Matrix 300N™

PRODUCT REFERENCE GUIDE



Image Based Reader

DATALOGIC

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Original Instructions

This manual refers to software version 1.8.2 and later.

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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

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



WARNING

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

TECHNICAL SUPPORT

Support Through the Website

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

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

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

Reseller Technical Support

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

COMPLIANCE

GENERAL

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

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

POWER SUPPLY

ATTENTION: READ THIS INFORMATION BEFORE INSTALLING THE PRODUCT

This product is intended to be installed by **Qualified Personnel** only.

This product is intended to be connected to a UL Listed Computer (LPS or “Class 2”) which supplies power directly to the reader, or a UL Listed Direct Plug-in Power Unit (rated 10 to 30 V, minimum 1 A) marked LPS or “Class 2”, or Power over Ethernet source Device supplied by UL Listed Direct Plug-in Power Unit marked LPS or “Class 2”.

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;
- connect pin "Earth" of the CBX connection box to a good Earth Ground;
- for direct connections, connect your cable shield to the locking ring nut of the connector.

CE COMPLIANCE

CE marking states the compliance of the product with essential requirements listed in the applicable European directive. Since the directives and applicable standards are subject to continuous updates, and since Datalogic promptly adopts these updates, the EU declaration of conformity is a living document. The EU declaration of conformity is available for competent authorities and customers through Datalogic commercial reference contacts. The main European directives applicable to Datalogic products require inclusion of an adequate analysis and assessment of the risk(s). This evaluation was carried out in relation to the applicable points of the standards listed in the Declaration of Conformity. Datalogic products are mainly designed for integration purposes into more

complex systems. For this reason it is under the responsibility of the system integrator to perform a new risk assessment regarding the final installation.

Warning

This is a Class A product. In a domestic environment this product may cause radio interference, in which case the user may be required to take adequate measures.

FCC COMPLIANCE

Modifications or changes to this equipment without the expressed written approval of Datalogic could void the authority to use the equipment.

This device complies with PART 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his/her own expense.

EAC COMPLIANCE

Customs Union:

The CU Conformity certification has been achieved; this allows the Product to bear the Eurasian Mark of conformity.

LED SAFETY

LED emission according to EN 62471.

LASER SAFETY

The Matrix 300N internal illuminators contain two aiming Laser LEDs used to position the reader.

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° 50, date June 24, 2007. This product is classified as a Class 2 laser product according to IEC 60825-1 regulations.



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.



Figure 1 - General Matrix 300N Warning Labels

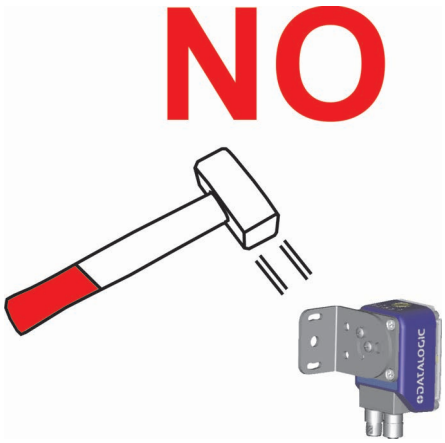
HANDLING

The Matrix 300N is designed to be used in an industrial environment and is built to withstand vibration and shock when correctly installed, however it is also a precision product and therefore before and during installation it must be handled correctly to avoid damage.

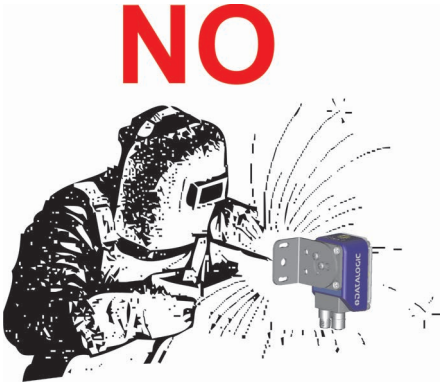
- avoid that the readers are dropped (exceeding shock limits)



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



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



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



GENERAL VIEW

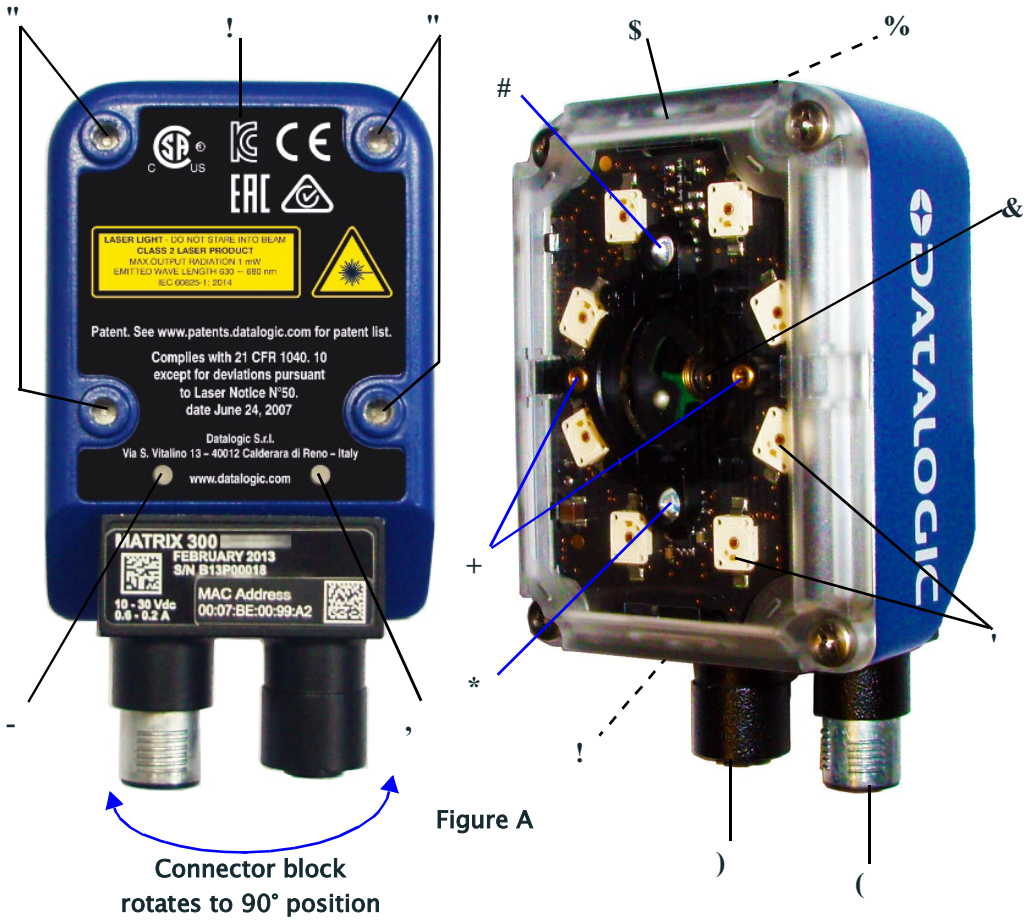


Figure A

Figure 1 - Matrix 300N™ 1.3 MP Software Adjustable Focus (Liquid Lens) Models

!	Device Class and Warning Labels	(	Power - Serial Interfaces - I/O Connector
"	Bracket Mounting Holes (4)	)	Ethernet Connector
#	Good Read LED (green)	*	No Read LED (red)
$	Lens Cover	+	Aiming System Laser Pointers
%	HMI X-PRESS Interface	,	Ethernet Connection LED
&	Lens	-	Power On LED
'	Internal Illuminator		

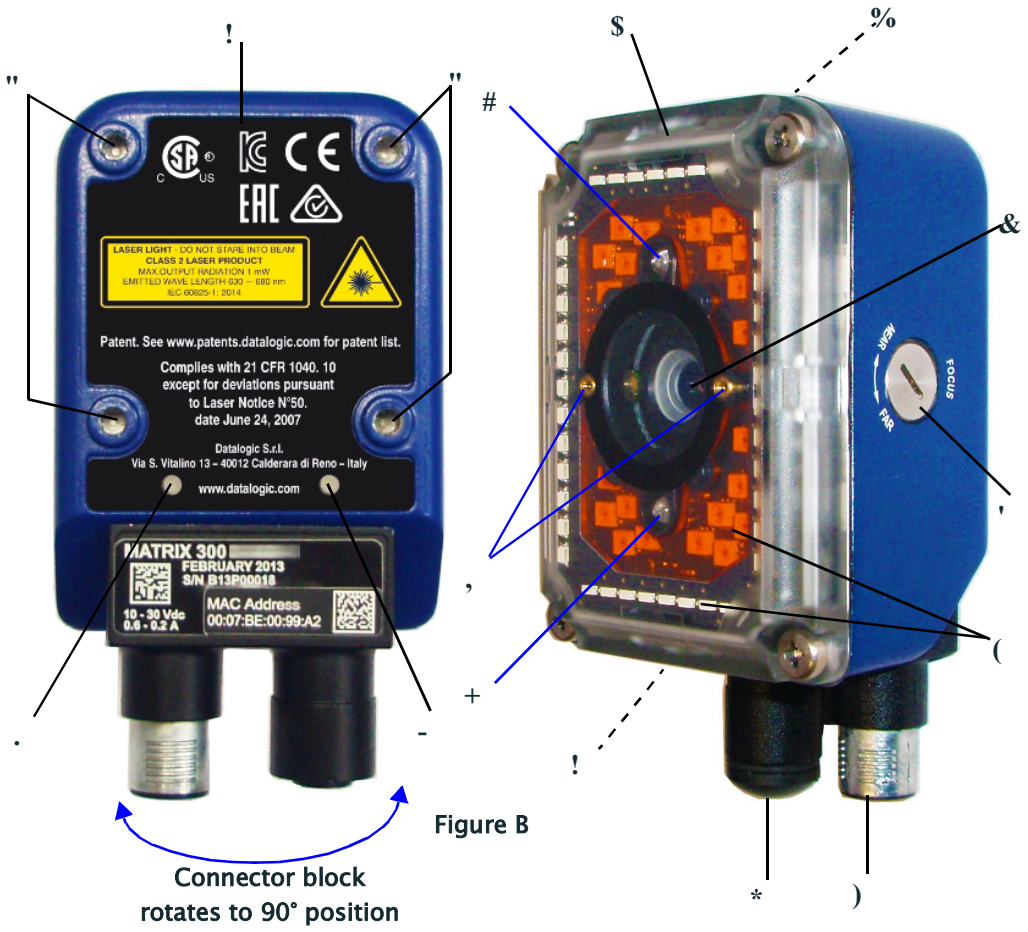


Figure 2 – Matrix 300N™ 1.3 MP Manual Adjustable Focus Models

!	Device Class and Warning Labels	(	Internal Illuminator
"	Bracket Mounting Holes (4)	)	Power - Serial Interfaces - I/O Connector
#	Good Read LED (green)	*	Ethernet Connector
$	Lens Cover	+	No Read LED (red)
%	HMI X-PRESS Interface	,	Aiming System Laser Pointers
&	Lens	-	Ethernet Connection LED
'	Focus Adjustment Screw	.	Power On LED

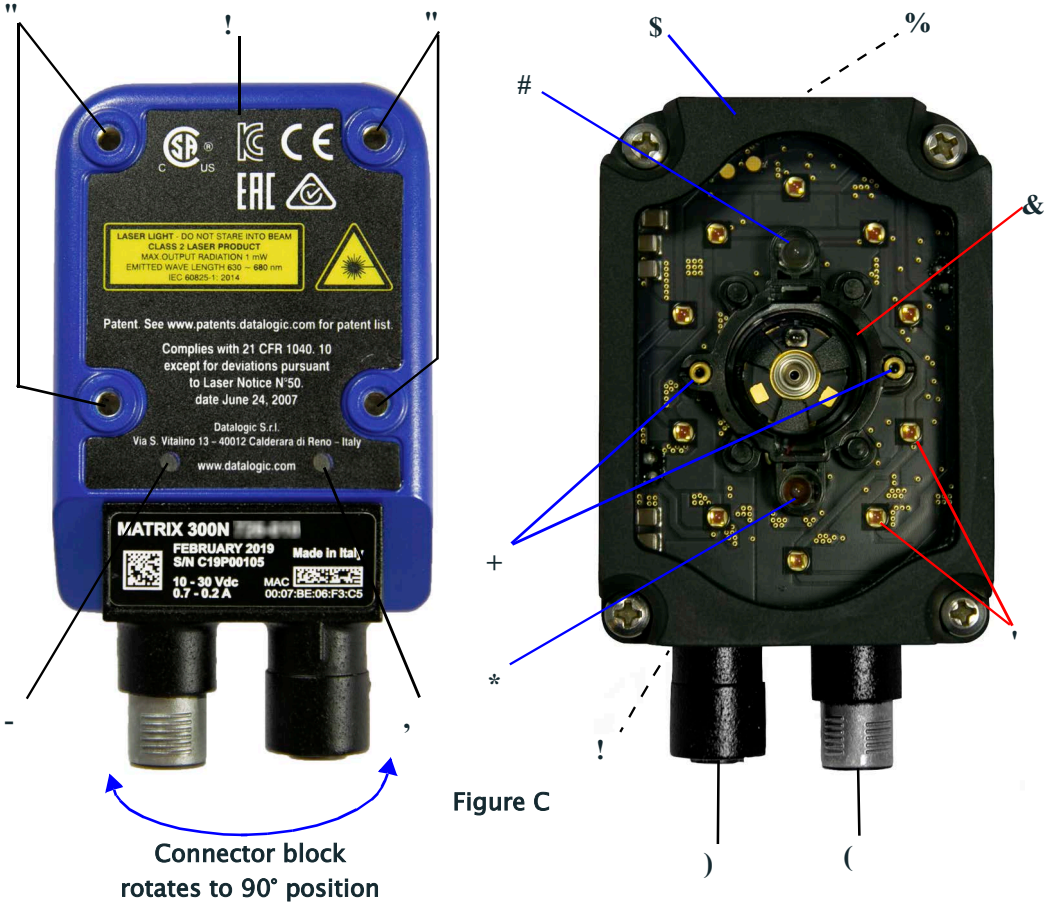


Figure C

Figure 3 - Matrix 300N™ 2 MPSoftware Adjustable Focus (Liquid Lens) Models

!	Device Class and Warning Labels	(	Power - Serial Interfaces - I/O Connector
"	Bracket Mounting Holes (4)	)	Ethernet Connector
#	Good Read LED (green)	*	No Read LED (red)
$	Lens Cover	+	Aiming System Laser Pointers
%	HMI X-PRESS Interface	,	Ethernet Connection LED
&	Lens	-	Power On LED
'	Internal Illuminator		

CHAPTER 1
RAPID CONFIGURATION

STEP 1 - CONNECT THE SYSTEM

To connect the system in a Stand Alone configuration, you need the hardware indicated in Figure 1. In this layout the data is transmitted to the Host on the main serial interface. Data can also be transmitted on the RS232 auxiliary interface irrespective of 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.

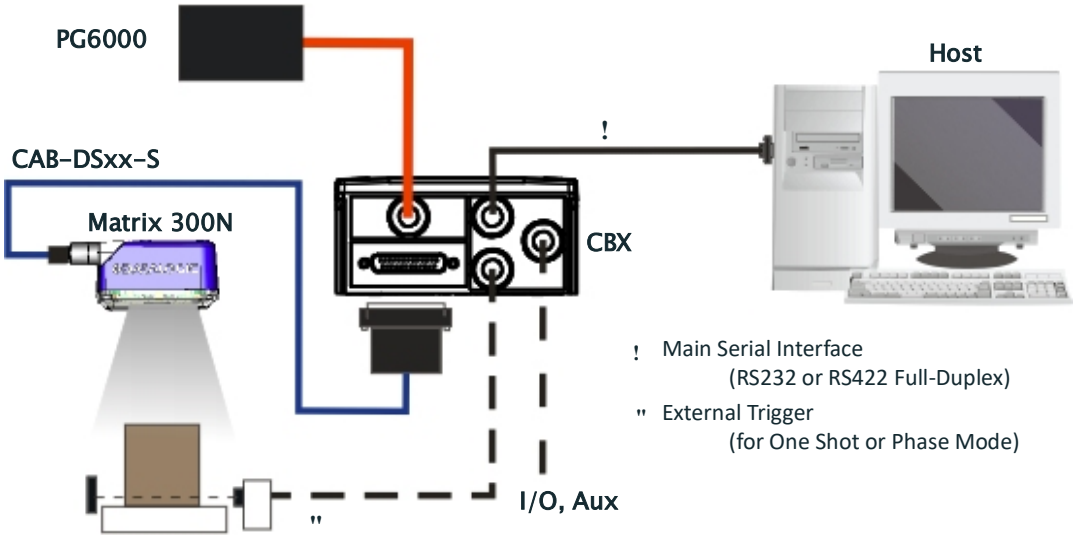


Figure 4 - Matrix 300N in Stand Alone Layout

CBX100/CBX500 Pinout for Matrix 300N

The table below gives the pinout of the CBX100/CBX500 terminal block connectors. Use this pinout when the Matrix 300N reader is connected by means of the CBX100/CBX500:

CBX100/500 Terminal Block Connectors			
Input Power		Outputs	
Vdc	Power Supply Input Voltage +	+V	Power Source - Outputs
GND	Power Supply Input Voltage -	-V	Power Reference - Outputs
Earth	Protection Earth Ground	O1+	Output 1+
		O1-	Output 1-
Inputs		O2+	Output 2+
+V	Power Source - External Trigger	O2-	Output 2-
I1A	External Trigger A (polarity insensitive)	O3A	Output 3 (CBX500 only)
I1B	External Trigger B (polarity insensitive)		
-V	Power Reference - External Trigger	Auxiliary Interface	
+V	Power Source - Inputs	TX	
I1A	Input 2 A (polarity insensitive)	RX	
I2B	Input 2 B (polarity insensitive)	SGND	
-V	Power Reference - Inputs	ID-NET™	
Shield		REF	Network Reference
Shield	Network Cable Shield	ID+	ID-NET network +
		ID-	ID-NET network -
Main Interface			
RS232		RS422 Full-Duplex	
TX		TX+	
-		TX-	
RX		[a]RX+	
-		*RX-	
SGND		SGND	

a. Do not leave floating, see RS232 Interface for connection details



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 2 - MOUNT AND POSITION THE READER

1. To mount the Matrix 300N, use the mounting brackets to obtain the most suitable position for the reader. The most common mounting configuration is shown in the figure below.

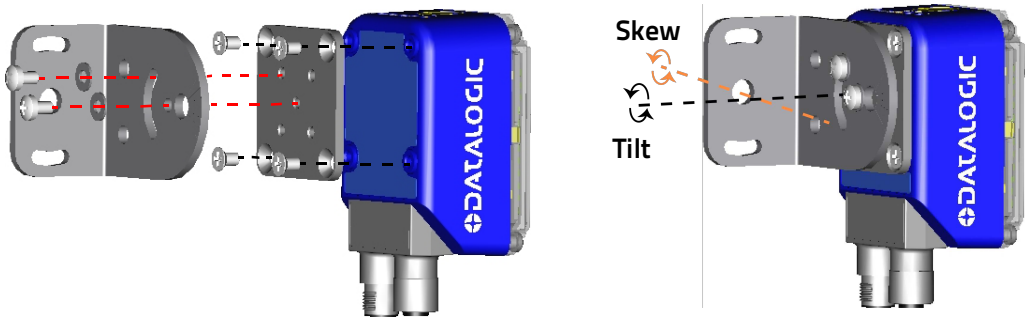


Figure 5 - Positioning with Mounting Bracket

2. When mounting the Matrix 300N, 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).

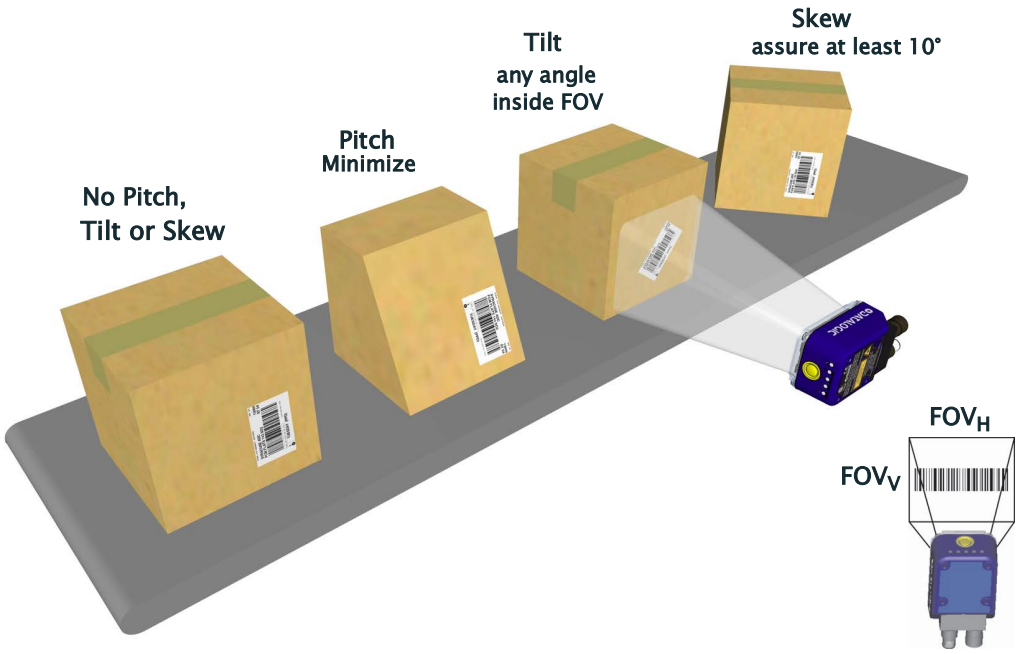


Figure 6 - Pitch, Skew and Tilt References

3. Refer to the reading diagrams in Chapter 6 to determine the distance your reader should be positioned at.

NOTE

Rapid Configuration of the Matrix 300N reader can be made either through the X-PRESS™ interface (steps 3-4) which requires no PC connection, or by using the DL.CODE Configuration Program (steps 5-6). Select the procedure according to your needs.

STEP 3 - AIM AND AUTOFOCUS THE READER

(Liquid Lens Models only)

Matrix 300N 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 the **Grade A Barcode Test Chart** in front of the reader at the correct reading distance for your application. See the Global FOV Diagrams for reference.

3. Enter the Aim/Autofocus function by pressing and holding the X-PRESS push button until the Aim LED is on.

4. Release the button to enter the Aim function. The laser pointers turn on, and the Autofocus procedure begins, see Figure . The Aim LED will blink until the procedure is completed.

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

   The Autofocus procedure ends when the Reading Distance and PPI values are successfully saved in the reader memory, the Aim LED will stop blinking and Matrix 300N emits 3 high pitched beeps.

   If the Autofocus cannot be reached after a timeout of about 3 (three) minutes, Matrix 300N will exit without saving the parameters to memory, the Aim LED will stop blinking and in this case Matrix 300N emits a long low pitched beep.

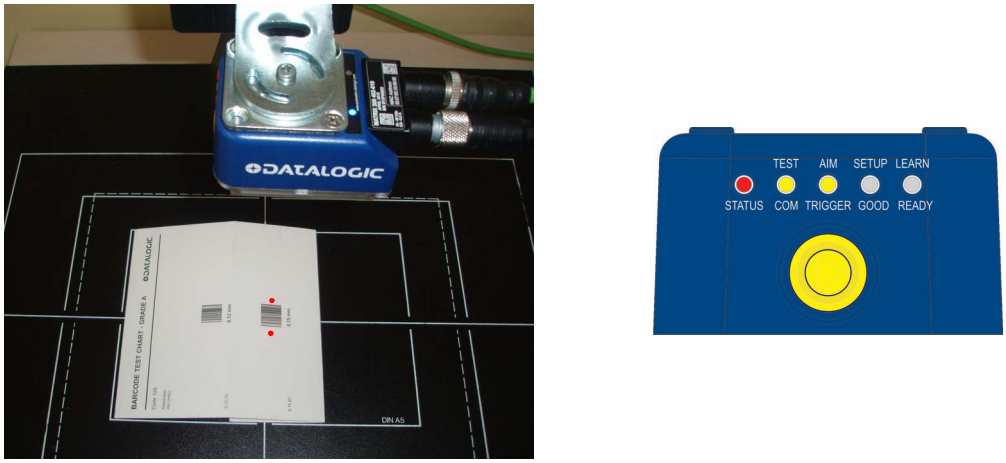


Figure 7 - X-PRESS Interface; Aim/Autofocus Function

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 pointers turn off.

(Manual Adjustable Focus Models only)

The Matrix 300N manual adjustable focus models are factory focused to a precise Reading Distance. If the distance is compatible with your application, you can use the X-PRESS Interface to install the reader, if not, use the DL.CODE procedure described in step 6 "**Advanced Setup for Manual Adjustable Focus Models**".

Place the reader at the factory focused Reading Distance and go to step 4.

Matrix 300N 4x1-0xx 6 mm lens = **85 mm**

Matrix 300N 4x3-0xx 9 mm lens = **180 mm**

Matrix 300N 4x4-0xx 12 mm lens = **250 mm**

Matrix 300N 4x5-0xx 16 mm lens = **320 mm**

STEP 4 - X-PRESS CONFIGURATION

Once Matrix 300N is focused at the correct reading distance, you must configure it for optimal code reading relative to your application.

Aim

1. Enter the Aim function by pressing and holding the X-PRESS push button until the Aim LED is on.
2. Release the button to enter the Aim function. The laser pointers turn on.
3. **Select a single code from your application**. Position the code at the center of the FOV (equidistant from the aiming indicators.

   For Liquid Lens models, the reader may start flashing and try to perform autofocus, however this will have no effect on the application specific code; it can be ignored.

   Exit the Aim function by pressing the X-PRESS push button once. After a short delay the Aim function is canceled and the laser pointers turn off.



Figure 8 - X-PRESS Interface: Aim Function

Setup

4. Enter the Setup function by pressing and holding the X-PRESS push button until the Setup LED is on.
5. Release the button to enter the Setup function. The Setup 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 Setup LED will stop blinking and Matrix 300N emits 3 high pitched beeps.

   If the calibration cannot be reached after a timeout of about 5 (five) seconds, Matrix 300N will exit without saving the parameters to memory, the Setup LED will stop blinking and in this case Matrix 300N emits a long low pitched beep.



Figure 8 - X-PRESS Interface: Setup Function

Learn

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

5. Release the button to enter the Learn function. The Learn LED will blink until the procedure is completed.
   The Learn procedure ends when the Image Processing and Decoding parameters for **a single code** are successfully saved in the reader memory, the Green Spot is activated, the Learn LED will stop blinking and Matrix 300N emits 3 high pitched beeps[1].

If the autolearning cannot be reached after a time-out of about 3 (three) minutes, Matrix 300N will exit without saving the parameters to memory, the Learn LED will stop blinking and in this case Matrix 300N emits a long low pitched beep.



Figure 9 - X-PRESS Interface: Learn Function

1. The Code Autolearn procedure will not recognize the following symbologies: Postal Codes, Pharmacode, MSI, Standard 2 of 5, Matrix 2 of 5.

NOTE **The Grade A Barcode Test Chart cannot be used to set the Code 128 symbology (even though the reader successfully reads the code). Use the application specific code if you need to set this symbology.**

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 300N, go to step 7.**

Reset Reader to Factory Default Environment (Optional)

If it ever becomes necessary to reset the reader's Environment parameters to their factory default values, 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 for about 3 seconds. Release and re-press the button during this LED blinking sequence**.

All the device Environment parameters are reset including the default IP Address. The Matrix 300N emits 3 high pitched beeps 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



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 (running Windows 7, 8.1, or 10), 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.

Device Discovery

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

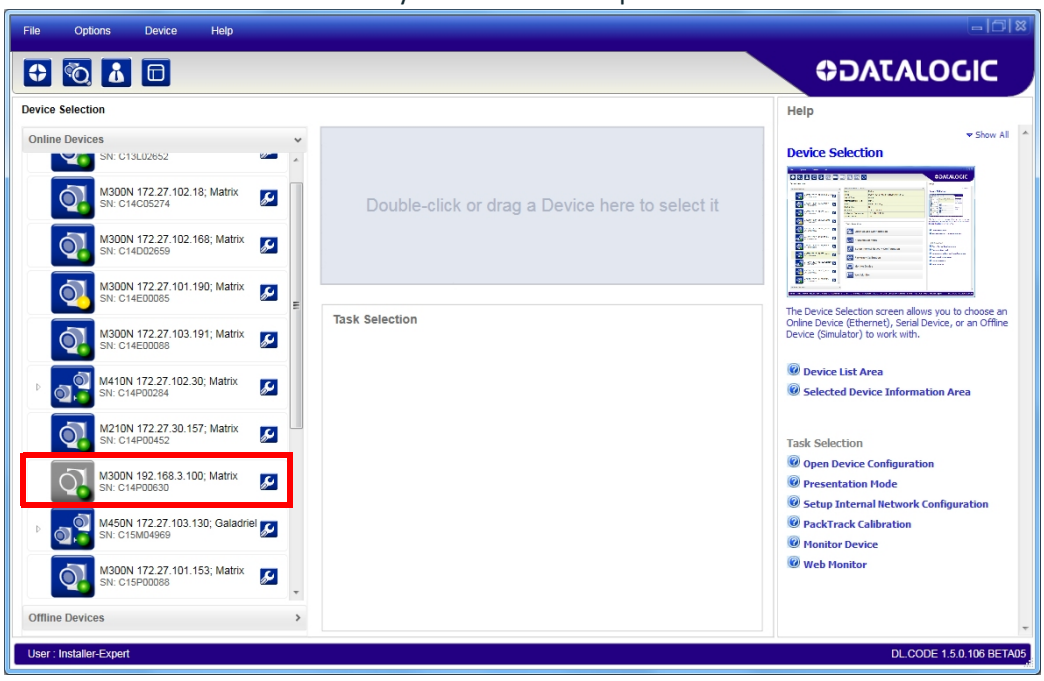


Figure 10 - Device Discovery

The discovery feature will also show devices not belonging to the LAN and display them in gray (see Figure Figure 10).

3. 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).



4. 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.

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

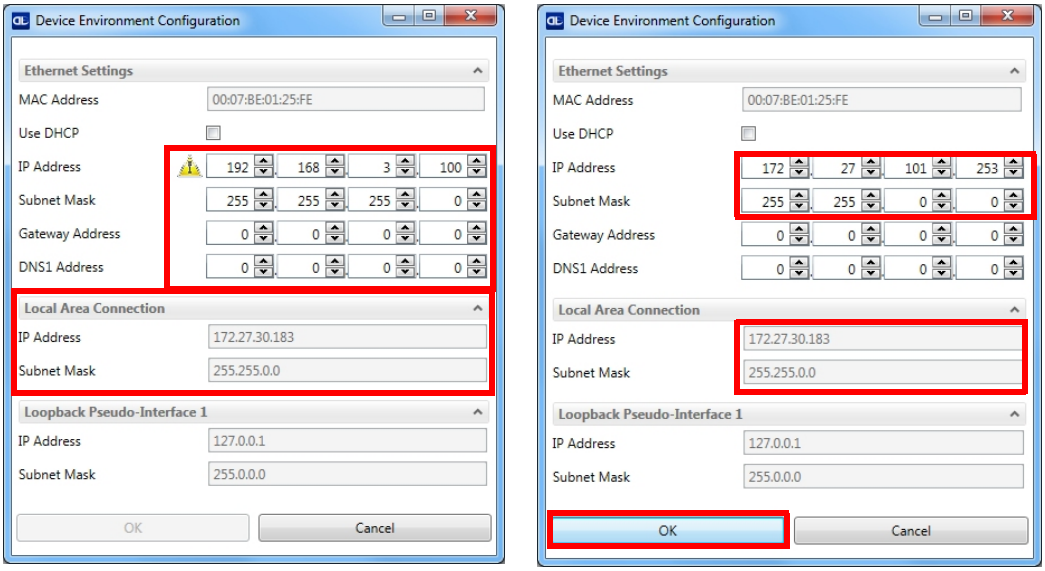
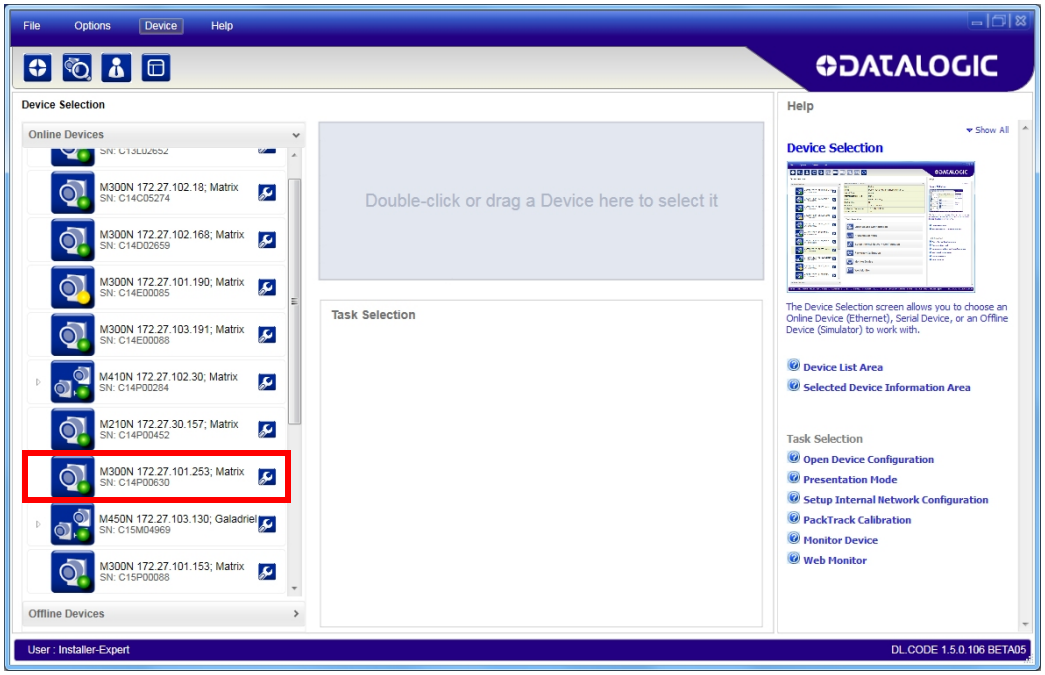


Figure 11 - Device Environment Configuration Window

6. 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.



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

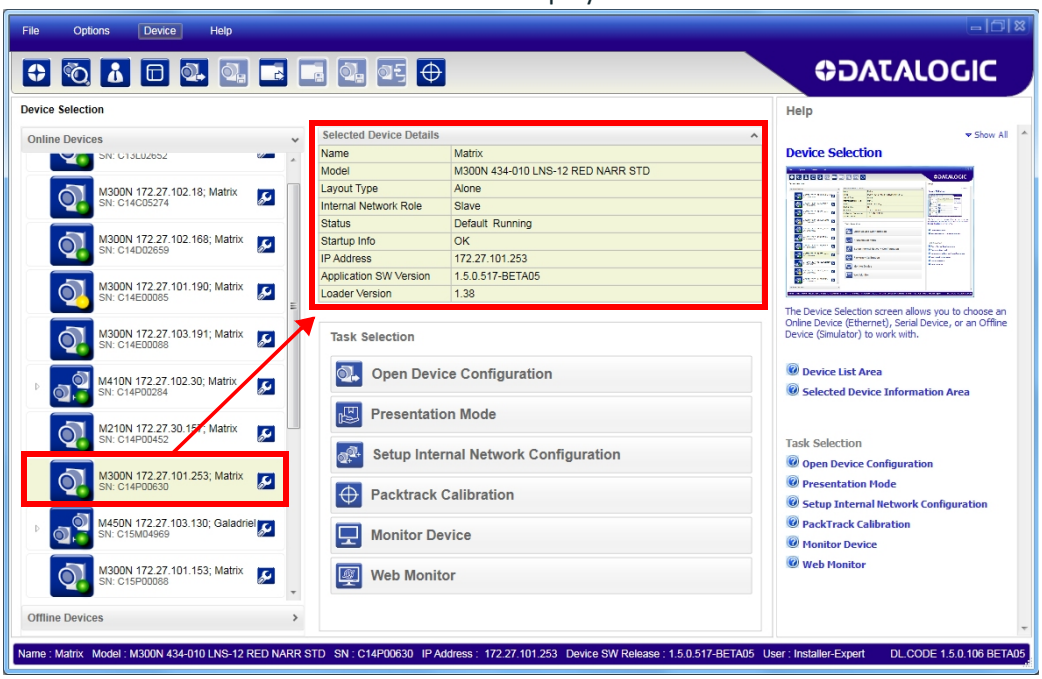


Figure 12 - DL.CODE Opening Window

STEP 6 - DEVICE CONFIGURATION

Automatic or Advanced Setup

Automatic Setup provides an automatic procedure for setting: optical/illumination, reading distance (for software adjustable focus liquid lens models), and code definition parameters to obtain the most stable decoding conditions for a single code symbology based on the images presented to the reader. It can be set to include Image Filters if necessary. See the table below for codes and filters managed by Automatic Setup. Automatic Setup is especially useful for DPM applications.

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

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



NOTE

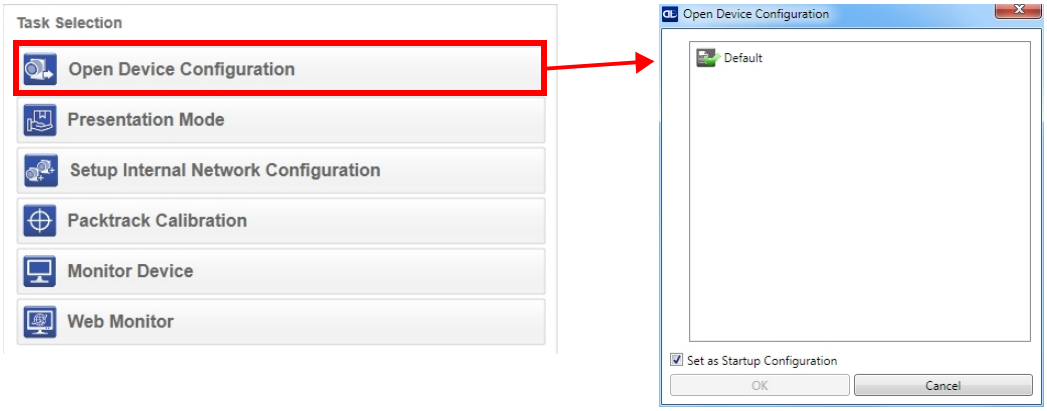
If your application requires multiple code symbologies, multiple image settings, Code Grading or other parameter settings for decoding, then use the Advanced Setup, see Advanced Setup for Software Adjustable Focus Models (Liquid Lens).

Automatic Setup

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

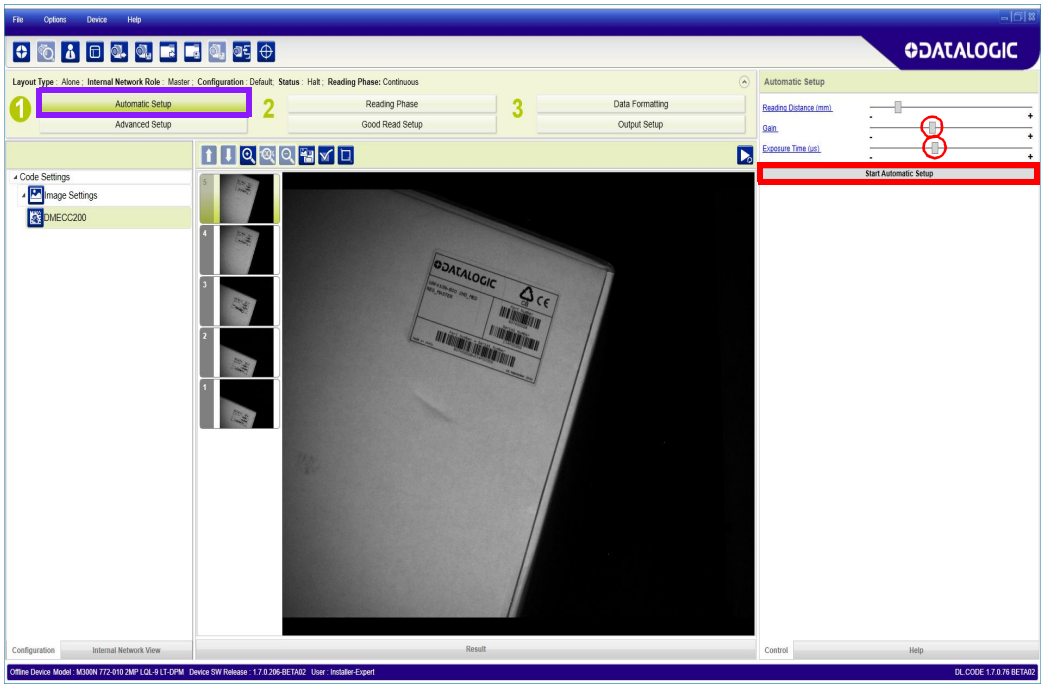
1. From the Task Area select Open Device Configuration.

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.

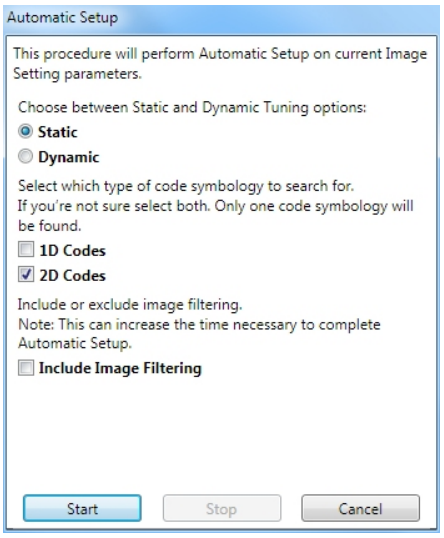
4. Click on the Pause button to stop image acquisition.



NOTE

If the image display area is too dark to see the images being captured, you can drag the Gain and Exposure Time sliders (circled in red in the figure above) to the right to increase visibility. This will not affect Automatic Setup.

5. Click on the **Start Automatic Setup** button. The following window is displayed:



6. Select the correct reading conditions: Static or Dynamic Tuning, 1D or 2D code, Include Image Filtering (to find the best decoding condition).

7. Click Start to begin the procedure. The reader begins acquiring images. At the end of the procedure the **Status: Completed** message appears. You can Close the Automatic Setup window.



Your reader is now optimized for decoding. Continue with the Reading Phase configuration described on page 30.

Advanced Setup for Software Adjustable Focus Models (Liquid Lens)

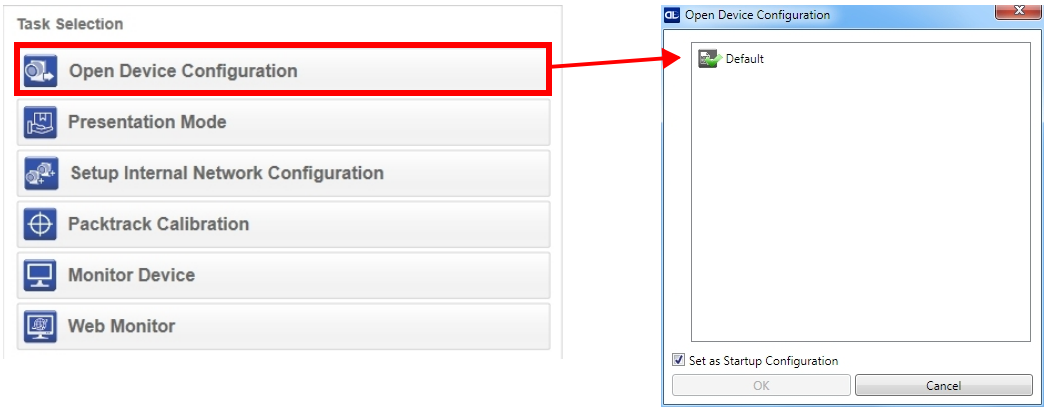
NOTE

For Manual Adjustable Focus models go to page 23 then continue the configuration with the "Reading Phase" on page 30**.**

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.

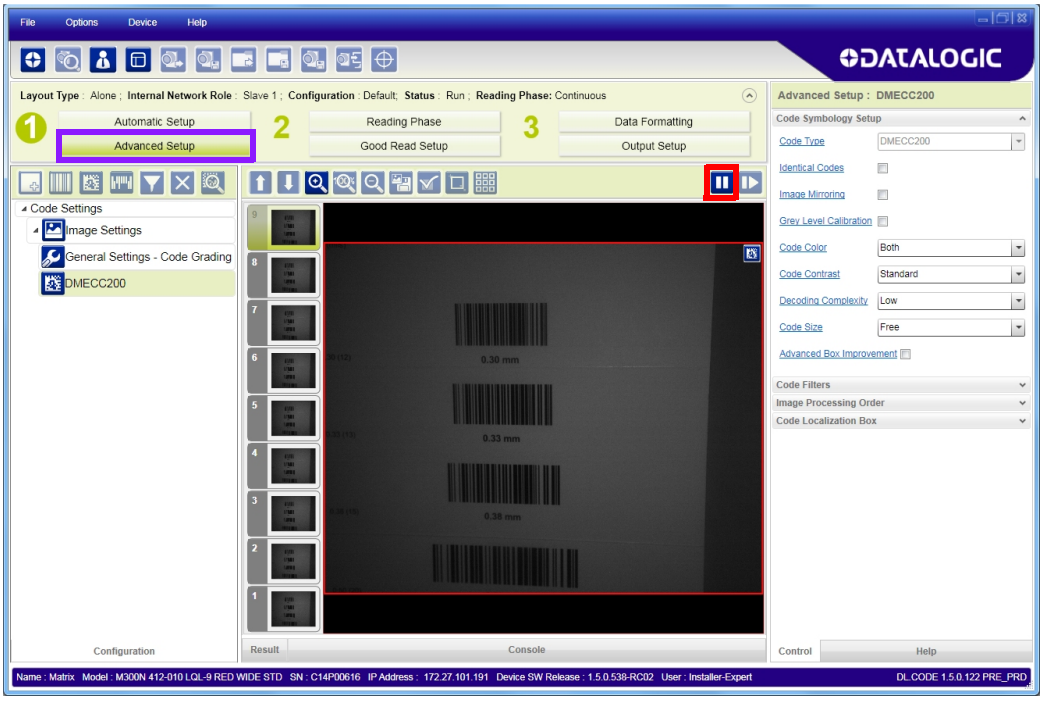
1. From the Task Area select Open Device Configuration.

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.

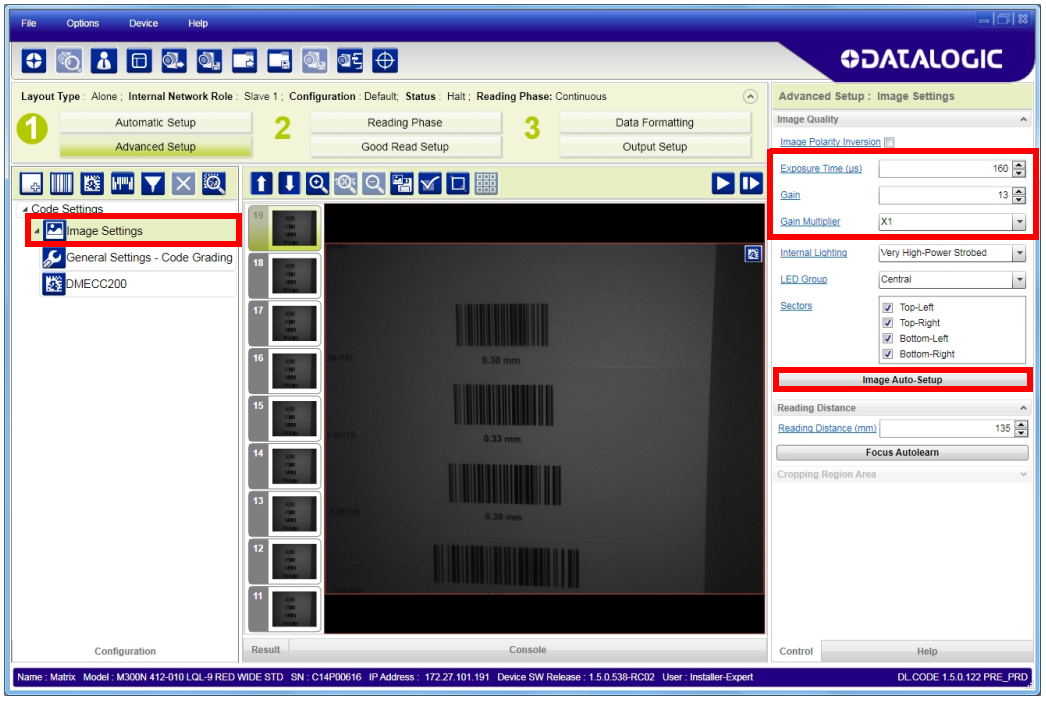


3. Click on the Advanced Setup button and press the Play icon.

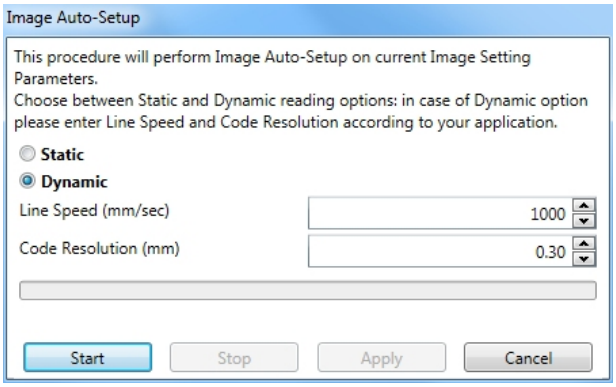
4. Place the **Grade A Barcode Test Chart** in the reading area. Once positioned, stop image acquisition by clicking on the Pause button.

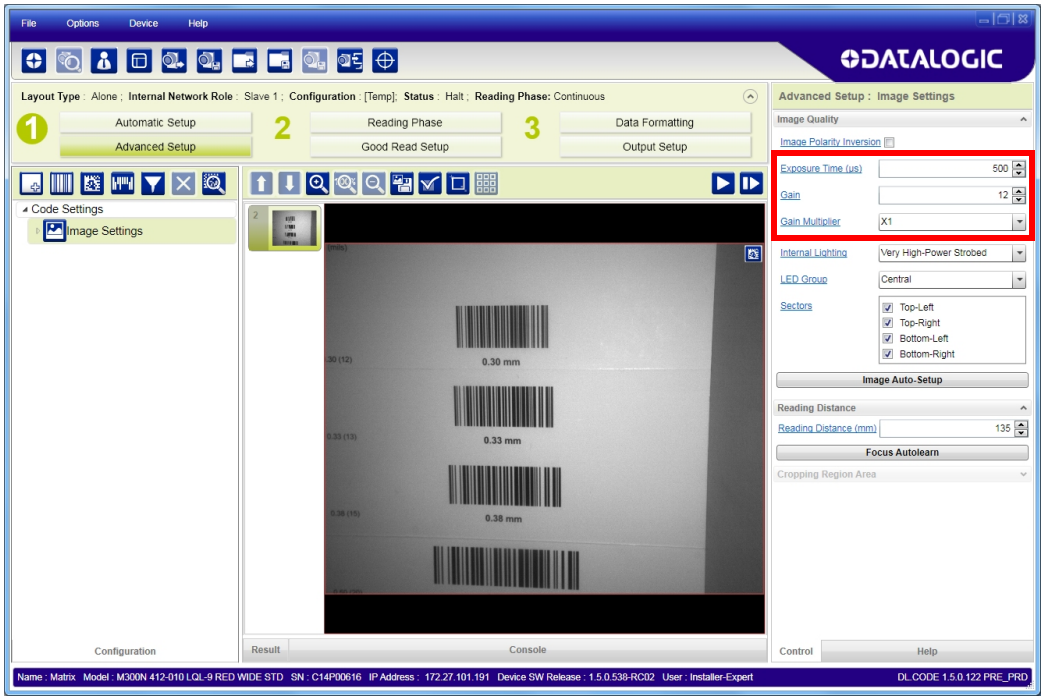


5. Click the Image Settings branch and then click the Image Auto Setup button to automatically acquire the best exposure time and gain values.



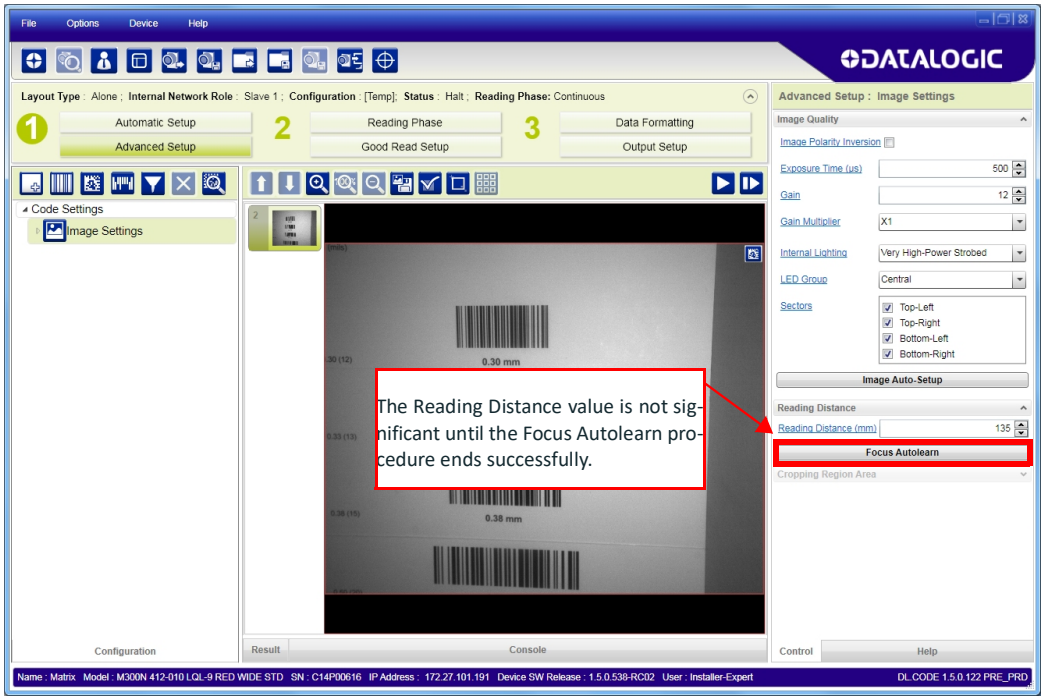
6. Select the Static or Dynamic Self-Tuning option; Start Autolearn and Apply to the Image Settings.



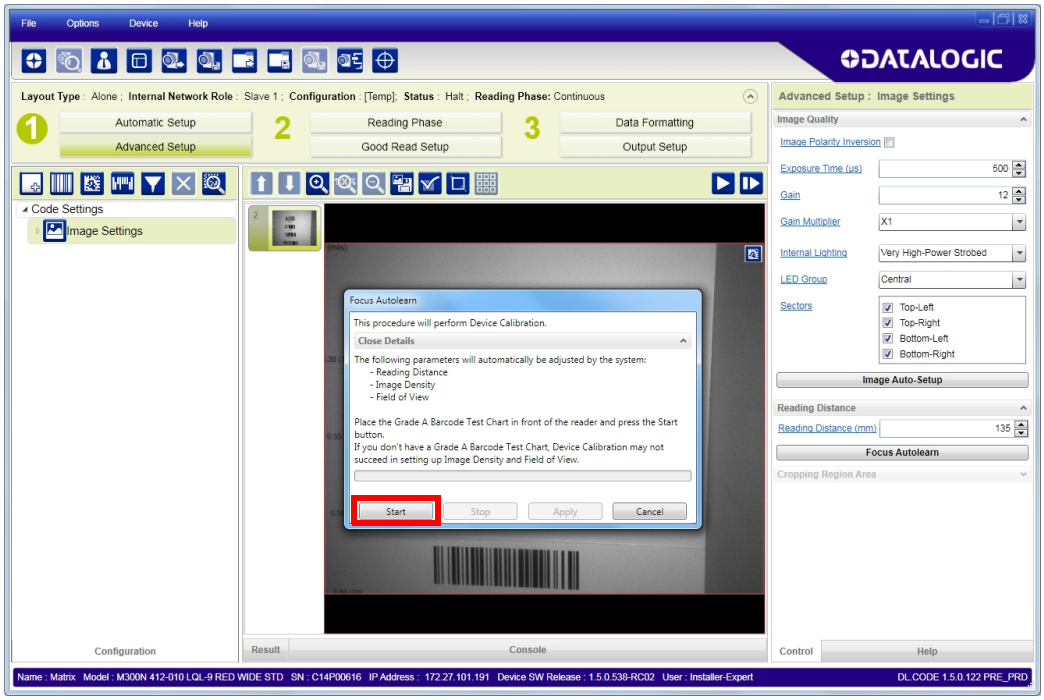


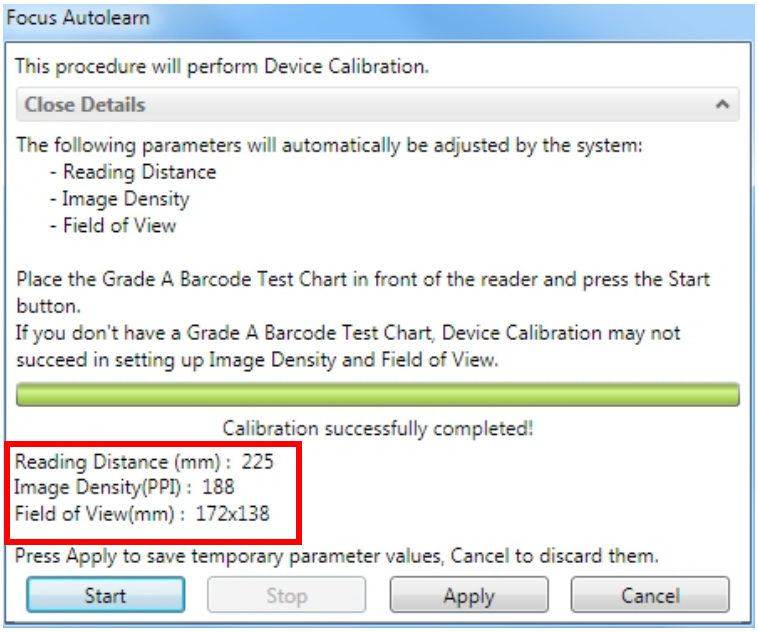
NOTE **For applications having multiple lighting or code reading conditions, up to 10 different Image Settings can be configured by adding them with the icon.**

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

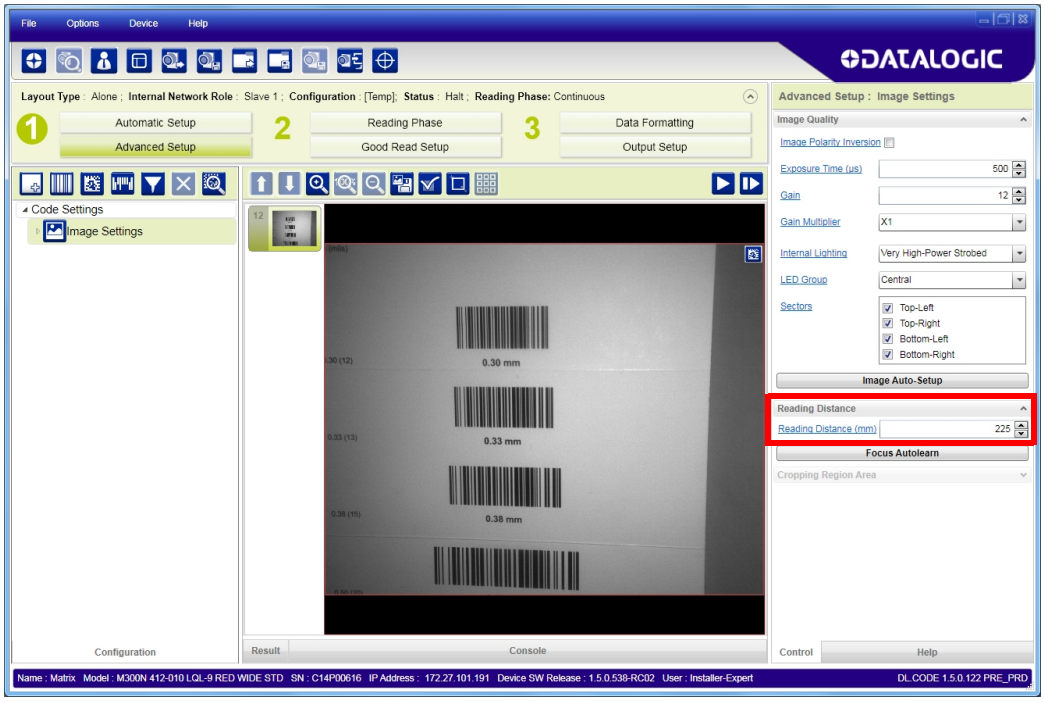


8. The Calibrate dialog box opens allowing you to start the procedure. Click Start.





At the end of the calibration you can see the new Reading Distance and Image Density (PPI) values as well as the FOV dimensions. Click Apply.

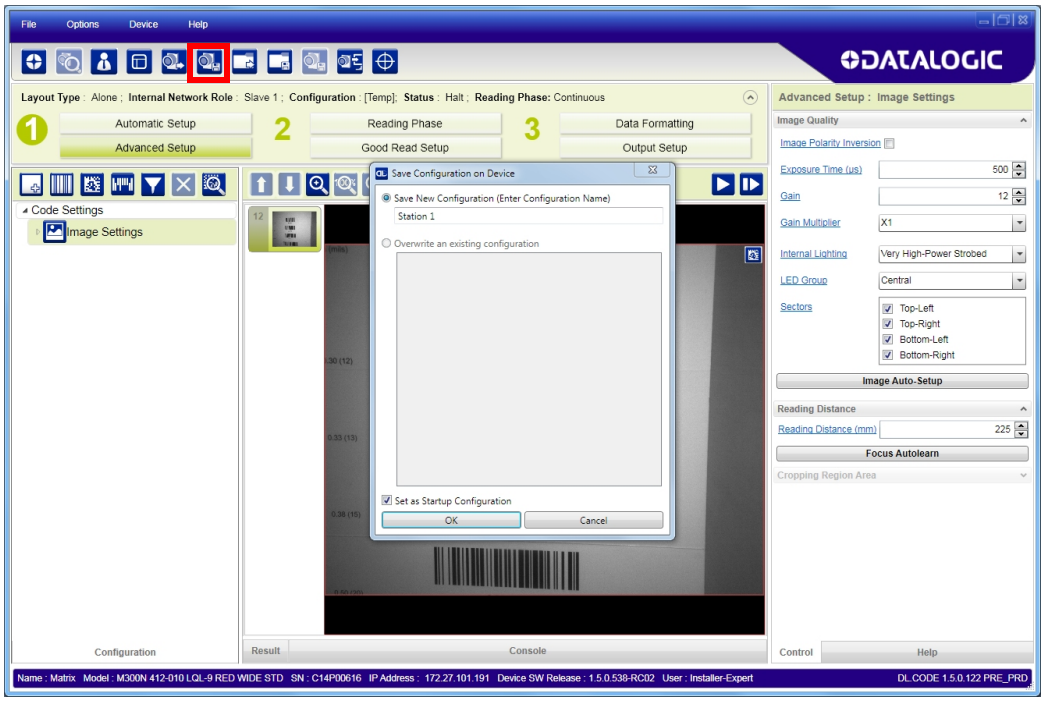


NOTE

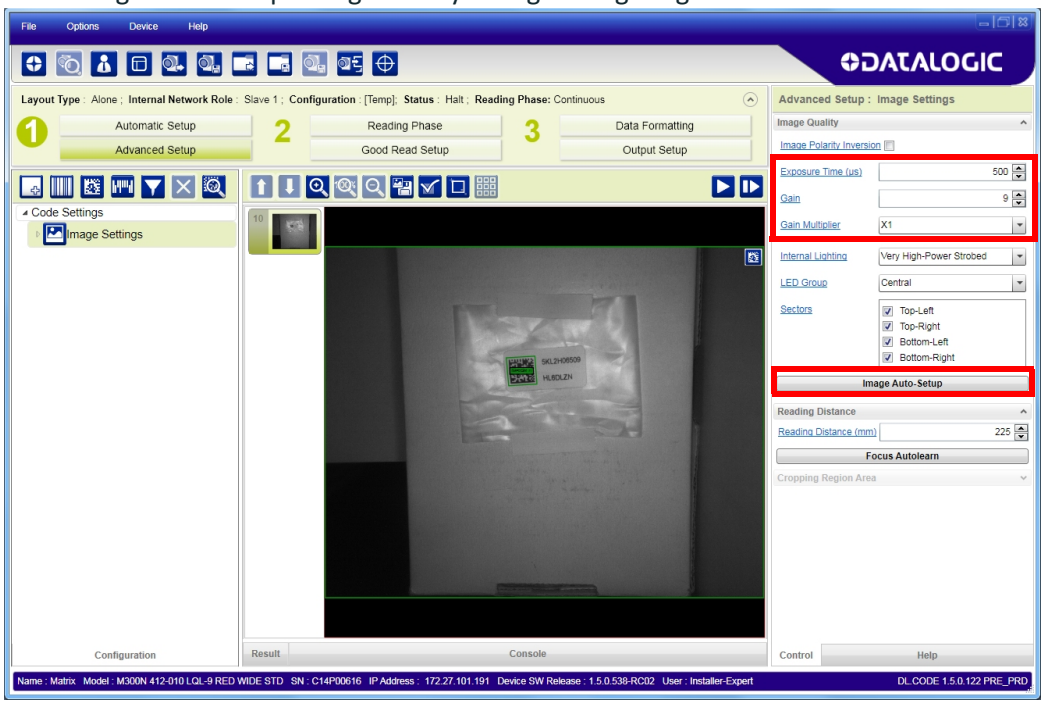
To enlarge the visual image of the code view, you can click on the zoom image icon repositioning it on the code.

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.

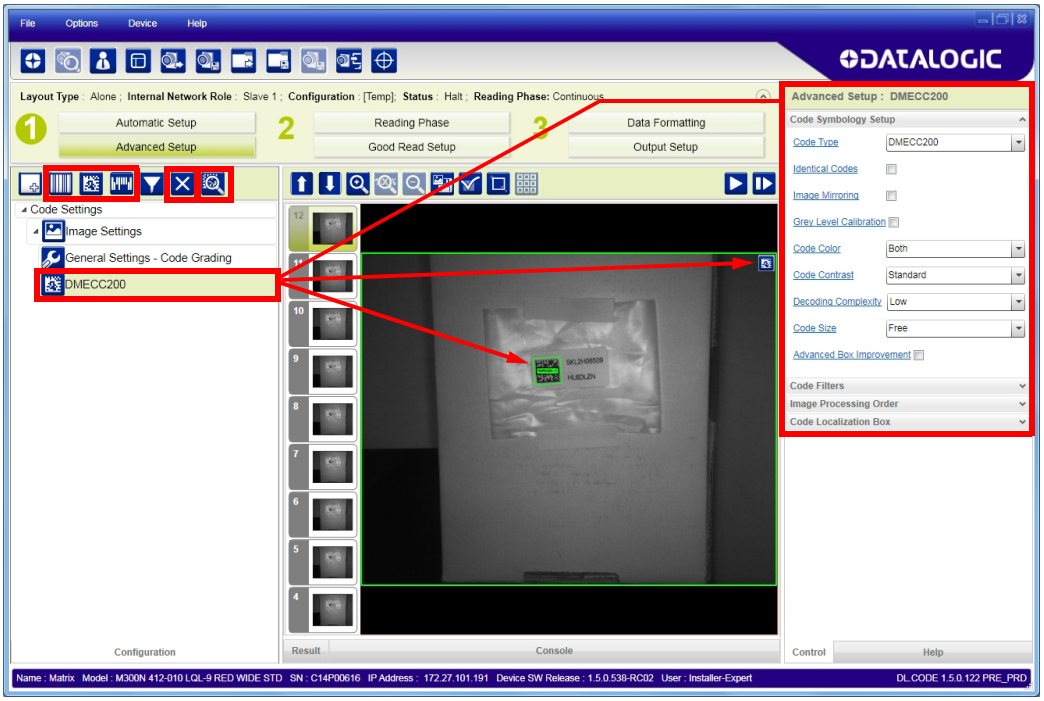


9. Now place **an application specific code** in front of the reader and repeat **only** the Image Auto-Setup to register any changes in lighting or code surface contrast.



10. Click on the Data Matrix ECC 200 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 small 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.

11. 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 Code Autolearn icon.[1] See the DL.CODE User's Manual for details.
12. For each code symbology set the relative parameters according to your application.

NOTE

Continue the configuration with the "Reading Phase" on page 30.

1. *The Code Autolearn procedure will not recognize the following symbologies: Pharmacode, MSI, Standard 2 of 5, Matrix 2 of 5.*

Advanced Setup for Manual Adjustable Focus Models

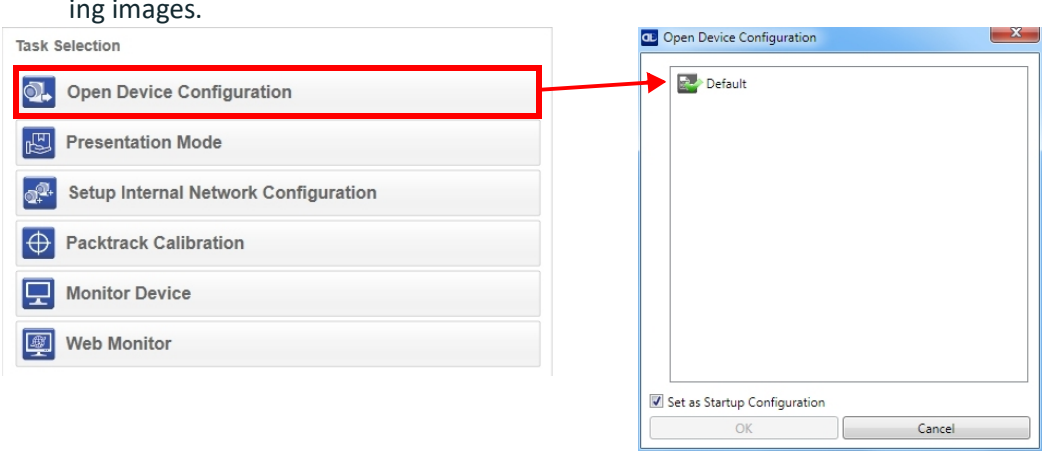
NOTE

For Software Adjustable Focus models go to page 16 then continue the configuration with the "Reading Phase" on page 30.

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.

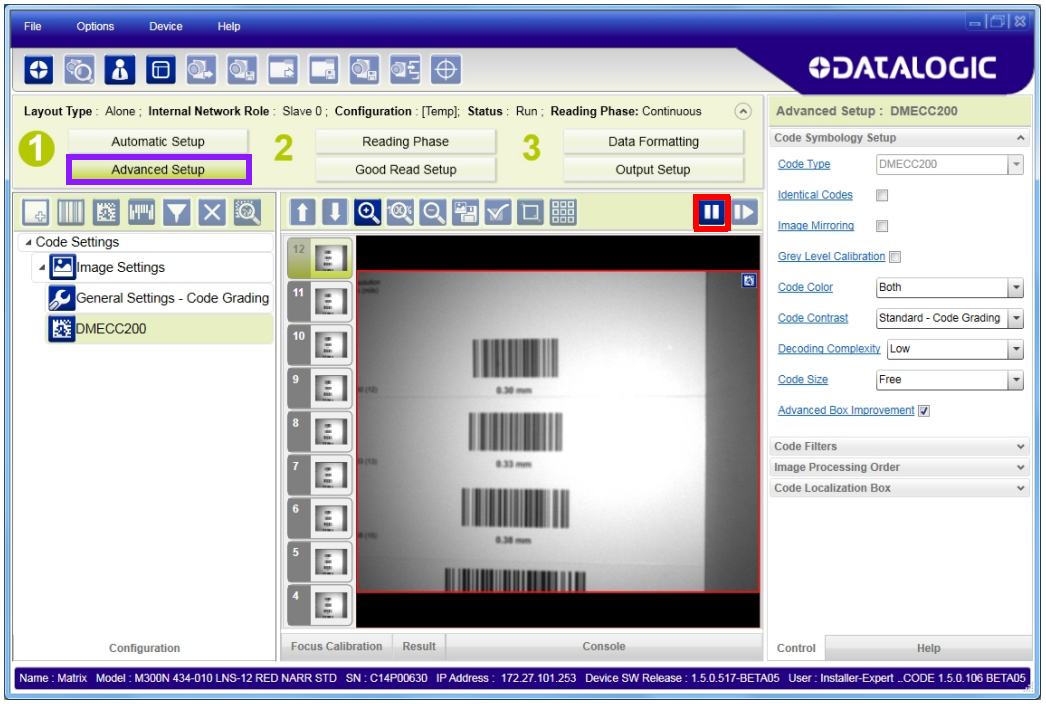
1. From the Task Area select Open Device Configuration.

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.

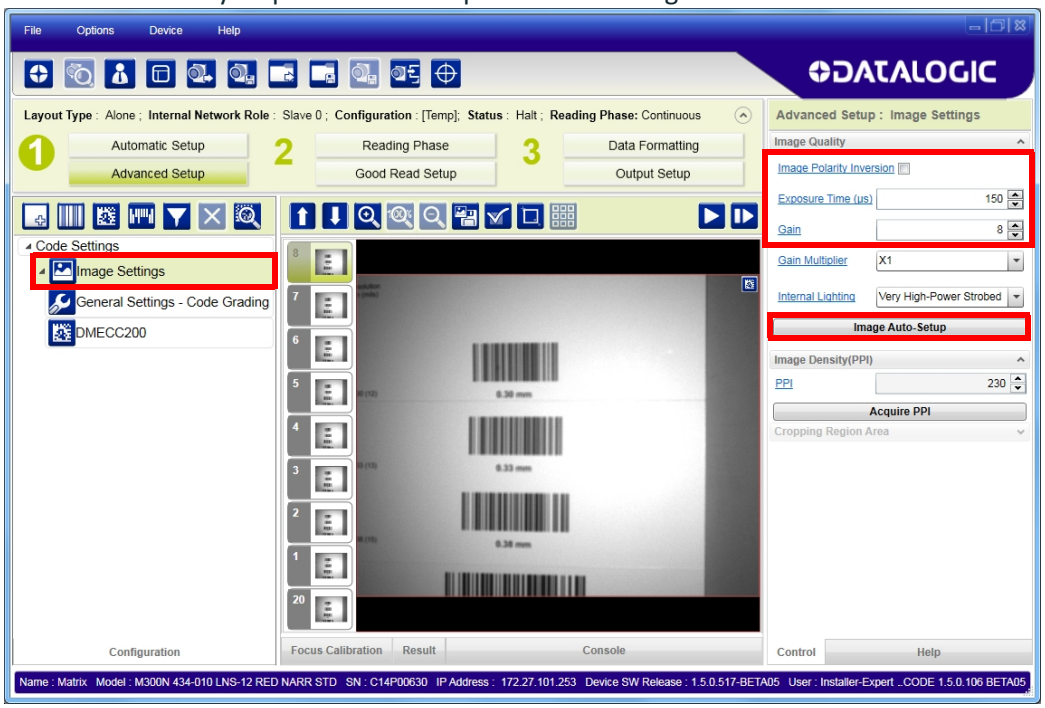


3. Click on the Advanced Setup button and press the Play icon.

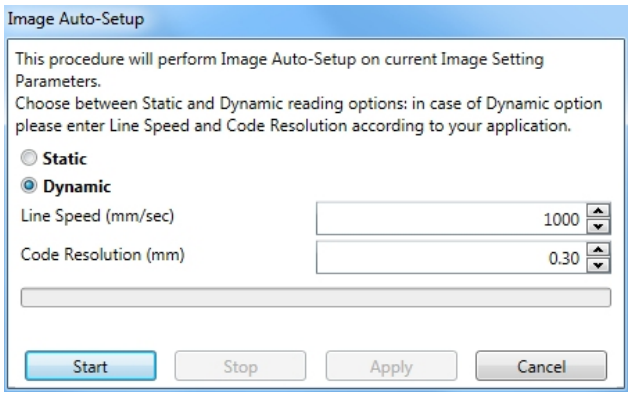
4. Place the **Grade A Barcode Test Chart** in the reading area. Once positioned, stop image acquisition by clicking on the Pause button.

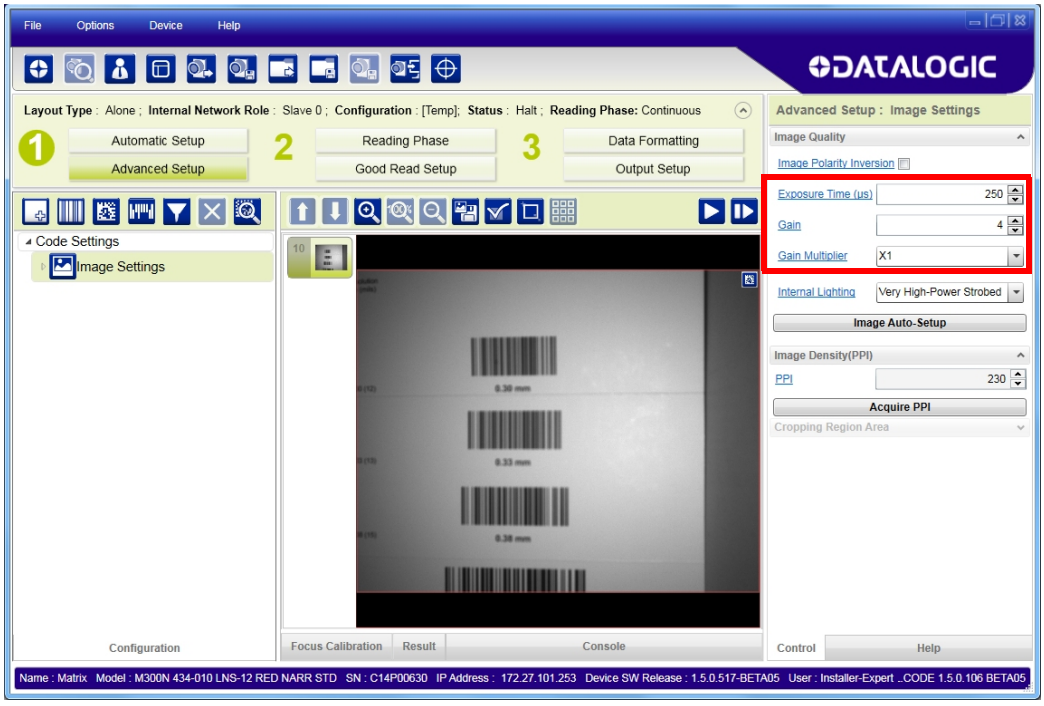


5. Click the Image Settings branch and then click the Image Auto Setup button to automatically acquire the best exposure time and gain values.



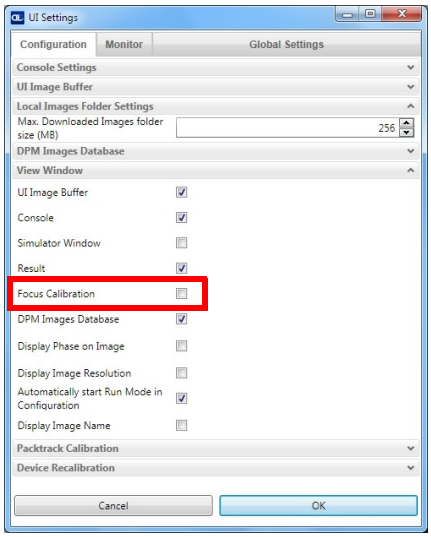
6. Select the Static or Dynamic Self-Tuning option; Start the Image Auto Setup and Apply to the Image Settings.



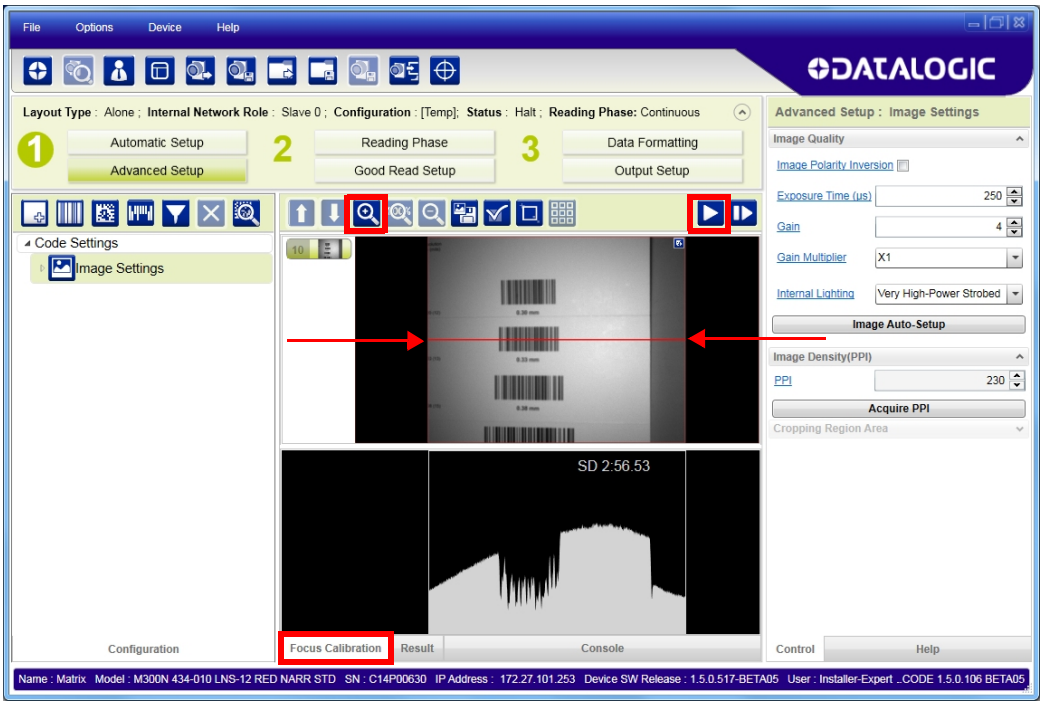


NOTE **For applications having multiple lighting or code reading conditions, up to 10 different Image Settings can be configured by adding them with the icon.**

For the next step you need to enable the Focus Calibration Tool from the Options>UI Settings Configurations tab if not already enabled.



7. Now click on the Focus Calibration tab at the bottom of the window. The oscilloscope view is shown in the bottom panel and can be used for manual focus adjustment.

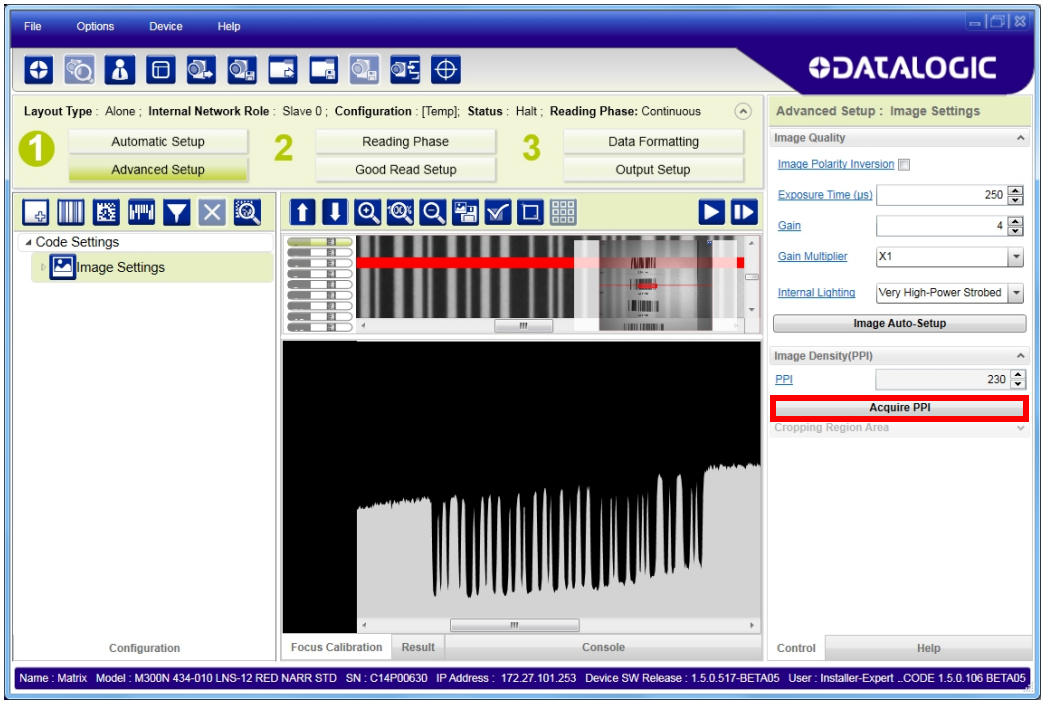


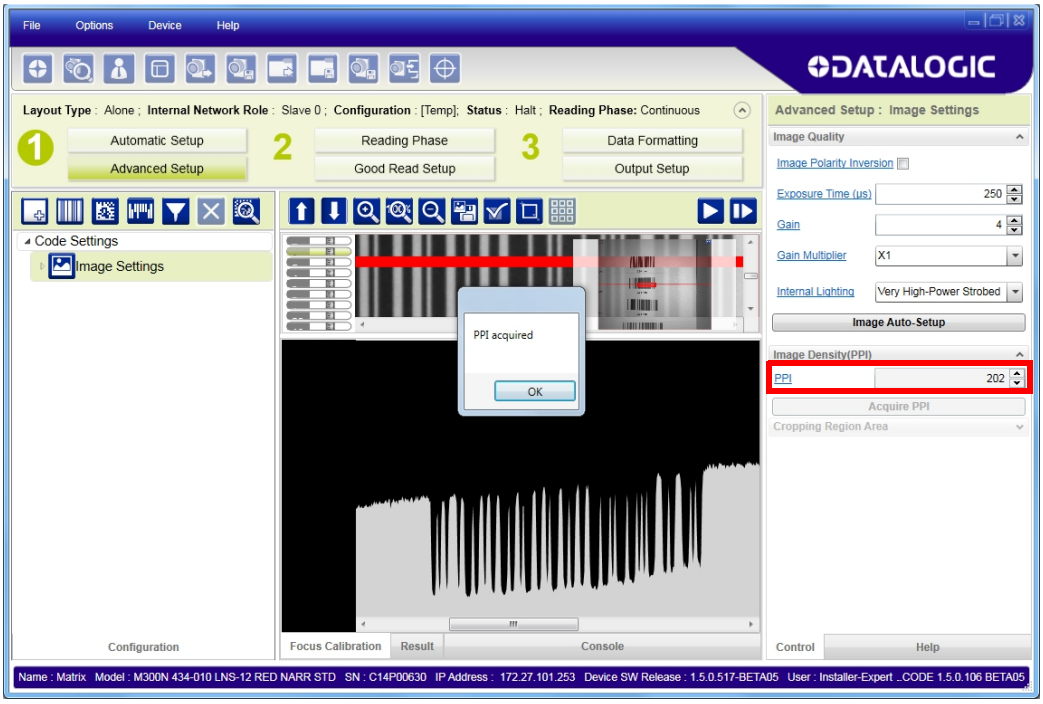
The red line in the image panel above the oscilloscope must pass through the code. You can click and drag the red line vertically to reposition it over the code.

NOTE

To enlarge the visual image of the code and the oscilloscope views, you can drag the Focus Calibration window up and click on the zoom image icon repositioning it on the code.

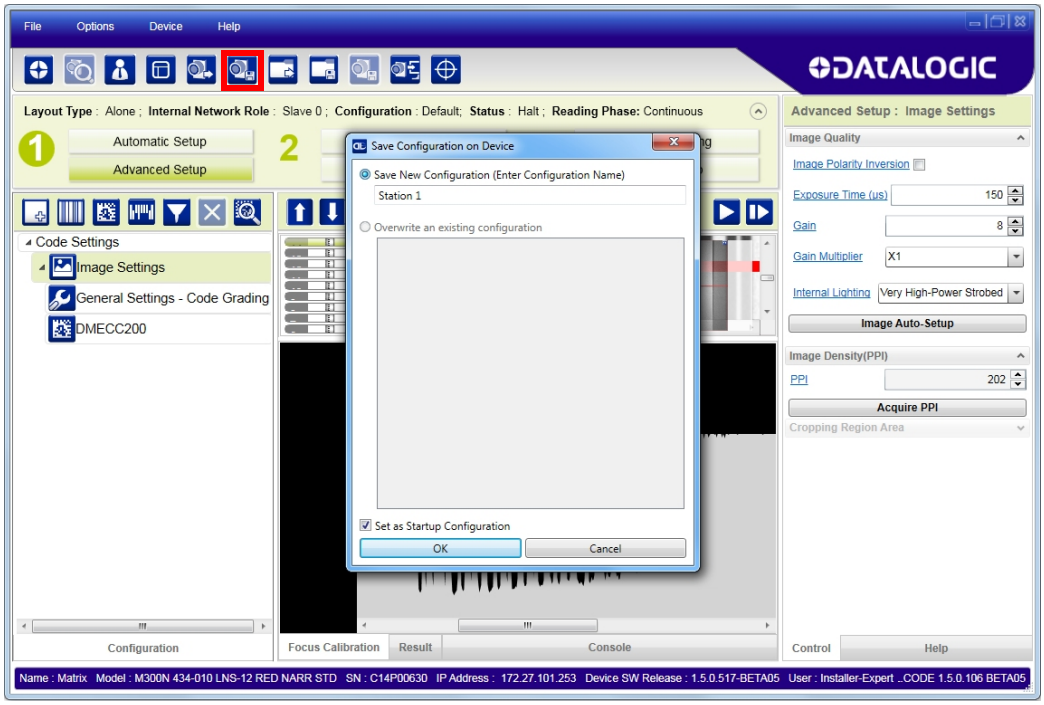
8. Click the **Acquire PPI** button to automatically set the Image Density so that Matrix 300N will function correctly and to the fullest extent of its capabilities. This procedure is necessary for first time installation, or if the focal distance is changed.





NOTE

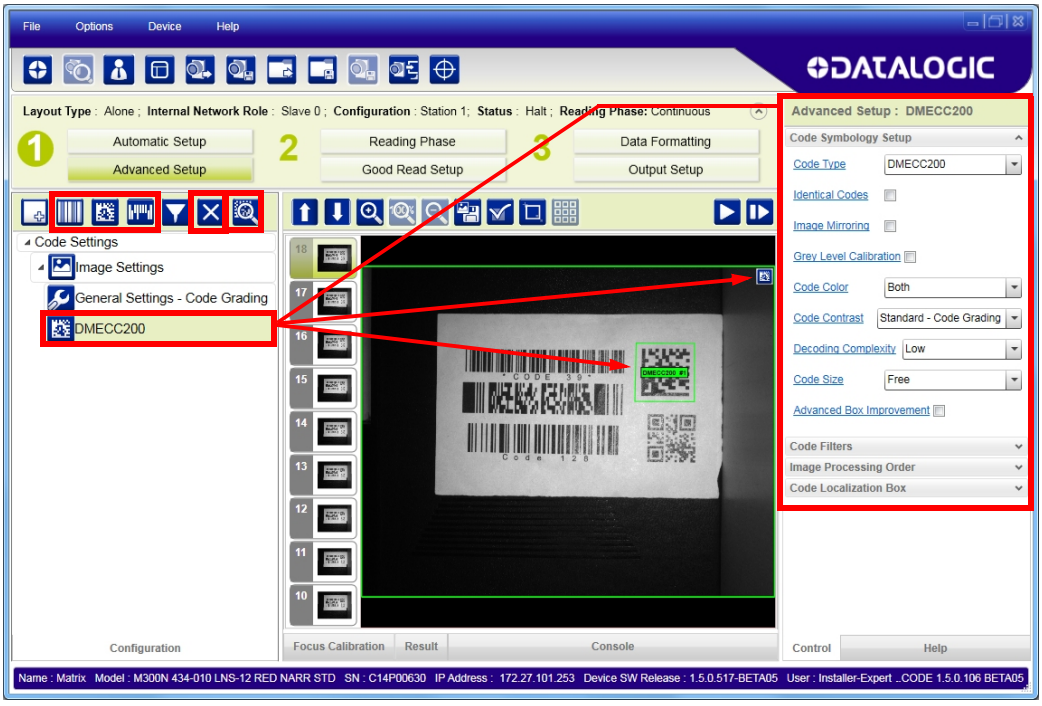
At this point it is probably a good idea to save the configuration from temporary memory to permanent memory giving it a specific name.



9. Now place **an application specific code** in front of the reader and **only** click the **Image Auto-Setup** to register any changes in lighting or code surface contrast. **Do not repeat Focus Calibration or PPI.**

10. Click on the Data Matrix ECC 200 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 small 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.

11. 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 Code Autolearn icon.[1] See the DL.CODE User's Manual for details.
12. For each code symbology set the relative parameters according to your application.

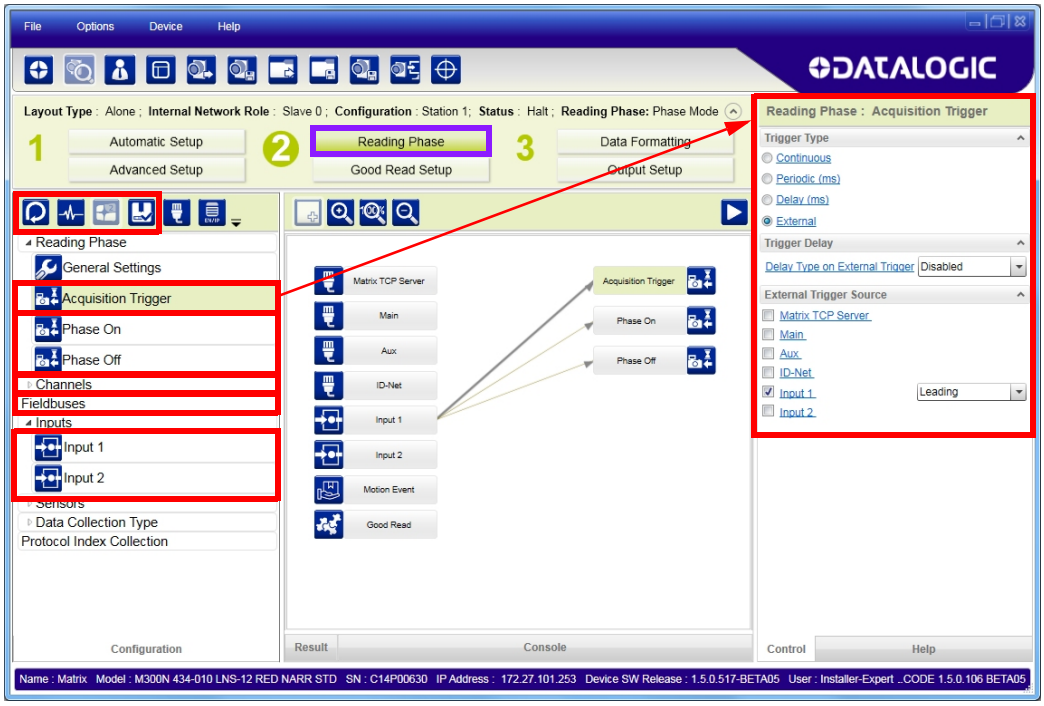
NOTE

Continue the configuration with the "Reading Phase" on page 30.

1. *The Code Autolearn procedure will not recognize the following symbologies: Pharmacode, MSI, Standard 2 of 5, Matrix 2 of 5.*

Reading Phase

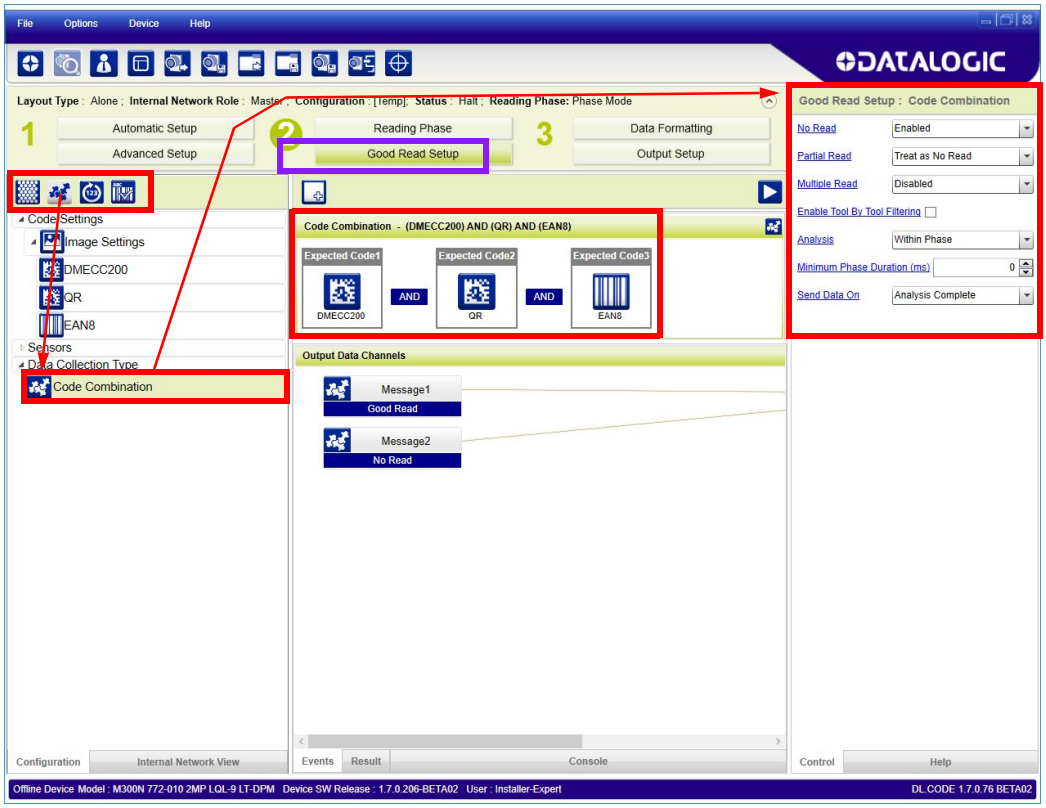
1. Select your application specific Operating Mode from the icons over the Configuration Parameters tree area: Continuous, One Shot, Phase Mode or PackTrack.



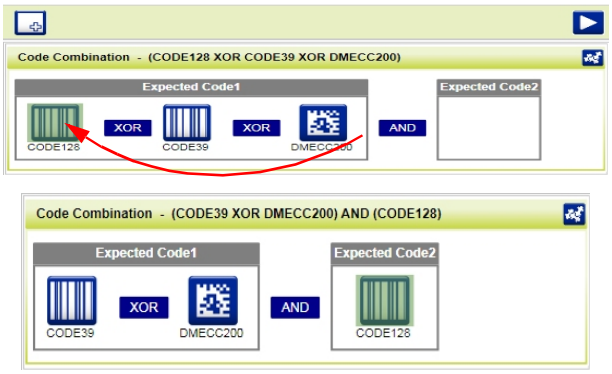
2. Configure the relative Operating Mode parameters from the Reading Phase parameters panel. Different groups will appear in the panel depending on the selected icons over the Configuration Parameters tree area.

Good Read Setup

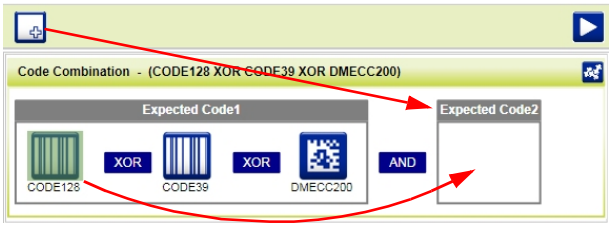
1. Select your specific data collection type from the icons over the Configuration Parameters tree area: Code Collection, Code Combination, Presentation or Match Code. Not all data collection types are available for all Operating Modes; for example PackTrack Operating Mode only supports Code Combination. 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 of 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.

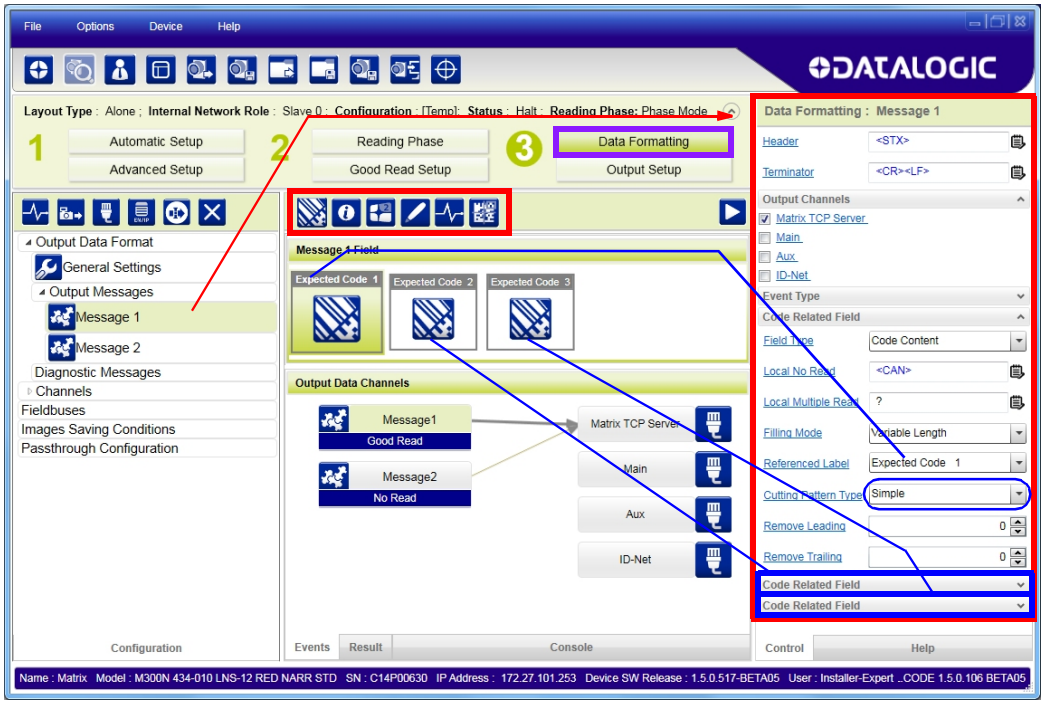


To create a logical AND condition from a logical XOR, create a new Expected Code box using the Add icon. Then drag the desired code icon from one box to the other.



Data Formatting

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

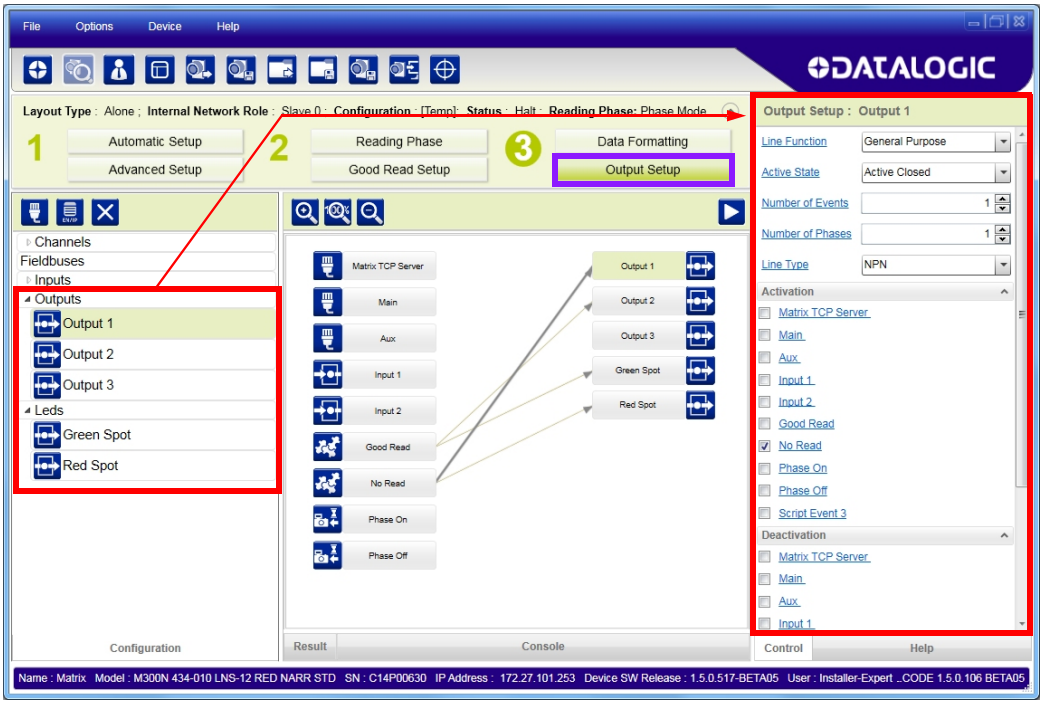


You can add fields to the output message by clicking on the icons above the Message Field area. They will be appended to the message. You can drag them to position them between other fields in the message so that the output message is ordered according to your application requirements.

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

Output Setup

1. Configure your application specific Digital Output(s) and Green/Red Spots (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.

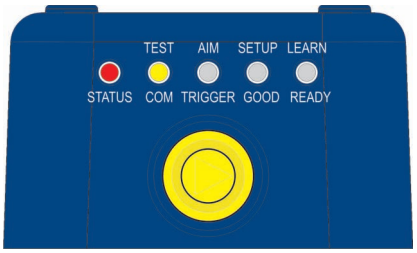


Figure 13 - X-PRESS Interface: Test Function

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:

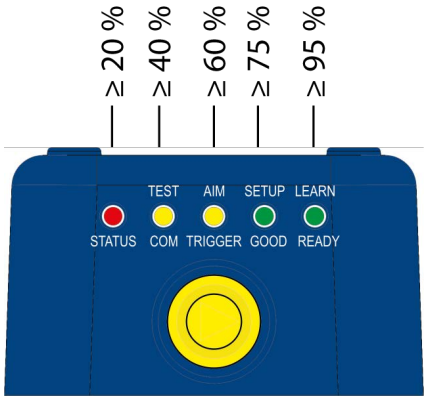


Figure 14 - Test Function Bar Graph

In case of No Read condition, only the STATUS LED 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.

CHAPTER 2
INTRODUCTION

PRODUCT DESCRIPTION

Matrix 300N 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 300N uses imaging technology and provides complete reading system functions by integrating image capturing, decoding and communicating in a single compact and versatile product.

Matrix 300N features excellent reading and verifying performance thanks to its smart proprietary decoding libraries and powerful sensor. In particular, the device comes in models with two different sensors: 1.3 megapixels and 2 megapixels.

Innovative X-PRESS interface, combined with illuminator laser pointers for aiming, auto-focus and a Good Read Spot, enhance the ease of setup and use.

Rugged construction, IP65 and IP67 protection, and max. 50°C operative temperature make the Matrix 300N the ideal product for industrial applications.

Matrix 300N has been developed for use in numerous industries like:

Automotive

- Parts and Assemblies Traceability
- DPM (Direct Part Marked) Code Grading and Trending[1]
- Tires Sorting

Electronics

- Parts Traceability and Control
- High Resolution Code Reading
- WIP Control and Tracking
- DPM (Direct Part Marked) Code Grading and Trending[1]

1. The code grading function evaluates the printing quality of the standard-compliant 2D codes in the scanned images. This feature does not take into consideration external environmental lighting parameters, therefore it cannot be equated with the official 2D code verification function.

Distribution & Retail Industry

- Presentation Scanner
- Small Objects Tracking & Sorting
- Warehouse applications

Medical & Pharmaceutical

- Medical Devices Traceability
- Pharmaceutical and Medicine Manufacturing
- Chemical & Biomedical Analysis

Food & Beverage

- Work in Progress Traceability
- Code Quality Control

Intralogistics

- Carton reading
- Reusable Totes Traceability
- Automated Warehouse
- Automatic Picking Process Control

Packaging

- Label Print & Check
- Secondary Packaging Traceability
- End of Line Palletizing

This technology intrinsically provides omni-directional reading.

Standard Application Program

A Standard Application Program is factory-loaded onto Matrix 300N. 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 or mini-DVD accessory).

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

Quick, automatic 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

- 1.3 MP or 2 MP sensor
- Powerful Internal Lighting Systems
- Outstanding decoding capability on 1D, 2D, Stacked, Postal symbologies
- Excellent performance on DPM applications
- Omni-directional reading
- Frame Rate up to 45 frames/sec
- Image Cropping for higher frame rate (up to 60 frames/sec)

Ease of Setup and Use

- Quick installation without PC by using X-PRESS interface for easy and intuitive setup
- LED pointers for aiming
- Automatic Imager calibration and Code Settings
- Visual Feedback 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)
- Smart Fast Bracket
- X-PRESS interface LEDs provide operational and performance feedback
- Green Spot and beeper for immediate Good Read feedback
- 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

- Electronic focus adjustment and dynamic focus through software controlled Liquid Lens models
- Multi LED-Chains illuminator with diffuser for DPM applications
- High-power polarized illuminator for reflecting surfaces
- Continuous High Power Mode (CHPM) to eliminate the flickering effect
- Compact dimensions and rotating, sealed M12 connectors for easy integration/ installation in tight space
- Complete set of Accessories like mounting brackets, connection boxes, cables and photocells

Industrial Connectivity

- 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 and Modbus TCP protocols
- 3 serial communication interfaces (Main, Auxiliary, ID-NET)
- 2 General purpose optocoupled Inputs
- 3 General purpose optocoupled Outputs (when using the CBX connection box)

Versatility

- Excellent reading performance on Direct Part Marked (DPM) symbols
- Code Quality Metrics reporting according to ISO/IEC 16022, ISO/IEC 18004, ISO/IEC 15416 and AIM DPM standards
- Match Code option with a user-defined match code database

Industrial Strength

- Rugged metal construction
- IP65 and IP67 protection class
- 45 °C max operating temperature
- Supply voltage ranges from 10 to 30 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, lens and protective cover, the mechanical dimensions are 95 x 54 x 43 mm and it weighs about 238 g, except for 2 MP Liquid Lens models: these are 1.5 mm higher because they also feature an aluminum painted cover, which provides a great level of thermal dissipation.

Electrical connection of Power, Host interfaces and I/O signals is provided through an M12 (IP67) 17-pin connector (Figure A, 8). A standard M12 D-Coded (IP67) Ethernet connector is also present (Figure A, 9).

INDICATOR AND KEYPAD BUTTON

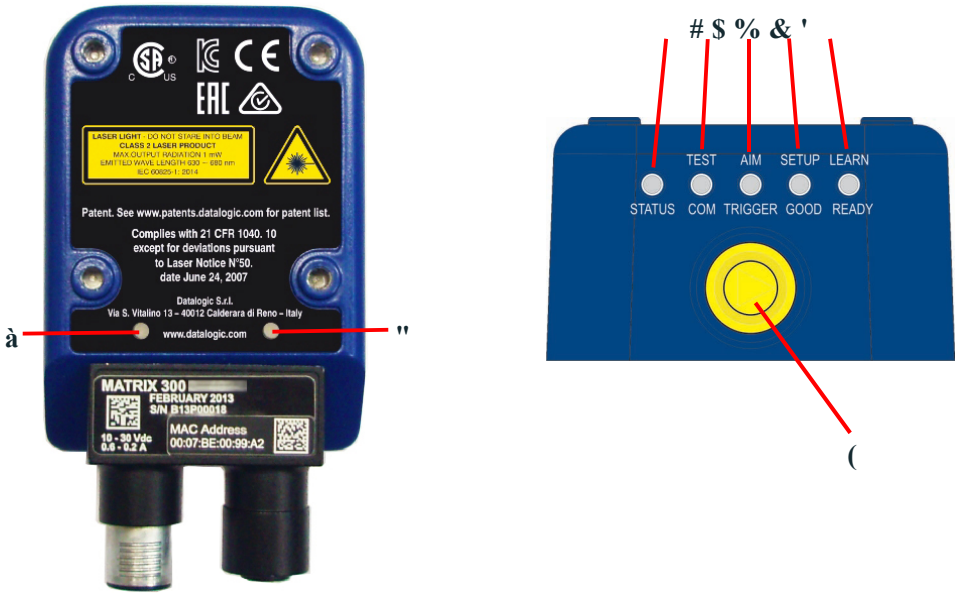


Figure 15 - Indicators

The following LED indicators are located on the reader:

PWR	blue LED indicates that the reader is connected to the power supply (Figure 15, 1)
NET	yellow LED indicates connection to the on-board Ethernet network (Figure 15, 2)

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

STATUS	red LED indicates a NO READ result (Figure 15, 3)
COM	yellow LED indicates active communication on the main serial port * (Figure 15, 4)
TRIGGER	yellow LED indicates the status of the reading phase (Figure 15, 5)
GOOD	green LED confirms successful reading (Figure 15, 6)
READY	green LED indicates that the reader is ready to operate (Figure 15, 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.

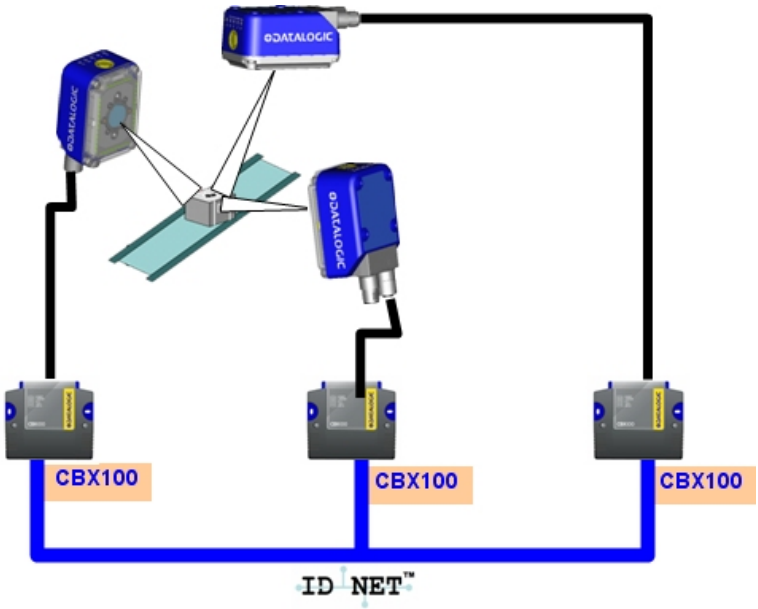
The keypad button (Figure 15, 8), is software programmable. By default it starts the X-PRESS interface for quick installation without using a PC (see "Step 4 - X-PRESS Configuration" on page 6).

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

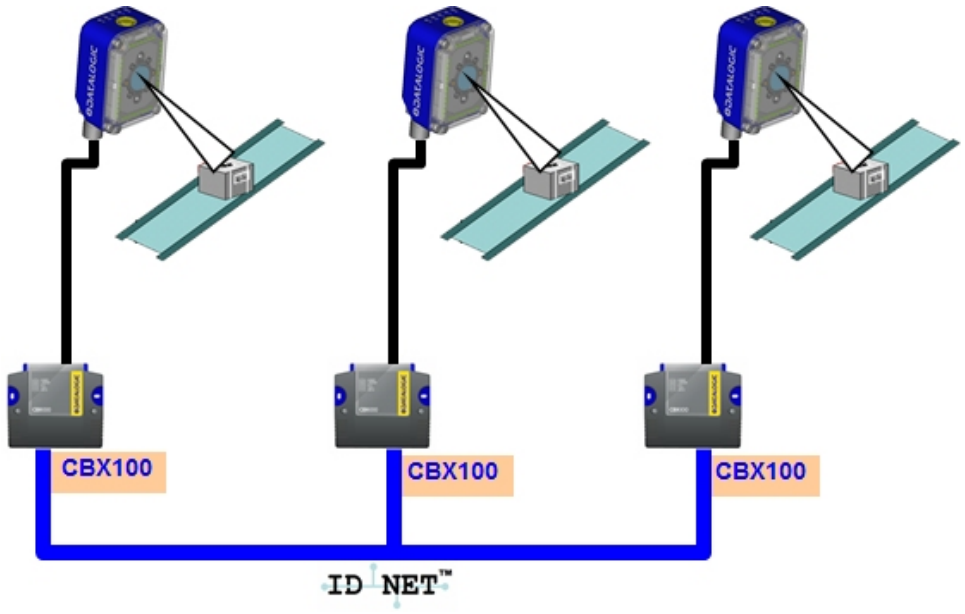


ID-NET interface allows local connection of multiple readers reading different sides of the same target. All readers share a single presence sensor and activate/deactivate simultaneously.

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 67 for connection details and "Internal Network Configurations" on page 156 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.

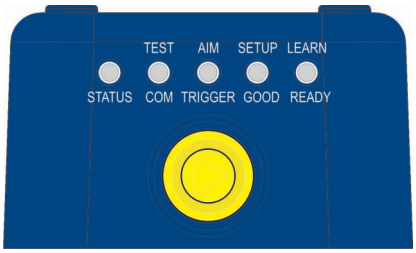
See "ID-NET Interface" on page 67 for connection details and "Internal Network Configurations" on page 156 for configuration details.

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:

- Test with bar graph visualization to check static reading performance
- Aim/Autofocus to turn on the LED pointers to aid positioning and focusing
- Setup to perform Exposure Time and Gain calibration
- Learn to self-detect and auto-configure for reading unknown codes



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 (Test, Aim, Setup or Learn).
3. **Release** the button to enter the specific function.

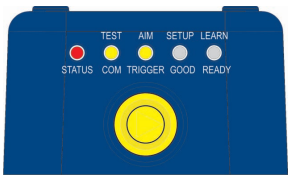
Once button is pressed, the cycle of LEDs activation is as follows:



Release button to exit →



Release button to enter Test Mode →



Release button to enter Aim/Autofocus Mode →



Release button to enter Setup Mode →



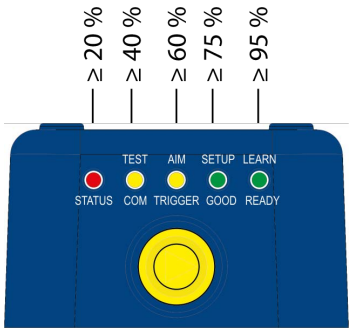
Release button to enter Learn Mode →



Release button to Exit → (cycle)

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 (red) is on and blinks.

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

NOTE

By default, the Test exits automatically after three minutes.

Aim/Autofocus

This function causes the laser pointers to turn on. Since the laser pointers are centered on the FOV they can be used to position the imager on the code. The Aim LED blinks to indicate this state. After a short delay, this function also performs the Autofocus procedure for Liquid Lens models.

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 pointers turn off.

Setup

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

The Setup 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 Setup LED will stop blinking and Matrix 300N emits 3 high pitched beeps.

If the calibration cannot be reached after a timeout of about 5 (five) seconds, Matrix 300N will exit without saving the parameters to memory, the Setup LED will stop blinking and in this case Matrix 300N emits a long low pitched beep.

Learn

Once entered, the imager starts a procedure to automatically detect and recognize **a single code** which is presented to it. Successive Learns will substitute the current code.

The Learn LED will blink until the procedure is completed.

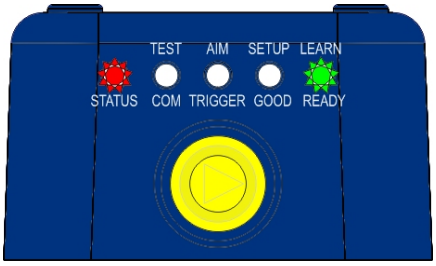
The Learn procedure ends when the Image Processing and Decoding parameters are successfully saved in the reader memory, the Green Spot is activated, the Learn LED will stop blinking and Matrix 300N emits 3 high pitched beeps.

If the autolearning cannot be reached after a timeout of about 3 (three) minutes, Matrix 300N will exit without saving the parameters to memory, the Learn LED will stop blinking and in this case Matrix 300N emits a long low pitched beep.

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

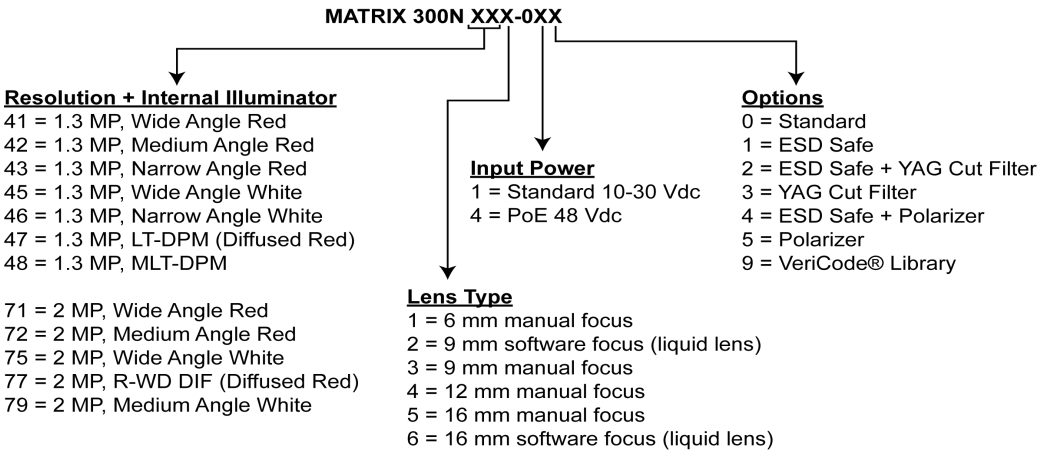
Diagnostic Indication

The “STATUS” (red) and “READY” (green) LED 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 300N 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 the Models tab on the Product page of the website.



Lighting System Notes

The following table shows the Matrix 300N lens/illuminator combinations. For more information see the Application Note on illuminator selection on the DL.CODE mini-DVD (downloaded .zip file or mini-DVD accessory).

Matrix 300N Models		Internal Illuminators	
Model	Lens Type	LEDs	Type
Matrix 300N 411-0xx Matrix 300N 481-0xx	6 mm Manual Focus	8 24/39	Red Wide Angle Red/Blue Bright/Dark Field DPM (sw configurable sectors)
Matrix 300N 412-0xx Matrix 300N 452-0xx Matrix 300N 472-0xx Matrix 300N 482-0xx Matrix 300N 712-0xx Matrix 300N 752-0xx Matrix 300N 772-0xx	9 mm Software Focus (Liquid Lens)	8 8 24/26 24/39 10 10 24/26	Red Wide Angle White Wide Angle Red Bright Field DPM (sw configurable sectors) Red/Blue Bright/Dark Field DPM (sw configurable sectors) Red Wide Angle White Wide Angle Red Bright Field DPM (sw configurable sectors)
Matrix 300N 423-0xx Matrix 300N 453-0xx Matrix 300N 473-0xx Matrix 300N 483-0xx	9 mm Manual Focus	8 8 24/26 24/39	Red Medium Angle White Wide Angle Red Bright Field DPM (sw configurable sectors) Red/Blue Bright/Dark Field DPM (sw configurable sectors)
Matrix 300N 434-0xx Matrix 300N 464-0xx	12 mm Manual Focus	8 8	Red Narrow Angle White Narrow Angle
Matrix 300N 435-0xx Matrix 300N 465-0xx	16 mm Manual Focus	8 8	Red Narrow Angle White Narrow Angle
Matrix 300N 716-0xx Matrix 300N 726-0xx Matrix 300N 776-0xx Matrix 300N 796-0xx	16 mm Software Focus (Liquid Lens)	10 10 24/26 10	Red Wide Angle Red Medium Angle Red Bright Field DPM (sw configurable sectors) White Medium Angle

AVAILABLE MODELS

Part Number	Description
937600050	MATRIX 300N 412-010 LQL-9 RED WIDE STD
937600051	MATRIX 300N 452-010 LQL-9 WHT WIDE STD
937600052	MATRIX 300N 472-010 LQL-9 LT-DPM STD
937600053	MATRIX 300N 482-010 LQL-9 MLT-DPM STD
937600054	MATRIX 300N 412-011 LQL-9 RED WIDE ESD
937600055	MATRIX 300N 452-011 LQL-9 WHT WIDE ESD
937600056	MATRIX 300N 472-011 LQL-9 LT-DPM ESD
937600057	MATRIX 300N 482-011 LQL-9 MLT-DPM ESD
937600058	MATRIX 300N 412-012 LQL-9 RED WIDE ESYF
937600059	MATRIX 300N 452-012 LQL-9 WHT WIDE ESYF
937600060	MATRIX 300N 472-012 LQL-9 LT-DPM ESYF
937600061	MATRIX 300N 482-012 LQL-9 MLT-DPM ESYF
937600062	MATRIX 300N 412-040 LQL-9 RED WIDE POE
937600063	MATRIX 300N 452-040 LQL-9 WHT WIDE POE
937600064	MATRIX 300N 472-040 LQL-9 LT-DPM POE
937600065	MATRIX 300N 482-040 LQL-9 MLT-DPM POE
937600066	MATRIX 300N 472-041 LQL-9 LT-DPM POE ESD
937600067	MATRIX 300N 482-041 LQL-9 MLT-DPM POE ES
937600068	MATRIX 300N 472-042 LQL-9 LT-DPM POE EY
937600070	MATRIX 300N 411-010 LNS-6 RED WIDE STD
937600071	MATRIX 300N 481-010 LNS-6 MLT-DPM STD
937600072	MATRIX 300N 411-011 LNS-6 RED WIDE ESD
937600073	MATRIX 300N 481-011 LNS-6 MLT-DPM ESD
937600074	MATRIX 300N 411-012 LNS-6 RED WIDE ESYF
937600075	MATRIX 300N 481-012 LNS-6 MLT-DPM ESYF
937600080	MATRIX 300N 435-010 LNS-16 RED NARR STD
937600081	MATRIX 300N 465-010 LNS-16 WHT NARR STD
937600082	MATRIX 300N 435-040 LNS-16 RED NARR POE
937600084	MATRIX 300N 423-010 LNS-9 RED MED STD
937600085	MATRIX 300N 453-010 LNS-9 WHT WIDE STD
937600086	MATRIX 300N 423-040 LNS-9 RED MED POE
937600088	MATRIX 300N 434-010 LNS-12 RED NARR STD

Part Number	Description
937600089	MATRIX 300N 464-010 LNS-12 WHT NARR STD
937600090	MATRIX 300N 434-040 LNS-12 RED NARR POE
937600092	MATRIX 300N 473-010 LNS-9 LT-DPM STD
937600093	MATRIX 300N 483-010 LNS-9 MLT-DPM STD
937600094	MATRIX 300N 473-011 LNS-9 LT-DPM ESD
937600095	MATRIX 300N 483-011 LNS-9 MLT-DPM ESD
937600096	MATRIX 300N 473-012 LNS-9 LT-DPM ESYF
937600097	MATRIX 300N 465-013 LNS-16 WHT NARR YF
937600098	MATRIX 300N 483-013 LNS-9 MLT-DPM YF
937600101	MATRIX 300N 412-014 LQL-9 RED WD ESD+PLZ
937600102	MATRIX 300N 452-014 LQL-9 WHT WD ESD+PLZ
937600103	MATRIX 300N 412-015 LQL-9 RED WD STD+PLZ
937600104	MATRIX 300N 452-015 LQL-9 WHT WD STD+PLZ
937600105	MATRIX 300N 413-015 LNS-9 RED WD STD+PLZ
937600106	MATRIX 300N 453-015 LNS-9 WHT WD STD+PLZ
937600167	MATRIX 300N 712-010 2MP LQL-9 R-WD STD
937600171	MATRIX 300N 712-015 2MP LQL-9 R-WD PLZ
937600172	MATRIX 300N 752-010 2MP LQL-9 W-WD STD
937600173	MATRIX 300N 772-010 2MP LQL-9 R-WD DIF
937600177	MATRIX 300N 726-010 2MP LQL-16 R-MD STD
937600182	MATRIX 300N 796-010 2MP LQL-16 W-MD STD
937600183	MATRIX 300N 776-010 2MP LQL-16 R-WD DIF

ACCESSORIES

The following accessories can be used with the Matrix 300N reader.

Accessory	Description	Order No.
Cables		
CAB-DS01-S	M12-IP67 Cable To CBX or QL (1M)	93A050058
CAB-DS03-S	M12-IP67 Cable To CBX or QL (3M)	93A050059
CAB-DS05-S	M12-IP67 Cable To CBX or QL (5M)	93A050060
CAB-ETH-M01	M12-IP67 Ethernet Cable (1M)	93A051346
CAB-ETH-M03	M12-IP67 Ethernet Cable (3M)	93A051347
CAB-ETH-M05	M12-IP67 Ethernet Cable (5M)	93A051348

Accessory	Description	Order No.
CBL-1534.02	Adapter Cable Ethernet M12 to RJ45	93A050057
CBL-1480-01	Thin M12/5P Male/Female (1M)	93A050049
CBL-1480-02	Thin M12/5P Male/Female (2M)	93A050050
CBL-1490	Term. Resist. Thin M12/5P/Male	93A050046
CBL-1496	Term. Resist. Thin M12/5P/Female	93A050047
Connectivity		
CBX100	Compact Connection Box	93A301067
CBX500	Modular Connection Box	93A301068
BM100	Backup Module for CBX100/500	93ACC1808
BM150	Display Module for CBX500	93ACC1809
Various Fieldbus Host Interface Modules and All-In-One Connection Box Kits are available		
BA100	DIN Rail Adapters	93ACC1821
BA200	Bosch and 80/20 Profile Adapters	93ACC1822
Various M12 Panel Connectors for CBX Connection Boxes are available		
BA900	Two Cable Glands Panel	93ACC1847
QL100	Quick Link Slave ID-NET T-Connector	93ACC1860
QL150	Quick Link Slave ID-NET + Service T-Connector	93ACC1868
QL200	Quick Link Slave ID-NET + Power T-Connector	93ACC1861
QL300	Quick Link Master ID-NET - Serial Host Connector	93ACC1862
QLM500	Quick Link Metal Master ID-NET - EthernNet/IP Gateway	93ACC0037
QLM600	Quick Link Metal Master ID-NET - Profibus Gateway	93ACC0033
QLM700	Quick Link Metal Master ID-NET - Profinet I/O Gateway	93ACC0038
Various M12 Service Cables and Field Mount Connectors are available for Quick Link Series Connectors		
Power Supplies		
PG6002	AC/DC Power Supply Unit (US)	93ACC1718
PG6001	AC/DC Power Supply Unit (UK)	93ACC1719
PG6000	AC/DC Power Supply Unit (EU)	93ACC1720
Sensors		
MEP-593	Photocell Kit PNP (PH-1)	93ACC1791
MEP-543	Photocell Kit-NPN	93ACC1728
S3Z-PR-5-C11-PL	Diffuse Proximity Sensor	95B010011
Bracket		
BK-30-010	Fixing Bracket Kit	93ACC0201

APPLICATION EXAMPLES

Document Handling

Matrix 300N is profitably used in the omnidirectional reading of 2D, stacked, linear and postal codes, for example in automated document handling and mail processing systems (see Figure 16).



Figure 16 - Address Coded in Data Matrix Symbology for Automated Mail Processing

Deformed or Overprinted Code Reading

Matrix 300N assures the reading of deformed and/or overprinted codes, even though damaged or printed on high reflective surfaces (see Figure 17, Figure 18, and Figure 19).



Figure 17 - Unidose Flow-Pack with PDF417 Code



Figure 18 - Overprinted Barcode Readable by Matrix 300N also Through the Envelope Window Film



Figure 19 - Barcode Printed on Curved Surface Readable by Matrix 300N in spite of Image Optical Distortion

Direct Part Marking

Matrix 300N is also very powerful in reading low-contrast direct part marked codes (see Figure 20, Figure 21, and Figure 22).



Figure 20 - Dot Matrix Code Directly Marked on Metal Surface by Using Dot Peening Technology

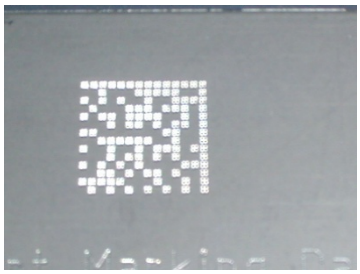


Figure 21 - Dot Peening Marking on Metal Surface with Multi-dot per Code Element

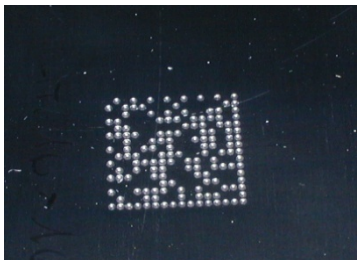


Figure 22 - Directly Marked Dot Matrix Code Characterized by Outstanding Separation Distance between Adjacent Code Elements

Ink-Jet Printing Technology

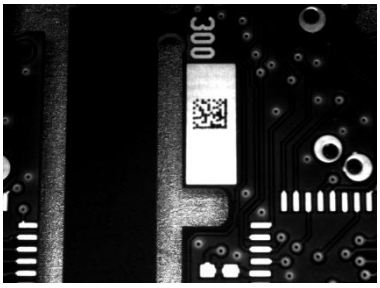


Figure 23 - Dot Matrix Code Directly Marked on PCB Copper Pad by Using Ink-Jet Technology

Laser Marking/Etching Technology

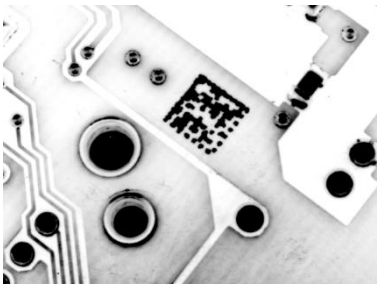


Figure 24 - Data Matrix Code Directly Marked on PCB Surface by Using Laser Etching Technology

CAUTION

If application codes must be read which are produced by Laser Marking in real time, use Matrix 300N models incorporating YAG Filters in order to avoid burning the CMOS sensor.

CHAPTER 3
INSTALLATION

PACKAGE CONTENTS

Verify that the Matrix 300N reader and all the parts supplied with the equipment are present and intact when opening the packaging; the list of parts includes:

- Matrix 300N reader
- Quick Reference Guide
- Test Charts (2)
- Mounting Kit
- Mounting Screws (4+2)
- Washers (2)
- Mounting Brackets (2)

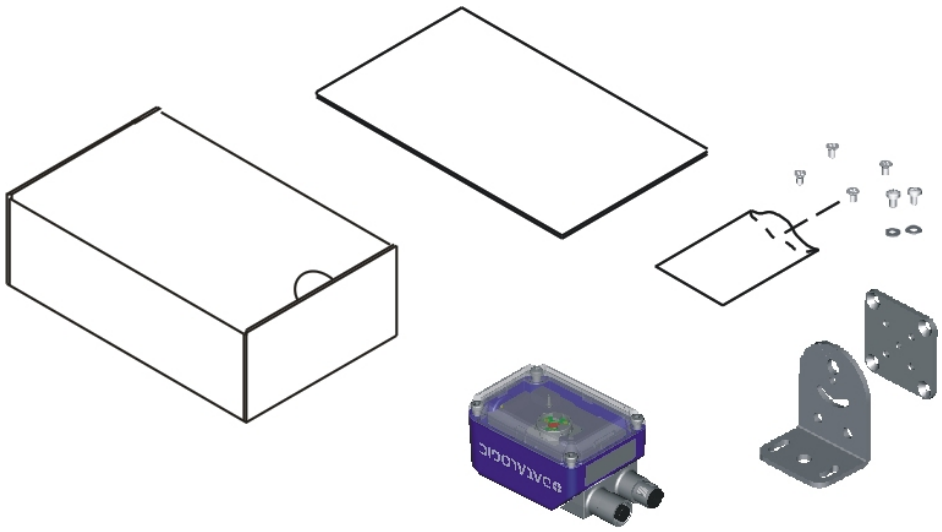


Figure 25 - Package Contents

MECHANICAL DIMENSIONS

Matrix 300N can be installed to operate in different positions. The two screw holes (M4 x 5) on the body of the reader are for mechanical fixture (Figure 26).

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

Refer to page 57 for various mounting solutions and correct positioning, and Chapter 6, Reading Features for FOV vs. Reading Distance considerations.

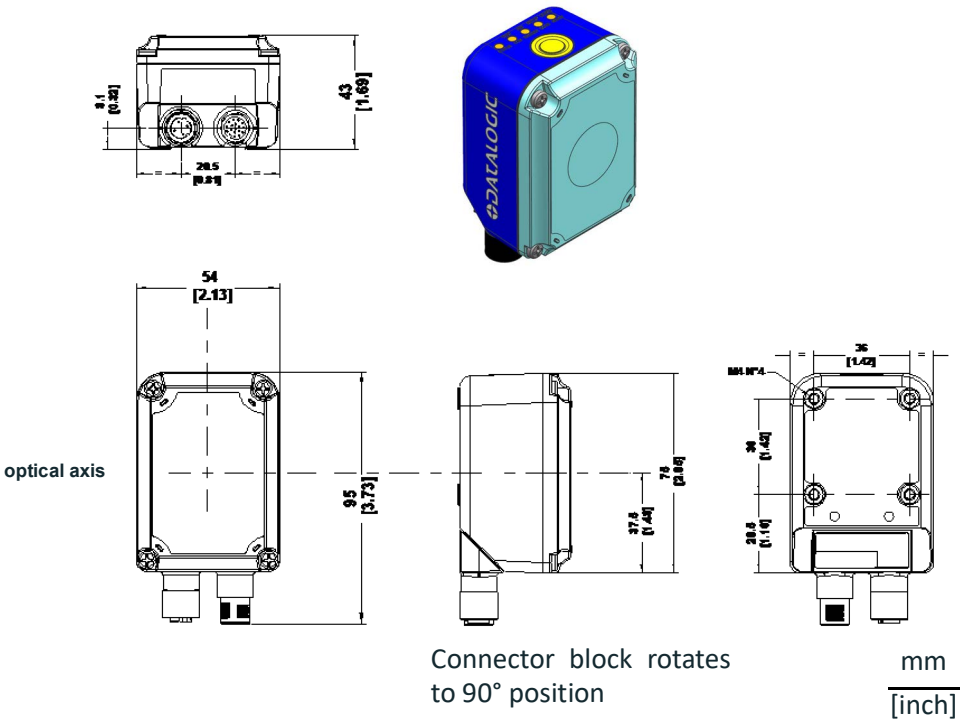


Figure 26 - Overall Dimensions Matrix 300N 1.3 MP and 2 MP DPM with Connector at 0°

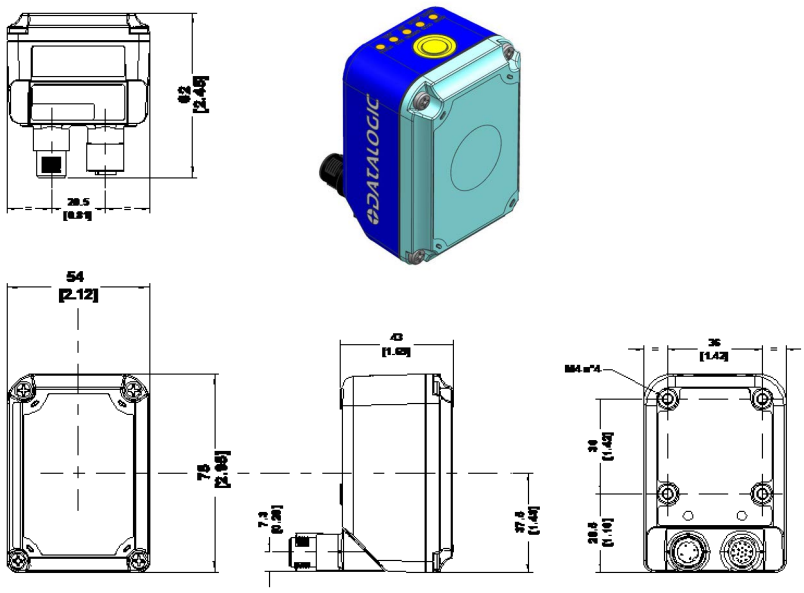


Figure 27 - Overall Dimensions Matrix 300N 1.3 MP and 2 MP DPM with Connector at 90°

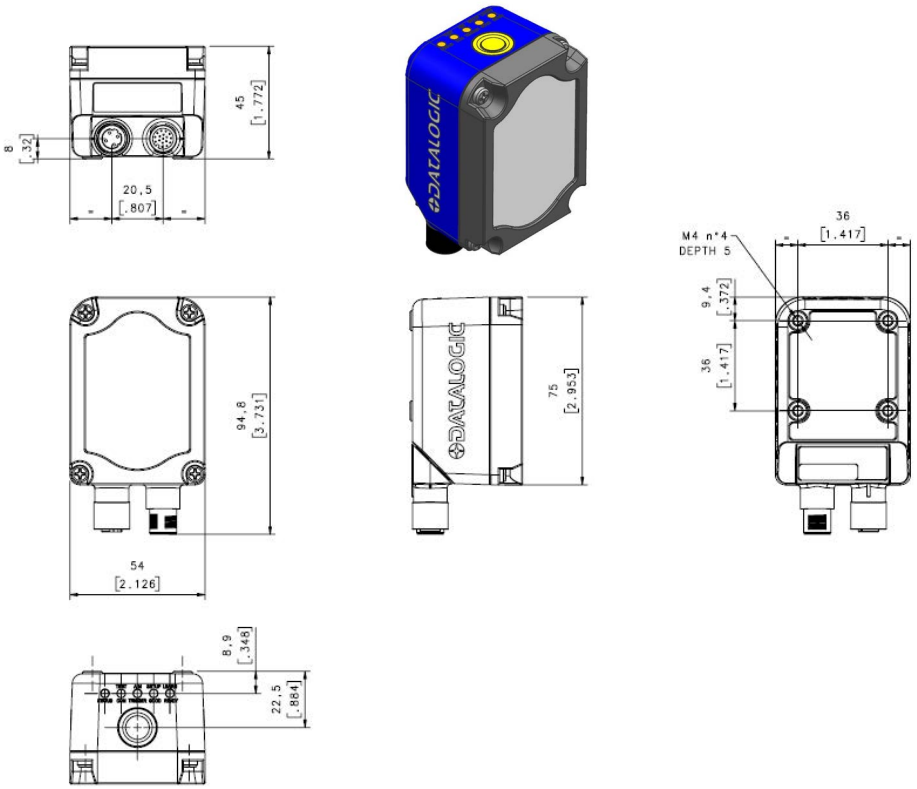


Figure 28 - Overall Dimensions Matrix 300N 2 MP (no DPM) with Connector at 0°

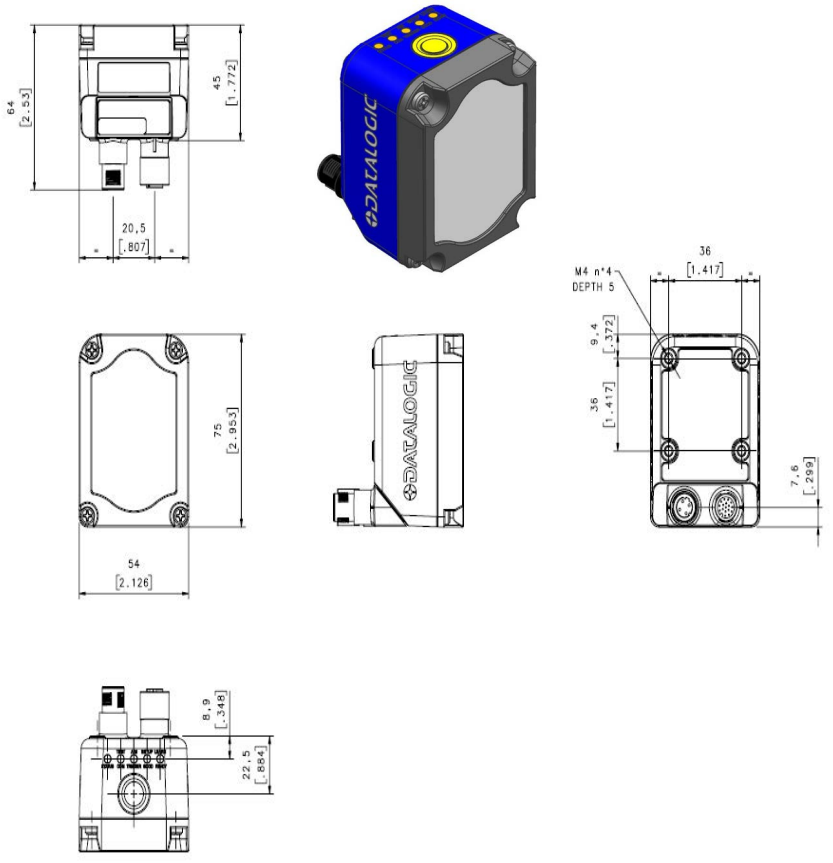


Figure 29 - Overall Dimensions Matrix 300N 2 MP (no DPM) with Connector at 90°

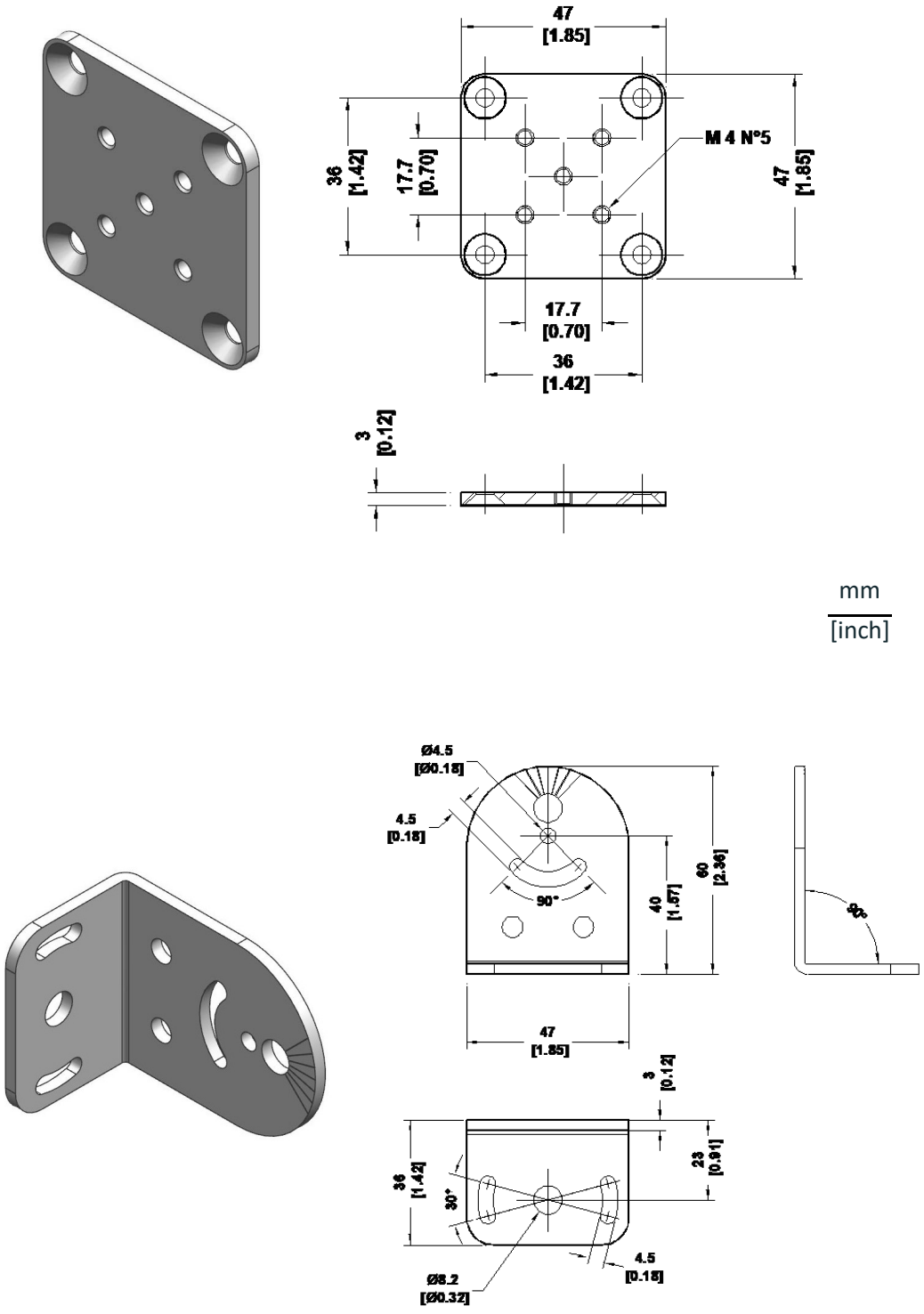


Figure 30 - Mounting Bracket Overall Dimensions

MOUNTING AND POSITIONING MATRIX 300N

Using the Matrix 300N mounting brackets you can obtain rotation on the various axes of the reader as shown in the diagram below:

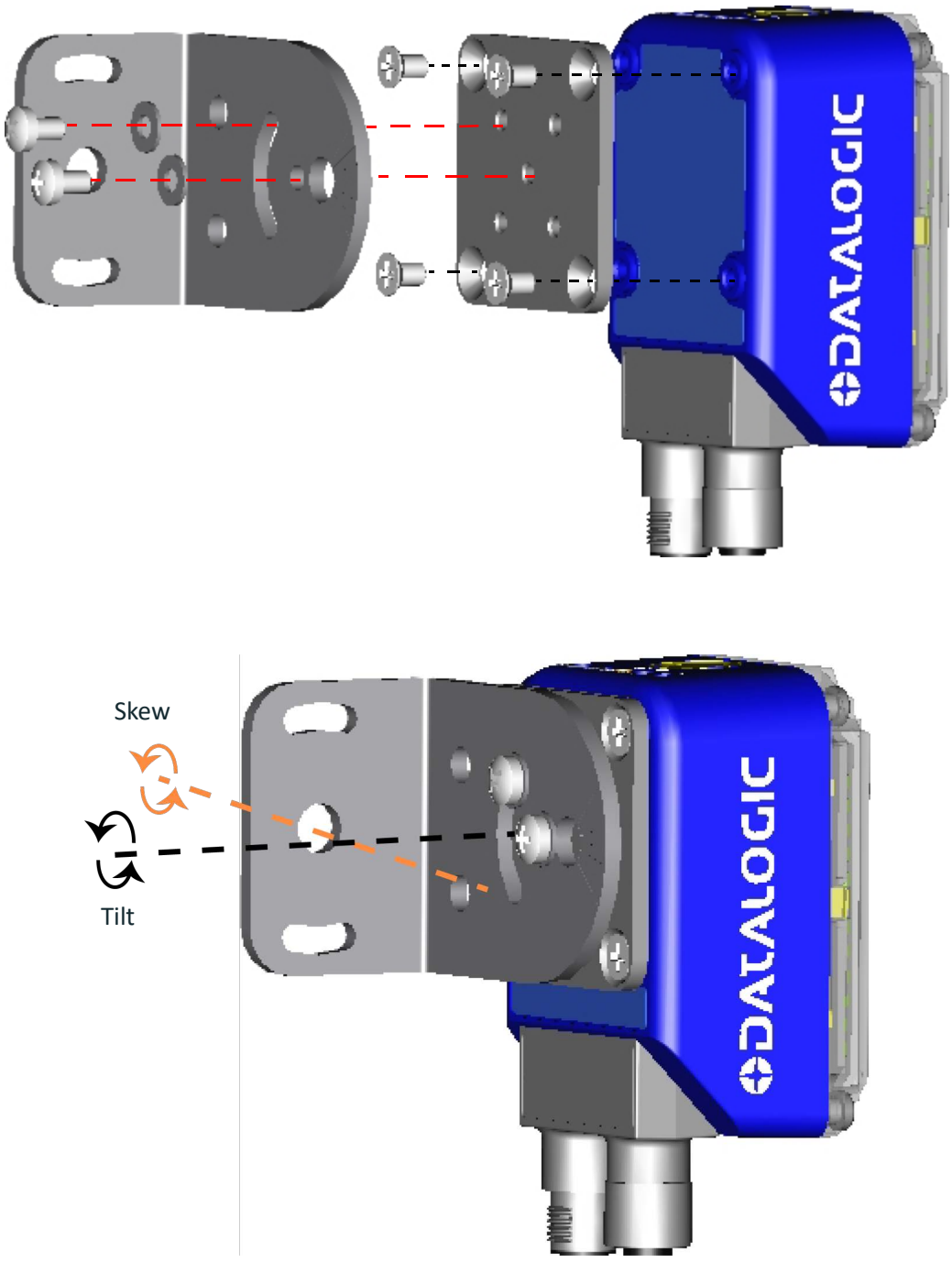


Figure 31 - Positioning with Mounting Bracket

Matrix 300N is able to decode code labels at a variety of angles. However, significant angular distortion may degrade reading performance.

When mounting Matrix 300N, take into consideration these **ideal** label position angles: **Pitch or Skew 10° to 20° and Tilt 0°**.

NOTE

Since Matrix 300N 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.

Note: Since Matrix 300N 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 32. 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 300N reader; it is advised to **assure at least 10°** for the Skew angle.

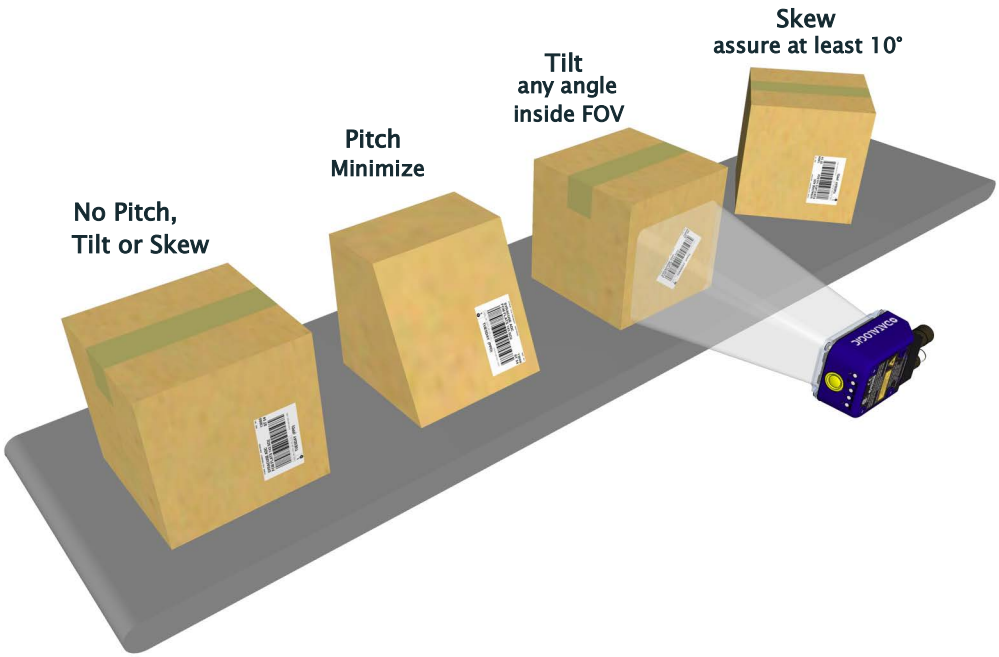


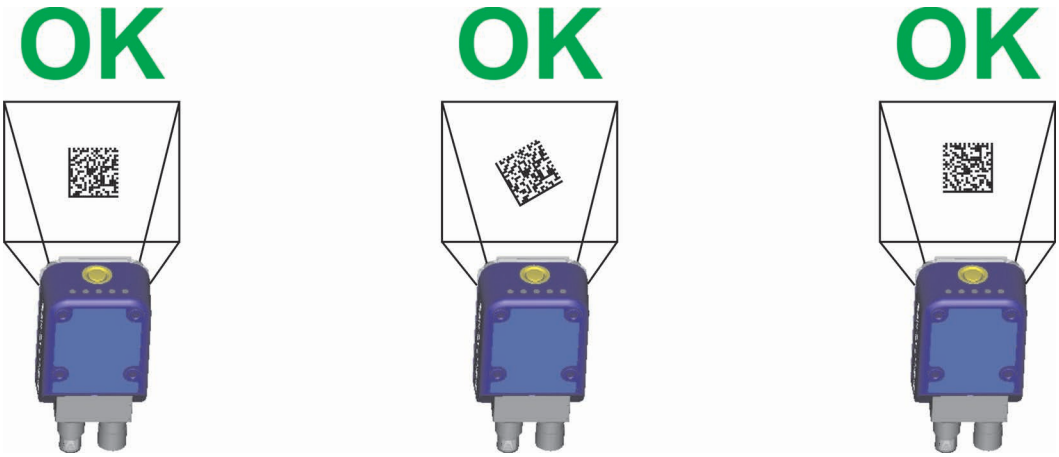
Figure 32 - Code Reading Orientation

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 33. Matrix 300N can read labels with any tilt angle. However, since linear barcodes are rectangular, keep in mind that the reader should be aligned to fit them into the horizontal FOV.



Linear Barcode Reading



2D Code Reading

Figure 33 - Tilt Angle Considerations

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

CHAPTER 4
CBX ELECTRICAL CONNECTIONS

All Matrix 300N Standard Input Power models can be connected to a CBX connection box through one of the available **CAB-DSxx-S** accessory cables. These accessory cables terminate in an M12 17-pin connector on the Matrix 300N 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 outputs (Outputs 1 and 2), 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**.**

The table below gives the pinout of the CBX100/500 terminal block connectors. Use this pinout when the Matrix 300N 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

Group	Label	Description
Outputs	+V	Power Source - Outputs
	-V	Power Reference - Outputs
	O1+	Output 1 + opto-isolated and polarity sensitive
	O1-	Output 1 - opto-isolated and polarity sensitive
	O2+	Output 2 + opto-isolated and polarity sensitive
	O2-	Output 2 - opto-isolated and polarity sensitive
	O3A	Output 3 - non opto-isolated (only available through CBX500)
Auxiliary Interface	TX	Transmit Data
	RX	Receive Data
	SGND	Auxiliary Interface Signal Ground
ID-NET	REF	Network Reference
	ID+	ID-NET network data +
	ID-	ID-NET network data -
	Shield	Network Cable Shield
Main Interface		
RS232	TX	
	RX	
	-	
	-	
	SGND	
RS422 Full Duplex	TX+	
	*RX+	
	TX-	
	*RX-	
	SGND	

* Do not leave floating, see "RS422 Full Duplex Interface" on page 66 for connection details.



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.

POWER SUPPLY

Power requirements and conditions depend on the Matrix 300N model: Standard or PoE (Power over Ethernet).

Standard Models

For these models power can be supplied to the reader through the CBX100/500 spring clamp terminal pins as shown in Figure 34:

Power Supply

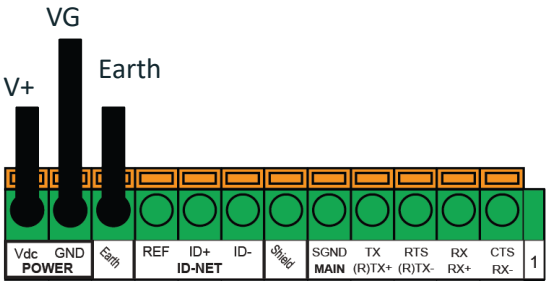


Figure 34 - Power Supply Connections

The power must be between 10 and 30 Vdc only.

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.

Power Over Ethernet (PoE) Models

The Ethernet pinout is as follows:



Figure 35 - M12 D-Coded Female Ethernet Nerwork Connector

Pin	Name	Description
1	TX+/DC-	Transmit data (+) DC power (-)
2	RX+/DC+	Received data (+) DC power (+)
3	TX-/DC-	Transmitted data (-) DC power (-)
4	RX-/DC+	Receive data (-) DC power (+)

CAUTION

Matrix 300N PoE models only accept Alternative A (power over RJ45 pins 1, 2, 3, 6), Class 0 power levels. Use an Endspan or Midspan PSE device that supports this configuration (i.e. PoE switch or Power over Ethernet Adapter).

Alternative B (power over RJ45 pins 4, 5, 7, 8) using an Endspan or Mid-span PSE device is not supported.

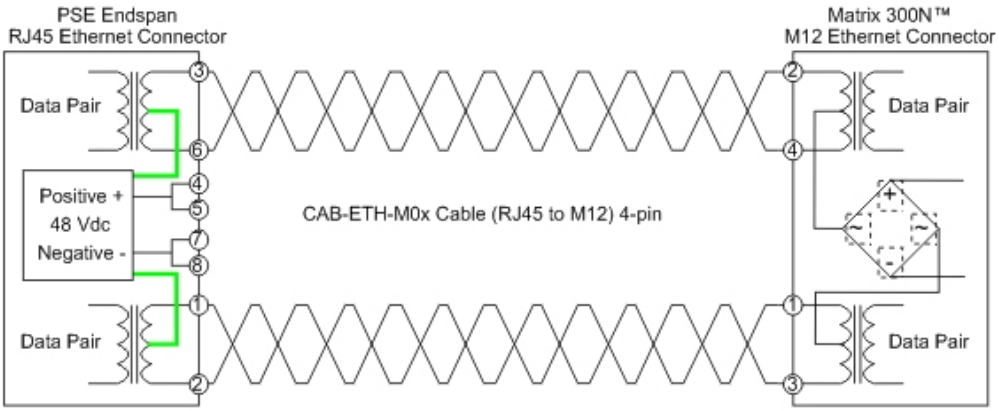


Figure 36 - Matrix 300N PoE PSE Endspan Alternative A Connections OK

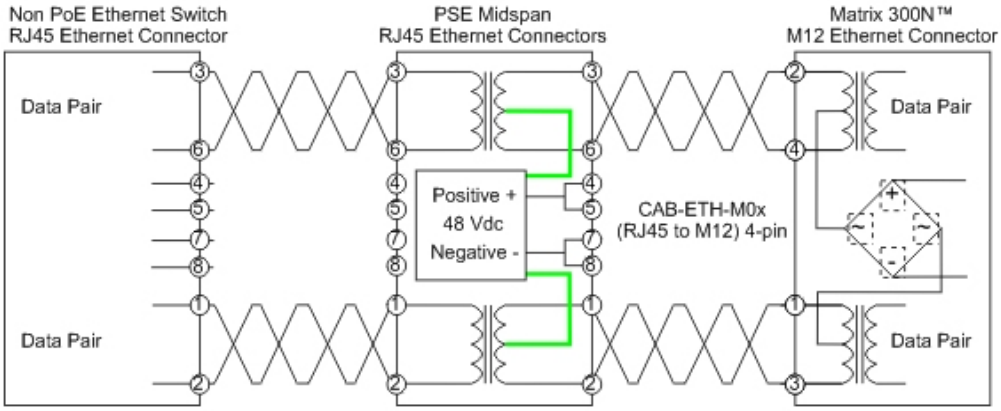


Figure 37 - Matrix 300N PoE PSE Midspan Alternative A Connections OK



Figure 38 - Matrix 300N PoE PSE Endspan Alternative B Connections NOT SUPPORTED

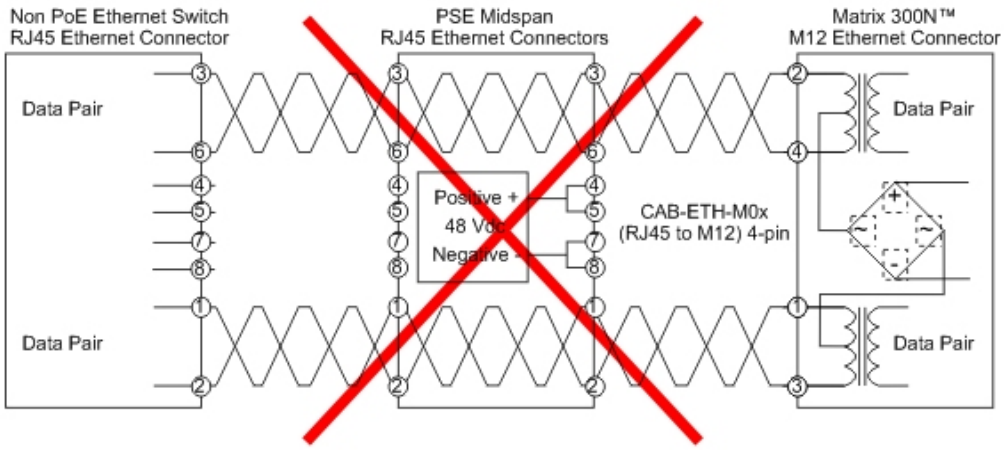


Figure 39 - Matrix 300N PoE PSE Midspan Alternative B Connections NOT SUPPORTED

CAUTION

For Matrix 300N PoE models, the internal Digital Output circuitry is not powered and supply power is not available to any Input/Output devices (Vdc=0). Only input device signals can be accepted directly on the M12 17-pin connector without power.

For these models, if it is necessary to use Input/Output devices, we recommend connecting them through the CBX, which must be powered separately.

See On-Board Ethernet Interface for further 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).

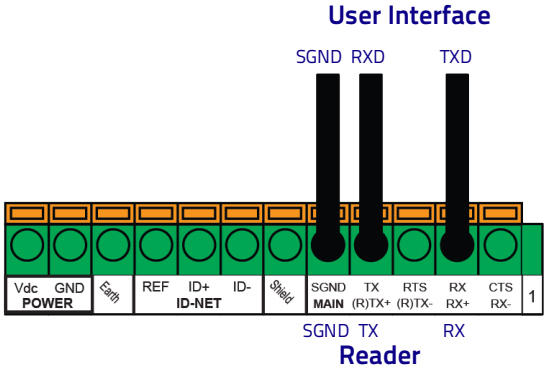


Figure 40 - RS232 Main Interface Connections

RS422 Full Duplex Interface

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

The CBX pinout follows:

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

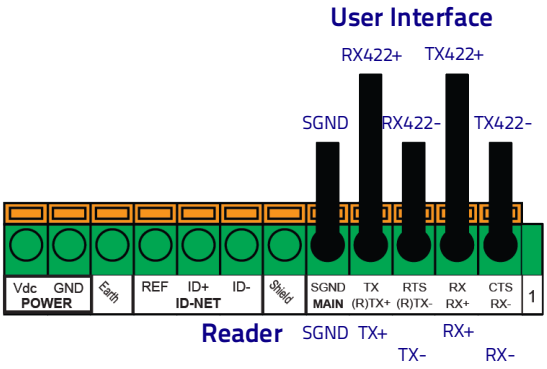


Figure 41 - RS422 Full Duplex Connections

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.

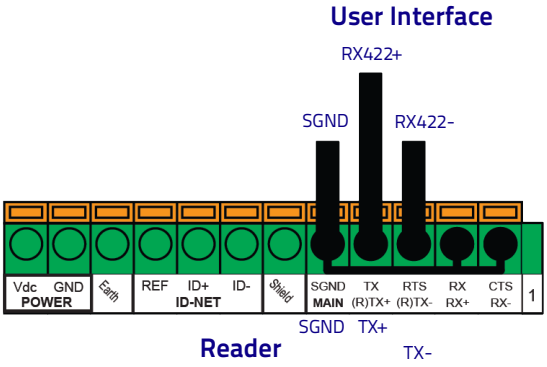


Figure 42 - RS422 Full Duplex Connections Using Only TX Signals to Host

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

These instructions are referred to Figure 44, Figure 45 and Figure 46.

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

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

* Application dependent, contact your Datalogic representative for details.



NOTE

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

ID-NET Response Time

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

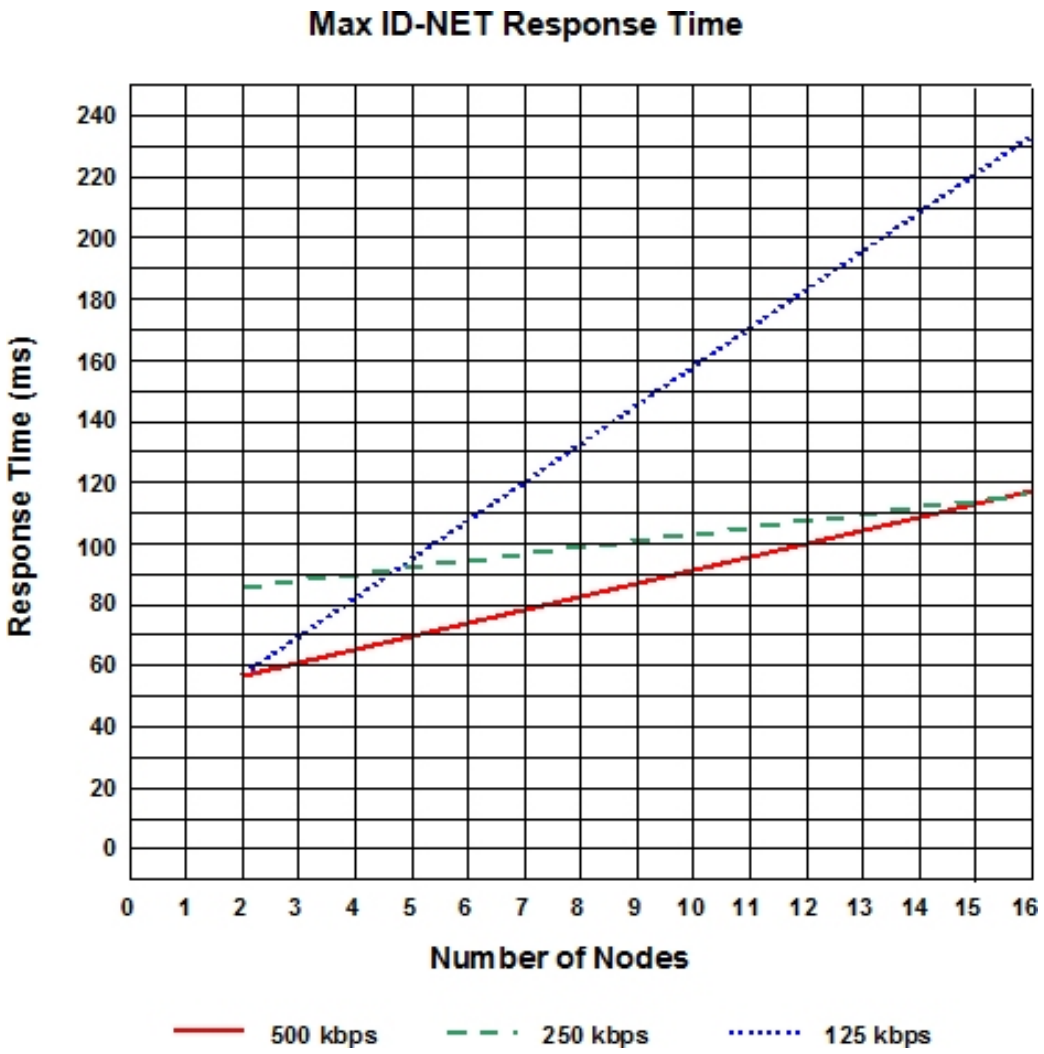


Figure 43 - ID-NET Response Time

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

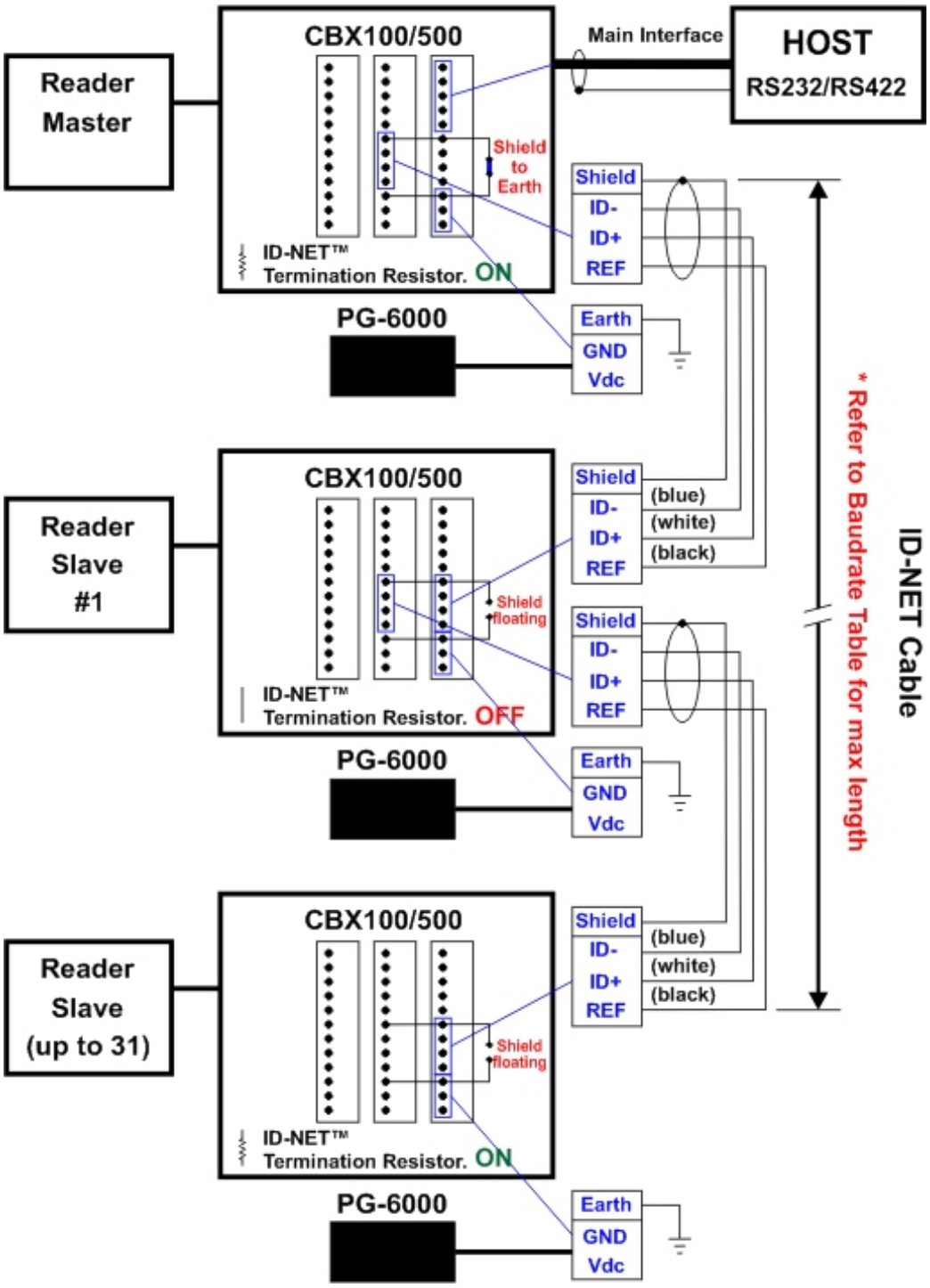


Figure 44 - ID-NET Network Connections with isolated power blocks

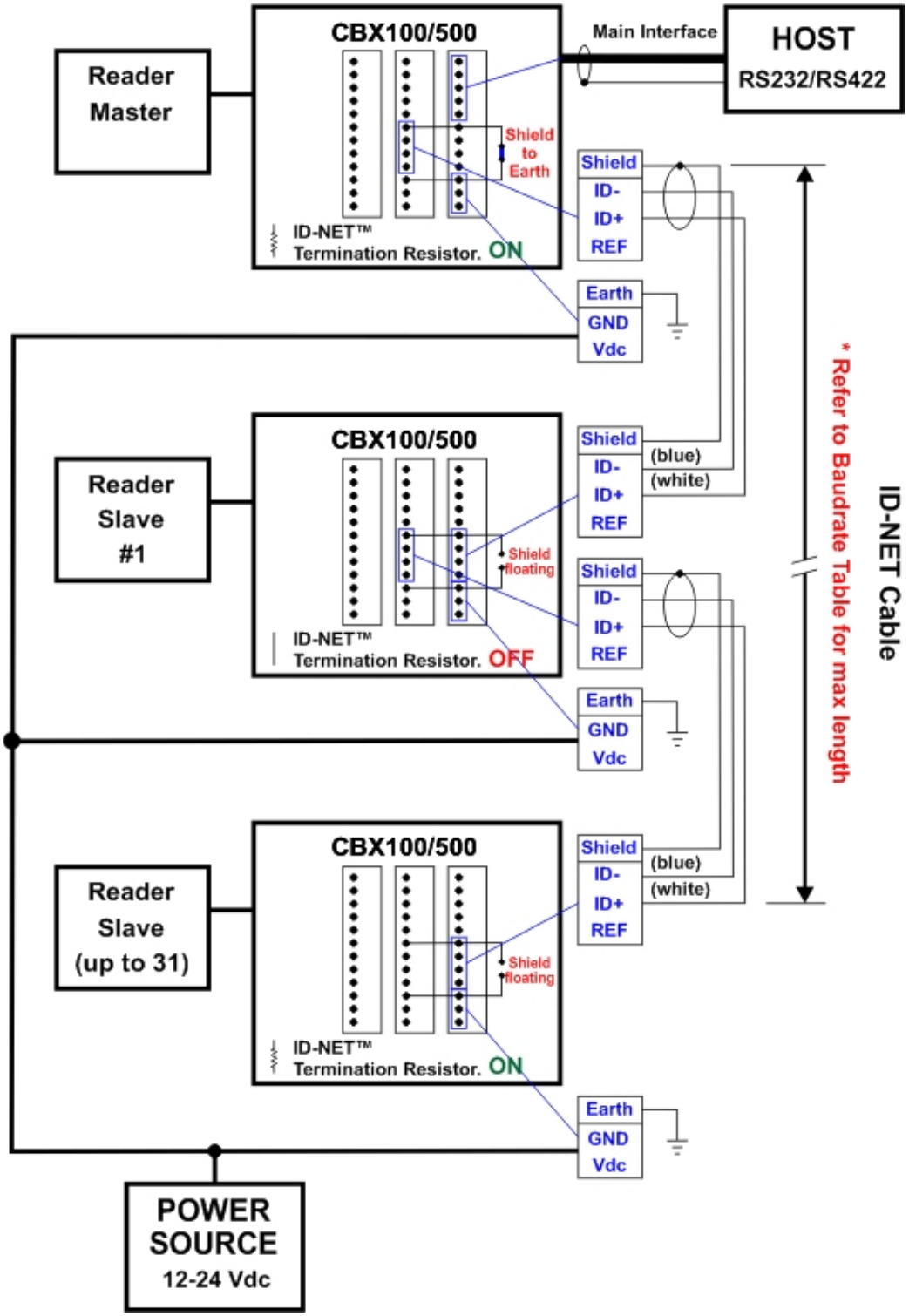


Figure 45 - ID-NET Network Connections with Common Power Branch Network

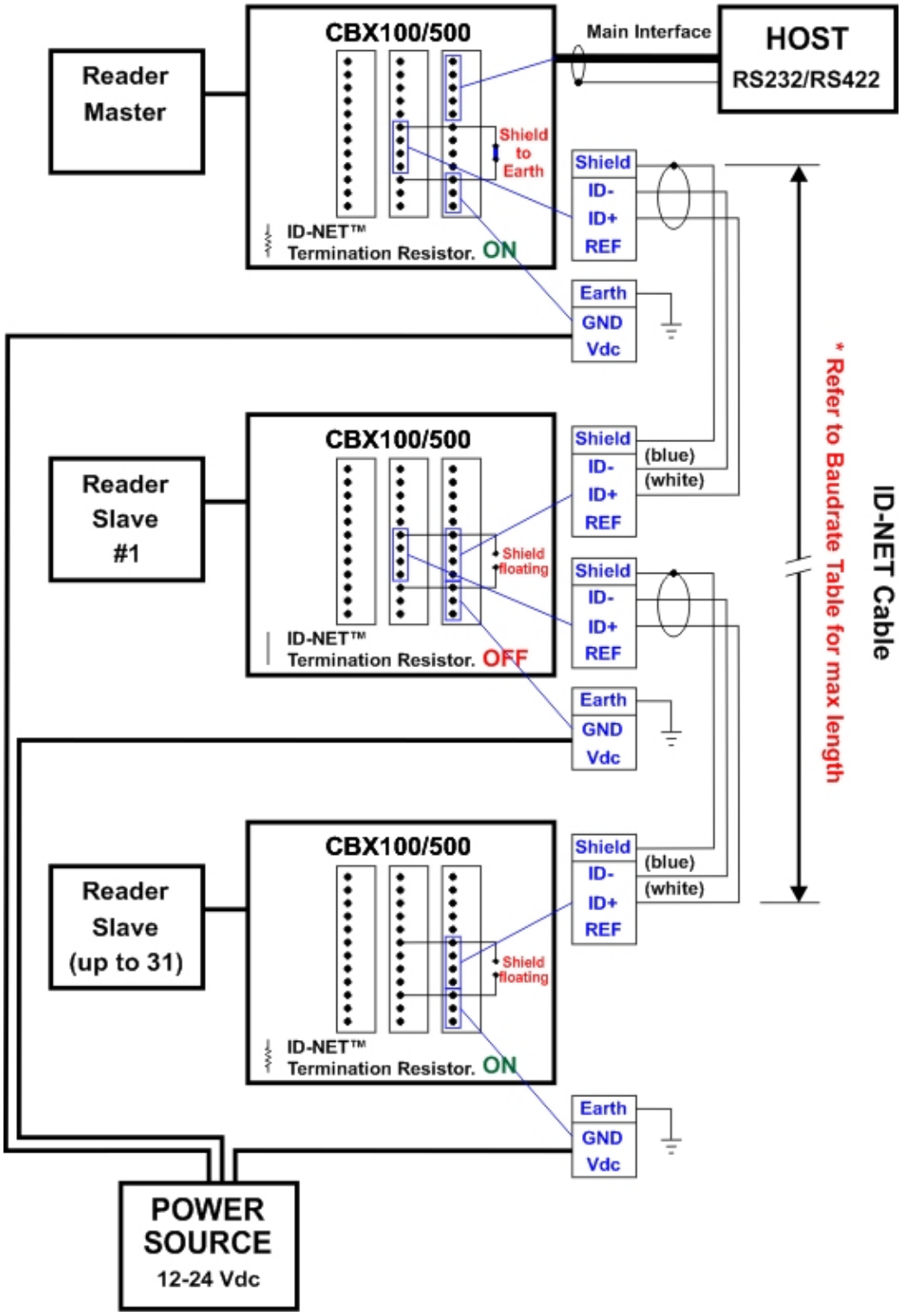


Figure 46 - ID-NET Network Connections with Common Power Star Network

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.

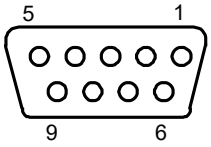


Figure 47 - 9-pin female connector

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

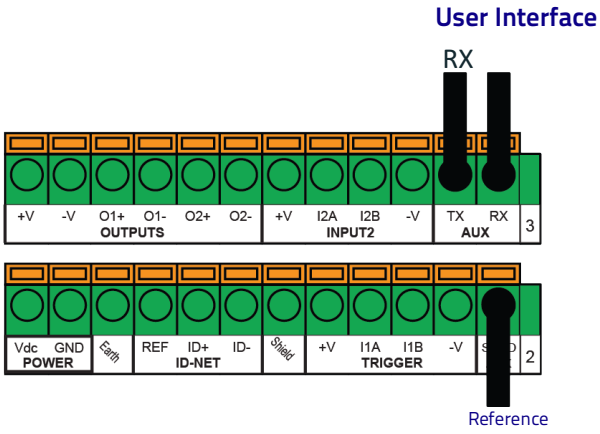


Figure 48 - RS232 Auxiliary Interface Connections

NOTE

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

INPUTS

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

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

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

The main functions of the general purpose Input 2 are:

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

The electrical features of both inputs are:

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

The active state of these inputs are selected in software.

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

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



NOTE

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

The connections are indicated in the following diagrams:

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

The yellow Trigger LED (Figure 15, 5) is on when the active state of the External Trigger corresponds to ON.

External Trigger Input Connections Using Matrix 300N 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.

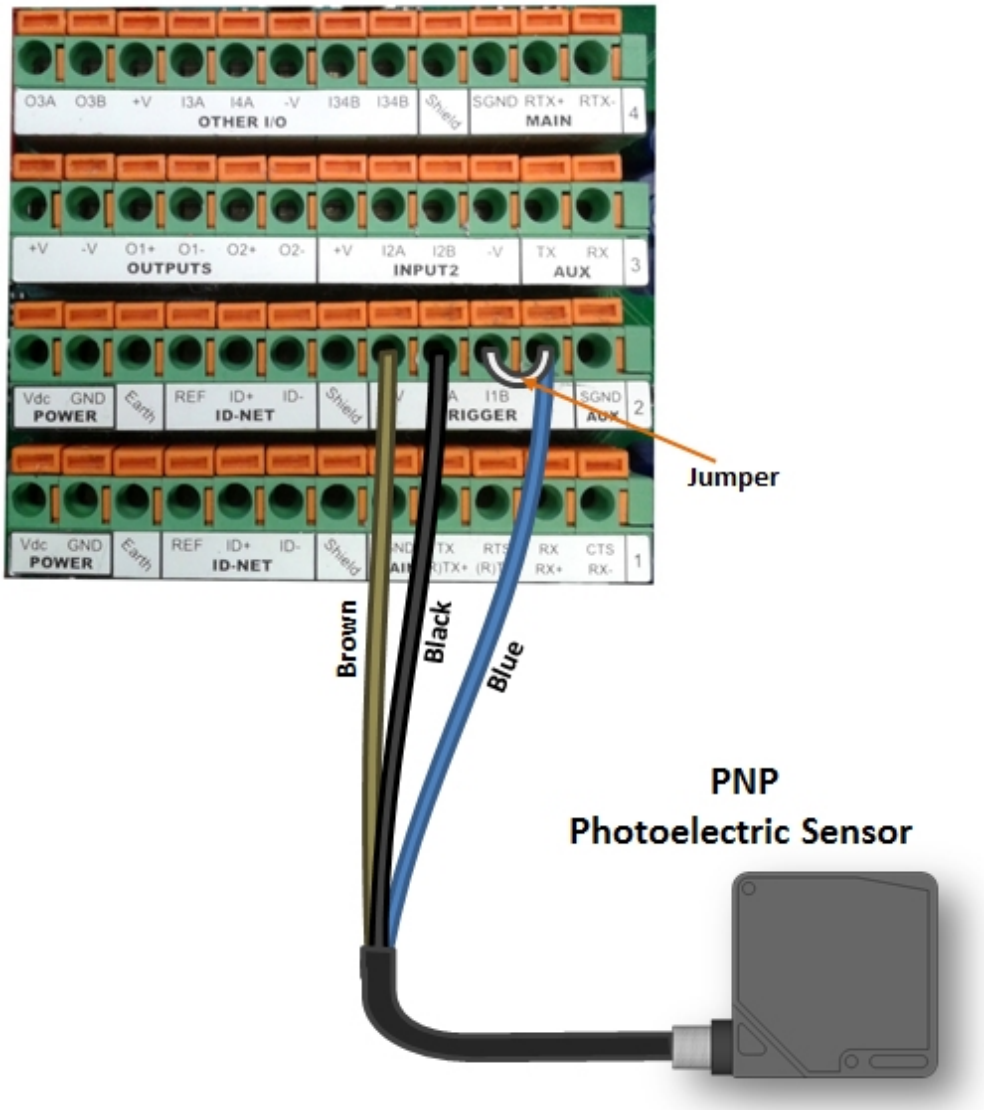


Figure 49 - PNP External Trigger Using Matrix 300N Power

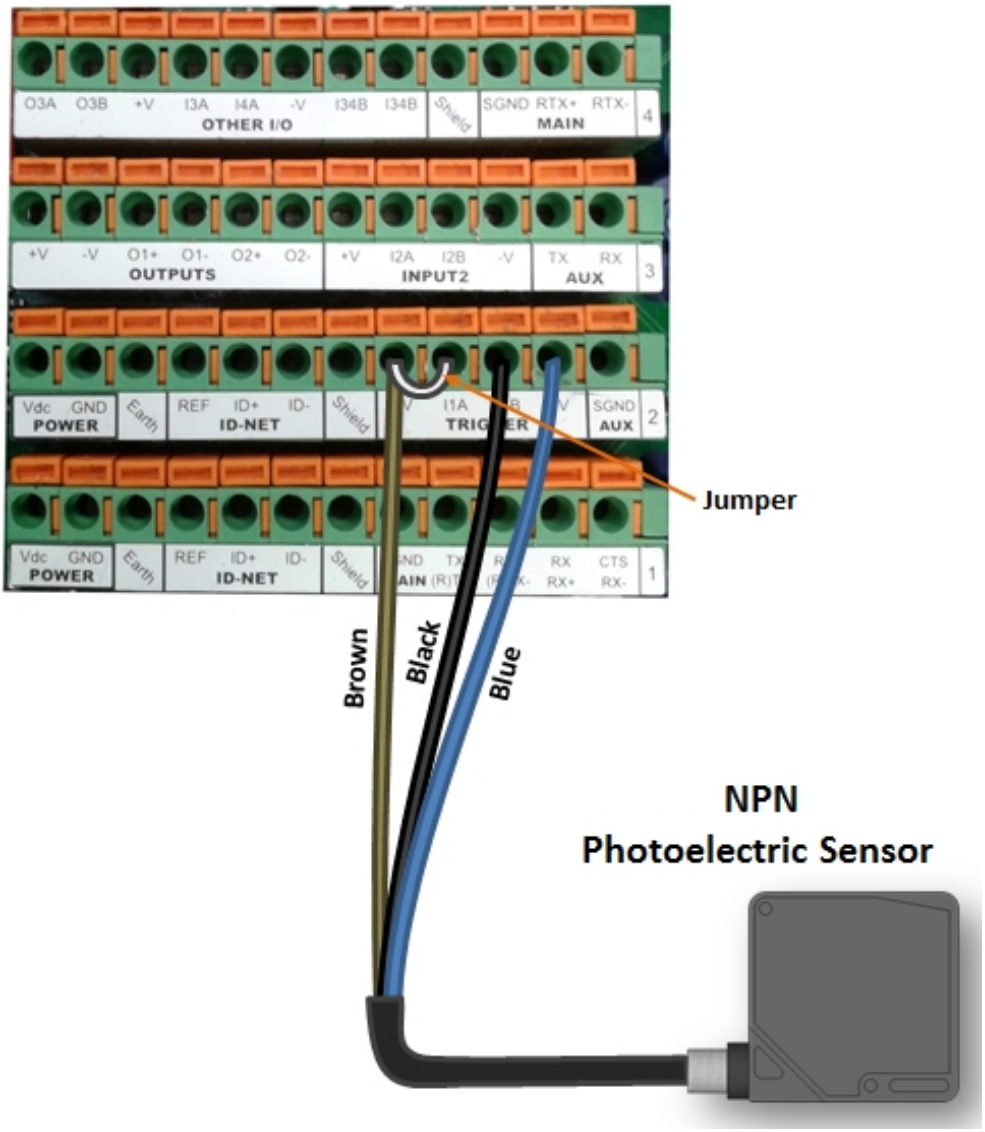


Figure 50 - NPN External Trigger Using Matrix 300N Power

External Trigger Input Connections Using External Power

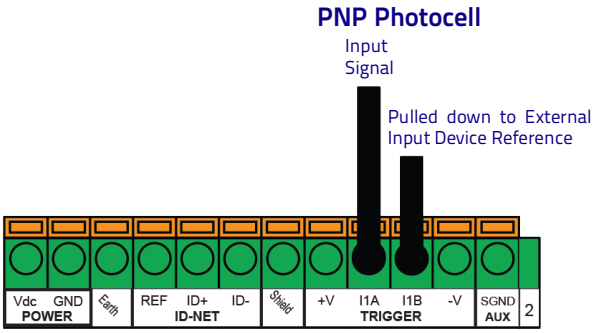


Figure 51 - PNP External Trigger Using External Power

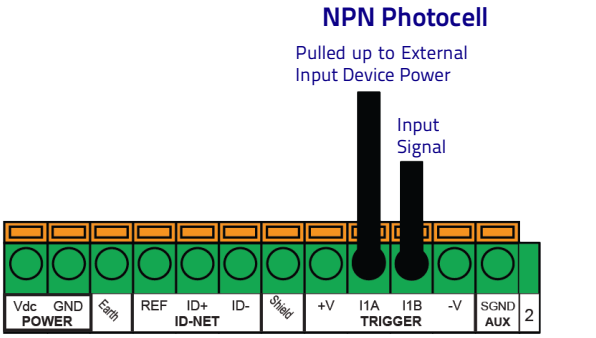


Figure 52 - NPN External Trigger Using External Power

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

Input 2 Connections Using Matrix 300N 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.

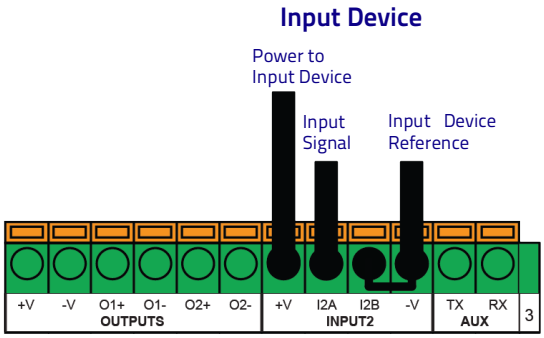


Figure 53 - PNP Input 2 Using Matrix 300N Power

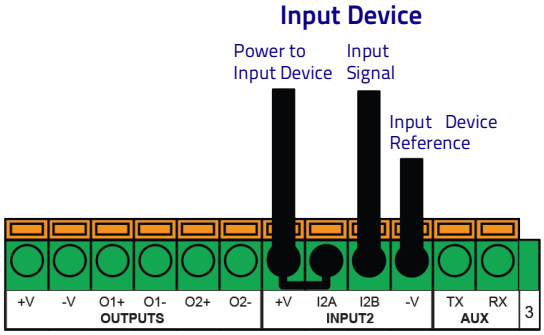


Figure 54 - NPN Input 2 Using Matrix 300N Power

Input 2 Connections Using External Power

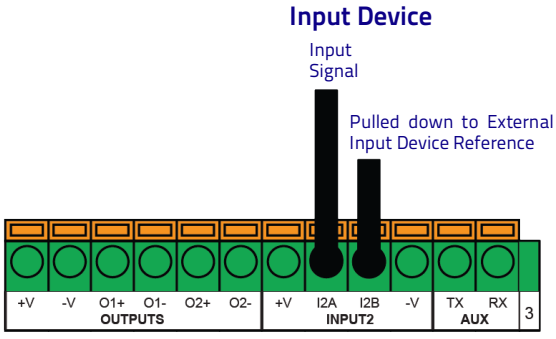


Figure 55 - PNP Input 2 Using External Power

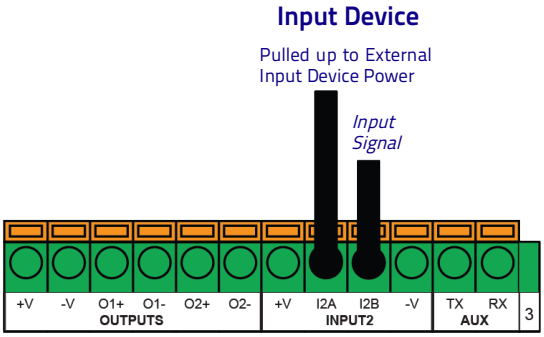


Figure 56 - NPN Input 2 Using External Power

Input 3 Connections (CBX500 Only)

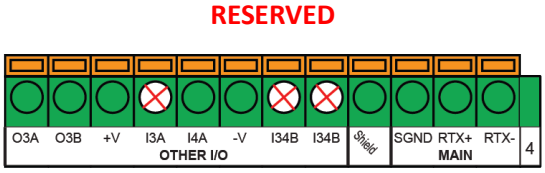


Figure 57 - Input 3 Using External Power

CAUTION

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

OUTPUTS

CAUTION

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

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

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

The electrical features of the outputs are the following:

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

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

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

Output 1 and 2 Connections Using Matrix 300N 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.

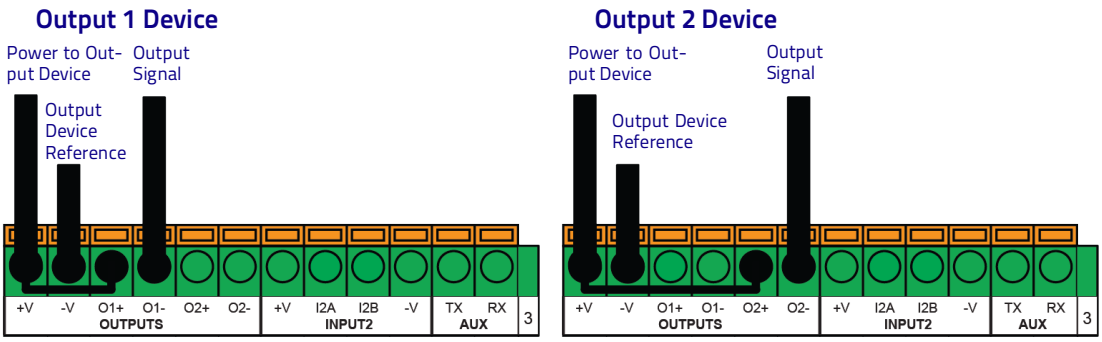


Figure 58 - PNP/Open Emitter Output Using Matrix 300N Power

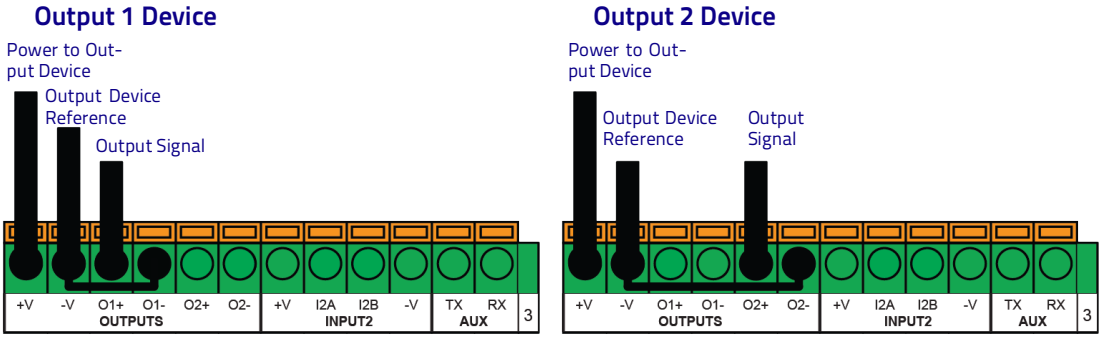


Figure 59 - NPN/Open Collector Output Using Matrix 300N Power

Output 1 and 2 Connections Using External Power

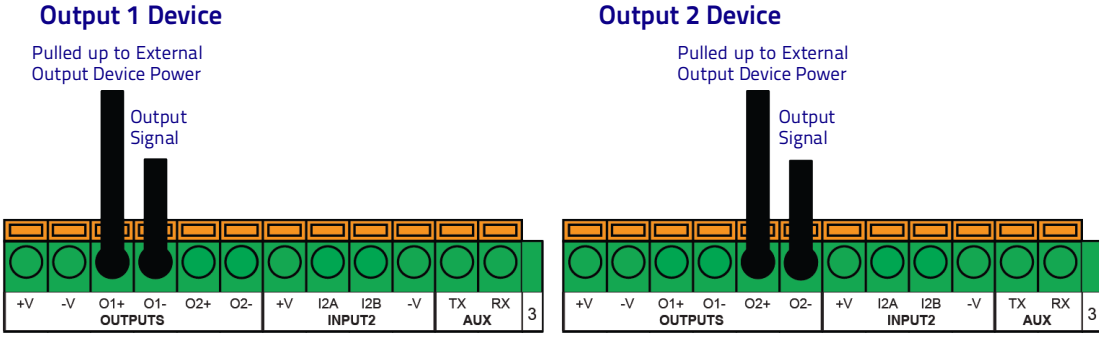


Figure 60 - PNP/Open Emitter Output Using External Power

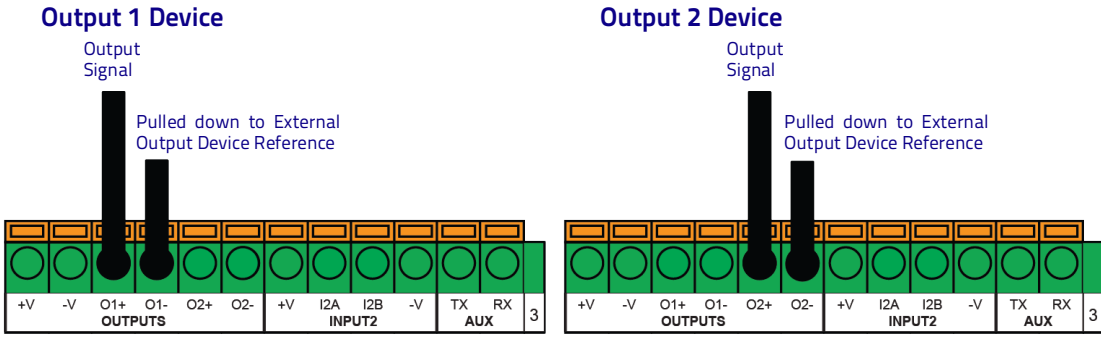


Figure 61 - NPN/Open Collector Output Using External Power

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 300N Power (CBX500 Only)

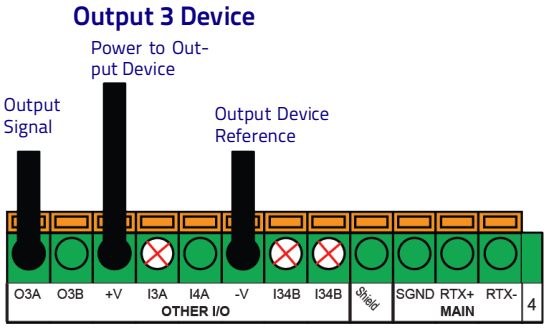


Figure 62 - Output 3 Using Matrix 300N Power

Output 3 Connections Using External Power (CBX500 Only)

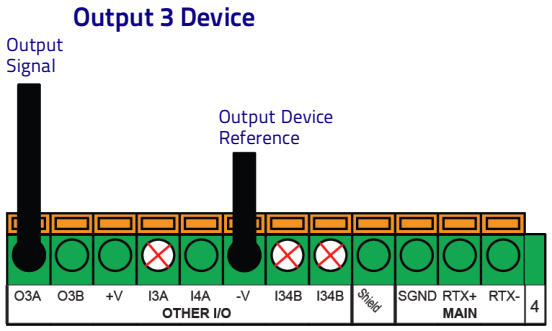


Figure 63 - Output 3 Using External Power

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 300N incorporates an auto-cross function.

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

On the Matrix 300N on-board Ethernet interface the following communication channels are available:

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

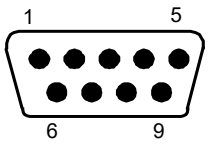
The following Fieldbus protocols are also available over the on-board Ethernet interface:

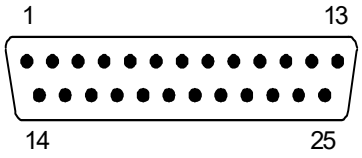
- EtherNet/IP
- PROFINET IO
- Modbus TCP Client

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

USER INTERFACE - SERIAL HOST

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

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

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

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

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 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-M0x cable. There is no need to use a crossover adapter since Matrix 300N incorporates an autocross function.

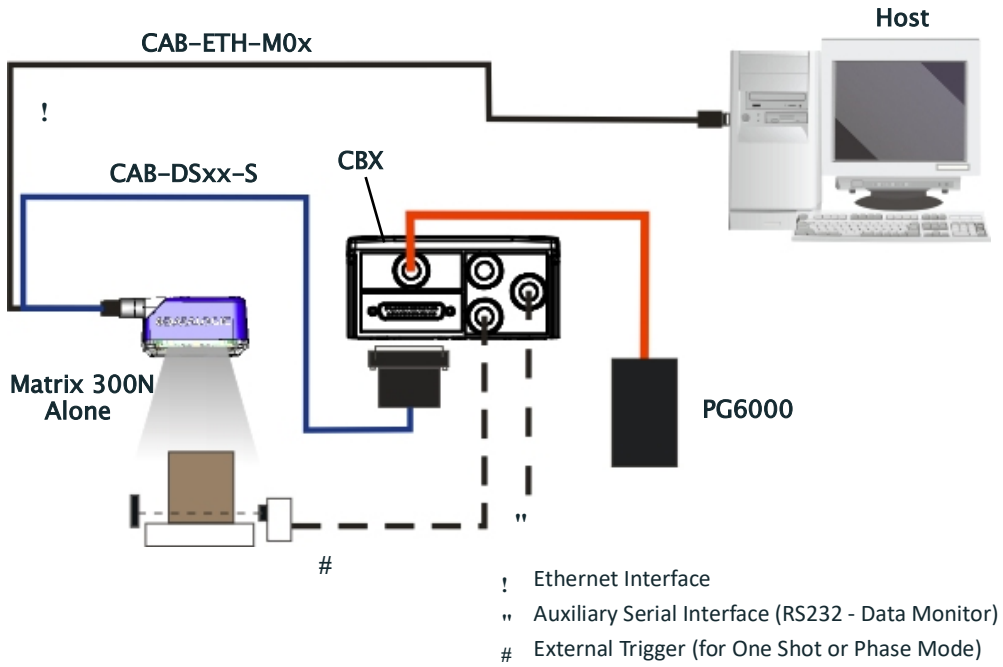


Figure 64 - Ethernet Point-to-Point Layout

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

When using a Local Area Network (LAN), one or more Matrix 300N readers can be connected to the network by using **CAB-ETH-M0x** cables:

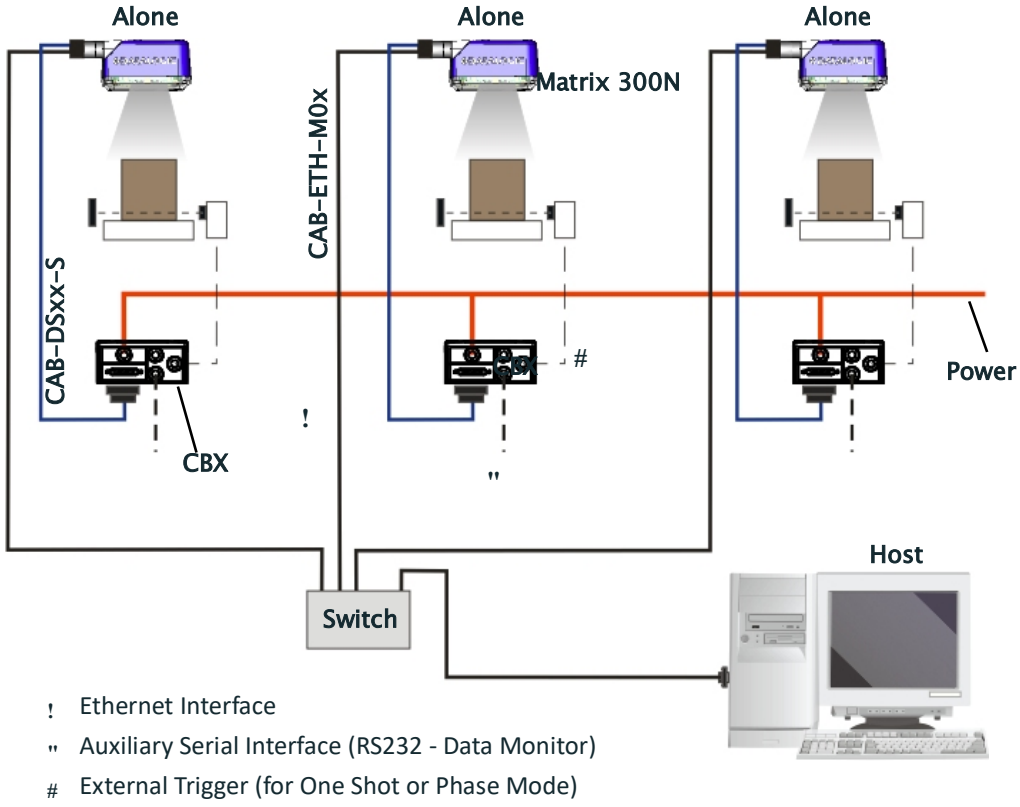


Figure 65 - Ethernet Network Layout

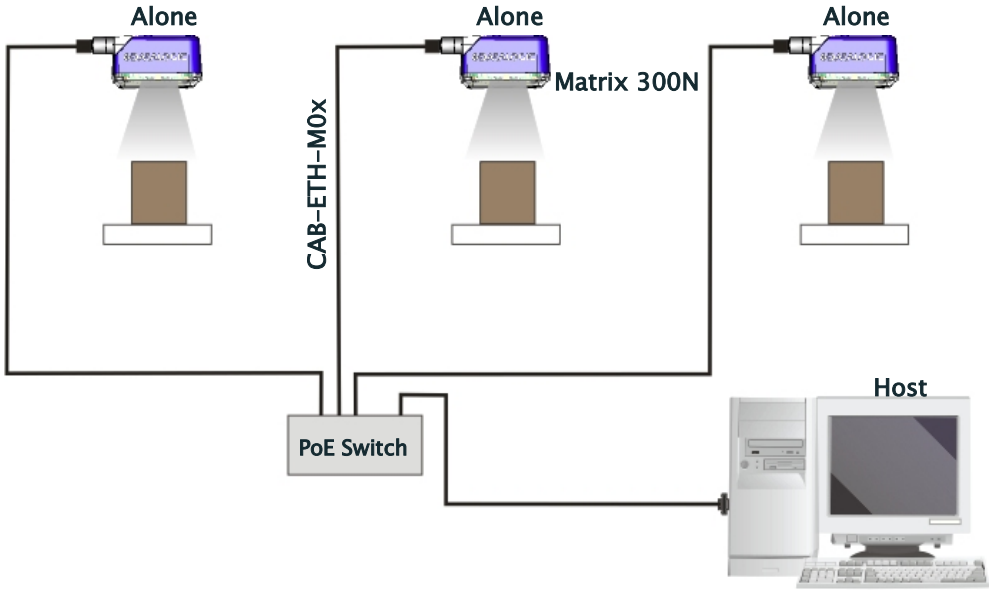


Figure 66 - PoE Ethernet Network Layout

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.

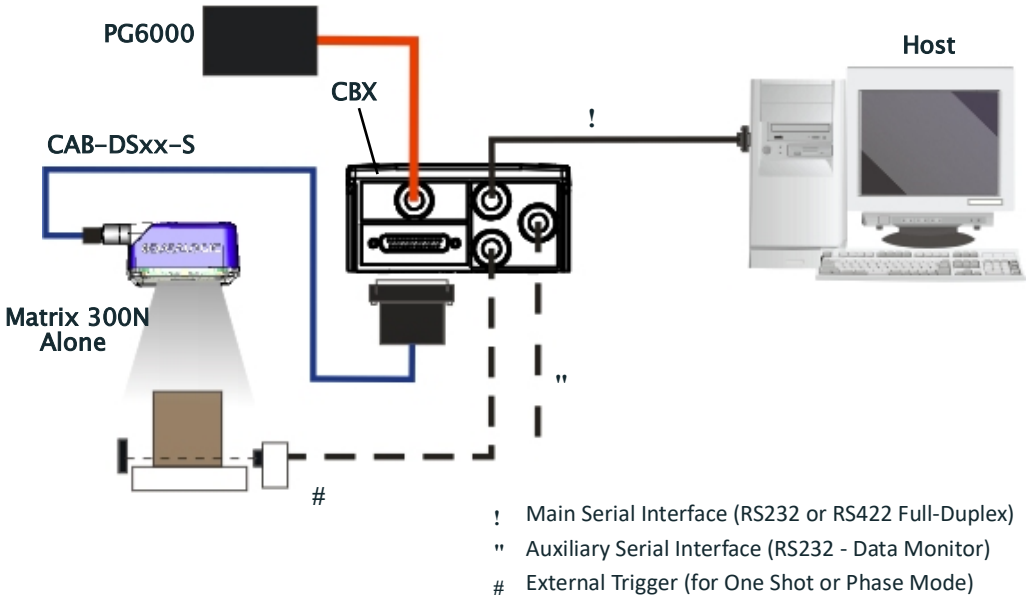


Figure 67 - Serial Interface Point-to-Point Layout

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

FIELDBUS CONNECTION

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

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

Data can be transmitted on the RS232 auxiliary interface irrespective of 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.

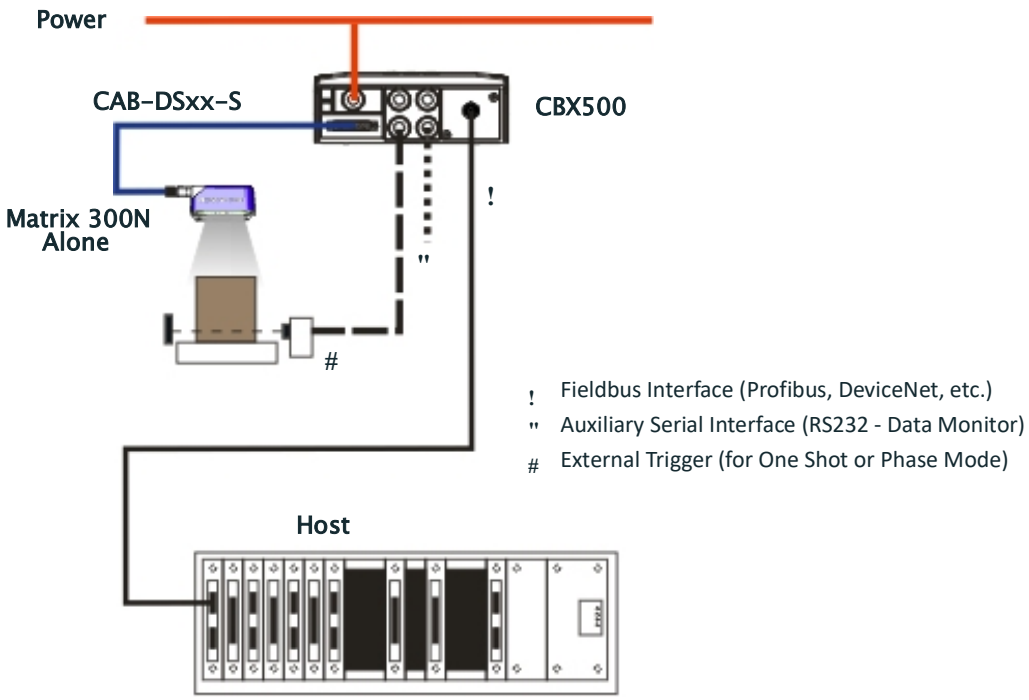


Figure 68 - Fieldbus Interface Point-to-Point Layout

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 to a Host can be collected by another device on its pass-through input channel and sent to a Host on a different output channel.

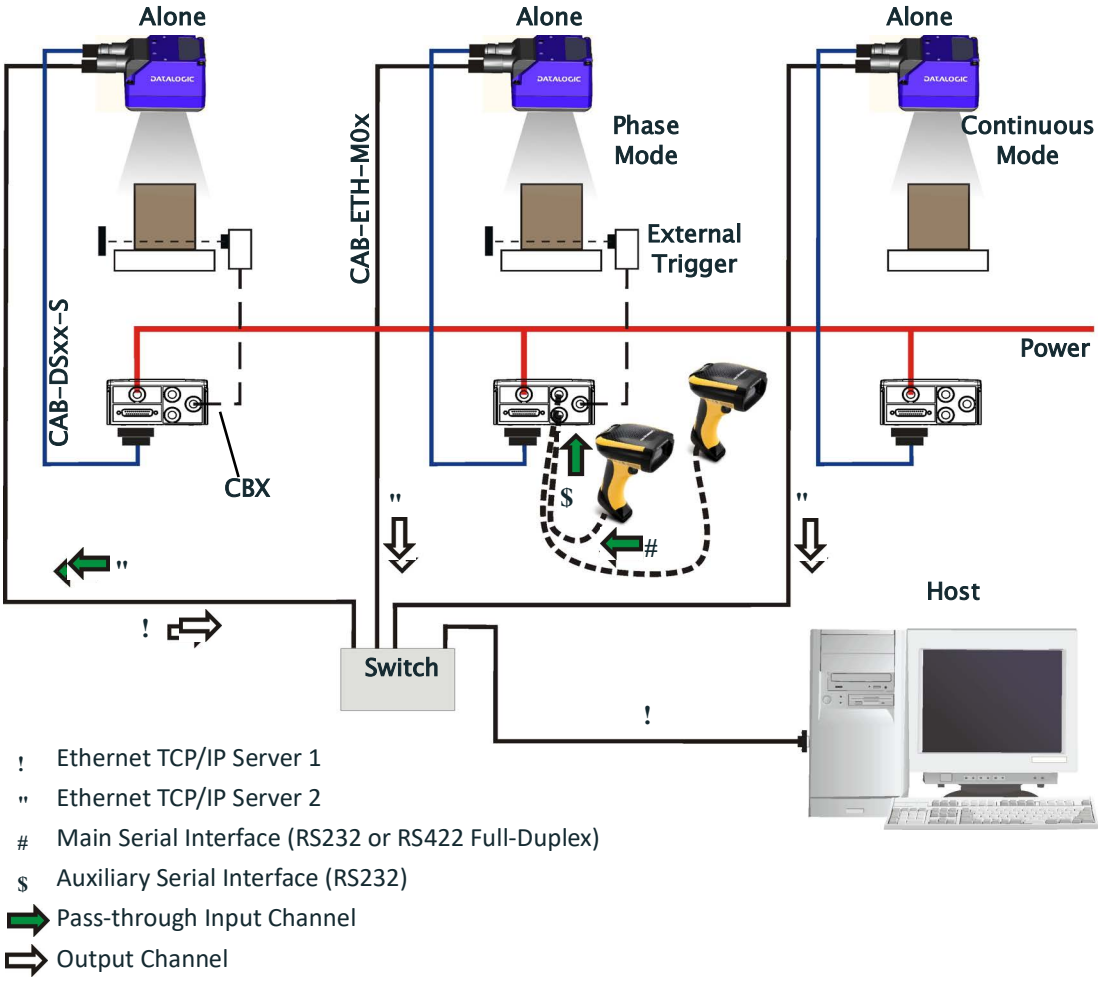


Figure 69 - Pass-Through Layout

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.

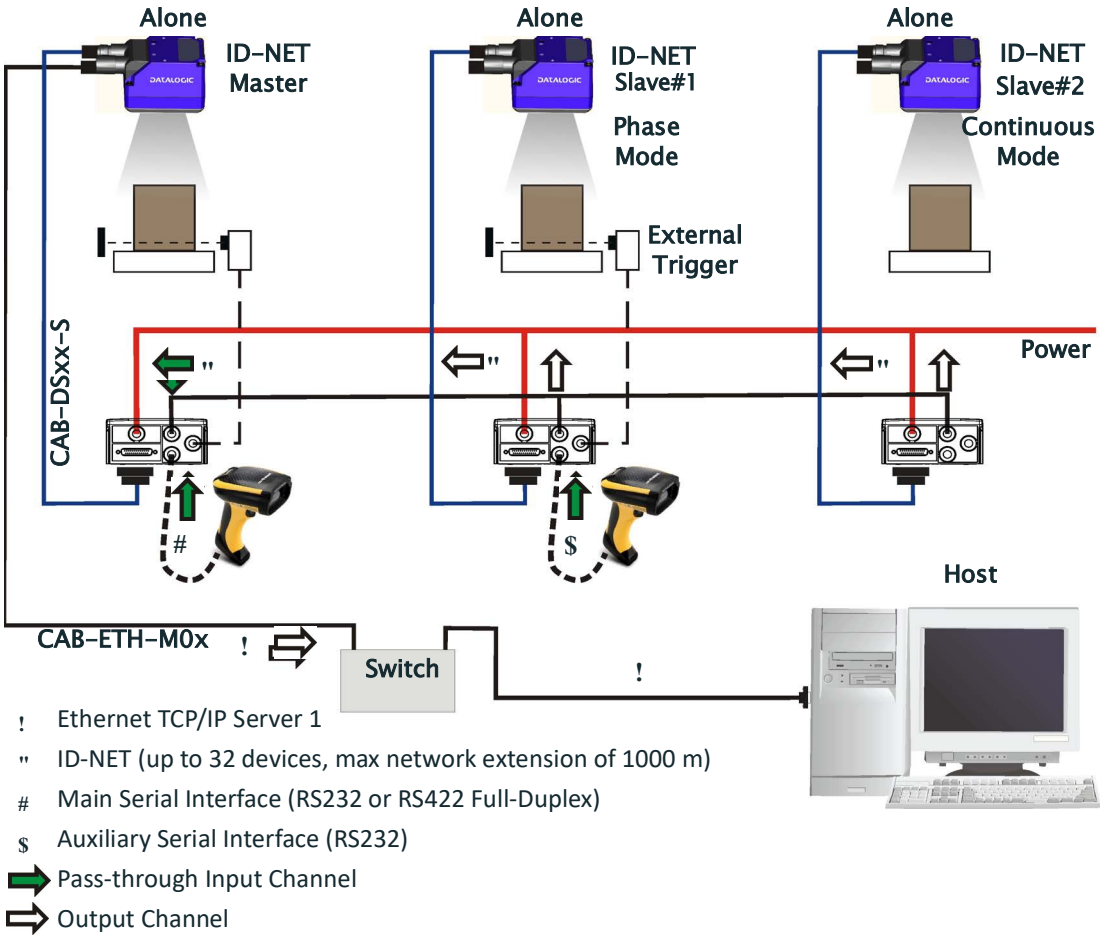


Figure 70 - ID-NET Multidata Layout (Pass-through)

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.

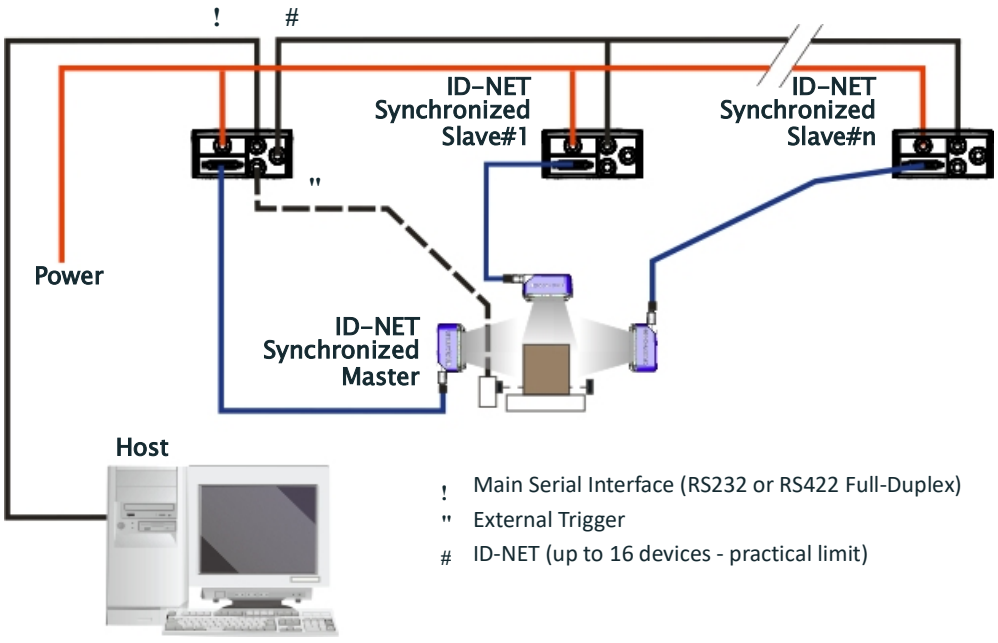


Figure 71 - ID-NET Synchronized Layout

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).

CHAPTER 6
READING FEATURES

FOV CALCULATION

Use the data in the following table to calculate the FOV for your application, referring to Figure 72 and the formula below.

Model	Lens Focus Type	d_0	View Angle Horizontal	View Angle Vertical	View Angle Diagonal	Min. Reading Distance
Matrix 300N 4x1-0xx	6 mm manual	7 mm	66°	55°	80°	35 mm
Matrix 300N 4x2-0xx	9 mm software	14 mm	40°	32°	50°	22 mm
Matrix 300N 4x3-0xx	9 mm manual	11 mm	41°	34°	52°	70 mm
Matrix 300N 4x4-0xx	12 mm manual	4 mm	32°	26°	40°	70 mm
Matrix 300N 4x5-0xx	16 mm manual	5 mm	24°	19°	30°	80 mm
Matrix 300N 7x2-0xx	9 mm software	18 mm	45°	34°	54°	30 mm
Matrix 300N 7x6-0xx	16 mm software	14 mm	25°	19°	31°	50 mm

The viewing angle has a tolerance of ± 1° depending on the reading distance.

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

where:

FOV_x = horizontal, vertical or diagonal FOV

α_x = horizontal, vertical or diagonal viewing angles.

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

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

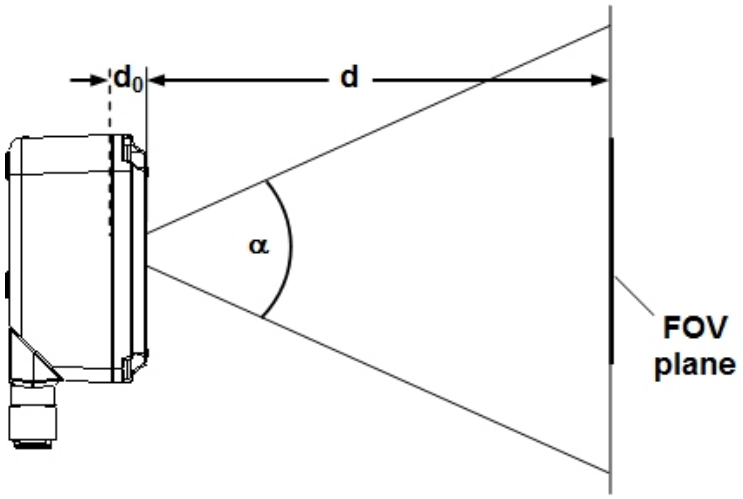


Figure 72 - Reading Distance References

Example:

The FOV for a **Matrix 300N 412-0xx** at a **reading distance of 200 mm** is:

FOV_H = 2 [(200 mm + 14 mm) * tan (40°/2)] ≅ **156 mm**
FOV_V = 2 [(200 mm + 14 mm) * tan (32°/2)] ≅ **123 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**.

See the Reading Diagrams, starting on page 101 for specific reading area examples.

1.3 MP Manual Adjustable Focus Models 6 mm (66°)

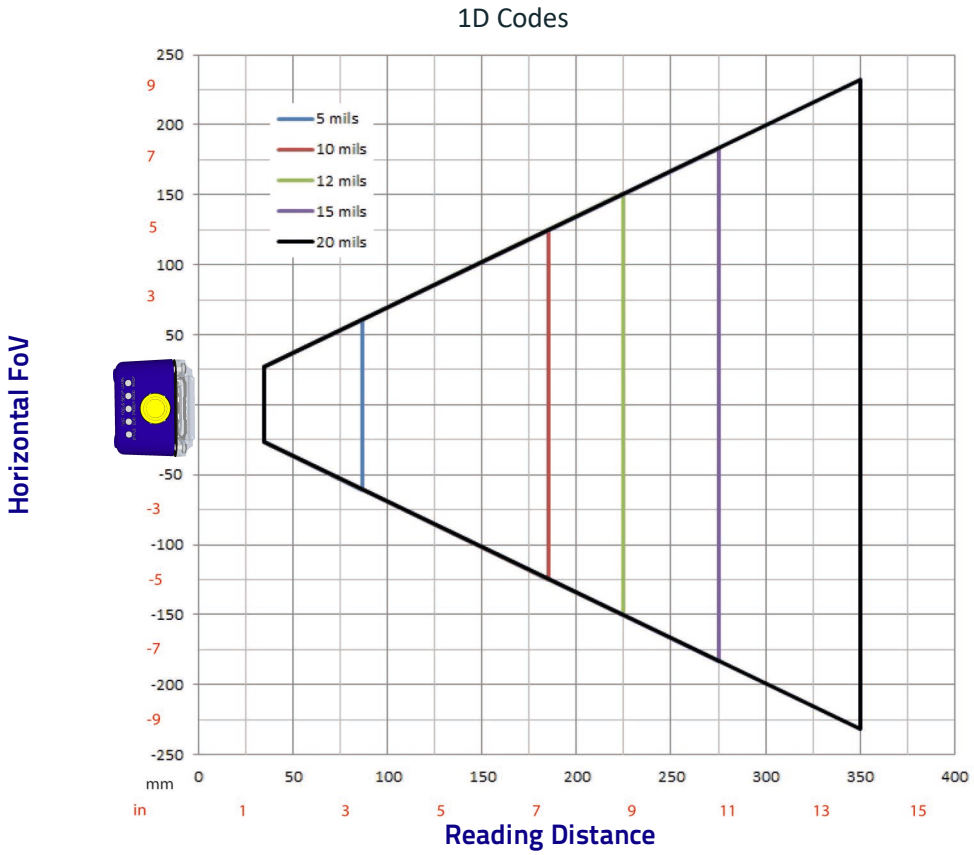


Figure 73 - 6 mm Global FOV Diagram

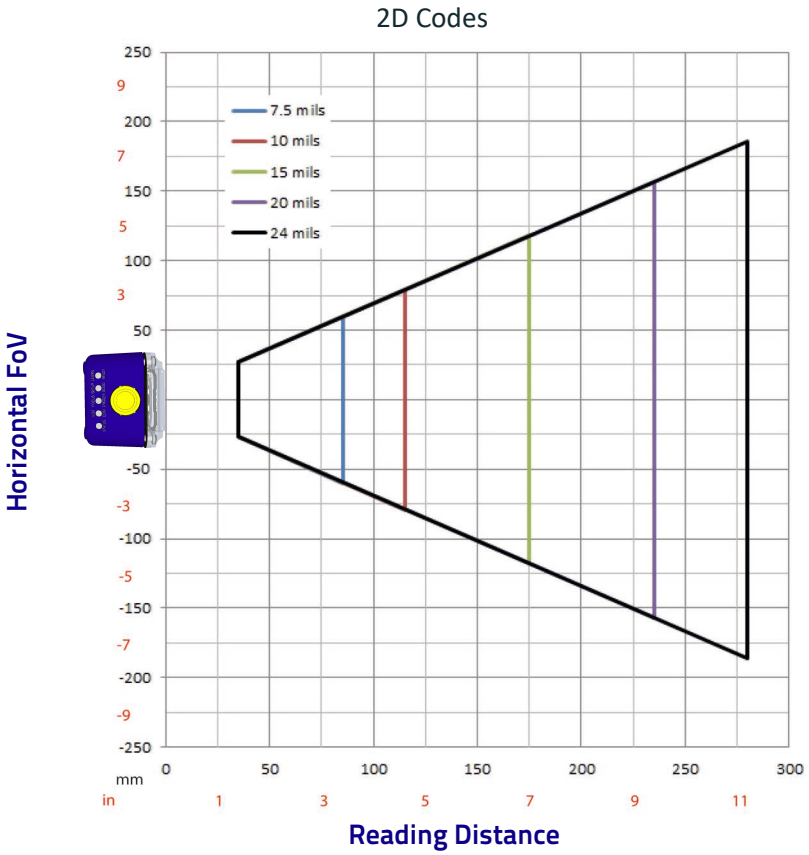


Figure 74 - 6 mm Global FOV Diagram

1.3 MP Software Adjustable Liquid Lens Models 9 mm (40°)

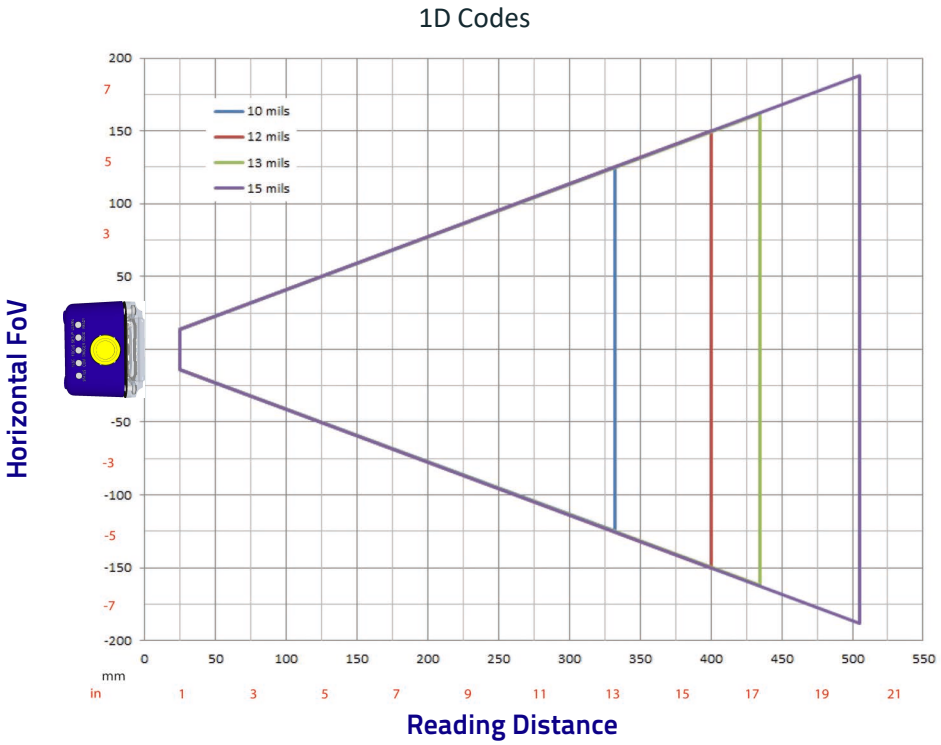


Figure 75 - 9 mm Global FOV Diagram

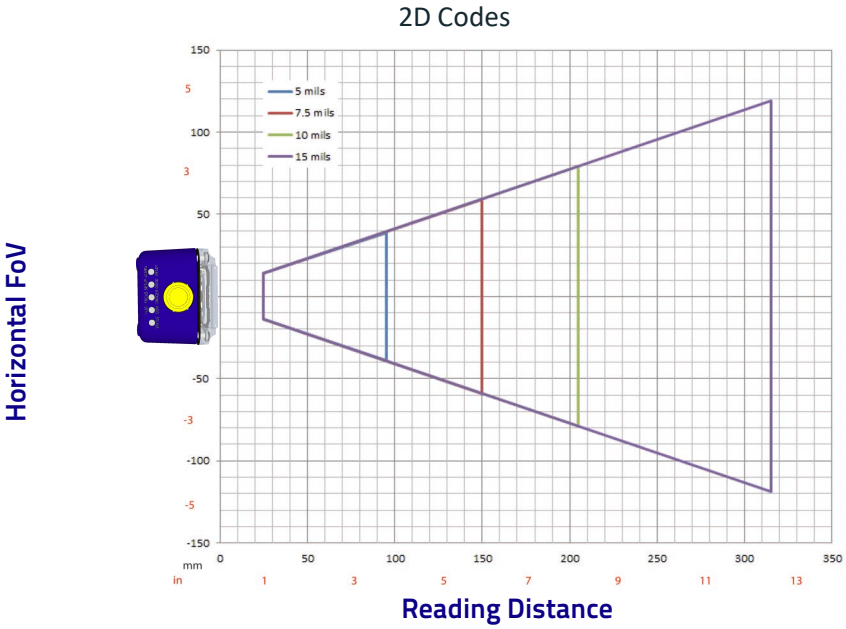


Figure 76 - 9 mm Global FOV Diagram

1.3 MP Manual Adjustable Focus Models 9 mm (41°)

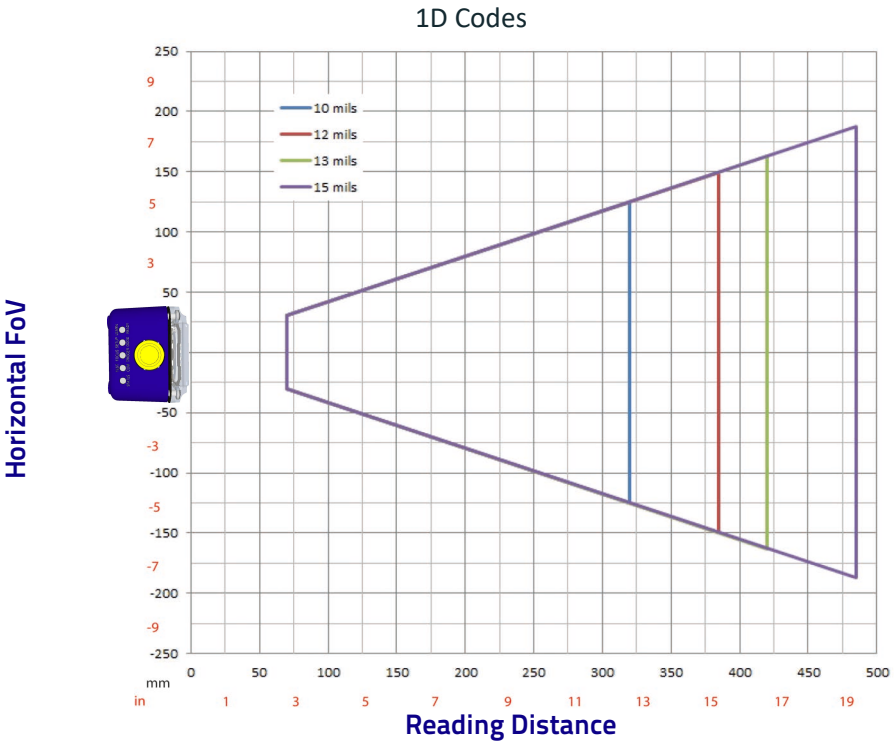


Figure 77 - 9 mm Global FOV Diagram

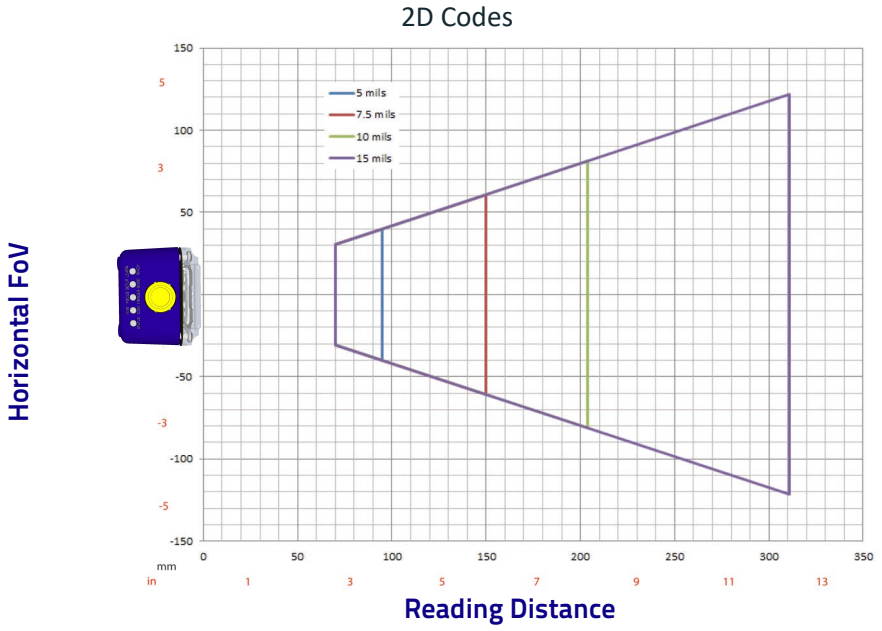


Figure 78 - 9 mm Global FOV Diagram

1.3 MP Manual Adjustable Focus Models 12 mm (32°)

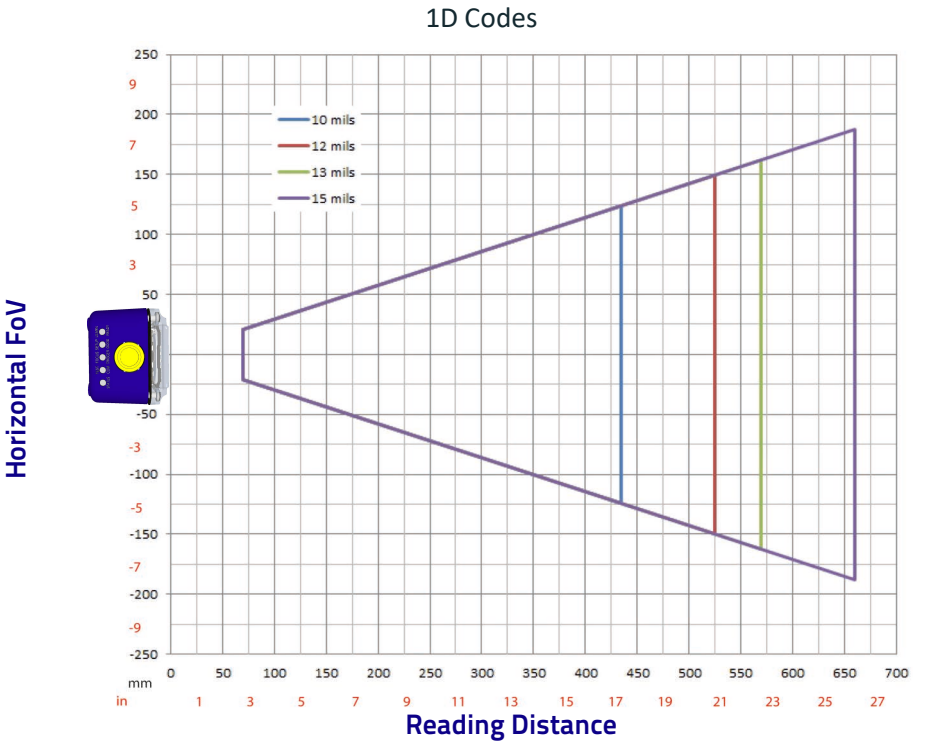


Figure 79 - 12 mm Global FOV Diagram

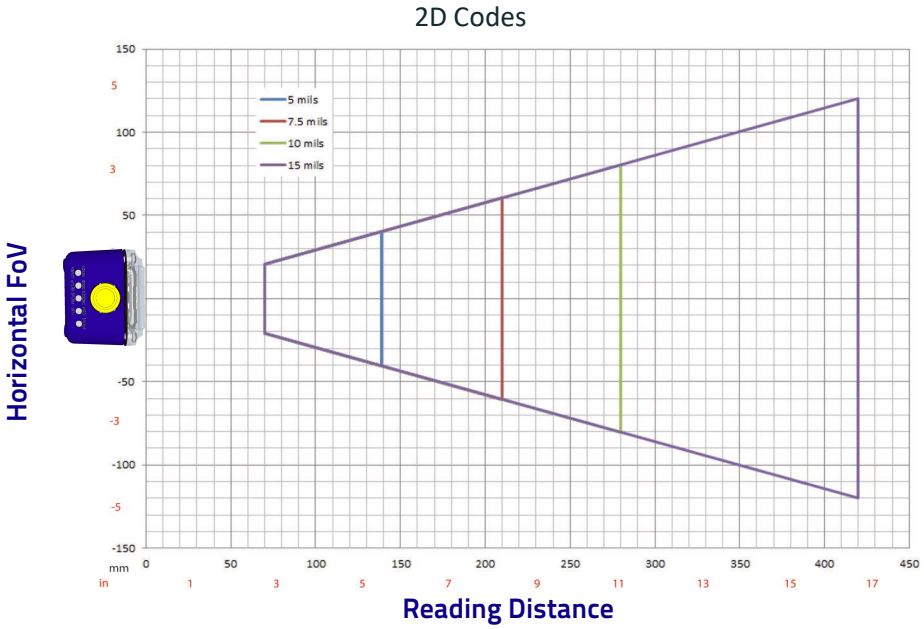


Figure 80 - 12 mm Global FOV Diagram

1.3 MP Manual Adjustable Focus Models 16 mm (24°)

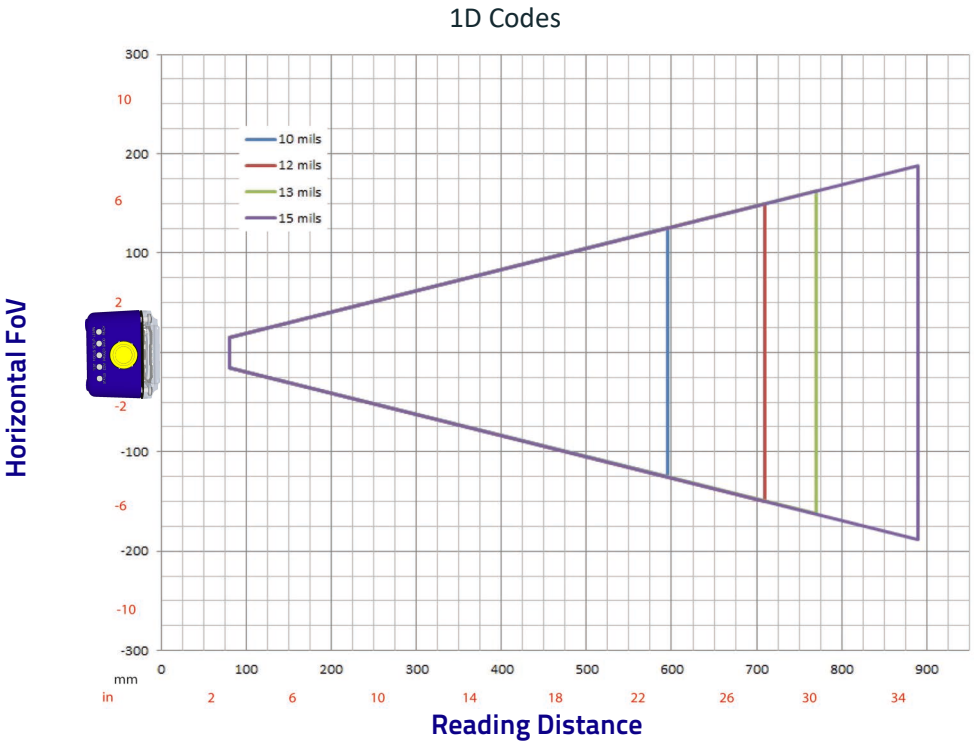


Figure 81 - 16 mm Global FOV Diagram

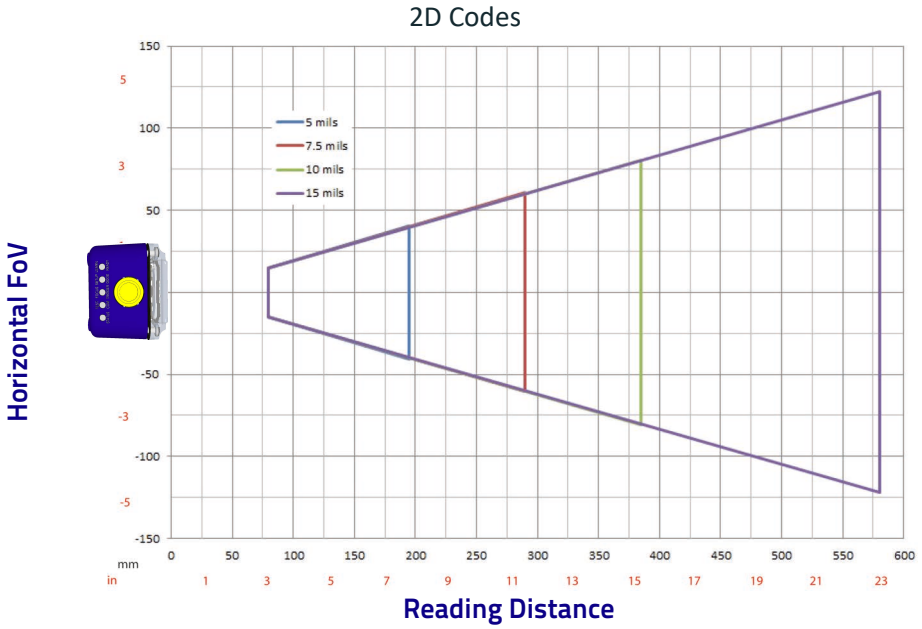


Figure 82 - 16 mm Global FOV Diagram

2 MP Software Adjustable Liquid Lens Models 9 mm (45°)

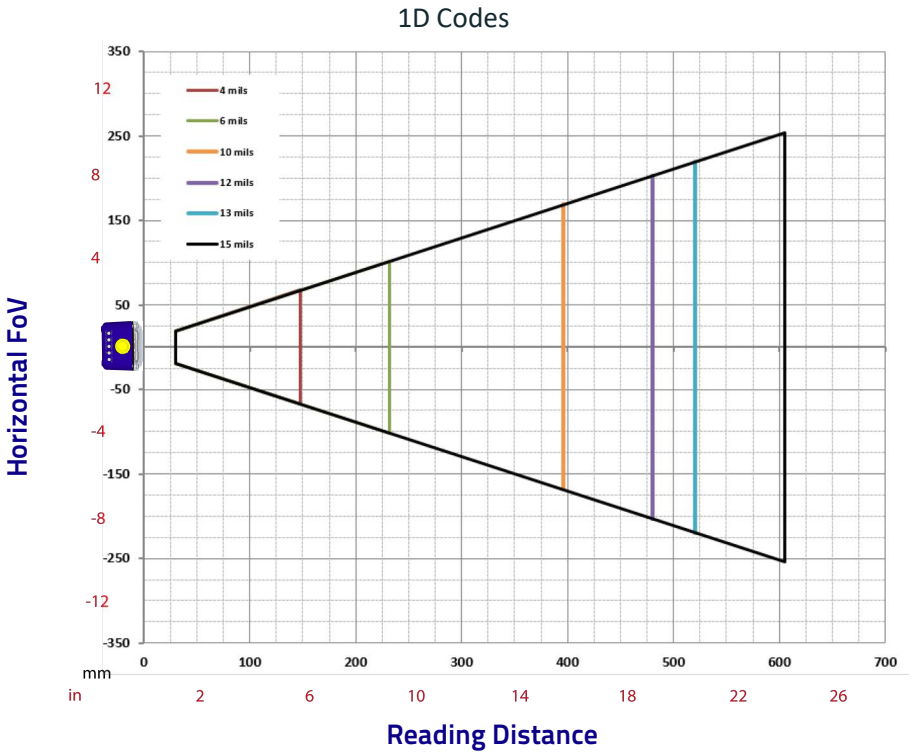


Figure 839 mm Global FOV Diagram

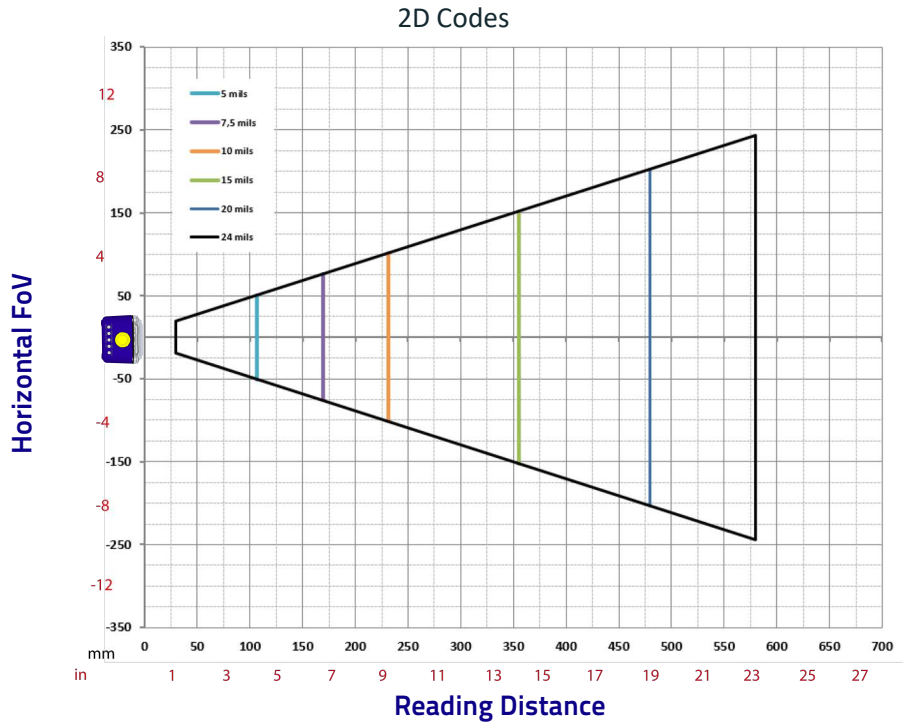


Figure 84 - 9 mm Global FOV Diagram

NOTE

The Polarized and Diffused embedded lighting systems are optimized to work at distances up to 350 mm. For longer reading distances, Datalogic recommends the use of Matrix 300N 2MP Standard models or external illumination.

2 MP Software Adjustable Liquid Lens Models 16 mm (25°)

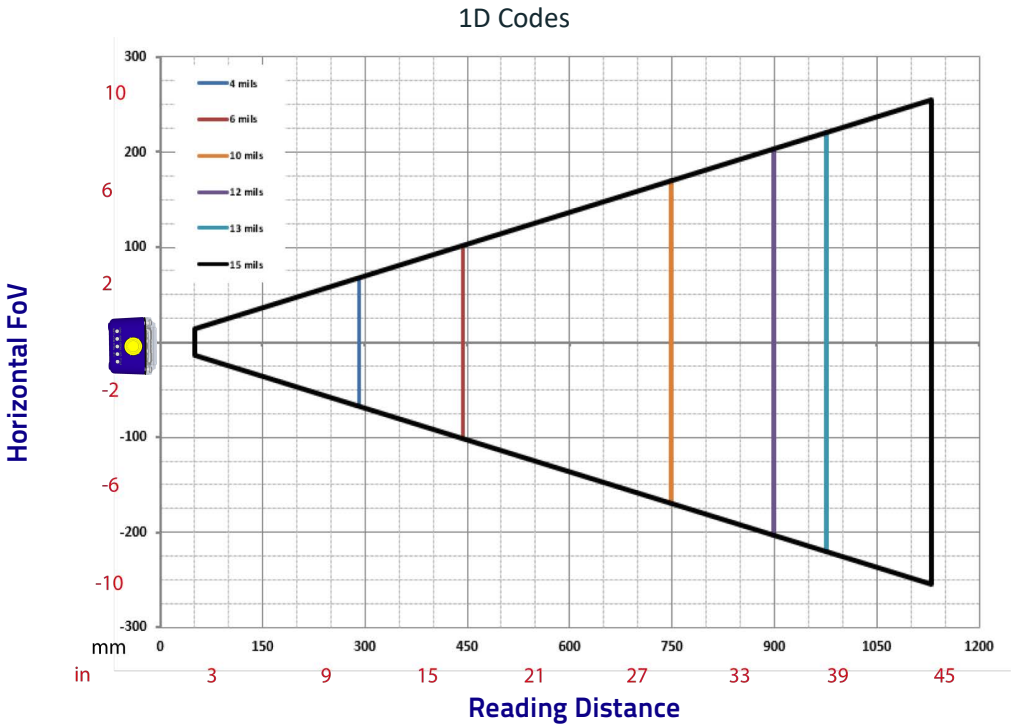


Figure 85 - 16 mm Global FOV Diagram

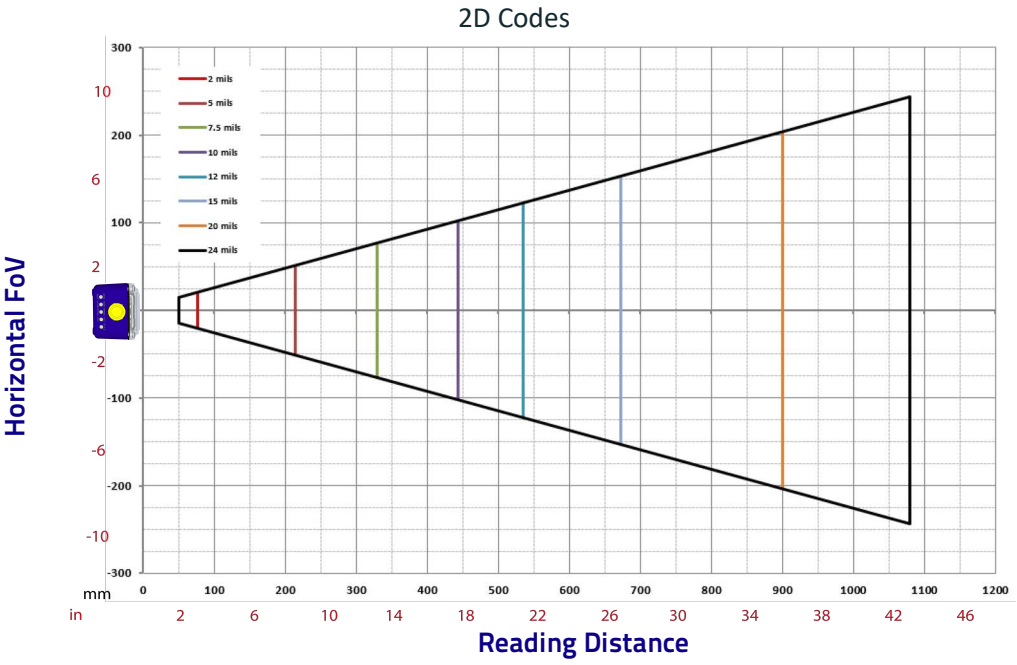


Figure 86 - 16 mm Global FOV Diagram

NOTE

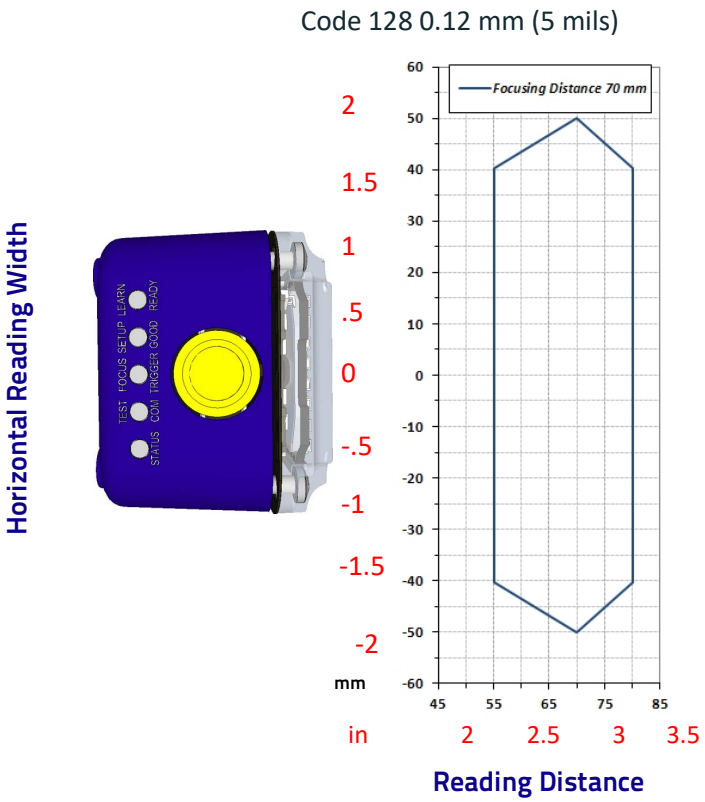
The Diffused embedded lighting system is optimized to work at distances up to 450 mm. For longer reading distances, Datalogic recommends the use of Matrix 300N 2MP Standard models or external illumination.

READING DIAGRAMS

- The following reading diagrams are to be considered as references and are given for typical performance at 25°C using high quality grade A symbols: Code 128 (1D code) and Data Matrix ECC 200 (2D code) from the Test Charts provided with the reader.
- Testing should be performed with the actual Matrix 300N using application codes in order to evaluate whether maximizing application performance requires adjustments to the HW/SW configuration with respect to the Reference Conditions given under each diagram.
- The ratio of the Vertical FOV width with respect to the Horizontal FOV width in the diagrams is:
- about equal to 0.8 for 1.3MP models; specifically 1024/1280. (i.e. $FOV_{V.} \cong FOV_{H}$ x 0.8).
- about equal to 0.7 for 2MP models; specifically 1200/1600. (i.e. $FOV_{V.} \cong FOV_{H}$ x 0.7).
- The reading distance ranges are measured from the reading window surface.
- The max theoretical Line Speed values for each diagram can be calculated using the formula in "Maximum Line Speed and Exposure Time Calculations" on page 132.
- Common software parameter settings for **1.3MP models**:
  - for all 6 mm models reading all code symbologies, and all 9 mm, 12 mm and 16 mm models reading 1D code symbologies are: Processing Mode=Advanced Code Setting;
  - for 9 mm, 12 mm and 16 mm models reading 2D code symbologies: Processing Mode=Standard; Code Contrast=Low; Decoding Complexity=Very High.
- Common software parameter settings for **2MP models**:
  - for all 9 mm and 16 mm models reading 1D code symbologies: Processing Timeout=1000 ms.
  - for all 9 mm and 16 mm models reading 2D code symbologies: Processing Mode=Standard; Decoding Complexity=High; Processing Mode=Standard; Processing Timeout=1000 ms.
- When defining a HW/SW configuration for the Matrix 300N for conditions different from those of the reference diagrams, it is suggested to keep in mind the following rules:
  - Changes in *Exposure Time* act directly proportional to the luminosity of the image and inversely proportional to the maximum code reading movement speed. Consequently, reducing the *Exposure Time* by half, reduces the luminosity of the image by half but doubles the theoretical code reading movement speed.
  - Changes in *Gain* act directly proportional to the luminosity of the image. However, increasing the *Gain* value can reduce the quality of the acquired image.
  - For DPM illuminators, the overall lighting power being considered is all **Sectors** ON from the **Central LED Group**, unless otherwise specified.

Matrix 300N 4x1-0xx (6 mm manual) 1D Codes (66°)

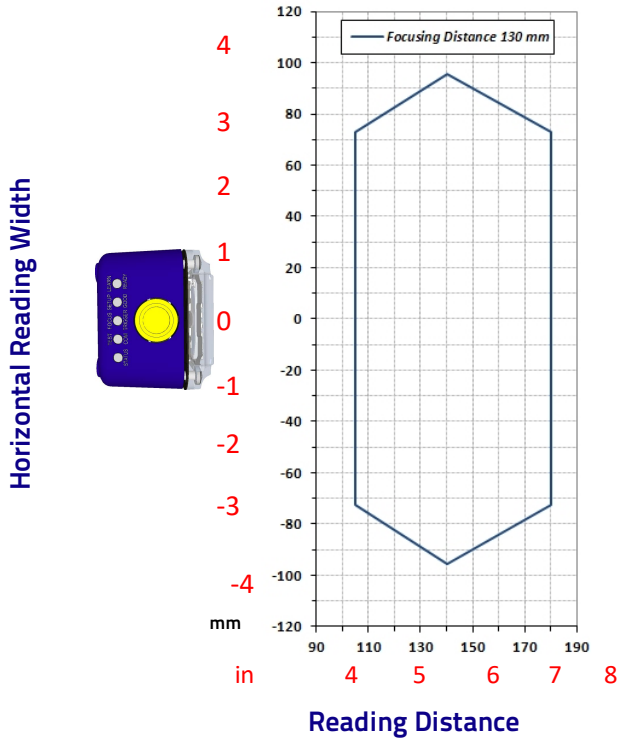
Matrix 300N 4x1-0xx (6 mm manual lens)



Conditions	
Hardware Settings	
Code Symbology	Code 128
Code Resolution	0.12 mm (5 mils)
Tilt Angle	0°
Skew Angle	15°
Focusing Distance (mm)	70
Software Parameters	
Internal Lighting	Very High Power Strobed
411-0xx Wide RED	
Exposure Time (µs)	90
Gain	5

Matrix 300N 4x1-0xx (6 mm manual lens)

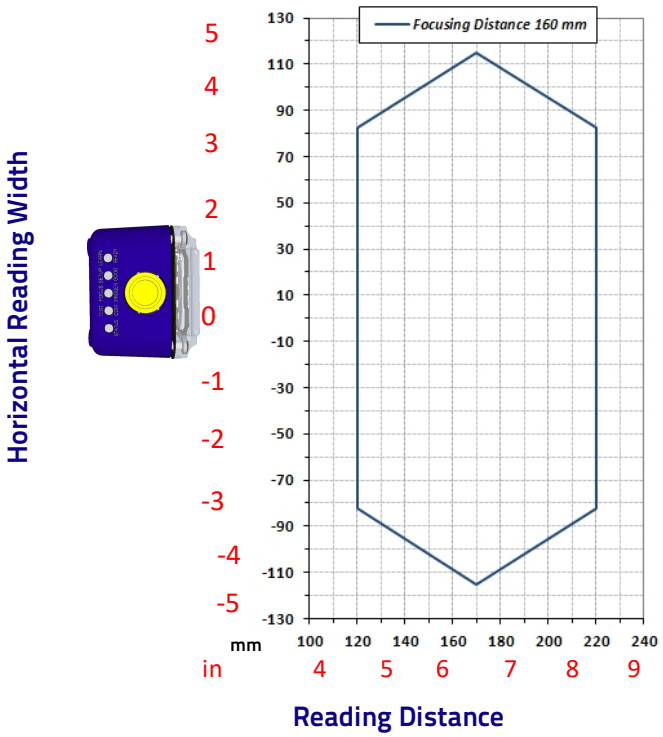
Code 128 0.25 mm (10 mils)



Conditions	
Hardware Settings	
Code Symbology	Code 128
Code Resolution	0.25 mm (10 mils)
Tilt Angle	0°
Skew Angle	15°
Focusing Distance (mm)	130
Software Parameters	
Internal Lighting	Very High Power Strobed
411-0xx Wide Red	
Exposure Time (µs)	80
Gain	20

Matrix 300N 4x1-0xx (6 mm manual lens)

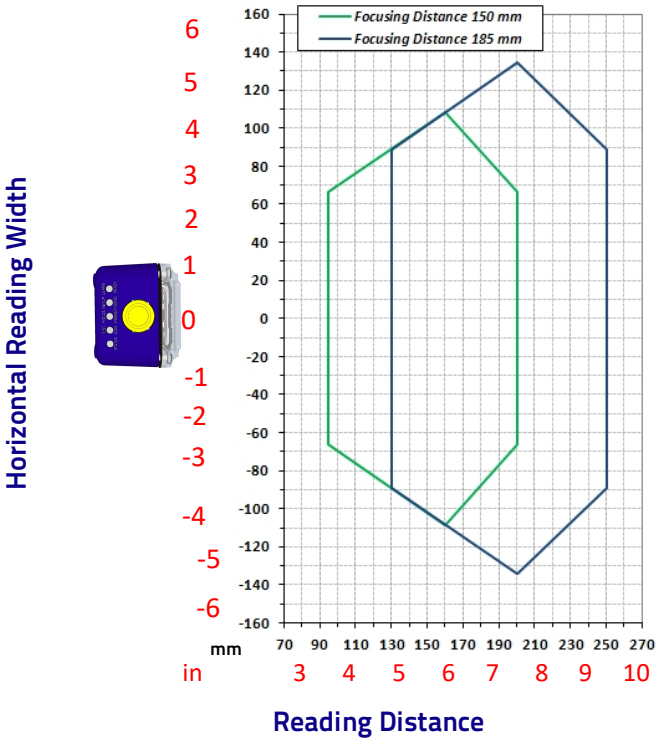
Code 128 0.30 mm (12 mils)



Conditions	
Hardware Settings	
Code Symbology	Code 128
Code Resolution	0.30 mm (12 mils)
Tilt Angle	0°
Skew Angle	15°
Focusing Distance (mm)	160
Software Parameters	
Internal Lighting	Very High Power Strobed
411-0xx Wide Red	
Exposure Time (µs)	100
Gain	20

Matrix 300N 4x1-0xx (6 mm manual lens)

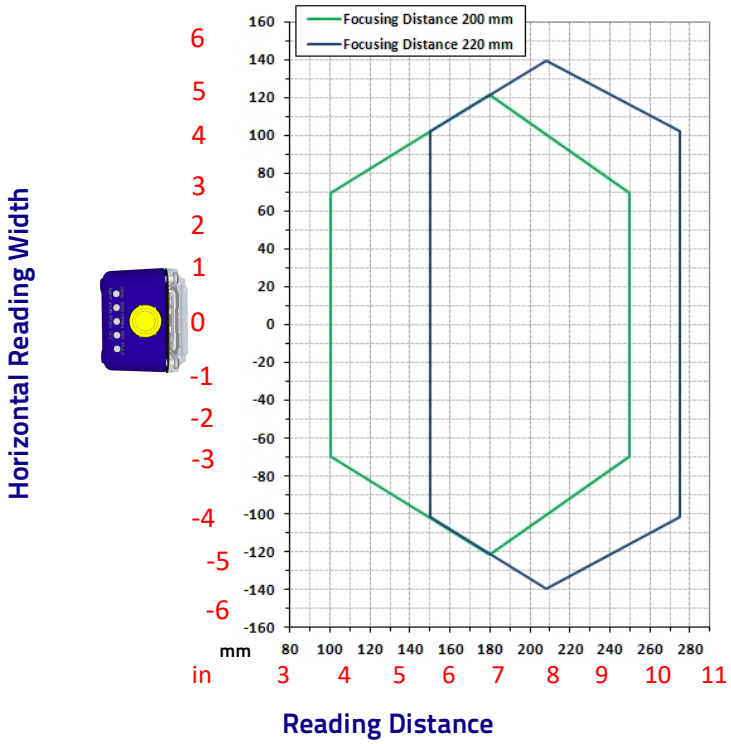
Code 128 0.33 mm (13 mils)



Conditions		
Hardware Settings		
Code Symbology	Code 128	
Code Resolution	0.33 mm (13 mils)	
Tilt Angle	0°	
Skew Angle	15°	
Focusing Distance (mm)	150	185
Software Parameters		
Internal Lighting	Very High Power Strobed	
411-0xx Wide Red		
Exposure Time (µs)	150	175
Gain	13	20

Matrix 300N 4x1-0xx (6 mm manual lens)

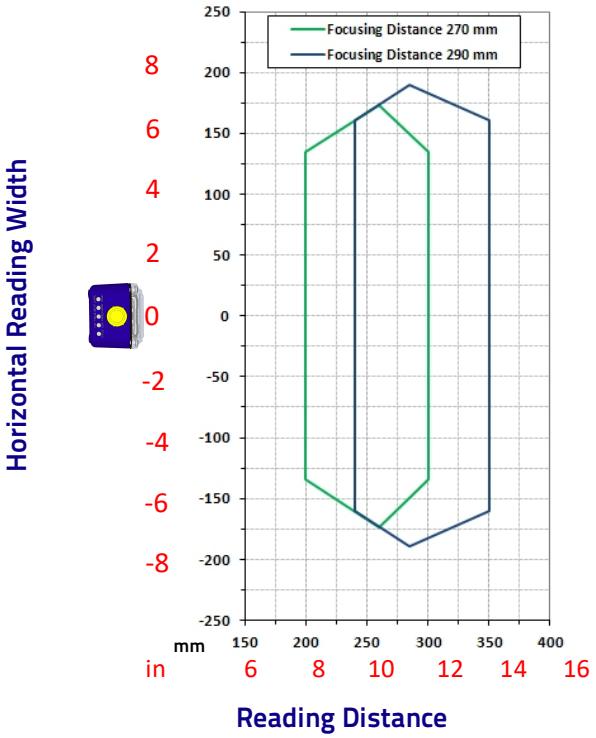
Code 128 0.38 mm (15 mils)



Conditions		
Hardware Settings		
Code Symbology	Code 128	
Code Resolution	0.38 mm (15 mils)	
Tilt Angle	0°	
Skew Angle	15°	
Focusing Distance (mm)	200	220
Software Parameters		
Internal Lighting	Very High Power Strobed	
411-0xx Wide Red		
Exposure Time (µs)	250	250
Gain	6	15

Matrix 300N 4x1-0xx (6 mm manual lens)

Code 128 0.50 mm (20 mils)

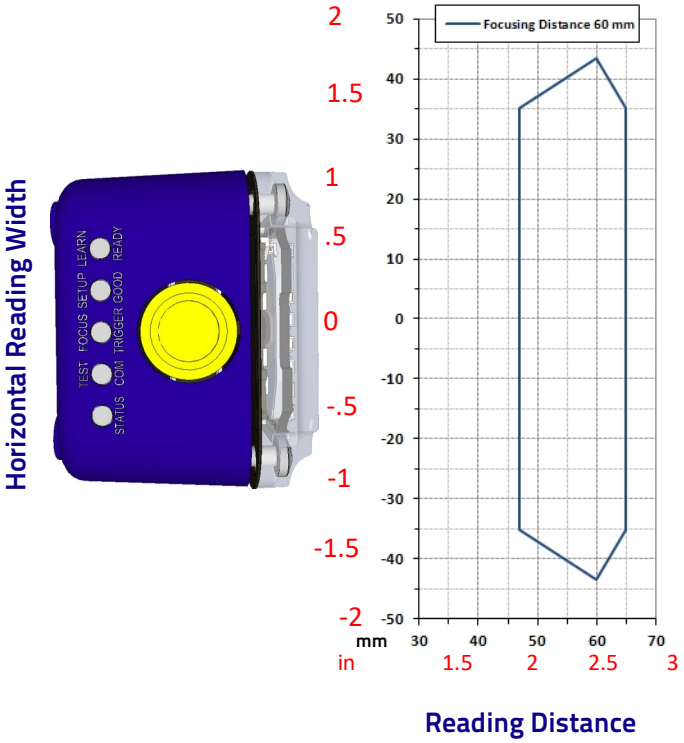


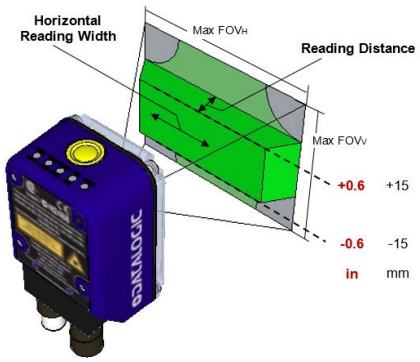
Conditions		
Hardware Settings		
Code Symbology	Code 128	
Code Resolution	0.50 mm (20 mils)	
Tilt Angle	0°	
Skew Angle	15°	
Focusing Distance (mm)	270	290
Software Parameters		
Internal Lighting	Very High Power Strobed	
411-0xx Wide Red		
Exposure Time (µs)	330	330
Gain	23	25

Matrix 300N 4x1-x00 (6 mm manual) 2D Codes (66°)

Matrix 300N 4x1-0xx (6 mm manual lens)

Data Matrix 0.19 mm (7.5 mils)





Due to the "fisheye" effect of the wide angle 6 mm lens, the reading area for higher resolution codes is limited to the central zone of the Vertical Field of View.

For these applications, **Image Cropping** is recommended above and below the central zone of the Vertical FOV, limiting image acquisition to the effective reading area and therefore increasing frame rate and reducing overall image processing time. See “Image Cropping” on page 147.

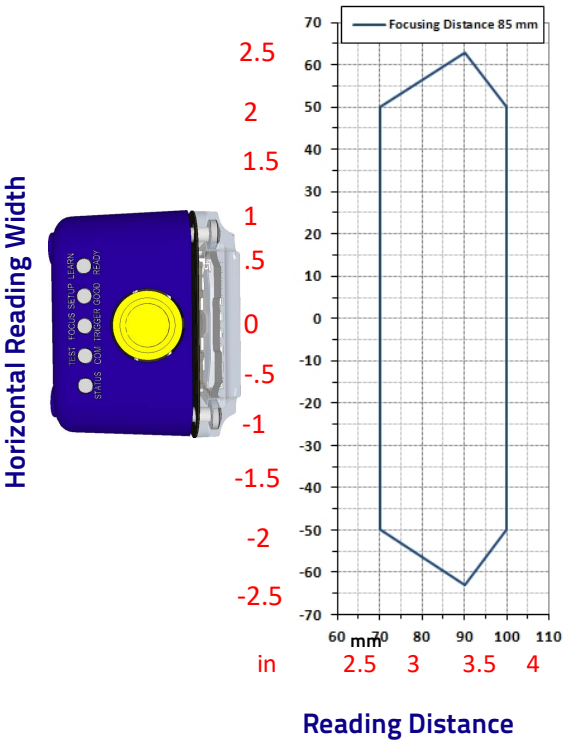
± 15 mm ≈ 550 pixels

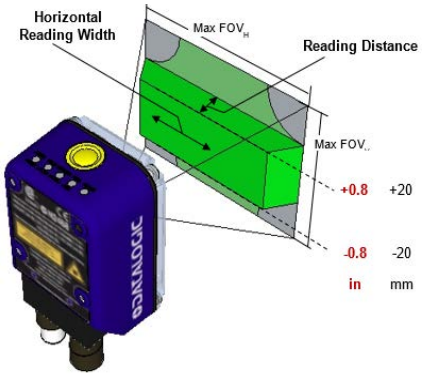
1. *Drag top of box to set* ***x,y coordinates*** ≅ **0,236**
2. *Drag bottom of box to set* ***vertical window dimensions*** ≅ **550 pixels**

Conditions	
Hardware Settings	
Code Symbology	Data Matrix ECC 200
Code Resolution	0.19 mm (7.5 mils)
Tilt Angle	45°
Skew Angle	0°
Focusing Distance (mm)	60
Software Parameters	
Internal Lighting	Very High Power Strobed
481-0xx MLT-DPM	
LED Group	Peripheral
Exposure Time (µs)	90
Gain	5

Matrix 300N 4x1-x00 (6 mm manual lens)

Data Matrix 0.25 mm (10 mils)





Due to the "fisheye" effect of the wide angle 6 mm lens, the reading area for higher resolution codes is limited to the central zone of the Vertical Field of View.

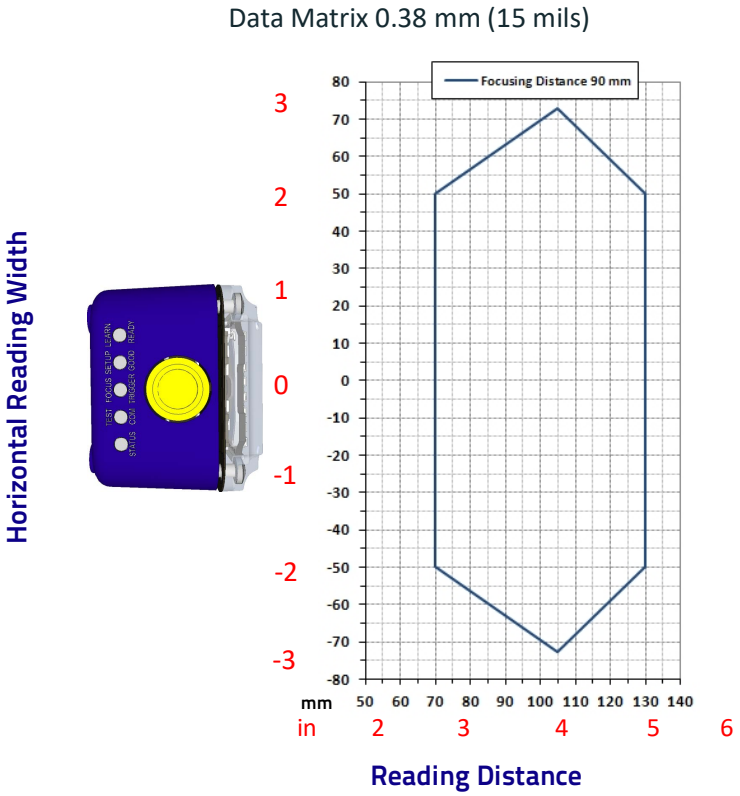
For these applications, **Image Cropping** is recommended above and below the central zone of the Vertical FOV, limiting image acquisition to the effective reading area and therefore increasing frame rate and reducing overall image processing time. See “Image Cropping” on page 147.

± 20 mm ≈ 512 pixels

1. *Drag top of box to set* ***x,y coordinates*** ≅ **0,255**
2. *Drag bottom of box to set* ***vertical window dimensions*** ≅ **512 pixels**

Conditions	
Hardware Settings	
Code Symbology	Data Matrix ECC 200
Code Resolution	0.25 mm (10 mils)
Tilt Angle	45°
Skew Angle	10°
Focusing Distance (mm)	85
Software Parameters	
Internal Lighting	Very High Power Strobed
411-0xx Wide red	
Exposure Time (µs)	170
Gain	4
481-0xx MLT-DPM	
Exposure Time (µs)	170
Gain	6

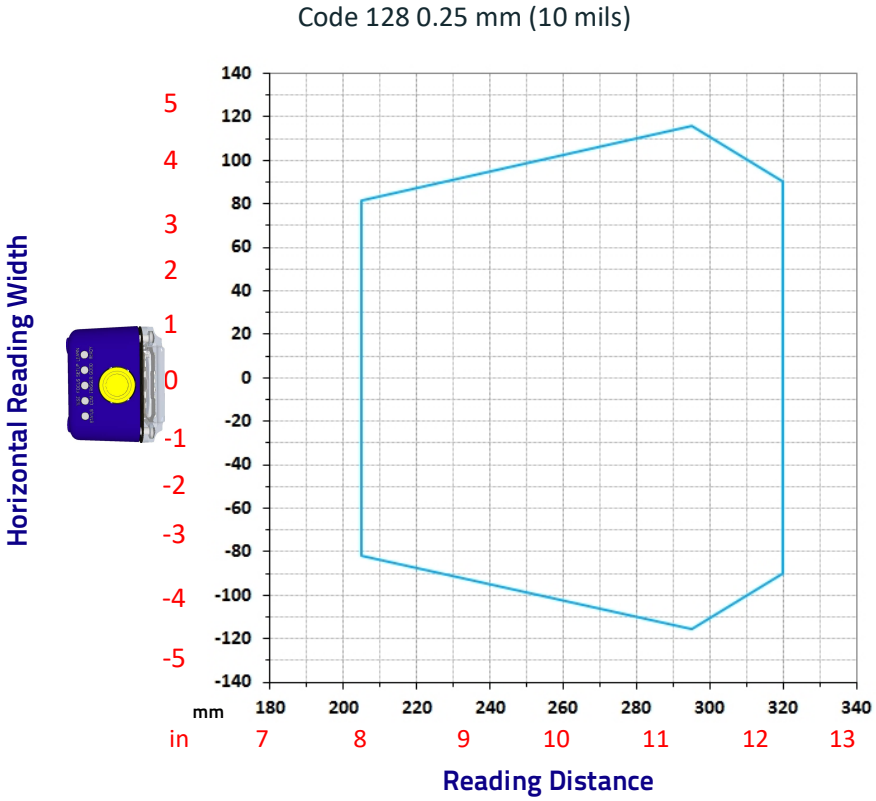
Matrix 300N 4x1-0xx (6 mm manual lens)



Conditions	
Hardware Settings	
Code Symbology	Data Matrix ECC 200
Code Resolution	0.38 mm (15 mils)
Tilt Angle	45°
Skew Angle	10°
Focusing Distance (mm)	90
Software Parameters	
Internal Lighting	Very High Power Strobed
411-0xx Wide Red	
Exposure Time (µs)	80
Gain	8
481-0xx MLT-DPM	
Exposure Time (µs)	80
Gain	12

Matrix 300N 4x3-0xx (9 mm manual) 1D Codes (41°)

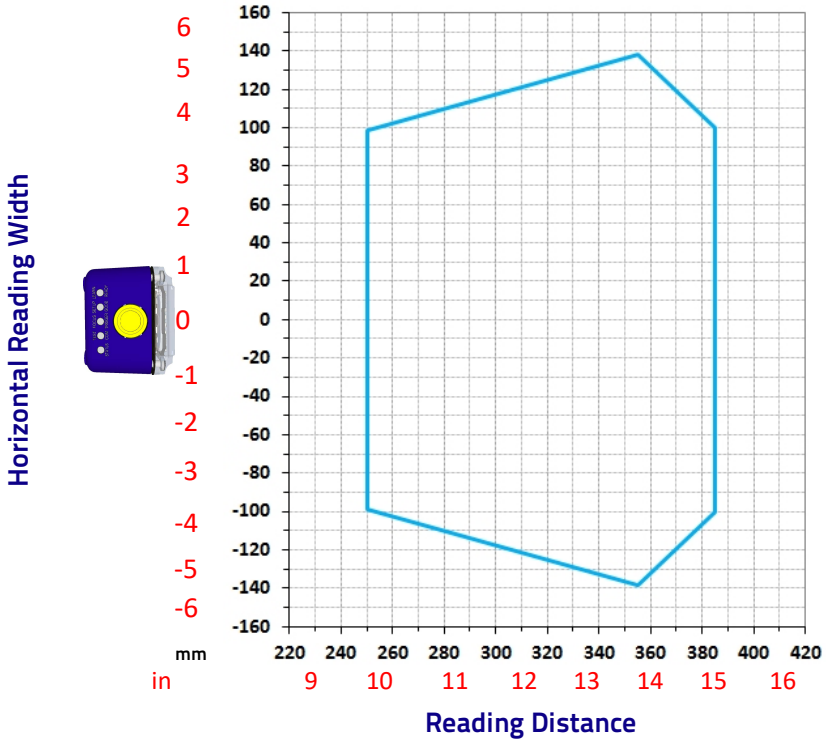
Matrix 300N 4x3-0xx (9 mm manual lens)



Conditions	
Hardware Settings	
Code Symbology	Code 128
Code Resolution	0.25 mm (10 mils)
Tilt Angle	45°
Skew Angle	15°
Focusing Distance (mm)	280
Software Parameters	
Internal Lighting	Very High Power Strobed
423-0xx Medium Red	
Exposure Time (µs)	166
Gain	11

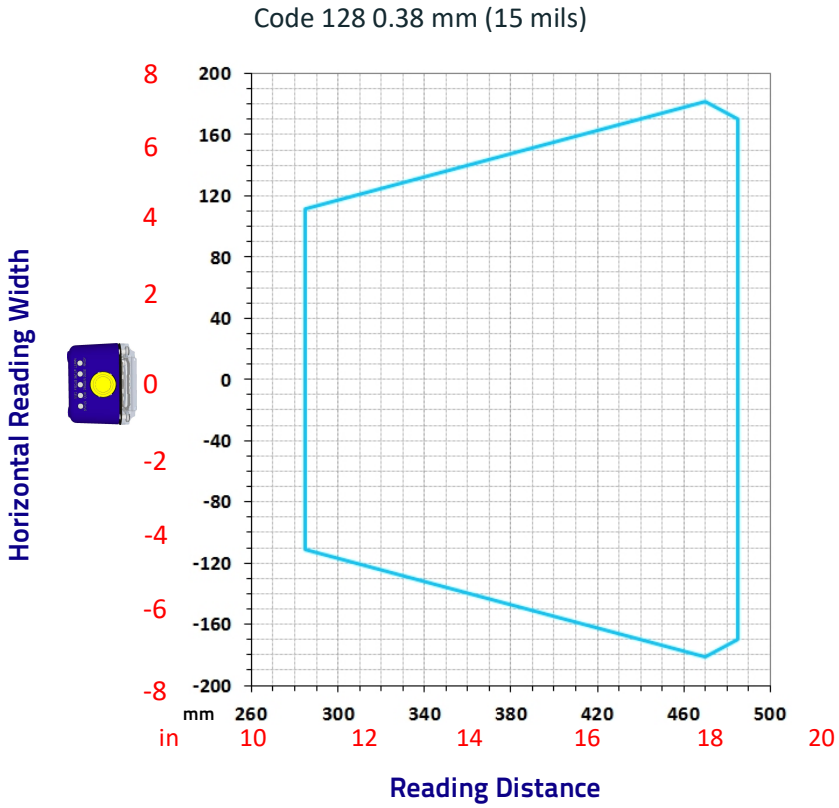
Matrix 300N 4x3-0xx (9 mm manual lens)

Code 128 0.30 mm (12 mils)



Conditions	
Hardware Settings	
Code Symbology	Code 128
Code Resolution	0.30 mm (12 mils)
Tilt Angle	45°
Skew Angle	15°
Focusing Distance (mm)	310
Software Parameters	
Internal Lighting	Very High Power Strobed
423-0xx Medium Red	
Exposure Time (µs)	200
Gain	14

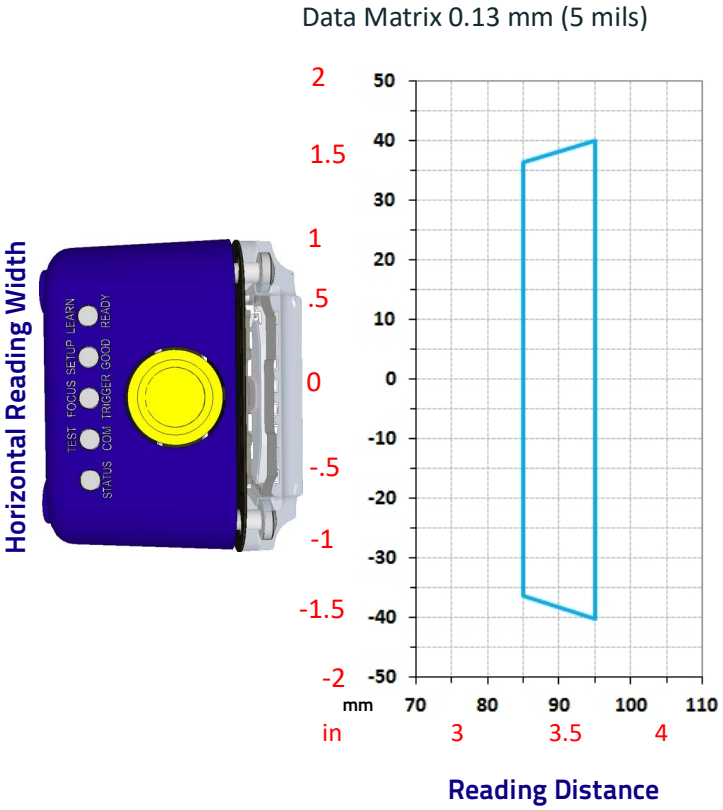
Matrix 300N 4x3-0xx (9 mm manual lens)



Conditions	
Hardware Settings	
Code Symbology	Code 128
Code Resolution	0.38 mm (15 mils)
Tilt Angle	45°
Skew Angle	15°
Focusing Distance (mm)	430
Software Parameters	
Internal Lighting	Very High Power Strobed
423-0xx Medium Red	
Exposure Time (µs)	305
Gain	20

Matrix 300N 4x3-0xx (9 mm manual) 2D Codes (41°)

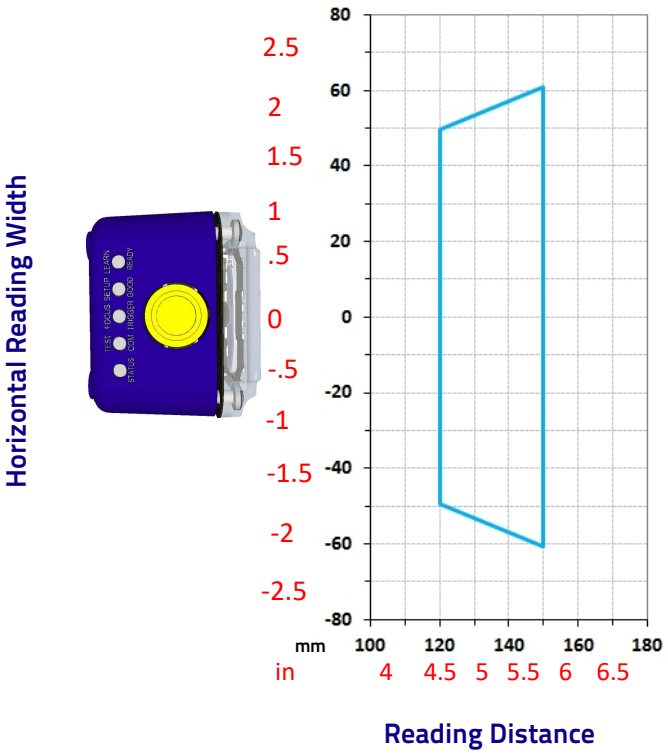
Matrix 300N 4x3-0xx (9 mm manual lens)



Conditions	
Hardware Settings	
Code Symbology	Data Matrix ECC 200
Code Resolution	0.13 mm (5 mils)
Tilt Angle	45°
Skew Angle	15°
Focusing Distance (mm)	91
Software Parameters	
Internal Lighting	Very High Power Strobed
423-0xx Medium Red	
Exposure Time (µs)	50
Gain	5

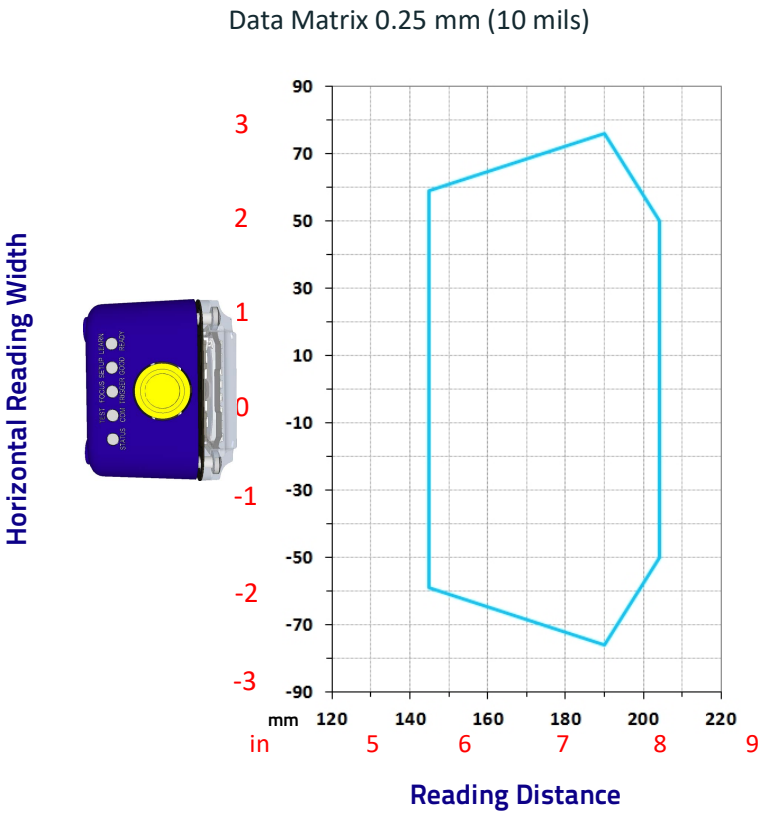
Matrix 300N 4x3-0xx (9 mm manual lens)

Data Matrix 0.19 mm (7.5 mils)



Conditions	
Hardware Settings	
Code Symbology	Data Matrix ECC 200
Code Resolution	0.19 mm (7.5 mils)
Tilt Angle	45°
Skew Angle	15°
Focusing Distance (mm)	135
Software Parameters	
Internal Lighting	Very High Power Strobed
423-0xx Medium Red	
Exposure Time (µs)	130
Gain	5

Matrix 300N 4x3-0xx (9 mm manual lens)

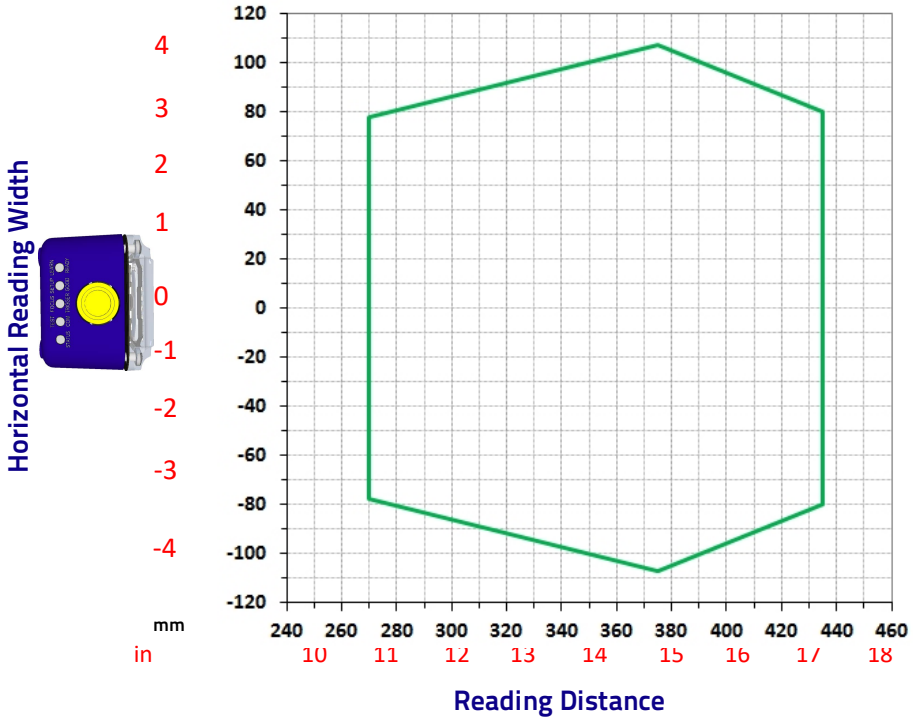


Conditions	
Hardware Settings	
Code Symbology	Data Matrix ECC 200
Code Resolution	0.25 mm (10 mils)
Tilt Angle	45°
Skew Angle	15°
Focusing Distance (mm)	180
Software Parameters	
Internal Lighting	Very High Power Strobed
423-0xx Medium Red	
Exposure Time (µs)	155
Gain	8
453-0xx Wide White	
Exposure Time (µs)	230
Gain	12
473-0xx LT-DPM	
Exposure Time (µs)	330
Gain	12
483-0xx MLT-DPM	
Exposure Time (µs)	310
Gain	8

Matrix 300N 4x4-0xx (12 mm manual) 1D Codes (32°)

Matrix 300N 4x4-0xx (12 mm manual lens)

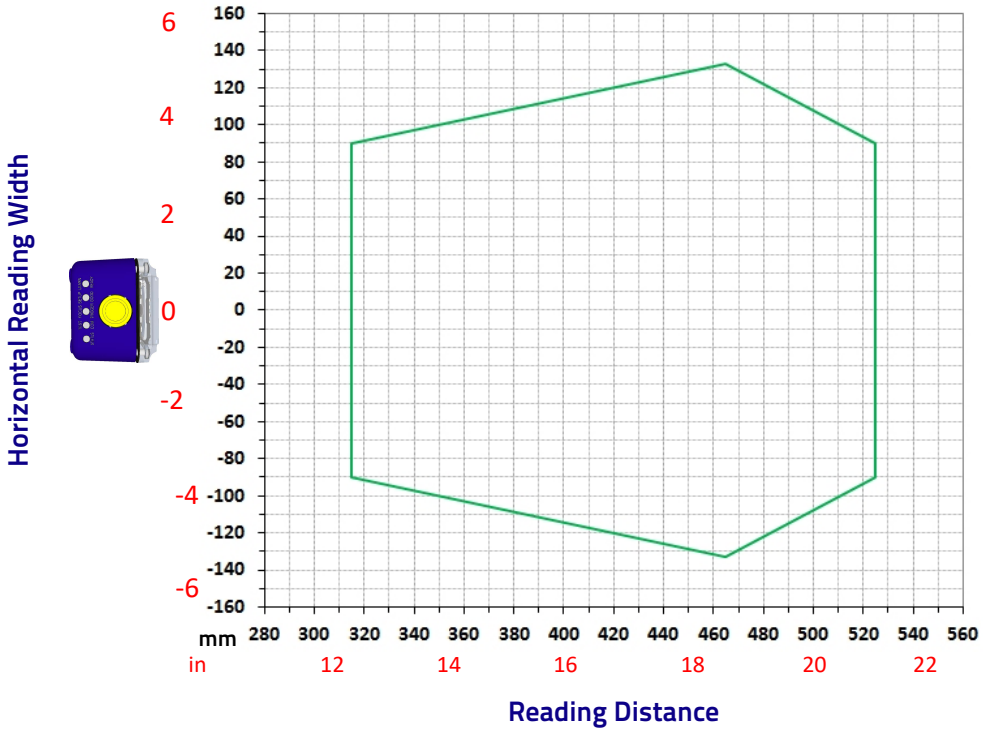
Code 128 0.25 mm (10 mils)



Conditions	
Hardware Settings	
Code Symbology	Code 128
Code Resolution	0.25 mm (10 mils)
Tilt Angle	45°
Skew Angle	15°
Focusing Distance (mm)	380
Software Parameters	
Internal Lighting	Very High Power Strobed
434-0xx Narrow Red	
Exposure Time (µs)	210
Gain	10

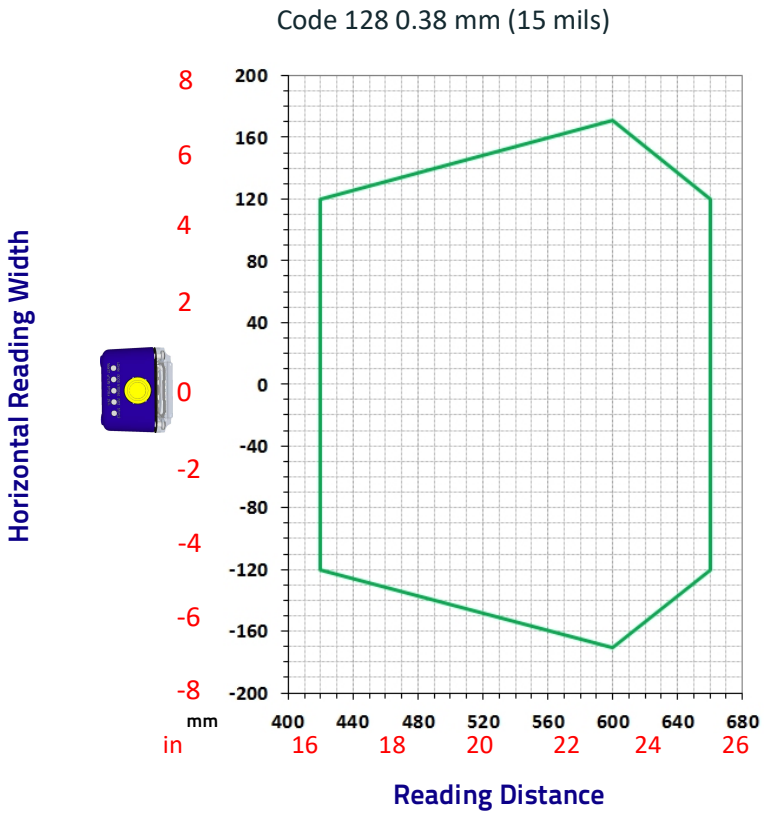
Matrix 300N 4x4-0xx (12 mm manual lens)

Code 128 0.30 mm (12 mils)



Conditions	
Hardware Settings	
Code Symbology	Code 128
Code Resolution	0.30 mm (12 mils)
Tilt Angle	45°
Skew Angle	15°
Focusing Distance (mm)	415
Software Parameters	
Internal Lighting	Very High Power Strobed
434-0xx Narrow Red	
Exposure Time (µs)	250
Gain	9

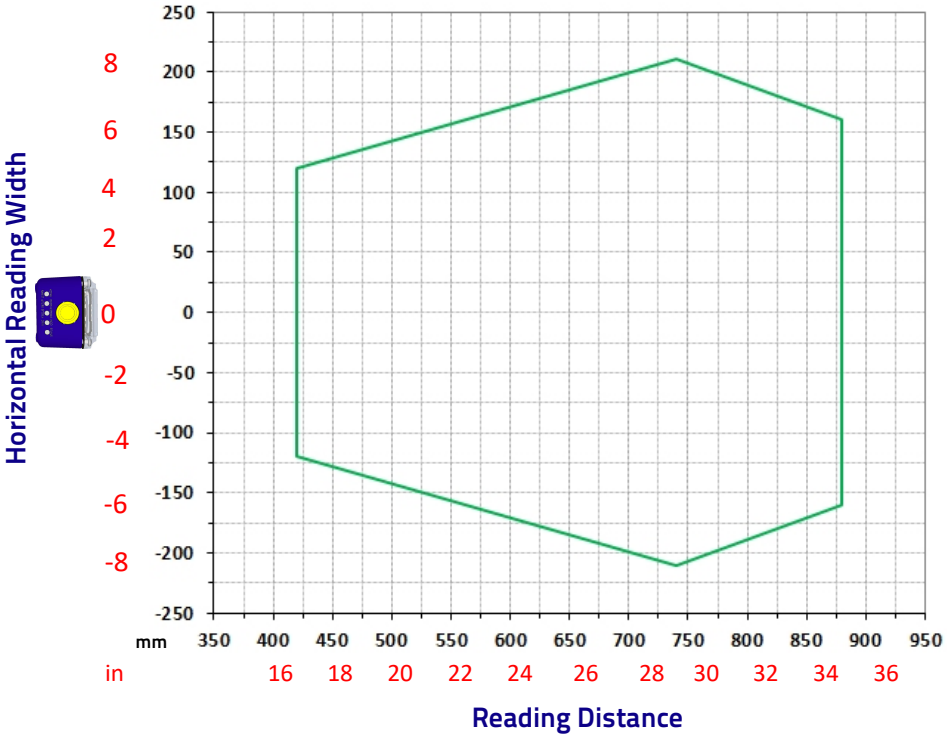
Matrix 300N 4x4-0xx (12 mm manual lens)



Conditions	
Hardware Settings	
Code Symbology	Code 128
Code Resolution	0.38 mm (15 mils)
Tilt Angle	45°
Skew Angle	15°
Focusing Distance (mm)	500
Software Parameters	
Internal Lighting	Very High Power Strobed
434-0xx Narrow Red	
Exposure Time (µs)	250
Gain	12

Matrix 300N 4x4-0xx (12 mm manual lens)

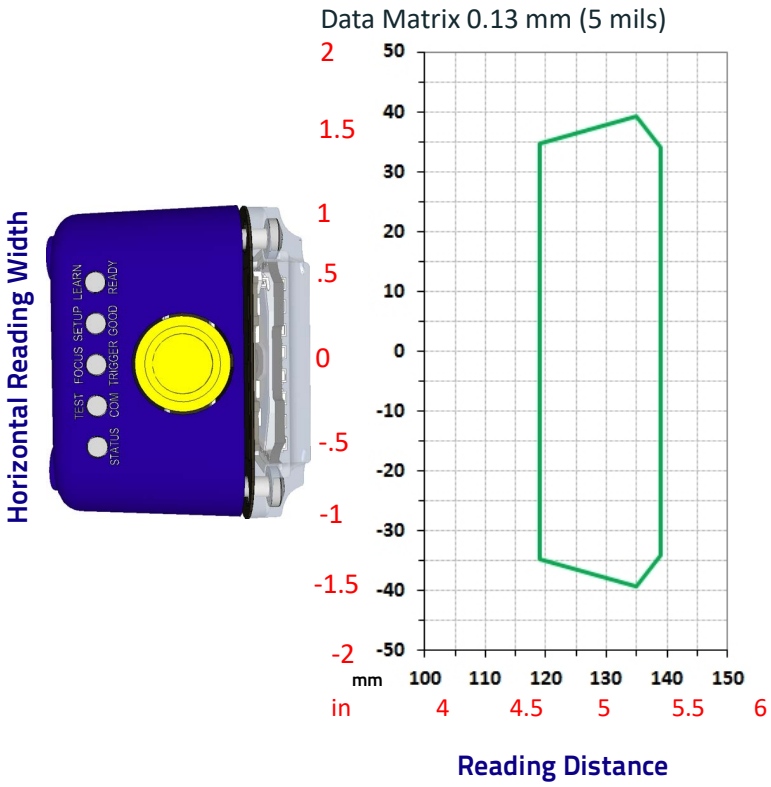
Code 128 0.50 mm (20 mils)



Conditions	
Hardware Settings	
Code Symbology	Code 128
Code Resolution	0.50 mm (20 mils)
Tilt Angle	45°
Skew Angle	15°
Focusing Distance (mm)	740
Software Parameters	
Internal Lighting	Very High Power Strobed
434-0xx Narrow Red	
Exposure Time (µs)	330
Gain	17

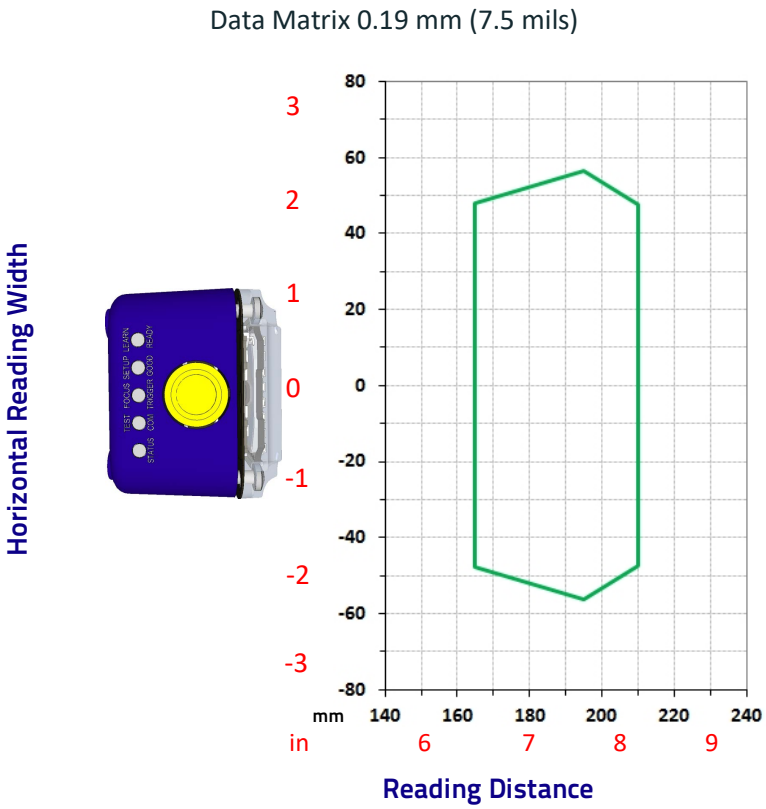
Matrix 300N 4x4-0xx (12 mm manual) 2D Codes (32°)

Matrix 300N 4x4-0xx (12 mm manual lens)



Conditions	
Hardware Settings	
Code Symbology	Data Matrix ECC 200
Code Resolution	0.13 mm (5 mils)
Tilt Angle	45°
Skew Angle	15°
Focusing Distance (mm)	133
Software Parameters	
Internal Lighting	Very High Power Strobed
434-0xx Narrow Red	
Exposure Time (µs)	45
Gain	5

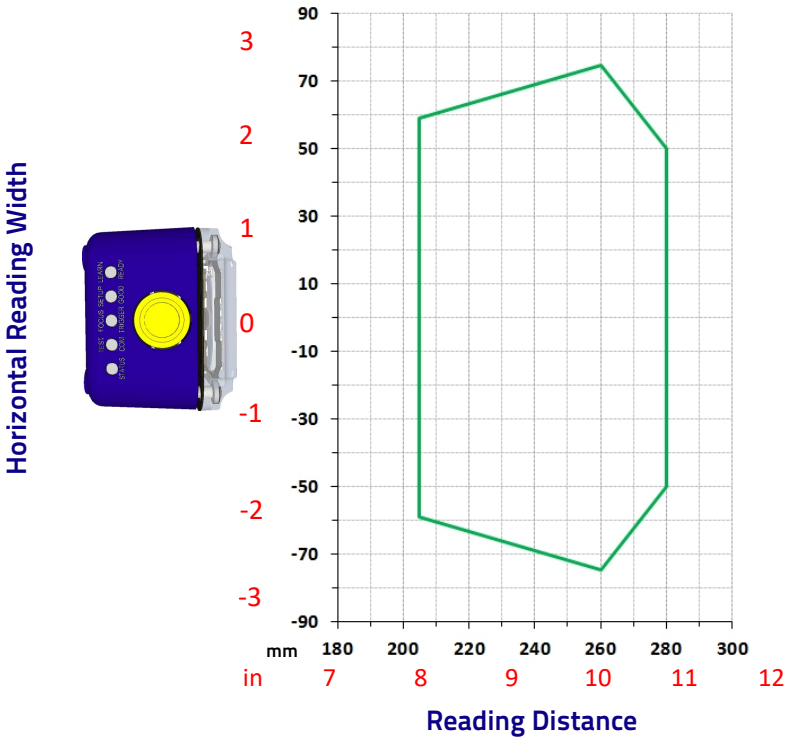
Matrix 300N 4x4-0xx (12 mm manual lens)



Conditions	
Hardware Settings	
Code Symbology	Data Matrix ECC 200
Code Resolution	0.19 mm (7.5 mils)
Tilt Angle	45°
Skew Angle	15°
Focusing Distance (mm)	195
Software Parameters	
Internal Lighting	Very High Power Strobed
434-0xx Narrow Red	
Exposure Time (µs)	90
Gain	5

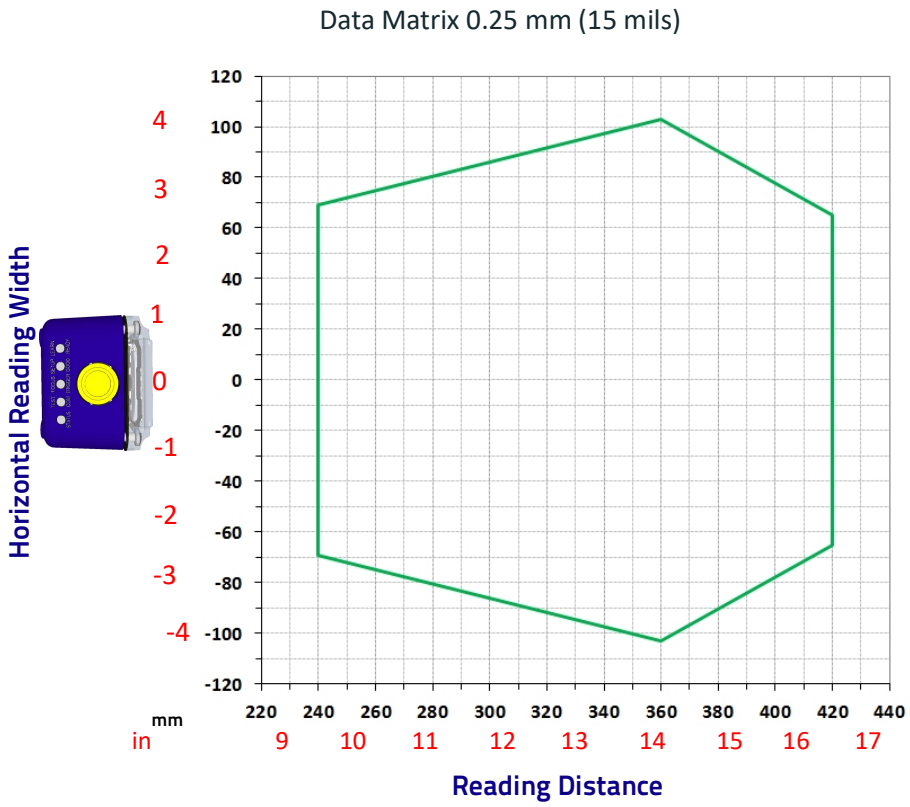
Matrix 300N 4x4-0xx (12 mm manual lens)

Data Matrix 0.25 mm (10 mils)



Conditions	
Hardware Settings	
Code Symbology	Data Matrix ECC 200
Code Resolution	0.25 mm (10 mils)
Tilt Angle	45°
Skew Angle	15°
Focusing Distance (mm)	250
Software Parameters	
Internal Lighting	Very High Power Strobed
434-0xx Narrow Red	
Exposure Time (µs)	150
Gain	8
464-0xx Narrow White	
Exposure Time (µs)	150
Gain	12

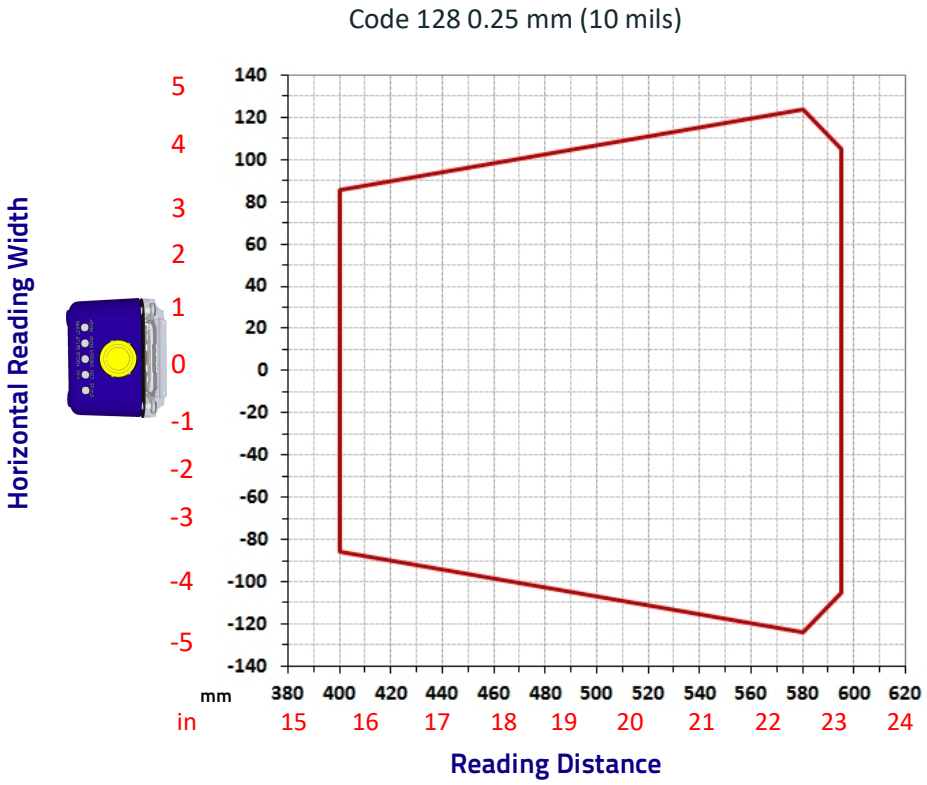
Matrix 300N 4x4-0xx (12 mm manual lens)



Conditions	
Hardware Settings	
Code Symbology	Code 128
Code Resolution	0.38 mm (15 mils)
Tilt Angle	45°
Skew Angle	15°
Focusing Distance (mm)	355
Software Parameters	
Internal Lighting	Very High Power Strobed
434-0xx Narrow Red	
Exposure Time (µs)	250
Gain	6

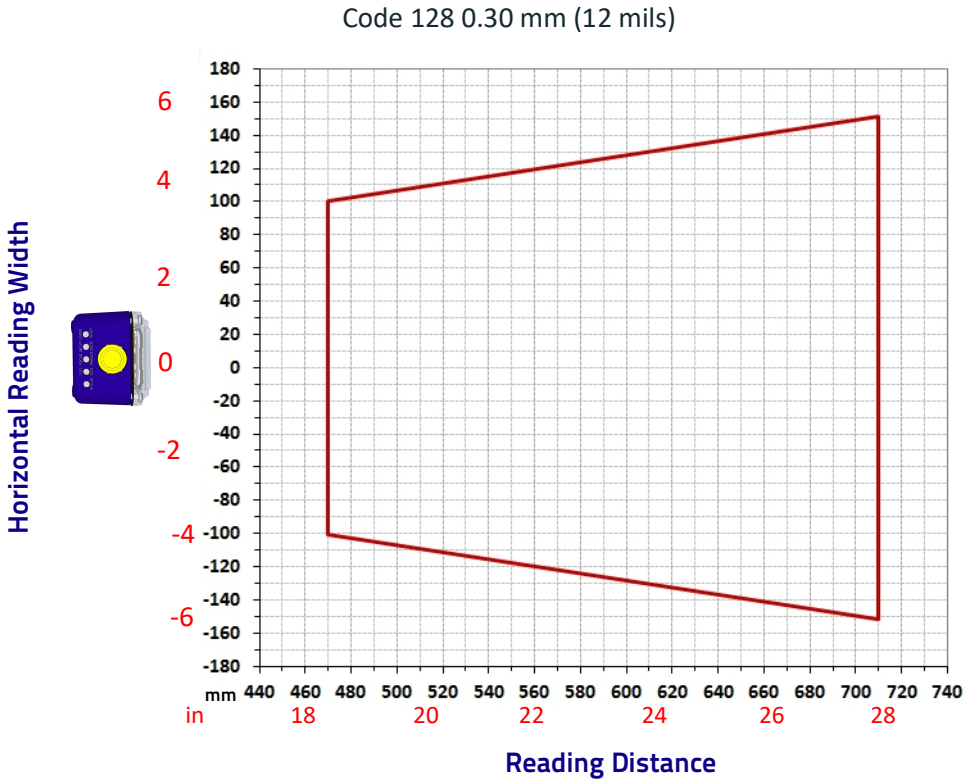
Matrix 300N 4x5-0xx (16 mm manual) 1D Codes (24°)

Matrix 300N 4x5-0xx (16 mm manual lens)



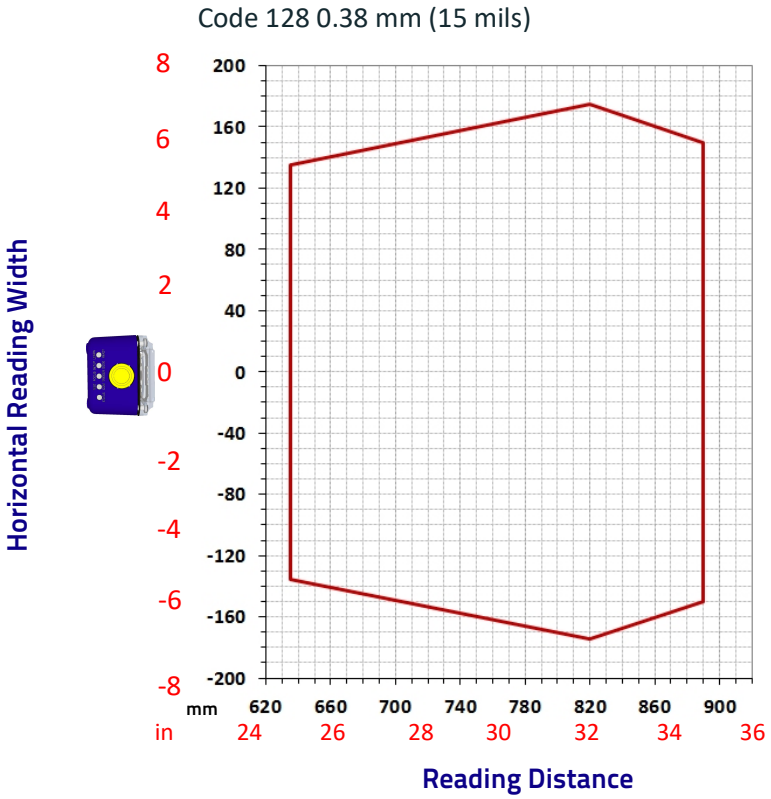
Conditions	
Hardware Settings	
Code Symbology	Code 128
Code Resolution	0.25 mm (10 mils)
Tilt Angle	45°
Skew Angle	15°
Focusing Distance (mm)	500
Software Parameters	
Internal Lighting	Very High Power Strobed
435-0xx Narrow Red	
Exposure Time (µs)	250
Gain	16

Matrix 300N 4x5-0xx (16 mm manual lens)



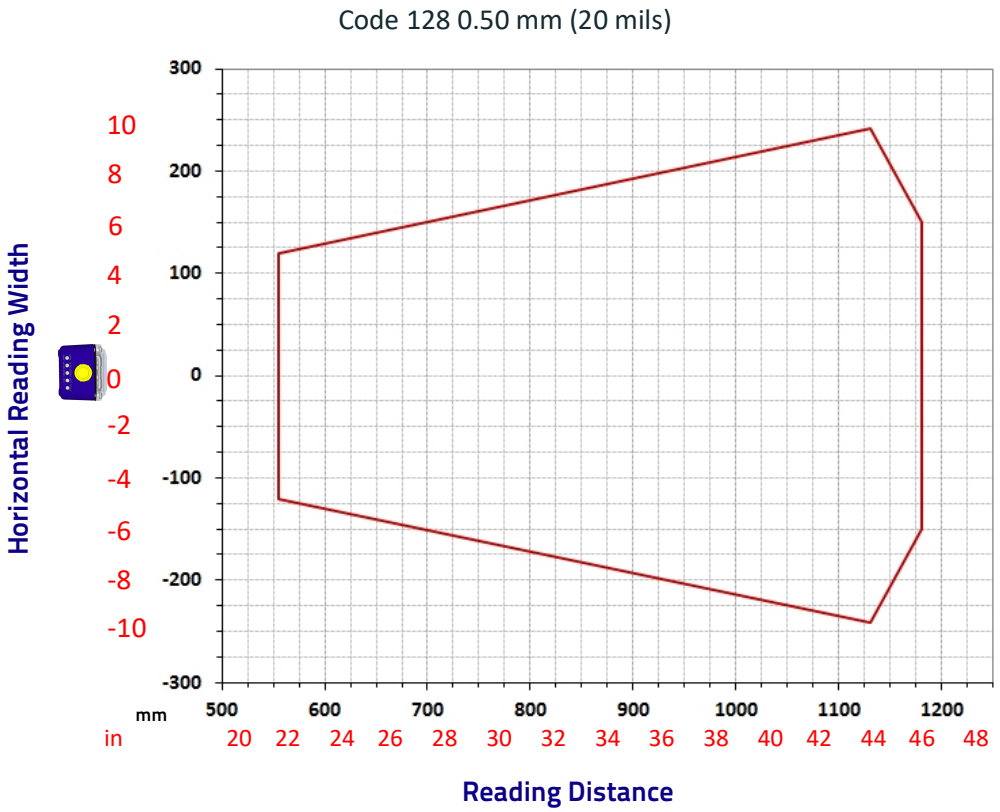
Conditions	
Hardware Settings	
Code Symbology	Code 128
Code Resolution	0.30 mm (12 mils)
Tilt Angle	45°
Skew Angle	15°
Focusing Distance (mm)	590
Software Parameters	
Internal Lighting	Very High Power Strobed
435-0xx Narrow Red	
Exposure Time (µs)	300
Gain	19

Matrix 300N 4x5-0xx (16 mm manual lens)



Conditions	
Hardware Settings	
Code Symbology	Code 128
Code Resolution	0.38 mm (15 mils)
Tilt Angle	45°
Skew Angle	15°
Focusing Distance (mm)	700
Software Parameters	
Internal Lighting	Very High Power Strobed
435-0xx Narrow Red	
Exposure Time (µs)	500
Gain	24

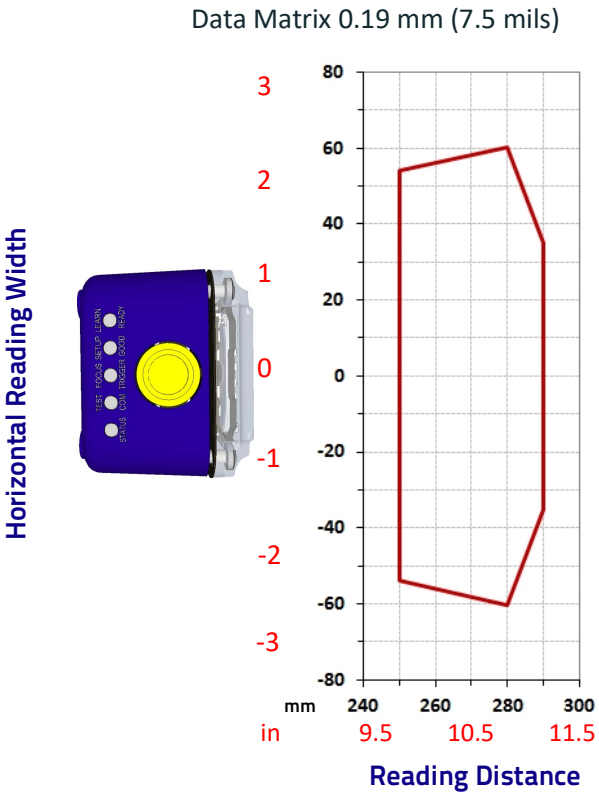
Matrix 300N 4x5-0xx (16 mm manual lens)



Conditions	
Hardware Settings	
Code Symbology	Code 128
Code Resolution	0.50 mm (20 mils)
Tilt Angle	45°
Skew Angle	15°
Focusing Distance (mm)	900
Software Parameters	
Internal Lighting	Very High Power Strobed
435-0xx Narrow Red	
Exposure Time (µs)	500
Gain	19

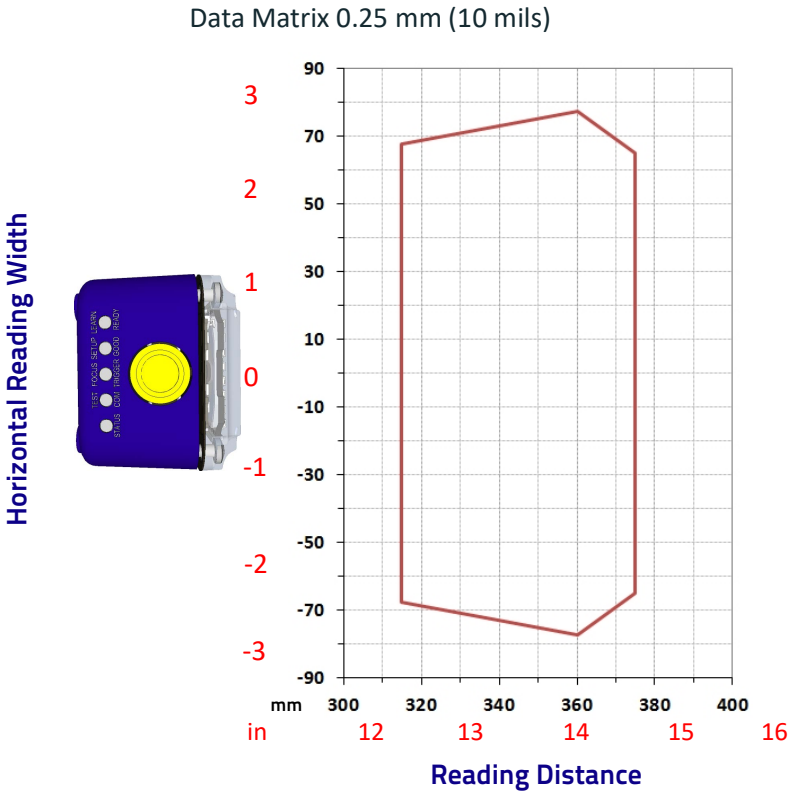
Matrix 300N 4x5-0xx (16 mm manual) 2D Codes (24°)

Matrix 300N 4x5-0xx (16 mm manual lens)



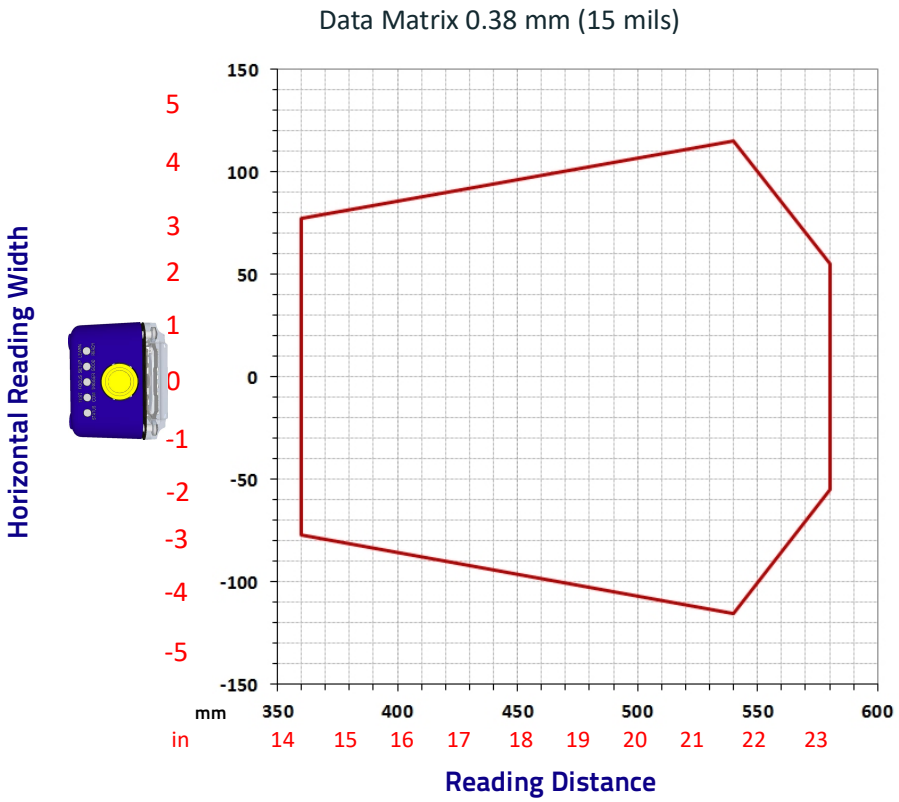
Conditions	
Hardware Settings	
Code Symbology	Data Matrix ECC 200
Code Resolution	0.19 mm (7.5 mils)
Tilt Angle	45°
Skew Angle	15°
Focusing Distance (mm)	275
Software Parameters	
Internal Lighting	Very High Power Strobed
435-0xx Narrow Red	
Exposure Time (µs)	190
Gain	7

Matrix 300N 4x5-0xx (16 mm manual lens)



Conditions	
Hardware Settings	
Code Symbology	Data Matrix ECC 200
Code Resolution	0.25 mm (10 mils)
Tilt Angle	45°
Skew Angle	15°
Focusing Distance (mm)	340
Software Parameters	
Internal Lighting	Very High Power Strobed
434-0xx Narrow Red	
Exposure Time (µs)	270
Gain	8
465-0xx Narrow White	
Exposure Time (µs)	270
Gain	8

Matrix 300N 4x5-0xx (16 mm manual lens)



Conditions	
Hardware Settings	
Code Symbology	Data Matrix ECC 200
Code Resolution	0.38 mm (15 mils)
Tilt Angle	45°
Skew Angle	15°
Focusing Distance (mm)	495
Software Parameters	
Internal Lighting	Very High Power Strobed
435-0xx Narrow Red	
Exposure Time (µs)	380
Gain	12

MAXIMUM LINE SPEED AND EXPOSURE TIME CALCULATIONS

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

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



NOTE

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

Assuming:

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

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

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

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

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

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

Example

A Matrix 300N using:

Internal Lighting Mode = Very High Power Strobe
Exposure Time = 100 µs
Code Resolution (X) = 0.254 mm (10 mils)

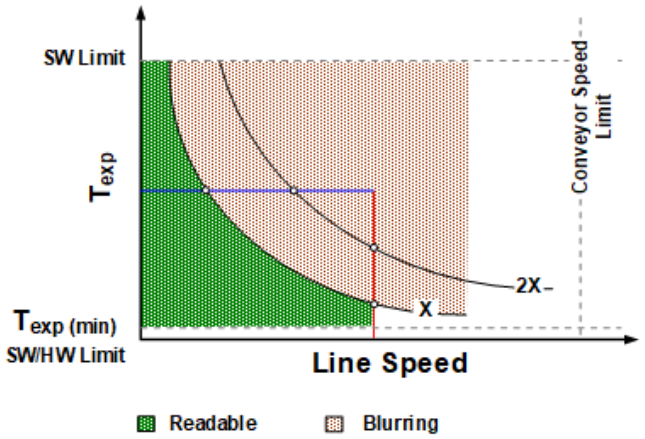
has a maximum line speed of:

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

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

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

$T_{exp\ (max)}$ 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;
- -*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.

CHAPTER 7
SOFTWARE CONFIGURATION

Software configuration of your Matrix 300N 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, Steps 3-4.

For the majority of applications however you will use DL.CODE, connecting to the reader through the on-board Ethernet interface. See Chapter 1, Steps 5-6.

DL.CODE SYSTEM REQUIREMENTS



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: 7, 8, or 10
- 1 GB RAM
- 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)



The Windows XP operating system is no longer supported by DL.CODE.

READER CONFIGURATION

For an example of Matrix device configuration see the example in Chapter 1, Steps 5-6.

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.

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.

Auto-Calibration

DL.CODE provides the **Image Auto-Setup** tool to maximize the reading performance by tuning the acquisition parameters (photometry) automatically. By selecting the **Image Auto-Setup** tool from the Image Settings branch in the Advanced Setup step, the following window appears:

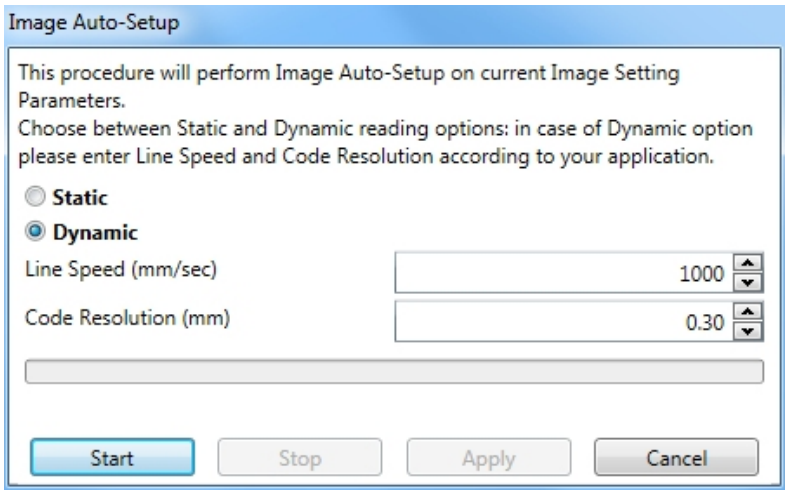


Figure 87 - Image Auto-Setup

Select the Static or Dynamic Self-Tuning option; Start Image Auto-Setup and Apply to the Image Settings. The Advanced Setup window works interactively so that you can see the results of the parameter setting changes as well as the decoding results (Results panel).

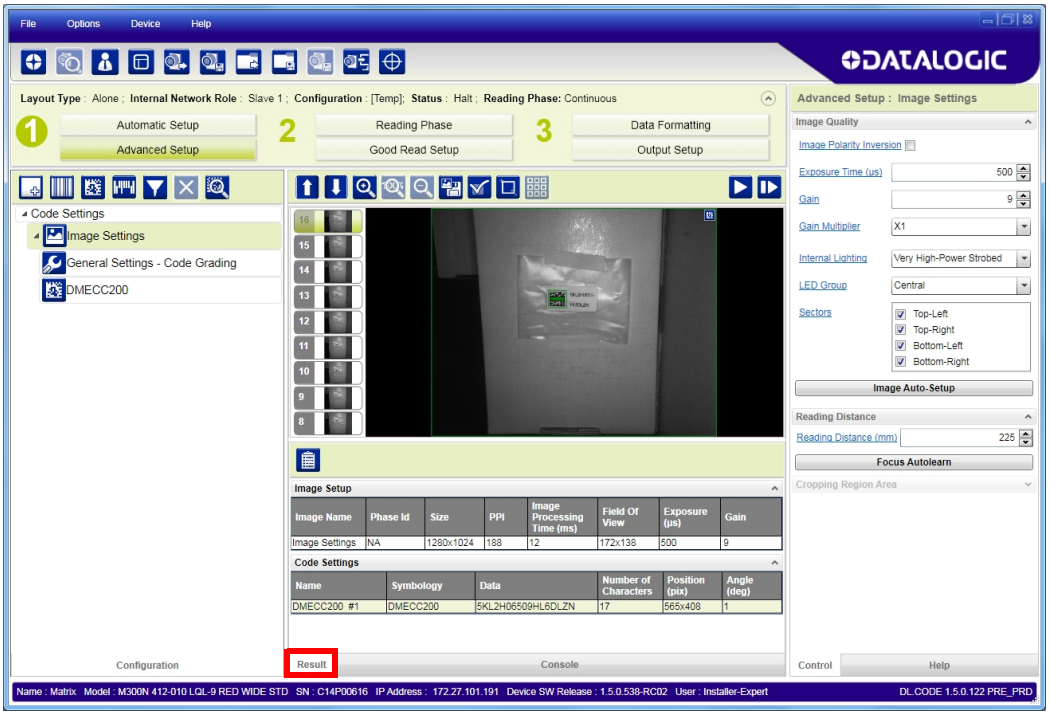


Figure 88 - Decoding Results OK

Manual Calibration

The following examples show some of the typical conditions occurring during the installation and how they can be tuned manually:

Under-exposure

To correct this result it is recommended to change the following parameters in their order of appearance:

1. increase the **Exposure Time**
2. increase the **Gain**

NOTE

In general, a longer exposure time corresponds to a lighter image but is susceptible to blurring due to code movement. Exposure time is also limited by the Internal Lighting mode parameter. Longer exposure times can be set if the power strobe level is lowered.

High gain settings may produce a grainy image that may affect the decoding process.

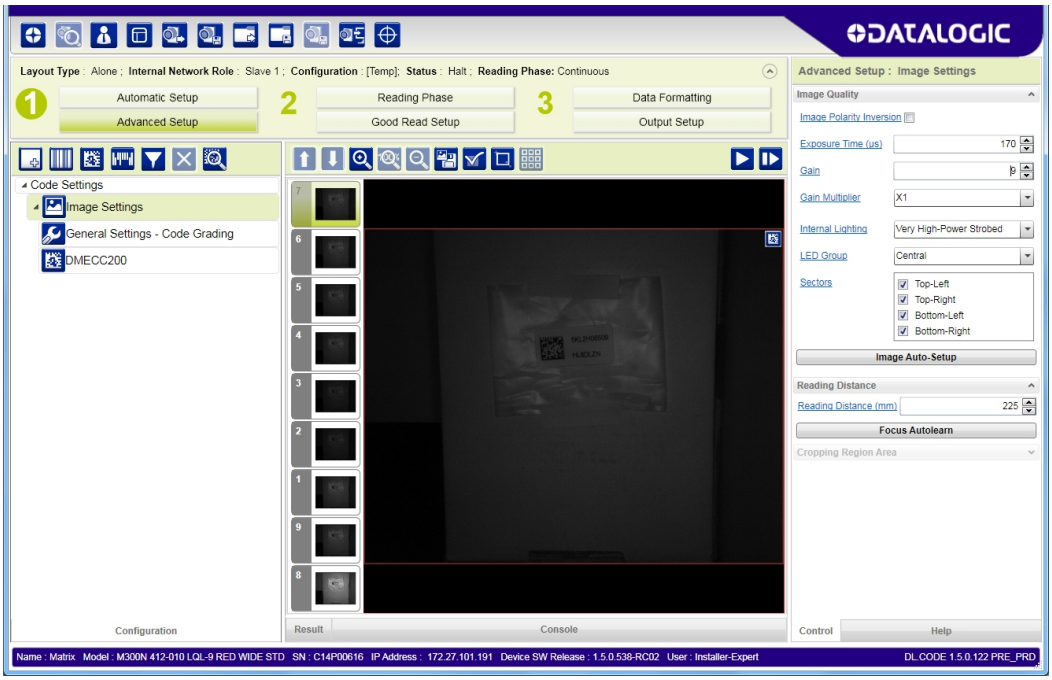


Figure 89 - Example Under Exposure: Too Dark

Over-exposure

To correct this result it is recommended to change the following parameters in their order of appearance:

1. decrease the **Gain**
2. decrease the **Exposure Time**

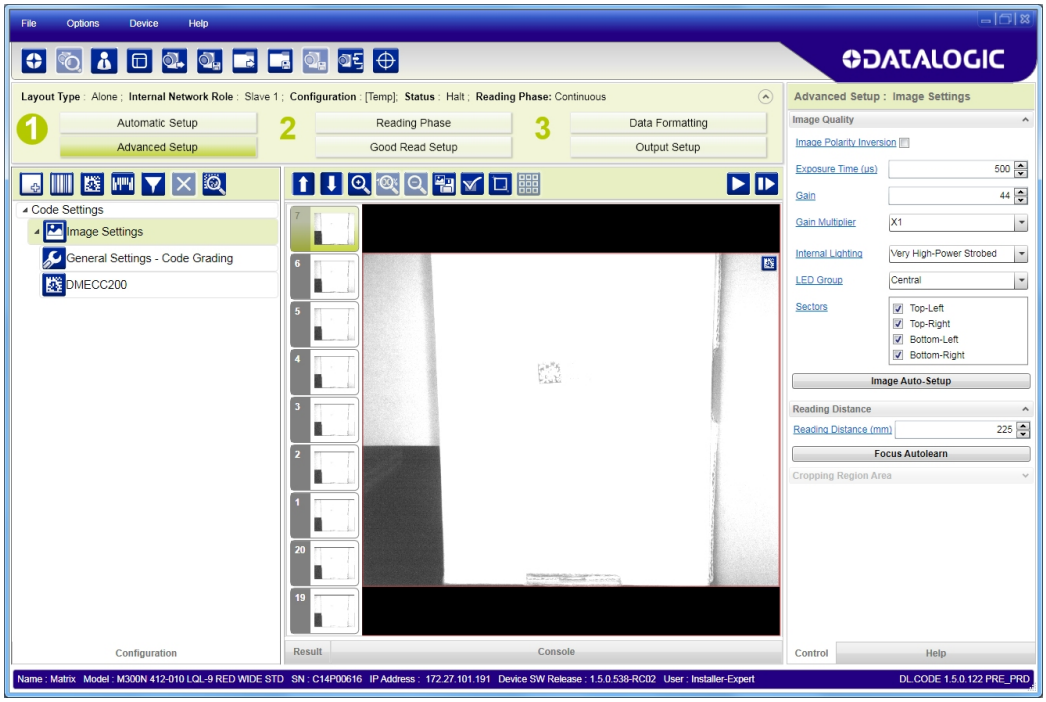


Figure 90 - Example Over Exposure: Too Light

Moving code out of the Field of View

To correct this result and have the code completely visible in FOV, it is possible to follow one or both the procedures listed below:

- reposition the reader
- use the **Delay on Trigger** and set the **Time** or **Space** values.

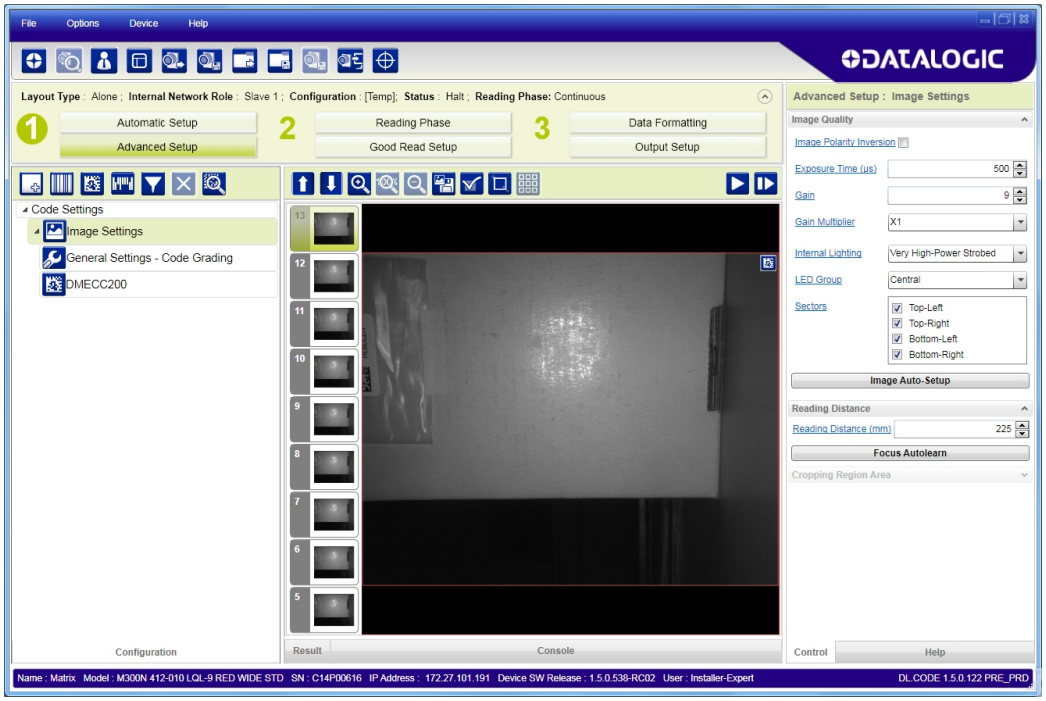


Figure 91 - Example Out of FOV

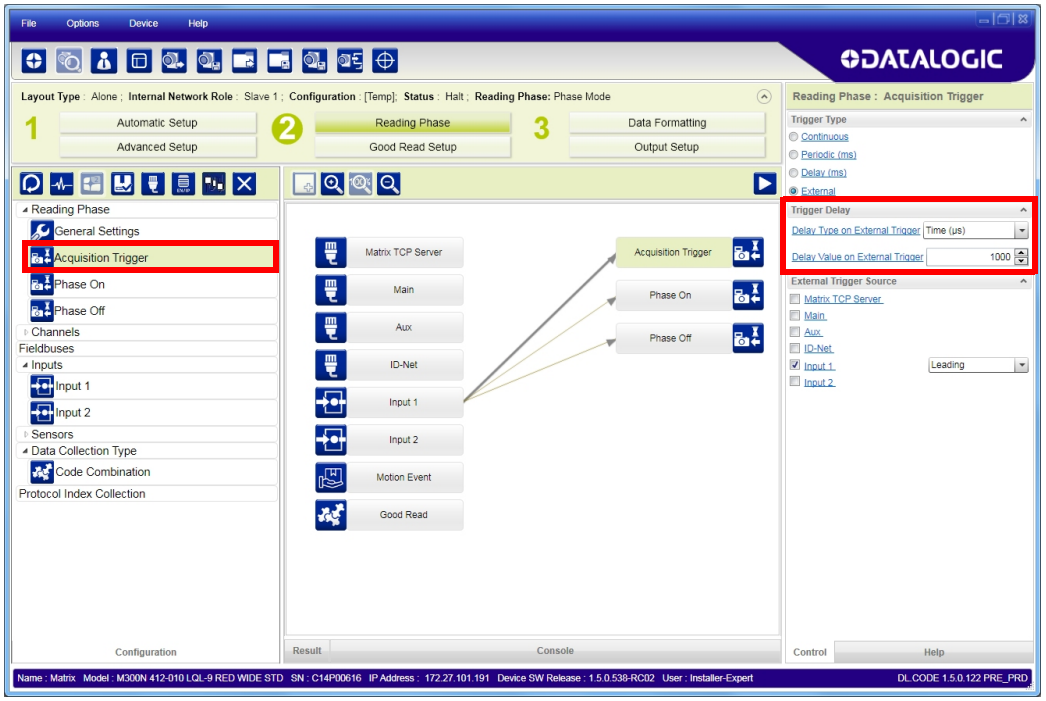


Figure 92 - Add Delay on Trigger to Correct Out of FOV

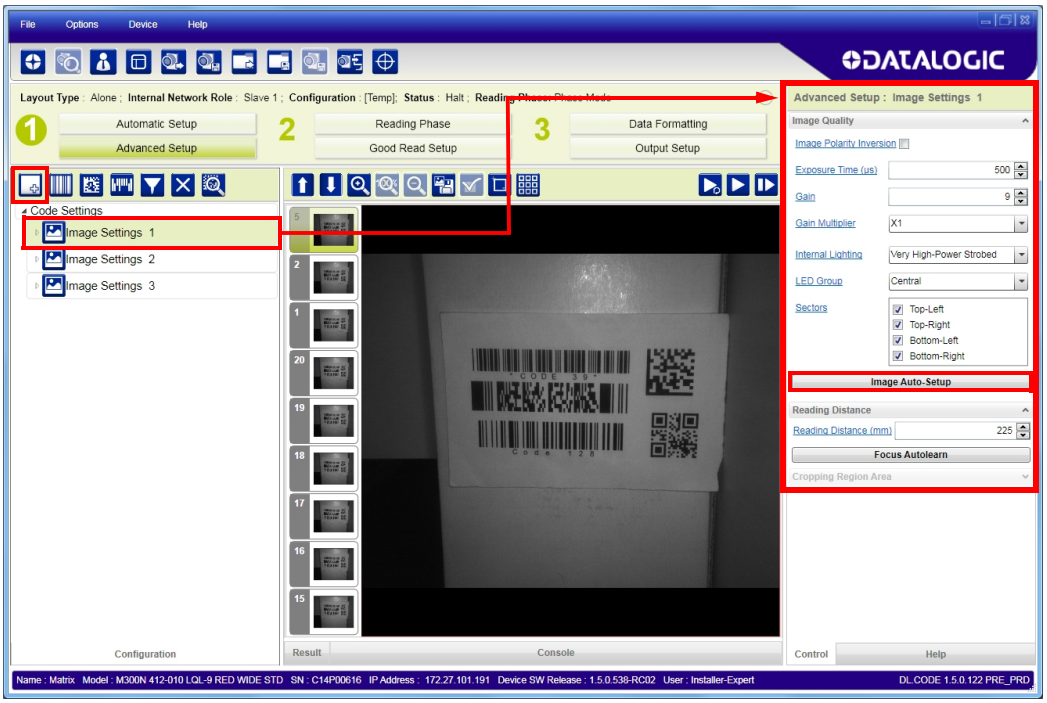
MULTI IMAGE ACQUISITION SETTINGS

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

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

This feature is available for all Operating Modes.

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

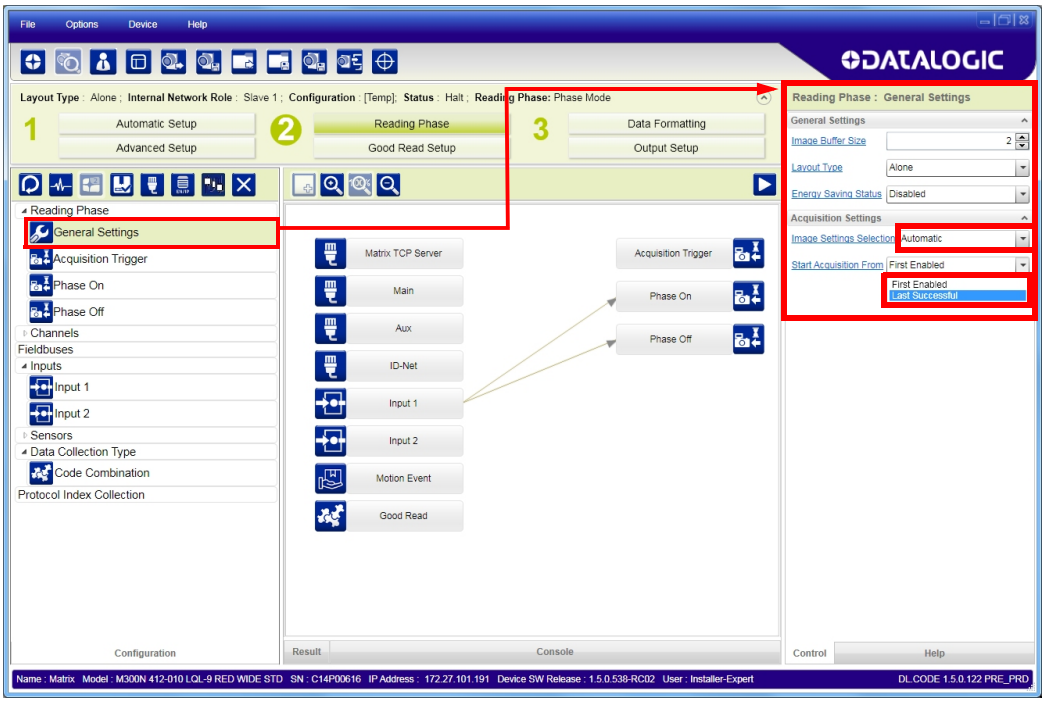


For each Image Setting condition start **Image Auto-Setup**, select the Static or Dynamic Self-Tuning option; and Apply it.

Automatic Image Settings Selection

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

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



NOTE

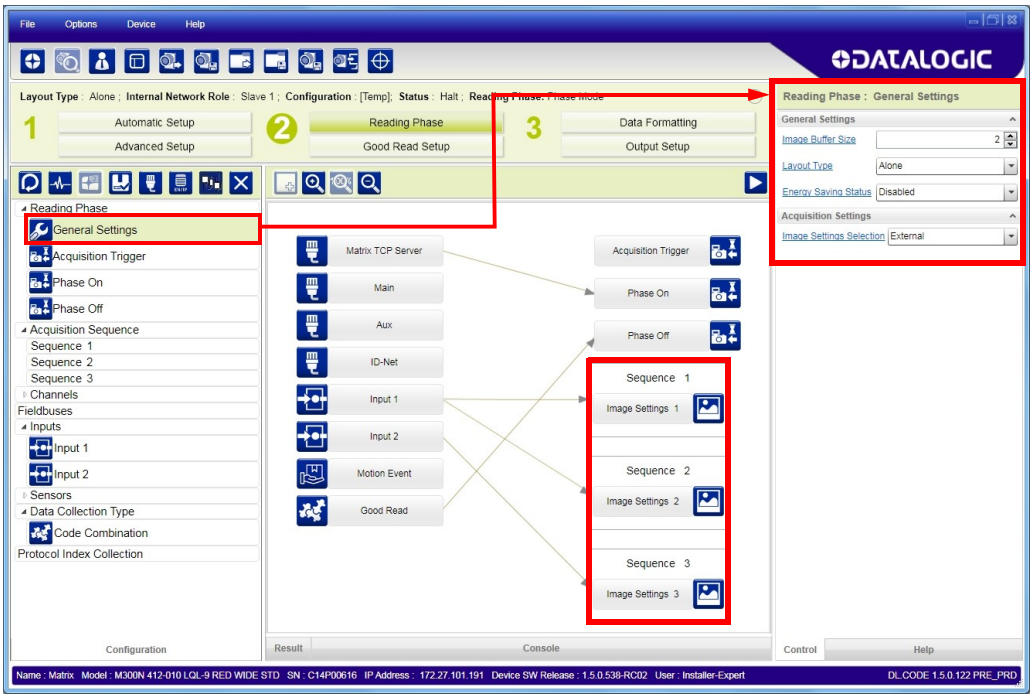
Applications typically require more than one acquisition to obtain sufficient Good Read percentages. This means that for *N* acquisitions we will surely have captured the correct lighting condition but we will also have captured some acquisitions with the wrong lighting condition. A consequence then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

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

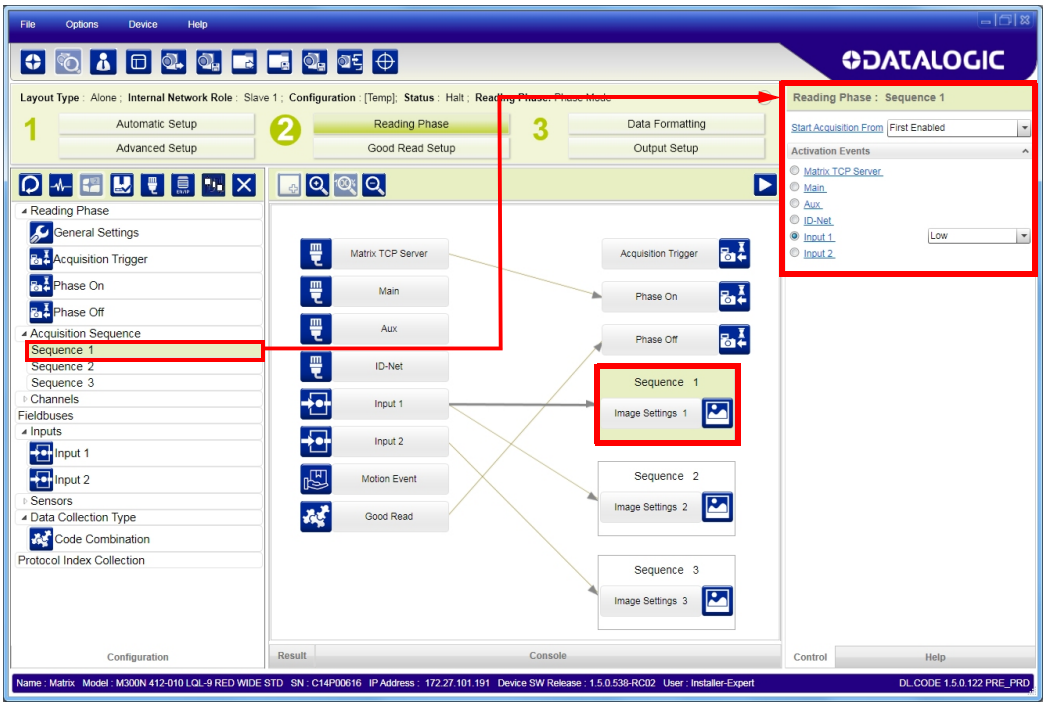
External Image Settings Selection

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

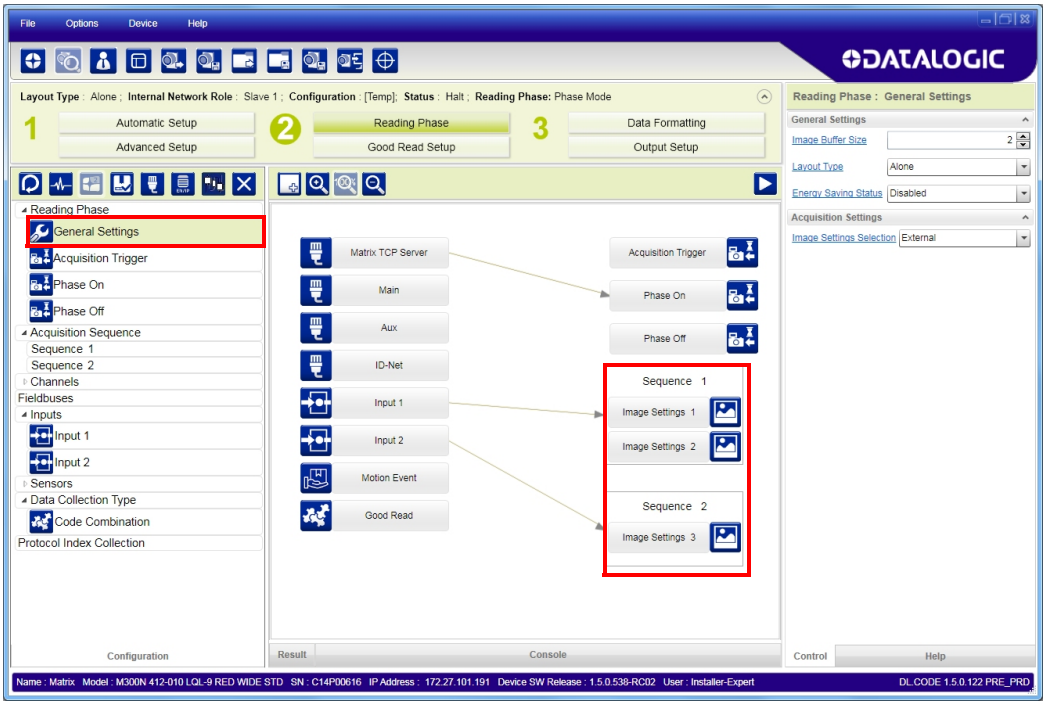
When the **Image Settings Selection** is **External**, Acquisition Sequences are created and by default each Image Setting has its own Acquisition Sequence.



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

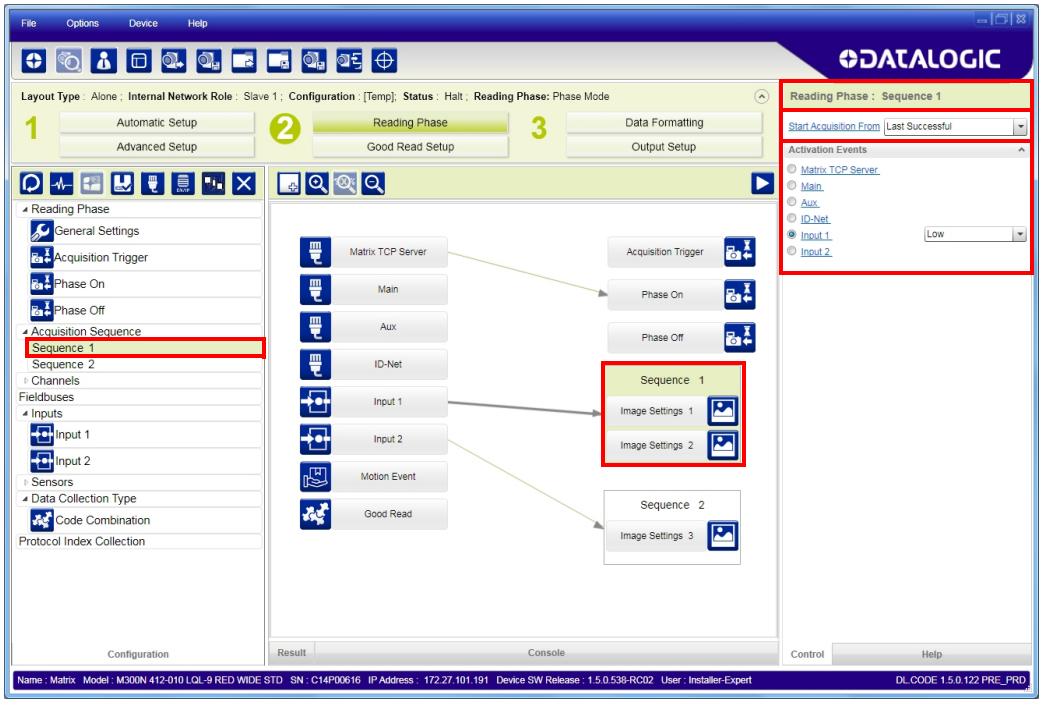


Alternatively a hybrid configuration can be made where more than one **Image Setting** can be grouped into an Acquisition Sequence by dragging it into the desired Sequence box. Select the empty Sequence box and delete it with the delete key.



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

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



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 145. 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.

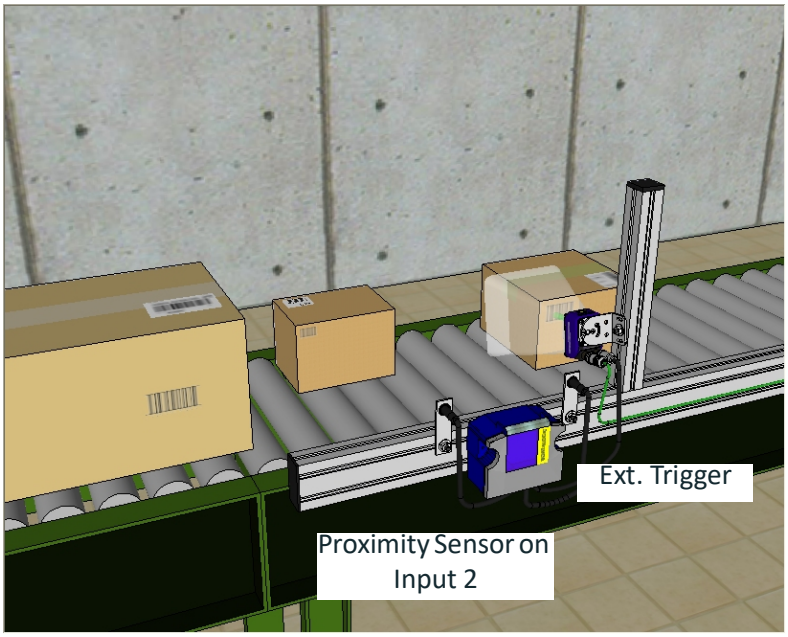


Figure 93 - Example Extending DOF Using External Image Settings Selection

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.

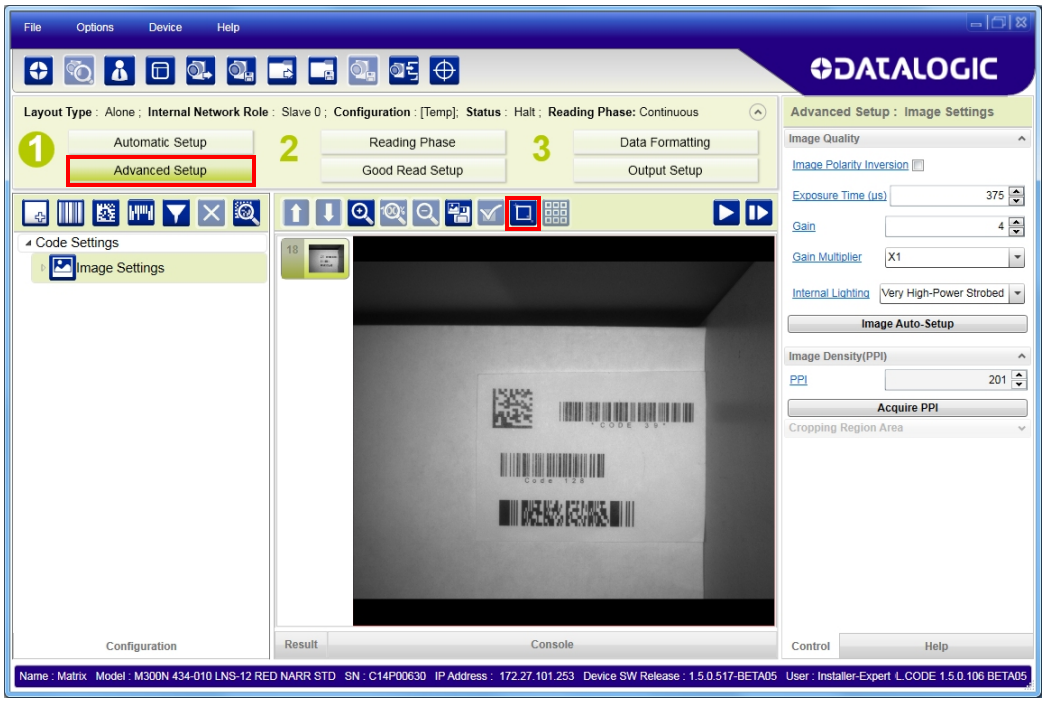
NOTE

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).

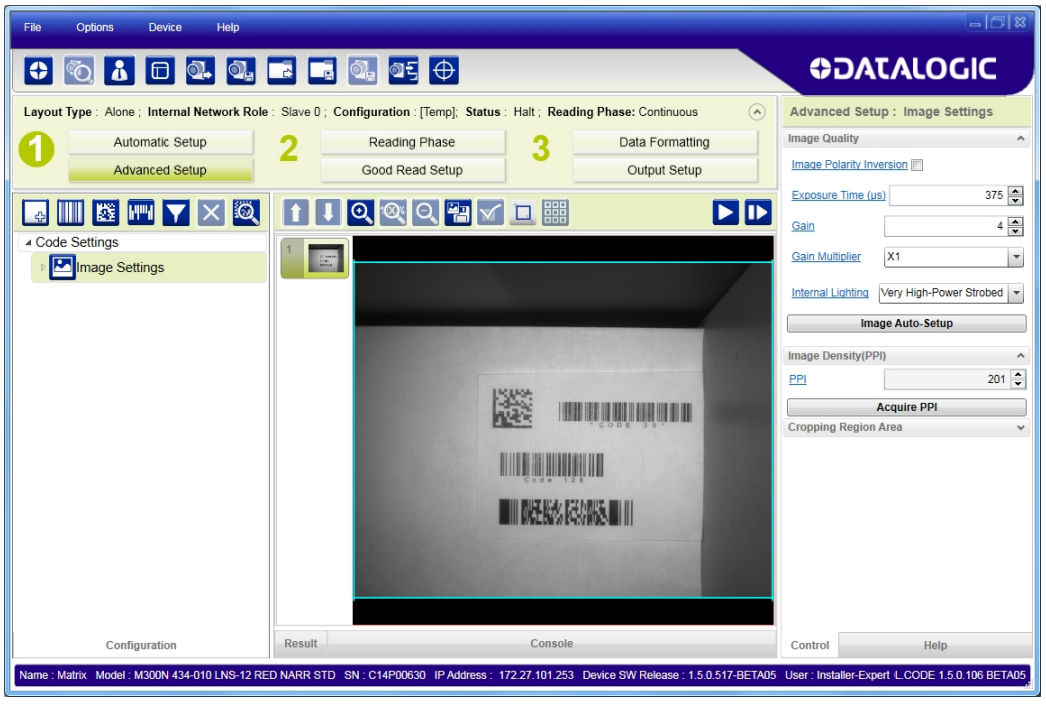
IMAGE CROPPING

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.

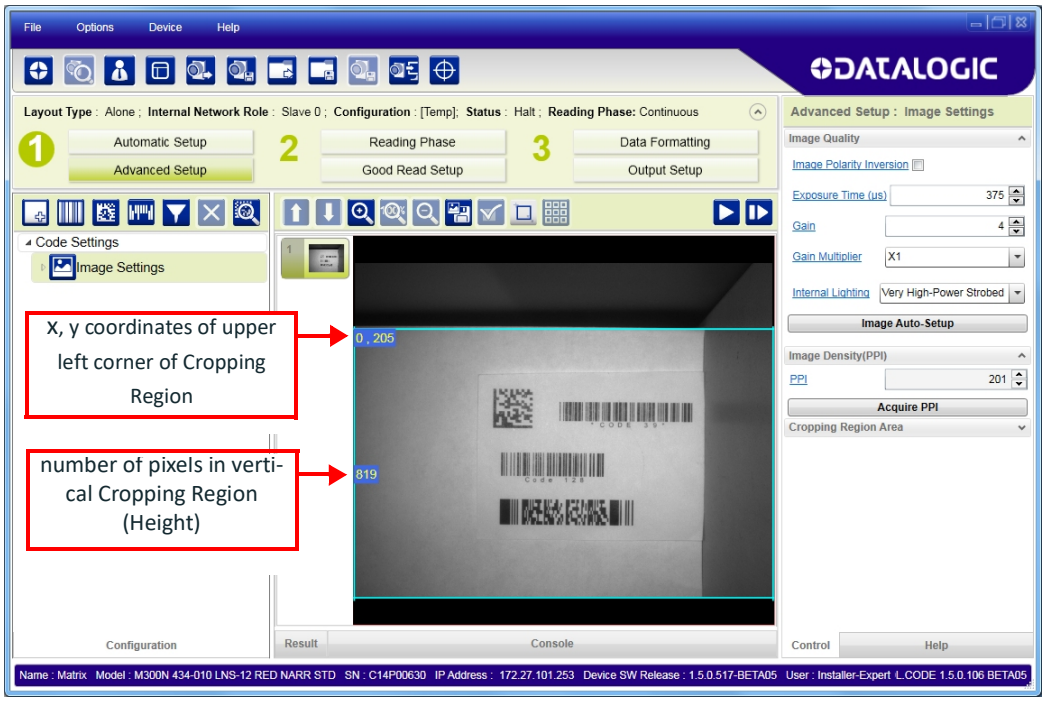
In Matrix 300N the frame rate is dependent on the number of rows and columns in the defined window. Image cropping allows reducing the Image processing area from the full FoV to a smaller area where codes are present. By excluding portions of the FoV, processing time is reduced.



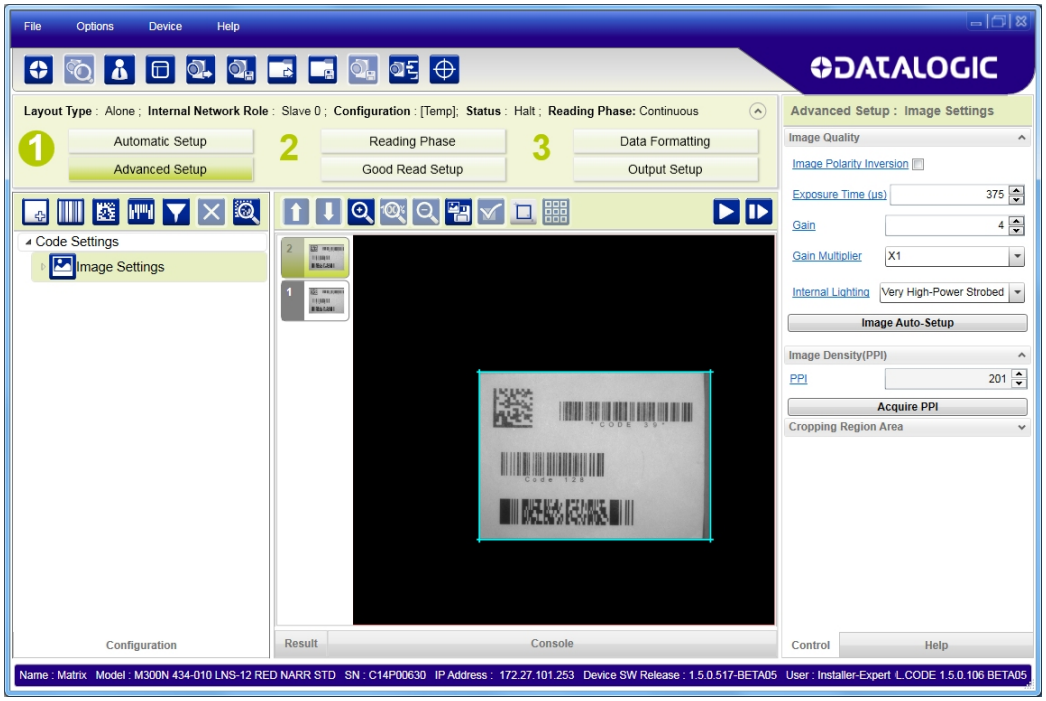
After clicking the Add Cropping Region icon, a blue border appears which by default is equal to the FoV.



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.

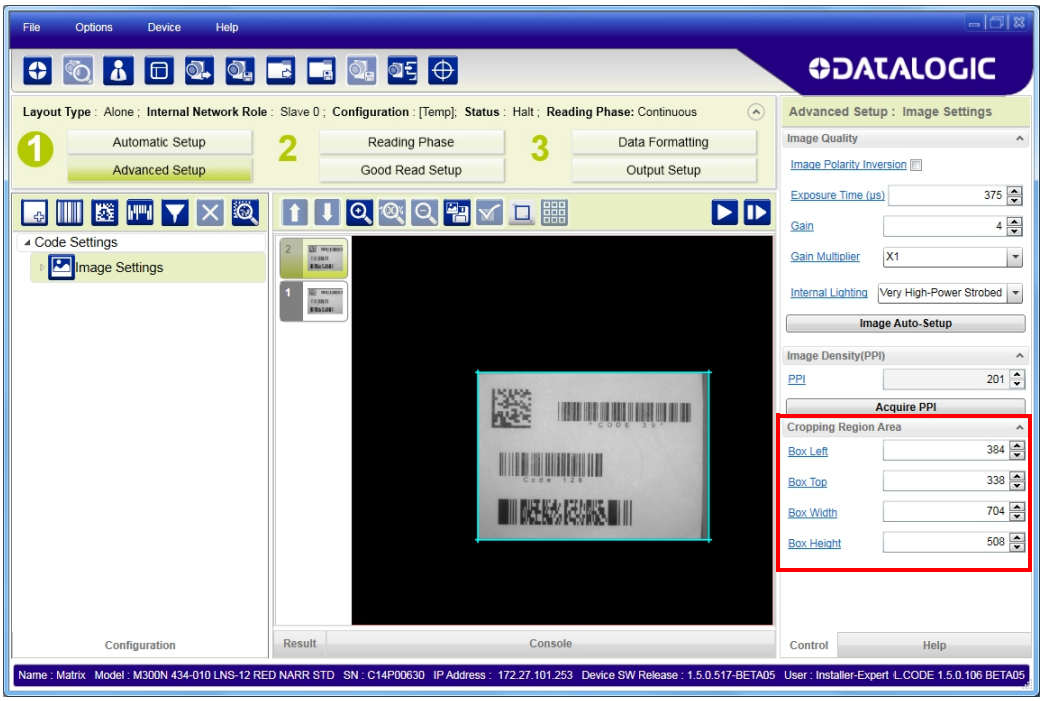
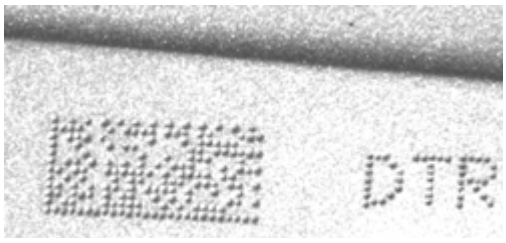
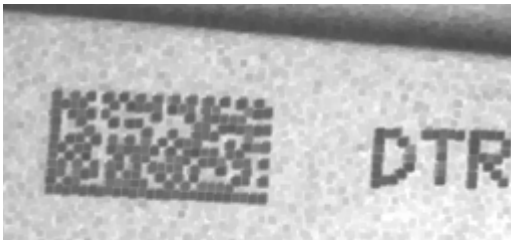
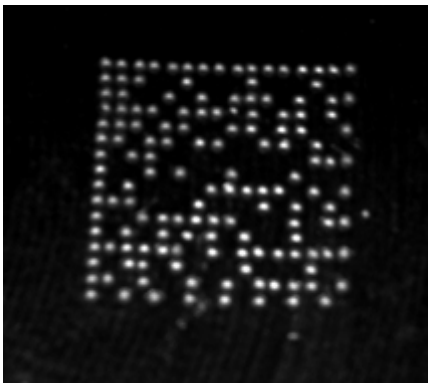
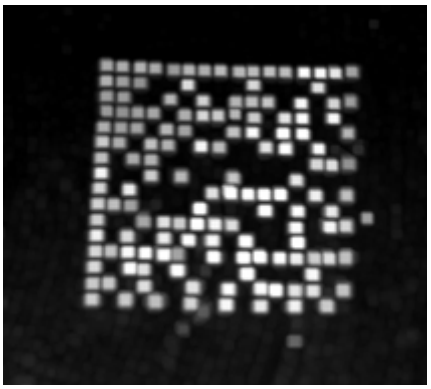


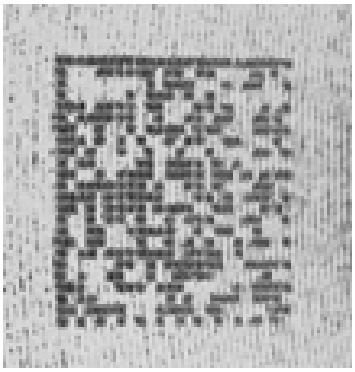
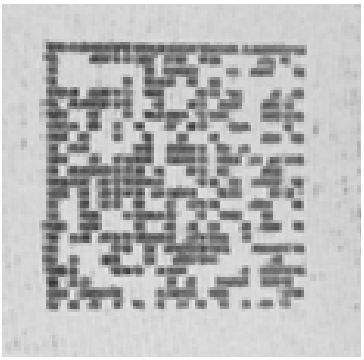
IMAGE FILTER

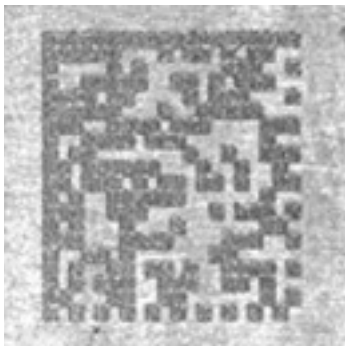
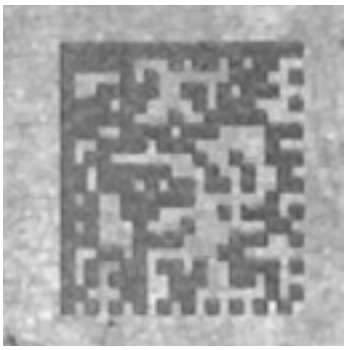
Sets the filter to be applied to the image before being processed. This parameter can be used to successfully decode particular ink-spread printed codes (e.g. direct part mark codes).

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

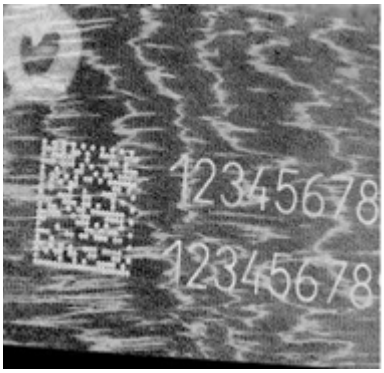
The ***Erode*** Filter enlarges the image dark zones to increase readability.	
	
Before - No Read	**After - Readable**

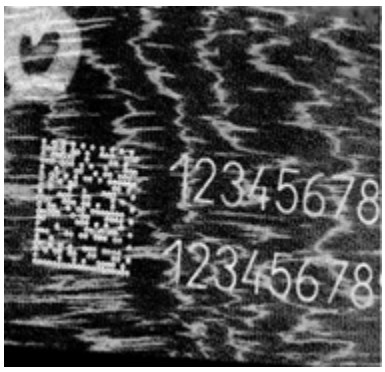
The ***Dilate*** Filter enlarges the image white zones to increase readability.	
	
Before - No Read	**After - Readable**

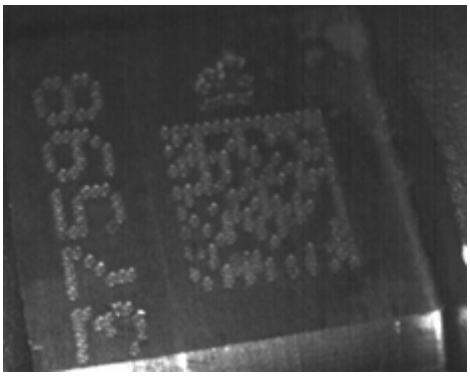
The ***Close*** filter eliminates dark areas (defects) in the white zones of the image.	
	
Before - No Read	**After - Readable**

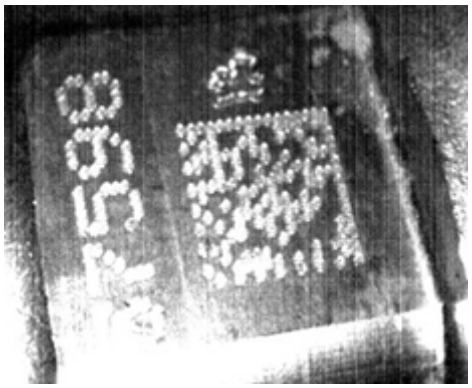
The ***Open*** filter eliminates white areas (defects) in the dark zones of the image.	
	
Before - No Read	**After - Readable**

The ***Contrast Stretching*** filter maximizes image contrast.









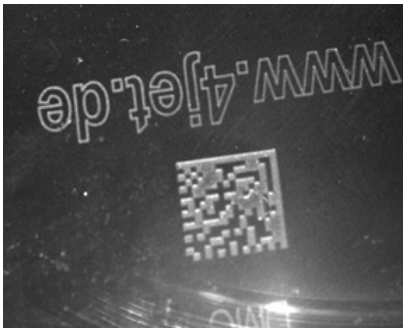
Before - No Read | **After - Readable**

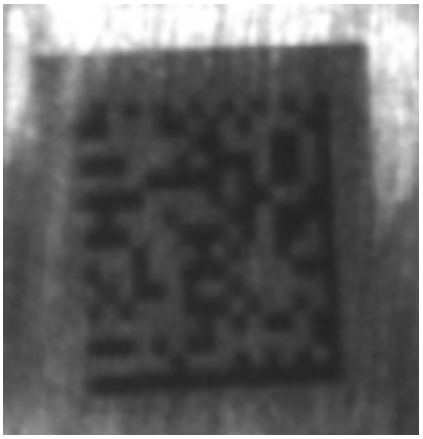
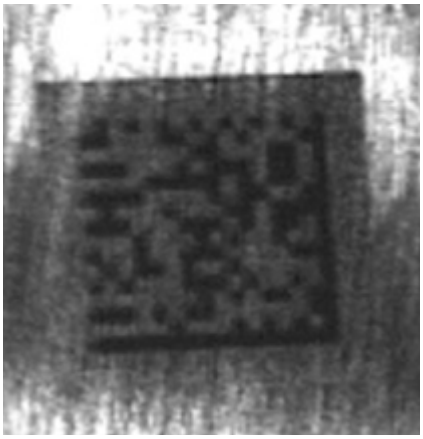
The ***Histogram Equalization*** filter makes the gray level distribution uniform.



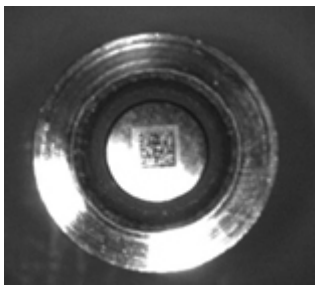


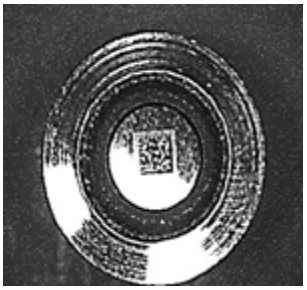
Before - No Read | **After - Readable**

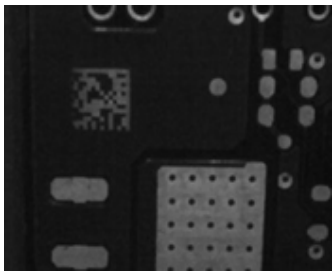
The ***Smoothing*** filter deletes small (insignificant) details in the center of the image.	
	
Before - No Read	**After - Readable**

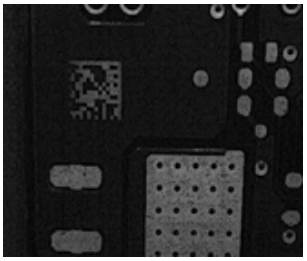
The ***Sharpening*** filter improves out of focus images.	
	
Before - No Read	**After - Readable**

The ***Deblurring*** filter improves blurred images.









Before - No Read | **After - Readable**

The ***Black Enhancement*** filter produces a nonlinear increase in the black level for light images.





Before - No Read | **After - Readable**

The ***White Enhancement*** filter produces a nonlinear increase in the white level for dark images.





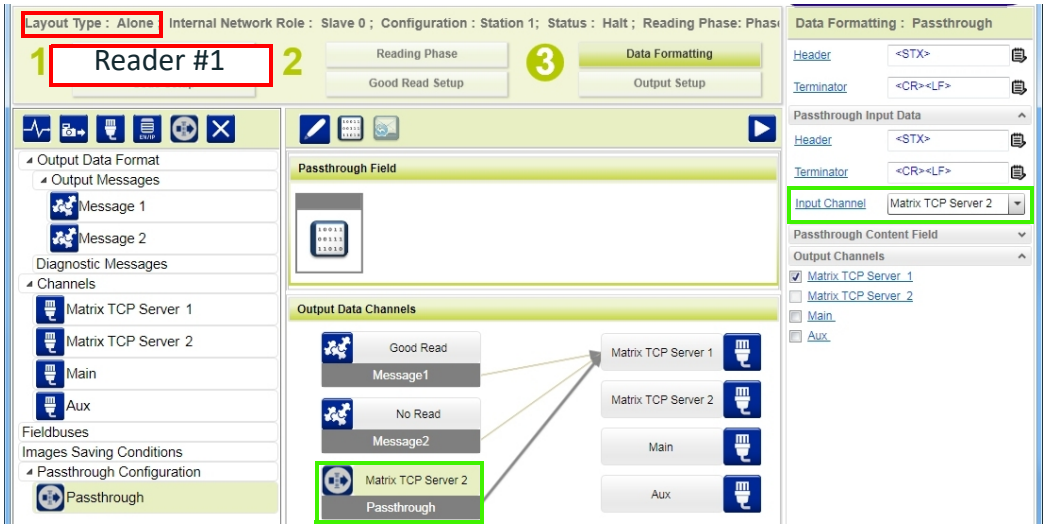
Before - No Read | **After - Readable**

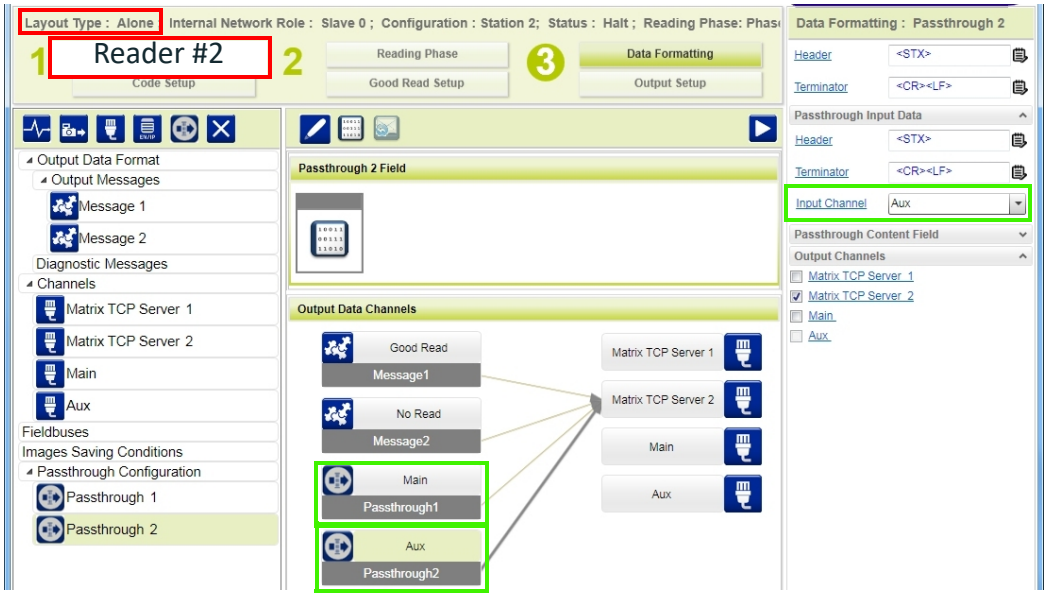
PASS-THROUGH CONFIGURATIONS

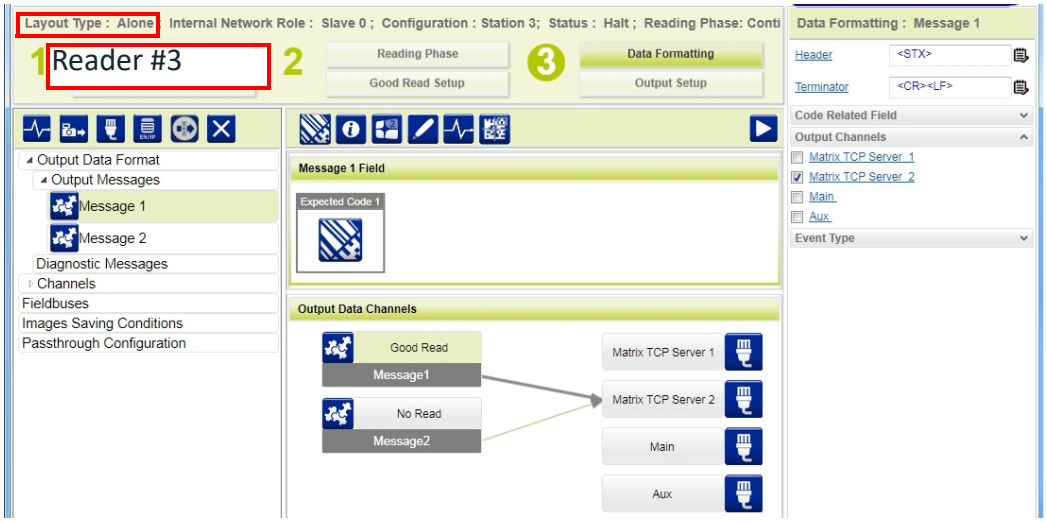
DL.CODE and Matrix 300N readers support pass-through multi device configurations.

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

The following screenshots show the pass-through configuration settings for the three devices in the example in "Pass-Through" on page 89.







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 54 and "Mounting And Positioning Matrix 300N" on page 57) and electrically (refer to "ID-NET Interface" on page 67) with factory default settings (Layout Type = Alone, Internal Network Role = Slave).
   In order to automatically recognize the ID-NET Slaves, all devices must be physically installed and electrically connected (including ID-NET network wiring). Run DL.CODE and verify that all the devices are discovered and shown in the device list area.

2. 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 157.

3. Depending on the application, select Multidata, Synchronized Phase Mode or Synchronized PackTrack Configuration.

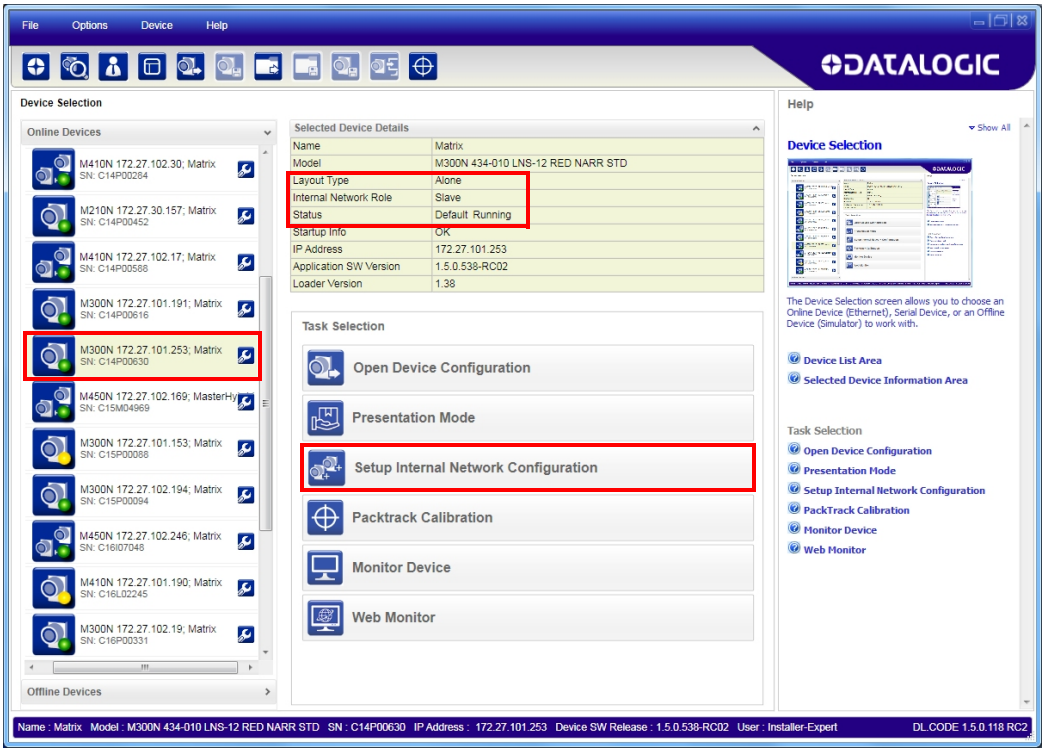
4. Connect to each Slave reader via Ethernet and set the Slave specific parameters depending on the application type. Save each Slave specific configuration. See "Multidata ID-NET Network Configurations" on page 159 or "Synchronized ID-NET Network Configurations" on page 163.

5. For Synchronized networks Verify/Test network performance. See "Verify Master/Slave Synchronized Configuration" on page 167.

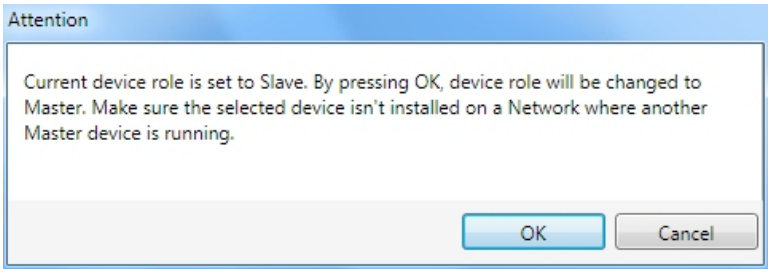
6. Perform the **Backup current Internal Network configurations** procedure. See "Backup" on page 171.

Master Configuration

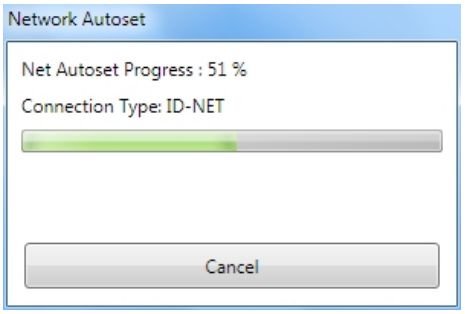
First start with the desired device to assign as ID-NET Master (current default setting is Slave). Click on Setup Internal Network Configuration from the Task area.



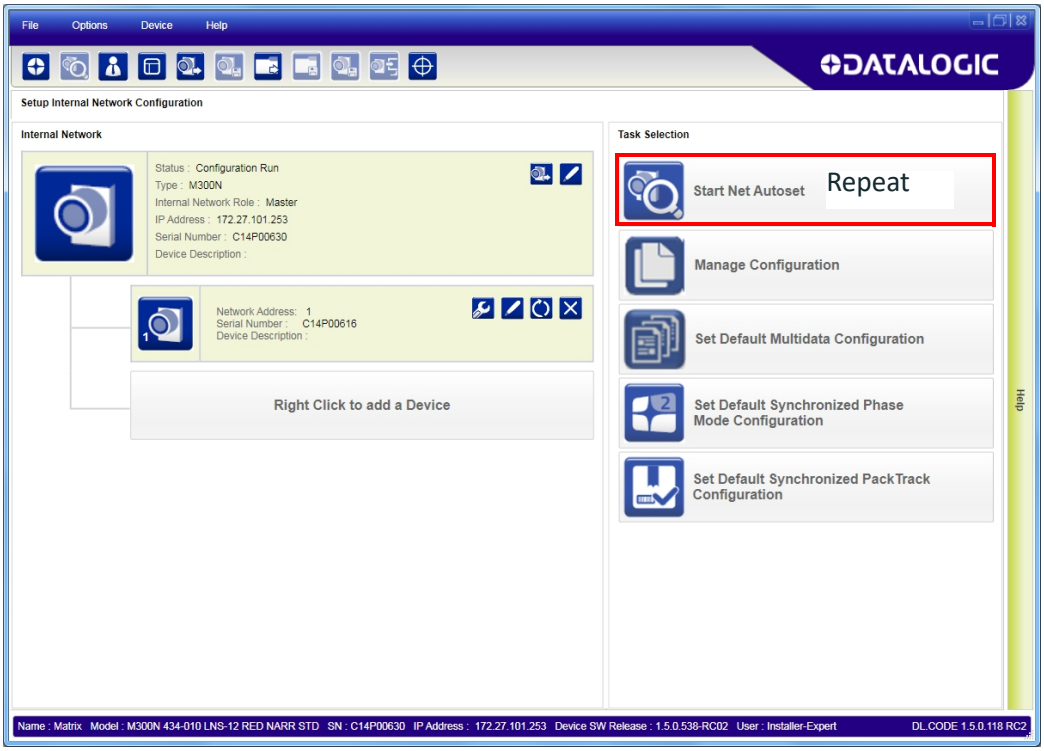
You will be advised that the device role will be changed to Master.



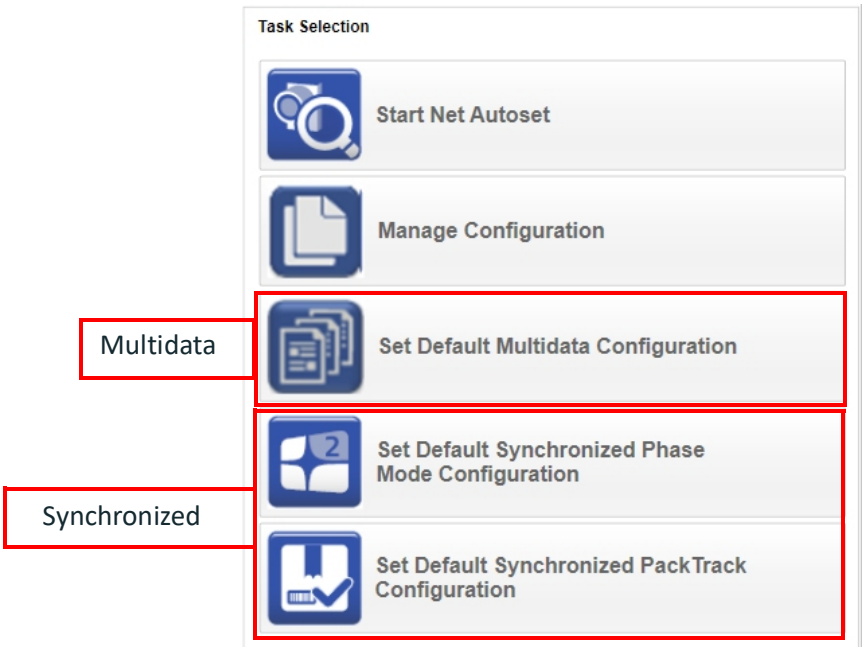
Click OK. The Net Autoset feature automatically starts to find Slave devices connected to the ID-NET network of the Master.



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



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



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

Multidata ID-NET Network Configurations

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

1. Complete the configuration of all the application parameters (including Image Settings) and save them to the Master with an application specific name.
   Optionally, checking the **Save on Slave Device** box can be helpful to save all the current individual Slave configurations with the new configuration *name*. This does not clone any parameters. If not checked, Slave configurations will remain as *Temp* configurations and you will be warned that changes to the Master have not been saved to the Cluster.
   For Multidata configurations, the option to **Clone Master configuration on Slaves must not be checked**.

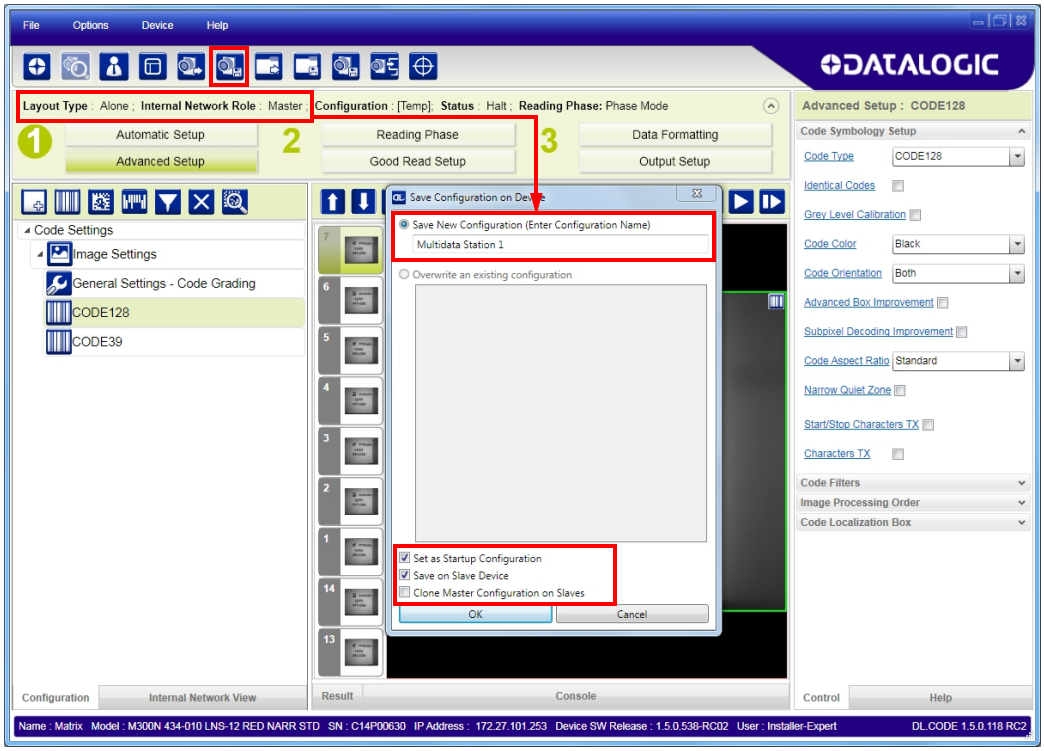


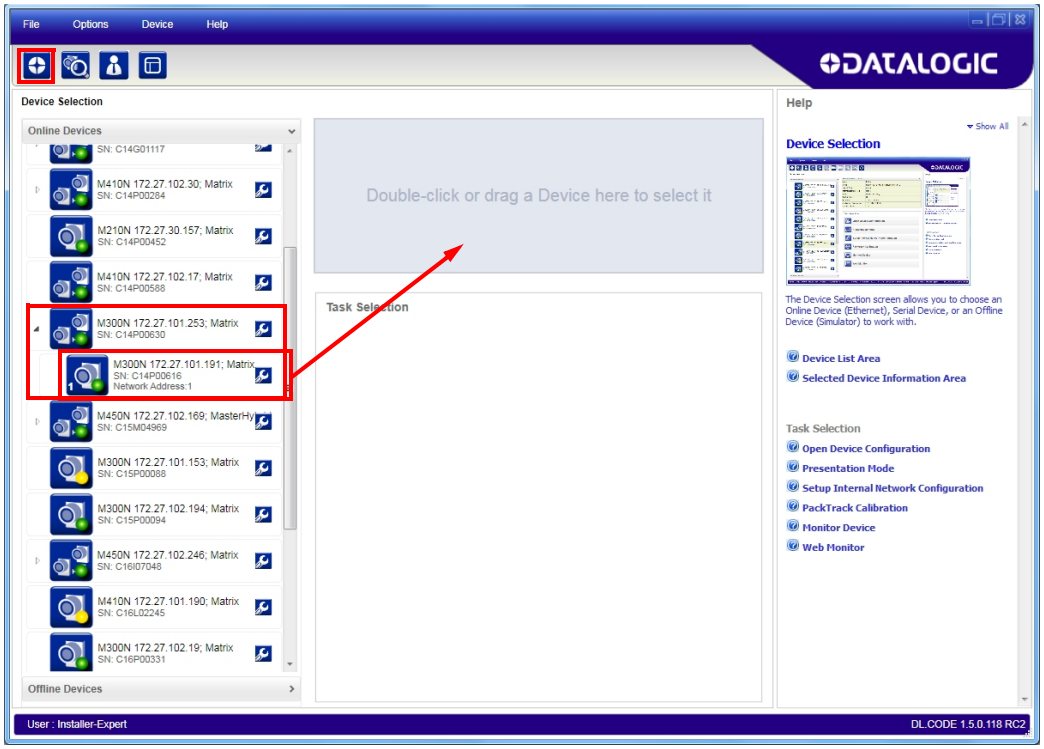
Figure 94 - Saving Multidata Configuration to Master

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

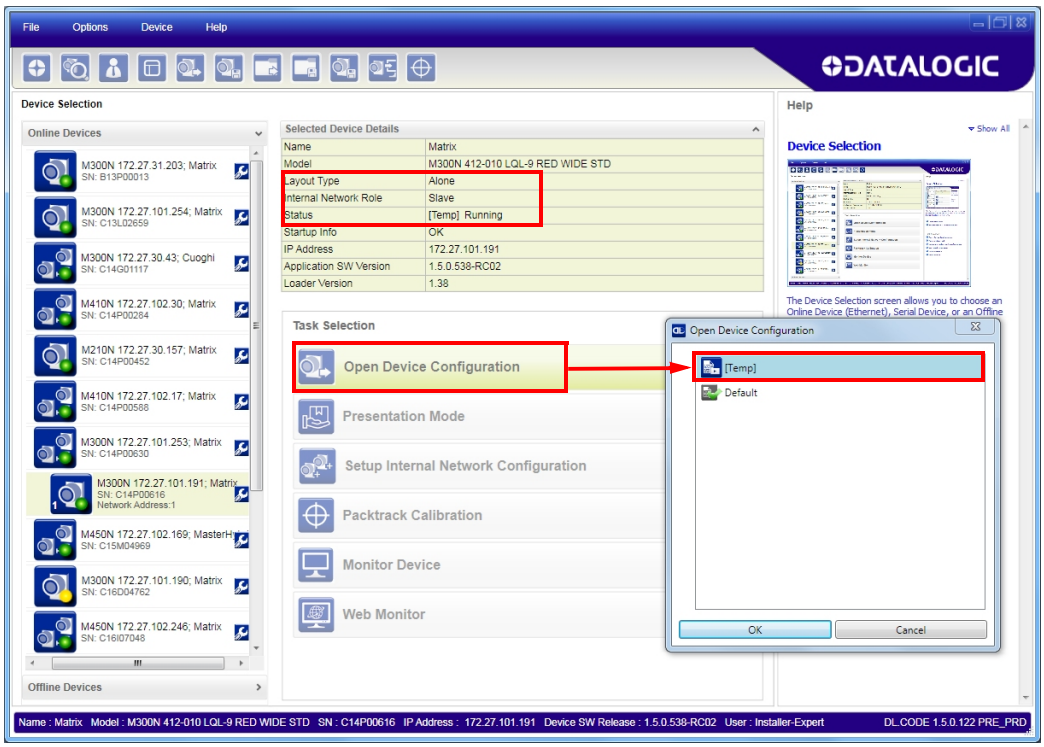
2. Connect to each Slave reader via Ethernet (see note below), and set all the configuration parameters of each Slave device.

NOTE

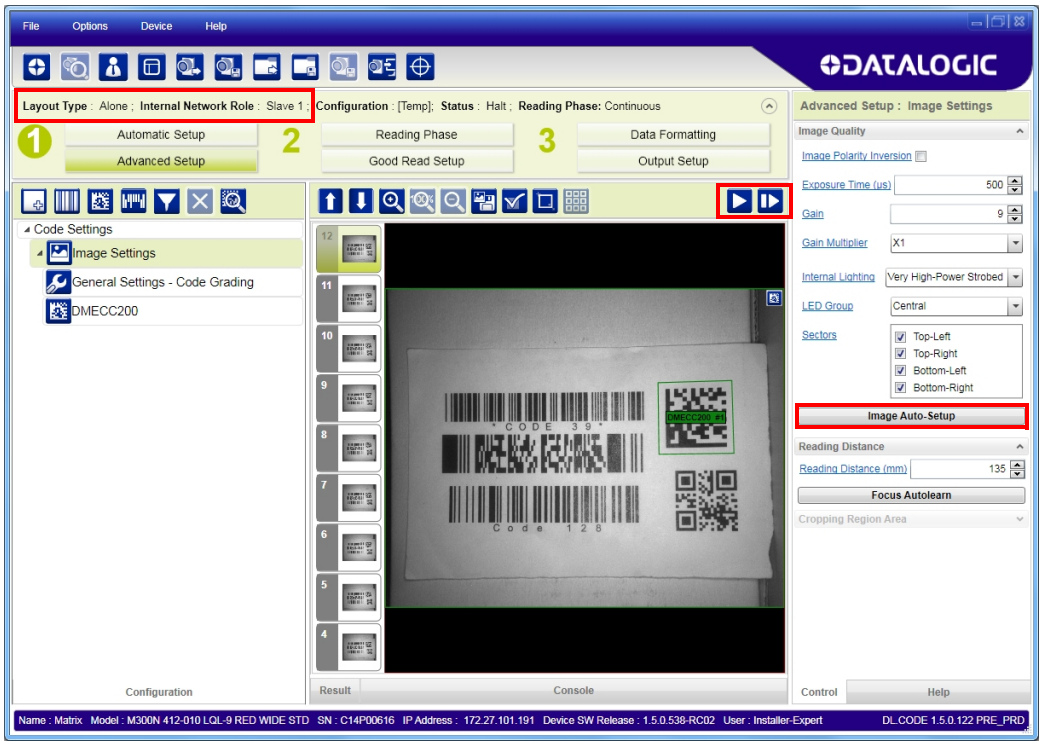
If necessary, Slave device photometric (Image Settings) parameters must be configured separately through DL.CODE. This is preferably done through each device's Ethernet TCP/IP channel. If Slave devices are not connected to Ethernet you must temporarily (manually) connect them one by one to perform Image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



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



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



Verify the focus and decoding with the capture image button.

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

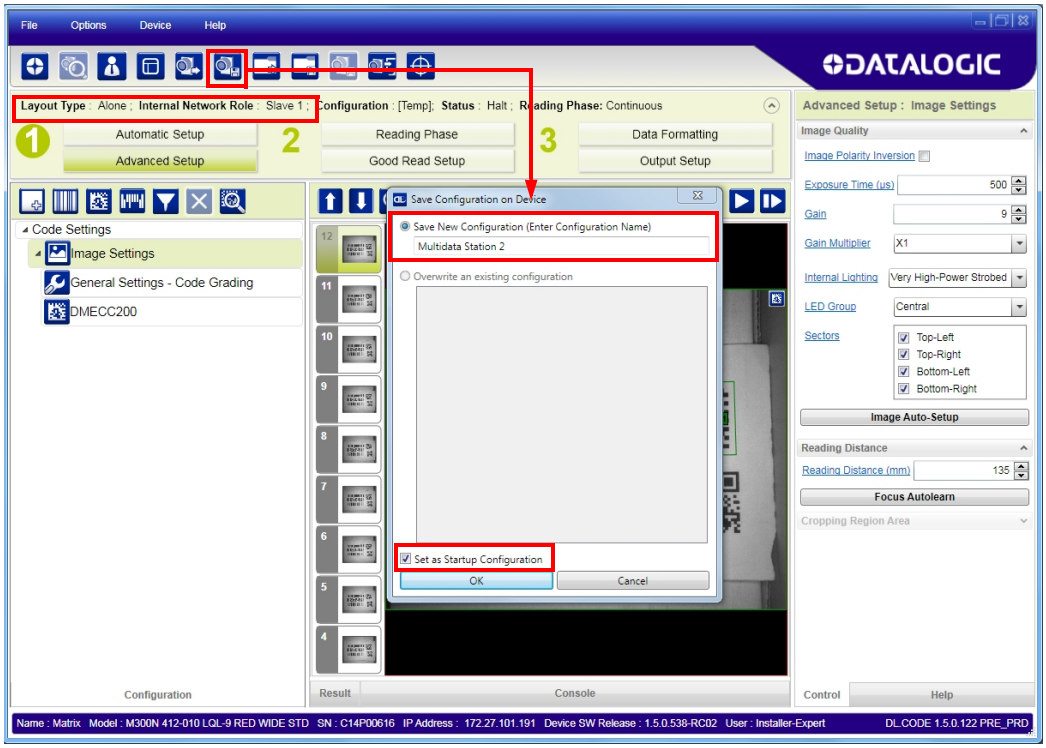
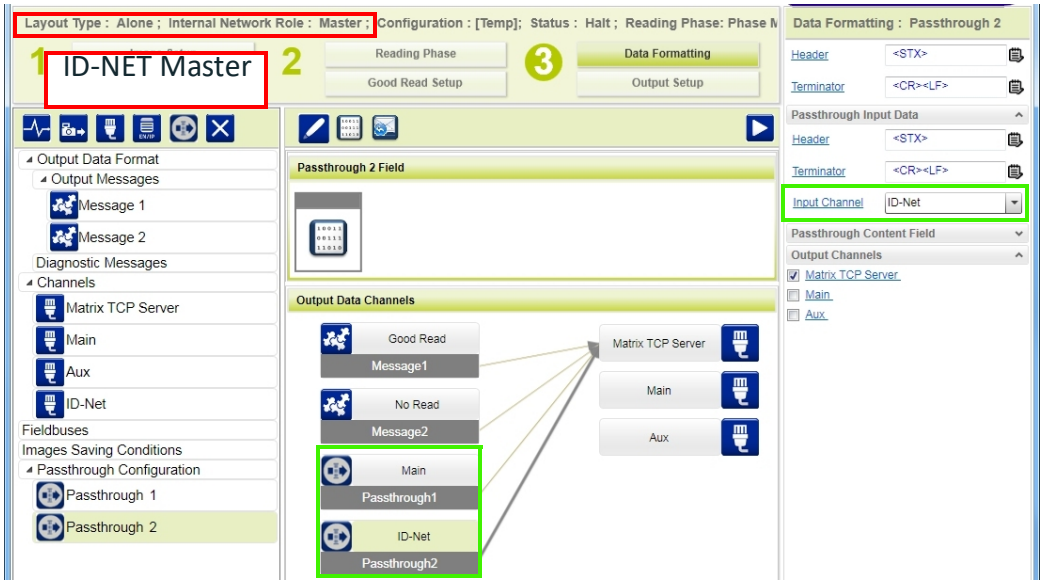


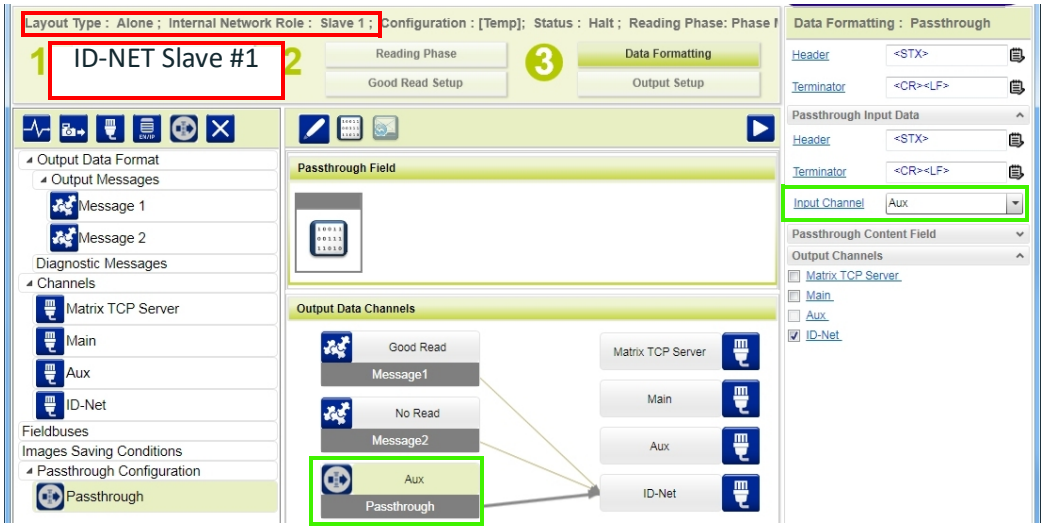
Figure 95 - Saving Multidata Configuration to Slave 1

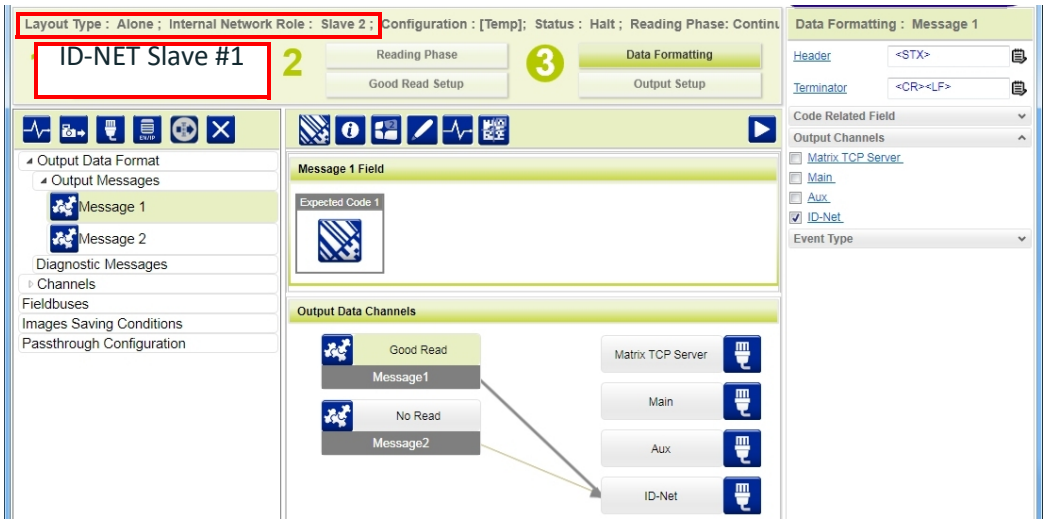
1. If **Save on Slave Device** was selected when saving the Master configuration, an application job with the same name (but with all Slave specific configuration parameters), has been saved to the Slaves. No parameters have been cloned from the Master. There are no common parameters managed by the Master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

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

The following screenshots show the pass-through configuration settings for the three devices in the example in "ID-NET Multidata Network (Pass-Through)" on page 90.







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**.

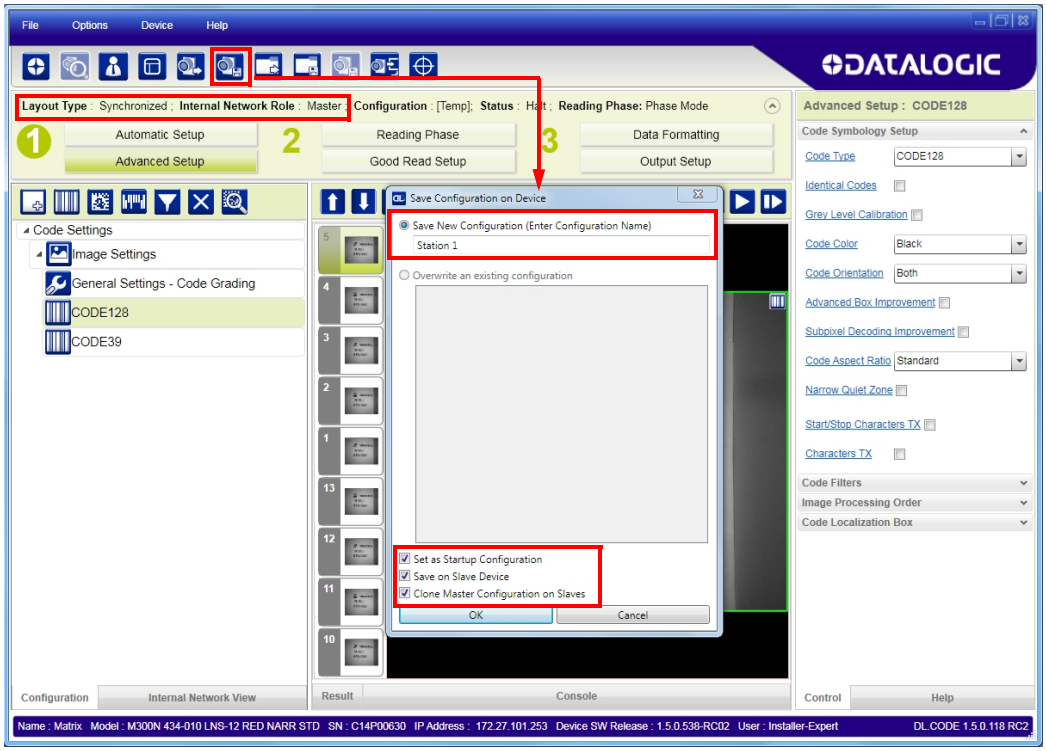
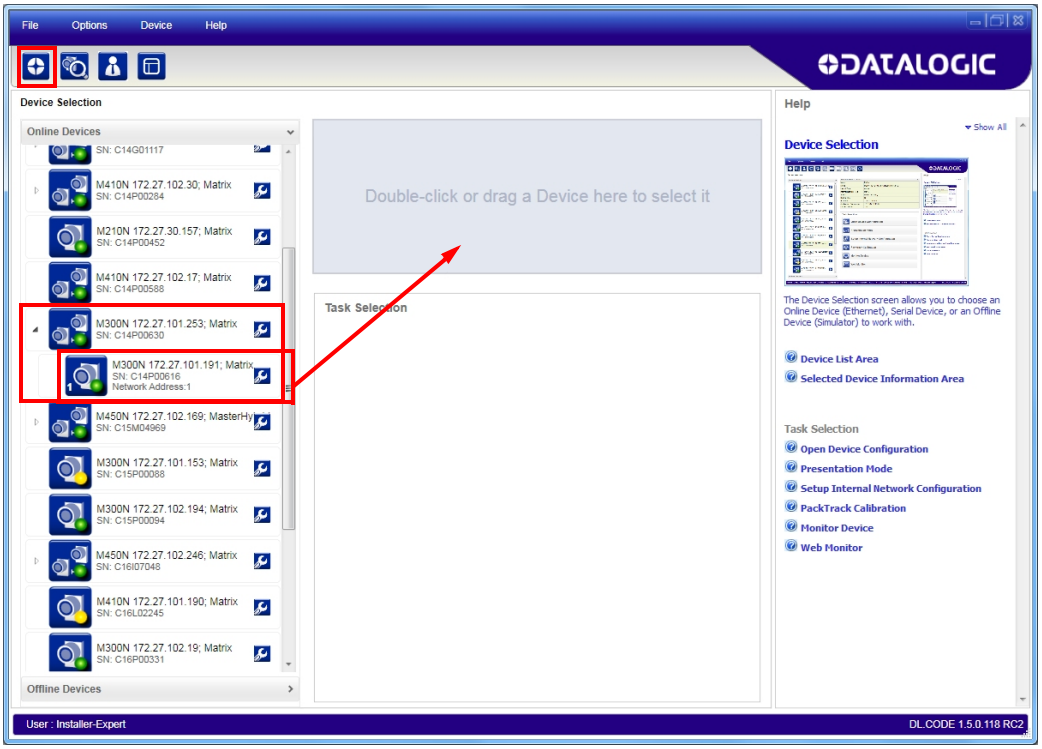


Figure 96 - Saving Synchronized Phase Mode Configuration to Master

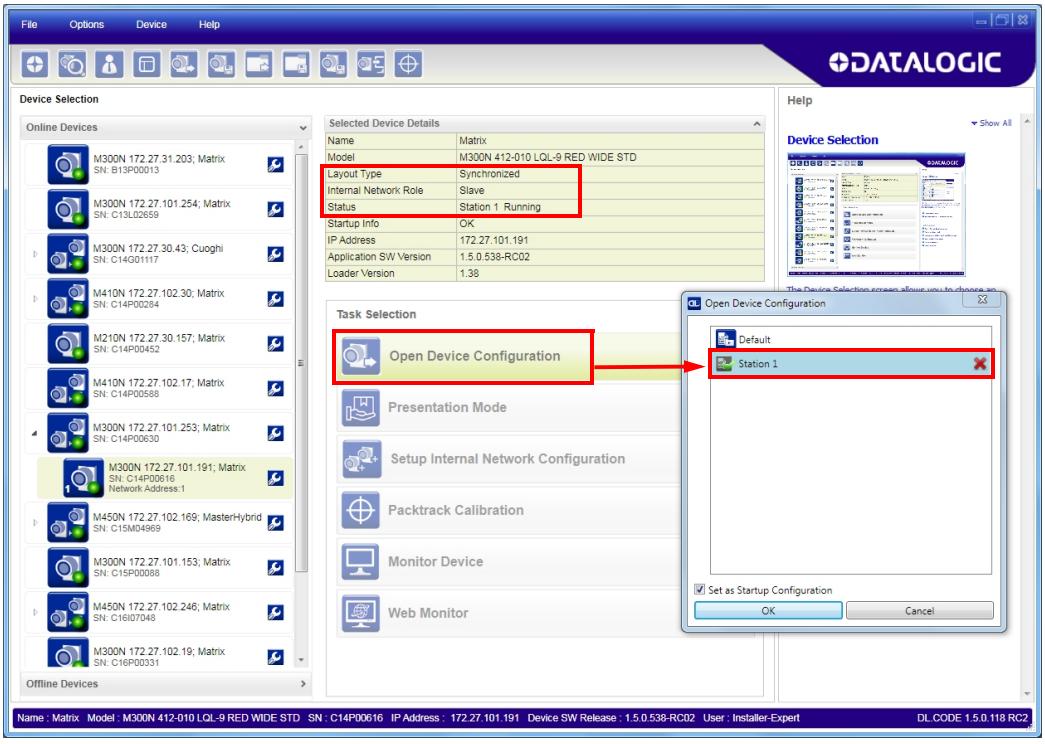
2. Connect to each Slave reader via Ethernet (see note below), and set the Slave specific parameters.

NOTE

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

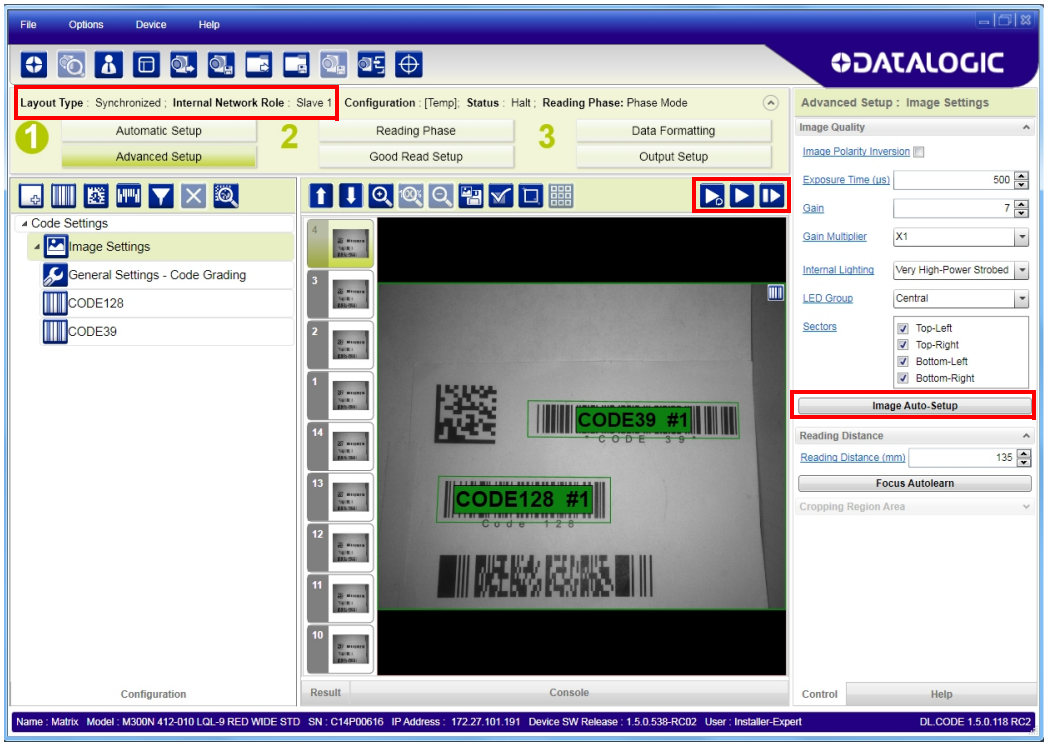


Open the cloned application job.



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

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



Verify the focus and decoding with the capture image button.

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

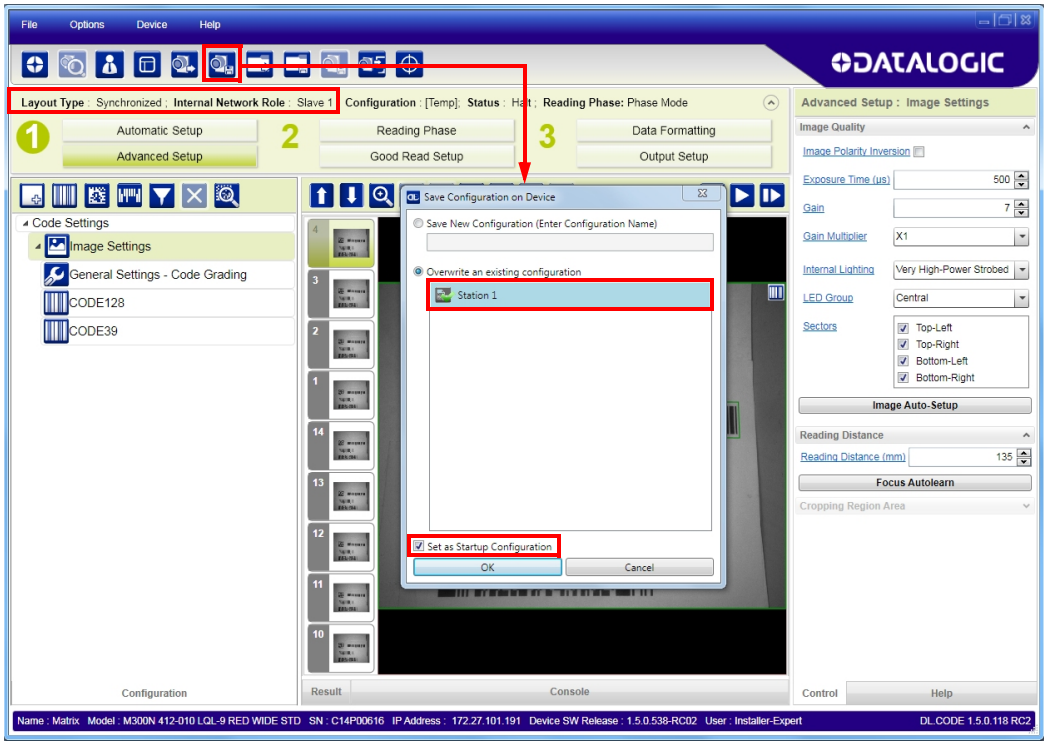


Figure 97 - Saving Synchronized Phase Mode Configuration to Slave

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

See "ID-NET Synchronized Network" on page 91 for an example.

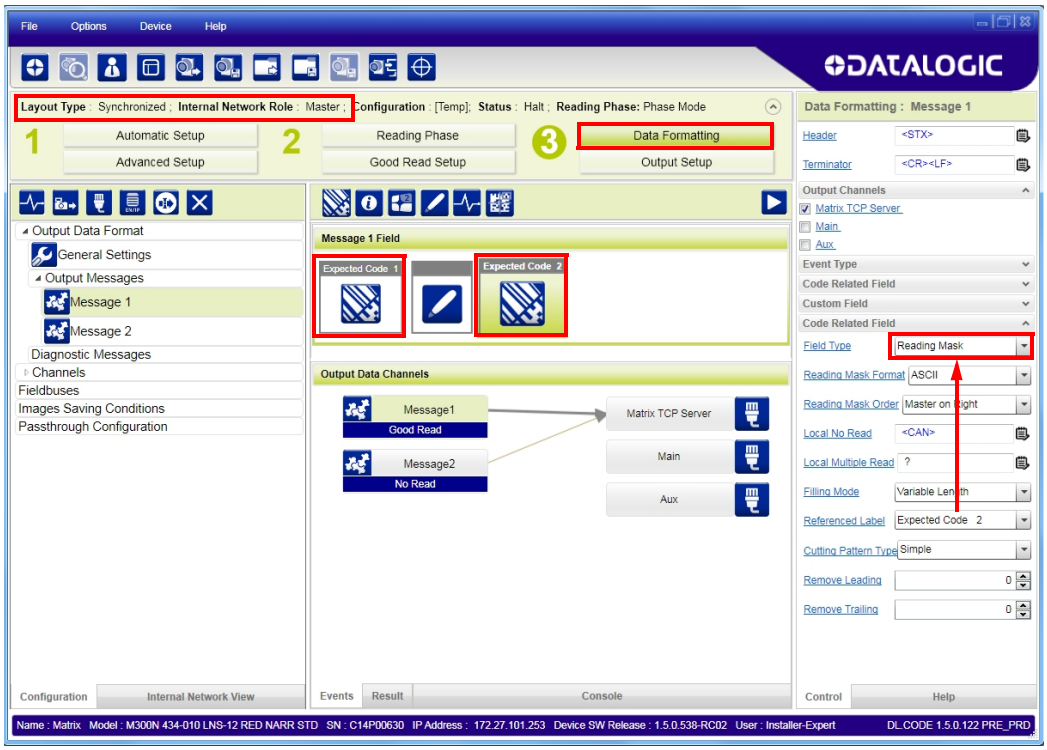
1. An application job with the same name as the Master's has been cloned to the Slaves. Each Slave can have its own Image Settings parameters saved in its own copy of the application job. Common parameters managed by the Master such as Operating Mode cannot be modified in the Slave jobs and are shown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

Verify Master/Slave Synchronized Configuration

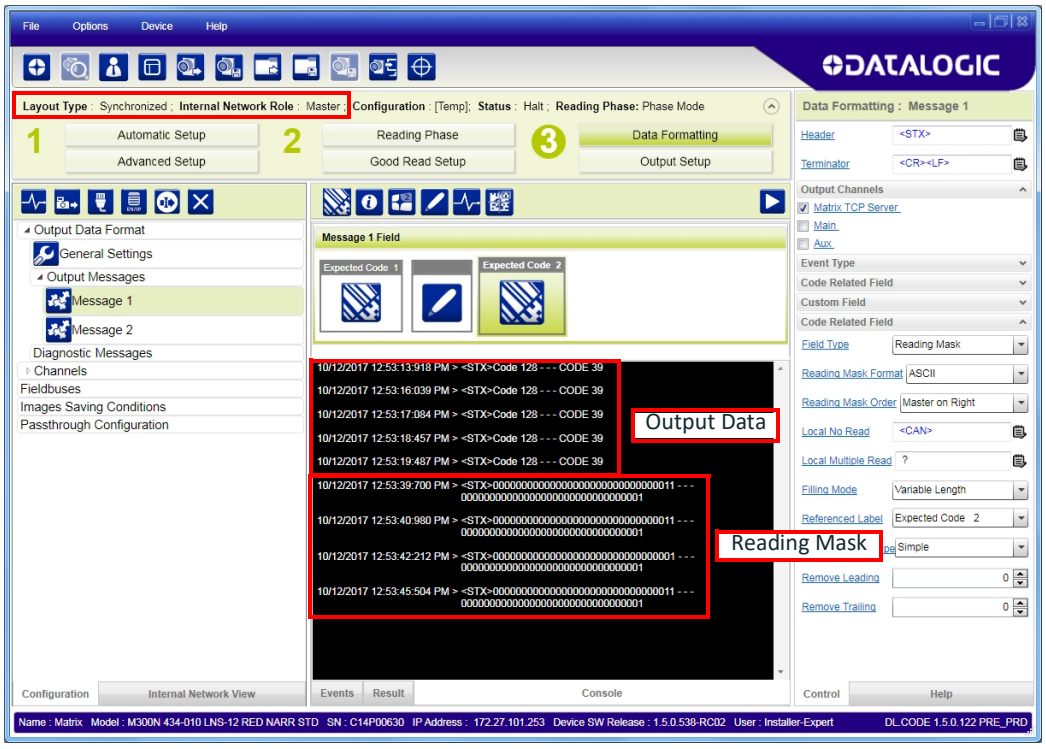
From the Master configuration, run the application and monitor the output data from the DL.CODE Console or a configured channel terminal.

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.

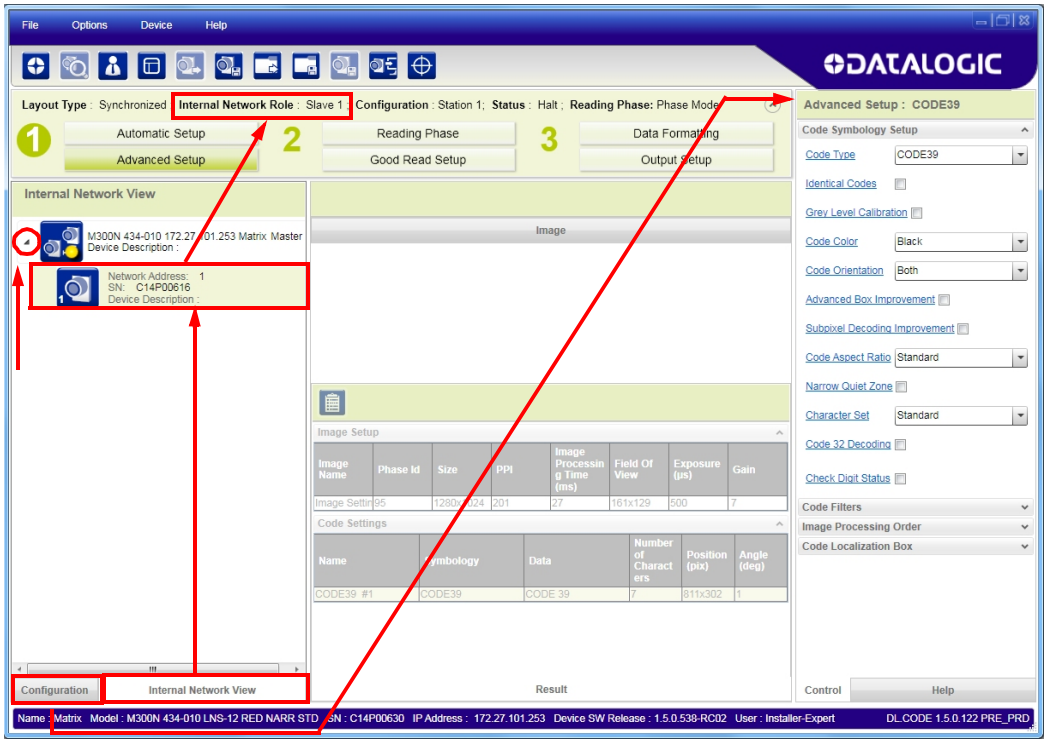
3. After verifying correct functioning of the reading devices, return the Expected Code fields from Reading Mask to Code Content.

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.

It can be performed for Single Reader and Internal Network (Master/Slave) configurations.

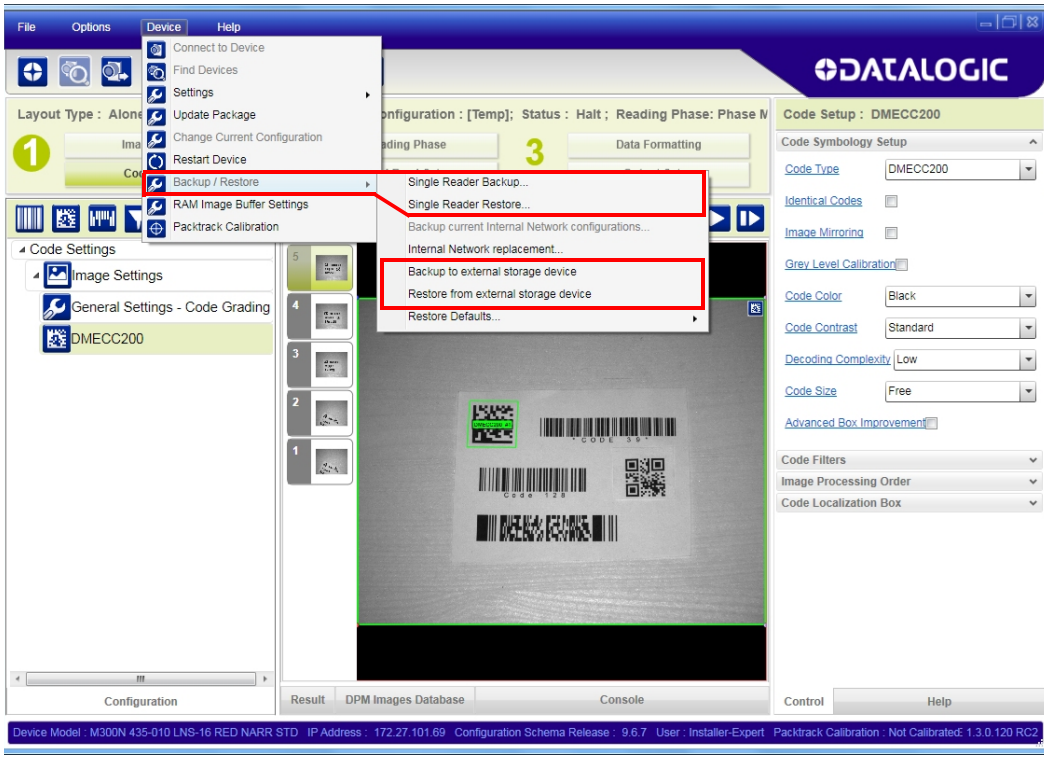
Backup and Restore functions allow performing Complete Configuration and Environment parameter storage for Single Reader and ID-NET (Master/Slave) network devices as well as device firmware. Backup and Restore can be applied to any reader connected through a device having external backup memory, regardless of the reader's network configuration.

Backup to and Restore from external device is supported by DL.CODE for all reading devices when connected to:

- CBX + BM100
- QLM-Series Gateways

NOTE

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



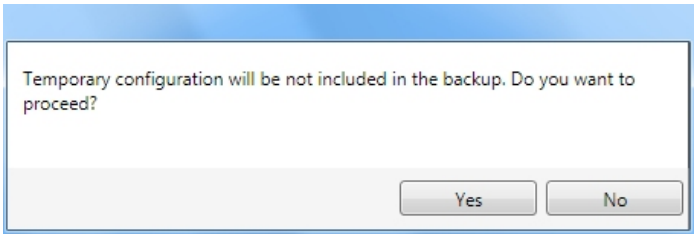
Backup

To perform a **Backup**:

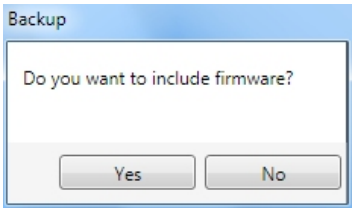
1. From the DL.CODE Device menu, select either **Single Reader Backup** (to file on PC); or **Backup to external storage device**.

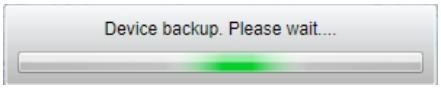
NOTE **For ID-NET network Backup, select the Backup current Internal Network configurations selection.**

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



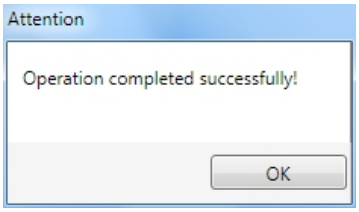
If you are performing a backup to a file you will be asked whether to include the firmware or not.







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



Restore

To perform a **Restore**:

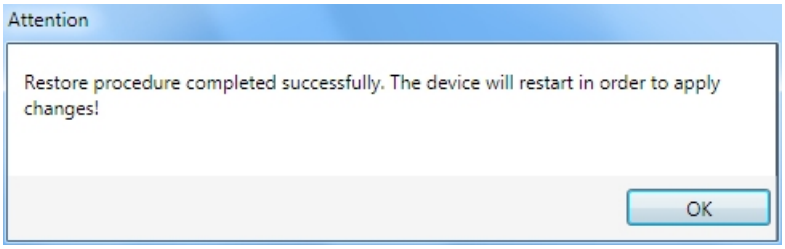
1. From the DL.CODE Device menu, select either **Single Reader Restore** (from file on PC); or **Restore from external storage device**.

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



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

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



Replacement



CAUTION

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

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

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



NOTE

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

RESTORE DEFAULTS

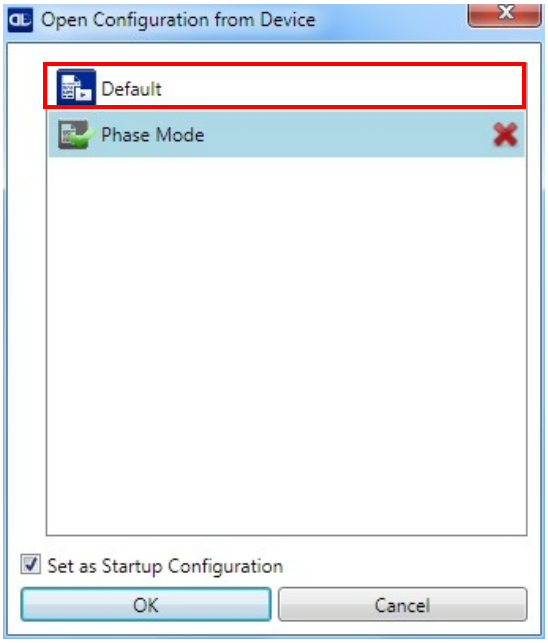
The device parameters are divided into two main classes, Configuration and Environment which are affected differently by the Restore Defaults commands.

- The Configuration parameters are the ones set in the various steps of the configuration process and are specific to each application. When multiple configurations (jobs) are saved on a single device, these parameters can be different from one configuration to the next.

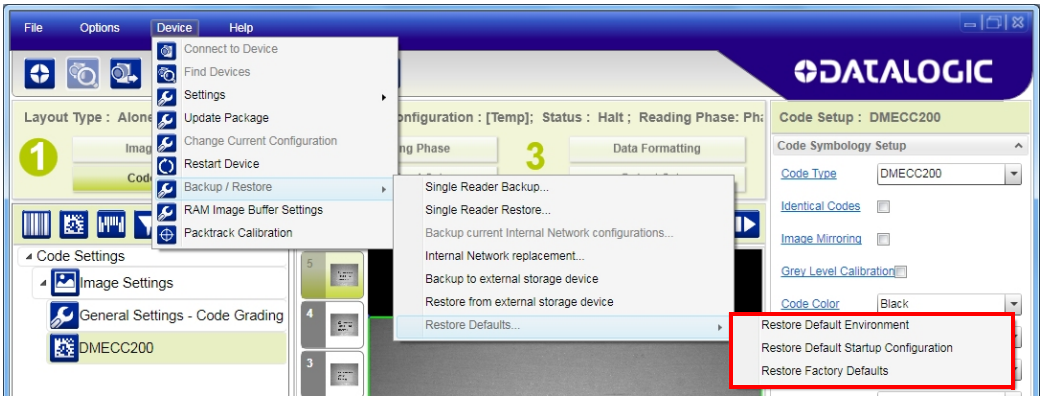
- Environment parameters regard the device Identity and Position in a Network (Ethernet, ID-NET, etc.) and are not influenced by the Default (or any other) Configuration present in memory.

Restore Default 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.



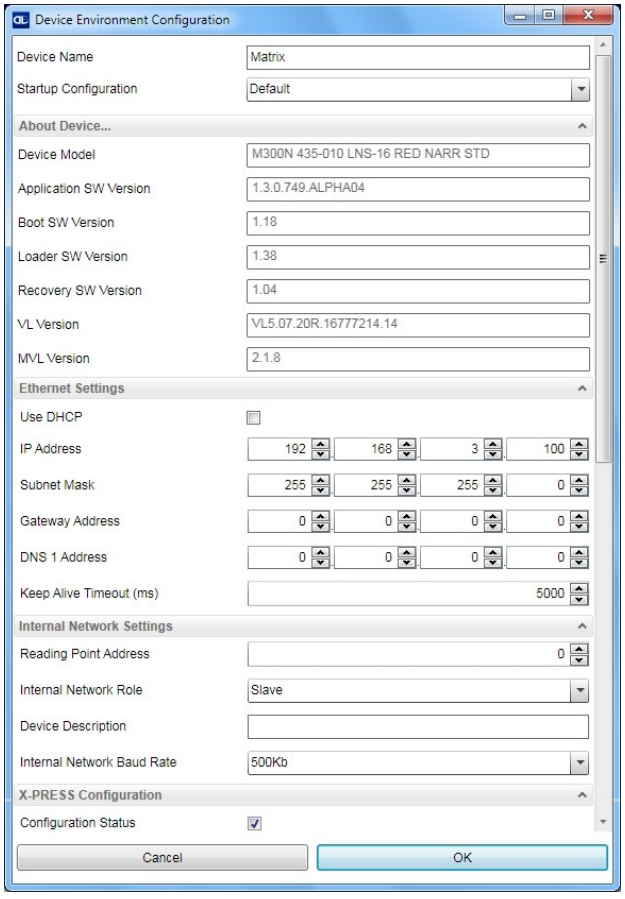
The same action can be performed from the Device menu >Backup/Restore > Restore Defaults > **Restore Default Startup Configuration**. The Default Configuration will be set to run at startup and the reader will be reset.



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

Restore 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

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 the state of the ID-NET network.

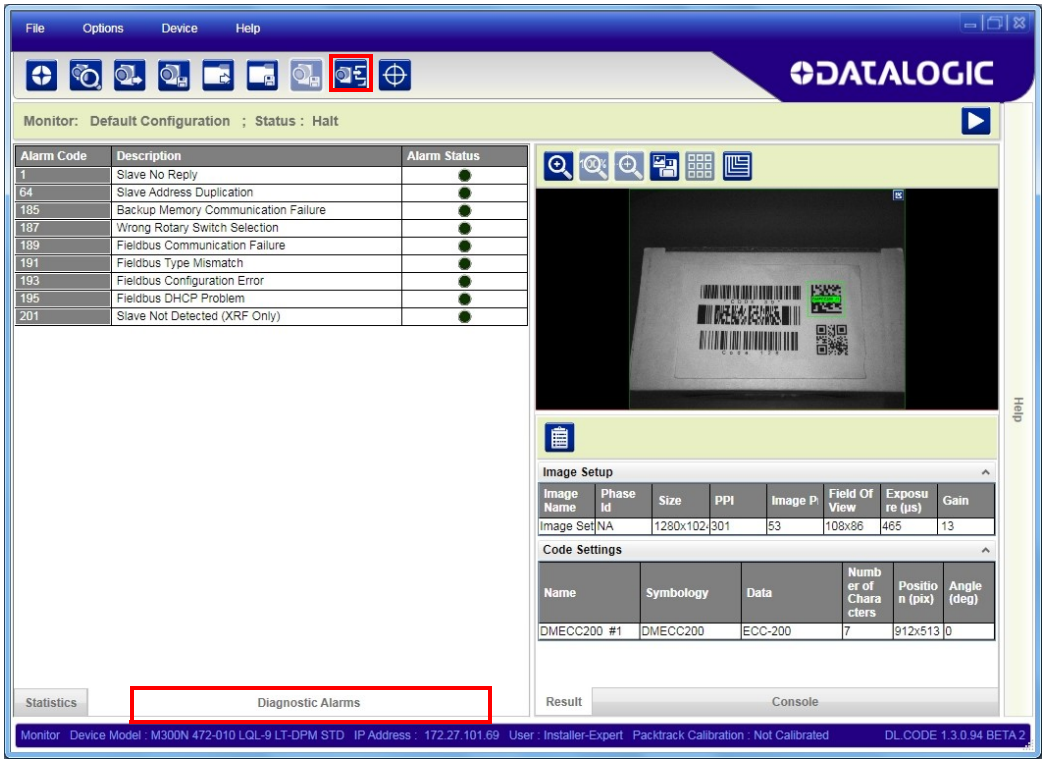


Figure 98 - Diagnostic Alarms

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).

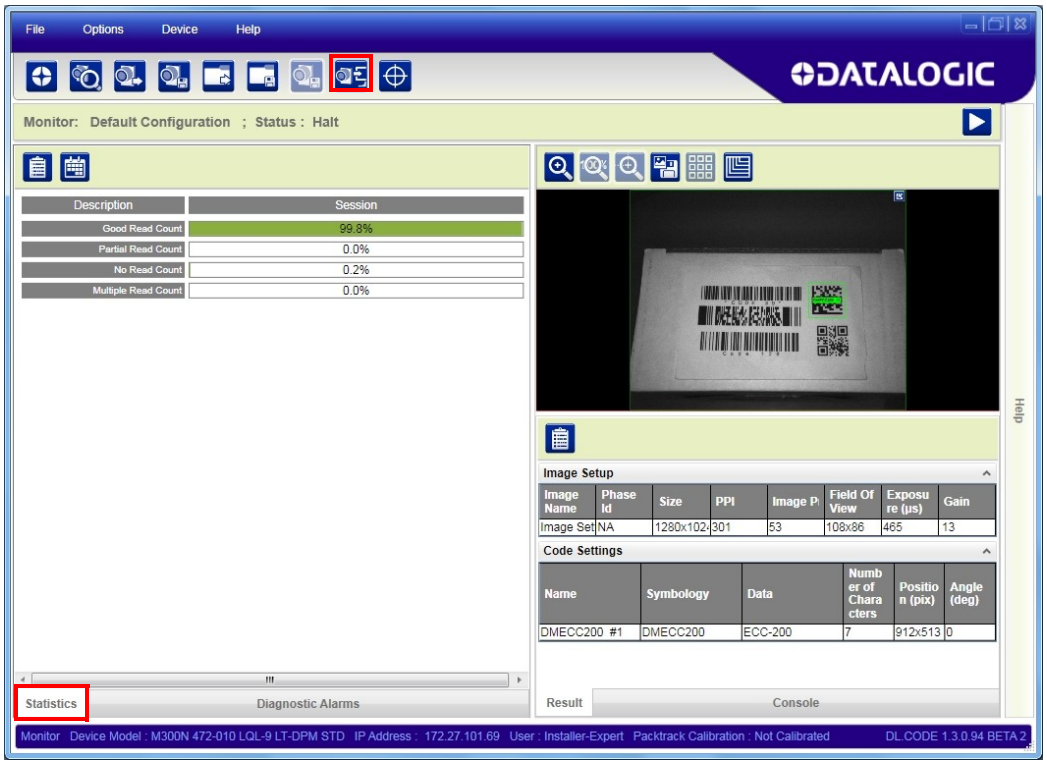
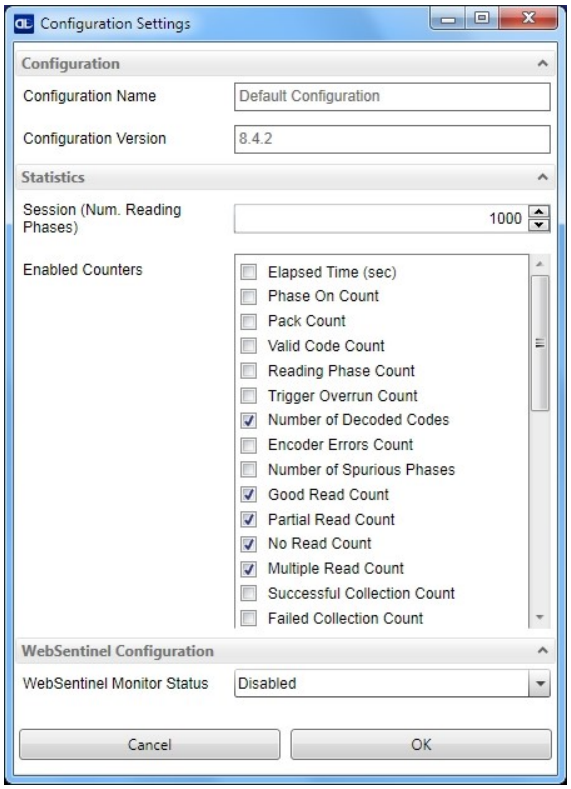


Figure 99 - Reading Statistics

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.



Up Enter Down

Figure 100BM150 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 pointers)
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 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
K K K 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
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
```

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 µs).

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).



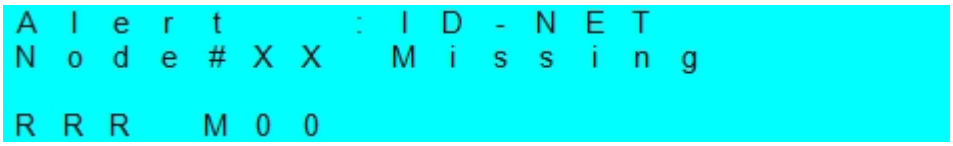
X = numeric Alarm Code (see below for the list of Alarm Codes)

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

N = Device Network Setting – M00=ID-NET Network Master, Sxx= ID-NET Network Slave address, Null string= Alone (no network)

Alarm Code	Description
1	Slave No Reply
64	Slave Address Duplication
171	Protocol Index Failure
185	Backup Memory Communication Failure
187	Wrong Rotary Switch Selection
189	Fieldbus Communication Failure
191	Fieldbus Type Mismatch
193	Fieldbus Configuration Error
195	Fieldbus DHCP Problem
201	No XRF Slave(s) Detected

Slave Node Alarms (Master only)



X = slave node number (1-31)

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

Network State (Master only)

```
0       Network      15
MSSSSSSSSSSSSSSS
16      Network      31
SSSSSSSSSSSSSSSS
```

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

```
AAAAAAAAAAAAA
XXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXX
YYCodes
```

A = reading result – Good Read, Partial Read, Multiple Read

X = code content

Y = number of codes read

Reading Mask Only (Master Only)

```
XXXXXXXXXXXXXXXX...
GYYY%NYYY%MYYY%PYYY%
SSSSSSSSSSSSSSSS
TTTTTTTTTTTTTTTT
```

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)

```
XXXXXXXXXXXXXXXX...
P=YYYYYY GR=ZZZ.ZZ%
SSSSSSSSSSSSSSSS
UUUUUUUUUUUUUUUU
```

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.



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 baud rate 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 (WIDE, MEDIUM, AND NARROW ANGLE)



Figure 101 - 1.3 MP (left) and 2 MP (right) models with Wide Angle Illuminators



Figure 102 - 1.3 MP (left) and 2 MP (right) models with Medium Angle Illuminators



Figure 103 - 1.3 MP model with Narrow Angle Illuminators

These illuminators are made up of 8 LEDs for 1.3 MP models and 10 LEDs for 2 MP models. LEDs are controlled simultaneously by the software application.

These are Bright Field general purpose illuminators. Wide Angle illuminators cover a larger area over a given distance, whereas Narrow Angle illuminators are ideal for areas needing a narrower field of coverage further from source.

The ***RED*** illuminator is an optimum solution for applications where codes are printed on paper and where Direct Park Marking (DPM) is obtained by ink jet or laser etching technology on flat non-reflective surfaces, without any evident machining flaws made by machine tools (e.g. cutters or lathes). The reader's pitch or skew angle helps to avoid direct reflection when codes are marked on very reflective surfaces.

The ***WHITE*** illuminator is suitable for applications with colored codes and/or colored backgrounds (e.g. red code on white background) or with mixed color codes (e.g. blue/red ink on white background).

According to model, the following combinations of ON/OFF lighting configurations can be obtained.

Wide Angle Illuminator combinations

1.3 MP models with Wide Angle Red Illuminator (41x-0xx)

OFF	ON
	

1.3 MP models with Wide Angle White Illuminator (45x-0xx)

OFF	ON
	

2 MP models with Wide Angle Red Illuminator (71x-0xx)

OFF	All ON	Even Alternate Chain	Odd Alternate Chain
			

2 MP models with Wide Angle White Illuminator (75x-0xx)

OFF	All ON	Even Alternate Chain	Odd Alternate Chain
			

Medium Angle Illuminator combinations

1.3 MP models with Medium Angle Red Illuminator (42x-0xx)

OFF	ON
	

2 MP models with Medium Angle Red Illuminator (72x-0xx)

OFF	All ON	Even Alternate Chain	Odd Alternate Chain
			

2 MP models with Medium Angle White Illuminator (79x-0xx)

OFF	All ON	Even Alternate Chain	Odd Alternate Chain
			

Narrow Angle Illuminator combinations

1.3 MP models with Narrow Angle Red Illuminator (43x-0xx)

OFF	ON
	

1.3 MP models with Narrow Angle White Illuminator (46x-0xx)

OFF	ON
	

DIFFUSED RED ILLUMINATOR



Figure 104 – 26/24-LED LT-DPM Illuminator

This illuminator is made up of 50 LEDs divided into two groups of four sectors each, independently controlled by the software application. Four sectors make up the internal group called *Central LED Group*. The other four sectors make up the external group called *Peripheral LED Group*.

Please note that the Diffused Red Illuminator is called **LT-DPM** for 1.3 MP models (47x-0xx) and **R-WD DIF** for 2 MP models (77x-0xx).

The following ON/OFF lighting configurations can be set.

Central LED Group			
Top-Left Sector	Top-Right Sector	Bottom-Right Sector	Bottom-Left Sector
			

Peripheral LED Group			
Left Sector	Top Sector	Right Sector	Bottom Sector
			

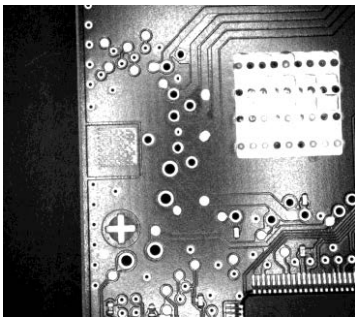
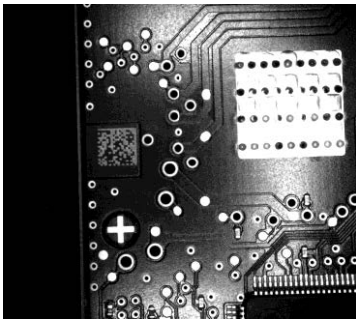
Via software each single sector can be turned on, however it is **NOT** possible to simultaneously turn on sectors belonging to the separate LED Groups - Peripheral and Central. Despite this restriction, thirty different combinations of ON/OFF lighting configurations can be obtained.

By enabling multiple Image Settings, each having a different ON/OFF LED combination, different consecutive images can be acquired, changing the activation of the eight LED sectors. This feature is particularly effective for reading codes printed/marked on reflective surfaces, by sequentially turning OFF the single LED sectors.

Examples for DPM Applications

In the example below, a Data Matrix code etched onto a PCB (reflective surface) must be read.

With all four LED sectors enabled (Example A), the code is not readable due to the LED reflections on the code surface. With different Image Settings in which the Right sector is turned off (removed from the parameter combination - Example B), the code is illuminated by the other LED sectors without the reflections on the code surface.

Example A INCORRECT illumination	Example B GOOD illumination
	

Furthermore, the use of the Diffused Red Illuminator is really effective in direct part marking applications (DPM), where linear machining flaws are present on the part surfaces. In these cases, an image of the code can be obtained having a very light background. In addition, the high number of LEDs and the diffuser increase background

uniformity because the dark bands that are generated by the spacing between adjacent LEDs are minimized.

Please consider that when using a Diffused Red Illuminator to illuminate surfaces with linear machining flaws, the well-lighted area depends on the direction of the machining flaws with respect to the illuminator's LED sectors, irrespective of the reading distance.

Clearly, this characteristic fixes the upper limit of the code dimensions compatible with the use of this illuminator. In reality, it is an actual limit of the usable part of the field of view. Therefore, this limit must be taken into account during the feasibility analysis of the solution, including the eventual positioning variation of the codes with respect to the center of the reader's field of view.

The arrangement of the LED sectors allows obtaining a well-lighted area even when the direction of the machining flaws is changed.

Refer to the following images for the dimension of lighted area illuminated by the different LED Groups.

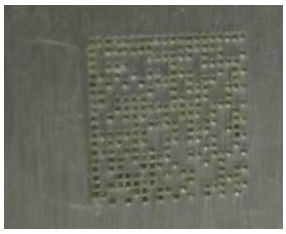
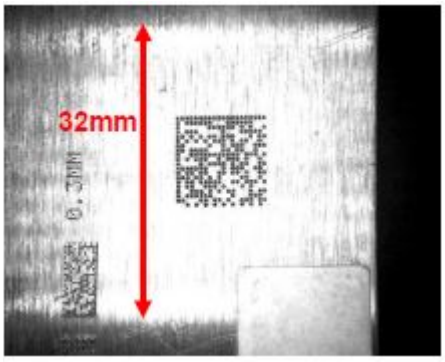


Figure 105 - Color Photo of Code



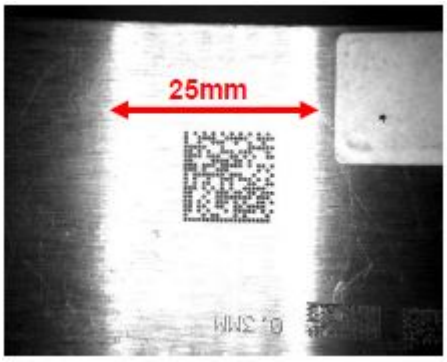


Figure 106 - Peripheral LED Group

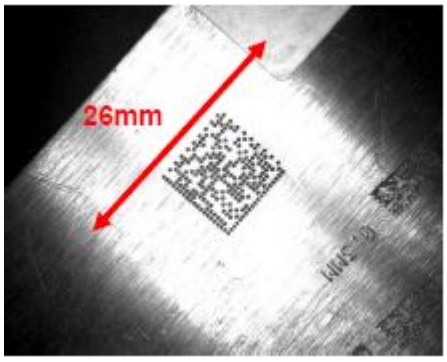


Figure 107 - Central LED Group

MLT-DPM ILLUMINATOR

This is both a Bright Field and a Dark Field illuminator available for 1.3 MP models.



Figure 108 - 39/24-LED MLT-DPM Illuminator

The **MLT-DPM** illuminator is made up of 63 LEDs divided into two groups of four sectors each, independently controlled by the software application.

Four sectors of six LEDs each make up the internal group called *Central LED Group* and correspond to Bright Field illumination. The operating distance range is typically from 20 to 250 mm. The reader focus distance further limits this range.

The use of the **MLT-DPM** *Central LED Group* is particularly effective in direct part mark applications (DPM), where linear machining flaws are present on the part surfaces. In these cases, an image of the code can be obtained having a very light background.

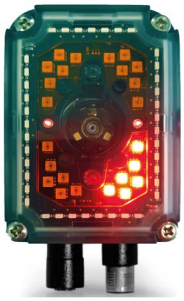
The other four sectors make up the external group called *Peripheral LED Group* and correspond to Dark Field illumination. Dark Field illumination is guaranteed by the 39 side-emitting blue LEDs divided as follows: a TOP sector of 7 LEDs, a BOTTOM sector of 8 LEDs and two sectors (LEFT and RIGHT) of 12 LEDs each.

The *Peripheral LED Group* can be the correct solution for DPM applications with highly reflective surfaces. In these applications, by using a traditional bright field illuminator, the code can result unreadable because in the acquired image some parts of the code are made invisible due to gray-level saturation generated by direct reflection of the illuminator LEDs.

To obtain optimum Dark Field illumination, it is necessary to work at close range, typically in the range from 20 to 50 mm. The reader focus distance further limits this range.

An orange filter is applied over the *Central LED Group* in order to avoid harmful blue light reflections off the *Peripheral LED* component packages.

The *Peripheral LED Group* can also be used as a Bright Field illuminator in the range from 50 to 100 mm. This group is similar to the ***Diffused Red Illuminator*** *Peripheral LED Group* but differs by the light intensity (lower in the ***MLT-DPM***) and wavelength emitted by the LEDs.

Central LED Group			
Top-Left Sector	Top-Right Sector	Bottom-Right Sector	Bottom-Left Sector
			

Peripheral LED Group			
Left Sector	Top Sector	Right Sector	Bottom Sector
			

Like the **Diffused Red Illuminator**, in software each single sector can be turned on, however it is **NOT** possible to simultaneously turn on sectors belonging to the separate LED Groups - Peripheral and Central. Despite this restriction, thirty different combinations of ON/OFF lighting configurations can be obtained.

By enabling multiple Image Settings, each having a different ON/OFF LED combination, different consecutive images can be acquired, changing the activation of the eight LED sectors. This feature is particularly effective for reading codes printed/marked on reflective surfaces, by sequentially turning OFF the single LED sectors.

Examples for DPM Applications

In the example below, two Data Matrix codes etched onto a plastic reflective surface must be read.

With all four LED sectors enabled (Example A), the code is not readable due to the LED reflections on the code surface. With different Image Settings in which the Bottom-Right sector is turned off (removed from the parameter combination - Example B) and the Top-Left sector is turned off (removed from the parameter combination - Example C), the code is illuminated by the other LED sectors without the reflections on the code surface.

Example A INCORRECT illumination	Example B GOOD illumination on Left code	Example C GOOD illumination on Right code
		

Please consider that, like the ***Diffused Red Illuminator***, when using ***MLT-DPM*** *Central LED Group* to illuminate surfaces with linear machining flaws, the well-lighted area depends on the direction of the machining flaws with respect to the illuminator's LED sectors, irrespective of the reading distance.

Clearly, this characteristic fixes the upper limit of the code dimensions compatible with the use of the ***MLT-DPM***. In reality, it is an actual limit of the usable part of the field of view. Therefore, this limit must be taken into account during the feasibility analysis of the solution, including the eventual positioning variation of the codes with respect to the center of the reader's field of view.

The arrangement of the LED sectors allows obtaining a well-lighted area even when the direction of the machining flaws is changed.

Refer to the following images for the dimension of lighted area illuminated by the different LED Groups.

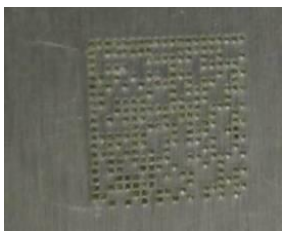


Figure 109 - Color Photo of Code

NOTE

When using the MLT-DPM Peripheral LED Group (Dark Field), the photometric parameters (Exposure time and Gain) are set to higher values in order to obtain results similar to the Diffused Red Illuminator Peripheral LED Group (Bright Field).

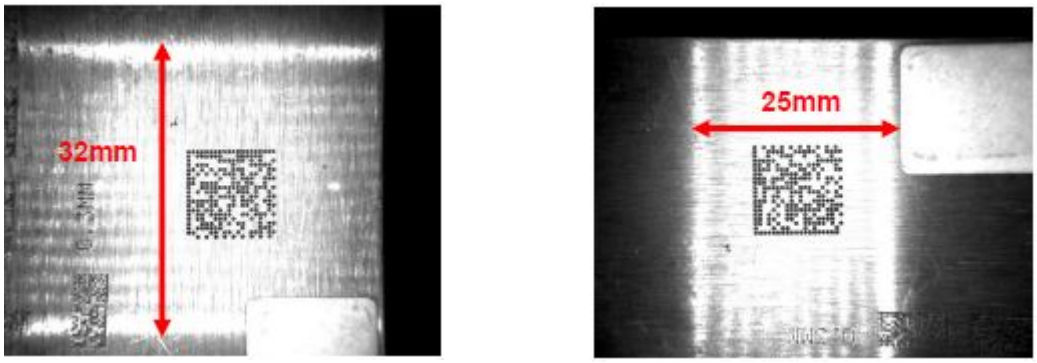


Figure 110 - MLT-DPM Peripheral LED Group

NOTE

When using the MLT-DPM Central LED Group (Dark Field), the photometric parameters (Exposure time and Gain) are set to lower values in order to obtain results similar to the Diffused Red Illuminator Central LED Group (Bright Field).

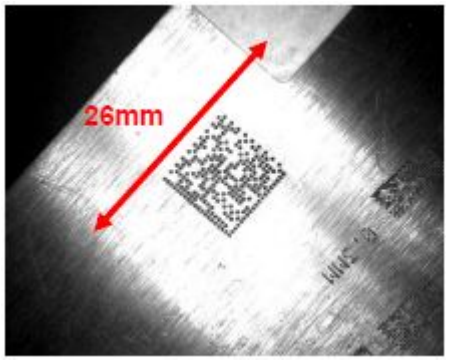


Figure 111 - MLT-DPM Central LED Group

POLARIZED ILLUMINATORS



Figure 112 - (left) 1.3 MP model with 8-LED Polarized Illuminator

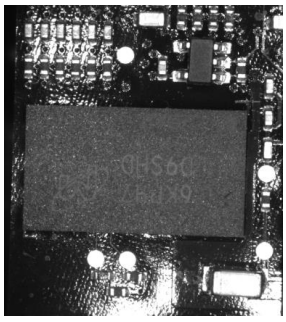
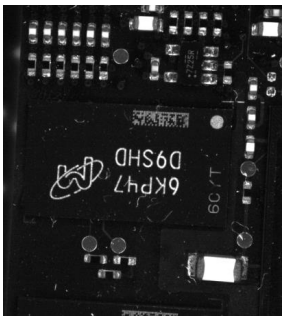
(right) 2 MP model with 10-LED Polarized Illuminator

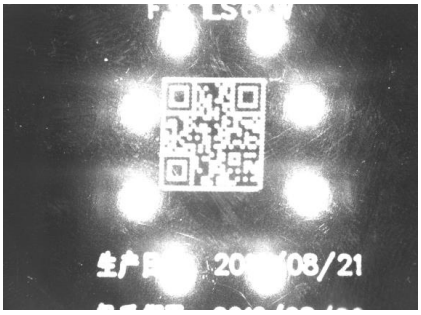
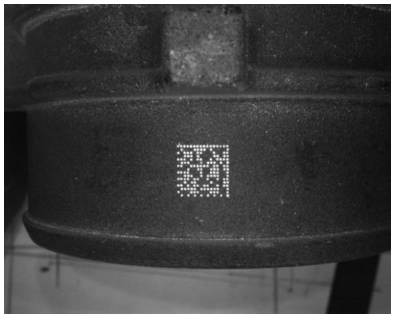
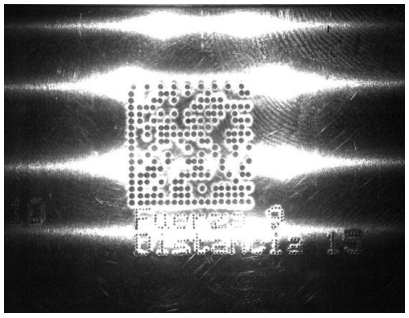
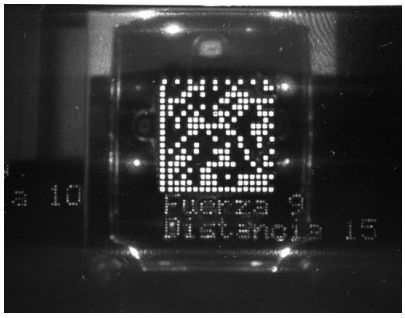
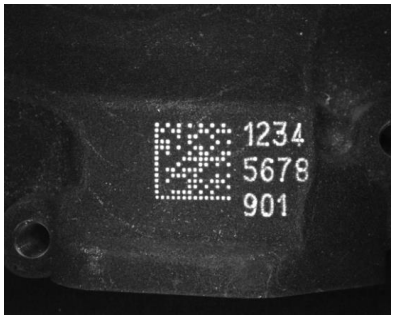
Matrix 300N also comes with a built-in polarizing filter. This is the ideal solution to reduce hot spots on reflective surface applications, such as:

- DPM on reflective metal surfaces
- DPM on non-metal reflecting surfaces
- DPM on electronic circuit boards
- Glossy labels
- Labels under plastic films

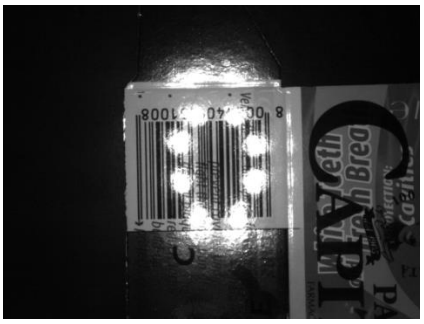
By removing LED reflection, Matrix 300N with polarized illuminators features extreme mounting flexibility, as it can be mounted 90° to the target surface. This in turn avoids code distortion and allows more reliable code grading.

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

DPM: Data Matrix on electronic components	
Non polarized	Polarized
	

DPM: Data Matrix and QR codes on metal surfaces	
Non polarized	Polarized
	
	
	
	

Bar Code under plastic film	
Non polarized	Polarized
	

Bar Code on glossy surfaces	
Non polarized	Polarized
	
	

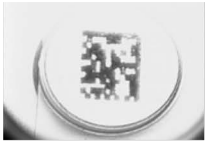
NOTE

If no polarized illuminator is used, the user may avoid LED reflections by turning on either the Even or the Odd Chain according to the code position in the reader's Field of View.

DIRECT PART MARKING APPLICATIONS

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

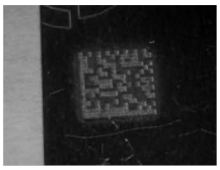
The possible selections progress from Low to Very High where Low can improve decoding time for good print/mark quality and/or relatively normal size codes. This is the default setting. Very High can improve the decode rate for low print/mark quality and/or small size codes. This algorithm is much more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



Washed out and Axial Distortion



Dot Peening On Scratched Surface



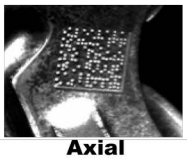
Low Contrast Problem



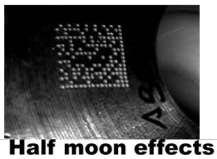
Background Problems



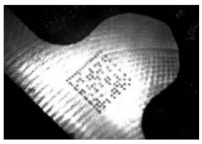
Marked On Curved Shiny Surface



Axial distortion



Half moon effects



Shiny surface, noisy background



Low contrast, noisy background

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

MATRIX 300N RECOMMENDED ILLUMINATION FOR DPM

In the following table these macro-cases are listed, each of them highlighting the most suitable Matrix 300N lighting system used to resolve the application.

Application Characteristics	STD. Red	STD. White	Diff. Red	MLT-DPM Central	MLT-DPM Peripheral	LT-51x	Polarized
Printed codes on opaque paper or labels having a flat surface	✓	✓	OK	✓	OK	OK	OK
Laser Etching or Ink Jet code marking on an opaque, flat surface having no evident machining flaws	✓	✓	OK	✓	OK	OK	OK
Code marking on an opaque, rough surface	✓	OK	OK	OK	✗	OK	OK
Code marking on a flat surface with evident machining flaws produced by machining tools	✗	✗	✓	OK	✓	OK	OK
Laser Etching or Dot Peening code marking on a flat, highly reflective surface	✗	✗	✗	✗	✓	✗	✓
Code marking on a white background	✗	✗	✗	✗	✗	✓	✗
Red-printed code on white background	✗	✓	✗	✗	OK	✗	✗
Mixed color codes/background	✗	✓	✗	✗	✗	✗	✗

Legend:



Suggested Lighting System

OK

Compatible Lighting System



Lighting System Not Recommended

NOTE

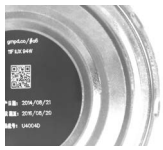
For correct use of the MLT-DPM Peripheral and LT-51x illuminators, make sure that the application working distance is within the lighting system working distance. See the table under "Lighting System Working Distances" on page 204.

Illumination Examples for DPM Applications

The following images have been captured by a Matrix 300N DPM model reader to demonstrate positioning and contrast considerations for DPM applications.

Code Positioning with Respect to Illumination

Since the various internal illuminators on the DPM models are located above or below the sensor, the light emitted from them can cause glare in the respective area of the image. If this glare covers the code, the reader will not be able to see it and therefore cannot decode it (see the first image in the table below).

Application	Non Polarized	Polarized	Diffused
Reading a Data Matrix code etched on a metal surface (can lid) Code at FoV center	 No Read	 OK	 OK
Reading a Data Matrix code etched on a metal surface (can lid) Code at FoV top	 OK	 OK	 OK
Reading a Data Matrix code etched on a metal surface (can lid) Code at FoV bottom	 OK	 OK	 OK
Reading a Data Matrix code etched on a metal surface (can lid) Code at FoV right	 OK	 OK	 OK
Reading a Data Matrix code etched on a metal surface (can lid) Code at FoV left	 OK	 OK	 OK

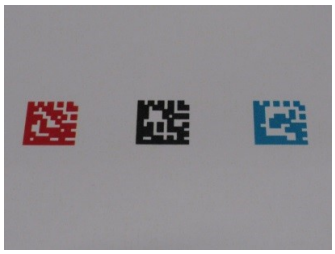
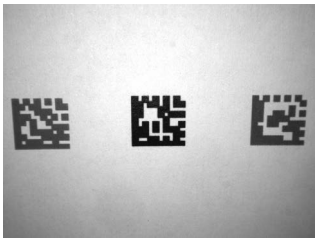
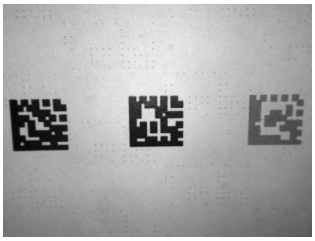
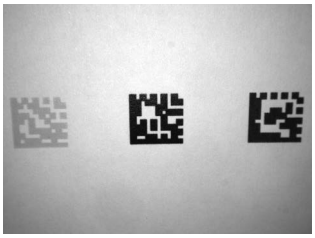
Color Contrast Considerations for DPM Applications

Matrix 300N DIF / MLT-DPM models are available in Red and Blue Light versions to help resolve applications that have colored codes and/or backgrounds.

The choice between the 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.

<table>
<tr><td colspan="4">Color Photo of Codes</td></tr>
<tr><td colspan="4"></td></tr>
<tr><td>STD White Light</td><td colspan="2">MLT-DPM Blue Light</td><td colspan="2">DIF / MLT-DPM Red Light</td></tr>
<tr><td></td><td colspan="2"></td><td colspan="2"></td></tr>
<tr><td>Good contrast on all codes</td><td>Red code (left) has good contrast</td><td>Blue code (right) has low contrast</td><td>Red code (left) has very low contrast</td><td>Blue code (right) has good contrast</td></tr>
</table>

Models	STD	MLT-DPM	DIF / MLT-DPM
Illumination Color	White	Blue	Red
Mixed color codes/background			
Red-printed code on light background White-printed code on red background	OK		
Red-printed code on dark background Black-printed code on red background	OK		
Blue-printed code on light background White-printed code on blue background	OK		
Blue-printed code on dark background Black-printed code on blue background	OK		

Legend:

 Suggested Lighting System

OK Compatible Lighting System

 Lighting System Not Recommended

LIGHTING SYSTEM WORKING DISTANCES

Reader Model	Lighting System	Working Distance
Matrix 300N 41x-010	Red Wide	20 to 550 mm
Matrix 300N 45x-010	White Wide	20 to 550 mm
Matrix 300N 47x-010	Diffused Red, both LED Groups	20 to 250 mm
Matrix 300N 48x-010	MLT-DPM Central LED Group	20 to 250 mm
Matrix 300N 48x-010	MLT-DPM Peripheral LED Group	20 to 50 mm
Matrix 300N 712-010	Red Wide	20 to 650 mm
Matrix 300N 712-015	Red Wide, Polarized	20 to 350 mm
Matrix 300N 752-010	White Wide	20 to 650 mm
Matrix 300N 772-010	Diffused Red, both LED Groups	20 to 350 mm
Matrix 300N 726-010	Red Medium	40 to 1200 mm
Matrix 300N 796-010	White Medium	40 to 1200 mm
Matrix 300N 776-010	Diffused Red, both LED Groups	40 to 450 mm
Any model	LT-51x	13 mm

The following figure shows the focus distance of a reader equipped with an LT-51x illuminator:

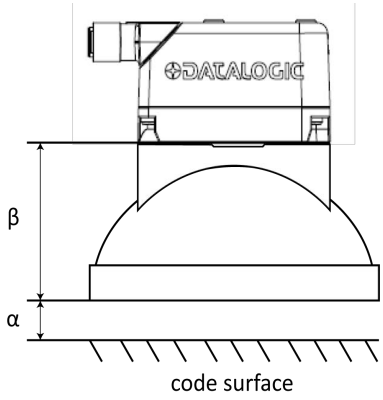


Figure 113 - Focus distance = α + β

The best results for this illuminator are obtained when **α** is approx. 13 mm (0.5''). **β** measures 75 mm, therefore the focus distance in this case equals 88 mm.

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 (25 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 93.

MATRIX 300N 2MP ILLUMINATION GUIDELINES

In the following table the most suitable Matrix 300N 2MP lighting systems are indicated according to general application requirements.

Focal length	9 mm		16 mm	
Reading distance	≤ 350 mm	> 350 mm	≤ 450 mm	> 450 mm
Recommended models for general purpose applications	STANDARD White / Red POLARIZED DIFFUSED	STANDARD White / Red Wide Angle	STANDARD White / Red DIFFUSED	STANDARD White / Red Medium Angle
Recommended models for DPM applications	Consider marking and surface type[a]	STANDARD Red Wide Angle	Consider marking and surface type [a]	STANDARD Red Medium Angle

a. For more details, please refer to “Matrix 300N Recommended Illumination for DPM” on page 200.

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.

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 Electrical Connections). If you are connecting directly to the Matrix 300N 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 are interested in.

- If you are unable to fix the problem and are going to contact your local Datalogic office or Datalogic Partner or ARC, we suggest providing (if possible): Application Program version, Parameter Configuration file, Serial Number and Order Number of your reader. You can get most of this information while DL.CODE is connected to the reader.

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

Troubleshooting Guide	
Problem	Suggestion
One Shot or Phase Mode using the Input 1 (External Trigger) or Input 2: the "TRIGGER" LED is not blinking while the External Trigger is switching.	Check if you are referring to the 17-pin connector or to the CBX spring clamp connectors. Is the sensor connected to Input 1 or Input 2? Is power supplied to the photo sensor? For NPN configuration, is power supplied to one of the two I1 or I2 signals (A or B)? For PNP configuration, is one of the two I1 or I2 signals grounded (A or B)? Are the photo sensor LEDS (if any) working correctly? Is the sensor/reflector system aligned (if present)? On the Reading Phase step check the Input 1 or Input 2 *Debouncing Time* parameter setting. On the Reading Phase step check the settings for *Acquisition Trigger*, *Reading Phase-ON*, and *Reading Phase-OFF* parameters.
One Shot or Phase Mode using serial trigger source: the "TRIGGER" LED is not blinking.	On the Reading Phase step check the settings for *Acquisition Trigger*, *Reading Phase-ON*, and *Reading Phase-OFF* parameters. Are the COM port parameters (*Baud Rate, Parity, Data Bits, Stop Bits*) correctly assigned? On the Reading Phase step check the settings of *Acquisition Trigger String*, *Reading Phase-ON String*, and *Reading Phase-OFF String* parameters. Is the serial trigger source correctly connected?
Phase Mode: the "TRIGGER" LED is correctly blinking but no image is displayed in the DL.CODE window.	Is the Phase frequency lower than the maximum frame rate?
Continuous Mode: the "TRIGGER" LED is not blinking.	Verify the correct software configuration settings.
Any Operating Mode: the "TRIGGER" LED is correctly blinking but no result is transmitted by the reader at the end of the reading phase collection.	Check the Code Collection parameters on the Reading Phase step and the Data Formatting parameters on the Data Formatting step.
Image not clear:	verify the Focus procedure
Image focused but not decoded:	verify the Calibrate Image Density procedure.

Troubleshooting Guide	
Problem	Suggestion
Reading: the reader always transmits the *No Read Message*	Run the Rapid Configuration procedure in Chapter 1, Rapid Configuration. Position the reader as described in "Mounting And Positioning Matrix 300N" on page 57 and through DL.CODE: Tune the Acquisition Delay on Trigger if the moving code is out of the reader field of view; Set the Continuous Operating Mode if no external trigger source is available; Tune the Image Settings to improve the code image quality; Check the parameter settings in the Advanced Setup step: 2D Codes, 1D Codes, and Postal Codes; View the full resolution code image to check the printing or marking quality.
Communication: reader is not transmitting anything to the host.	Is the serial cable wiring correct? If using CBX, be sure the RS422 termination switch is OFF. Are the host serial port settings the same as the reader serial port settings? In DL.CODE Device menu > Settings > Settings > LED Configuration, the COM LED Function can be configured to indicate Main Serial Port TX or Main Serial Port RX.
Communication: data transferred to the host are incorrect, corrupted or incomplete.	Are the host serial port settings the same as the reader serial port settings? In the DL.CODE Data Formatting step check the settings of Header and Terminator String parameters. In the DL.CODE Data Formatting step, check the various Message Field parameter settings.
Configuration: cannot access environment parameters in DL.CODE (Device>Settings>Settings menu item is gray)	Are you using the Installer - Expert User level? If not, change it in the Options>Change User menu.
How do I obtain my reader Serial Number?	The reader Serial Number consists of 9 characters: one letter, 2 numbers, another letter followed by 5 numbers. The reader Serial Number is printed on a label that is affixed to the case or connector block of the reader. The Serial Number is also visible from the DL.CODE Device List Area.
How do I obtain my reader Order Number?	The reader Order Number consists of 9 numbers. The reader Order Number can be obtained by comparing the Device Model (in DL.CODE Device Menu > Settings > Settings > About Device) with the product models page on the Datalogic website.

CHAPTER 11
TECHNICAL FEATURES

ELECTRICAL FEATURES

Electrical Features		
Power	**4xx-01x models** **7xx-01x models**	**4xx-04x models**
Supply Voltage	10 to 30 Vdc	PoE Device 48 Vdc
Consumption	0.7 to 0.2 A	0.13 W max
Communication Interfaces		
Main: RS232, RS422 Full-duplex	2400 to 115200 bit/s	
Auxiliary: RS232	2400 to 115200 bit/s	
ID-NET	Up to 1 Mbaud	
Ethernet (Built-in) supported application protocols	10/100 Mbit/s TCP/IP, EtherNet/IP, 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 [a] Output 1, 2 and 3	NPN or PNP short circuit protected; NN available for 7xx-0xx models	
V_{OUT} (I_{LOAD} = 0 mA) Max.	30 Vdc	
V_{OUT} (I_{LOAD} = 100 mA) Max.	3 Vdc	
I_{LOAD} Max.	100 mA	

a. when connected to the CBX connection boxes the electrical features for Output 1 and 2 become the following: Opto-isolated; V_{CE} = 30 Vdc max.; I_{CE} = 40 mA continuous max.; 130 mA pulsed max.; $V_{CE\ saturation}$ = 1 Vdc max. @ 10 mA; P_D = 90 mW Max. @ 50 °C ambient temp.

OPTICAL FEATURES

Optical Features		
Image Sensor	CMOS sensor with Global Shutter	
Image Format	**4xx-0xx models**	**7xx-0xx models**
	1.3 M pixels SXGA (1280X1024) pixels	2.0 M pixels UXGA (1600X1200) pixels
Frame Rate	45 frames/sec.	
Pitch	± 35°	
Tilt	0° - 360°	
LED Safety	according to EN 62471	
Lenses Focal Length	**Manual Adjustable Focus** 4x1-0xx models = 6 mm 4x3-0xx models = 9 mm 4x4-0xx models = 12 mm 4x5-0xx models = 16 mm	**Software Adjustable Focus** 4x2-0xx models = 9 mm 7x2-0xx models = 9 mm 7x6-0xx models = 16 mm
Lighting System	Internal Illuminator	
Aiming System	Laser Pointers	

ENVIRONMENTAL FEATURES

Environmental Features	
Operating Temperature [a]	0 to 50 °C (32 to 122 °F) for liquid lens models: 0 to 45 °C (32 to 113 °F)
Storage Temperature	-20 to 70 °C (-4 to 158 °F)
Max. Humidity	90% non condensing
Vibration Resistance EN 60068-2-6	14 mm @ 2 to 10 Hz; 1.5 mm @ 13 to 55 Hz; 2 g @ 70 to 500 Hz; 2 hours on each axis
Bump Resistance EN 60068-2-29	30g; 6 ms; 5000 shocks on each axis
Shock Resistance EN 60068-2-27	30g; 11 ms; 3 shocks on each axis
Protection Class [b] EN 60529	IP65 and IP67

a. high ambient temperature applications should use metal mounting bracket for heat dissipation.
b. when correctly connected to IP67 cables with seals.

PHYSICAL FEATURES

	Connector position 0°	Connector position 90°
Dimensions	**4xx-0xx models** 95 x 54 x 43 mm (3.7 x 2.1 x 1.7 in.) **7xx-0xx models** 95 x 54 x 45 mm (3.7 x 2.1 x 1.8 in.)	**4xx-0xx models** 75 x 54 x 62 mm (3.0 x 2.1 x 2.4 in.) **7xx-0xx models** 75 x 54 x 64 mm (3.0 x 2.1 x 2.5 in.)
Weight	**4xx-0xx models** about 238 g (8.4 oz.) **7xx-0xx models** 236.5 - 274.5 g (8.3 - 9.7 oz.) depending on the model	
Material	Aluminum	

SOFTWARE FEATURES

Readable Code Symbologies		
1D and Stacked	**2D[a]**	**Postal**
PDF417 Standard and Micro PDF417 Code 128 (GS1-128) Code 39 (Standard and Full ASCII) Code 32 MSI Plessey Code Standard 2 of 5 Matrix 2 of 5 Interleaved 2 of 5 Codabar Code 93 Pharmacode EAN-8/13 - UPC-A/E (including Addon 2 and Addon 5) GS1 DataBar Family Composite Symbologies	Data Matrix ECC 200 (Standard, GS1 and Direct Marking) QR Code (Standard and Direct Marking) Micro QR Code MaxiCode Aztec Code Dotcode	Australia Post Royal Mail 4 State Customer Kix Code Japan Post Planet PostNet PostNet (+BB) Intelligent Mail Swedish Post
Operating Mode	Continuous, One Shot, Phase Mode, PackTrack	
Configuration Methods	X-PRESS Human Machine Interface Windows-based SW (DL.CODE) via Ethernet Interface Host Mode Programming sequences sent over Serial or Ethernet TCP interfaces	
Parameter Storage	Permanent memory (Flash)	

a. VeriCode® licensed models available.

CODE QUALITY METRICS

Standard	Supported Symbologies
ISO/IEC 16022	Data Matrix ECC 200
ISO/IEC 18004	QR Code
AIM DPM	Data Matrix ECC 200, QR Code
ISO/IEC 15416	Code 128, Code 39, Interleaved 2 of 5, Codabar, Code 93, EAN-8-13, UPC-A/E

USER INTERFACE

LED Indicators	Power, Ready, Good; Trigger, Com, Status, (Ethernet Network); Good Read (Green Spot), No Read (Red Spot)
Keypad Button	Configurable via DL.CODE
Beeper	Configurable via DL.CODE

APPENDIX A
ALTERNATIVE CONNECTIONS

The connector pinouts and notes given in this appendix are for custom cabling applications.

POWER, COM AND I/O CONNECTOR

The Matrix 300N 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:

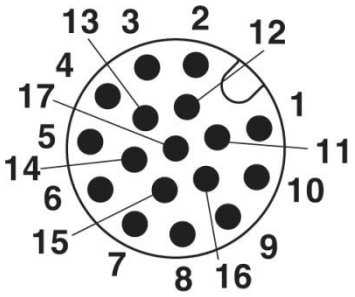


Figure 1 – M12 17-pin male Power, COM and I/O Connector

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)

Power, Com and I/O Connector Pinout			
Pin	Name	Description	
9	O1	Output 1	(NPN or PNP short circuit protected and software programmable)
8	O2	Output 2	
16	O3	Output 3	
14	RX	Auxiliary RS232 RX	
4	TX	Auxiliary RS232 TX	
7	ID+	ID-NET network data +	
15	ID-	ID-NET network data -	
Pin	Name	RS232	RS422 Full-Duplex
17	Main Interface (SW Selectable)	TX	TX+
11		RX	*RX+
12		-	TX-
10		-	*RX-

* Do not leave floating, see "RS422 Full Duplex Interface" on page 66 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

A Standard M12 D-Coded female connector is provided for the on-board Ethernet connection. This interface is IEEE 802.3 10 BaseT and IEEE 802.3u 100 BaseTx compliant.

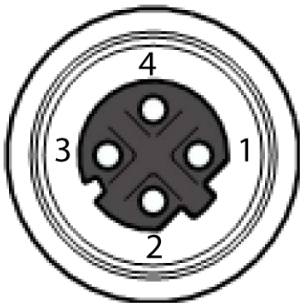


Figure 2 – M12 D-Coded Female Ethernet Network Connector

On-Board Ethernet Network Connector Pinout		
Pin	Name	Description
1	TX+	Transmit data +
2	TX-	Transmit data -
3	RX+	Receive data +
4	RX-	Receive data -

Power over Ethernet (PoE) Models

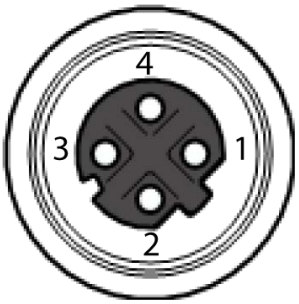


Figure 3 – M12 D-Coded Female Ethernet Network Connector

On-Board Ethernet Network Connector Pinout		
Pin	Name	Description
1	TX+ / DC-	Transmit data (+) DC power (-)
2	RX+ / DC+	Received data (+) DC power (+)
3	TX- / DC-	Transmitted data (-) DC power (-)
4	RX- / DC+	Receive data (-) DC power (+)

CAUTION

Matrix 300N PoE models only accept Alternative A (power over RJ45 pins 1, 2, 3, 6), Class 0 power levels. Use an Endspan or Midspan PSE device that supports this configuration (i.e. PoE switch or Power over Ethernet Adapter).

Alternative B (power over RJ45 pins 4, 5, 7, 8) using an Endspan or Midspan PSE device is not supported.

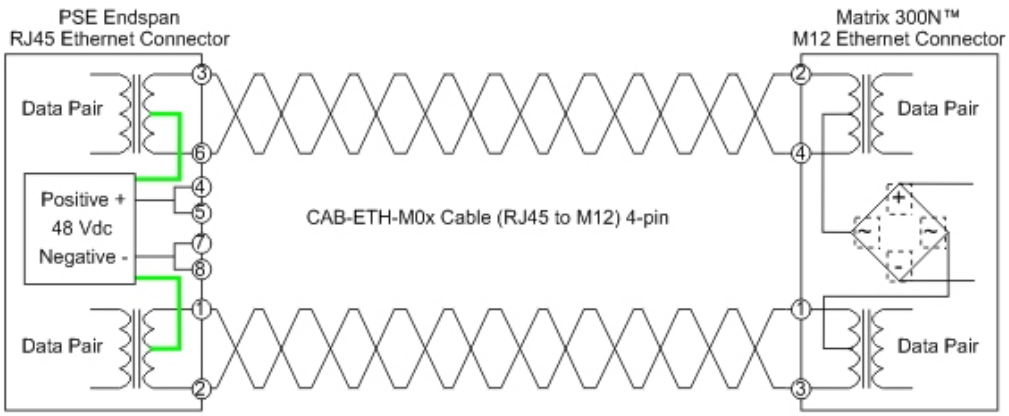


Figure 4 - Matrix 300N PoE PSE Endspan Alternative A Connections OK

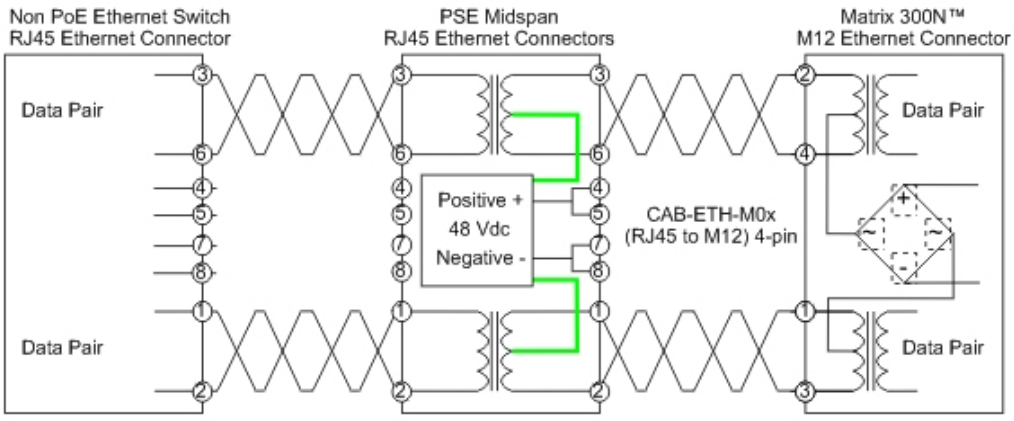


Figure 5 - Matrix 300N PoE PSE Midspan Alternative A Connections OK



Figure 6 - Matrix 300N PoE PSE Endspan Alternative B Connections NOT SUPPORTED

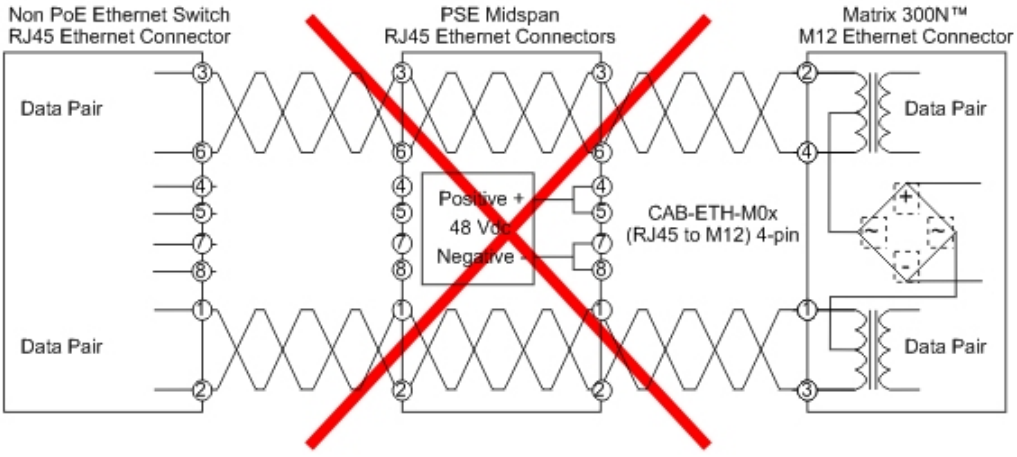


Figure 7 - Matrix 300N PoE PSE Midspan Alternative B Connections NOT SUPPORTED

CAUTION

For Matrix 300N PoE models, the internal Digital Output circuitry is not powered and supply power is not available to any Input/Output devices (Vdc=0). Only input device signals can be accepted directly on the M12 17-pin connector without power.

For these models, if it is necessary to use Input/Output devices, we recommend connecting them through the CBX, which must be powered separately.

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 optocoupled 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 73 for more details.

The electrical features of both inputs are:

INPUT	$\lvert V_{AB} \rvert$ Min.	$\lvert V_{AB} \rvert$ Max.	I_{IN} Max.
Open	0 V	2 V	0 mA
Closed	4.5 V	30 V	10 mA

The relative pins on the M12 17-pin connector are:

Input Pinout		
Pin	Name	Description
1	Vdc	Power Supply input voltage +
6	I1A	External Trigger A (polarity insensitive)
5	I1B	External Trigger B (polarity insensitive)
13	I2A	Input 2 A (polarity insensitive)
3	I2B	Input 2 B (polarity insensitive)
2	GND	Power Supply input voltage -

OUTPUTS

Three general purpose **non opto-isolated** but short circuit protected outputs are available on the M12 17-pin connector.

The pinout is the following:

Output Pinout		
Pin	Name	Description
9	O1	Configurable digital output 1
8	O2	Configurable digital output 2
16	O3	Configurable digital output 3
2	GND	Output reference signal

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.

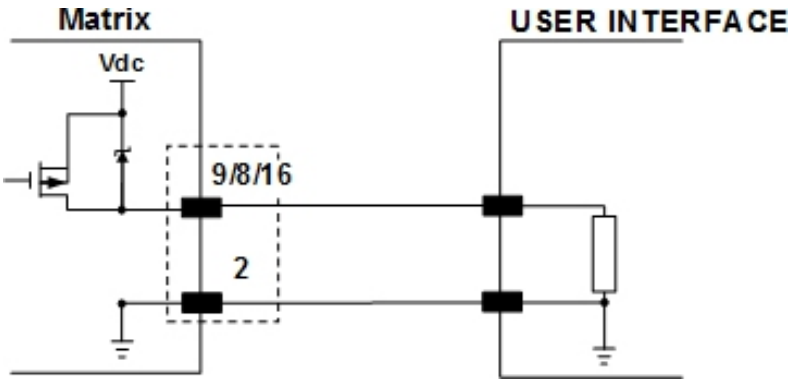


Figure 8 – PNP Output Connection

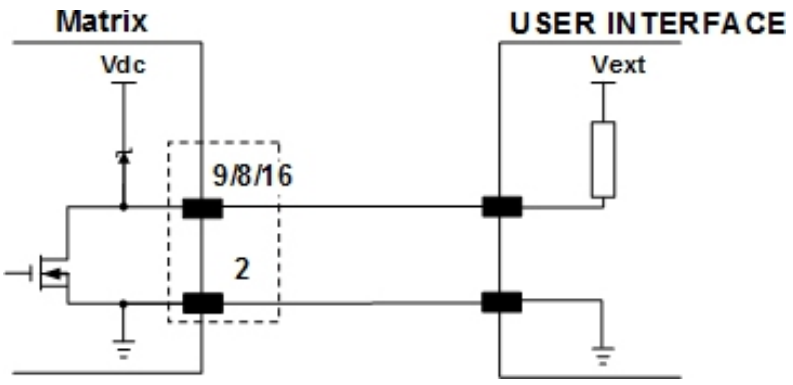


Figure 9 – NPN Output Connection

CAUTION

For NPN output connections, the external interface voltage (Vext) must not exceed the Matrix 300N power supply source voltage (Vdc) otherwise correct output functioning cannot be guaranteed.

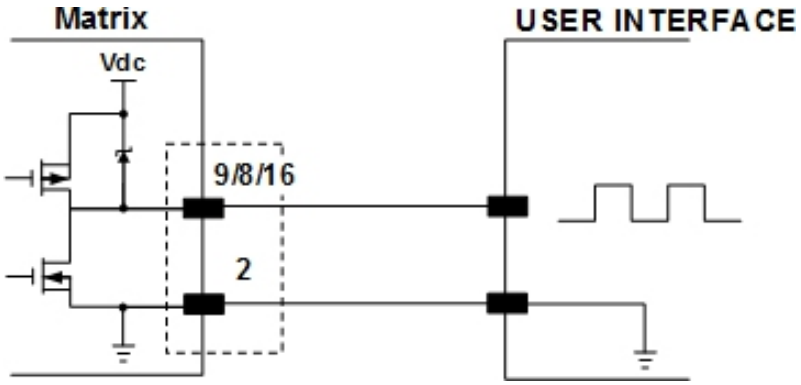


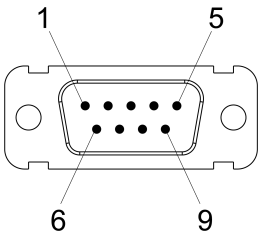
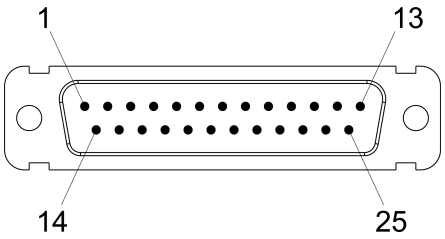
Figure 10 - Push-Pull Output Connection

CAUTION

For Matrix 300N PoE models, the internal Digital Output circuitry is not powered and supply power is not available to any Input/Output devices (Vdc=0). Only input device signals can be accepted directly on the M12 17-pin connector without power.

For these models, if it is necessary to use Input/Output devices, we recommend connecting them through the CBX, which must be powered separately.

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.

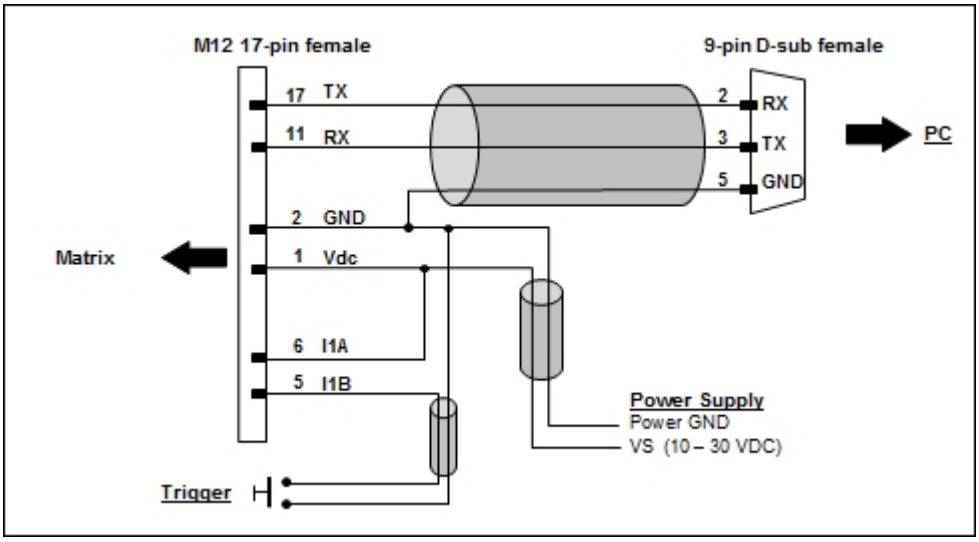


Figure 11 – Test Cable

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 owing to the symbol marking technique. It is also used with very reflective surfaces.

Decode

To recognize a barcode symbology *(e.g.,* Codabar, Code 128, Code 3 of 9, UPC/EAN, etc.) and analyze the content of the barcode scanned.

Depth of Field

The difference between the minimum and the maximum distance of the object in the field of view that appears to be in focus.

Diffused Illumination

Distributed soft lighting from a wide variety of angles used to eliminate shadows and direct reflection effects from highly reflective surfaces.

Direct Part Mark (DPM)

A symbol marked on an object using specific techniques like dot peening, laser etching, chemical etching, etc.

EEPROM

Electrically Erasable Programmable Read-Only Memory. An on-board non-volatile memory chip.

Element

The basic unit of data encoding in a 1D or 2D symbol. A single bar, space, cell, dot.

Exposure Time

For digital cameras based on image sensors equipped with an electronic shutter, it defines the time during which the image will be exposed to the sensor to be acquired.

Flash

Non-volatile memory for storing application and configuration files.

Host

A computer that serves other terminals in a network, providing services such as network control, database access, special programs, supervisory programs, or programming languages.

Image Processing

Any form of information processing for which the input is an image and the output is for instance a set of features of the image.

Image Resolution

The number of rows and columns of pixels in an image. The total number of pixels of an image sensor.

Image Sensor

Device converting a visual image to an electric signal. It is usually an array of CCD (Charge Coupled Devices) or CMOS (Complementary Metal Oxide Semiconductor) pixel sensors.

IEC

(International Electrotechnical Commission): Global organization that publishes international standards for electrical, electronic, and other technologies.

IP Address

The terminal's network address. Networks use IP addresses to determine where to send data that is being transmitted over a network. An IP address is a 32-bit number referred to as a series of 8-bit numbers in decimal dot notation *(e*.g., 130.24.34.03). The highest 8-bit number you can use is 254.

ISO

(International Organization for Standardization): A network of the national standards institutes of several countries producing world-wide industrial and commercial standards.

LED (Light Emitting Diode)

A low power electronic light source commonly used as an indicator light. It uses less power than an incandescent light bulb but more than a Liquid Crystal Display (LCD).

LED Illuminator

LED technology used as an extended lighting source in which extra optics added to the chip allow it to emit a complex radiated light pattern.

Matrix Symbologies (2D Codes)

An arrangement of regular polygon shaped cells where the center-to-center distance of adjacent elements is uniform. Matrix symbols may include recognition patterns which do not follow the same rules as the other elements within the symbol.

Multi-row (or Stacked) Symbologies

Symbologies where a long symbol is broken into sections and stacked one upon another similar to sentences in a paragraph.

RAM

Random Access Memory. Data in RAM can be accessed in random order, and quickly written and read.

Symbol Verification

The act of processing a code to determine whether or not it meets specific requirements.

Transmission Control Protocol/Internet Protocol (TCP/IP)

A suite of standard network protocols that were originally used in UNIX environments but are now used in many others. The TCP governs sequenced data; the IP governs packet forwarding. TCP/IP is the primary protocol that defines the Internet.

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