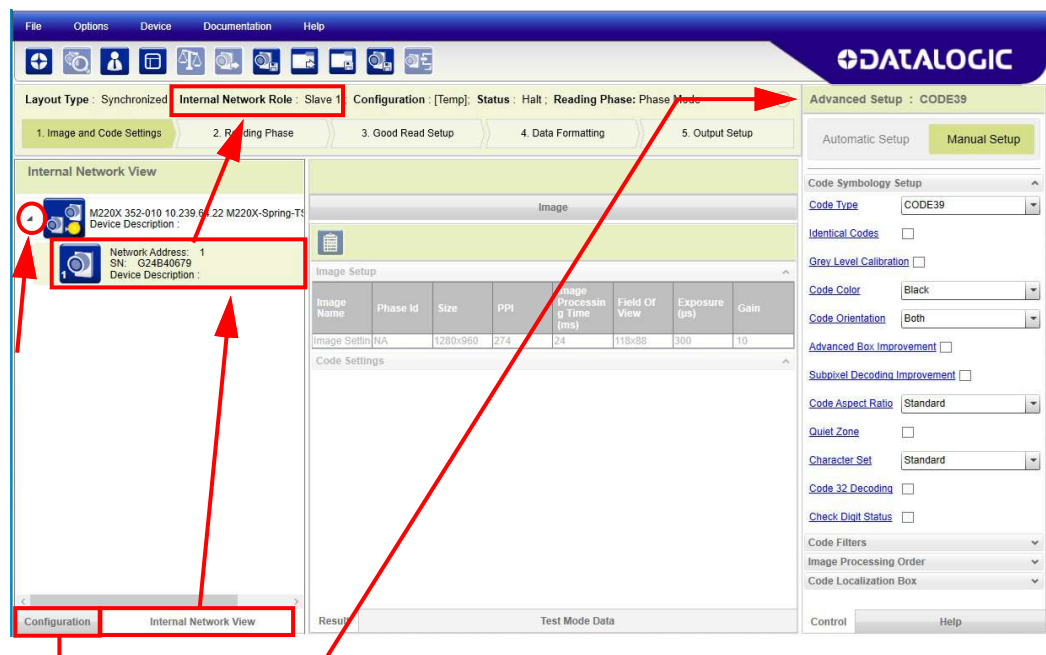
The figure above shows that both the Master and Slave 1 are reading Code 128 while only the Master is reading Code 39.

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.

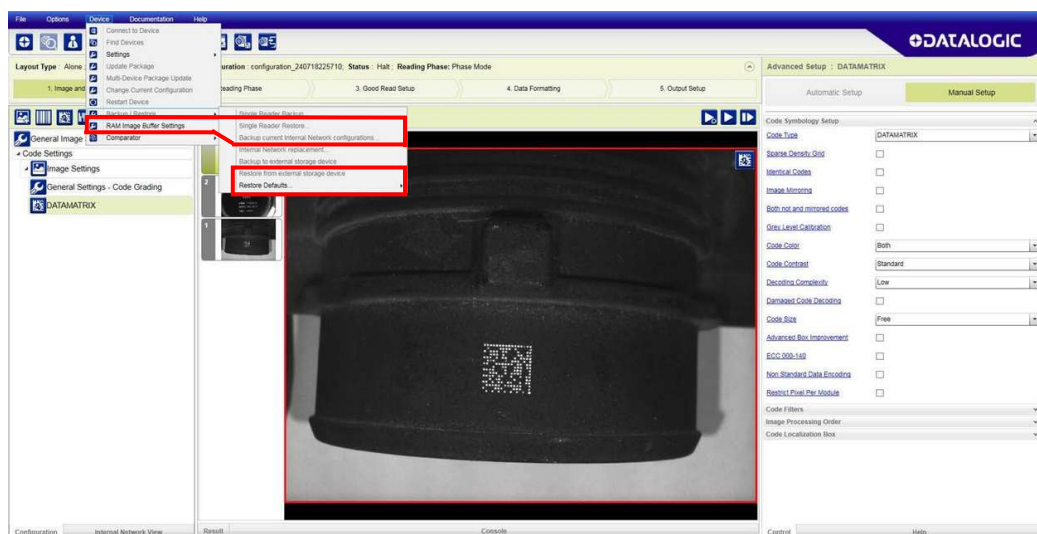
When performing Backup and Restore to/from file, device firmware can be included.

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

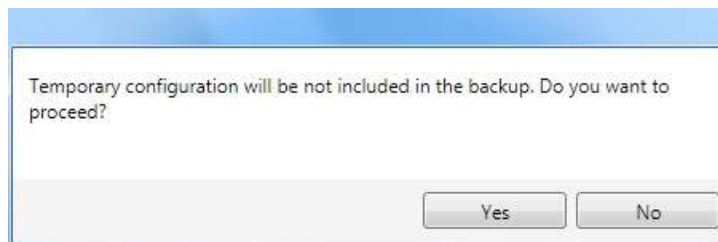
To perform a **Backup**:

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

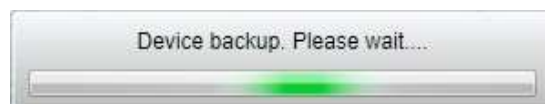
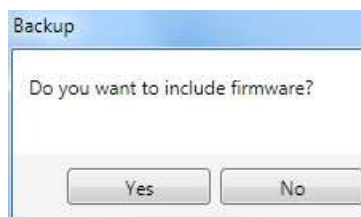


**NOTE:** For ID-NET network Backup, select the **Backup current Internal Network configurations** selection.

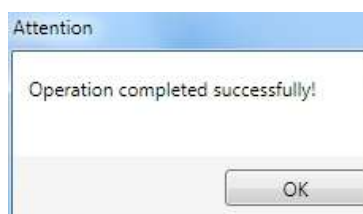
You will be reminded that configuration in temporary memory will not be saved so you should save the configuration to the reader before performing Backup.



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**.

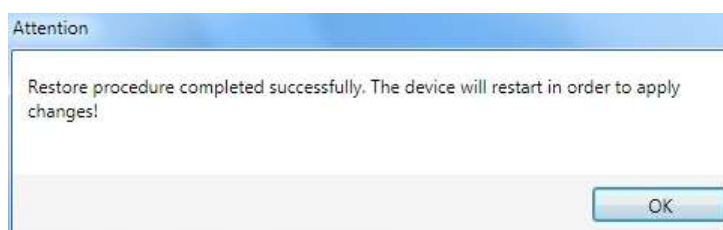


**NOTE: For ID-NET network Restore, select the Internal Network replacement selection.**



If restoring an ID-NET network through 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.**

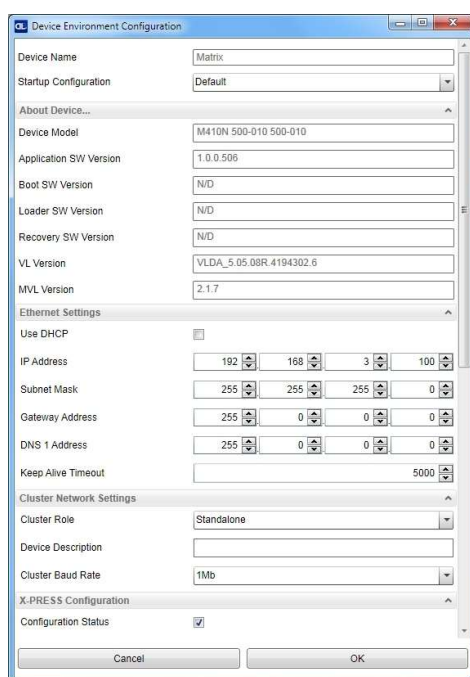
## RESTORE DEFAULTS

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

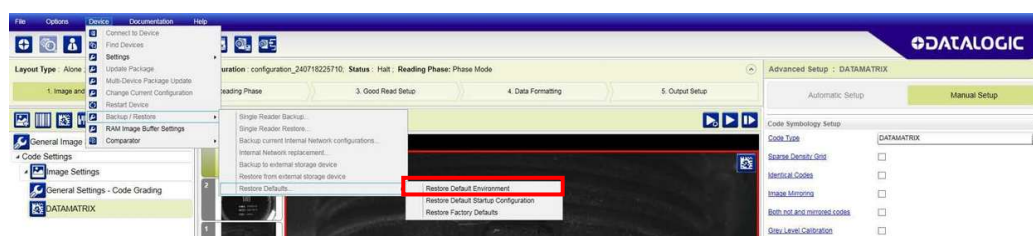
**Restore Default Environment** returns all Environment parameters to their factory default settings. The default IP address will be restored as well as all the parameters managed in the Device Environment Configuration window.



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

**IP Address = 192.168.3.100**

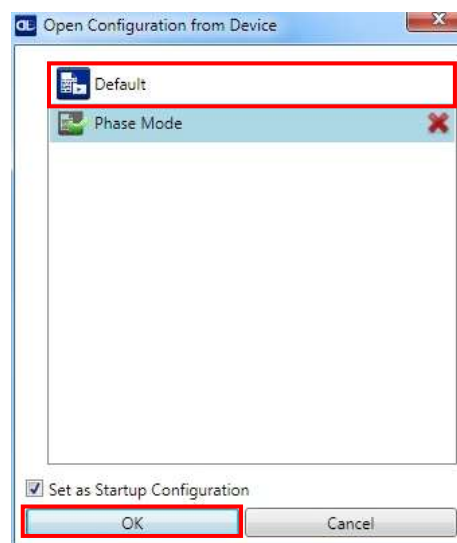
Go to the Device menu > Backup/Restore > Restore Defaults > **Restore Default Startup Configuration**.



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.



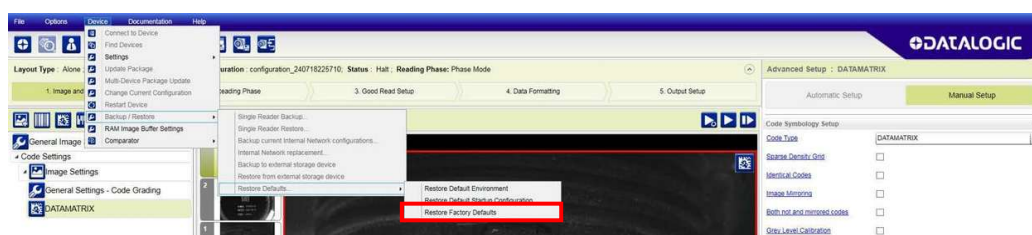
The same action can be performed from the Device menu >Backup/Restore > Restore Defaults > **Restore Default Startup Configuration**. The Default Configuration will be set to run at startup and the reader will be reset.



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.

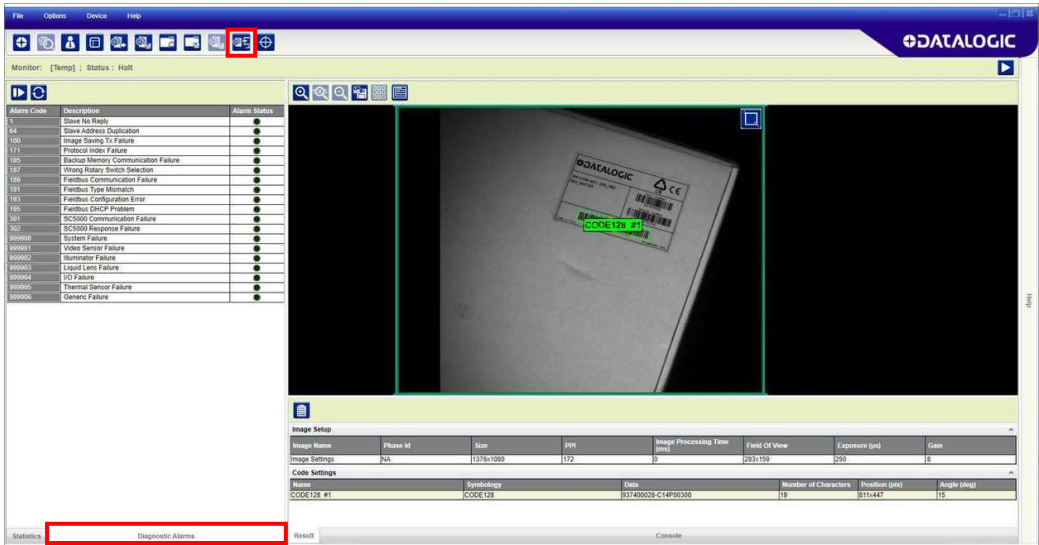


Figure 123 - Diagnostic Alarms

## 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).

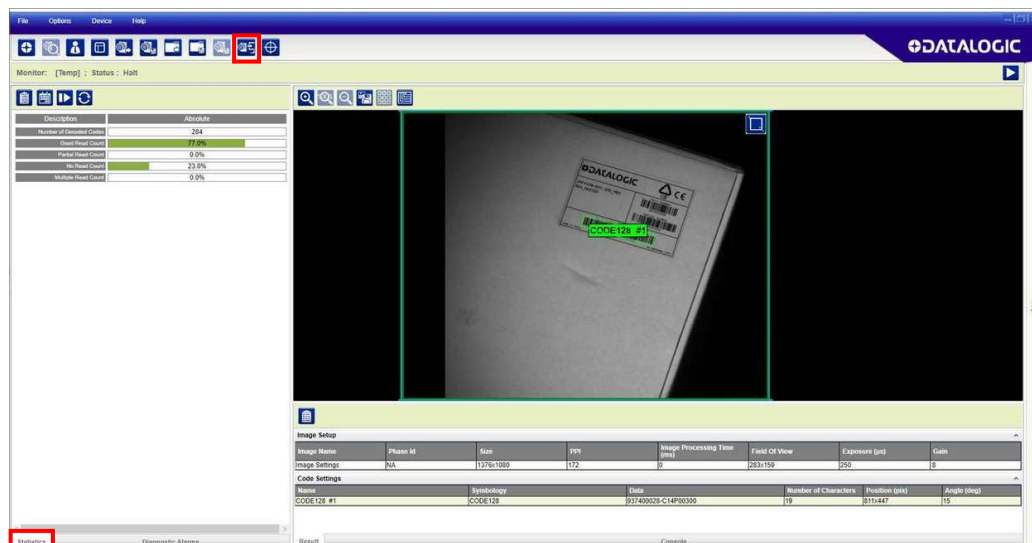
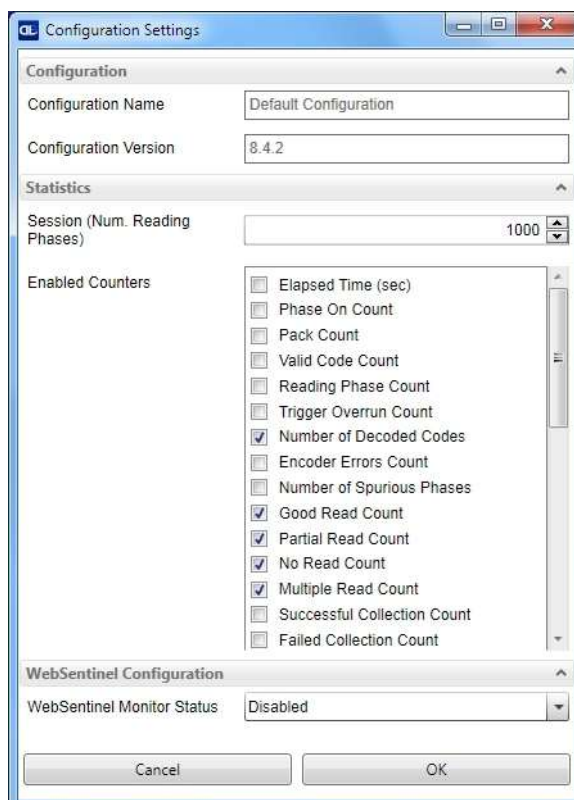


Figure 124 - Reading Statistics

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

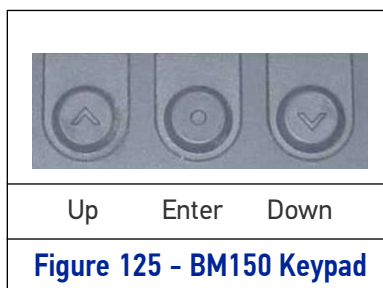
BM150 must be detected through the BM100 backup memory module at power-up/reset and this is done through a command setting in DL.CODE. By connecting the reader to DL.CODE the following parameters can be managed.

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 125 - 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 M M M M M M M M M M M M
K K K V V V V V V V V V V   R R R   N N N
S N   D D D D D D D D D D
E T H   A A A   A A A   A A A   A A A

```

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 A A %   Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z
Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z
Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z

```

A = reading percentage from 000 to 100%.

Z = code content.

### Calibration (Setup) Results

```

E x p = X X X X
G a i n = G G
C a l i b r a t i o n
O K ( p e r m a n e n t )

```

X = exposure value (in  $\mu$ s).

G = gain value

### Code Setting (Learn) Results

```

X X X X X X X X X
C o d e   S e t t i n g
O K ( p e r m a n e n t )

```

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).

```

A l e r t      :
F a i l u r e      # X X X
R R R      N N N
  
```

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)

```

A l e r t      : I D - N E T
N o d e # X X      M i s s i n g
R R R      M 0 0
  
```

X = slave node number (1-31)

R = Device Network Type – MUL=Multidata, SYN=Synchronized

## Network State (Master only)

```

0      N e t w o r k      1 5
M S S S S S S S S S S S S S S
1 6      N e t w o r k      3 1
S S S S S S S S S S S S S S S
  
```

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 | 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 | 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 | 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 | S | S | S | S | S |
| T | T | T | T | T | 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 | X | X | X | X |
| P | = | Y | 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 | S | S | S | S | S |
| U | U | U | U | U | 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 FOR SOFTWARE ADJUSTABLE FOCUS MODELS (LIQUID LENS)

#### 14 LEDs Illuminator

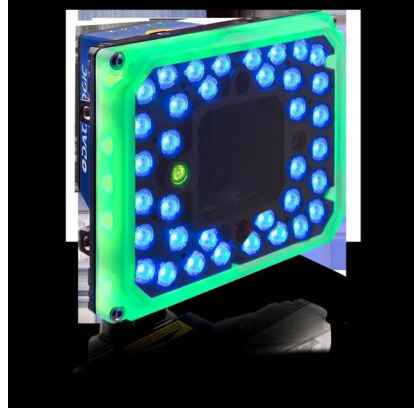


| 14 LEDs MODELS AND LED CHAIN CONFIGURATION |                  |
|--------------------------------------------|------------------|
| LIGHTS ON                                  | LEDs COLOR       |
| All Chains                                 | White, Red, Blue |
| Central Chain                              | White, Red, Blue |
| Top/Bottom Chain                           | White, Red, Blue |



Figure 126 - LED chains for 14 LEDs models

## 36 LEDs Illuminator



### 36 LEDs MODELS AND LED CHAIN CONFIGURATION

| LIGHTS ON    | LEDs COLOR       |
|--------------|------------------|
| All Chains   | White, Red, Blue |
| Top Left     | White, Red, Blue |
| Top Right    | White, Red, Blue |
| Left         | White, Red, Blue |
| Right        | White, Red, Blue |
| Bottom Left  | White, Red, Blue |
| Bottom Right | White, Red, Blue |

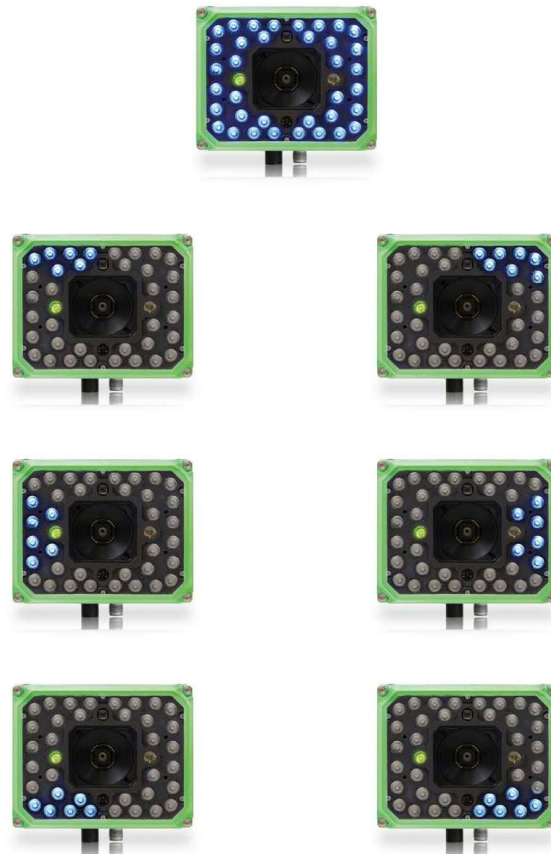


Figure 127 - LED chains for 36 LEDs models

## STANDARD ILLUMINATORS FOR MANUAL ADJUSTABLE FOCUS MODELS (C-MOUNT)

### 36 LEDs Illuminator



| 36 LEDs MODELS AND LED CHAIN CONFIGURATION |                  |
|--------------------------------------------|------------------|
| LIGHTS ON                                  | LEDs COLOR       |
| All Chains                                 | White, Red, Blue |
| Top Left                                   | White, Red, Blue |
| Top Right                                  | White, Red, Blue |
| Left                                       | White, Red, Blue |
| Right                                      | White, Red, Blue |
| Bottom Left                                | White, Red, Blue |
| Bottom Right                               | White, Red, Blue |

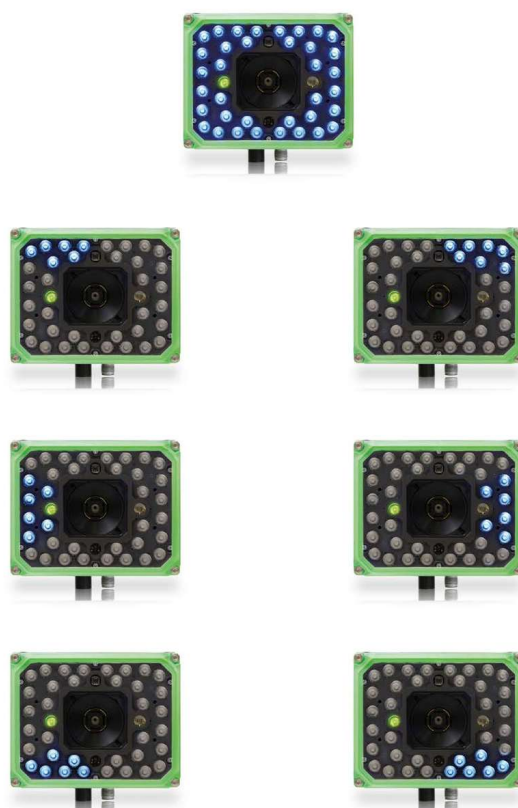


Figure 128 - LED chains for 36 LEDs models

POLARIZER



Figure 129 - Standard and polarizing cover for 14 (left) and 36 (right) LEDs models

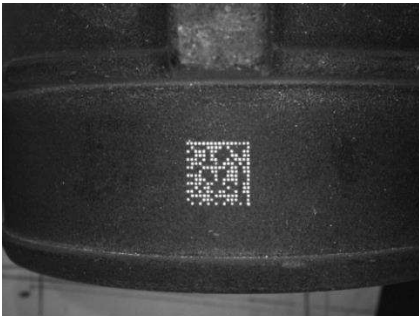
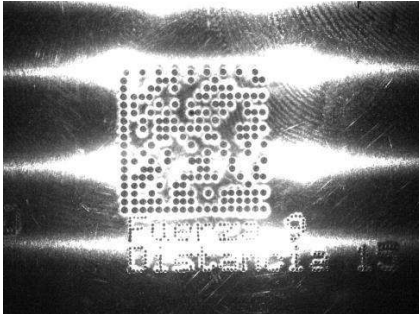
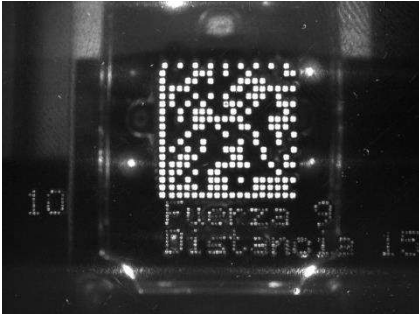
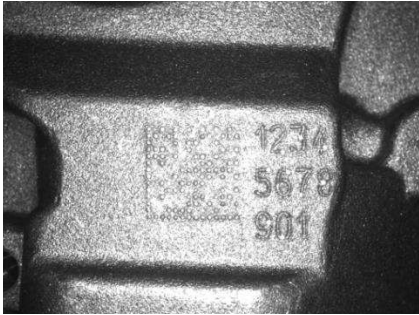
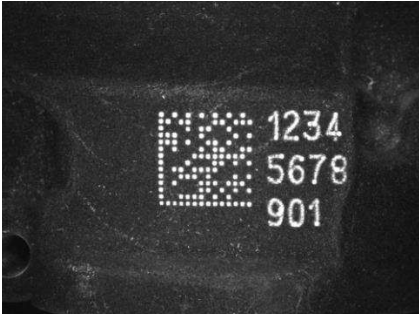
Matrix 320 2mp also comes with a polarizing cover. This is the ideal solution to reduce hot spots on reflective surface applications, such as:

- 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 2mp 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.

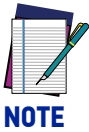
The following examples show the difference between codes read with and without polarizing filters:

| 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                                                                           |
|  |  |



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/marketing technique used to create the symbol and on the overall printing/marketing 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



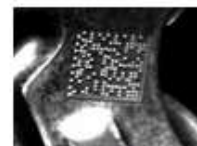
Low Contrast Problem



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 2MP RECOMMENDED ILLUMINATION

In the following table these macro-cases are listed, each of them highlighting the most suitable Matrix 320 2mp 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.<br>cover<br>with<br>white ill.                                                 | STD.<br>cover<br>with<br>blue ill.                                                  | STD.<br>cover<br>with<br>red ill.                                                   | PLZ.<br>cover<br>with<br>white ill.                                                  | PLZ.<br>cover<br>with<br>blue ill.                                                    | PLZ.<br>cover<br>with<br>red ill.                                                     | LT-51x<br>ext.<br>red ill.                                                            |
|----------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| Printed codes on opaque paper or labels having a flat surface                                      |    |    |    |    |    |    |    |
| Laser Etching or Ink Jet code marking on an opaque, flat surface having no evident machining flaws |    |    |    |    |    |    |    |
| Code marking on an opaque, rough surface                                                           |    |    |    |    |    |    |    |
| Code marking on a flat surface with evident machining flaws produced by machining tools            |  |  |  |  |  |  |  |
| 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                                                                     |  |  |  |  |  |  |  |
| Code under plastic film or glossy surface with 0 skew                                              |  |  |  |  |  |  |  |

Legend:



Suggested



Compatible



Not recommended

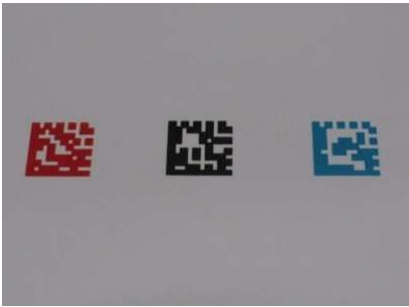
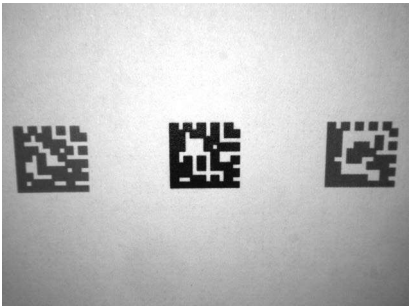
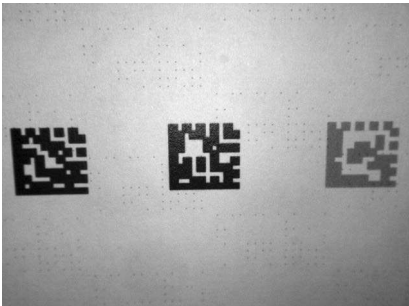
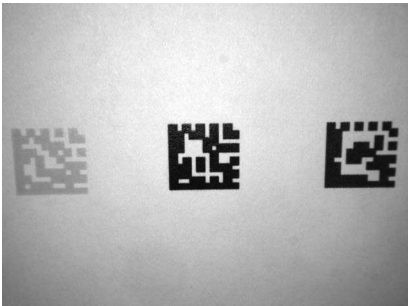
## Color Contrast Considerations

Matrix 320 2mp models are available in White, Blue, and Red Light versions to help resolve applications that have colored codes and/or backgrounds.

The choice between the white, blue or red 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.

| Color Photo of Codes                                                                |                                                                                     |                                    |                                                                                      |                                     |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|------------------------------------|--------------------------------------------------------------------------------------|-------------------------------------|
|   |                                                                                     |                                    |                                                                                      |                                     |
| Matrix 320 2mp White Illuminator                                                    | Matrix 320 2mp Blue Illuminator                                                     |                                    | Matrix 320 2mp Red Illuminator                                                       |                                     |
|  |  |                                    |  |                                     |
| Good contrast on all codes                                                          | Red code (left) has good contrast                                                   | Blue code (right) has low contrast | Red code (left) has very low contrast                                                | Blue code (right) has good contrast |

| Illumination Color                                                             | White | Blue                                                                                | Red                                                                                 |
|--------------------------------------------------------------------------------|-------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Red-printed code on light background<br>White-printed code on red background   | OK    |  |  |
| Red-printed code on dark background<br>Black-printed code on red background    | OK    |  |  |
| Blue-printed code on light background<br>White-printed code on blue background | OK    |  |  |
| Blue-printed code on dark background<br>Black-printed code on blue background  | OK    |  |  |

**Legend:**

Suggested Lighting System



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 (35 mm for liquid lens models). 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 126.

# 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 2mp 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                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>DL.CODE Installation:</b><br>Autorun or Start.hta doesn't run | Check Windows settings to see if Autorun is disabled.<br>Associate the file type .hta with the Microsoft HTML Application host <b>mshta.exe</b> in Windows\System32.                                                                                                                                                                                                                                                                                |
| <b>Power ON:</b><br>the "POWER" LED is not lit.                  | Is power connected?<br>If using a power adapter (like PG6000), is it connected to wall outlet?<br>If using rail power, does rail have power?<br>If using CBX, does it have power (check switch and LED)?<br>Check if you are referring to the M12 17-pin connector or to the CBX spring clamp connectors.<br>Measure Voltage either at pin <b>1</b> and pin <b>2</b> (for 17-pin connector) or at spring clamp <b>Vdc</b> and <b>GND</b> (for CBX). |

| Troubleshooting Guide                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Problem                                                                                                                                                      | Suggestion                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>One Shot or Phase Mode using the Input 1 (External Trigger) or Input 2:</b><br>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.<br>Is the sensor connected to Input 1 or Input 2?<br>Is power supplied to the photo sensor?<br>For NPN configuration, is power supplied to one of the two I1 or I2 signals (A or B)?<br>For PNP configuration, is one of the two I1 or I2 signals grounded (A or B)?<br>Are the photo sensor LEDS (if any) working correctly?<br>Is the sensor/reflector system aligned (if present)?<br>On the Reading Phase step check the Input 1 or Input 2 <i>Debounce Time</i> parameter setting.<br>On the Reading Phase step check the settings for <i>Acquisition Trigger</i> , <i>Reading Phase-ON</i> , and <i>Reading Phase-OFF</i> parameters. |
| <b>One Shot or Phase Mode using serial trigger source:</b><br>the "TRIGGER" LED is not blinking.                                                             | On the Reading Phase step check the settings for <i>Acquisition Trigger</i> , <i>Reading Phase-ON</i> , and <i>Reading Phase-OFF</i> parameters.<br>Are the COM port parameters ( <i>Baud Rate</i> , <i>Parity</i> , <i>Data Bits</i> , <i>Stop Bits</i> ) correctly assigned?<br>On the Reading Phase step check the settings of <i>Acquisition Trigger String</i> , <i>Reading Phase-ON String</i> , and <i>Reading Phase-OFF String</i> parameters.<br>Is the serial trigger source correctly connected?                                                                                                                                                                                                                           |
| <b>Phase Mode:</b><br>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?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Continuous Mode:</b><br>the "TRIGGER" LED is not blinking.                                                                                                | Verify the correct software configuration settings.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Any Operating Mode:</b><br>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.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Image not clear:</b>                                                                                                                                      | verify the Focus procedure                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Image focused but not decoded:</b>                                                                                                                        | verify the Calibrate Image Density procedure.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

| Troubleshooting Guide                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-----------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Problem                                                                                                               | Suggestion                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Reading:</b><br>the reader always transmits the <i>No Read Message</i>                                             | Run the Rapid Configuration procedure in <a href="#">Chapter 1, Rapid Configuration</a> .<br>Position the reader as described in " <a href="#">Mounting And Positioning Matrix 320 2mp</a> " on <a href="#">page 58</a> and through DL.CODE:<br>Tune the Acquisition Delay on Trigger, if the moving code is out of the reader field of view;<br>Set the Continuous Operating Mode if no external trigger source is available;<br>Tune the Image Settings to improve the code image quality;<br>Check the parameter settings in the Advanced Setup step: 2D Codes, 1D Codes, and Postal Codes;<br>View the full resolution code image to check the printing or marking quality. |
| <b>Communication:</b><br>reader is not transmitting anything to the host.                                             | Is the serial cable wiring correct?<br>If using CBX, be sure the RS422 termination switch is OFF.<br>Are the host serial port settings the same as the reader serial port settings?<br>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.                                                                                                                                                                                                                                                                                                                         |
| <b>Communication:</b><br>data transferred to the host are incorrect, corrupted or incomplete.                         | Are the host serial port settings the same as the reader serial port settings?<br>In the DL.CODE Data Formatting step check the settings of Header and Terminator String parameters.<br>In the DL.CODE Data Formatting step, check the various Message Field parameter settings.                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Configuration:</b><br>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.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>How do I obtain my reader Serial Number?</b>                                                                       | The reader Serial Number consists of 9 characters: one letter, 2 numbers, another letter followed by 5 numbers.<br>The reader Serial Number is printed on a label that is affixed to the case or connector block of the reader.<br>The Serial Number is also visible from the DL.CODE Device List Area.                                                                                                                                                                                                                                                                                                                                                                         |
| <b>How do I obtain my reader Order Number?</b>                                                                        | The reader Order Number consists of 9 numbers.<br>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 with Software Adjustable Focus                                       | Matrix 320 with Manual Adjustable Focus                                         |
| Supply Voltage                                         | 24 Vdc ± 10%                                                                    |                                                                                 |
| Peak Supply Current                                    | 1 A max.                                                                        | Without illuminator: 0.25 A max.<br>With illuminator <sup>1</sup> : 0.85 A max. |
| Average Supply Current                                 | 14 LEDs model: 0.42 A<br>36 LEDs model: 0.62 A                                  | Without illuminator: 0.15 A<br>With illuminator: 0.52 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)<br>supported application protocols | 10/100/1000 Mbit/s<br>TCP/IP, UDP, FTP, EtherNet/IP,<br>Modbus TCP, PROFINET-IO |                                                                                 |
| Inputs                                                 |                                                                                 |                                                                                 |
| Input 1(External Trigger) and Input 2                  | Opto-coupled and polarity insensitive                                           |                                                                                 |
| Max. Voltage                                           | 30 Vdc                                                                          |                                                                                 |
| Max. Input Current                                     | 10 mA                                                                           |                                                                                 |
| Outputs <sup>2</sup>                                   |                                                                                 |                                                                                 |
| Output 1, 2 and 3                                      | NPN, PNP, or PP short circuit protected;                                        |                                                                                 |
| V <sub>OUT</sub> (I <sub>LOAD</sub> = 0 mA) Max.       | 24 Vdc                                                                          |                                                                                 |
| V <sub>OUT</sub> (I <sub>LOAD</sub> = 100 mA) Max.     | 3 Vdc                                                                           |                                                                                 |
| I <sub>LOAD</sub> 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<sub>CE</sub> = 30 Vdc max.; I<sub>CE</sub> = 40 mA continuous max.; 130 mA pulsed max.;
  - V<sub>CE saturation</sub> = 1 Vdc max. @ 10 mA; P<sub>D</sub> = 90 mW Max. @ 50 °C ambient temp.

| OPTICAL FEATURES  |                                                                                                                                |                                                           |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|
|                   | Matrix 320 with Software Adjustable Focus                                                                                      | Matrix 320 with Manual Adjustable Focus                   |
| Image Sensor      | CMOS                                                                                                                           |                                                           |
| Image Format      | 2.0 Mpixel (1920 x 1080)                                                                                                       |                                                           |
| Frame Rate        | 60 frames/s                                                                                                                    |                                                           |
| Pitch             | ± 35°                                                                                                                          |                                                           |
| Tilt              | 0° - 360°                                                                                                                      |                                                           |
| LED Safety        | according to EN 62471                                                                                                          |                                                           |
| Lenses            | Liquid Lenses                                                                                                                  | C-Mount Lenses<br>(4mm, 6mm, 8mm, 12mm, 16mm, 25mm, 35mm) |
| Lighting System   | Internal illuminator<br>(14 or 36 LEDs)                                                                                        | External or internal illuminator (36 LEDs)                |
| Illumination      | Liquid Lens 6 mm: Blue and Red internal illuminator.<br>Liquid Lens 9 mm and 16 mm: Blue, Red, and White internal illuminator. | Internal illuminators with blue, white, IR, UV lights     |
| Aperture Angle    | Liquid Lens 6 mm: 48°<br>Liquid Lens 9 mm: 34°<br>Liquid Lens 16 mm: 20°                                                       | 73°, 51°, 38°, 25°, 19°, 12°, 9°                          |
| Reading Range     | min. 0 mm, max. 2500 mm<br>Refer to "FOV Calculation" on page 125                                                              |                                                           |
| Aiming System     | Laser cross red projection aiming                                                                                              |                                                           |
| Polarizing Filter | Polarizing cover accessory                                                                                                     |                                                           |

| PHYSICAL FEATURES                                  |                                                       |                                                          |                                                            |                                                              |
|----------------------------------------------------|-------------------------------------------------------|----------------------------------------------------------|------------------------------------------------------------|--------------------------------------------------------------|
|                                                    | Matrix 320<br>with Software Adjustable Focus          |                                                          | Matrix 320<br>with Manual Adjustable Focus                 |                                                              |
|                                                    | Matrix 320 with<br>14 LEDs illuminator                | Matrix 320 with<br>36 LEDs illuminator                   | Matrix 320<br>without illuminator                          | Matrix 320<br>with illuminator                               |
| Dimensions<br>(with lens cover)<br>Connector at 0° | H x W x L<br>109 x 54 x 56 mm<br>(4.3 x 2.1 x 2.2 in) | H x W x L<br>115.5 x 126 x 70 mm<br>(4.6 x 4.9 x 2.8 in) | H x W x L<br>108.7 x 54 x 54.3 mm<br>(4.3 x 2.1 x 2.14 in) | H x W x L<br>115.5 x 126 x 124.8 mm<br>(4.6 x 4.9 x 4.91 in) |
| Connector at 90°                                   | 88 x 54 x 76 mm<br>(3.5 x 2.1 x 2.1 in)               | 101 x 126 x 91 mm<br>(4.6 x 4.9 x 2.8 in)                | 88 x 54 x 54.3 mm<br>(3.5 x 2.1 x 2.14 in)                 | 101 x 126 x 138.2 mm<br>(4.6 x 4.9 x 5.44 in)                |
| Weight                                             | with lens and internal illuminator                    |                                                          | C-Mount base only                                          | Base+Adapter+Illuminator                                     |
|                                                    | 380 g (13.4 oz)                                       | 640 g (22.6 oz)                                          | 300 g (10.6 oz)                                            | 900 g (31.7 oz)                                              |
| Material                                           | Aluminum                                              |                                                          |                                                            |                                                              |

## ENVIRONMENTAL FEATURES

|                                           | Matrix 320 with Software Adjustable Focus                                             | Matrix 320 with Manual Adjustable Focus  |
|-------------------------------------------|---------------------------------------------------------------------------------------|------------------------------------------|
| Operating Temperature <sup>1</sup>        | 0 to 45 °C (32 to 113 °F)                                                             | -10 to 50 °C (14 to 122 °F) <sup>2</sup> |
| Storage Temperature                       | -20 to 70 °C (-4 to 158 °F)                                                           |                                          |
| Max. Humidity                             | 90% non condensing                                                                    |                                          |
| Vibration Resistance<br>EN 60068-2-6      | 14 mm @ 2 to 10 Hz; 1.5 mm @ 13 to 55 Hz;<br>2 g @ 70 to 500 Hz; 2 hours on each axis |                                          |
| Bump Resistance<br>EN 60068-2-29          | 30g; 6 ms;<br>5000 shocks on each axis                                                |                                          |
| Shock Resistance<br>EN 60068-2-27         | 30g; 11 ms;<br>3 shocks on each axis                                                  |                                          |
| Protection Class <sup>3</sup><br>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 938100071.
3. when correctly connected to IP67 cables with seals and the Lens Cover is correctly mounted.

## CODE QUALITY METRICS

| Standard                       | Supported Symbolologies                                                    |
|--------------------------------|----------------------------------------------------------------------------|
| 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);<br>Good Read (Green Spot) |
| Keypad Button  | Configurable via DL.CODE                                                                |

## SOFTWARE FEATURES

### Readable Code Symbologies

| 1D and Stacked                                                                                                                                                                                                                                                                                                         | 2D                                                                                                                                                          | Postal                                                                                                                                            |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| PDF417 Standard and<br>Micro PDF417<br>Code 128 (GS1-128)<br>Code 39 (Standard and Full ASCII)<br>Code 32<br>MSI<br>Standard 2 of 5<br>Matrix 2 of 5<br>Interleaved 2 of 5<br>Codabar<br>Code 93<br>Pharmacode<br>EAN-8/13 - UPC-A/E<br>(including Addon 2 and Addon 5)<br>GS1 DataBar Family<br>Composite Symbologies | Data Matrix ECC 200<br>(Standard, GS1 and Direct Marking)<br>QR Code (Standard and<br>Direct Marking)<br>Micro QR Code<br>MAXICODE<br>Aztec Code<br>DotCode | Australia Post<br>Royal Mail 4 State Customer<br>Kix Code<br>Japan Post<br>PLANET<br>POSTNET<br>POSTNET (+BB)<br>Intelligent Mail<br>Swedish Post |
| <b>Operating Mode</b>                                                                                                                                                                                                                                                                                                  | Continuous, One Shot, Phase Mode, PackTrack                                                                                                                 |                                                                                                                                                   |
| <b>Configuration Methods</b>                                                                                                                                                                                                                                                                                           | X-PRESS Human Machine Interface<br>DL.CODE Windows-based SW (Ethernet or Serial interface)<br>Serial Host Mode Programming sequences                        |                                                                                                                                                   |
| <b>Parameter Storage</b>                                                                                                                                                                                                                                                                                               | 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 2mp 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:

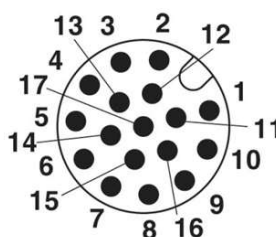


Figure 1 - M12 17-pin male Power, COM and I/O Connector

| 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 *                                                   |
| 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<br>(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 95 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.

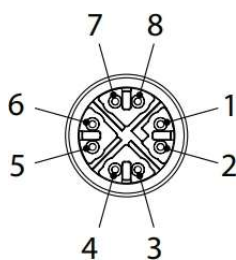


Figure 2 - M12 X-Coded Female Ethernet Network Connector

| 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+ |

## 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 102 for more details.

The electrical features of both inputs are:

| INPUT  | $ V_{AB} $ MIN. | $ V_{AB} $ 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  | Output 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.

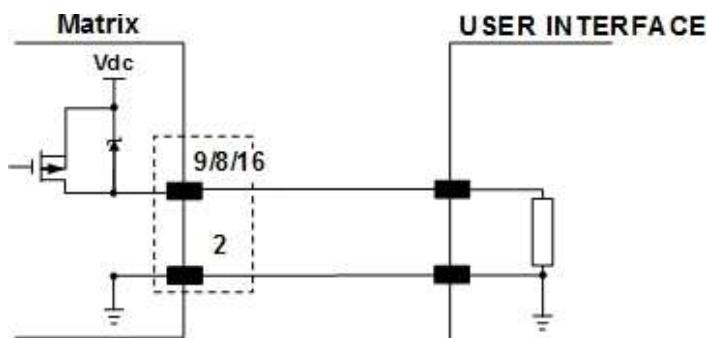


Figure 3 - PNP Output Connection

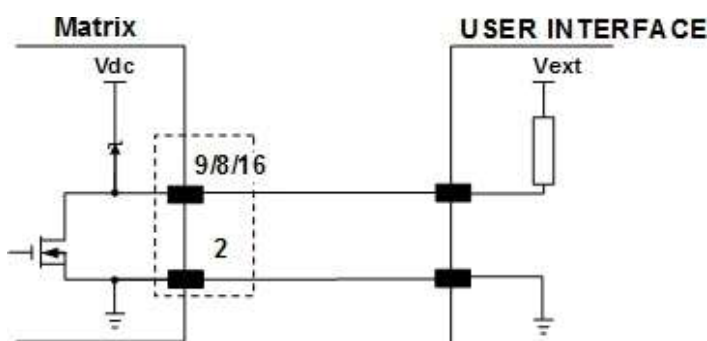


Figure 4 - NPN Output Connection



**CAUTION:** For NPN output connections, the external interface voltage ( $V_{ext}$ ) must not exceed the Matrix 320 2mp power supply source voltage ( $V_{dc}$ ) otherwise correct output functioning cannot be guaranteed.

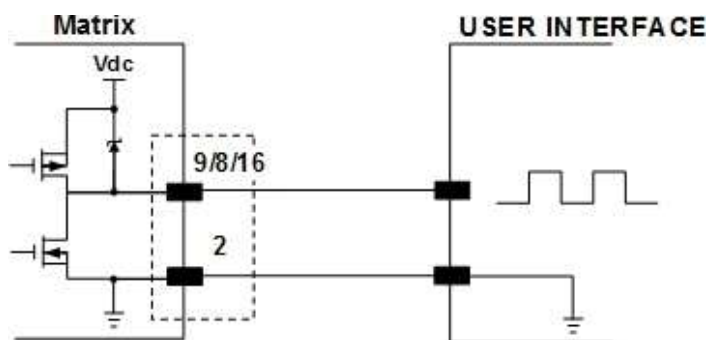
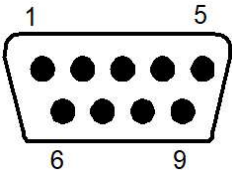
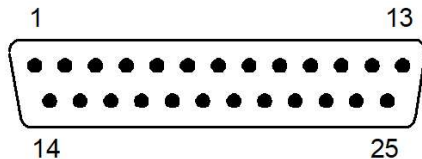


Figure 5 - Push-Pull Output Connection

## 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.

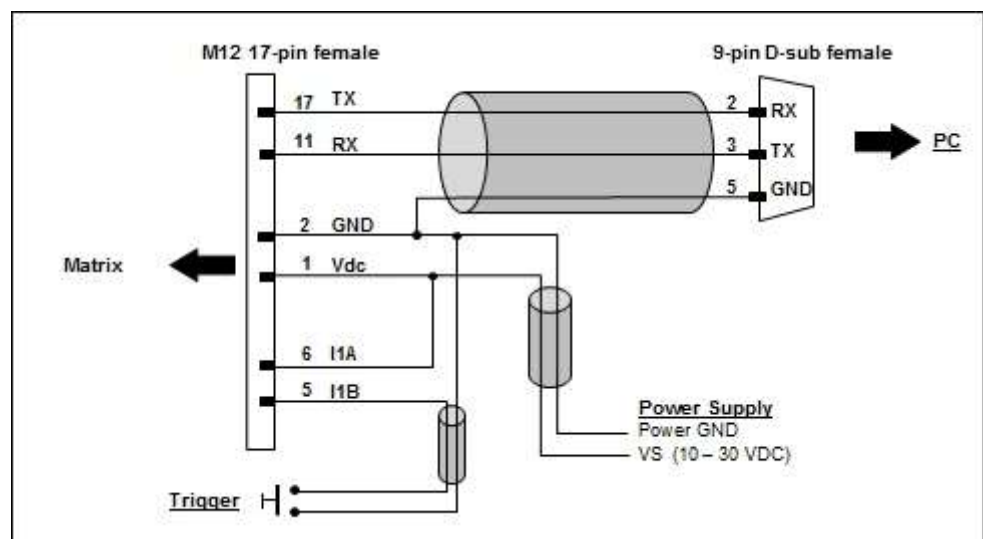


Figure 6 - Test Cable

# 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:**

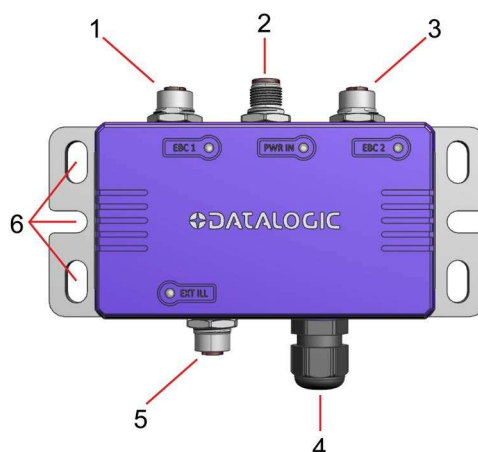
|           |   |        |     |         |        |      |     |     |
|-----------|---|--------|-----|---------|--------|------|-----|-----|
| 938100017 | - | MATRIX | 320 | 701-230 | LL6    | 14L  | 60D | RED |
| 938100019 | - | MATRIX | 320 | 703-230 | LL6    | 14L  | 60D | BLU |
| 938100020 | - | MATRIX | 320 | 705-330 | LL9    | 14L  | 45D | RED |
| 938100021 | - | MATRIX | 320 | 706-330 | LL9    | 14L  | 45D | WHT |
| 938100022 | - | MATRIX | 320 | 707-330 | LL9    | 14L  | 45D | BLU |
| 938100023 | - | MATRIX | 320 | 709-430 | LL16   | 14L  | 25D | RED |
| 938100024 | - | MATRIX | 320 | 710-430 | LL16   | 14L  | 25D | WHT |
| 938100025 | - | MATRIX | 320 | 711-430 | LL16   | 14L  | 25D | BLU |
| 938100026 | - | MATRIX | 320 | 717-230 | LL6    | 36L  | 60D | RED |
| 938100028 | - | MATRIX | 320 | 719-230 | LL6    | 36L  | 60D | BLU |
| 938100029 | - | MATRIX | 320 | 721-330 | LL9    | 36L  | 45D | RED |
| 938100030 | - | MATRIX | 320 | 722-330 | LL9    | 36L  | 45D | WHT |
| 938100031 | - | MATRIX | 320 | 723-330 | LL9    | 36L  | 45D | BLU |
| 938100032 | - | MATRIX | 320 | 725-430 | LL16   | 36L  | 25D | RED |
| 938100033 | - | MATRIX | 320 | 726-430 | LL16   | 36L  | 25D | WHT |
| 938100034 | - | MATRIX | 320 | 727-430 | LL16   | 36L  | 25D | BLU |
| 938100035 | - | MATRIX | 320 | 700-030 | CM 2MP | 1/3" |     |     |

## 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

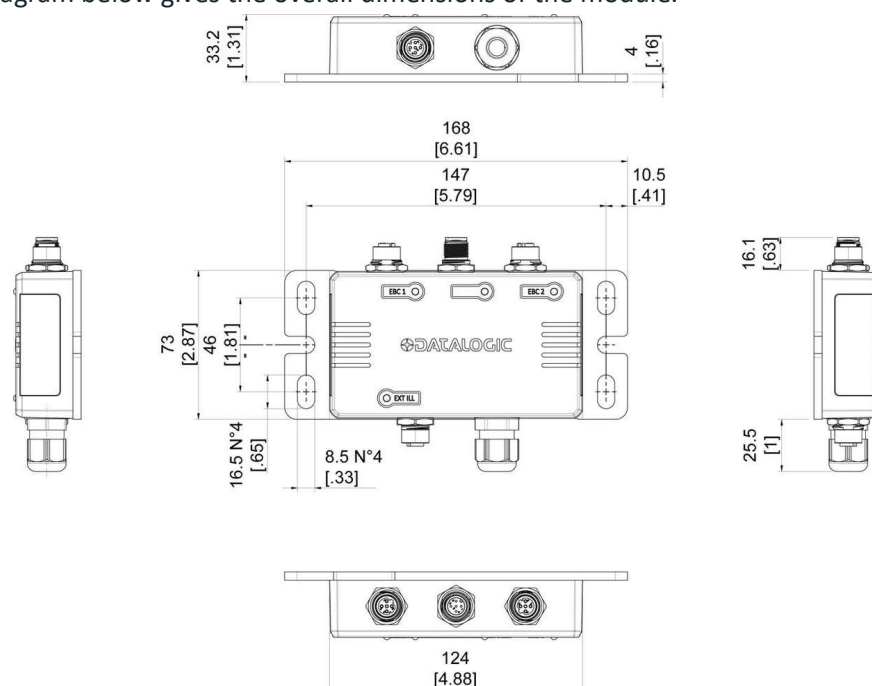


|                             |                              |
|-----------------------------|------------------------------|
| 1. EBC 1 connector and LED  | 4. Pigtail connector         |
| 2. PWR IN connector and LED | 5. EXT ILL connector and LED |
| 3. EBC 2 connector and LED  | 6. Mounting slots (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.

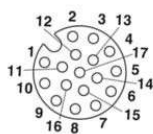
### EBC 1

This LED blinks yellow when there is Link Activity on Port 1.

### EBC 2

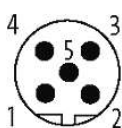
This LED blinks yellow when there is Link Activity on Port 2.

## ELECTRICAL CONNECTIONS



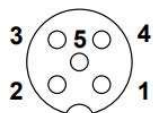
Pigtail connector - M12 17 poles female

| 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+                                      |



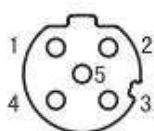
PWR IN connector - M12 5 poles male

| 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. |
|---------------------------------------------|-----------|
| <b>PWR IN cables</b>                        |           |
| AS-I to M12 straight - 1mt                  | 93ACC0067 |
| AS-I to M12 straight - 2mt                  | 93ACC0068 |
| <b>Ethernet cables</b>                      |           |
| ETH Cable M12-M12 (Straight-Straight) - 1mt | 93A050065 |
| ETH Cable M12-M12 (Straight-Straight) - 3mt | 93A050066 |
| ETH Cable M12-M12 (Straight-Straight) - 5mt | 93A050067 |
| <b>Illuminator cables</b>                   |           |
| 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](http://www.data-logic.com).

## TYPICAL LAYOUTS

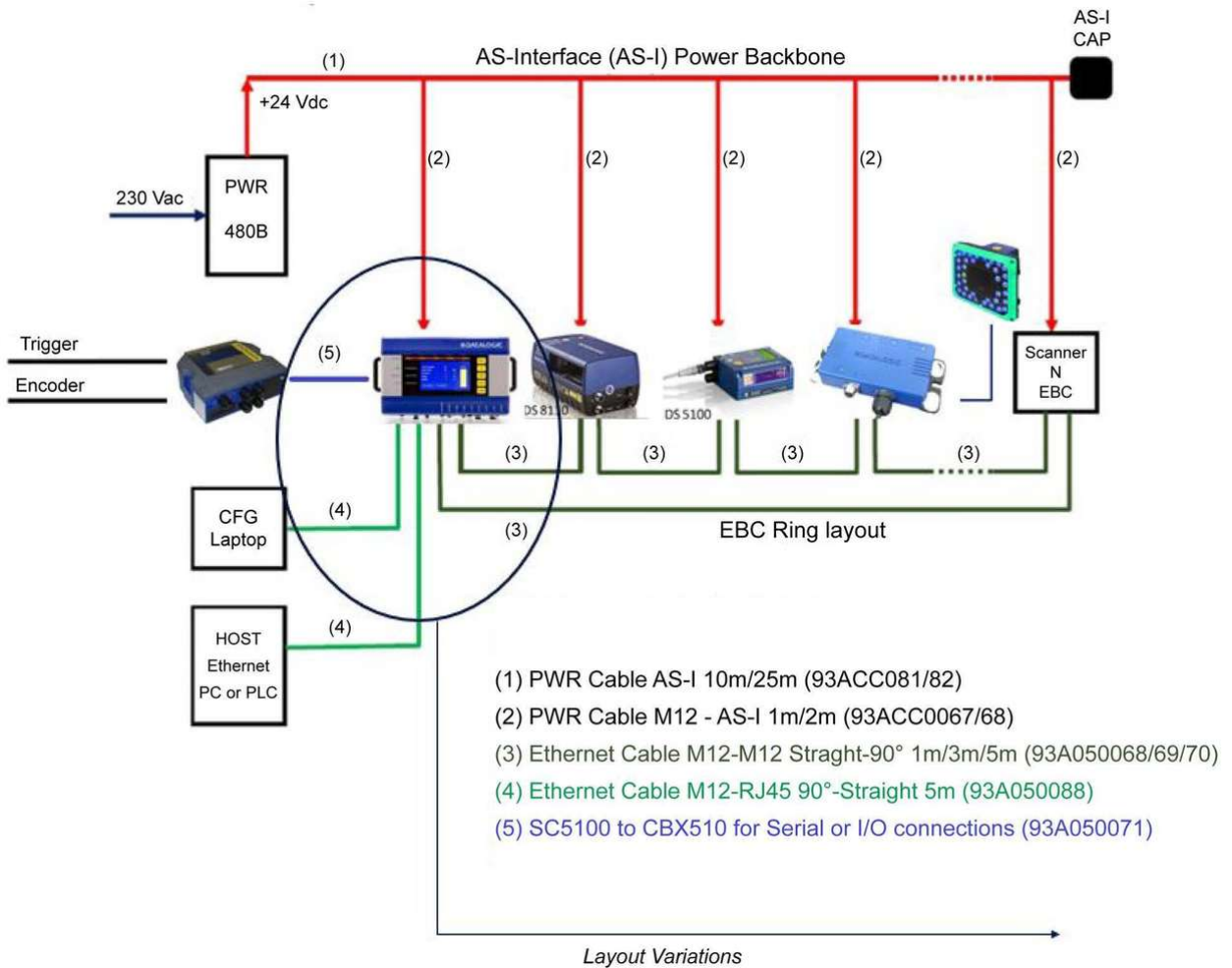
### Large Synchronized Network Layout

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.

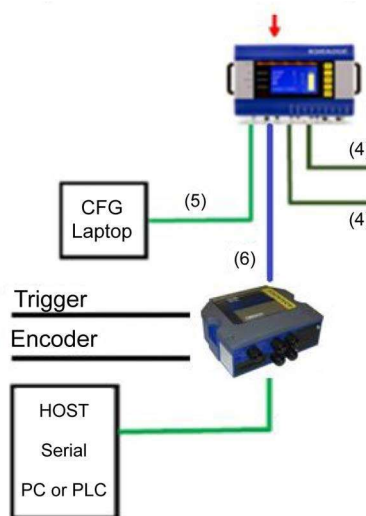
## Ethernet TCP/IP to Host

The host can be connected to the controller through an Ethernet direct cable or through a hub/switch:



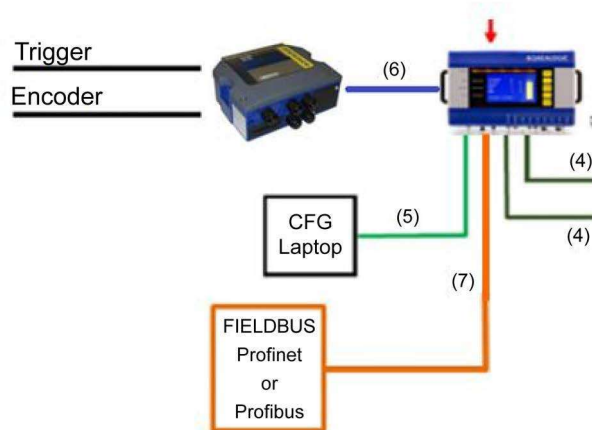
## COM to Host

The host can be connected via COM (RS232 or RS422) to the controller through a CBX510.



## Fieldbus to Host

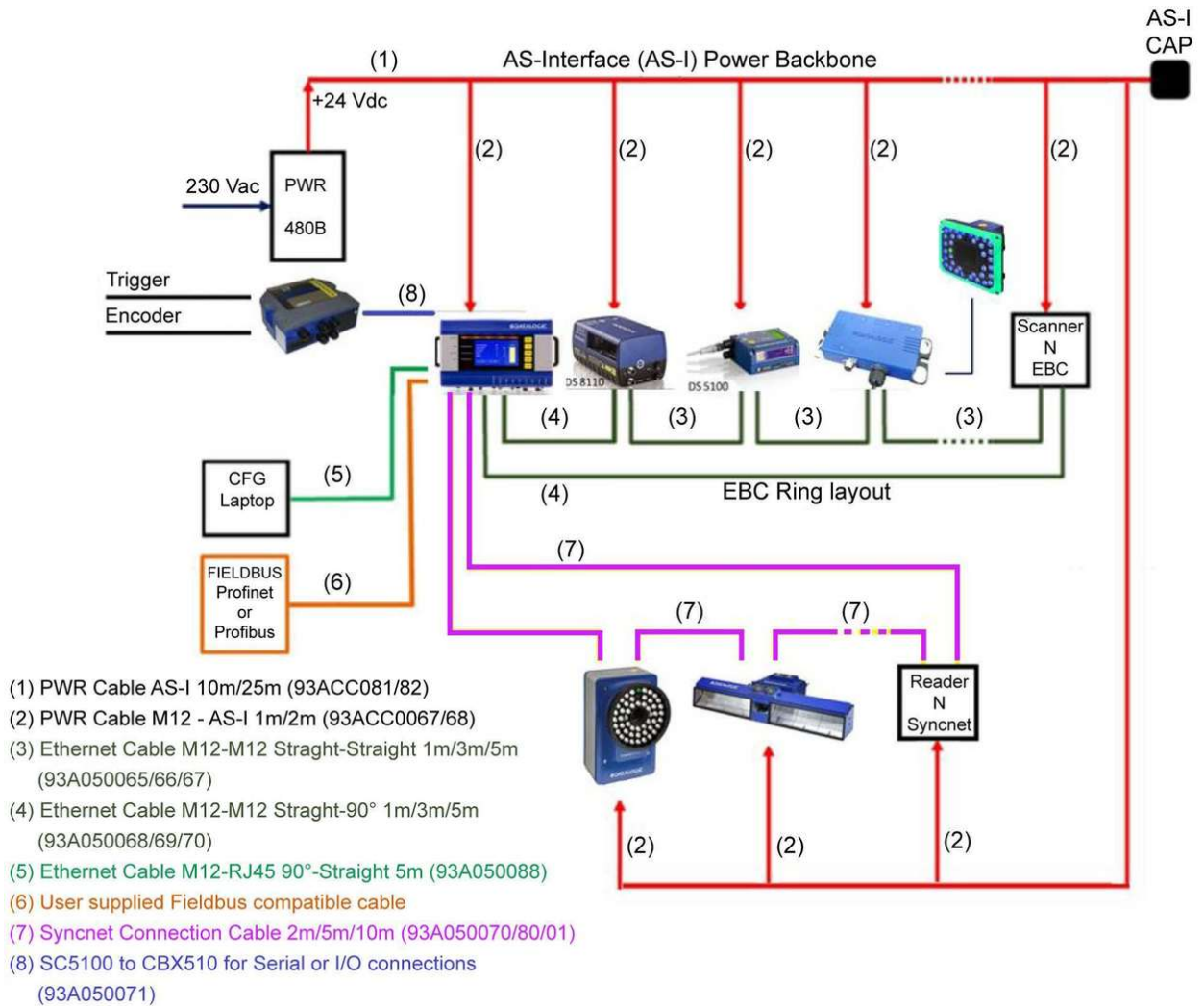
The host can be connected to a SC5100 dedicated Fieldbus model.



## EBC - Syncnet Mixed Layout

The SC5100 controller allows compatible Slave devices to connect to a Syncnet Network.

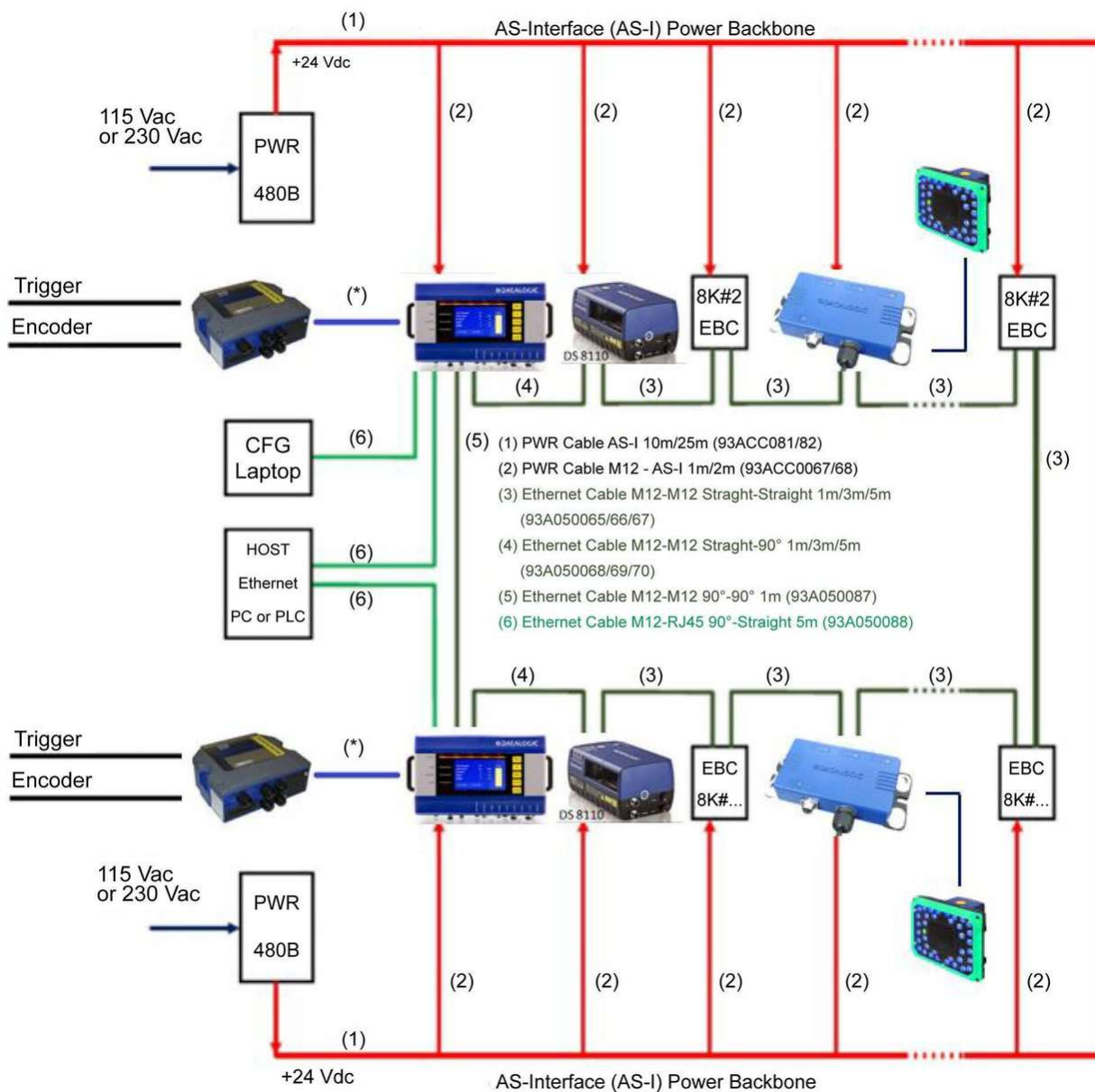
The EBC controller in this layout allows communication between Laser Scanners, AV readers and Matrix readers.



## Redundant System Layout

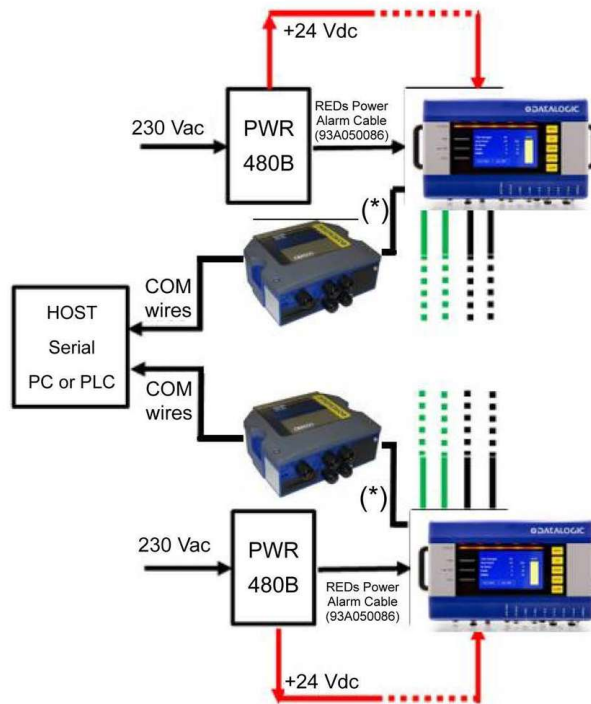
For large local EBC networks, a redundant system can be configured in which two controllers are used together with their respective PWR power supply units. The scanners are distributed equally between the PWR units.

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<br>170 x 72 x 32 mm<br>(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;<br>1.5 mm @ 13 to 55 Hz;<br>2 gn @ 70 to 500 Hz;<br>2 hours on each axis |
| Bump resistance EN 60068-2-29                | 30 g; 6 mm;<br>5000 shocks on each axis                                                      |
| Shock resistance EN 60068-2-29               | 30 g; 11 ms;<br>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).

# 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 due 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 Symbolologies (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) Symbolologies**

Symbolologies 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.





© 2020-2026 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 S.r.l.**

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