



> Matrix 410N™



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Matrix 410N™ Reference Manual

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REFERENCES

CONVENTIONS

This manual uses the following conventions:

"User" refers to anyone using a Matrix 410N™ reader.

"Reader" refers to the Matrix 410N™ reader.

"You" refers to the System Administrator or Technical Support person using this manual to install, configure, operate, maintain or troubleshoot a Matrix 410N™ reader.

REFERENCE DOCUMENTATION

For further details refer to: the DL.CODE™ Help On Line, DL.CODE™ User's Guide, Matrix Reading Methods provided as supplementary documentation on the DL.CODE™ mini-DVD (downloaded ISO file or mini-DVD accessory).

SUPPORT THROUGH THE WEBSITE

Datalogic provides several services as well as technical support through its website. Log on to **www.datalogic.com** and click on the **Industrial Automation** links for further information:

- **PRODUCTS – FIXED INDUSTRIAL BARCODE READERS**

Select your product from the links on the **Fixed Industrial Barcode Readers** page. The product page describes specific Info, Features, Applications, Models, Accessories, and Downloads including documentation, software drivers, and utility programs.

- **SUPPORT & SERVICES – INDUSTRIAL AUTOMATION**

Several links from the **Industrial Automation** list take you to additional services such as: Service Program which contains Maintenance Agreements and Warranty Extensions; Repair Centers; On-Line RMA Return Material Authorizations; Technical Support through email or phone; Downloads for additional downloads.

PATENTS

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

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

Utility patents: EP0996284B1, EP0999514B1, EP1014292B1, IT1404187, JP4435343B2, JP4571258B2, US6512218, US6616039, US7053954, US8058600, US8289387, US8368000, ZL200780053699.6

COMPLIANCE

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.

EMC COMPLIANCE

In order to meet the EMC requirements:

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

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 Direct Plug-in Power Unit marked LPS or "Class 2".

LED SAFETY

For all Datalogic Matrix 410N™ compatible internal illuminators, LED emission according to EN 62471.

CE COMPLIANCE

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 which 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 own expense.

LASER SAFETY

Matrix 410N™ with the LT-007 illuminator accessory contains 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.



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

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

The following warning label content is applied to each of the laser equipped products indicated in the General View illustration (Figure A).



Example Laser Warning Labels

Produit(s) conforme selon 21CFR 1040.10 sauf des dérogations relatives à la Laser Notice N° 50, date Juin 24, 2007.

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

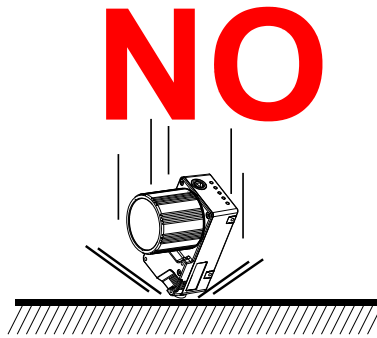


Exemple d'étiquettes d'avertissement laser

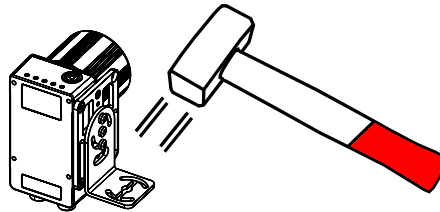
HANDLING

The Matrix 410N™ is designed to be used in an industrial environment and is built to withstand vibration and shock when correctly installed, however it is also a precision product and therefore before and during installation it must be handled correctly to avoid damage.

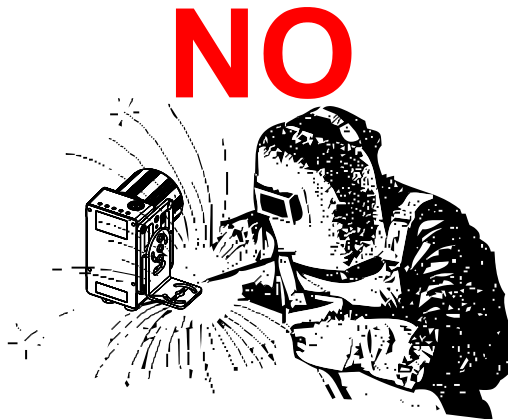
- avoid that the readers are dropped (exceeding shock limits).



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



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



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



GENERAL VIEW

Matrix 410N™

(shown with Lens and Illuminator accessories)



* some Illuminator models are equipped with Laser Pointer LEDs.

Figure A

- | | |
|---------------------------------------------|----------------------------------|
| ① Device Class and Warning Labels | ⑥ HMI X-PRESS™ Interface |
| ② Mounting Holes (12) | ⑦ Power On LED |
| ③ Lens Cover | ⑧ Power - Serial - I/O Connector |
| ④ Lens (separate accessory) | ⑨ Ethernet Connector |
| ⑤ Internal Illuminator (separate accessory) | ⑩ Ethernet Connection LED |

1 RAPID CONFIGURATION

STEP 1 – ASSEMBLE THE READER

The first step to perform is to assemble the accessories that make up the Matrix 410N™ reader¹. The lens and either an internal or an external illuminator must be used. This procedure shows an internal illuminator.



CAUTION: Matrix 410N™ must be disconnected from the power supply during this procedure.

1. In a dust-free environment, remove the Matrix 410N™ Lens Cover by unscrewing it.



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

2. Remove the sensor protection label by pulling it off of the base.
3. Mount the lens by screwing it tightly onto the base.

If the Locking Knobs on the lens are obstructed because they are aligned behind an illuminator spacer base and illuminator spacer, insert the Lens Spacer between the Matrix 410N™ body and the C-Mount lens so that the Locking Knobs will be unobstructed.



NOTE: It is strongly recommended to apply a lens locking sticker (provided with the lens), for applications where Matrix 410N™ is subjected to vibration.

4. If using an internal illuminator:
 - a. Mount the four internal illuminator spacers onto the illuminator spacer bases provided on the Matrix 410N™ body.
 - b. Align and mount the Illuminator tightly onto the spacers using the four screws and washers provided in the illuminator package. The spacers are positioned asymmetrically to avoid incorrect alignment.
5. To keep dust and dirt off of the lens during mounting, temporarily replace the lens cover.

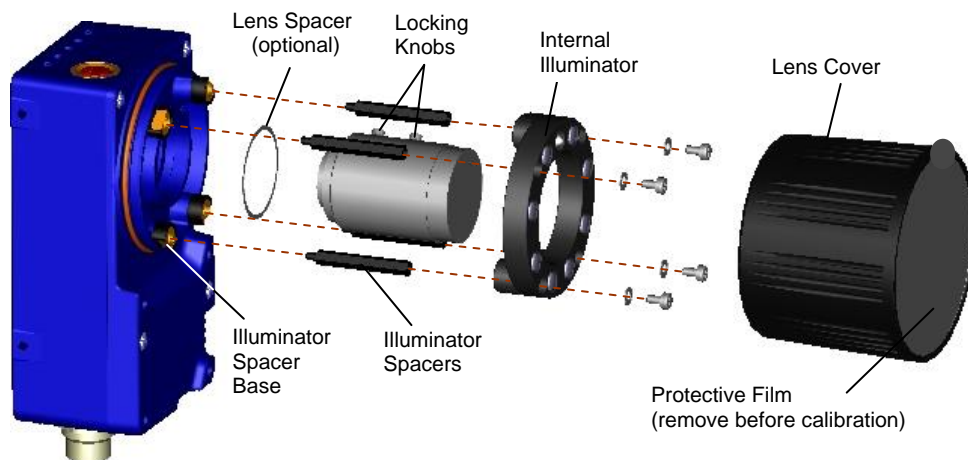


Figure 1 – Assembling Matrix 410N™ Accessories

¹ XRF models are pre-assembled at the factory.

Required Accessories

The following table shows the correct lens/illuminator combinations to be used for Matrix 410N™ imager assembly. For more information see the Application Note on illuminator selection on the DL.CODE™ mini-DVD (downloaded ISO file or mini-DVD accessory).

| Lenses | | | Internal Illuminators | | | |
|-------------|------------|-------------------|------------------------------------------------------------------------------------------|----------------------------------------------------------|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Part Number | Name | C-Mount Lens Type | Part Number | Name | LEDs | Type |
| 93ACC1793 | LNS-1006 * | 6 mm | 93A401020 93A401022 | LT-002 LT-004 | 8 8 | Red Wide Angle White Wide Angle |
| 93ACC1794 | LNS-1109 | 9 mm | 93A401020 93A401022 93A401023 | LT-002 LT-004 LT-005 | 8 8 32 | Red Wide Angle White Wide Angle Blue 8x4 LED chain for DPM |
| 93ACC1795 | LNS-1112 | 12.5 mm | 93A401020 93A401022 93A401023 | LT-002 LT-004 LT-005 | 8 8 32 | Red Wide Angle White Wide Angle Blue 8x4 LED chain for DPM |
| 93ACC1796 | LNS-1116 | 16 mm | 93A401019 93A401021 93A401023 | LT-001 LT-003 LT-005 | 8 8 32 | Red Narrow Angle White Narrow Angle Blue 8x4 LED chain for DPM |
| 93ACC1797 | LNS-1125 | 25 mm | 93A401019 93A401021 93A401024 93A401030 93A401026 93A400031 | LT-001 LT-003 LT-006 LT-007 LT-010 LT-011 | 8 8 8 8 15 15 | Red Narrow Angle White Narrow Angle Red Super Narrow Angle Red Super Narrow Angle High Power Blue Super Narrow Angle High Power Red Super Narrow Angle |
| 93ACC1798 | LNS-1135 | 35 mm | 93A401024 93A401030 93A401026 93A400031 | LT-006 LT-007 LT-010 LT-011 | 8 8 15 15 | Red Super Narrow Angle Red Super Narrow Angle High Power Blue Super Narrow Angle High Power Red Super Narrow Angle |
| 93ACC1799 | LNS-1150 | 50 mm | 93A401024 93A401030 93A401026 93A400031 | LT-006 LT-007 LT-010 LT-011 | 8 8 15 15 | Red Super Narrow Angle Red Super Narrow Angle High Power Blue Super Narrow Angle High Power Red Super Narrow Angle |

* LNS-1006 produces a slight vignetting effect at the corners of the FOV at short focal lengths.



CAUTION: LT-005: In order to function properly, DL.CODE™ must correctly manage the illuminator parameters. Follow the DL.CODE™ Illuminator Management Procedure below.

LT-010 and LT-011: To avoid damage to the devices, DL.CODE™ must correctly manage the illuminator parameters. Follow the DL.CODE™ Illuminator Management Procedure below.

When using a 25 mm focal length lens (LNS-1125), it is possible to use Super Narrow Angle Illuminators (LT-006, LT-007, LT-010 or LT-011) as well as the Narrow Angle Illuminators LT-001 or LT-003. It is suggested to use the Narrow Angle Illuminators in applications with very low contrast codes and in all cases where the higher lighting power of the LT-006, LT-007, LT-010 or LT-011 isn't necessary. LT-010 and LT-011 Illuminators are especially effective in high speed code movement applications.

Internal Lighting Mode Limitations

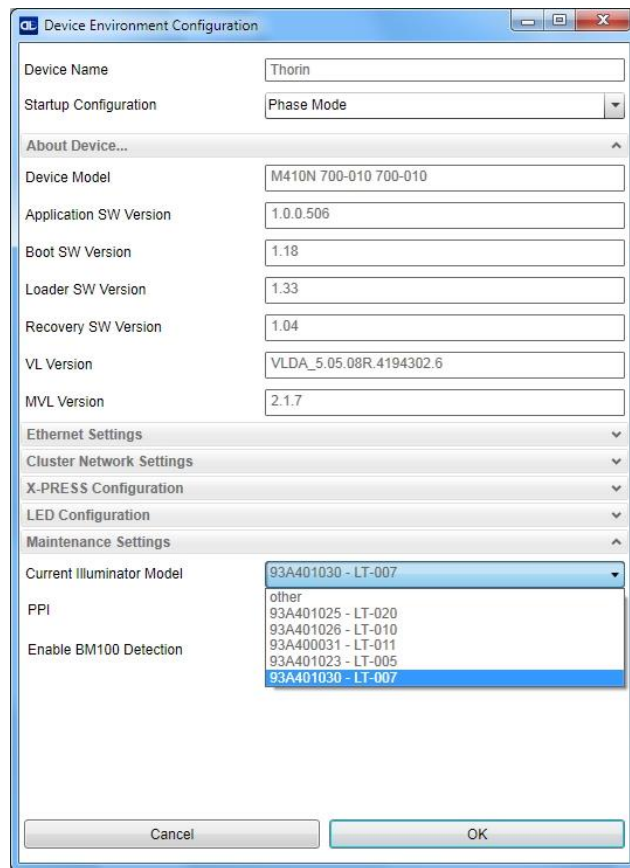
- For all illuminators the application program imposes protective limits on the frame rate to avoid overheating.
- LT-010 and LT-011 illuminators do not work in Continuous High-Power mode.

See the Help On Line for more details on the Internal Lighting Mode parameter.

DL.CODE™ Illuminator Management Procedure

1. Connect the reader to DL.CODE™ as described in this chapter.
2. In the DL.CODE™ Device menu click the Settings > Settings > Maintenance Settings > Current Illuminator Model item and select the Illuminator being used from the list.
3. Click OK and at the device reset prompt click Yes and wait until the device resets. You can confirm by reopening this item from the same menu.

The above procedure must also be performed before any attempt to use the X-PRESS™ configuration on readers mounting the LT-005, LT-007, LT-010 or LT-011 illuminators.



STEP 2 – CONNECT THE SYSTEM

To connect the system in a Stand Alone configuration, you need the hardware indicated in Figure 2. 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 independently from the main interface selection.

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

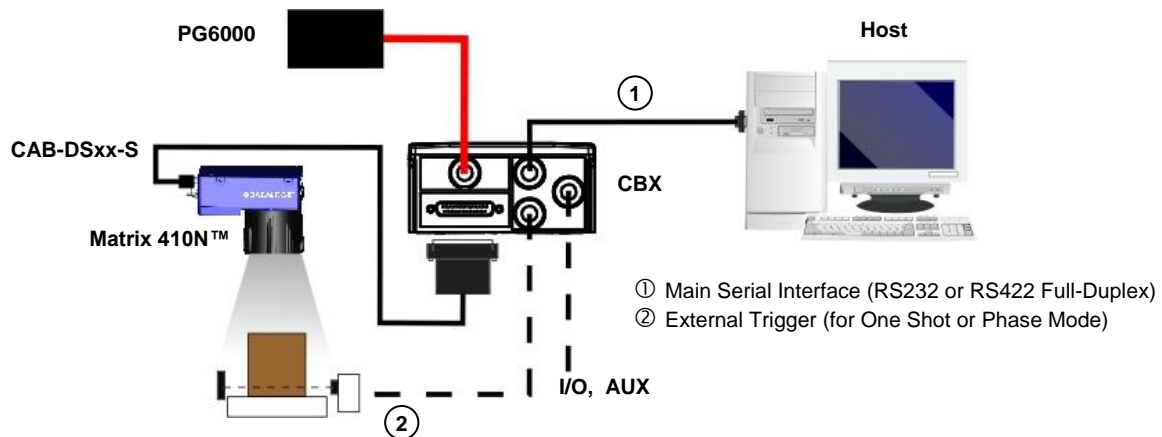


Figure 2 – Matrix 410N™ in Stand Alone Layout

CBX100/CBX500 Pinout for Matrix 410N™

The table below gives the pinout of the CBX100/CBX500 terminal block connectors. Use this pinout when the Matrix 410N™ 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 | Auxiliary Interface TX |
| I2A | Input 2 A (polarity insensitive) | RX | Auxiliary Interface RX |
| I2B | Input 2 B (polarity insensitive) | SGND | Auxiliary Interface Reference |
| -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 | *RX+ | |
| | | *RX- | |
| | SGND | SGND | |

* Do not leave floating, see par. 4.2.2 for connection details.



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

STEP 3 – MOUNT AND POSITION THE READER

1. To mount the Matrix 410N™, use the mounting brackets to obtain the most suitable position for the reader. Two of the most common mounting configurations are shown in the figures below. Other mounting solutions are provided in par. 3.3.

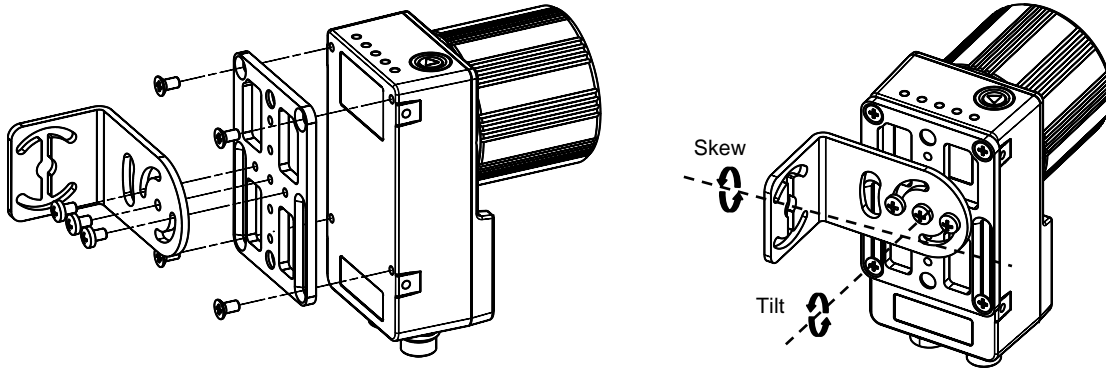


Figure 3 –Positioning with Mounting Bracket (Back)

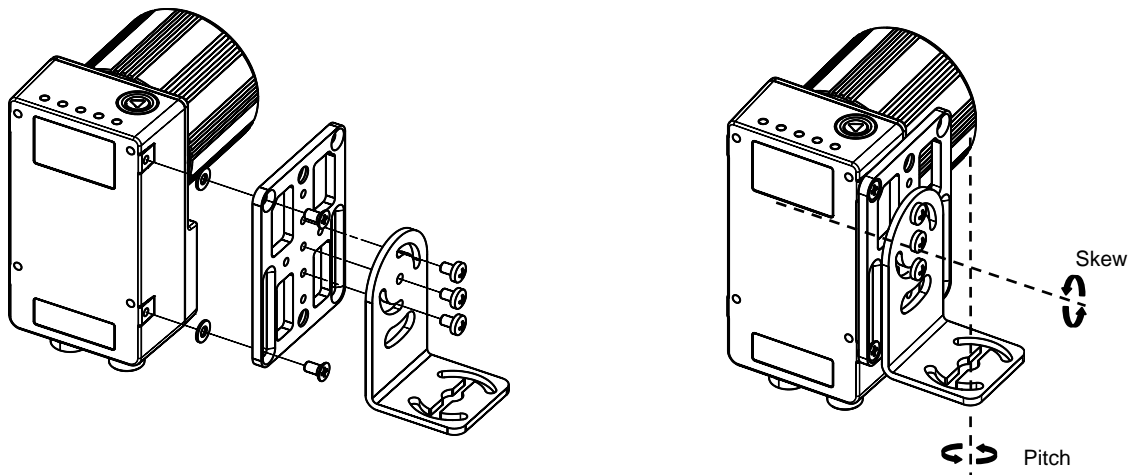


Figure 4 –Positioning with Mounting Bracket (Side)

2. When mounting the Matrix 410N™ 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).

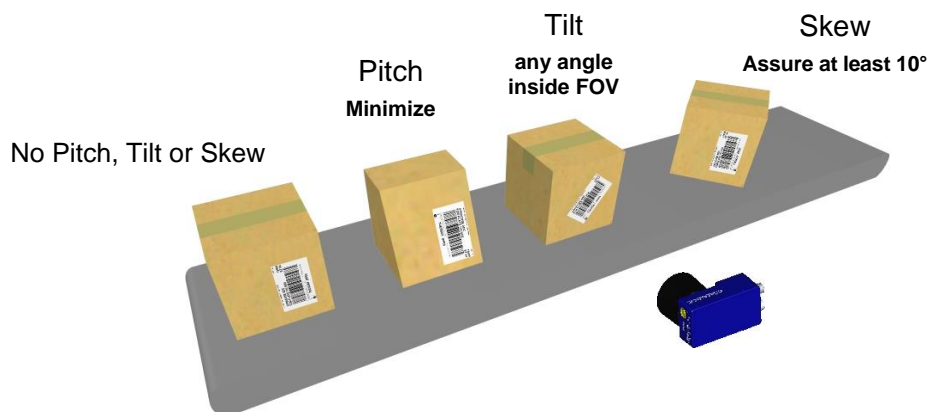


Figure 5 – Pitch, Skew and Tilt Angles

3. Refer to the Reading Features table in chp. 6 for **FOV calculation** and **minimum distance requirements** according to the base/lens combination used for your application.



NOTE: Rapid Configuration of the Matrix 410N™ reader can be made **either** through the X-PRESS™ interface (steps 4-6) which requires no PC connection, **or** by using the DL.CODE™ configuration tool (steps 7-8). Select the procedure according to your needs.

STEP 4 – FOCUS THE READER

Matrix 410N™ provides a built-in tool called Blue Diamonds™ to aid focusing the reader. The Blue Diamonds™ are accessed through the X-PRESS™ Interface.

1. Remove the lens cover in order to focus the reader.
2. Prepare the correct accessory lens for your application:
 - a. Loosen the two Locking Knobs on the lens.
 - b. Adjust the Focus ring to the "**Far position**" and the Diaphragm ring to the "**F4**"² number setting which is the preferred setting for installation.
3. Power the reader on. During the reader startup (reset or restart phase), all the LEDs blink for one second. On the connector side of the reader near the cable, the "POWER ON" LED (blue) indicates the reader is correctly powered.
4. Enter the Focus function by pressing and holding the X-PRESS™ push button until the Focus LED is on.
5. Release the button to enter the Focus function. The Blue Diamonds™ turn on.

The procedure is as follows:

- a. Adjust the Focus ring towards the "Near position" until the Blue Diamonds™ are perfectly in focus, see Figure 7.

At long focal distances a "skew" angle may cause a noticeable difference in focus between the two diamonds, in this case select the best possible focus (both diamonds slightly out of focus). Tighten the Focus Locking Knob.



Figure 6 – X-PRESS™ Interface: Focus Function

- b. Tighten the Diaphragm Locking Knob.



NOTE: If necessary you can use the Focusing Tool in the DL.CODE™ Image Setup step for fine focusing. See Step 8.

² For far reading distances, the Diaphragm ring can be set to values between **F2** and **F4** to increase image lighting and Blue Diamond™ visibility.

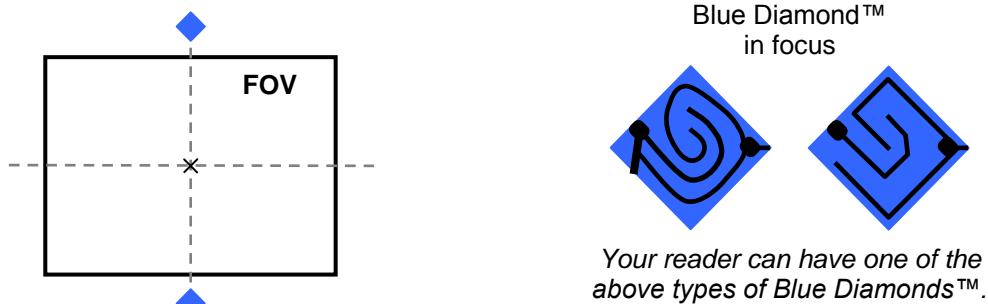


Figure 7 – Focus Function Using Blue Diamonds™

6. Exit the Focus function by pressing the X-PRESS™ push button once. The Blue Diamonds™ turn off.
7. Replace the lens cover, screwing it tightly to the base.

STEP 5 – CALIBRATE IMAGE DENSITY

In order to function correctly to the fullest extent of its capabilities, Matrix 410N™ must acquire information regarding image density or PPI (pixels per inch). This calibration takes place through the X-PRESS™ Interface and the **Grade A Barcode Test Chart** included in the package. This procedure is necessary for the first time installation, if the lens type is changed or if the focal distance is changed.

Locate

1. Enter the Focus function by pressing and holding the X-PRESS™ push button until the Focus LED is on.
2. Release the button to enter the Focus function. The Blue Diamonds™ turn on.
3. From the **Grade A Barcode Test Chart**, select the longest code whose length fits between the two Blue Diamonds™. Rotate the code 90 degrees and position the code at the center of the FOV (equidistant from the Blue Diamonds™).

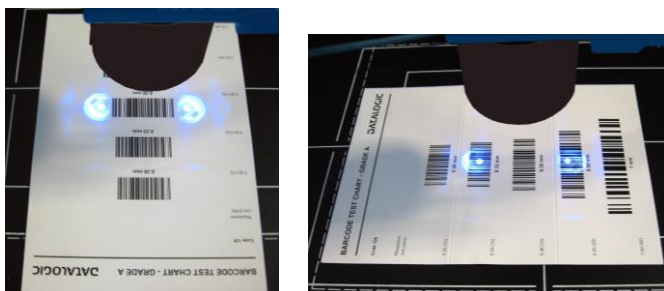


Figure 8 – X-PRESS™ Interface: Locate Function

4. Exit the Focus function by pressing the X-PRESS™ push button once. The Blue Diamonds™ turn off.

Setup

5. Enter the Setup function by pressing and holding the X-PRESS™ push button until the Setup LED is on.
6. 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 remain on continuously and Matrix 410N™ emits 3 high pitched beeps.

If the calibration cannot be reached after a timeout of about 5 (five) seconds Matrix 410N™ will exit without saving the parameters to memory, the Setup LED will not remain on continuously but it will just stop blinking. In this case Matrix 410N™ emits a long low pitched beep.

7. Exit the Setup function by pressing the X-PRESS™ push button once.



Figure 9 – X-PRESS™ Interface: Setup Function

Learn

8. Enter the Learn function by pressing and holding the X-PRESS™ push button until the Learn LED is on.
9. 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 Density value is successfully saved in the reader memory, the Learn LED will remain on continuously, the Green Spot is activated and Matrix 410N™ emits 3 high pitched beeps.

If the calibration cannot be reached after a timeout of about 3 (three) minutes Matrix 410N™ will exit without saving the parameters to memory, the Learn LED will not remain on continuously but it will just stop blinking. In this case Matrix 410N™ emits a long low pitched beep.

10. Exit the Learn function by pressing the X-PRESS™ push button once.



Figure 10 – X-PRESS™ Interface: Learn Function

STEP 6 – X-PRESS™ CONFIGURATION

Once Matrix 410N™ has calibrated image density, you can configure it for optimal code reading relative to your application. This configuration can be performed either through the X-PRESS™ Interface or the DL.CODE™ configuration program.

Locate

1. Enter the Focus function by pressing and holding the X-PRESS™ push button until the Focus LED is on.
2. Release the button to enter the Focus function. The Blue Diamonds™ turn on.
3. **Select a code from your application.** Position the code at the center of the FOV (equidistant from the Blue Diamonds™).
4. Exit the Focus function by pressing the X-PRESS™ push button once. The Blue Diamonds™ turn off.



Figure 11 – X-PRESS™ Interface:
Locate Function

Setup

5. Enter the Setup function by pressing and holding the X-PRESS™ push button until the Setup LED is on.
6. 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 remain on continuously and Matrix 410N™ emits 3 high pitched beeps.

If the calibration cannot be reached after a timeout of about 5 (five) seconds Matrix 410N™ will exit without saving the parameters to memory, the Setup LED will not remain on continuously but it will just stop blinking. In this case Matrix 410N™ emits a long low pitched beep.

7. Exit the Setup function by pressing the X-PRESS™ push button once.



Figure 12 – X-PRESS™ Interface:
Setup Function

Learn

8. Enter the Learn function by pressing and holding the X-PRESS™ push button until the Learn LED is on.
9. 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 are successfully saved in the reader memory, the Learn LED will remain on continuously, the Green Spot is activated and Matrix 410N™ emits 3 high pitched beeps³.

If the autolearning cannot be reached after a timeout of about 3 (three) minutes Matrix 410N™ will exit without saving the parameters to memory, the Learn LED will not remain on continuously but it will just stop blinking. In this case Matrix 410N™ emits a long low pitched beep.

10. Exit the Learn function by pressing the X-PRESS™ push button once.



Figure 13 – X-PRESS™ Interface: Learn Function



NOTE: If you have used this procedure to configure Matrix 410N™ go to step 9.

Reset Reader to Factory Default (Optional)

If it ever becomes necessary to reset the reader to the 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.**

The Configuration and Environment parameters are reset. The Matrix 410N™ emits 3 high pitched beeps and after a few seconds enters run mode.



NOTE: If you release the button while the LEDs are all fixed on (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.

³ The Learn procedure will not recognize the following symbologies: Postal Codes, Pharmacode, MSI, Standard 2 of 5, Matrix 2 of 5.

STEP 7 – INSTALLING DL.CODE™ CONFIGURATION PROGRAM

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 XP, Vista, or 7), download the DL.CODE™ installer (**DL.CODE X.x_Setup.exe**) from the website and run it following the installation procedure.
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.

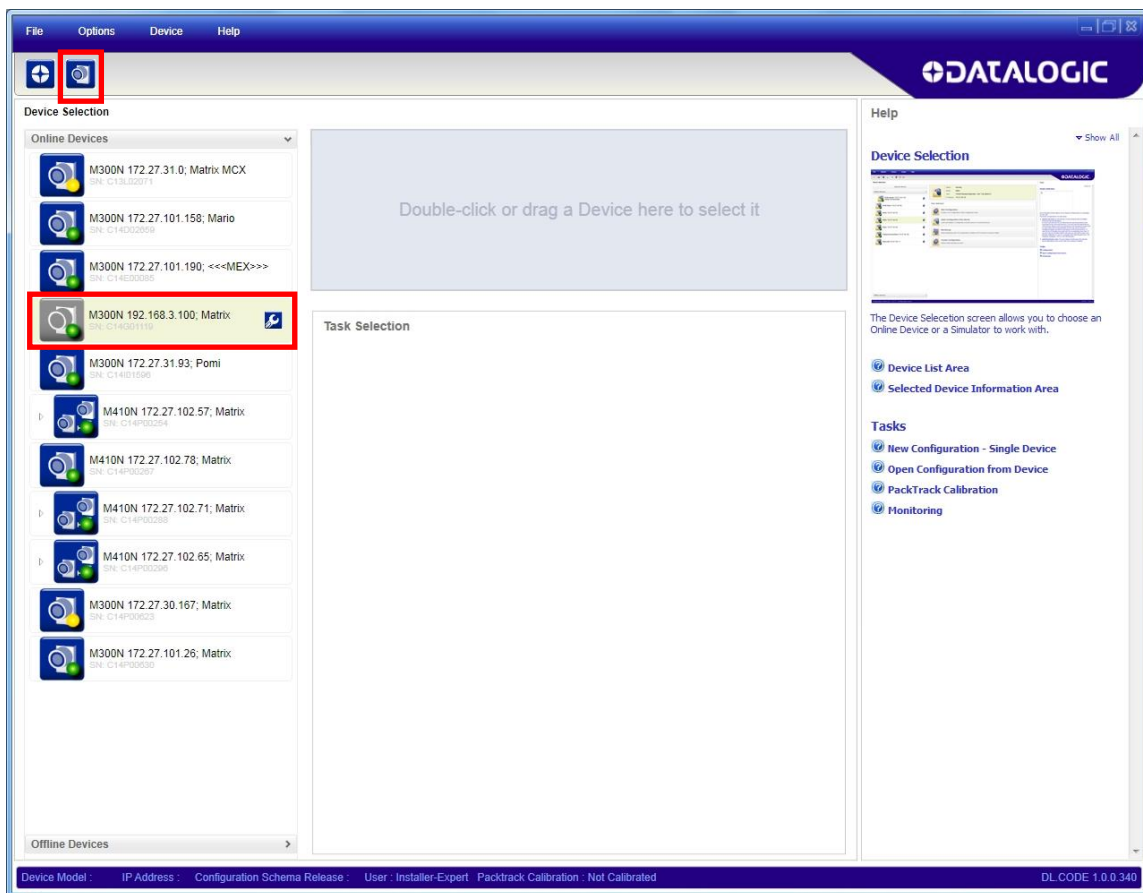



Figure 14 – Device Discovery

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

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. Click on the device wrench icon  (or the Device>Settings>Settings menu) to open the Device Environment Configuration window.
5. Change the Ethernet Settings (IP Address, Subnet Mask, Gateway Address etc.) according to the network requirements.

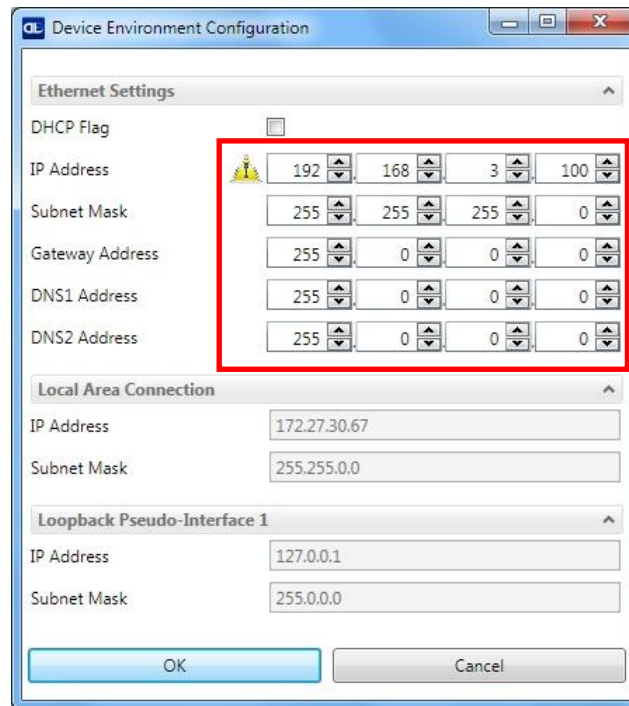
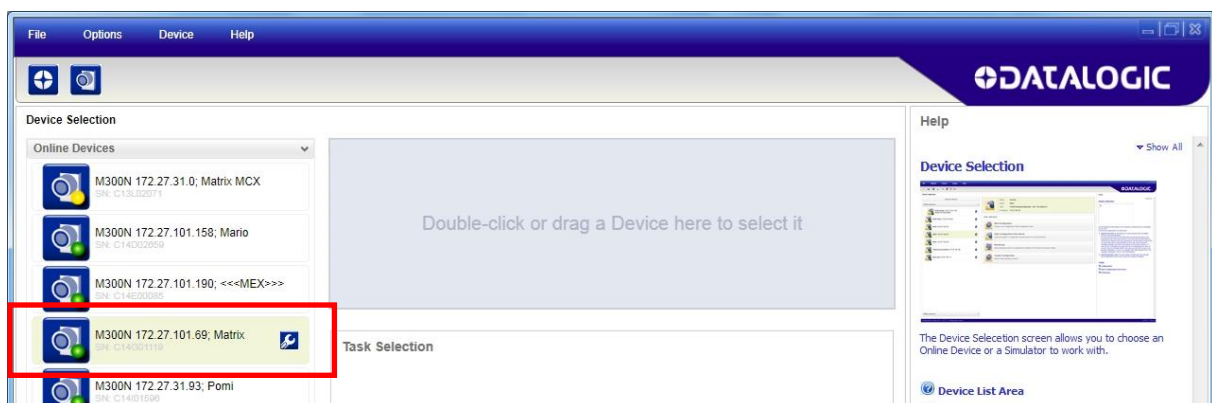


Figure 15 Device Environment Configuration Window

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



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

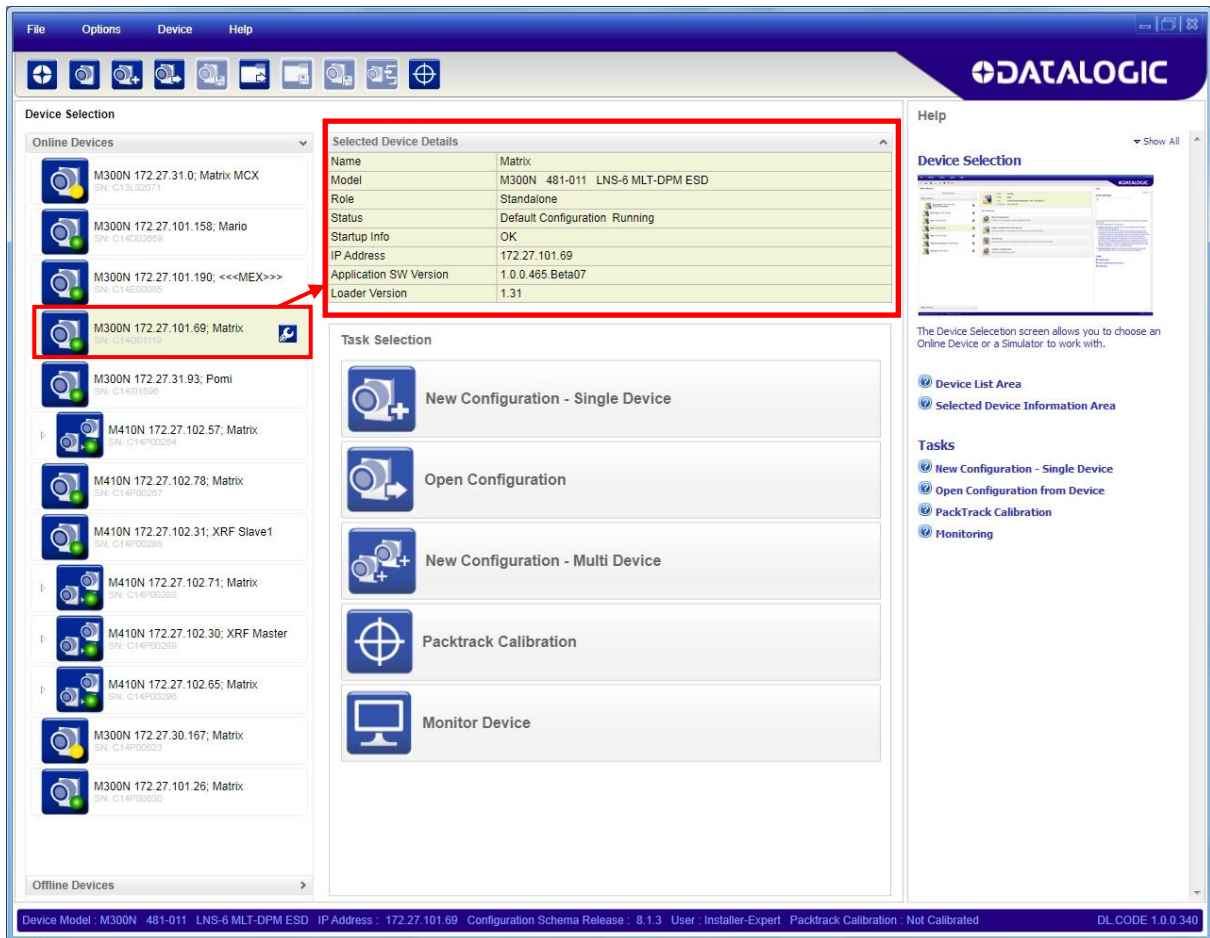


Figure 16 – DL.CODE™ Opening Window



CAUTION: In order for DL.CODE™ to correctly manage the illuminator parameters, in the DL.CODE™ Device menu click the Settings > Settings > Maintenance Settings > Current Illuminator Model item and select the Illuminator being used from the list.

Click OK and at the device reset prompt click Yes and wait until the device resets. You can confirm by reopening this item from the same menu.

STEP 8 – DEVICE CONFIGURATION

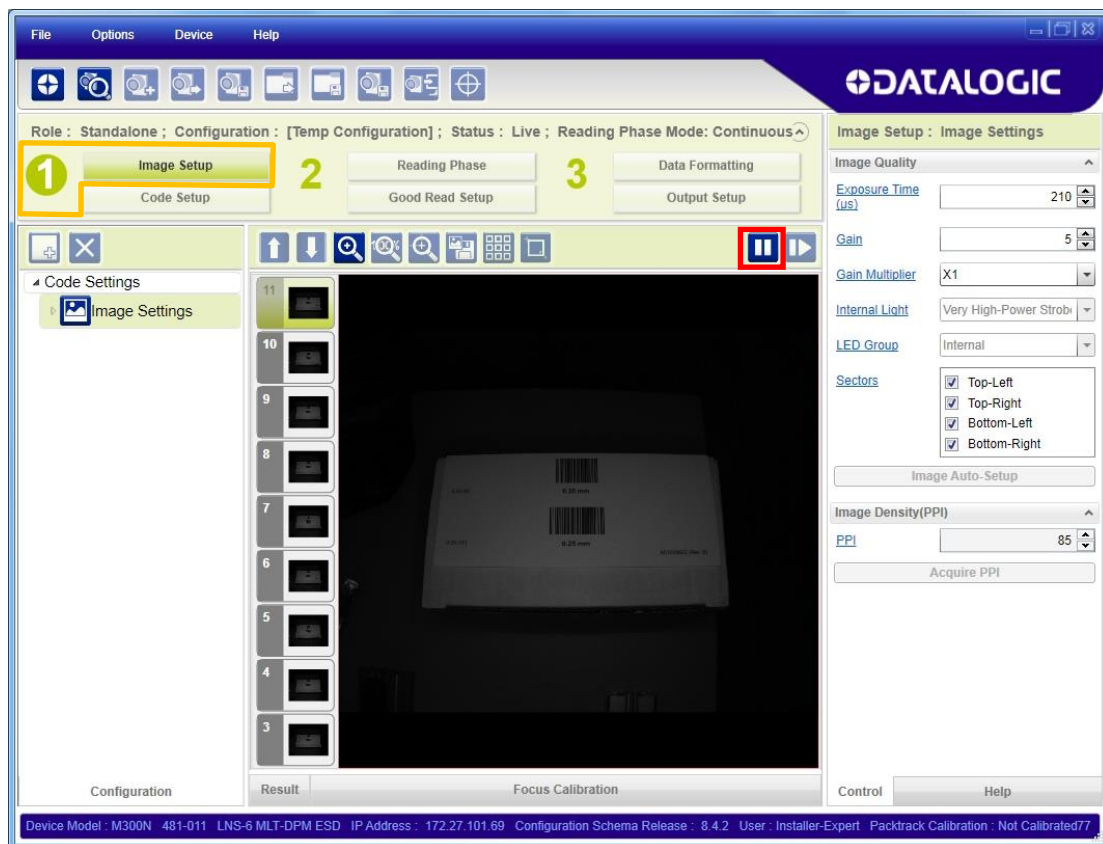
Image Setup

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

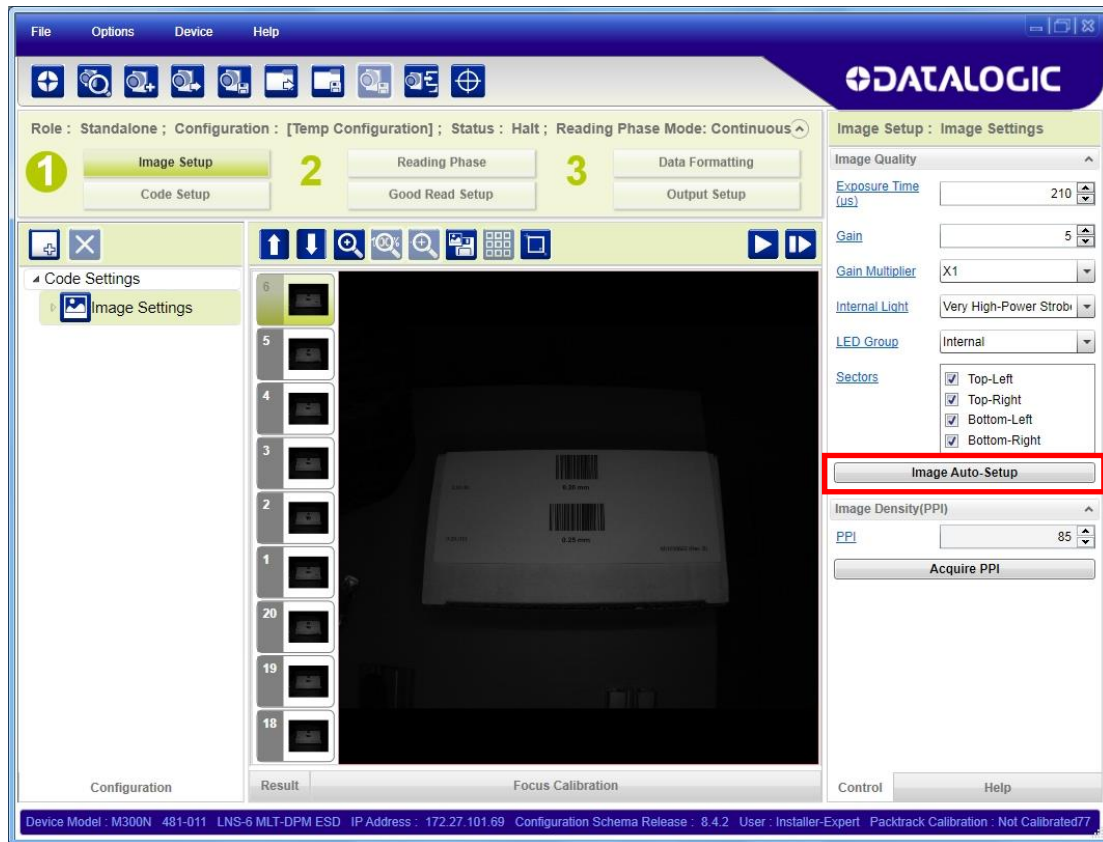
1. From the Task Area select New Configuration – Single Device. The device enters run mode and begins acquiring images.



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




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

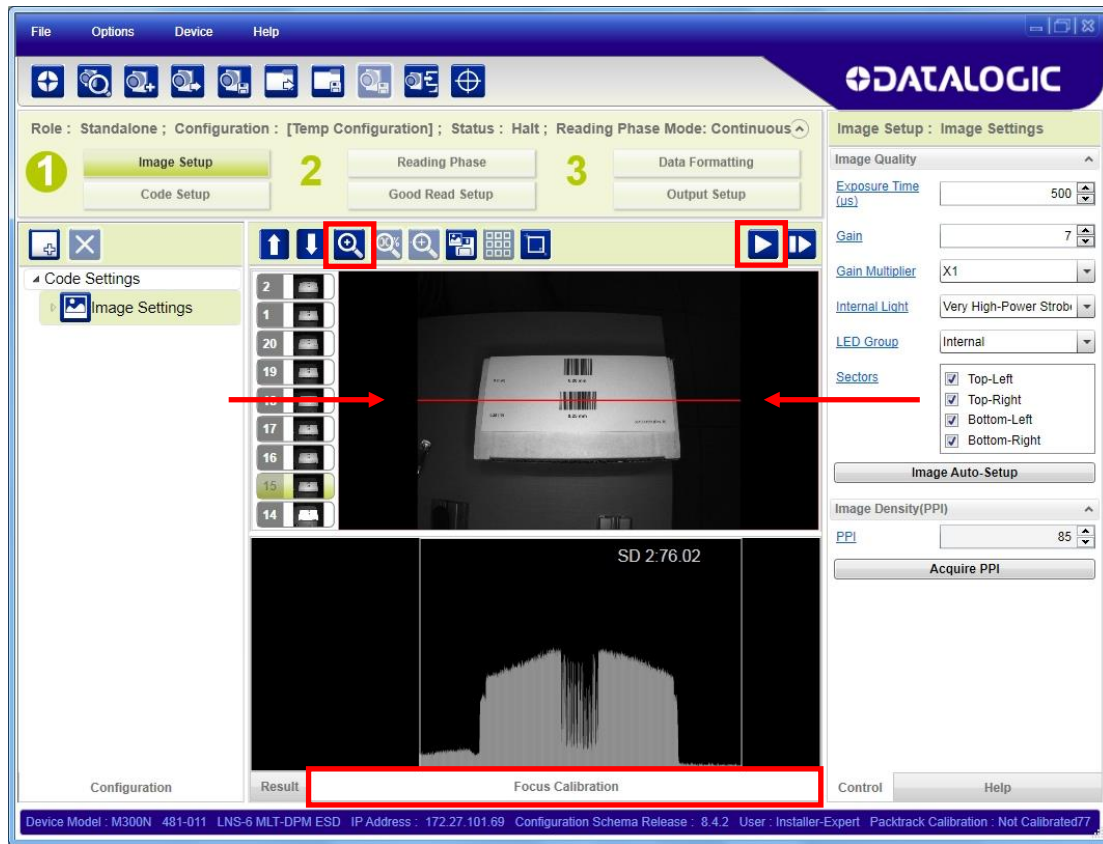


Select the Static or Dynamic Self-Tuning option; Start Autolearn and Apply to the Image Setup.




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

4. 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. Click Play to enter run mode and reposition the code.

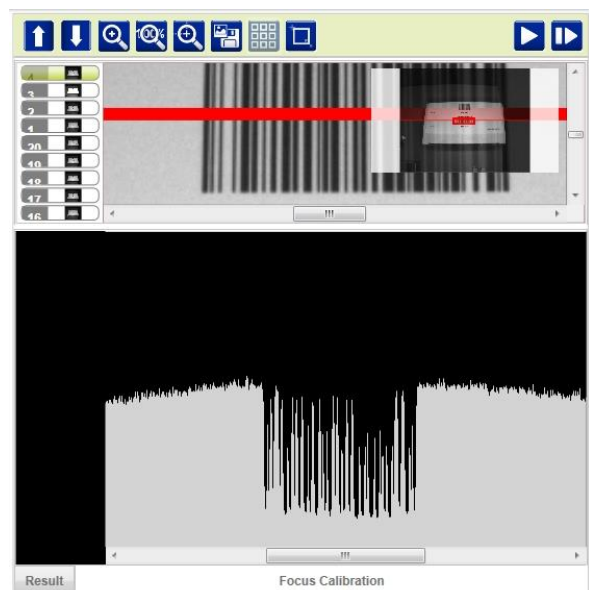


NOTE: To enlarge the visual image of the code and the oscilloscope views, you can drag the Focus Calibration window up and click on the zoom image icon  repositioning it on the code.

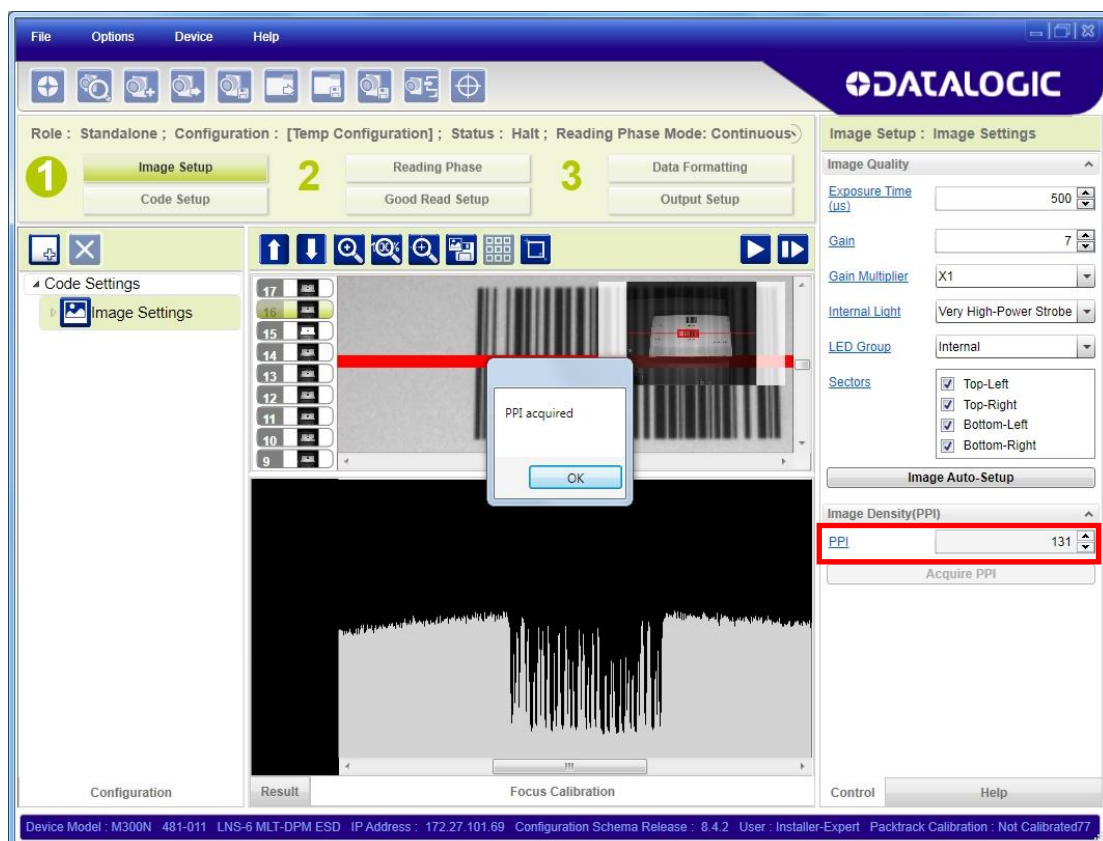
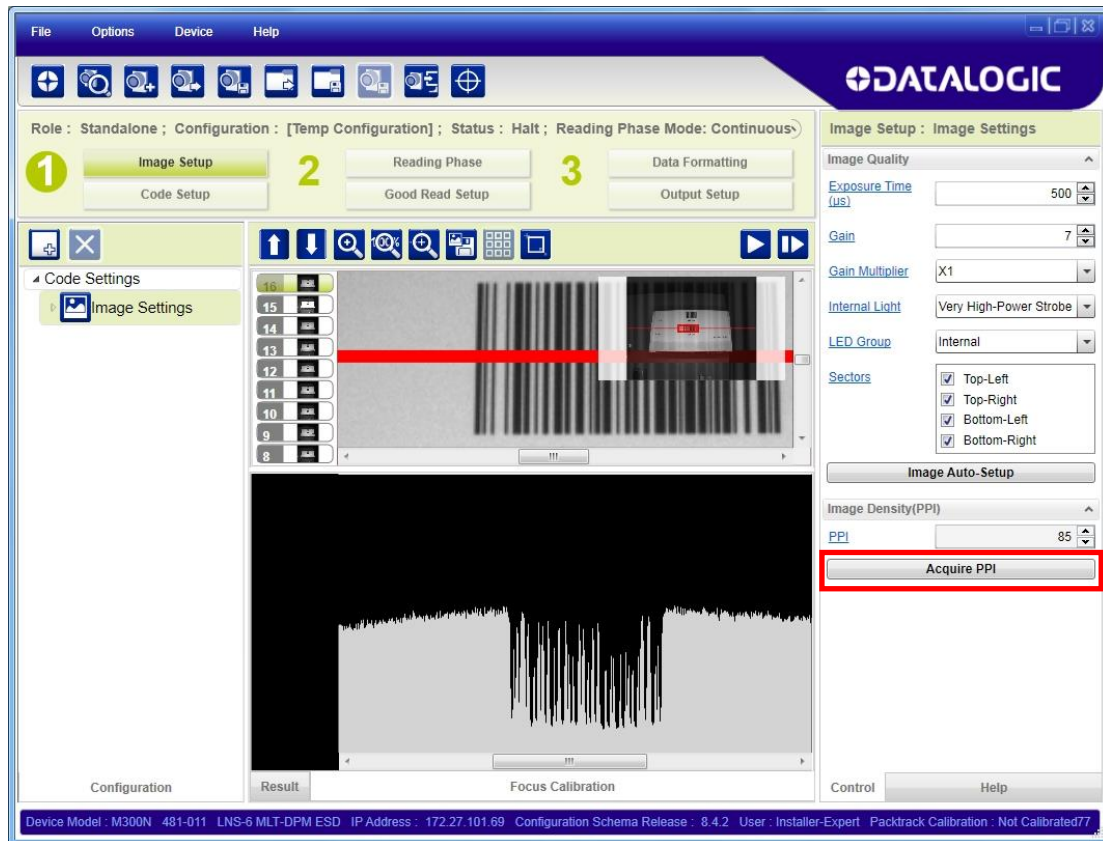
While in run mode, manually adjust the focus until the bars relative to the code in the oscilloscope demonstrate their maximum length (focus).

You can also see the visual focus on the code view.

When focused, click Pause to stop image acquisition.

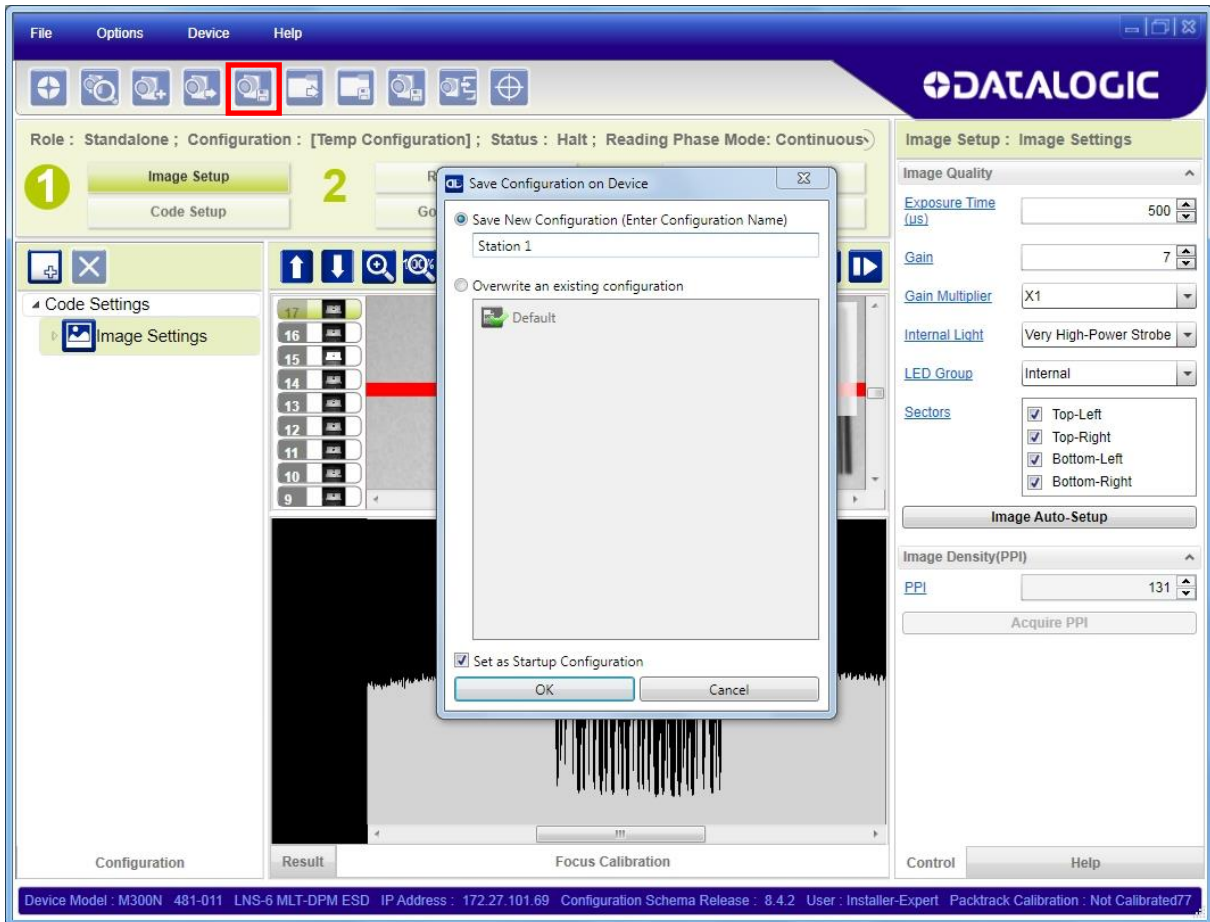


- Click the **Acquire PPI** button to automatically set Image Density so that Matrix 410N™ will function correctly and to the fullest extent of its capabilities. This procedure is necessary for first time installations, or if the lens type or focal distance are changed.





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.



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


Do not repeat Focus Calibration or PPI.


Code Setup

1. Click on the Code Setup button. By default, the Data Matrix ECC 200 symbology is enabled. If this symbology is among those in your application it will be shown in the image display with its code symbology name and a green box around it indicating it is decoded.



NOTE: The large green box for each symbol indicates the code locator 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.

2. 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  icon.

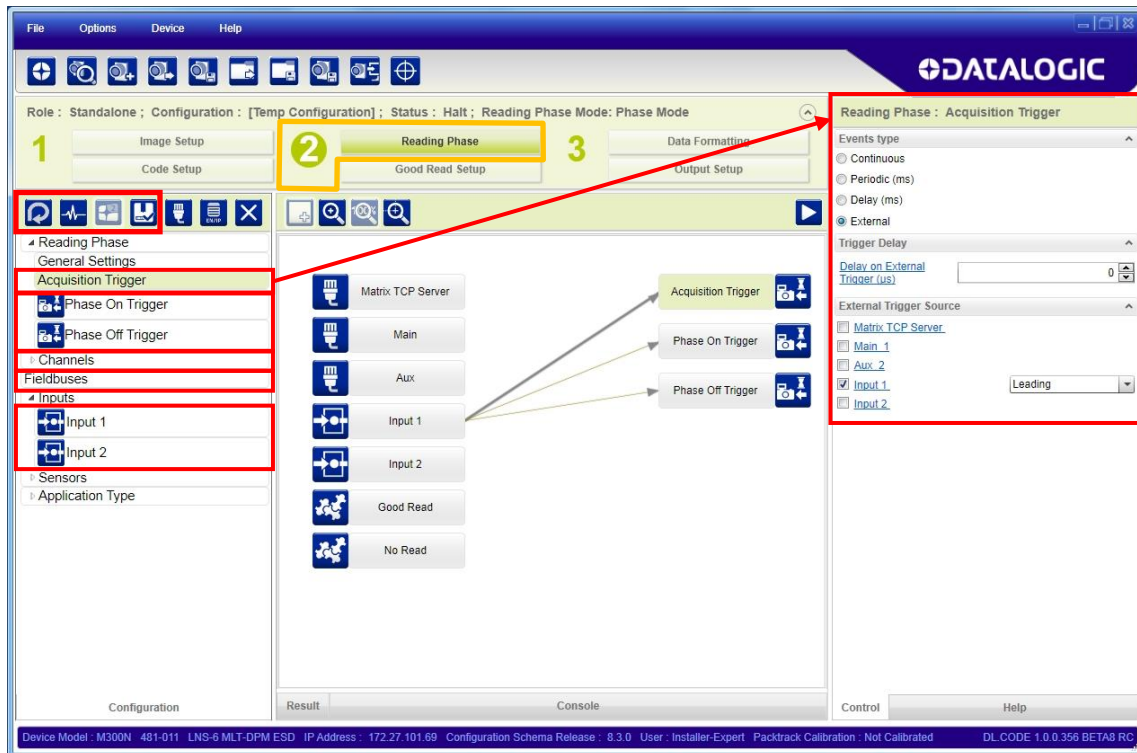
If you don't know the code type, you can use the Code Autolearn feature by clicking on the  icon⁴.

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

⁴ 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.

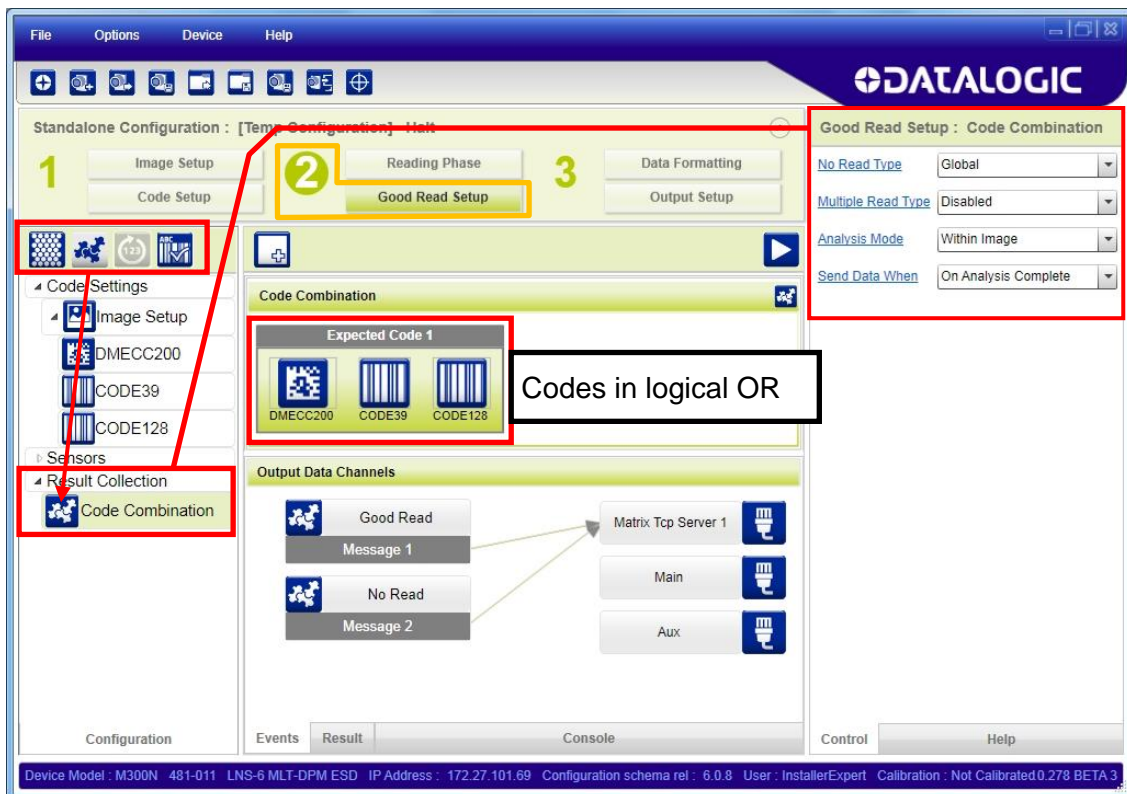


2. Configure the relative Operating Mode parameters from the Reading Phase parameters panel. Different groups will appear in the panel depending on the selected icons over the Configuration Parameters tree area.

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 grey and cannot be selected.

The following example shows Code Combination. By default, the Expected Codes are in logical OR, which means that any single decoded code will produce a Good Read condition independent from the other codes being decoded or not.




2. If all codes are required to be decoded to produce a Good Read condition, then they need to be combined in logical AND. To do this, create a new Expected Code box using the  icon. Then drag the Code icon from one box to the other.

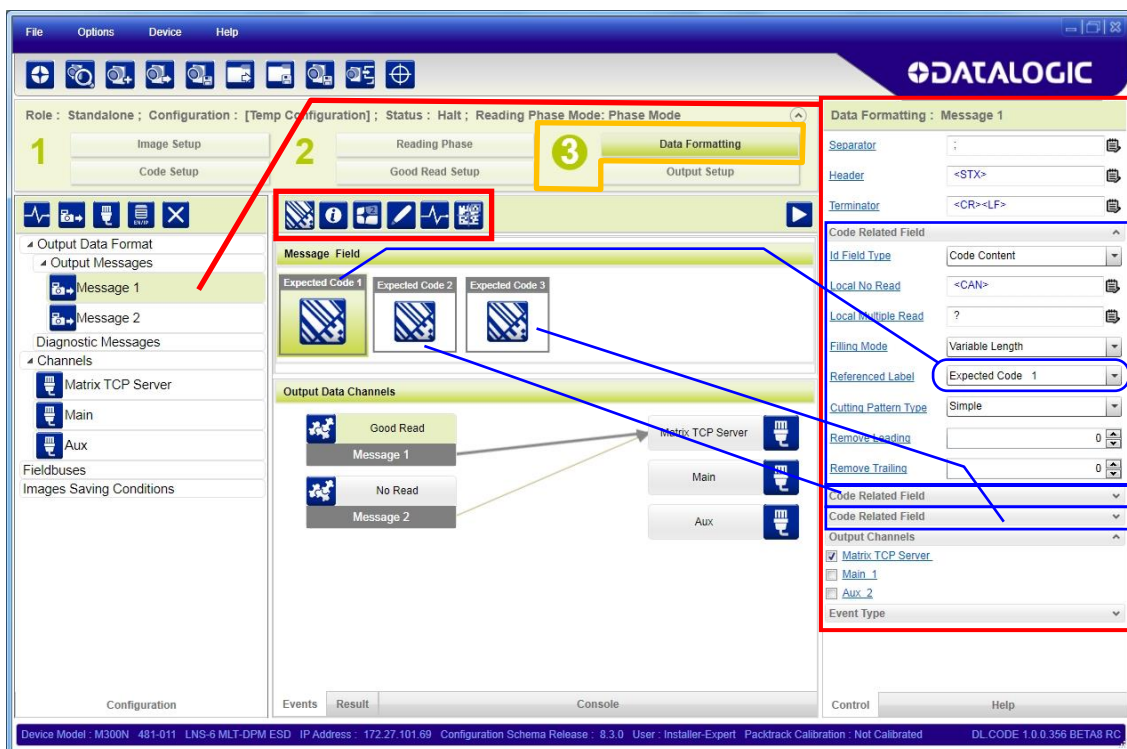




Figure 17 Codes in Logical AND

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 Spot (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 9 – 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.



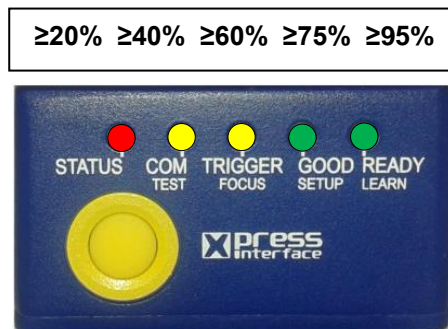
Figure 18 – X-PRESS™ Interface: Test Function

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



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

The Bar Graph has the following meaning:



In case of No Read condition, only the STATUS LED 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 configured from a host computer using the Host Mode programming procedure.

2 INTRODUCTION

2.1 PRODUCT DESCRIPTION

Matrix 410N™ 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 410N™ uses imaging technology and provides complete reading system functions by integrating image capturing, decoding and communicating in a single compact and versatile product.

Matrix 410N™ sets a new standard in 2D imager technology offering high performance with improved reading flexibility thanks to its intrinsic modularity.

Matrix 410N™ features excellent reading and verifying performance thanks to 1.3 and 2.0 Mega pixel sensors and smart proprietary decoding libraries.

The modular combination of Mega pixels sensors, powerful lighting and adjustable C-Mount lenses provide high flexibility in covering application with various requirements.

Innovative X-PRESS™ interface, combined with Blue Diamonds™ aiming and focusing system and a Good Read Spot, enhance the ease of setup and use.

Rugged construction, IP67 protection and max 50°C operative temperature make the Matrix 410N™ the ideal product for industrial applications.

Matrix 410N™ has been developed for use in numerous industries like:

Automotive

- DPM (Direct Part Marked) Reading
- Tires Sorting

Electronics

- Large PCB Board Tracking
- Electronics Product Tracking

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

This technology intrinsically provides omni-directional reading.

Standard Application Program

A Standard Application Program is factory-loaded onto Matrix 410N™. 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 ISO file or mini-DVD accessory).

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

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

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

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

Programmability

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

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

Excellent Performance

- 1.3 MPixel & 2.0 MPixel models
- Adjustable focus through C-Mount lenses
- 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 60 frames/sec for 1.3 Mpixel models and 43 frame/sec for 2.0 Mpixel models
- Image Cropping for higher frame rate
- Up to 100 readable codes in a single frame

Ease of Setup

- Quick installation without PC by using X-PRESS™ interface for easy and intuitive setup
- Blue Diamonds™ aiming and focusing system
- 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 Setups (parameter sets)
- Smart Fast Bracket

Ease of Use

- 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

- Modular design
- Adjustable C-Mount lenses
- Complete set of Accessories like external lighting systems, light filters, mounting brackets, connection boxes, cables and photocells
- 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 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

- Industrial compact 2D reader
- Rugged full metal construction
- Sealed circular M12 connectors
- IP67 protection class
- 50 °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, C-Mount lens and protective cover, the mechanical dimensions are 123 x 60.5 x 87 mm and it weighs about 482 g.

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 present for TCP/IP connections (Figure A, 9).

2.2 INDICATORS AND KEYPAD BUTTON



Figure 19 - Indicators

The following LED indicators are located on the reader:

| | |
|------------|------------------------------------------------------------------------------------|
| NET | yellow LED indicates connection to the on-board Ethernet network (Figure 19, 1) |
| PWR | blue LED indicates that the reader is connected to the power supply (Figure 19, 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 19, 3) |
| COM | yellow LED indicates active communication on the main serial port * (Figure 19, 4) |
| TRIGGER | yellow LED indicates the status of the reading phase (Figure 19, 5) |
| GOOD | green LED confirms successful reading (Figure 19, 6) |
| READY | green LED indicates that the reader is ready to operate (Figure 19, 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 par. 2.5.

The keypad button (Figure 19, 8), is software programmable. By default it starts the X-PRESS™ interface for quick installation without using a PC (see chp. 1).

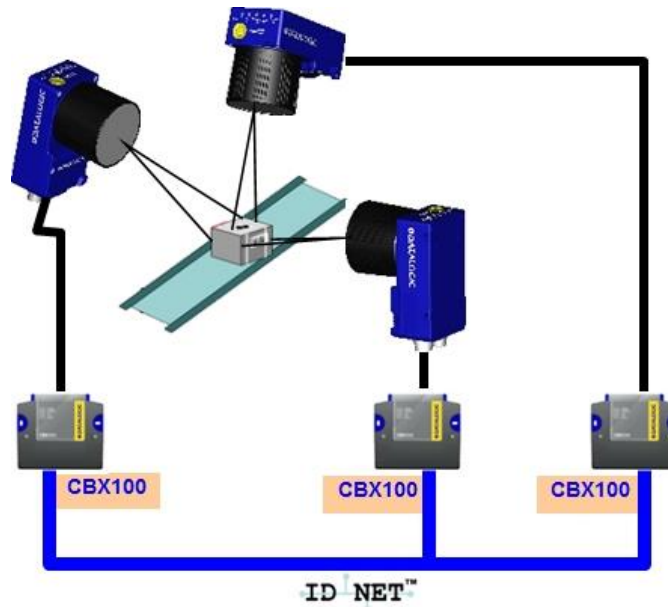
2.3 ID-NET™

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 configuration is 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.

2.3.1 How To Setup/Configure the Reader Network

A complete ID-NET™ reader network can be easily setup through DL.CODE™ as follows:

Multi Device 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.



NOTE: DL.CODE™ only supports Master/Slave SYNCHRONIZED ID-NET™ network configurations.

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

1. Mount all the readers mechanically (refer to par. 3.2 and 3.3) and electrically (refer to par. 4.3) with factory default settings (Stand Alone).

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 New Configuration - Multi Device. You will be prompted to change the device to Master. Click Yes. The device will be reset. See par. 2.3.2.
3. The Slave units will automatically be recognized. Then **Apply** the changes.
4. Select Phase Mode or PackTrack Configuration and complete the configuration of all the application parameters (including Image Setup) and save them to the Master with the option to **Clone Master configuration on Slaves**.
5. Connect to each Slave reader via Ethernet and set the photometric parameters (**Image Setup**) of each Slave device and save them, overwriting the configuration previously saved by the Master. See par. 2.3.3.

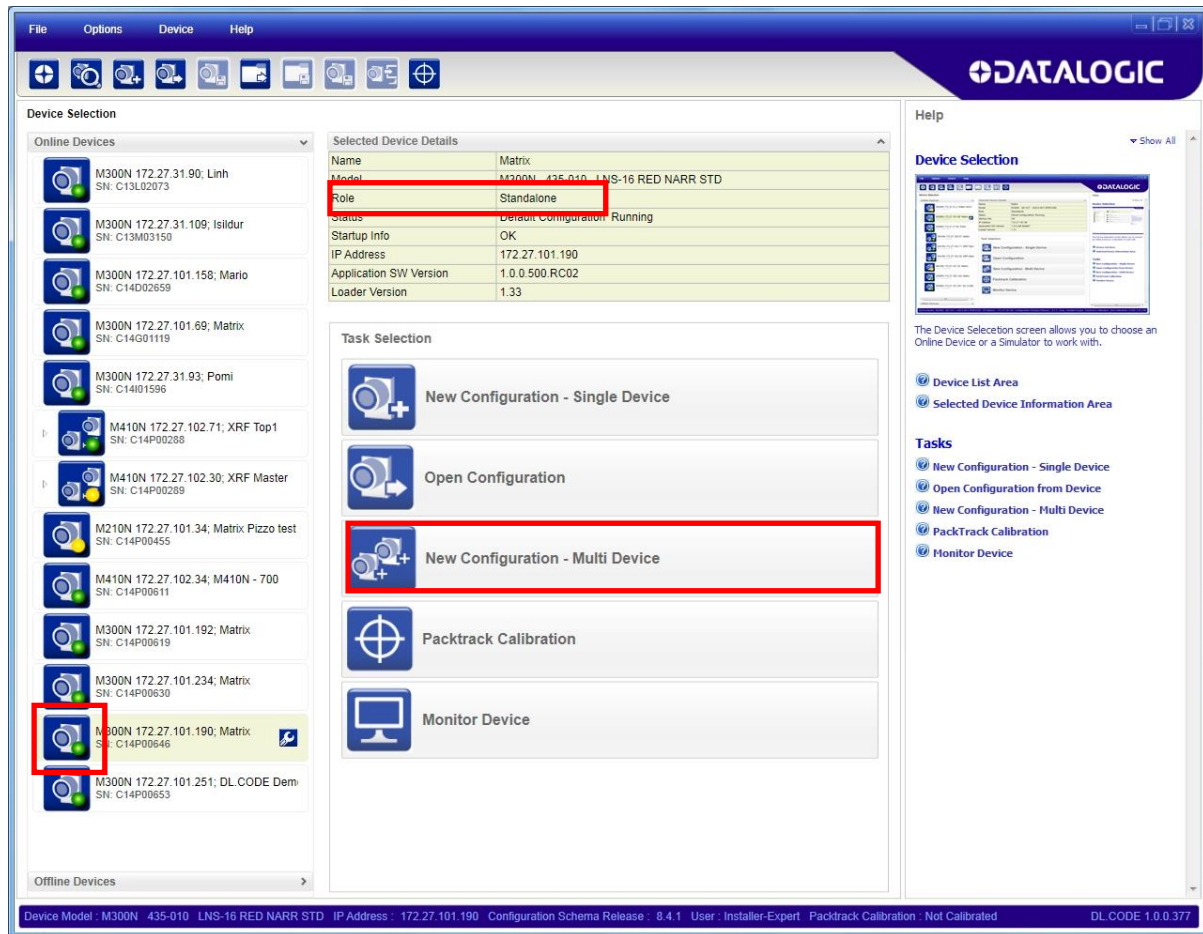


NOTE: When the Slaves are not positioned on the same plane or side as the Master, you must configure the Slave device photometric parameters (Image Setup) in DL.CODE™ through its Ethernet connection. If Slave devices do not have an individual Ethernet connection you must temporarily (manually) connect them one by one to perform Image Setup.

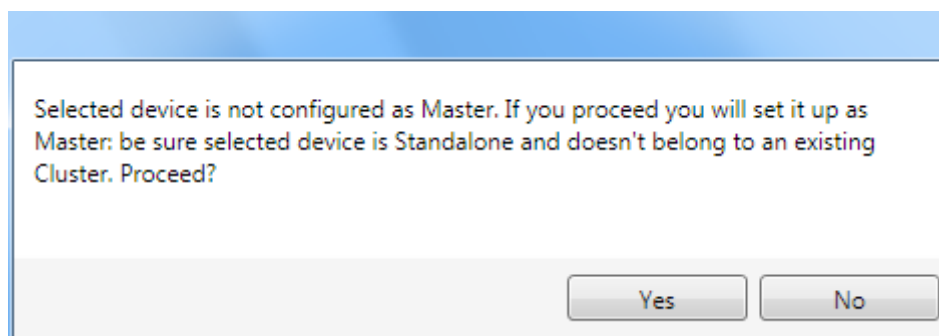
6. Verify/Test network performance. See par. 2.3.4.
7. Perform the **Backup Current Cluster Configuration** procedure. See par. 2.4.

2.3.2 Master Configuration

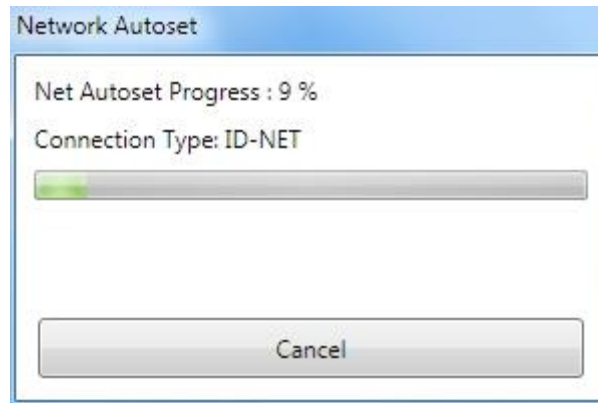
First start with the desired device to assign as ID-NET™ Master (current default setting is Standalone).



Select New Configuration – Multi Device from the Task area.

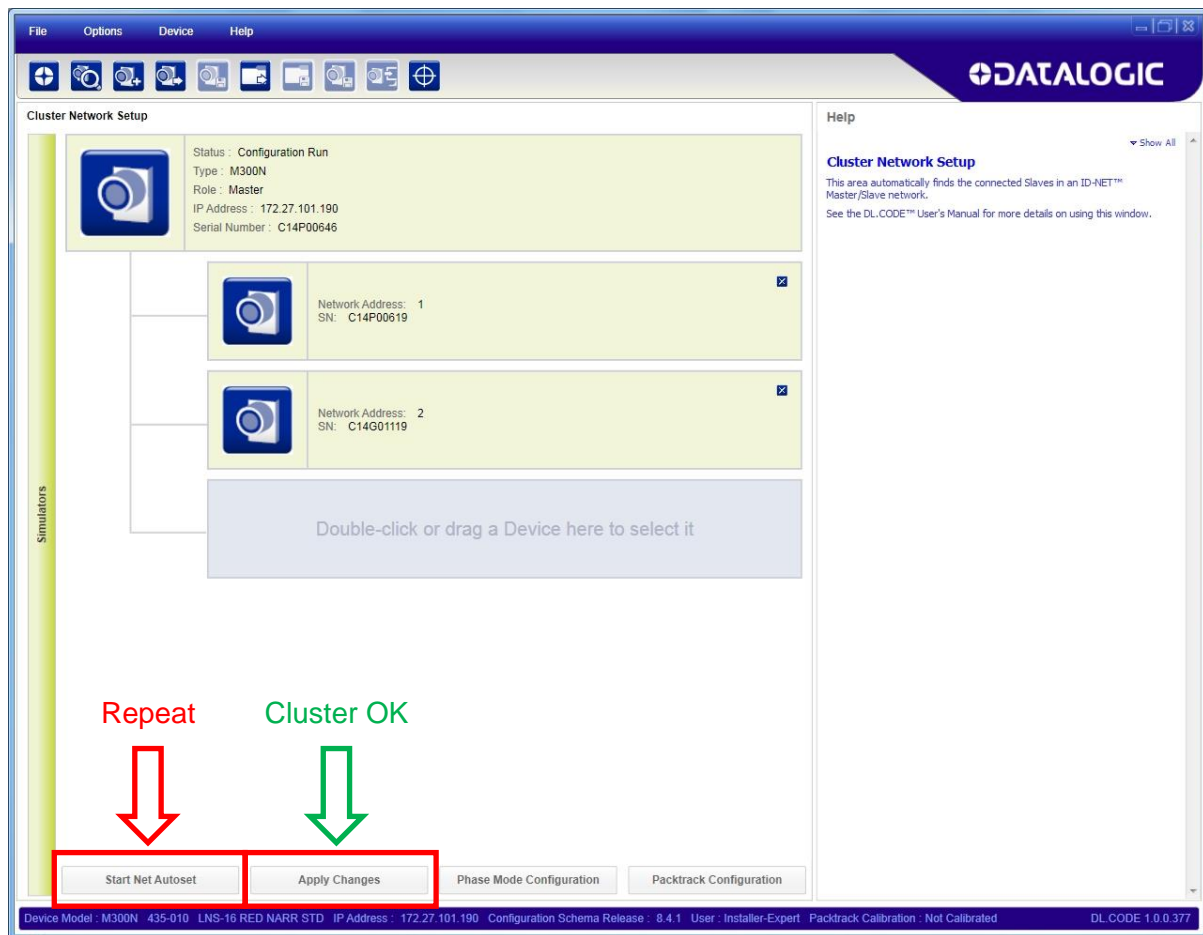


The Net Autoset feature automatically starts to find Slave devices connected to the ID-NET™ network of the Master.



When finished, if all the Slaves have been correctly recognized click on the **Apply Changes** button.

If not, verify all device connections and power, then repeat the operation by clicking on the Start Net Autoset button.

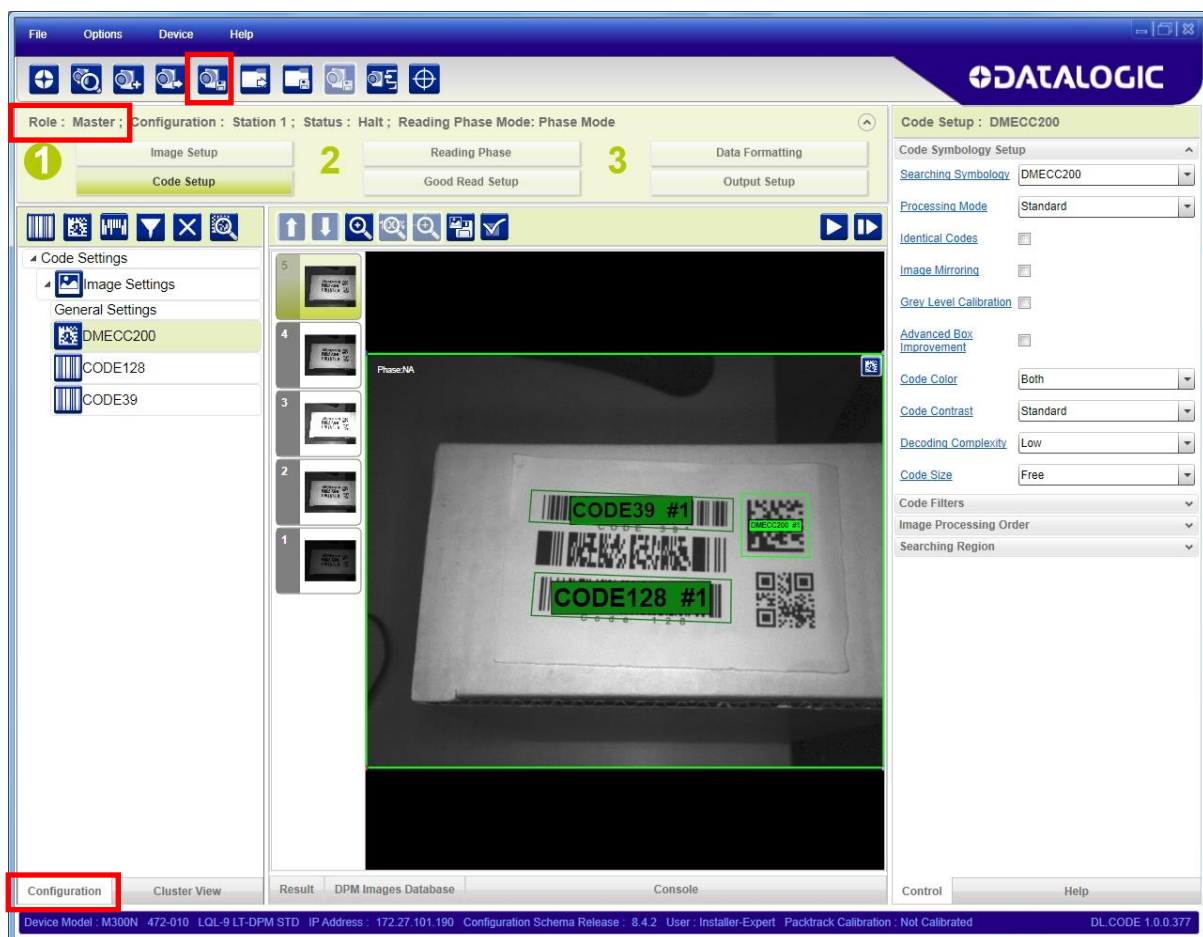




Click Yes to store the Slave table on the Master.

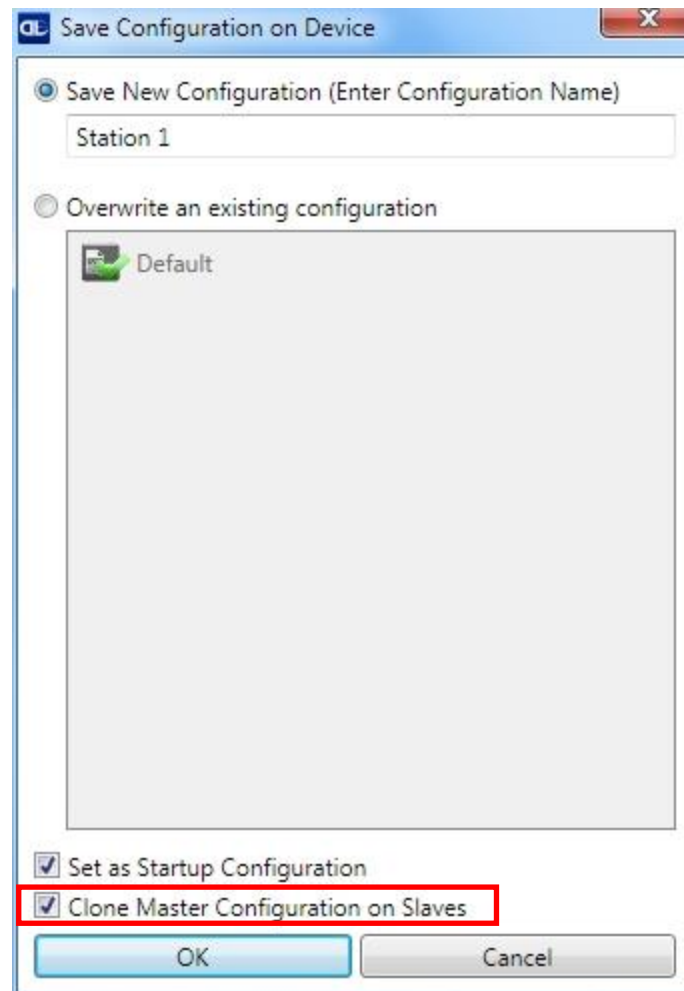
Depending on the application type, click on either the **Phase Mode Configuration** or the **PackTrack Configuration** button to start the configuration. This will perform a pre-configuration of the operating mode. Wait until the Master configuration page is displayed.

You can now complete the configuration of the Master including all the application specific parameters.



Now save the new configuration (job) to the Master Device using a name relative to the Application (i.e. Station 1) making sure to check the **Clone Master Configuration on Slaves**.

This will save a configuration with the same name and content on each device (Master and all Slaves).



2.3.3 Slave Configuration

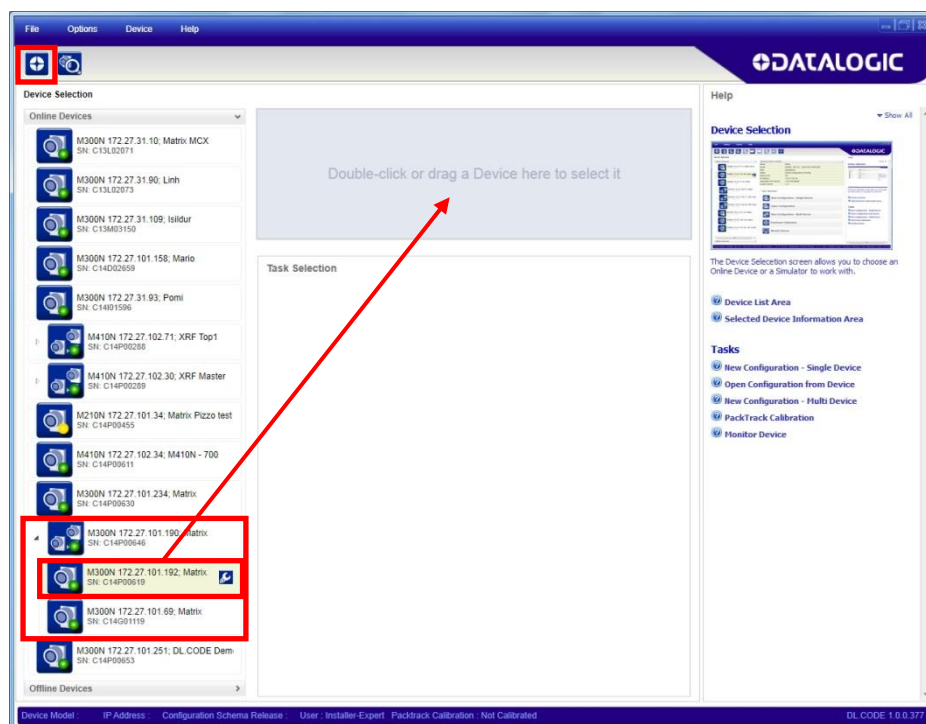


NOTE: When the Slaves are not positioned on the same plane or side as the Master, you must configure the Slave device photometric parameters (Image Setup) in DL.CODE™ through its Ethernet connection. If Slave devices do not have an individual Ethernet connection you must temporarily (manually) connect them one by one to perform Image Setup.

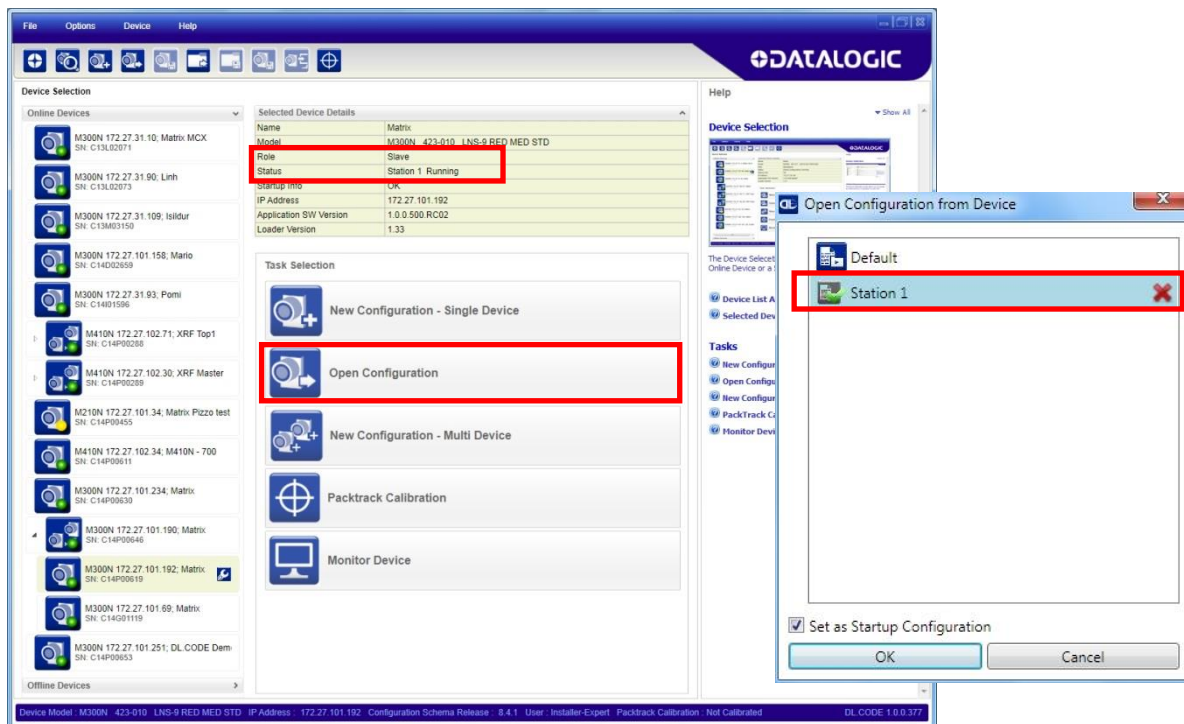
Now that the ID-NET™ network is configured, the Slave specific parameters need to be set. These depend on the application and include the following:

- photometric parameters (Image Setup 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**)

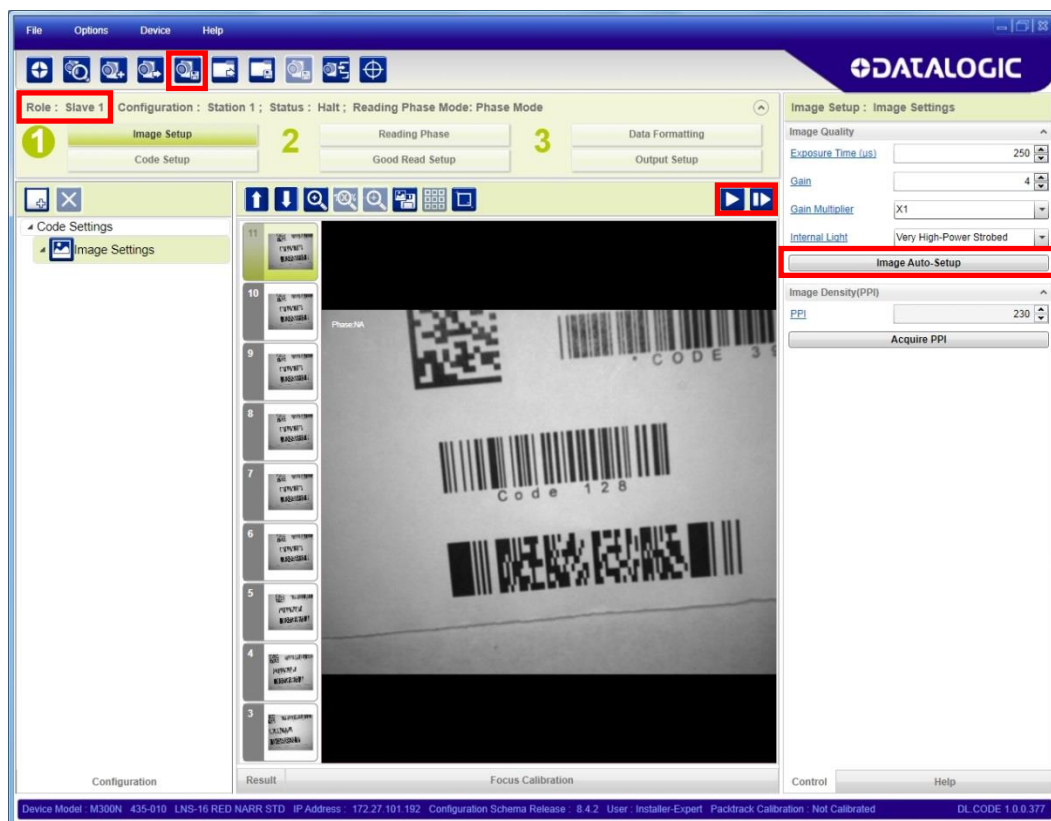
To do this, click on the Getting started icon and open the Master branch to see the connected Slaves. Each Slave can be connected to through its Ethernet interface.




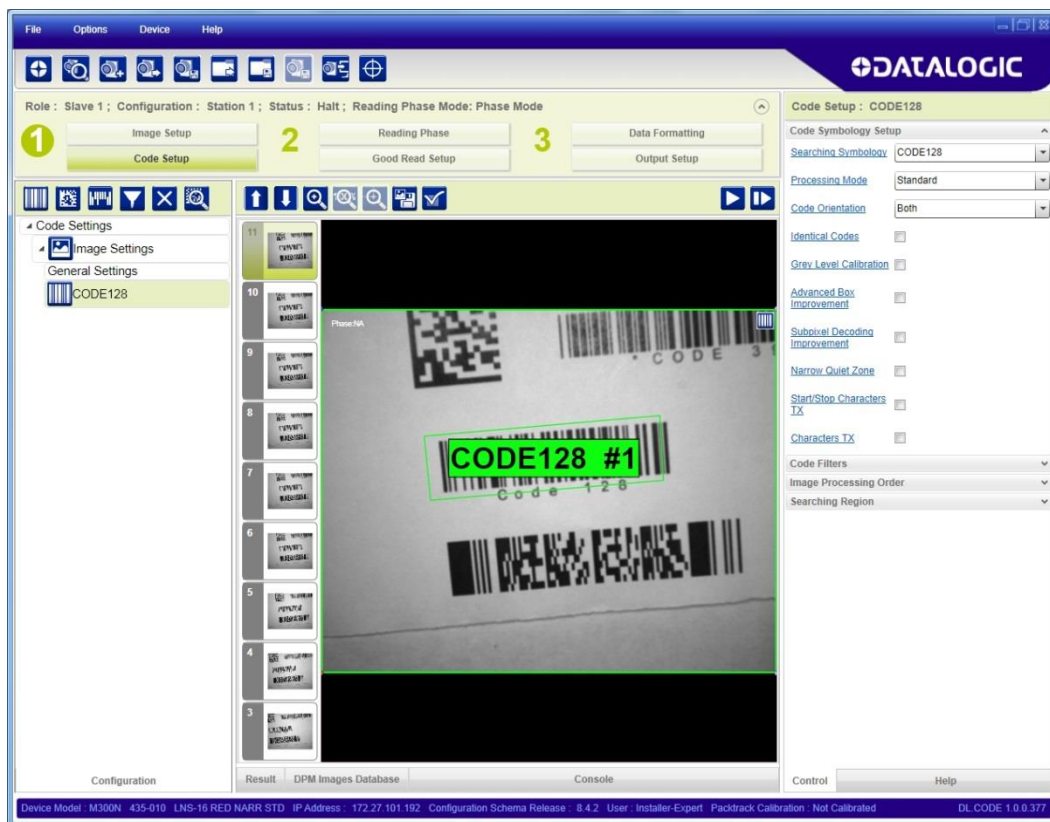
Open the configuration named “Station 1” from the Slave reader.



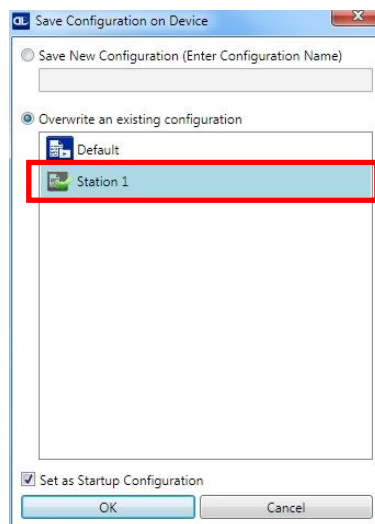
When the configuration opens, pause run mode and execute the Image Auto-Setup feature to adjust the photometry of the Slave reader.



Verify the focus and decoding with the capture image  and Code Setup page.

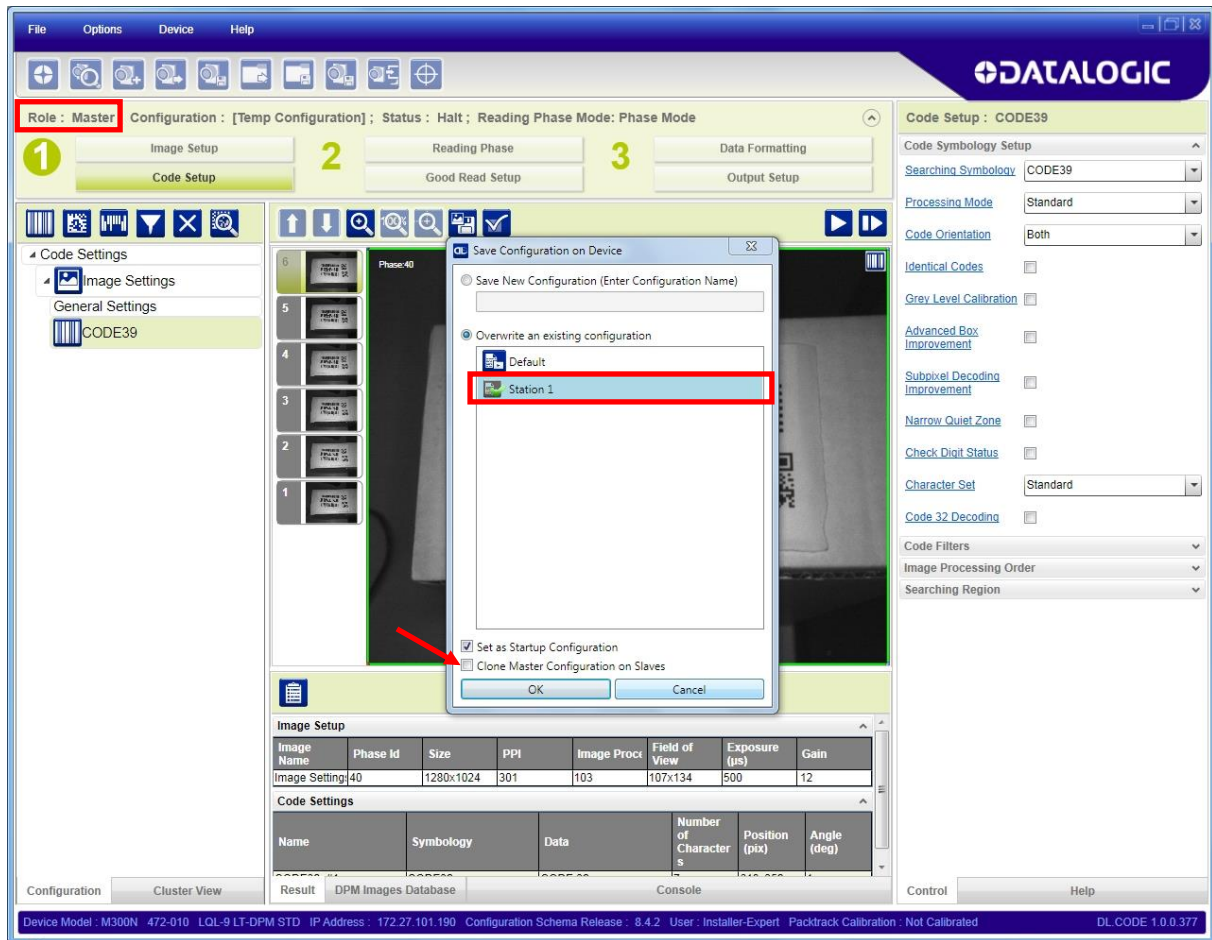


Now save the configuration to the Slave device by overwriting its existing one (i.e. Station 1).



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

Return to the Master device and open the configuration (Station 1). **Now Save on device overwriting Station 1 with Clone Master Configuration on Slaves DISABLED!**. This step will Save all Master and Slave jobs maintaining the individual settings.



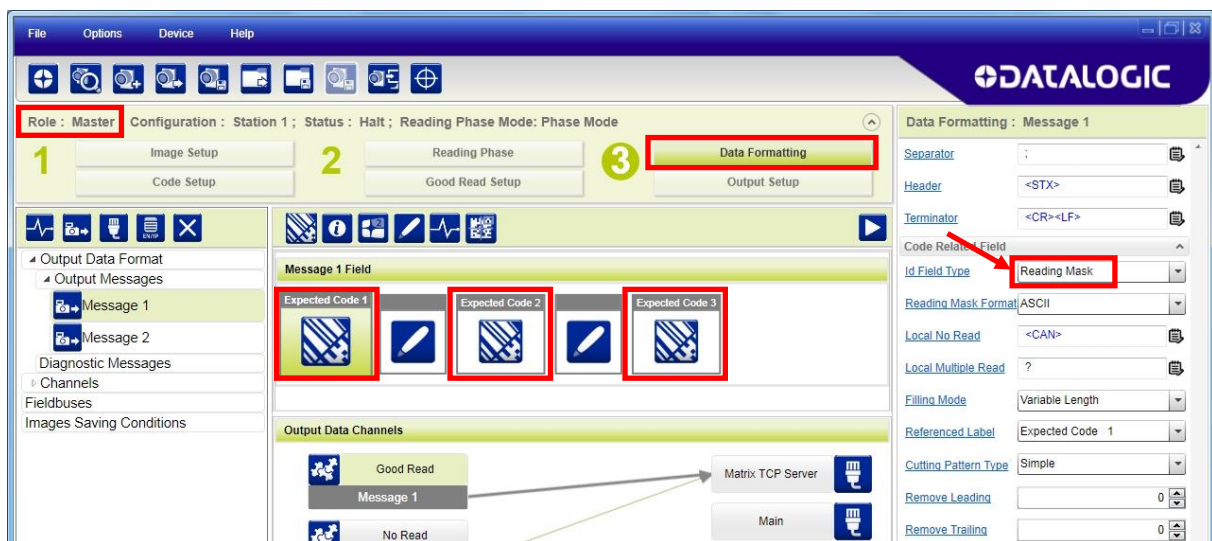
2.3.4 Verify Master/Slave Setup

From the Master Station 1 configuration, run the application and monitor the output data from the DL.CODE™ Console or a configured channel terminal.

The configuration opens in run mode. Run the application and monitor the output data from the DL.CODE™ Console or a configured channel terminal.

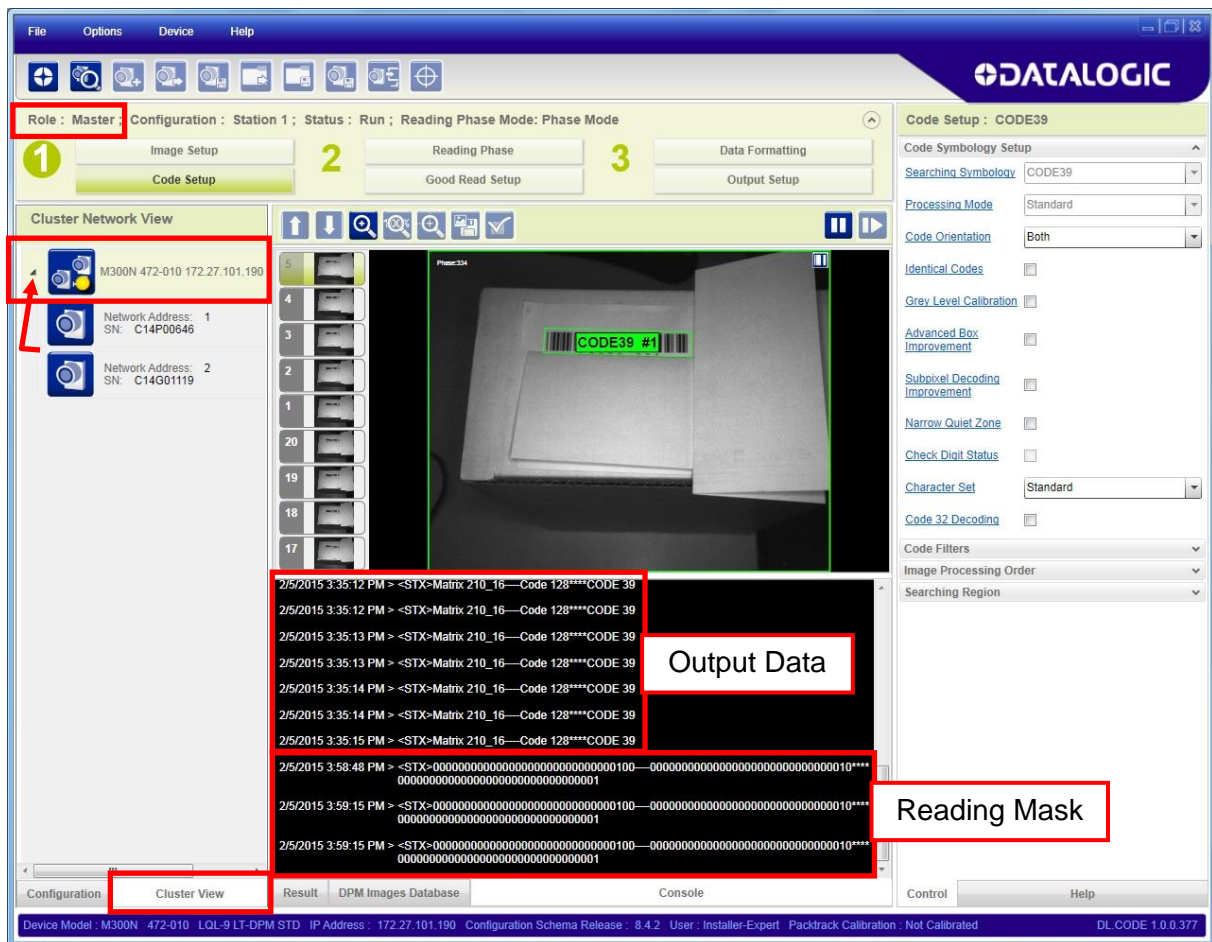
You can also temporarily apply the **Reading Mask** field in place of each Code Content field to verify if all devices are reading. To do this:

- a) from the Master, change each Expected Code field from Code Content to Reading Mask.



- b) **Save on device overwriting Station 1 with Clone Master Configuration on Slaves DISABLED!**

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. The Master is the last character in the string (first character to the right). The Slaves are shown in order from right to left (1 to 31).

Example: Master + Slave 2 = 00000000000000000000000000000101

After verifying correct functioning of the reading devices, return the Expected Code fields from Reading Mask to Code Content and **Save on device overwriting Station 1 with Clone Master Configuration on Slaves DISABLED!** again.

To view the connected Slaves configurations, click on the Cluster View tab at the bottom of the screen and open the Master branch. Select any slave and then click the Configuration tab at the bottom of the screen. By selecting the various configuration steps above you can visualize the slave configuration.

2.4 BACKUP AND RESTORE THROUGH DL.CODE™

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

It can be performed for Stand Alone and Cluster (Master/Slave) configurations.

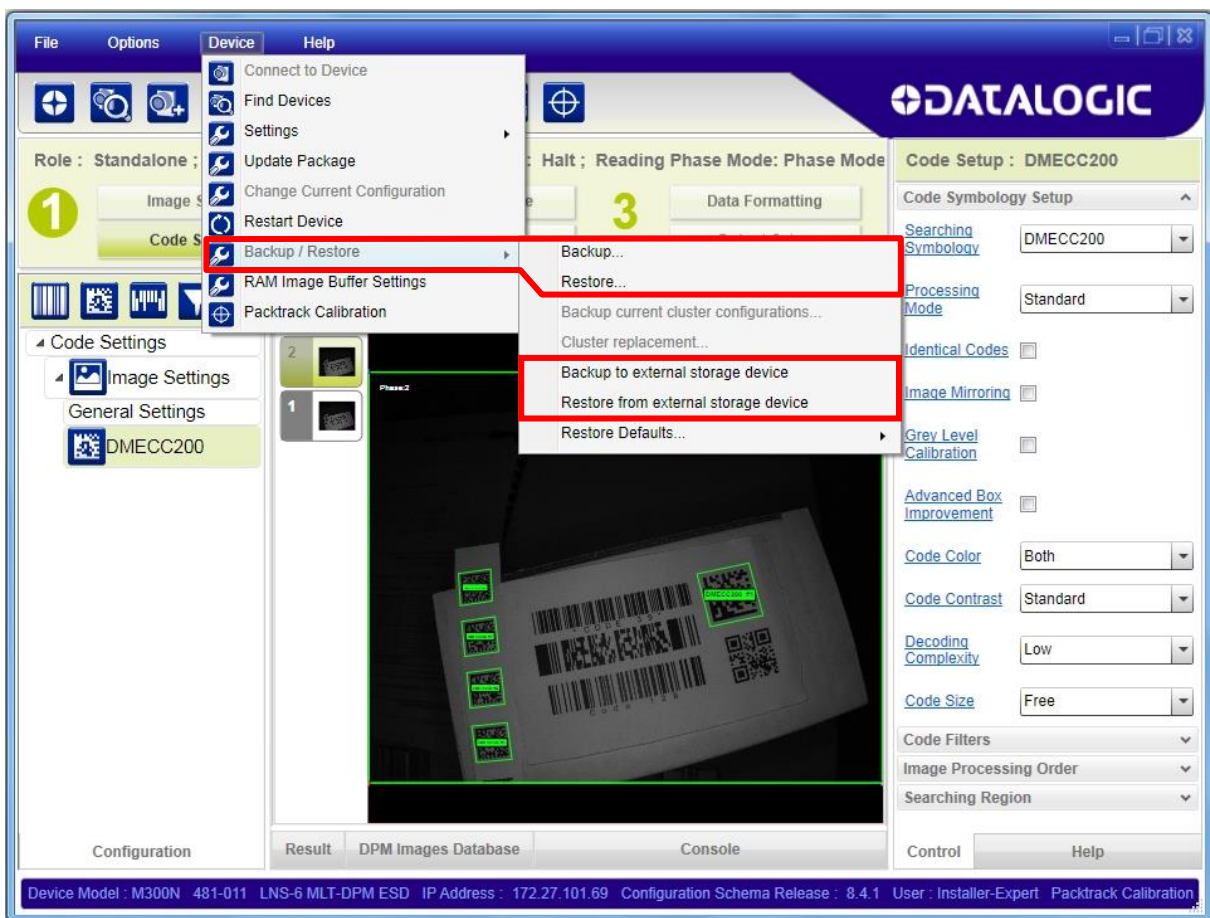
Backup and Restore functions allow performing Complete Configuration and Environment parameter storage for Stand Alone and ID-NET (Master/Slave) network devices. Backup and Restore can be applied to any reader connected through a device having external backup memory, regardless of the reader's network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

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

- CBX + BM100
- QLM-Series Gateways



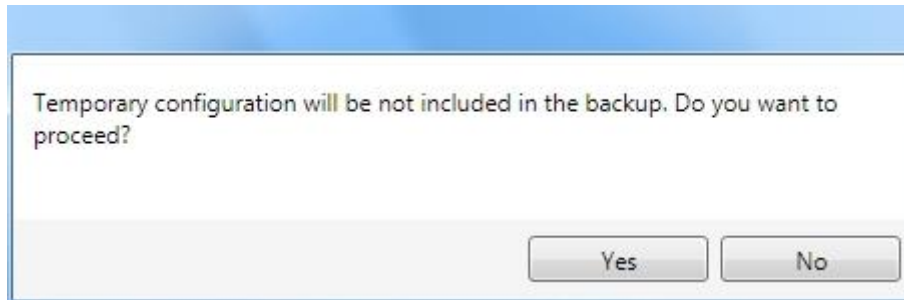
NOTE: Before executing a Backup on a BM100 backup module make sure the Write Protection switch is set to Unlocked.



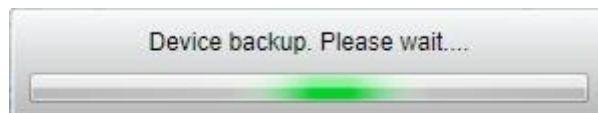
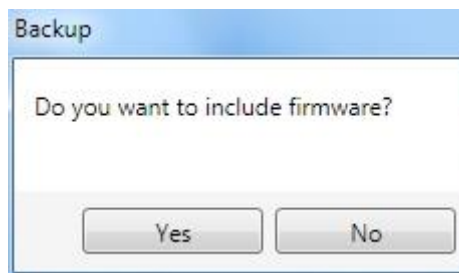
2.4.1 Backup

To perform a **Backup**:

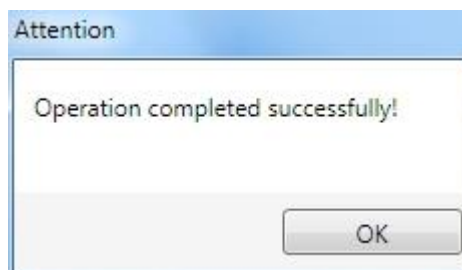
1. Select either “Backup” (to file on PC) or “Backup to external storage device” from the DL.CODE™ Device menu. You will be reminded that configuration in temporary memory will not be saved so you should save the configuration to the reader before performing Backup.



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.



2.4.2 Restore

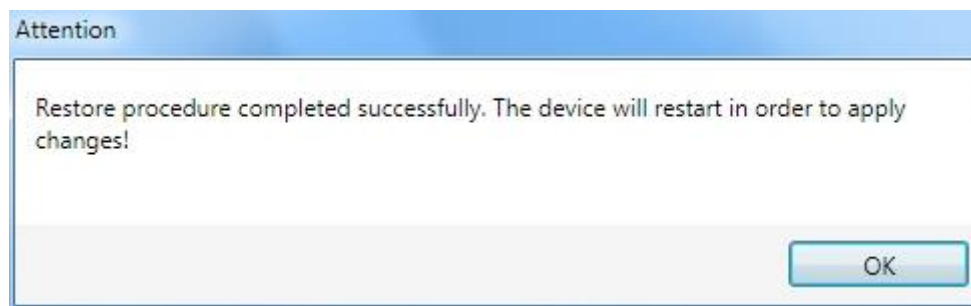
To perform a **Restore**:

1. Select either "Restore" (from file on PC) or "Restore from external storage device" from the DL.CODE™ Device menu



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

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



2.4.3 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 "Restore" (from file on PC) or "Restore from external storage device" item (see: Restore procedure).



NOTE: For ID-NET™ network Backup and Restore, select the **Backup Current Cluster Configuration** and **Cluster Replacement** selections.



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

2.5 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
- Focus/Locate to turn on the Blue Diamonds™ to aid focusing and positioning.
- Setup to perform Exposure Time and Gain calibration.
- Learn to self-detect and auto-configure for reading unknown codes

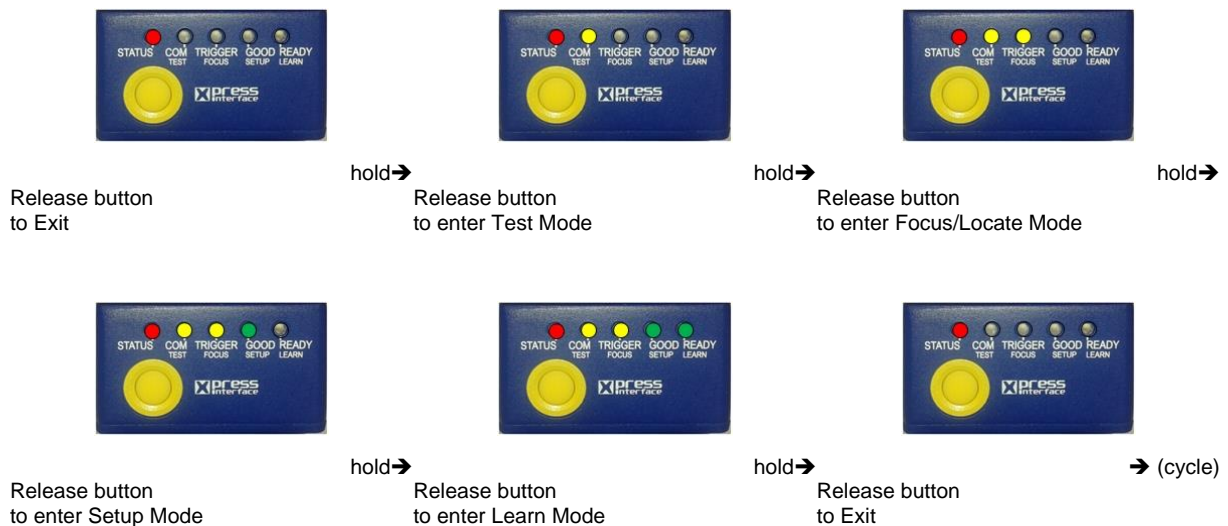


2.5.1 X-PRESS™ Functions

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

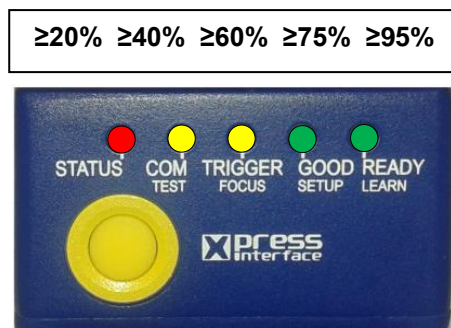
- 1 – **Press** the button (the Status LED will give a visual feedback).
- 2 – **Hold** the button until the specific function LED is on (Test, Focus, Setup or Learn).
- 3 – **Release** the button to enter the specific function.

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



Test Mode (Function 1)

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



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

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



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

Focus/Locate (Function 2)

This function causes the Blue Diamonds™ to turn on. The Blue Diamonds™ can be used to focus the lens at the desired reading distance and since they are centered on the FOV they can also be used to position the imager on the code. The Focus LED blinks to indicate this state.

To exit the Focus/Locate Mode, press the X-PRESS™ push button once. The Blue Diamonds™ turn off.

Setup (Function 3)

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 remain on continuously and Matrix 410N™ emits 3 high pitched beeps.

If the calibration cannot be reached after a timeout of about 5 (five) seconds Matrix 410N™ will exit without saving the parameters to memory, the Setup LED will not remain on continuously but it will just stop blinking. In this case Matrix 410N™ emits a long low pitched beep.

Learn (Function 4)

Once entered, the imager starts a procedure to automatically detect and recognize codes which are presented to it.

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 Learn LED will remain on continuously and Matrix 410N™ emits 3 high pitched beeps.

If the calibration cannot be reached after a timeout of about 3 (three) minutes, Matrix 410N™ will exit without saving the parameters to memory, the Learn LED will not remain on continuously but it will just stop blinking. In this case Matrix 410N™ emits a long low pitched beep.

2.5.2 Diagnostic Indication

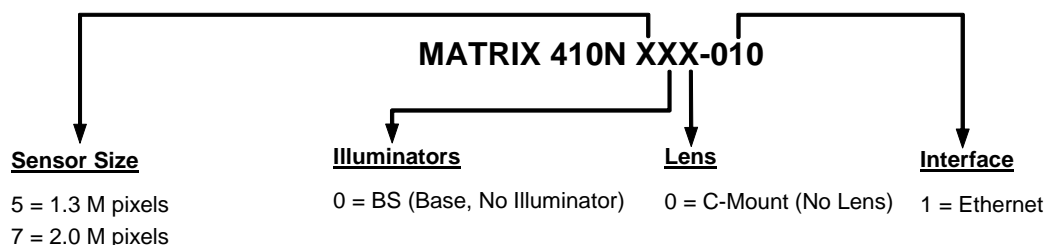
The "STATUS" and "READY" LEDs blink simultaneously to signal the presence of an error. Diagnostic message transmission on interfaces can be enabled to provide details about specific error conditions. See the Diagnostic Error Conditions chart in the Diagnostic page of the DL.CODE™ Monitor.



| LED | STATUS |
|---------|--------|
| READY | BLINK |
| GOOD | |
| TRIGGER | |
| COM | |
| STATUS | BLINK |

2.6 MODEL DESCRIPTION

The Matrix 410N™ reader is available in different basic versions according to the following characteristics:



Further characteristics depend on the accessory lenses and internal or external illuminators.

2.7 ACCESSORIES

The following accessories can be used with the Matrix 410N™ reader.

| Accessory | Description | Order No. |
|------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|-----------|
| Lenses | | |
| LNS-1006 | 6 mm C-Mount Lens | 93ACC1793 |
| LNS-1109 | 9 mm C-Mount Lens | 93ACC1794 |
| LNS-1112 | 12.5 mm C-Mount Lens | 93ACC1795 |
| LNS-1116 | 16 mm C-Mount Lens | 93ACC1796 |
| LNS-1125 | 25 mm C-Mount Lens | 93ACC1797 |
| LNS-1135 | 35 mm C-Mount Lens | 93ACC1798 |
| LNS-1150 | 50 mm C-Mount Lens | 93ACC1799 |
| Internal Illuminators | | |
| LT-001 | Internal Illuminator Red Narrow Angle | 93A401019 |
| LT-002 | Internal Illuminator Red Wide Angle | 93A401020 |
| LT-003 | Internal Illuminator White Narrow Angle | 93A401021 |
| LT-004 | Internal Illuminator White Wide Angle | 93A401022 |
| LT-005 | Internal Illuminator Blue 8x4 LED Chain for DPM | 93A401023 |
| LT-006 | Internal Illuminator Red Super Narrow Angle | 93A401024 |
| LT-007 | Internal Illuminator Red Super Narrow Angle w Laser Pointers | 93A401030 |
| LT-010 | Internal Illuminator High Power Blue Super Narrow Angle | 93A401026 |
| LT-011 | Internal Illuminator High Power Red Super Narrow Angle | 93A400031 |
| External Illuminators | | |
| LT-410 | Coaxial Lighting System | 93A401015 |
| LT-510 | Mini-Dome Lighting System | 93A401016 |
| LT-511 | Dome Lighting System | 93A401017 |
| LT-630 | Four Bar Lighting System | 93A401018 |
| LT-700 | Linear Array Lighting System | 93A401028 |
| Filters | | |
| FLT-111 | IR Cut Filter (d 27 mm) | 93ACC1800 |
| FLT-112 | IR Cut Filter (d 25.5 mm) | 93ACC1801 |
| FLT-121 | Linear Polarizer (d 27 mm) | 93ACC1802 |
| FLT-122 | Linear Polarizer (d 25.5 mm) | 93ACC1803 |
| 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 |
| 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 - Ethernet/IP Gateway | 93ACC0037 |
| QLM600 | Quick Link Metal Master ID-NET - Profibus Gateway | 93ACC0033 |
| QLM700 | Quick Link Metal Master ID-NET - Profinet I/O Gateway | 93ACC0038 |
| Various M12 Service Cables and Field Mount Connectors are available for Quick Link Series Connectors | | |

| Accessory | Description | Order No. |
|-------------------------|-------------------------------------|-----------|
| 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 |
| LTC-630 | Four Bar Lighting System Controller | 93ACC1790 |
| Sensors | | |
| MEP-593 | Photocell Kit PNP (PH-1) | 93ACC1791 |
| MEP-543 | Photocell Kit-NPN | 93ACC1728 |
| Brackets | | |
| USX-60 | Adjustable Bracket | 93ACC1729 |
| BK-21-000 | LT-700 Fixing Bracket | 93ACC0052 |
| BK-4410 | Coaxial LT Bracket Matrix 410N | 93ACC1804 |
| BK-4990 | Generic LT Bracket Matrix 410N | 93ACC1805 |
| External Mirrors | | |
| EMK-MTX-380 | External Mirror – 380 mm | 93ACC0086 |
| EMK-MTX-600 | External Mirror XRF410N – 600 mm | 93ACC0116 |
| ESD Safe Lens Cover | ESD Safe Lens Cover for Matrix 410N | 93ACC1858 |

2.7.1 Lighting System Notes

The following table shows the correct lens/illuminator combinations to be used for Matrix 410N™ imager assembly. For more information see the Application Note on illuminator selection on the DL.CODE™ mini-DVD (downloaded ISO file or mini-DVD accessory).

| Lenses | | | Internal Illuminators | | | |
|-------------|------------|-------------------|------------------------------------------------------------------------------------------|----------------------------------------------------------|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Part Number | Name | C-Mount Lens Type | Part Number | Name | LEDs | Type |
| 93ACC1793 | LNS-1006 * | 6 mm | 93A401020 93A401022 | LT-002 LT-004 | 8 8 | Red Wide Angle White Wide Angle |
| 93ACC1794 | LNS-1109 | 9 mm | 93A401020 93A401022 93A401023 | LT-002 LT-004 LT-005 | 8 8 32 | Red Wide Angle White Wide Angle Blue 8x4 LED chain for DPM |
| 93ACC1795 | LNS-1112 | 12.5 mm | 93A401020 93A401022 93A401023 | LT-002 LT-004 LT-005 | 8 8 32 | Red Wide Angle White Wide Angle Blue 8x4 LED chain for DPM |
| 93ACC1796 | LNS-1116 | 16 mm | 93A401019 93A401021 93A401023 | LT-001 LT-003 LT-005 | 8 8 32 | Red Narrow Angle White Narrow Angle Blue 8x4 LED chain for DPM |
| 93ACC1797 | LNS-1125 | 25 mm | 93A401019 93A401021 93A401024 93A401030 93A401026 93A400031 | LT-001 LT-003 LT-006 LT-007 LT-010 LT-011 | 8 8 8 8 15 15 | Red Narrow Angle White Narrow Angle Red Super Narrow Angle Red Super Narrow Angle High Power Blue Super Narrow Angle High Power Red Super Narrow Angle |
| 93ACC1798 | LNS-1135 | 35 mm | 93A401024 93A401030 93A401026 93A400031 | LT-006 LT-007 LT-010 LT-011 | 8 8 15 15 | Red Super Narrow Angle Red Super Narrow Angle High Power Blue Super Narrow Angle High Power Red Super Narrow Angle |
| 93ACC1799 | LNS-1150 | 50 mm | 93A401024 93A401030 93A401026 93A400031 | LT-006 LT-007 LT-010 LT-011 | 8 8 15 15 | Red Super Narrow Angle Red Super Narrow Angle High Power Blue Super Narrow Angle High Power Red Super Narrow Angle |

* LNS-1006 produces a slight vignetting effect at the corners of the FOV at short focal lengths.



CAUTION: LT-005: In order to function properly, DL.CODE™ must correctly manage the illuminator parameters. Follow the DL.CODE™ Illuminator Management Procedure below.

LT-010 and LT-011: To avoid damage to the devices, DL.CODE™ must correctly manage the illuminator parameters. Follow the DL.CODE™ Illuminator Management Procedure below.

When using a 25 mm focal length lens (LNS-1125), it is possible to use Super Narrow Angle Illuminators (LT-006, LT-007, LT-010 or LT-011) as well as the Narrow Angle Illuminators LT-001 or LT-003. It is suggested to use the Narrow Angle Illuminators in applications with very low contrast codes and in all cases where the higher lighting power of the LT-006, LT-007, LT-010 or LT-011 isn't necessary. LT-010 and LT-011 Illuminators are especially effective in high speed code movement applications.

Internal Lighting Mode Limitations

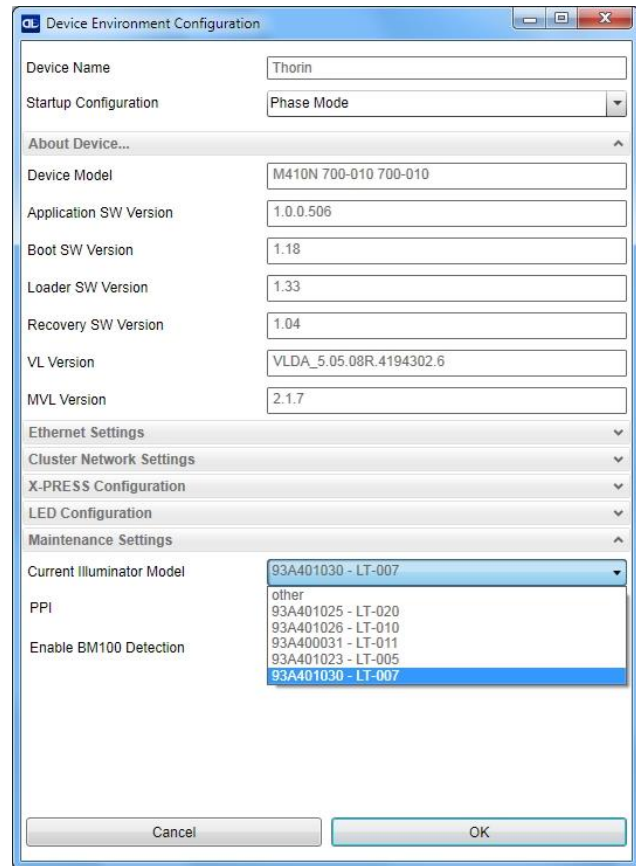
- For all illuminators the application program imposes protective limits on the frame rate to avoid overheating.
- LT-010 and LT-011 illuminators do not work in Continuous High-Power mode.

See the Help On Line for more details on the Internal Lighting Mode parameter.

DL.CODE™ Illuminator Management Procedure

4. Connect the reader to DL.CODE™ as described in this chapter.
5. In the DL.CODE™ Device menu click the Settings > Settings > Maintenance Settings > Current Illuminator Model item and select the Illuminator being used from the list.
6. Click OK and at the device reset prompt click Yes and wait until the device resets. You can confirm by reopening this item from the same menu.

The above procedure must also be performed before any attempt to use the X-PRESS™ configuration on readers mounting the LT-005, LT-007, LT-010 or LT-011 illuminators.



2.8 APPLICATION EXAMPLES

2.8.1 Document Handling

Matrix 410N™ 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 20).



Figure 20 - Address Coded in Data Matrix Symbology for Automated Mail Processing

2.8.2 Multiple Code Reading in a Single Image

The Matrix 410N™ high resolution image sensors allow the reading of many small codes in a single image (see 96 vial application in Figure 21).

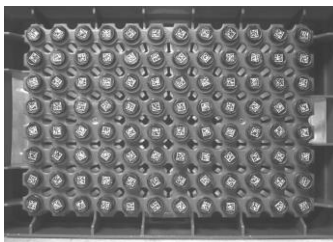


Figure 21 - 96-Vial Rack

2.8.3 Deformed or Overprinted Code Reading

Matrix 410N™ assures the reading of deformed and / or overprinted codes, even though damaged or printed on high reflective surfaces (see Figures 22, 23, 24).



Figure 22 - Unidose Flow-Pack with PDF417 Code



Figure 23 - Overprinted Barcode Readable by Matrix 410N™ also Through the Envelope Window Film



Figure 24 - Barcode Printed on Curved Surface Readable by Matrix 410N™ in spite of Image Optical Distortion

2.8.4 Direct Part Marking

Matrix 410N™ is also very powerful in reading low-contrast direct part marked codes (see Figures 25, 26, 27, 28 and 29).



Figure 25 - Dot Matrix Code Directly Marked on Metal Surface by Using Dot Peening Technology

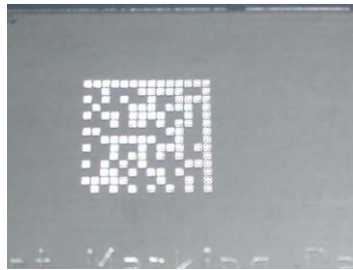


Figure 26 - Dot Peening Marking on Metal Surface with Multi-dot per Code Element

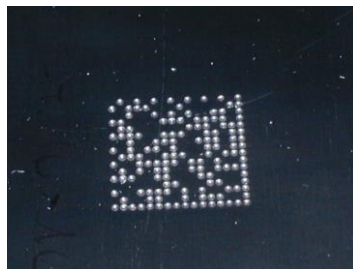


Figure 27 - Directly Marked Dot Matrix Code Characterized by Outstanding Separation Distance between Adjacent Code Elements

2.8.5 Ink-Jet Printing Technology

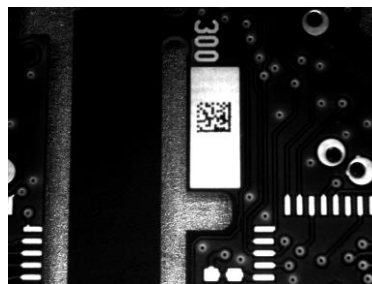


Figure 28 - Dot Matrix Code Directly Marked on PCB Copper Pad by Using Ink-Jet Technology

2.8.6 Laser Marking/Etching Technology



Figure 29 - Data Matrix Code Directly Marked on PCB Surface by Using Laser Etching Technology



CAUTION: If application codes must be read which are produced by Laser Marking in real time, use the correct diameter accessory IR Cut Filter with the Matrix 410N™ reader in order to avoid burning the CMOS sensor.

2.9 EXTERNAL LIGHTING SYSTEMS

In some direct part marking applications best reading results are obtained by using an external lighting system. A series of accessory illuminators are available which cover a variety of applications.

The LT-410 Coaxial Lighting System is an axial diffuse illuminator designed for reading codes produced by Dot Peening or Laser Etching on flat parts having a matte, specular or mixed surface reflectivity.



Figure 30 - LT-410 Coaxial Lighting System

The LT-510 Mini Dome Lighting System is a diffuse mini dome light designed for reading printed label or Direct Marking codes on small parts with a curved or specular surface.



Figure 31 - LT-510 Mini Dome Lighting System

The LT-511 Dome Lighting System is a diffuse dome light designed for reading printed label or Direct Marking codes on parts with a curved surface.



Figure 32 - LT-511 Dome Lighting System

The LT-630 Four Bar Lighting System is designed for Code verification applications according to ISO/IEC 15415 or ISO/IEC 15416 specifications.



Figure 33 - LT-630 Four Bar Lighting System

The LT-700 Linear Array Lighting System provides a high intensity light source designed for the following applications:

- with uneven, noisy and scratched surfaces
- where dot peening or laser etching codes are directly marked onto metal surfaces or PCBs and need to be highlighted. Here the use of more than one LT-700 at different positions can remove any shadowing effect.
- in the presence of highly reflective surfaces (metal, glass, etc.) causing direct reflections. Low light path to surface angles strongly reduce direct reflections.



Figure 34 - LT-700 Linear Array Lighting System

3 INSTALLATION

3.1 PACKAGE CONTENTS

Verify that the Matrix 410N™ reader and all the parts supplied with the equipment are present and intact when opening the packaging; the list of parts includes:

- ❑ Matrix 410N™ reader
- ❑ Quick Reference Guide
- ❑ Test Charts (2)
- ❑ Mounting Kit
 - Mounting Screws (4 + 3)
 - Washers (2)
 - Mounting Brackets (2)

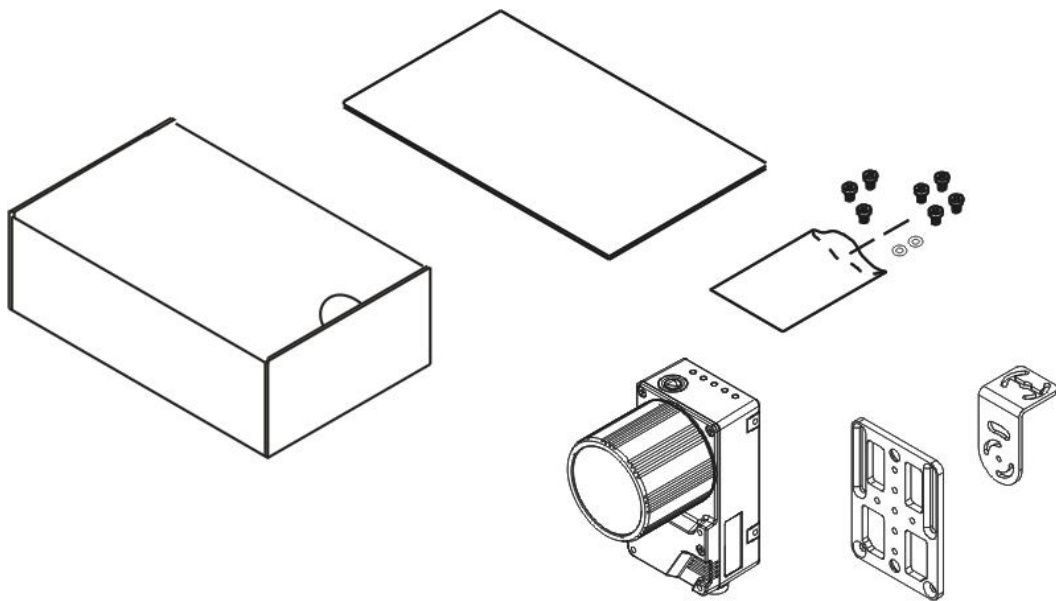


Figure 35 - Package Contents

3.2 MECHANICAL DIMENSIONS

Matrix 410N™ can be installed to operate in different positions. The twelve screw holes (M4 x 5) on the body of the reader are for mechanical fixture (Figure 36).

The diagram below gives the overall dimensions of the reader and may be used for its installation.

Refer to par. 3.3 for various mounting solutions and correct positioning and chp. 6 for FOV vs. Reading Distance considerations.

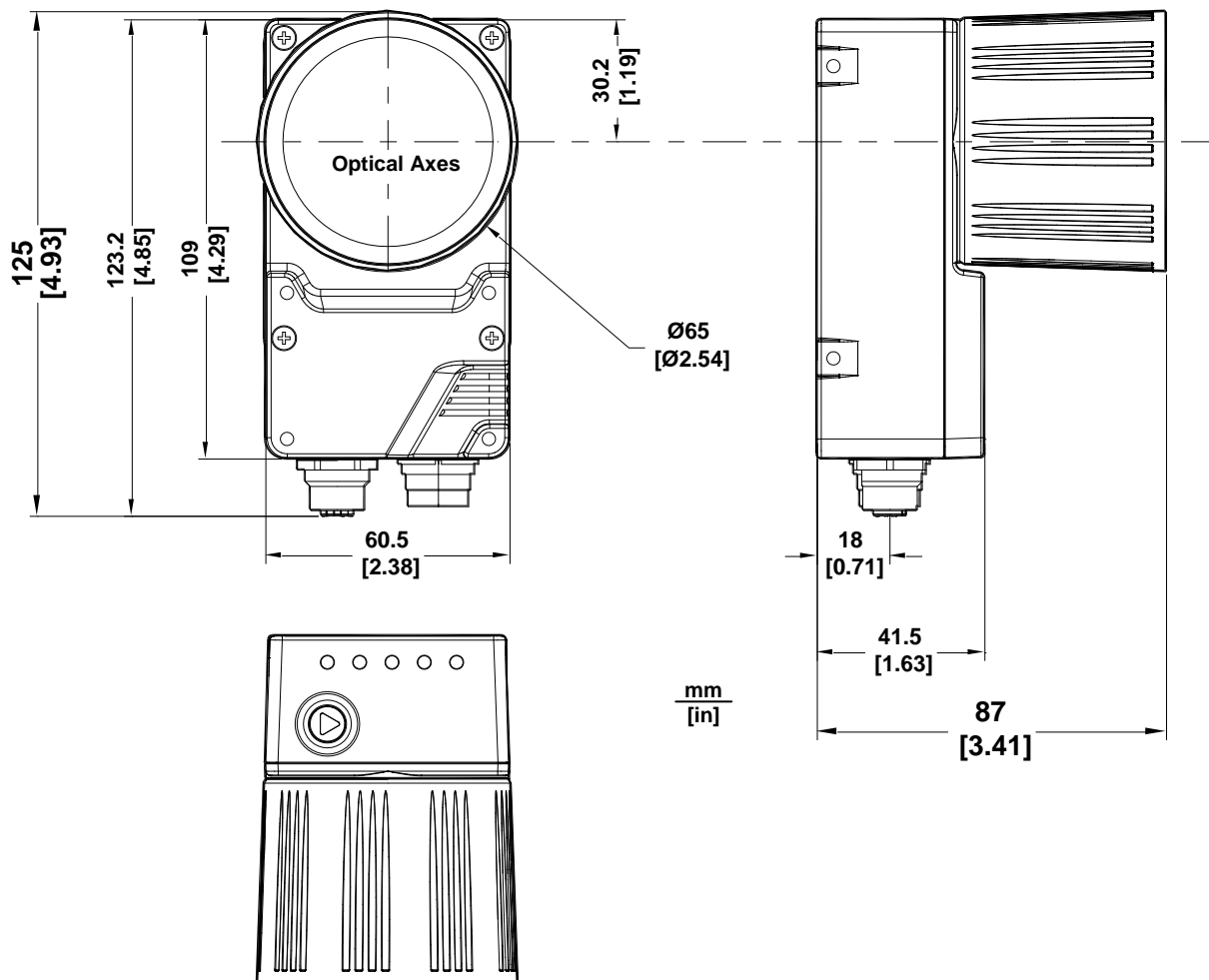


Figure 36 - Overall Dimensions

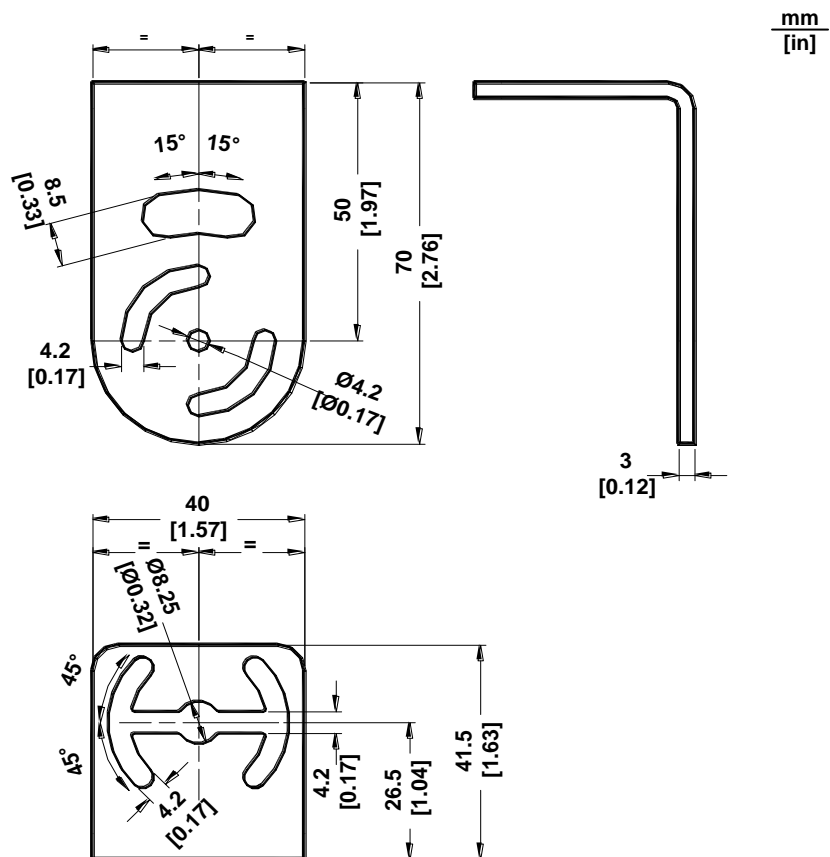
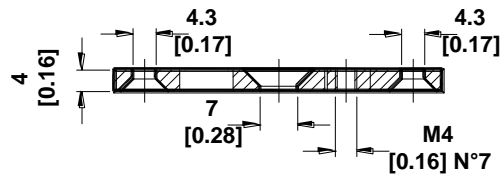
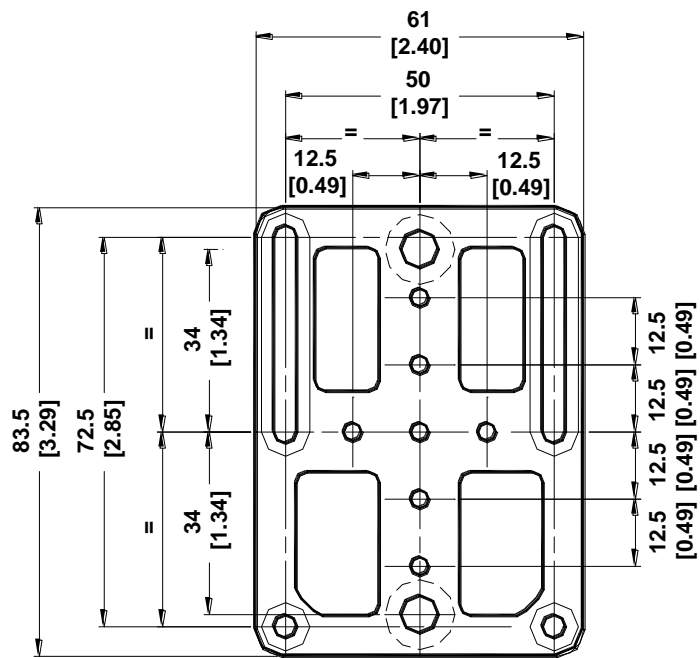


Figure 37 - Mounting Bracket Overall Dimensions

3.3 MOUNTING AND POSITIONING MATRIX 410N™

Using the Matrix 410N™ mounting brackets you can obtain rotation on the various axes of the reader as shown in the diagram below:

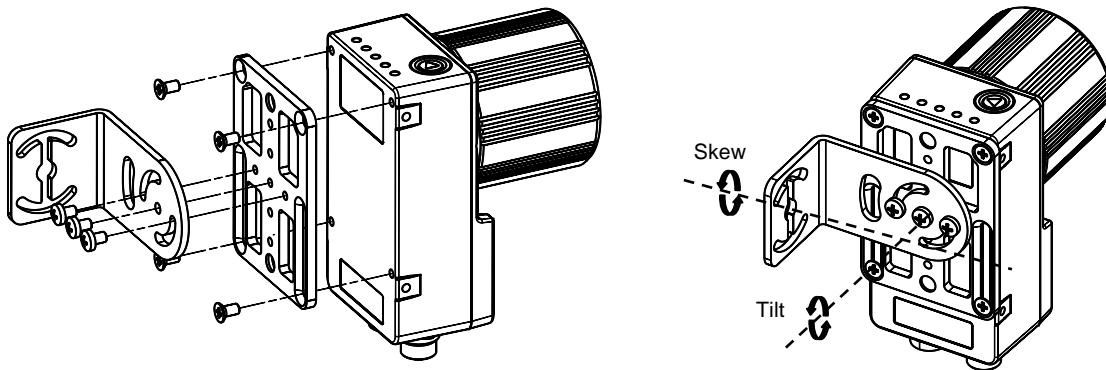


Figure 38 –Positioning with Mounting Bracket (Back)

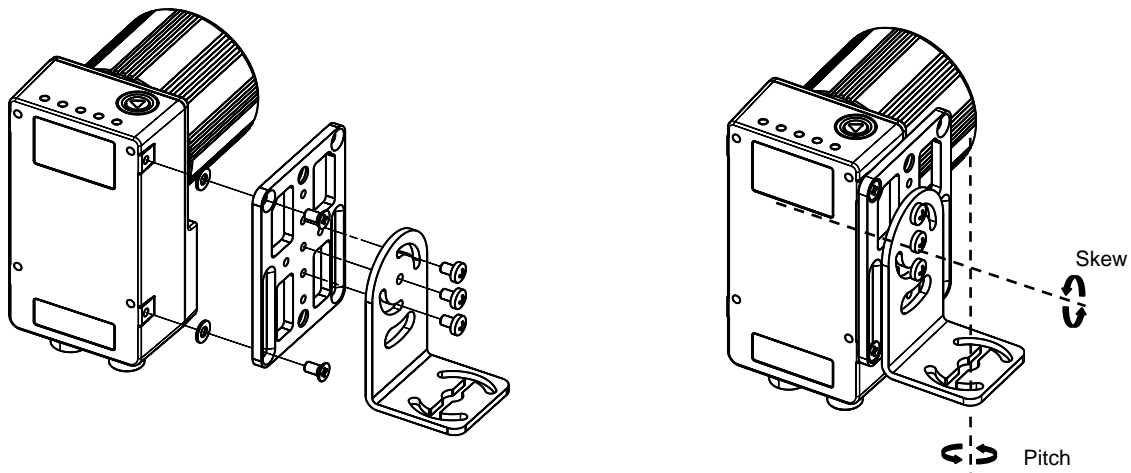


Figure 39 –Positioning with Mounting Bracket (Side)

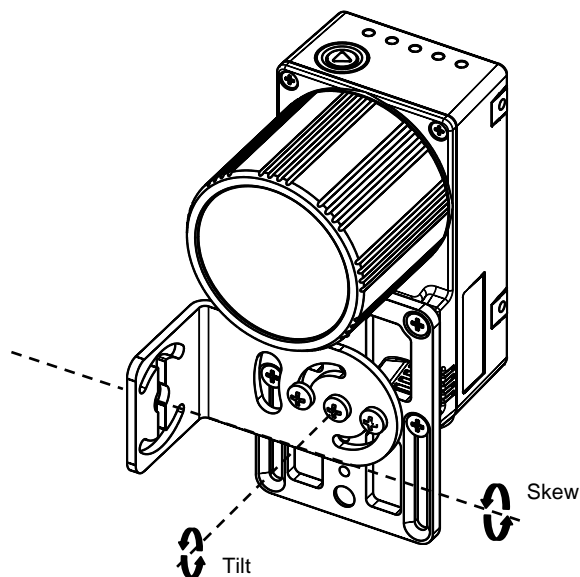


Figure 40 –Positioning with Mounting Bracket (Front)

Matrix 410N™ is able to decode code labels at a variety of angles, however significant angular distortion may degrade reading performance.

When mounting Matrix 410N™, take into consideration these **ideal** label position angles: **Pitch or Skew 10° to 20° and Tilt 0°.**

Note: Since Matrix 410N™ 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, Tilt and Skew** angles are represented in Figure 41. 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 410N™ reader; it is advised to **assure at least 10°** for the Skew angle.

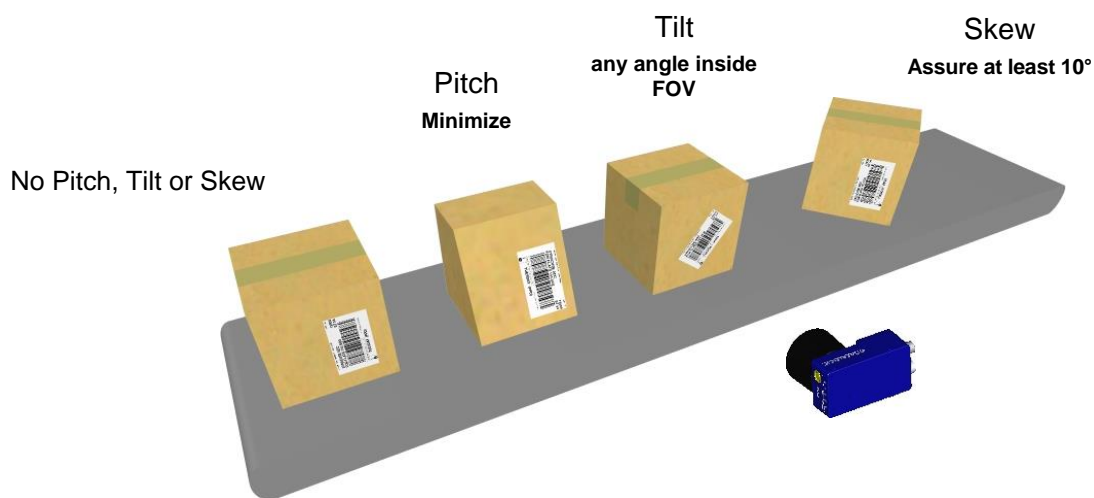


Figure 41 – Pitch Tilt and Skew Angles

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

Matrix 410N™ can read labels with any tilt angle. Keep in mind however, that since linear barcodes are rectangular, the reader should be aligned to fit them into the horizontal FOV.

See chp. 6 for FOV vs. Reading Distance considerations.

4 CBX ELECTRICAL CONNECTIONS

All Matrix 410N™ models can be connected to a CBX connection box through one of the available **CAB-DSxx-S** accessory cables. These accessory cables terminate in a 17-pin connector on the Matrix 410N™ 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, optoisolated output signals, and filtered reference signals.



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

The table below gives the pinout of the CBX100/500 terminal block connectors. Use this pinout when the Matrix 410N™ reader is connected by means of the CBX100/500:

| CBX100/500 Terminal Block Connectors | | |
|--------------------------------------|------------------------------------------------------------|-------------------|
| Input Power | | |
| Vdc | Power Supply Input Voltage + | |
| GND | Power Supply Input Voltage - | |
| Earth | Protection Earth Ground | |
| Inputs | | |
| +V | Power Source – External Trigger | |
| I1A | External Trigger A (polarity insensitive) | |
| I1B | External Trigger B (polarity insensitive) | |
| -V | Power Reference – External Trigger | |
| +V | Power Source – Inputs | |
| I2A | Input 2 A (polarity insensitive) | |
| I2B | Input 2 B (polarity insensitive) | |
| -V | Power Reference – Inputs | |
| Outputs | | |
| +V | Power Source - Outputs | |
| -V | Power Reference - Outputs | |
| O1+ | Output 1 + | |
| O1- | Output 1 - | |
| O2+ | Output 2 + | |
| O2- | Output 2 - | |
| O3A | Output 3 non opto-isolated (only available through CBX500) | |
| Auxiliary Interface | | |
| TX | Auxiliary Interface TX | |
| RX | Auxiliary Interface RX | |
| SGND | Auxiliary Interface Reference | |
| ID-NET™ | | |
| REF | Network Reference | |
| ID+ | ID-NET™ network + | |
| ID- | ID-NET™ network - | |
| Shield | Network Cable Shield | |
| Main Interface | | |
| | RS232 | RS422 Full-Duplex |
| | TX | TX+ |
| | RX | *RX+ |
| | - | TX- |
| | - | *RX- |
| | SGND | SGND |

* Do not leave floating, see par. 4.2.2 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.

4.1 POWER SUPPLY

Power can be supplied to the reader through the CBX100/500 spring clamp terminal pins as shown in Figure 42:

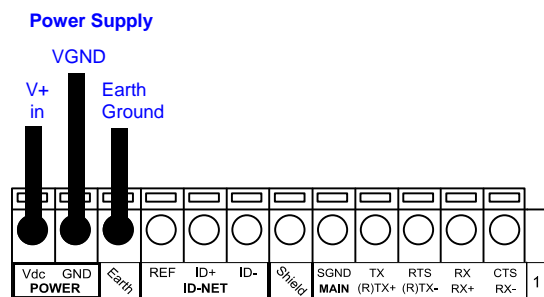


Figure 42 - Power Supply Connections

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.

4.2 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.

4.2.1 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 | Function |
|------------|---------------|
| 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).

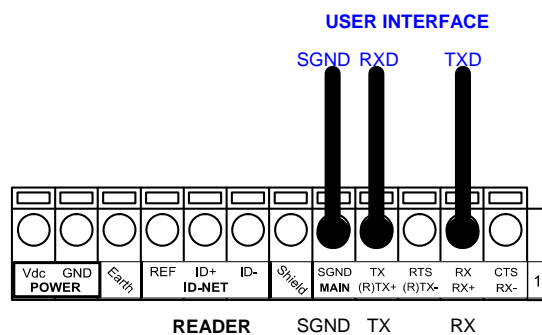


Figure 43 – RS232 Main Interface Connections

4.2.2 RS422 Full-Duplex Interface

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

The CBX pinout follows:

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

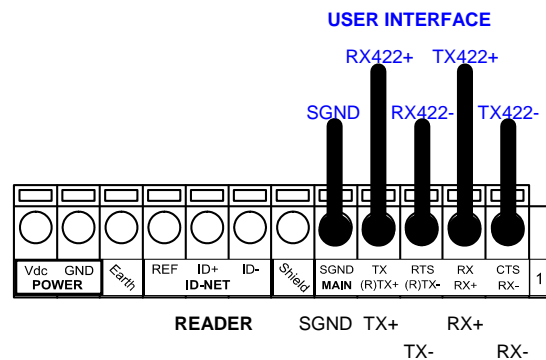


Figure 44 - RS422 Full-duplex Connections



NOTE: For applications that do not use RX422 signals, do not leave these lines floating but connect them to SGND as shown below.

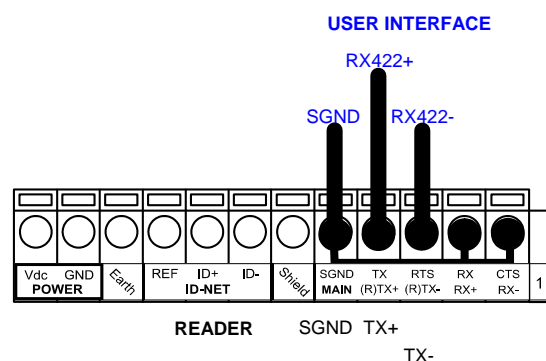


Figure 45 - RS422 Full-duplex Connections using Only TX Signals

4.3 ID-NET™ INTERFACE

| CBX100/500 | Function |
|------------|----------------------|
| Shield | Network Cable Shield |
| ID+ | ID-NET™ network + |
| ID- | ID-NET™ network - |
| REF | Network Reference |

4.3.1 ID-NET™ Cables

The following instructions are referred to Figure 47, Figure 48 and Figure 49.

- 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 | | | | |
|----------------|----------|----------|-----------------|-------|
| Baud Rate | 125 kbps | 250 kbps | 500 kbps | 1Mbps |
| Cable Length | 1200 m | 900 m | 700 m | * |

* Application dependent, contact your Datalogic Automation representative for details.



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

4.3.2 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.

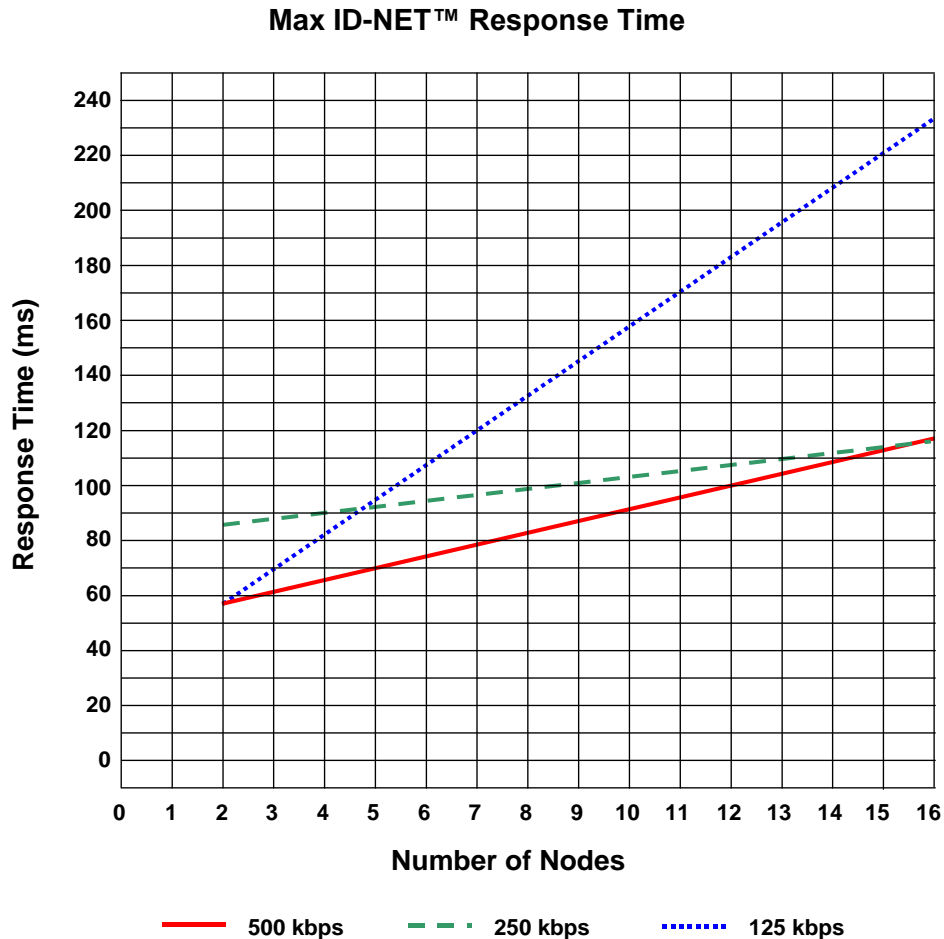


Figure 46 – ID-NET™ Response Time

CONDITIONS:

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

4.3.3 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.

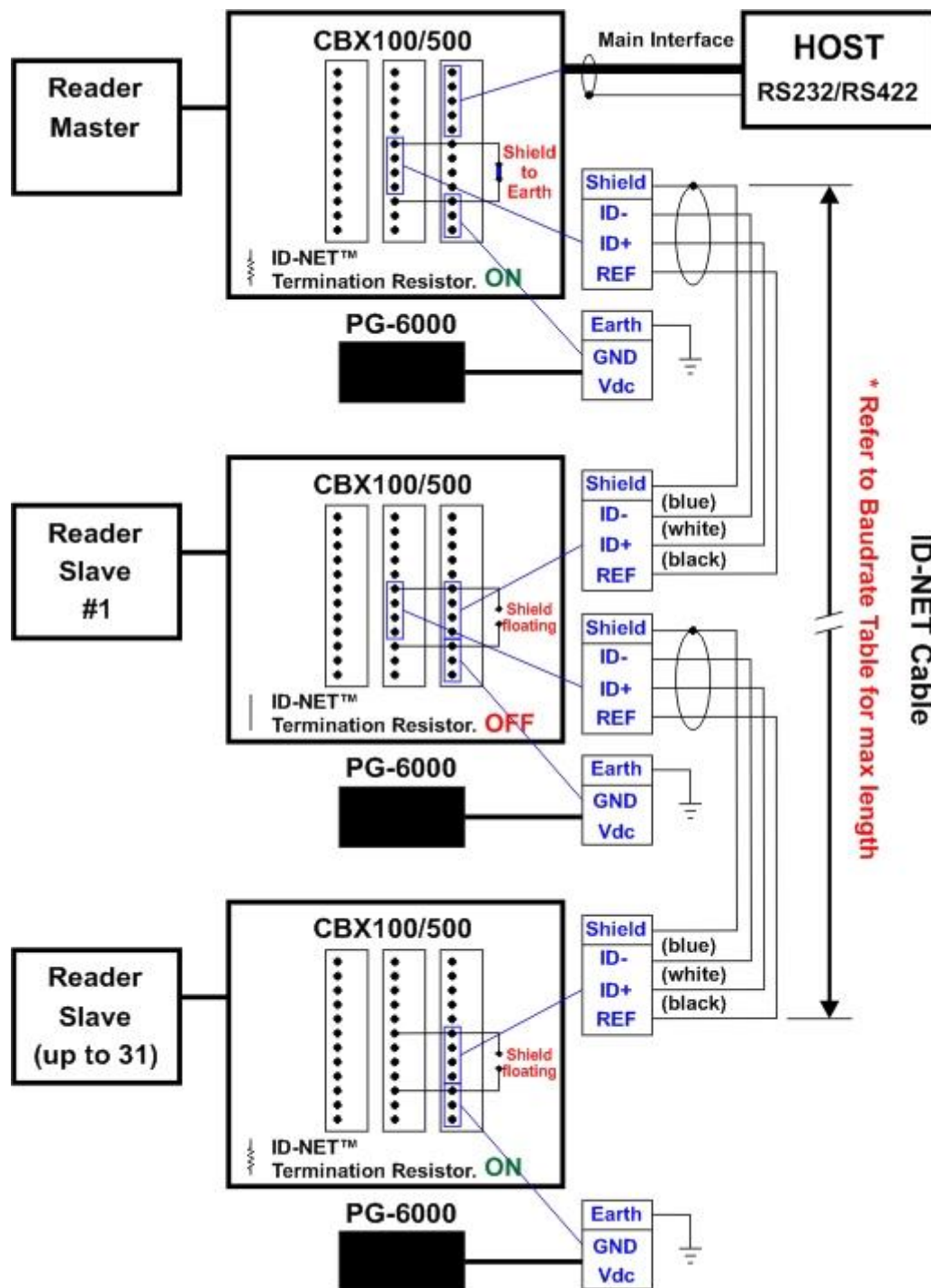


Figure 47 – ID-NET™ Network Connections with isolated power blocks

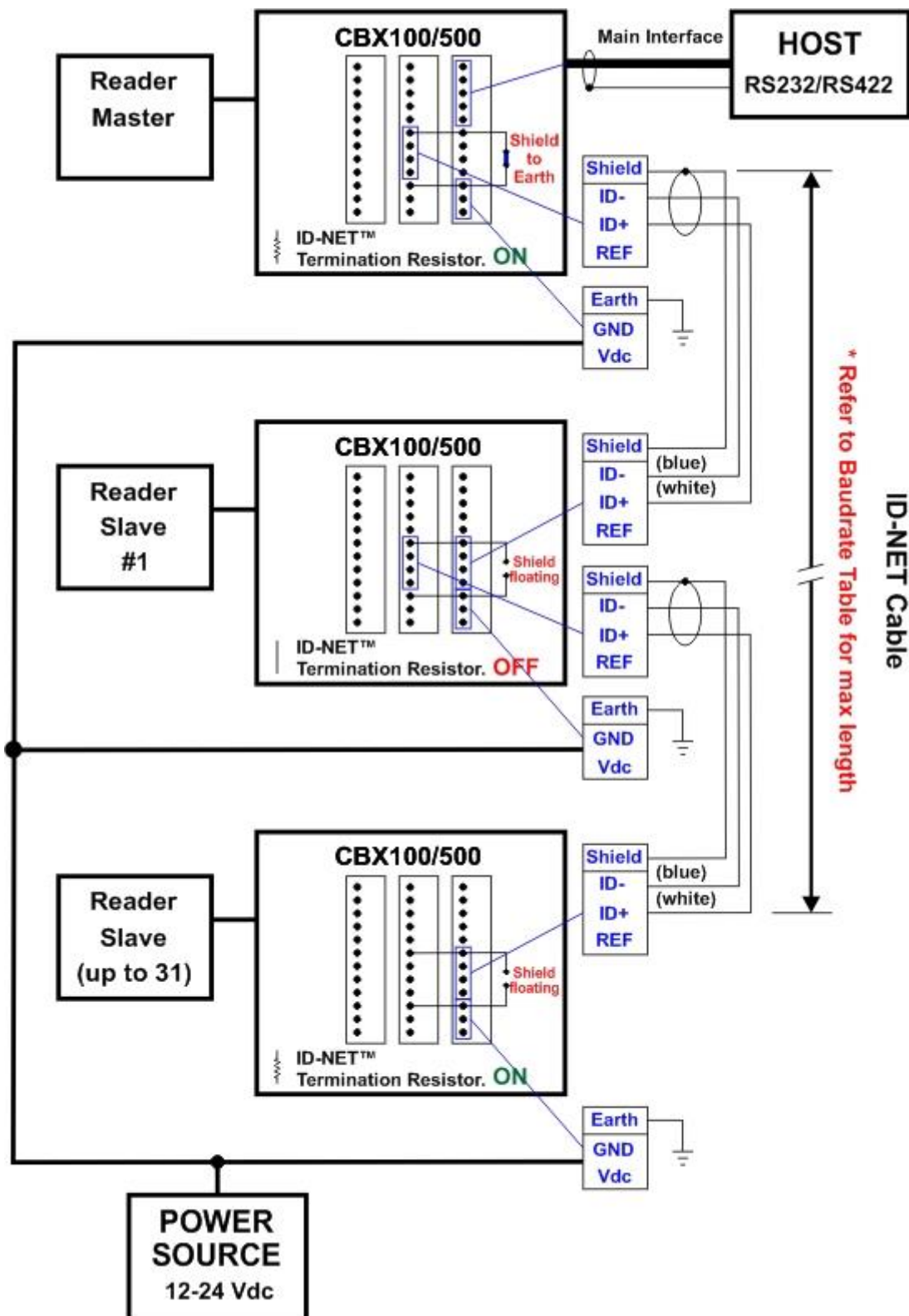


Figure 48 - ID-NET™ Network Connections with Common Power Branch Network

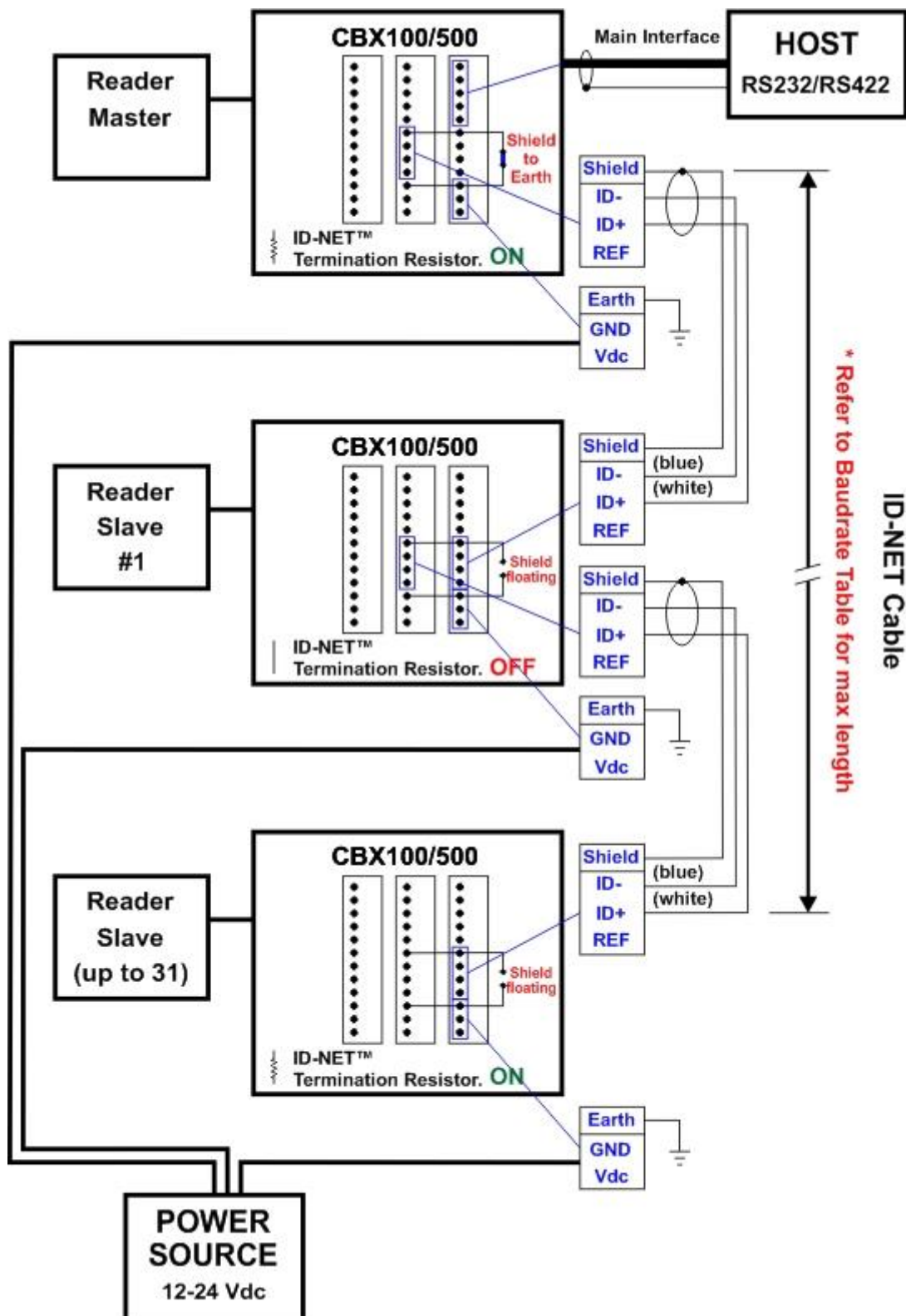


Figure 49 – ID-NET™ Network Connections with Common Power Star Network

4.4 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.

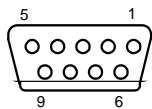


Figure 50 - 9-pin female connector

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

| CBX100/500 | Function |
|------------|-----------------------------------|
| RX | Auxiliary Interface Receive Data |
| TX | Auxiliary Interface Transmit Data |
| SGND | Auxiliary Interface Reference |

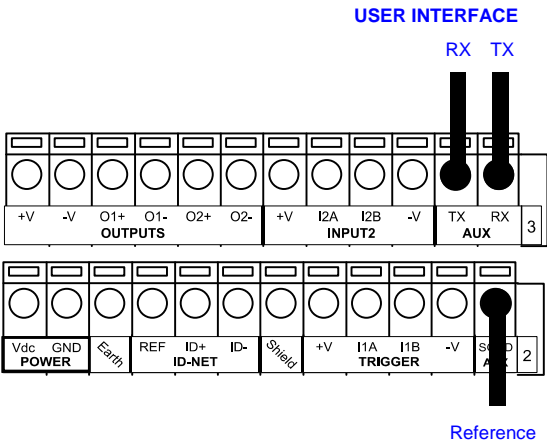


Figure 51 - RS232 Auxiliary Interface Connections



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

4.5 INPUTS

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

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

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

The main functions of the general purpose Input 2 are:

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

The electrical features of both inputs are:

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

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

The active state of these inputs are selected in software.

An anti-disturbance filter is implemented in software on both inputs so that the minimum pulse duration is $\cong 0.5$ milliseconds. This value can be increased through the software parameter Debouncing Time. 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 | Function |
|------------|-------------------------------------------|
| +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 19, 5) is on when the active state of the External Trigger corresponds to ON.

EXTERNAL TRIGGER INPUT CONNECTIONS USING MATRIX 410N™ 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.

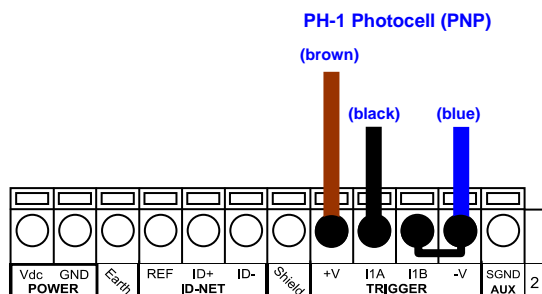


Figure 52 – PH-1 External Trigger Using MATRIX 410N™ Power

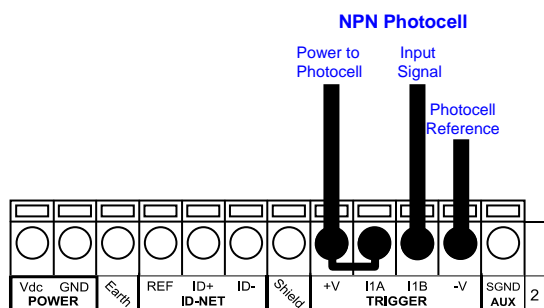


Figure 53 - NPN External Trigger Using MATRIX 410N™ Power

EXTERNAL TRIGGER INPUT CONNECTIONS USING EXTERNAL POWER

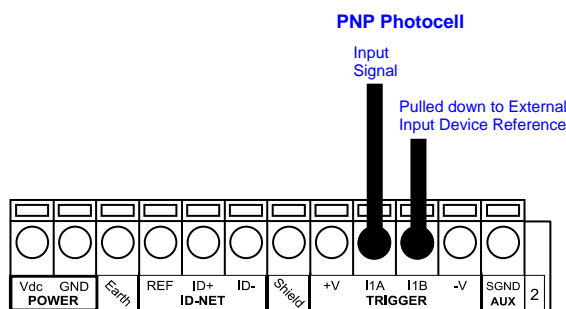


Figure 54 - PNP External Trigger Using External Power

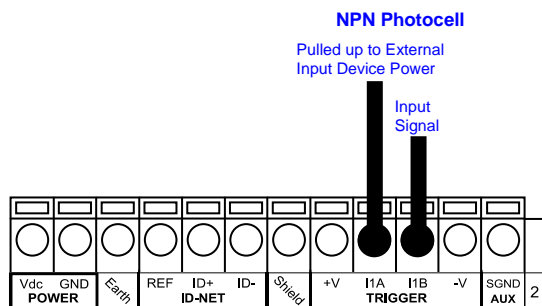


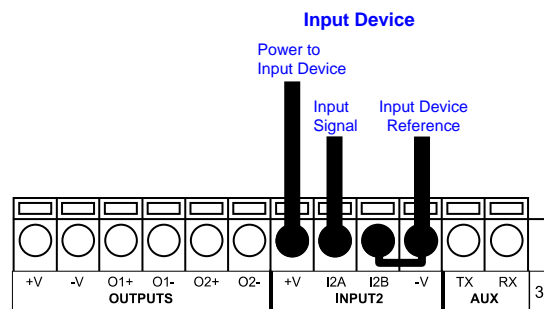
Figure 55 - NPN External Trigger Using External Power

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

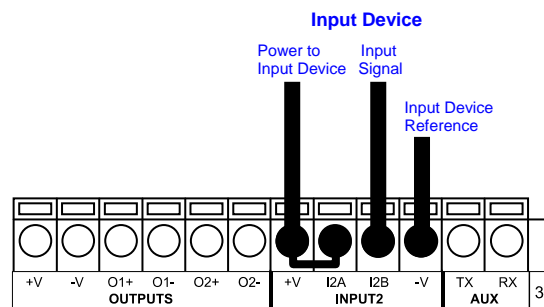
INPUT 2 CONNECTIONS USING MATRIX 410N™ POWER



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.



PNP Input 2 Using MATRIX 410N™ Power



NPN Input 2 Using MATRIX 410N™ Power

INPUT 2 CONNECTIONS USING EXTERNAL POWER

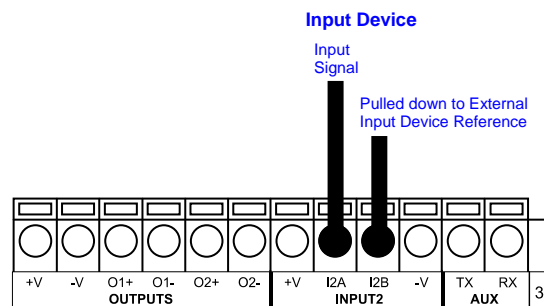


Figure 56 - PNP Input 2 Using External Power

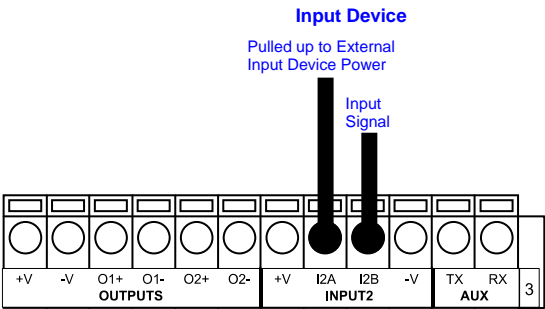


Figure 57 - NPN Input 2 Using External Power

INPUT 3 CONNECTIONS (CBX500 Only)

RESERVED

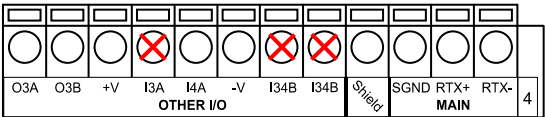


Figure 58 - Input 3 Using External Power



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

4.6 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 | Function |
|------------|-------------------------------------------------------|
| +V | Power Source - Outputs |
| O1+ | Output 1 + |
| O1- | Output 1 - |
| O2+ | Output 2 + |
| O2- | Output 2 - |
| O3A | Output 3 non opto-isolated (only available on CBX500) |
| -V | Power Reference Outputs |

The electrical features of the two outputs are the following:

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

By default, Output 1 is associated with the Partial Read and No Read events, which activates when the code(s) signaled by the external trigger are not decoded, and Output 2 is associated with the Complete 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 410N™ 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.

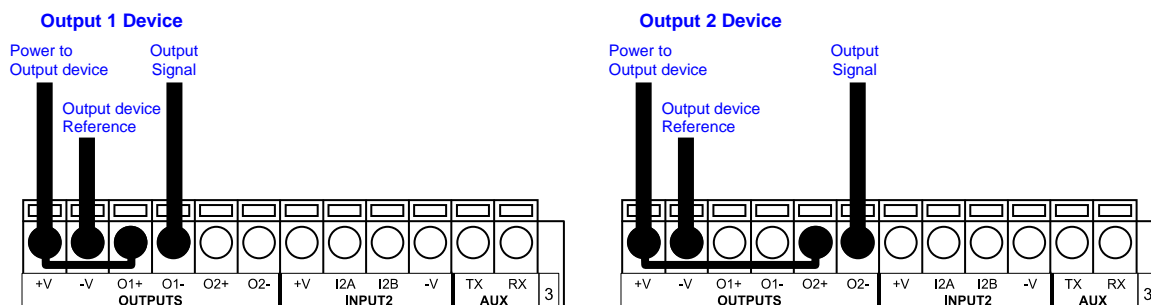


Figure 59 – PNP/Open Emitter Output Using MATRIX 410N™ Power

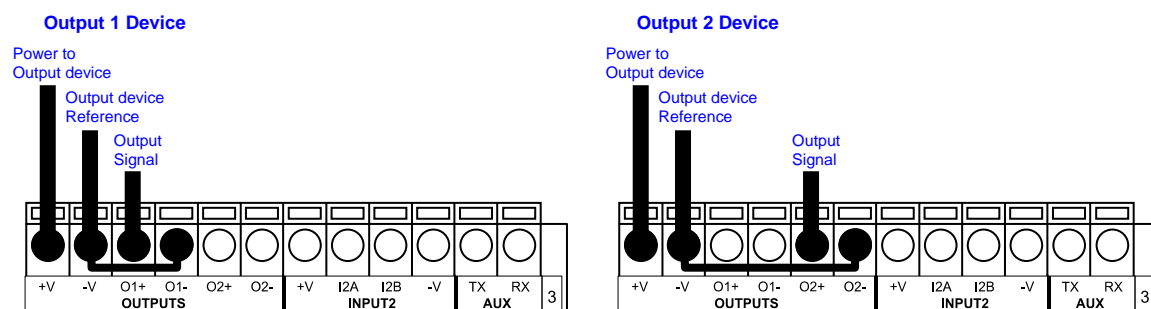


Figure 60 – NPN/Open Collector Output Using MATRIX 410N™ Power

OUTPUT 1 AND 2 CONNECTIONS USING EXTERNAL POWER

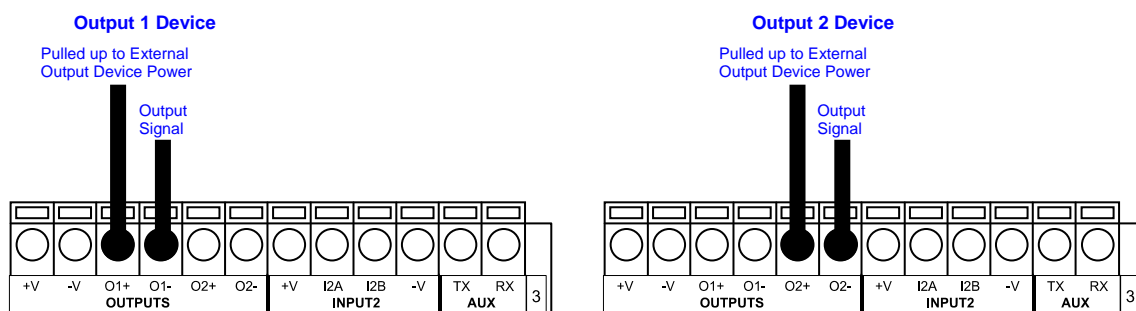


Figure 61 – PNP/Output Open Emitter Using External Power

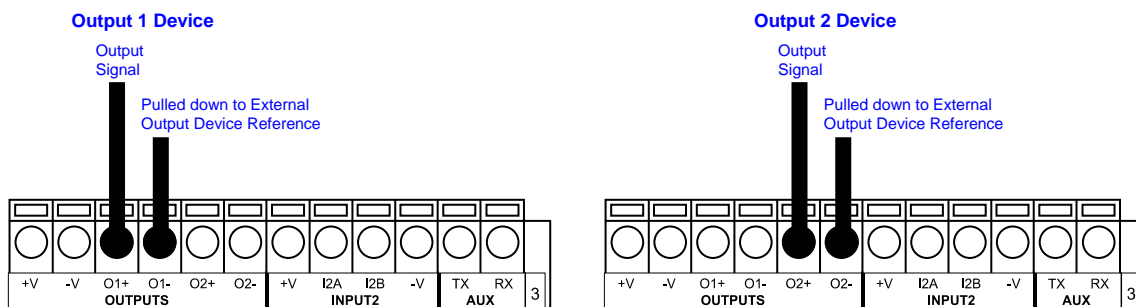


Figure 62 – NPN/Output Open Collector Using External Power

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 this output, set the Line Type configuration parameter according to the hardware connection to the CBX: NPN, PNP or Push-Pull.

OUTPUT 3 CONNECTIONS USING MATRIX 410N™ POWER (CBX500 Only)

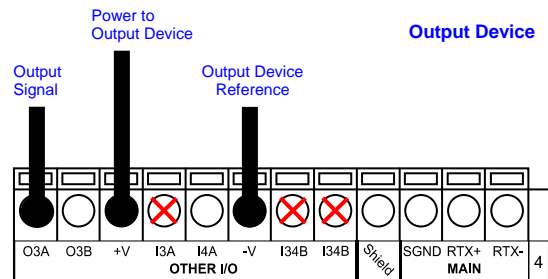


Figure 63 - Output 3 Using Matrix 410N™ Power

OUTPUT 3 CONNECTIONS USING EXTERNAL POWER (CBX500 Only)

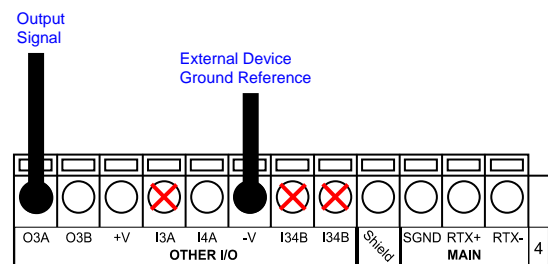


Figure 64 - Output 3 Using External Power



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

4.7 EXTERNAL LIGHTING SYSTEMS

If an External Illuminator is used, it can be powered from the CBX connection box. It must be connected to the **Vdc** and **GND** terminal clamps.



CAUTION: Power is available directly to the Illuminator, independently from the Power Supply Switch inside the CBX.

In the case of the LT-700 illuminators, one of the available digital outputs must be connected as the control signal. In DL.CODE™, configure the Output Line Function parameter to one of the External Illuminator selections: Always On or Strobed.

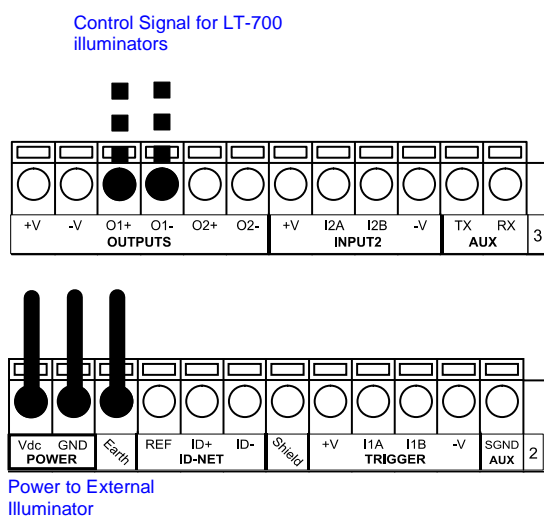


Figure 65 – External Lighting System Connections

Below is a table summarizing the various External Illuminator wiring and power requirements:

| Illuminator | Wire Color | CBX/Matrix Signal | Meaning |
|--------------------------|------------|-------------------|---------------------|
| LT-410 LT-510, LT-511 | White | Vdc | 24 Vdc |
| | Black | GND | Ground |
| | Shield | Earth | Shield/Earth Ground |
| LT-700 | Red | Vdc | 10 to 30 Vdc |
| | Black | GND | Ground |
| | White | Earth | Shield/Earth Ground |
| | Green | O1- or O2- | Control Signal - |
| | Yellow | O1+ or O2+ | Control Signal + |

4.8 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 410N™ incorporates an auto-cross function.

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

On the Matrix 410N™ on-board Ethernet interface the following communication channels are available:

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

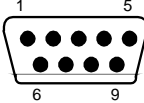
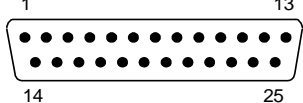
The following Fieldbus protocols are also available over the on-board Ethernet interface:

- 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™ and to the "Matrix Ethernet Service Guide.pdf" document provided as supplementary documentation.

4.9 USER INTERFACE – SERIAL HOST

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

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

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.

5.1 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 410N™ incorporates an autocross function.

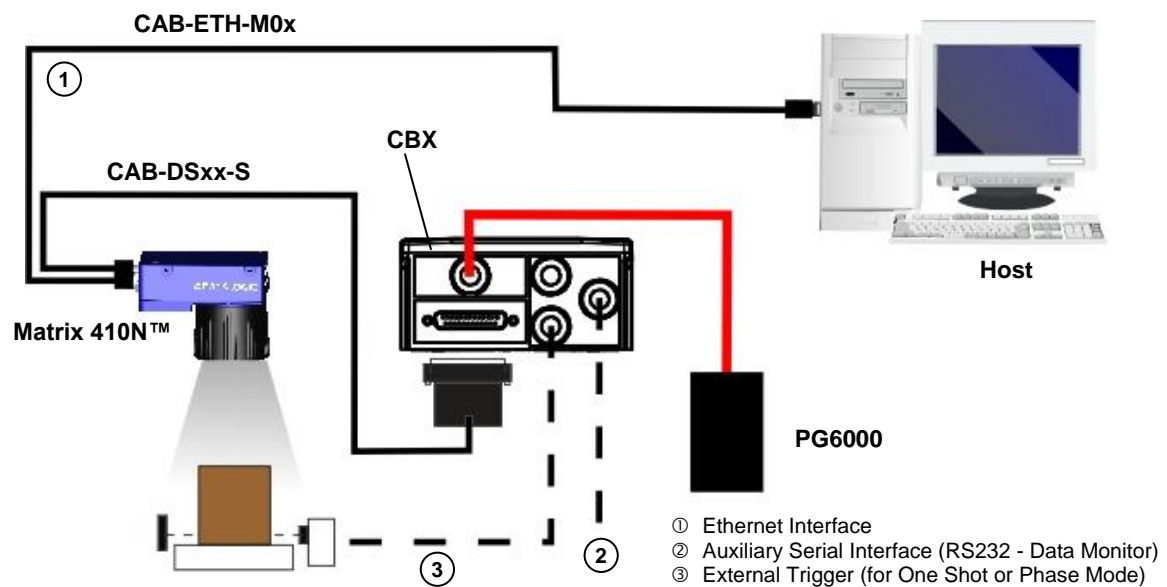


Figure 66 - Ethernet Point-to-Point Layout

When using a Local Area Network (LAN), one or more Matrix 410N™ readers can be connected to the network by using **CAB-ETH-M0x** cables.

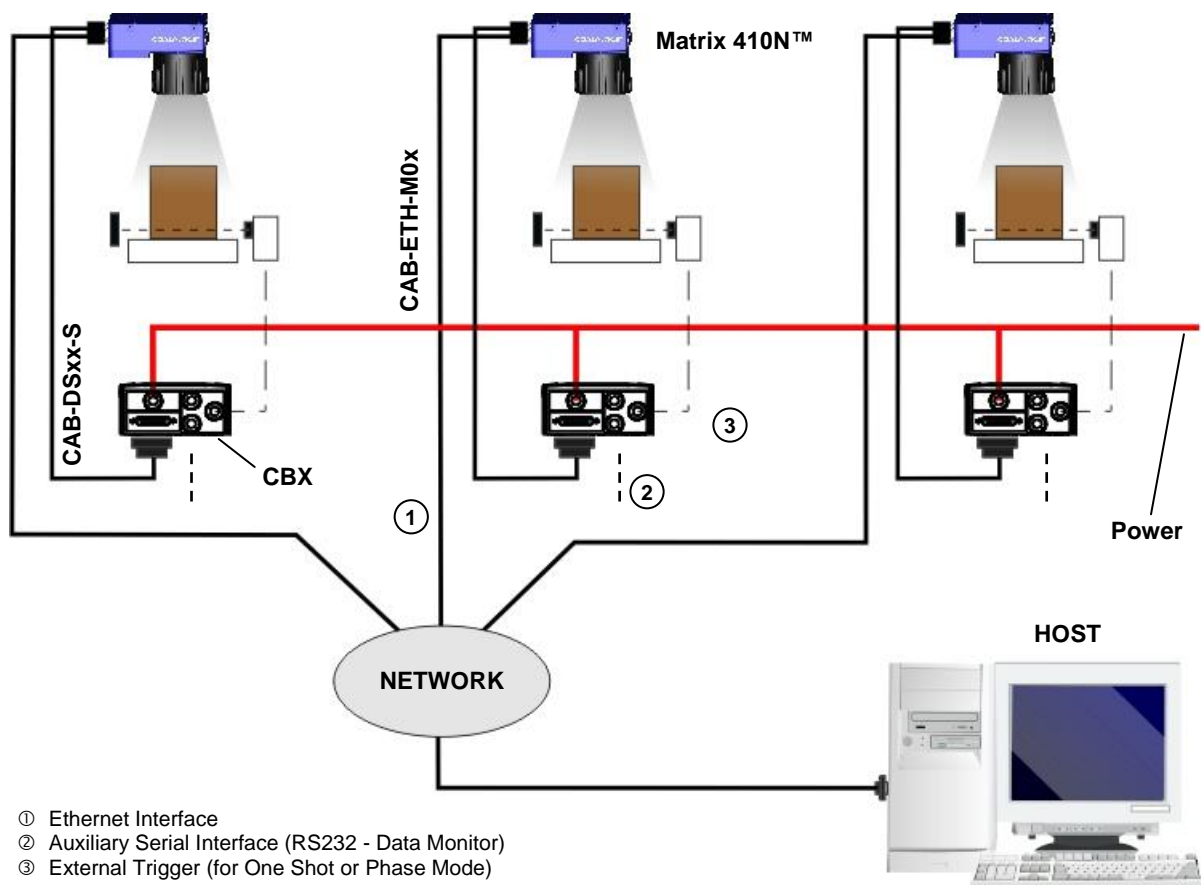


Figure 67 - Ethernet Network Layout

5.2 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.

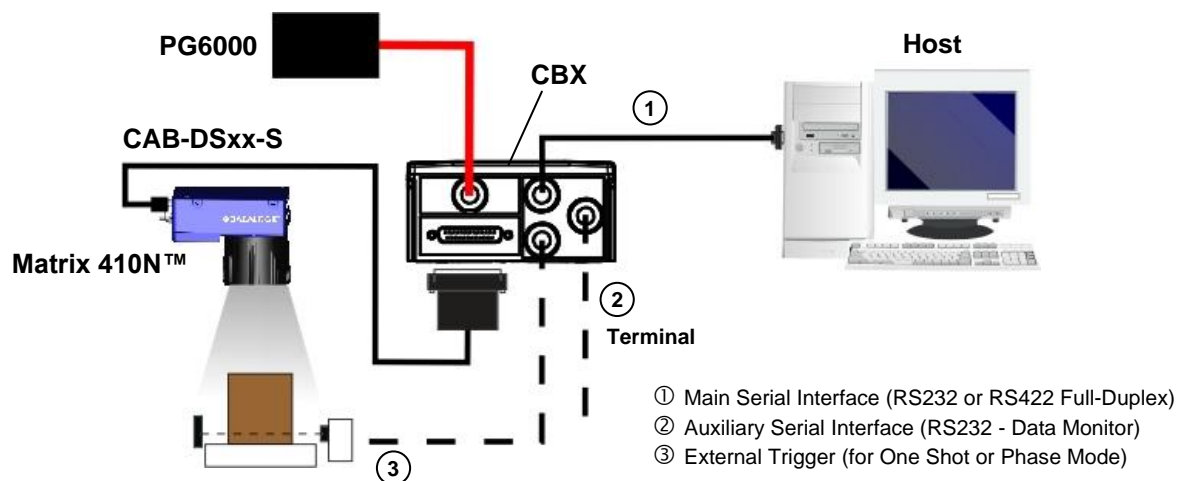


Figure 68 – Serial Interface Point-to-Point Layout

5.3 FIELDBUS CONNECTION

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

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

Data can be transmitted on the RS232 auxiliary interface independently from the 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.

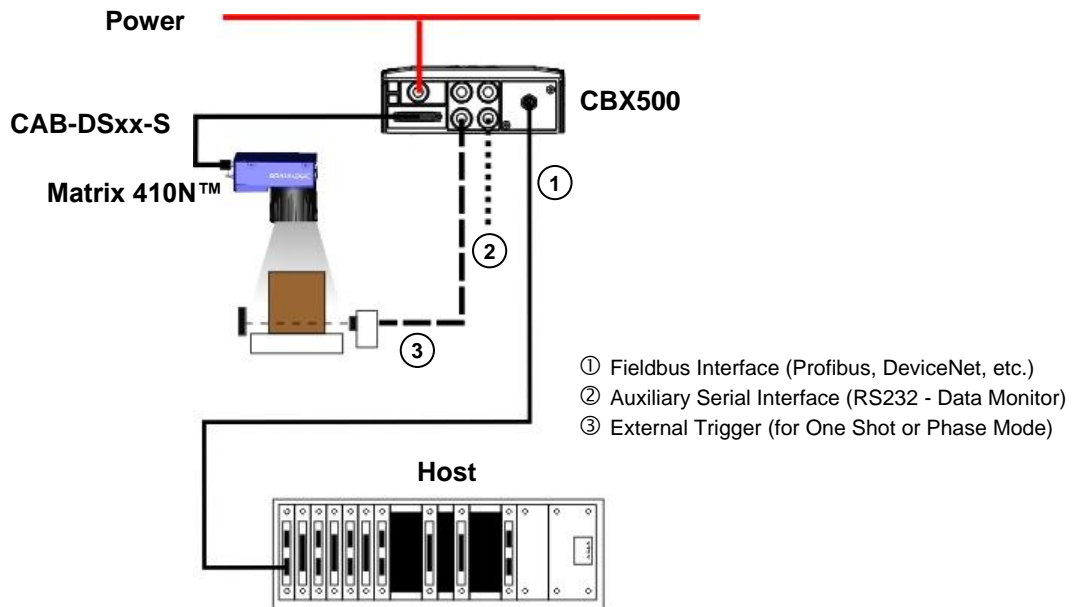


Figure 69 – Fieldbus Interface Point-to-Point Layout

5.4 ID-NET™ SYNCHRONIZED NETWORK



NOTE: DL.CODE™ only supports Master/Slave SYNCHRONIZED ID-NET™ network configurations.

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 the RS232/RS422 main serial interface.

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.

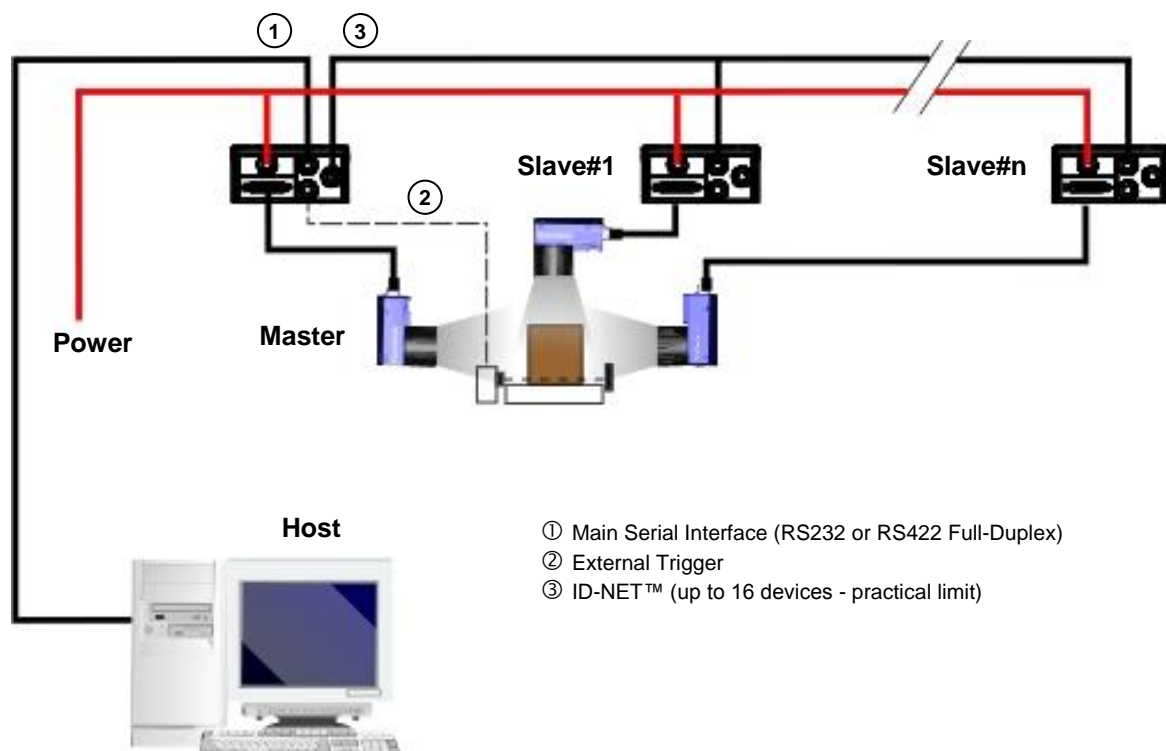


Figure 70 – ID-NET™ M/S Synchronized Layout

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).

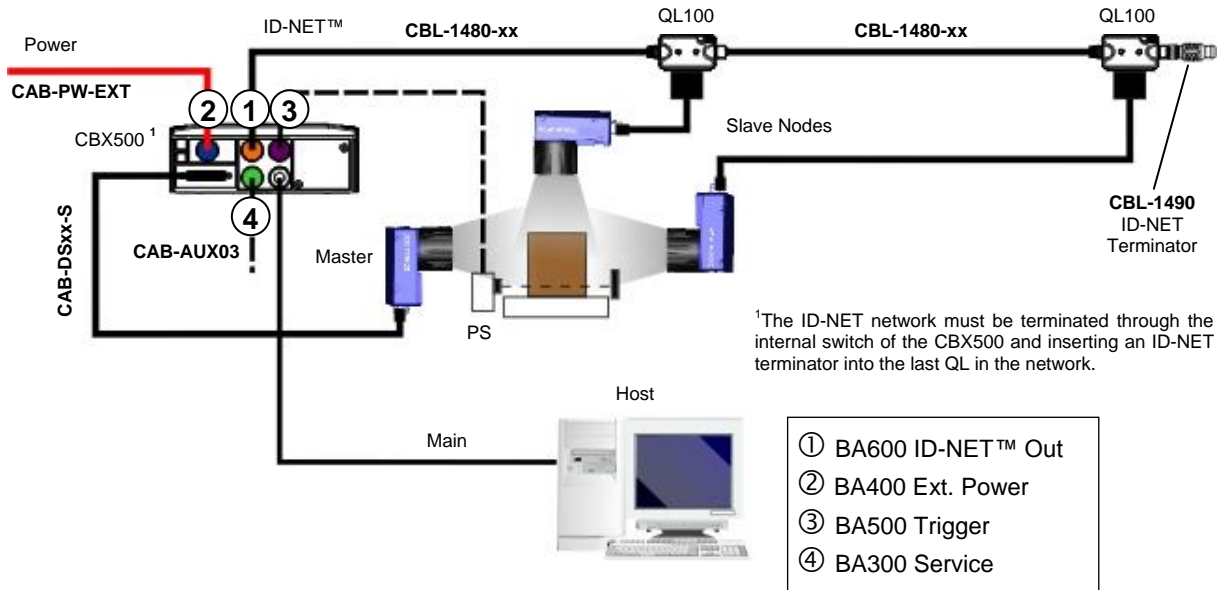


Figure 71 - ID-NET™ Synchronized Layout
Matrix 410N™ Master with CBX500 + Matrix 410N™ Slaves with QL100

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

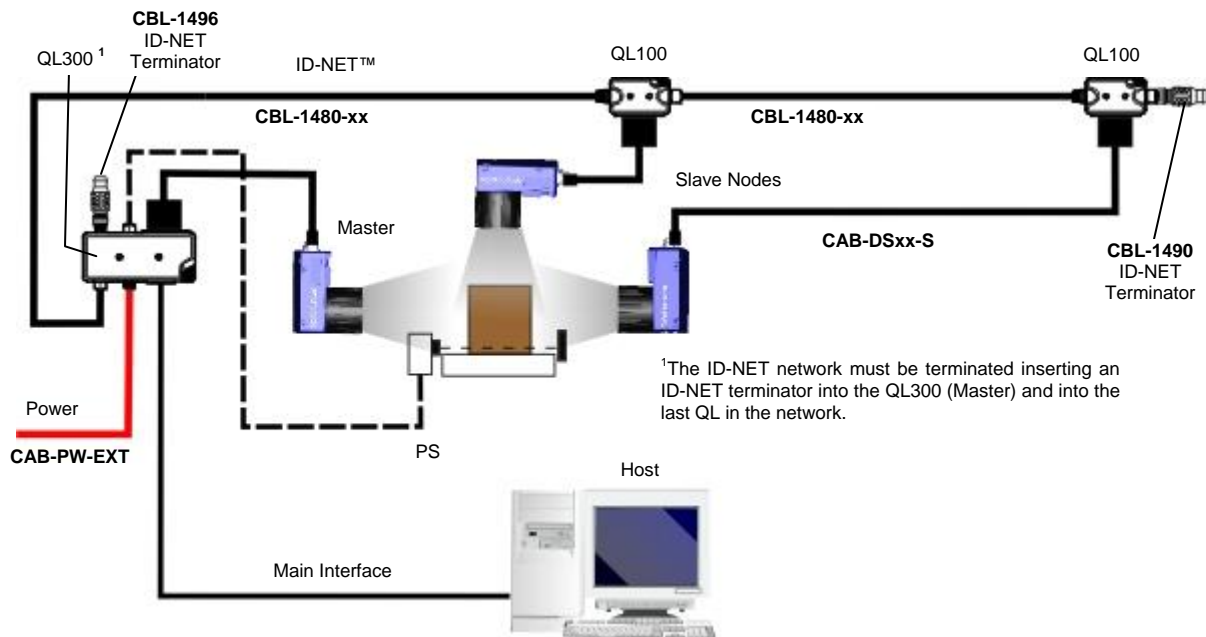


Figure 72 - ID-NET™ Synchronized Layout
Matrix 410N™ Master with QL300 + Matrix 410N™ Slaves with QL100

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

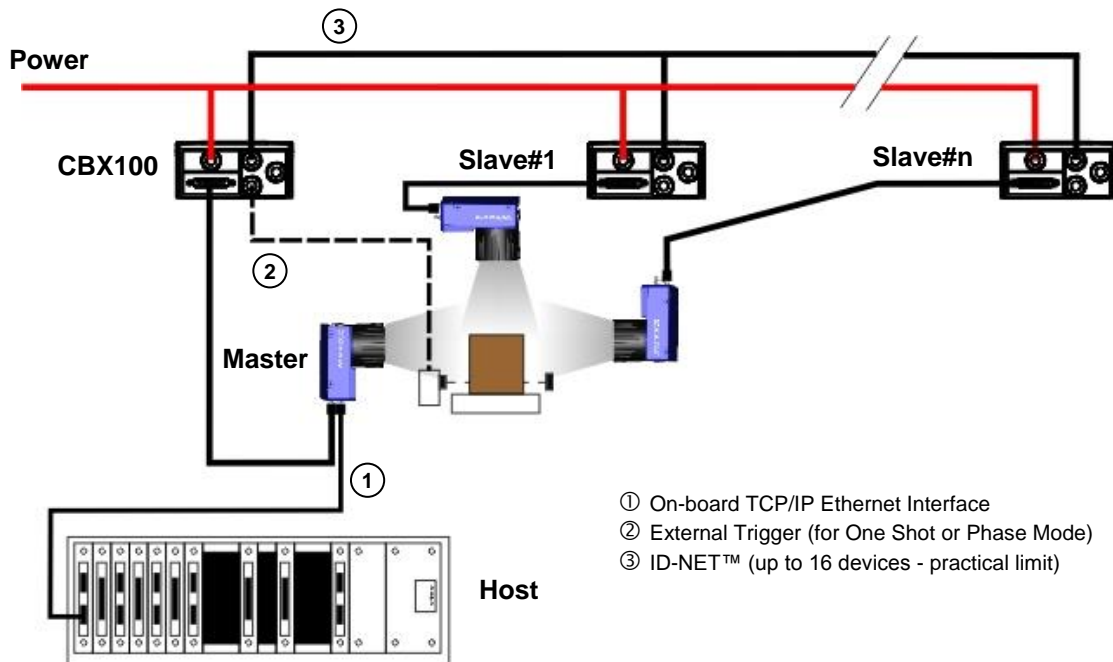


Figure 73 – ID-NET™ M/S Synchronized Layout with on-board TCP/IP Ethernet Interface to Host

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

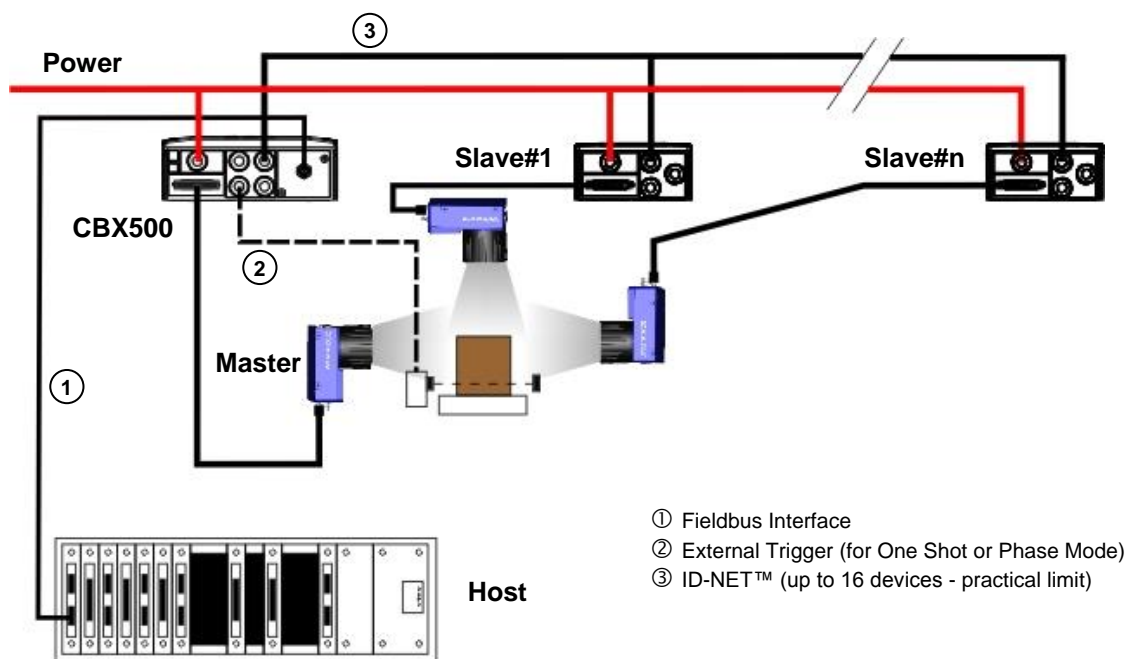


Figure 74 – ID-NET™ Fieldbus M/S Synchronized Layout

6 READING FEATURES

6.1 FOV CALCULATION

Use the data in the following table to calculate the FOV for your application, referring to Figure 75 and the formula below.

| Model | Lens | d _o Offset | Viewing Angle Horizontal | Viewing Angle Vertical | Viewing Angle Diagonal | Min Focus Distance mm |
|-----------------------------------|------------------|--------------------------|-----------------------------|---------------------------|---------------------------|-----------------------------|
| Matrix 410N 500-0x0 (1.3MP) | LNS-1106 6 mm | 20 | 61° | 50° | 74° | 85 |
| | LNS-1109 9 mm | 30 | 41° | 34° | 51° | 85 |
| | LNS-1112 12.5 mm | 30 | 30° | 24° | 38° | 85 |
| | LNS-1116 16 mm | 30 | 23° | 19° | 30° | 85 |
| | LNS-1125 25 mm | 15 | 15° | 12° | 19° | 135 |
| | LNS-1135 35 mm | 15 | 11° | 9° | 14° | 235 |
| | LNS-1150 50 mm | 15 | 7° | 6° | 10° | 500 |
| Matrix 410N 700-0x0 (2.0MP) | LNS-1006 6 mm | 20 | 64° | 50° | 76° | 85 |
| | LNS-1109 9 mm | 26 | 43° | 33° | 53° | 85 |
| | LNS-1112 12.5 mm | 26 | 32° | 24° | 39° | 85 |
| | LNS-1116 16 mm | 26 | 25° | 19° | 31° | 85 |
| | LNS-1125 25 mm | 26 | 16° | 12° | 20° | 135 |
| | LNS-1135 35 mm | 10 | 12° | 9° | 15° | 235 |
| | LNS-1150 50 mm | 10 | 8° | 6° | 11° | 500 |

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

$$FOV_x = 2 \left[(d + d_o) \tan (\alpha_x/2) \right]$$

where:

FOV_x = horizontal, vertical or diagonal FOV

α_x = horizontal, vertical or diagonal viewing angles.

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

d_o = offset (in mm) from center of lens to external lens cover surface

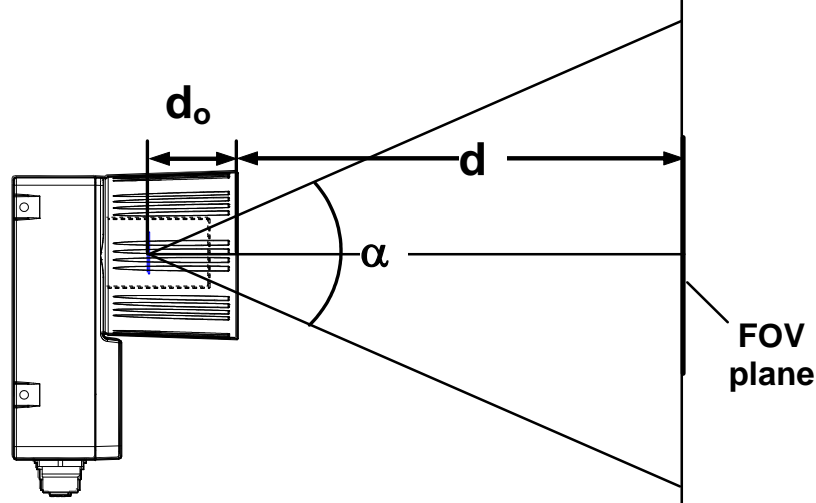


Figure 75 – Reading Distance References

Example:

The FOV for a **Matrix 410 700-0x0 base** using the **16 mm lens** at a **focus distance of 600 mm** is:

$$\text{FOV}_H = 2 [(600 \text{ mm} + 26 \text{ mm}) \tan (25^\circ/2)] \approx \mathbf{278 \text{ mm}}$$

$$\text{FOV}_V = 2 [(600 \text{ mm} + 26 \text{ mm}) \tan (19^\circ/2)] \approx \mathbf{210 \text{ mm}}$$

6.2 GLOBAL FOV DIAGRAMS

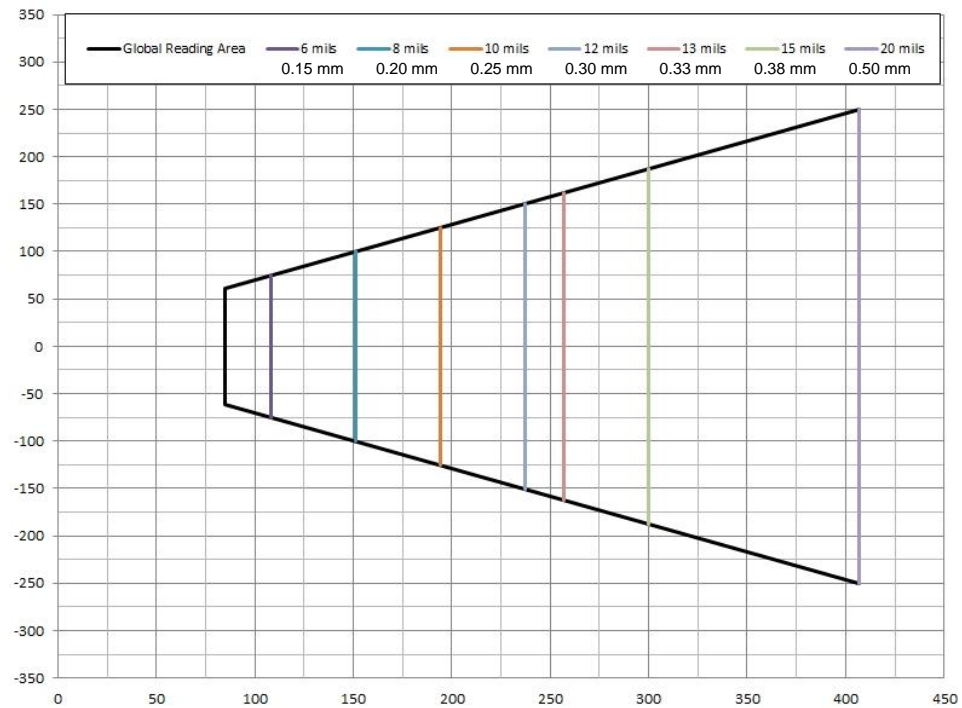


NOTE: The following diagrams are given for typical performance at 25°C using high quality grade A symbols according to ISO/IEC 15416 (1D code) and ISO/IEC 15415 (2D code) print quality test specifications. Testing should be performed with actual application codes in order to maximize the application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

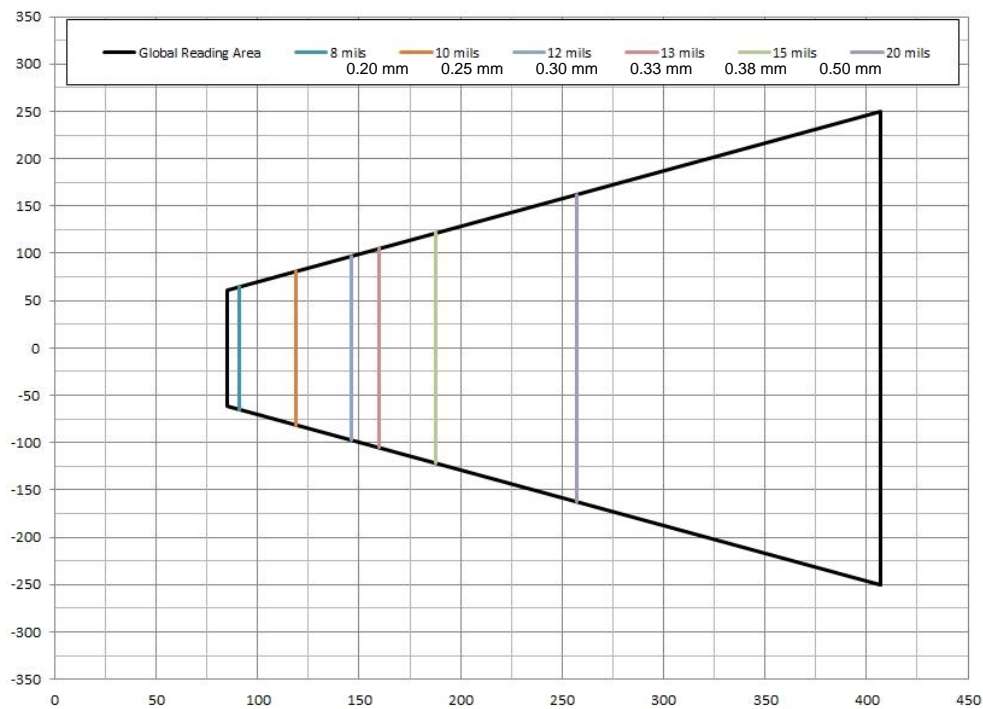
The following diagrams show the **maximum obtainable** Field of View for 1D and 2D codes using Processing Mode = Advanced Code Setting. **Depending on the code resolution, symbology, and number of characters in the code, the Reading Area can be different from the FOV.**

6.2.1 Matrix 410 500-0x0 (1.3 MP)

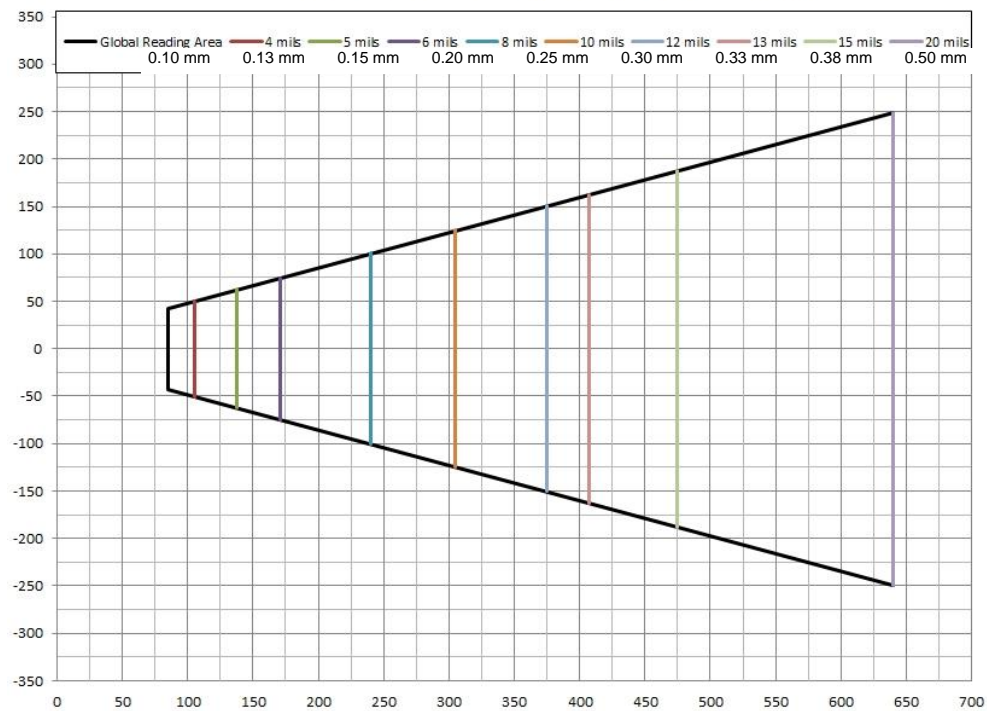
Code 128 PPE = 1.3 - M410N 1.3 MPixel - f = 6mm



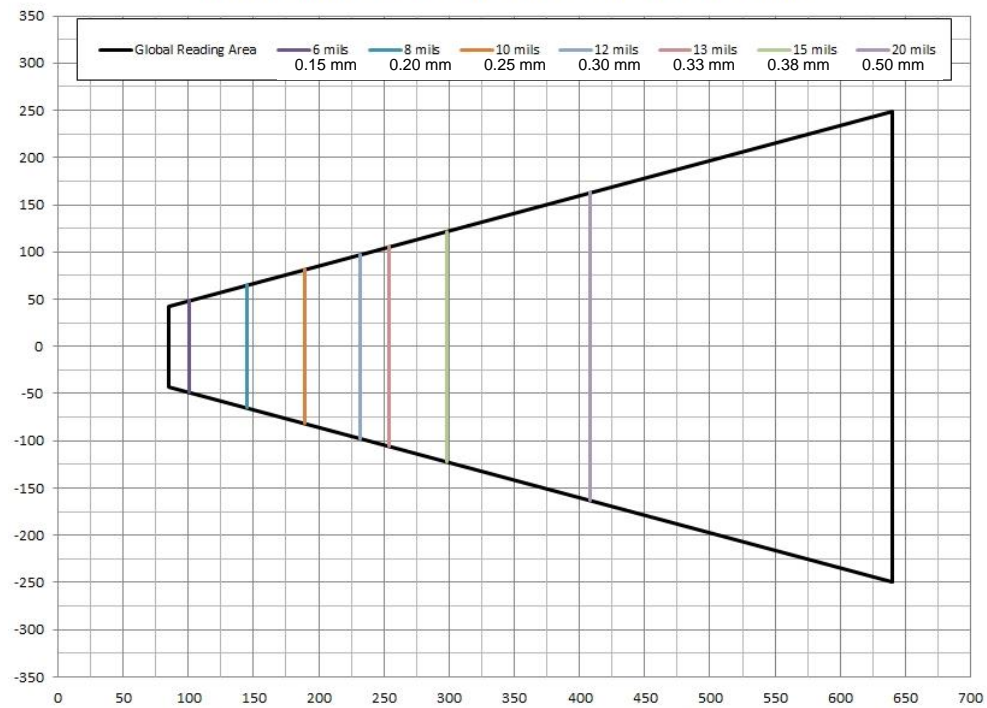
Data Matrix PPE = 2 - M410N 1.3 MPixel - f = 6mm

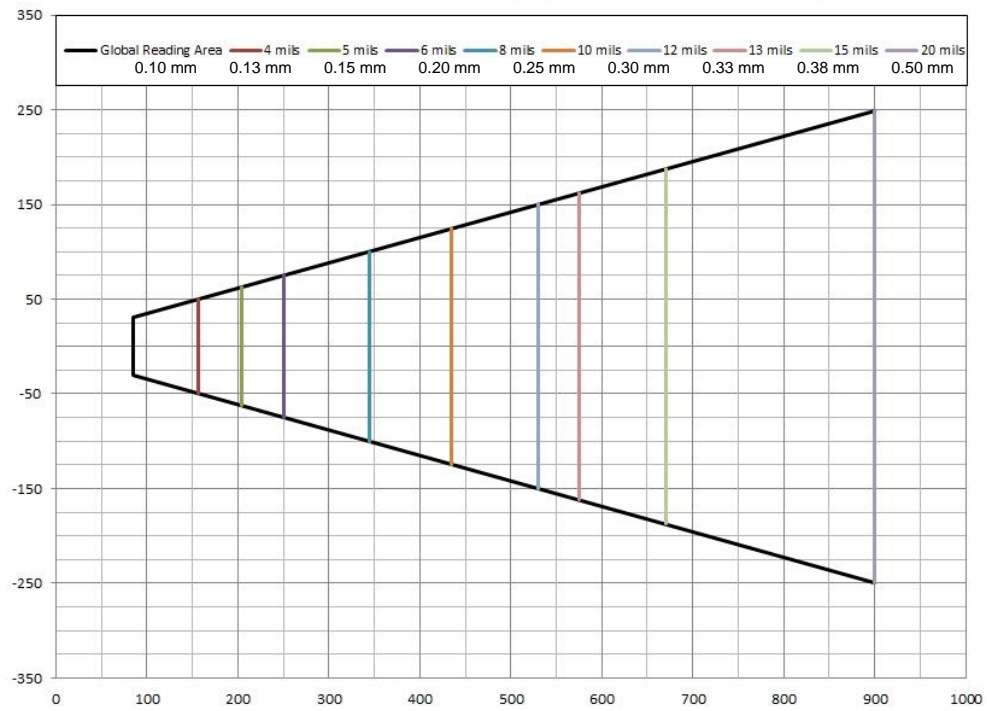
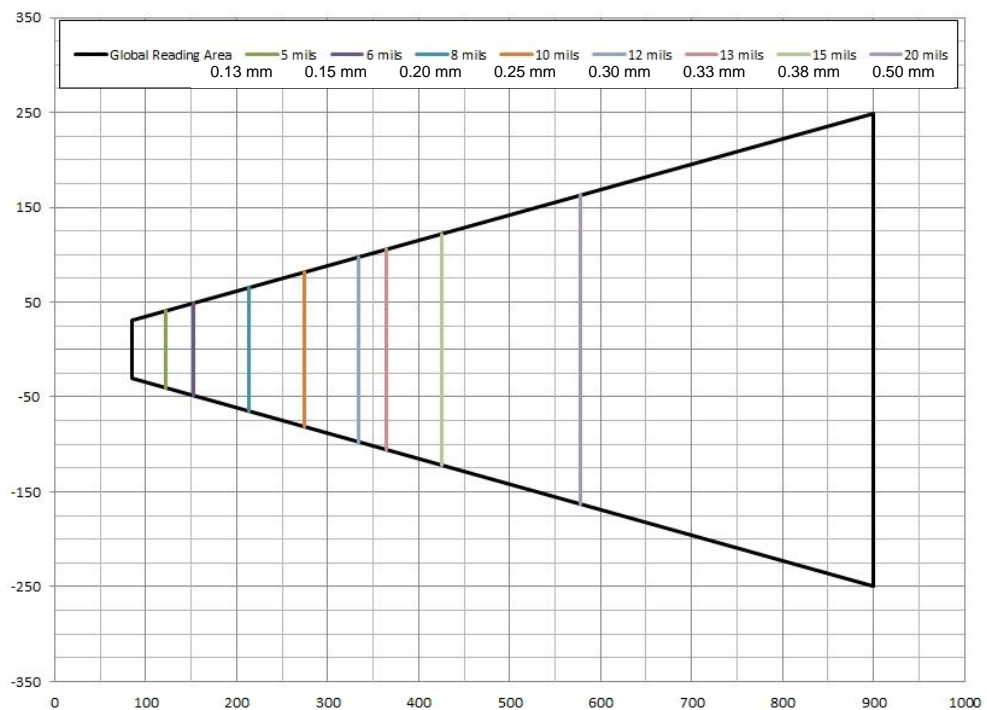


Code 128 PPE = 1.3 - M410N 1.3 MPixel - f = 9mm

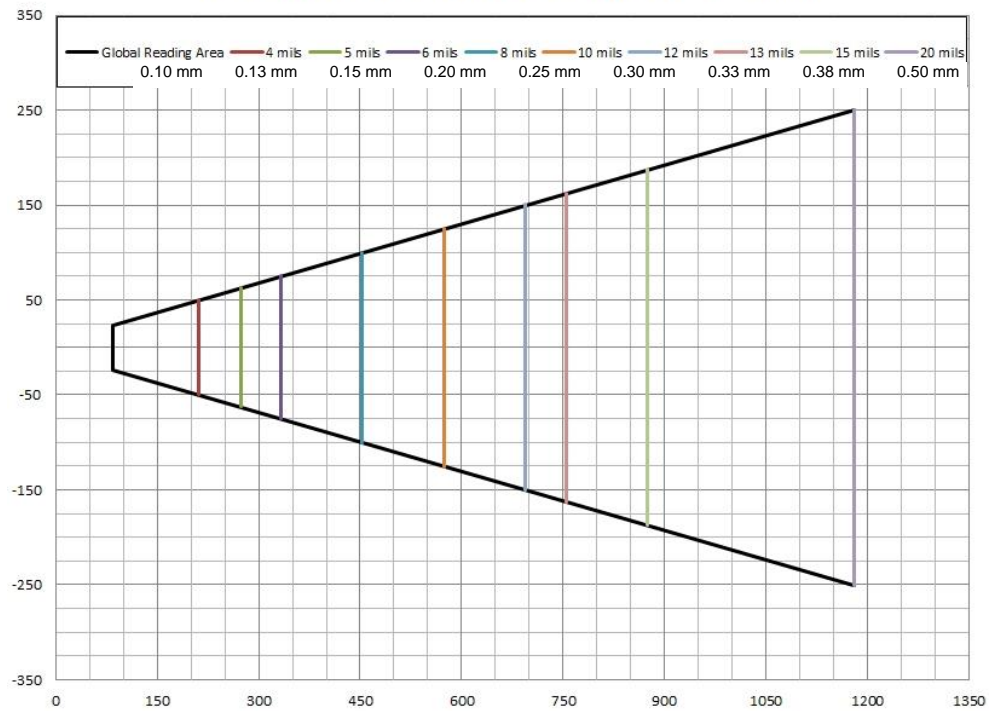


Data Matrix PPE = 2 - M410N 1.3 MPixel - f = 9mm

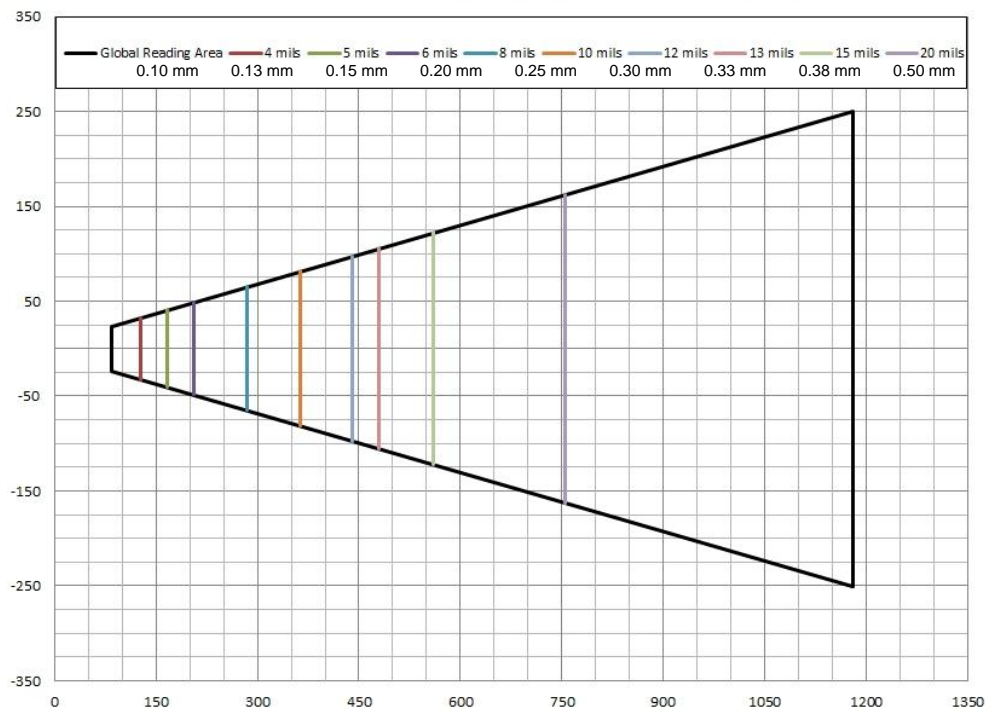


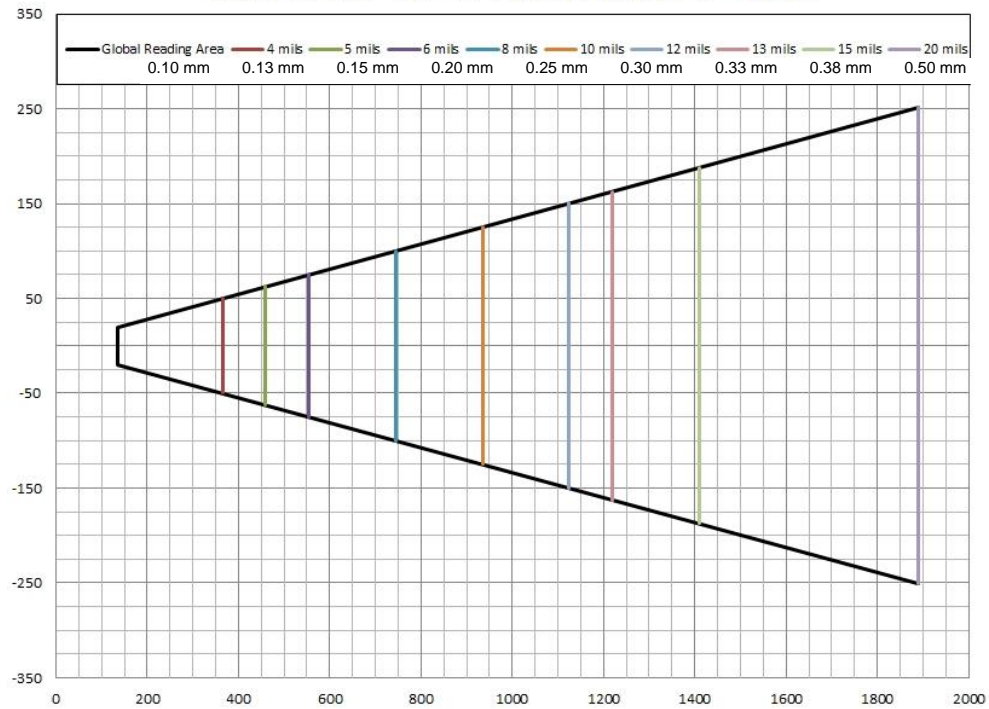
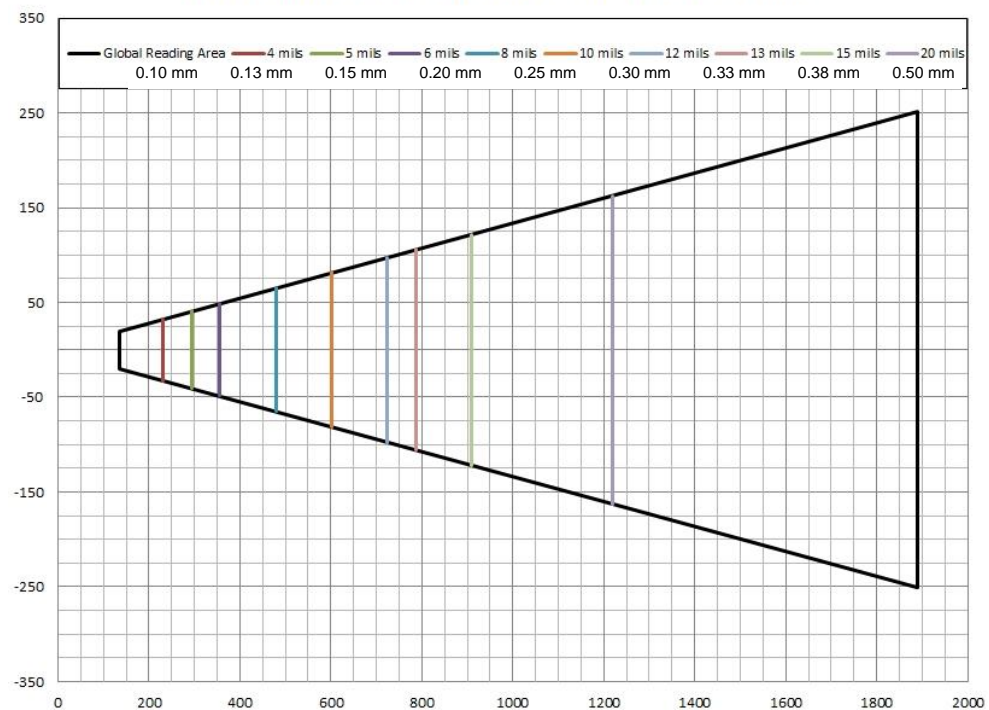
Code 128 PPE = 1.3 - M410N 1.3 MPixel - f = 12.5mm**Data Matrix PPE = 2 - M410N 1.3 MPixel - f = 12.5mm**

Code 128 PPE = 1.3 - M410N 1.3 MPixel - f = 16mm

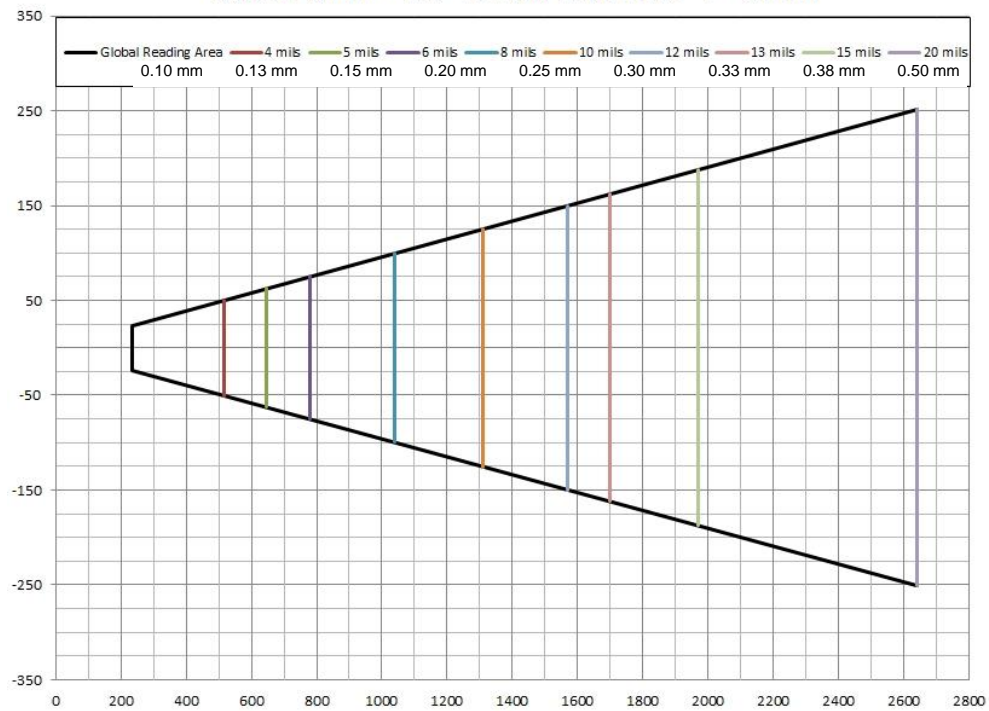


Data Matrix PPE = 2 - M410N 1.3 MPixel - f = 16mm

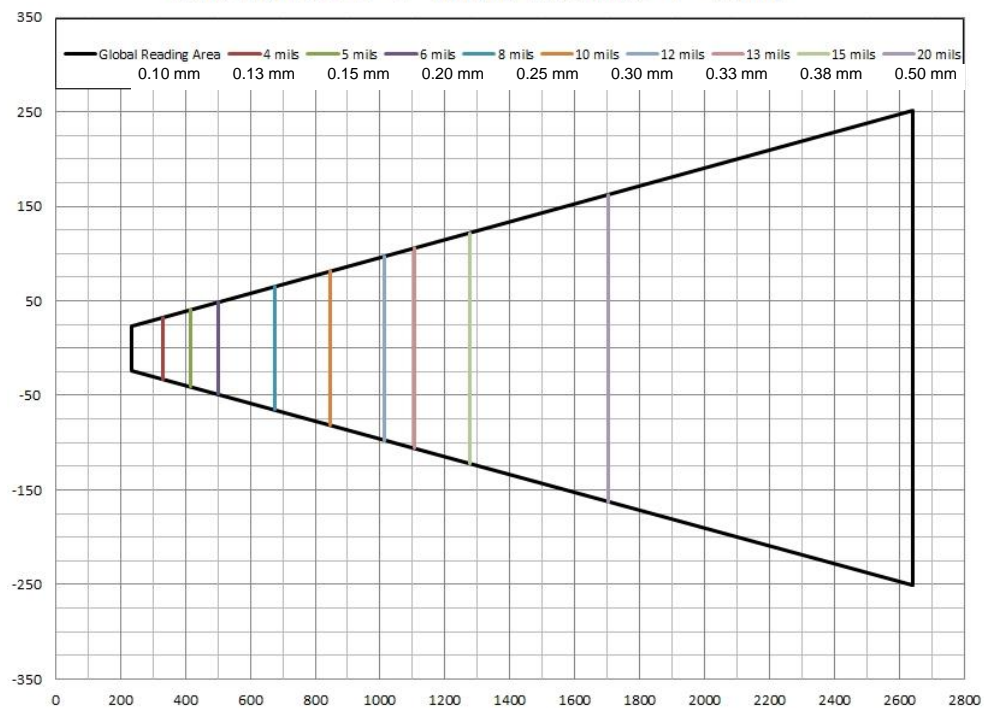


Code 128 PPE = 1.3 - M410N 1.3 MPixel - f = 25mm**Data Matrix PPE = 2 - M410N 1.3 MPixel - f = 25mm**

Code 128 PPE = 1.3 - M410N 1.3 MPixel - f = 35mm

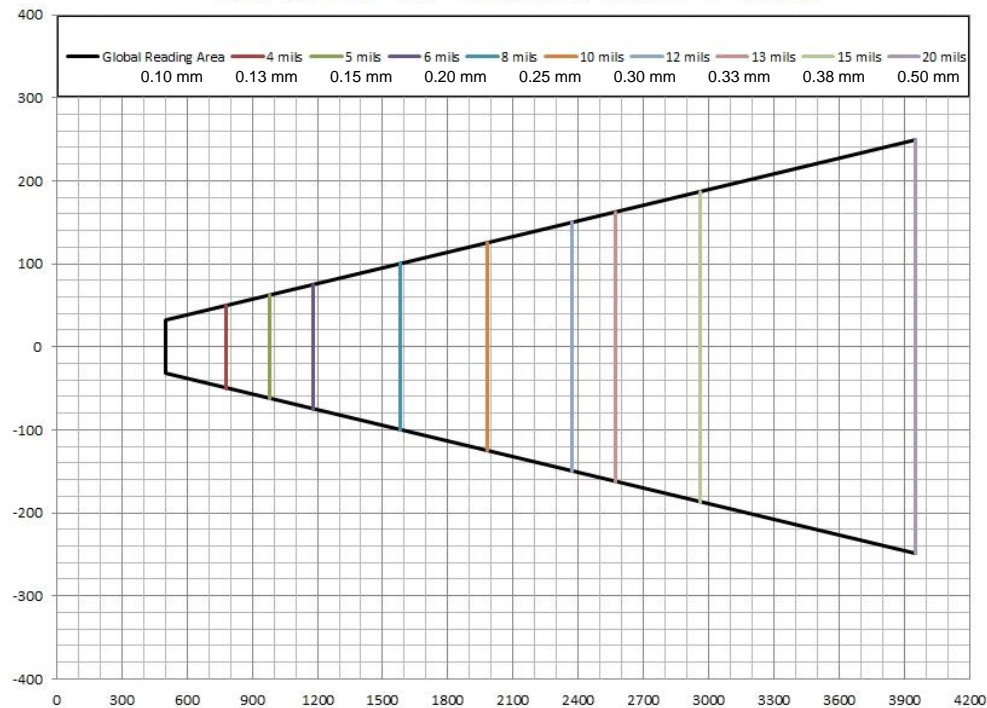


Data Matrix PPE = 2 - M410N 1.3 MPixel - f = 35mm

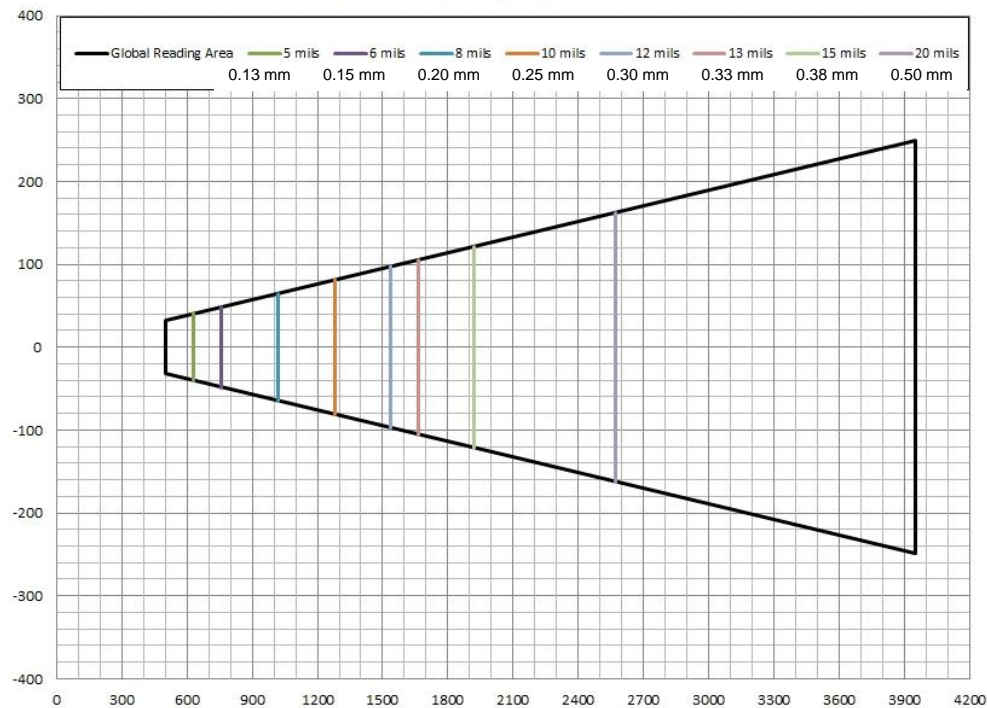


50mm 1D (Linear) Codes

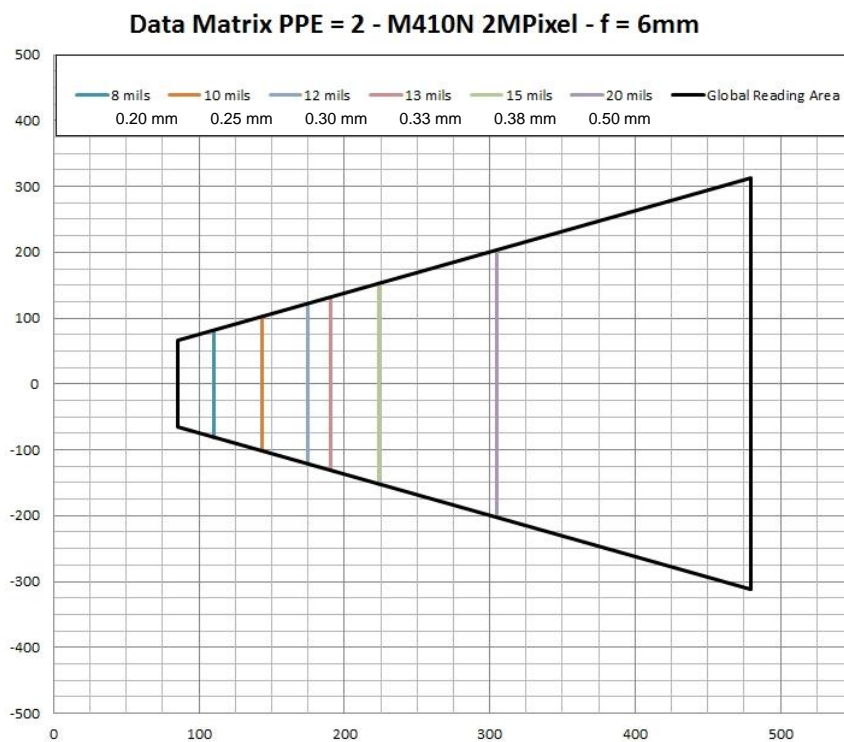
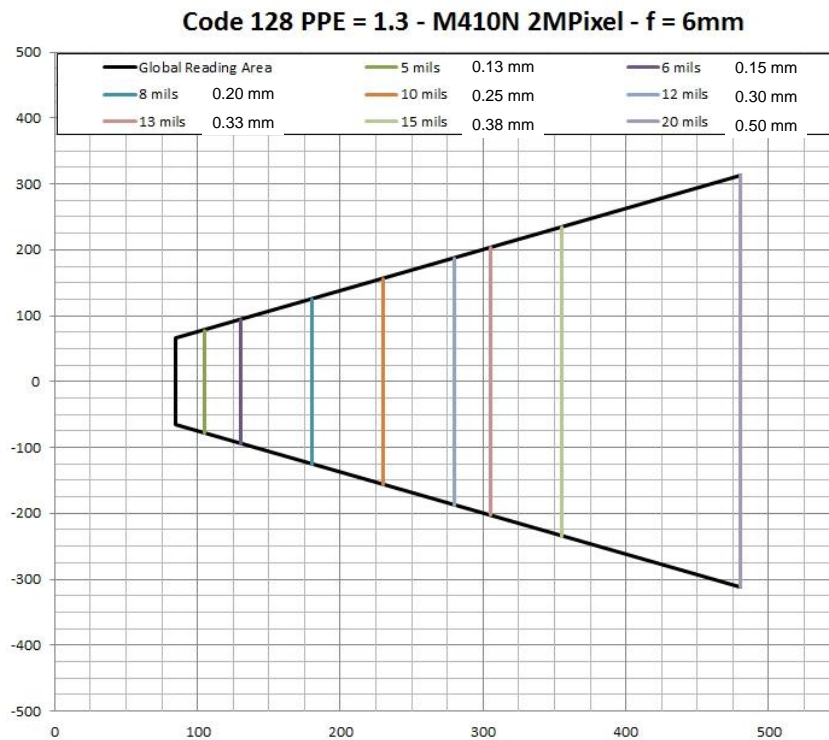
Code 128 PPE = 1.3 - M410N 1.3 MPixel - f = 50mm



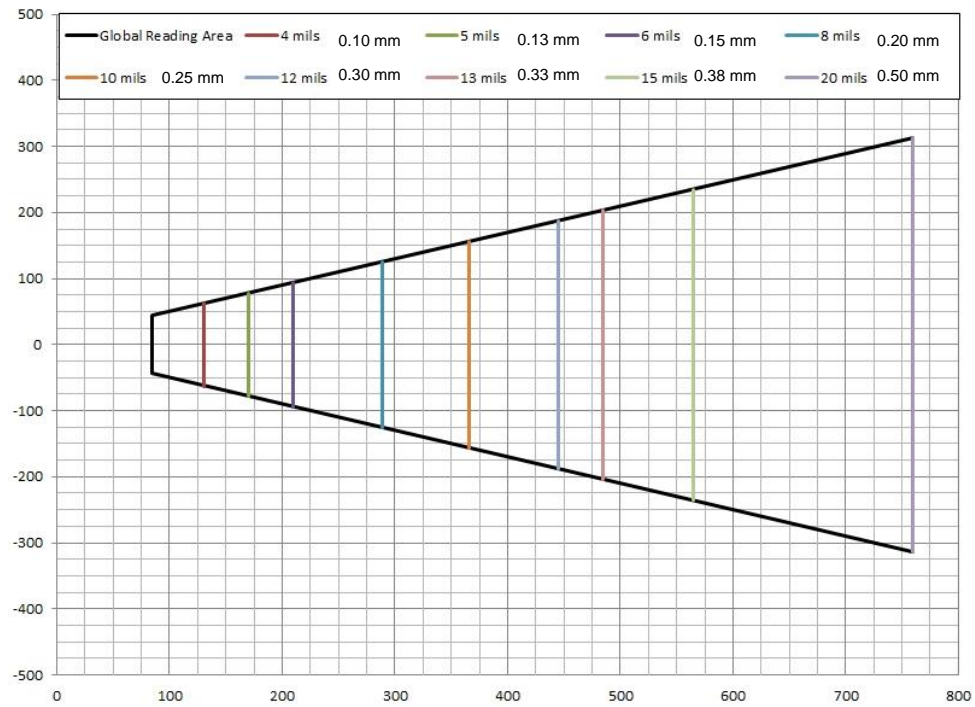
Data Matrix PPE = 2 - M410N 1.3 MPixel - f = 50mm



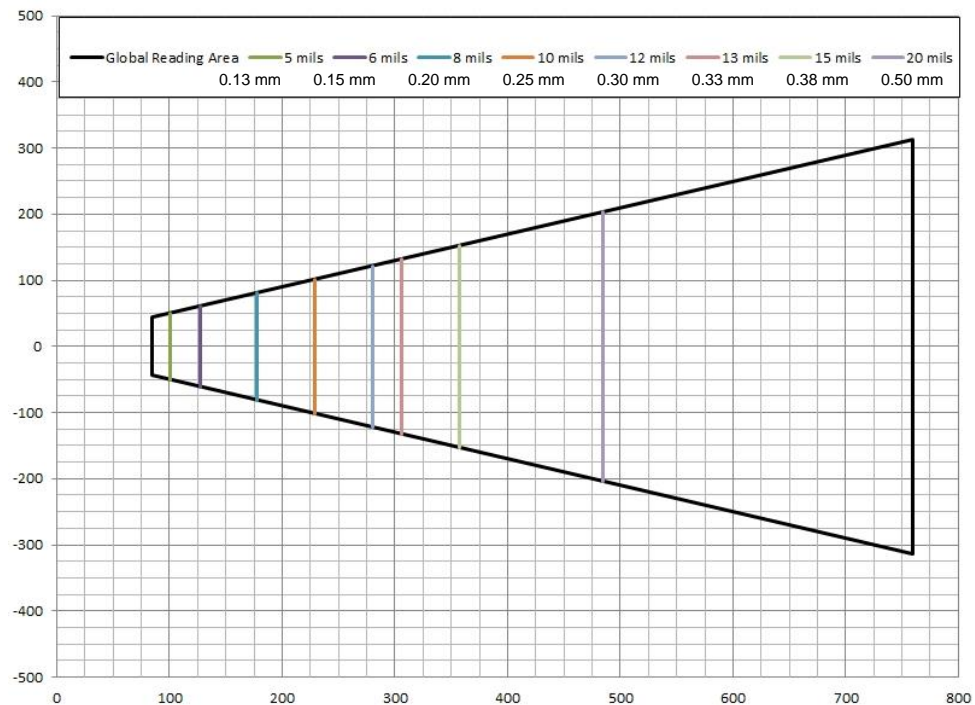
6.2.2 Matrix 410 700-0x0 (2.0 MP)

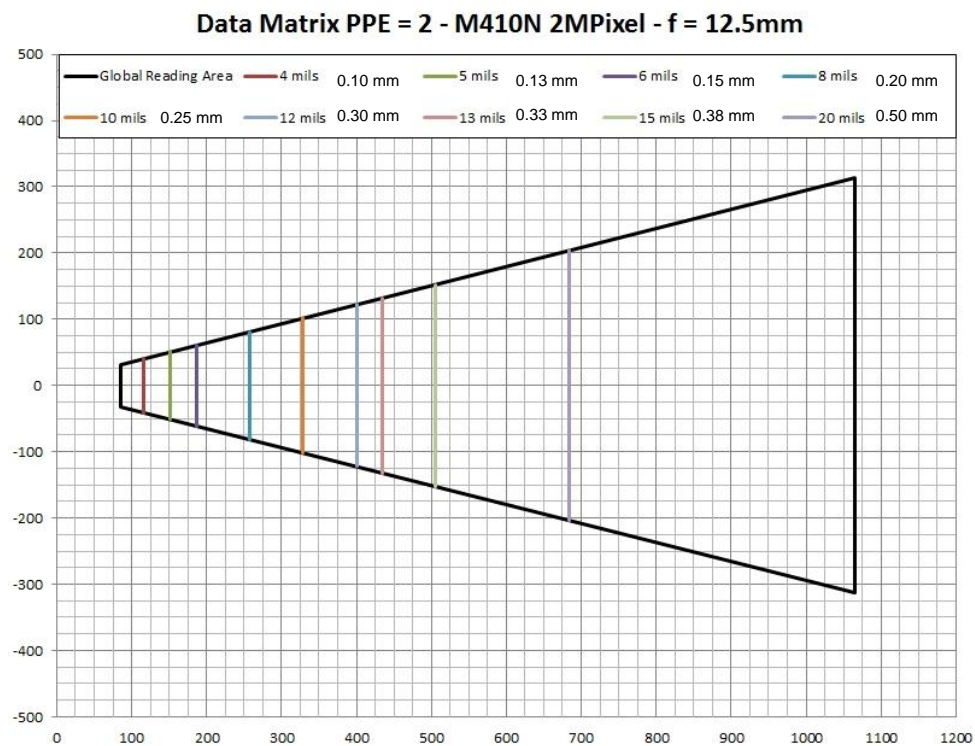
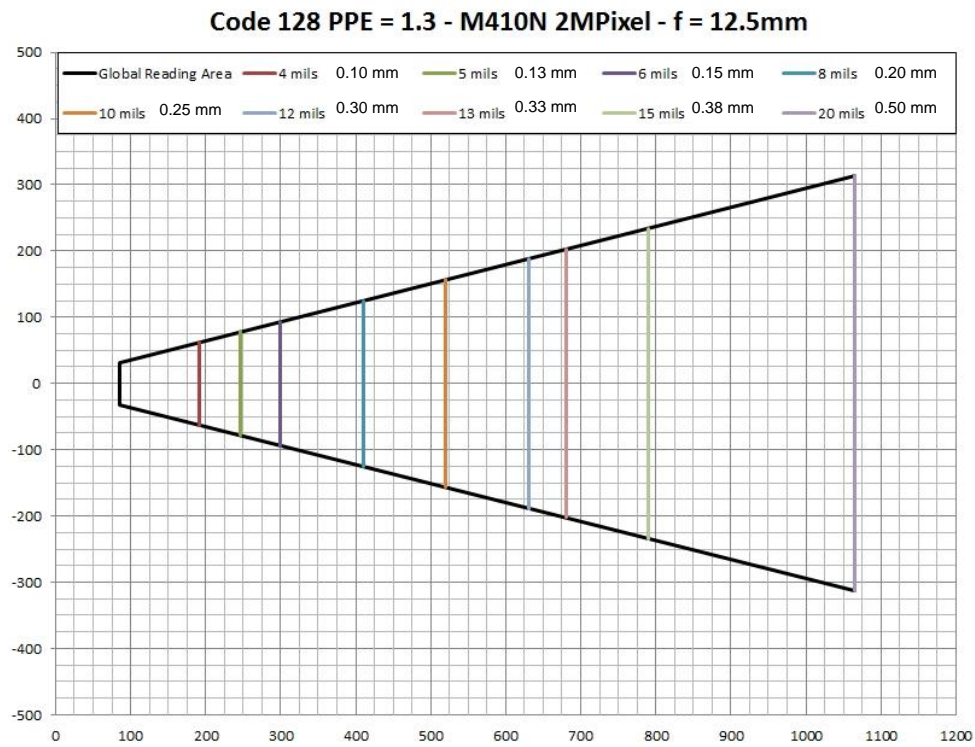


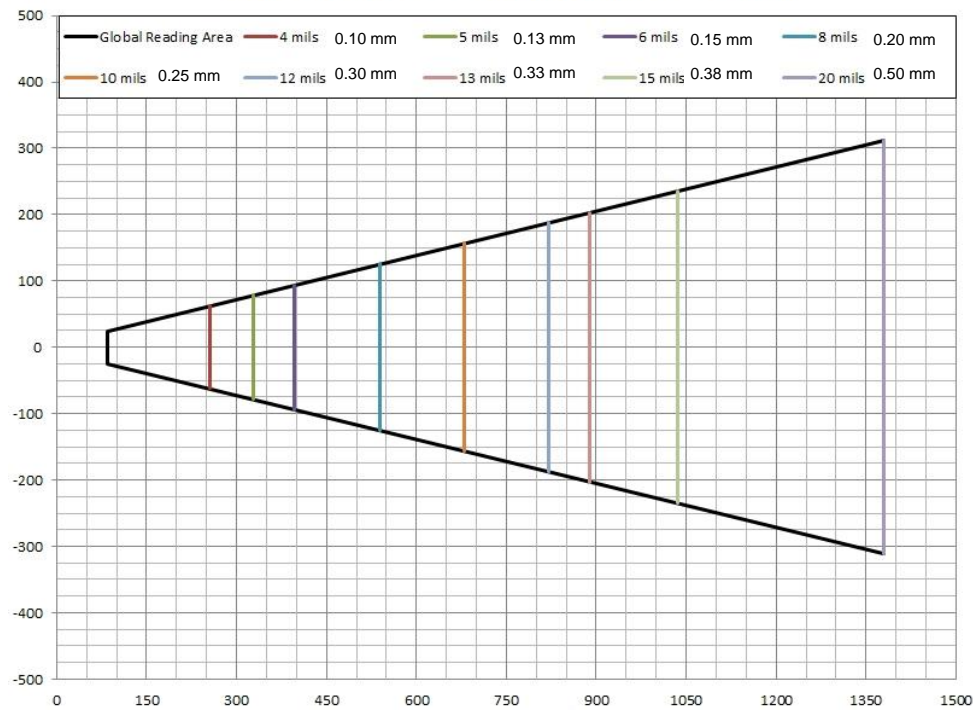
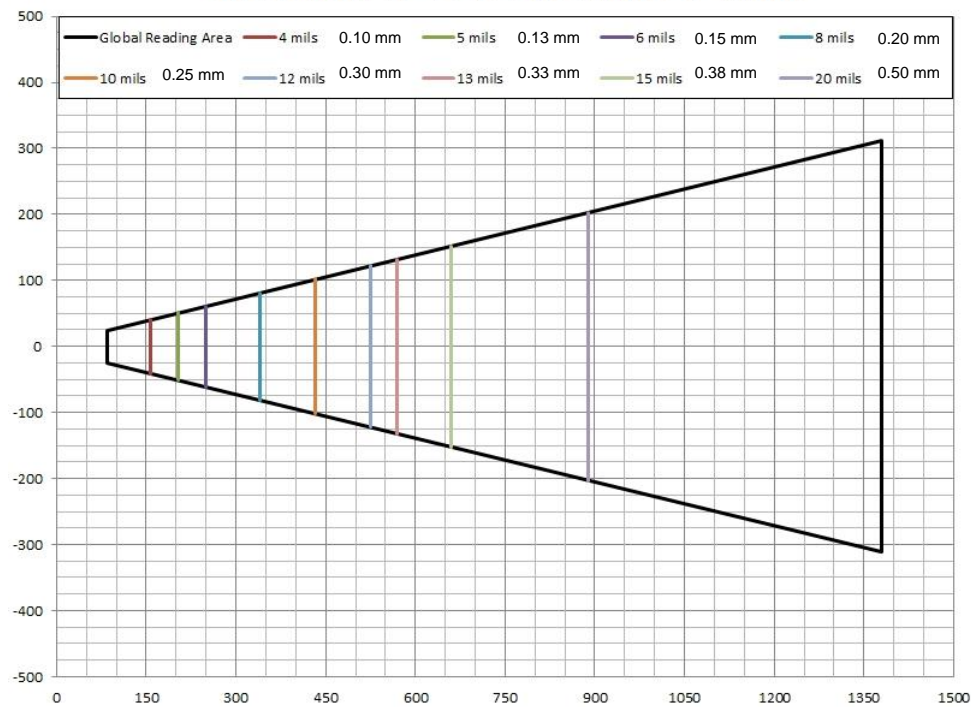
Code 128 PPE = 1.3 - M410N 2 MPixel - f = 9mm

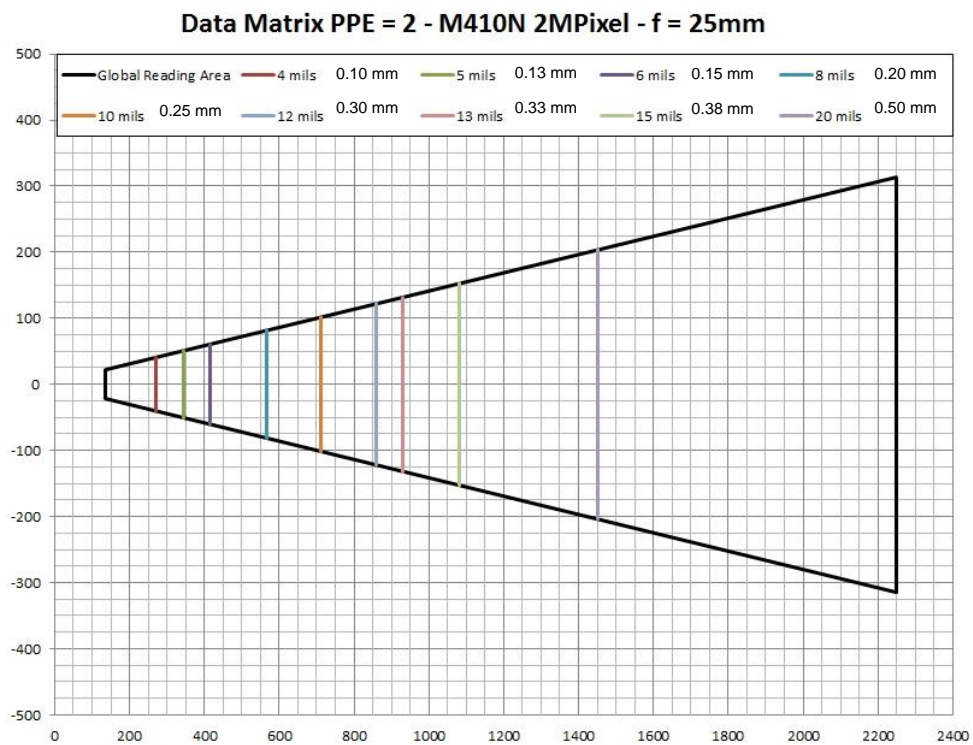
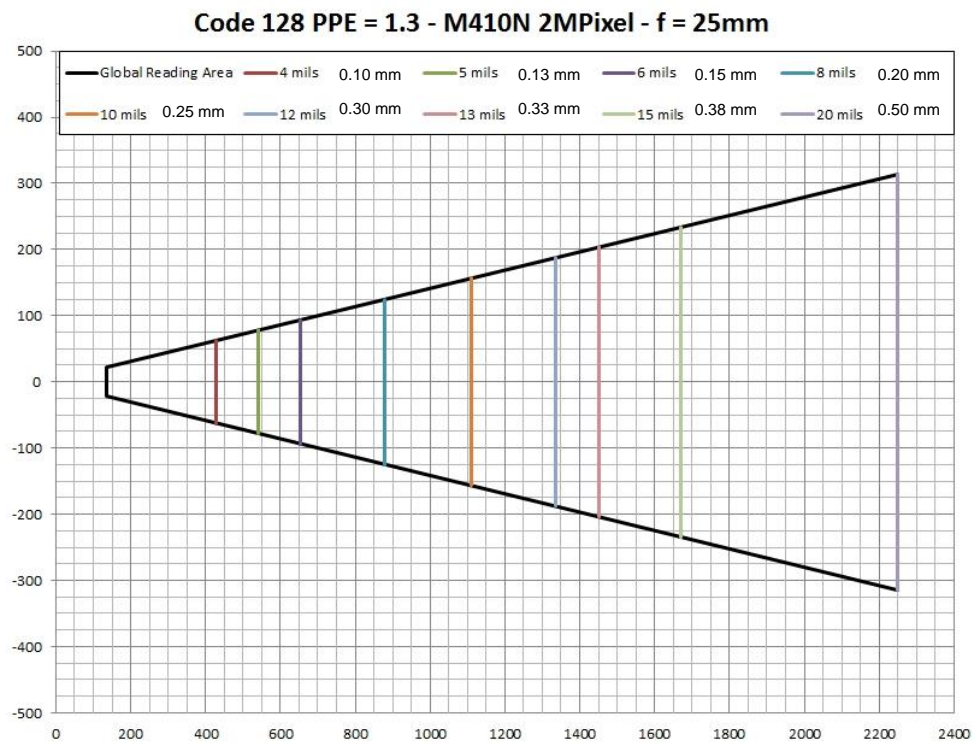


Data Matrix PPE = 2 - M410N 2 MPixel - f = 9mm

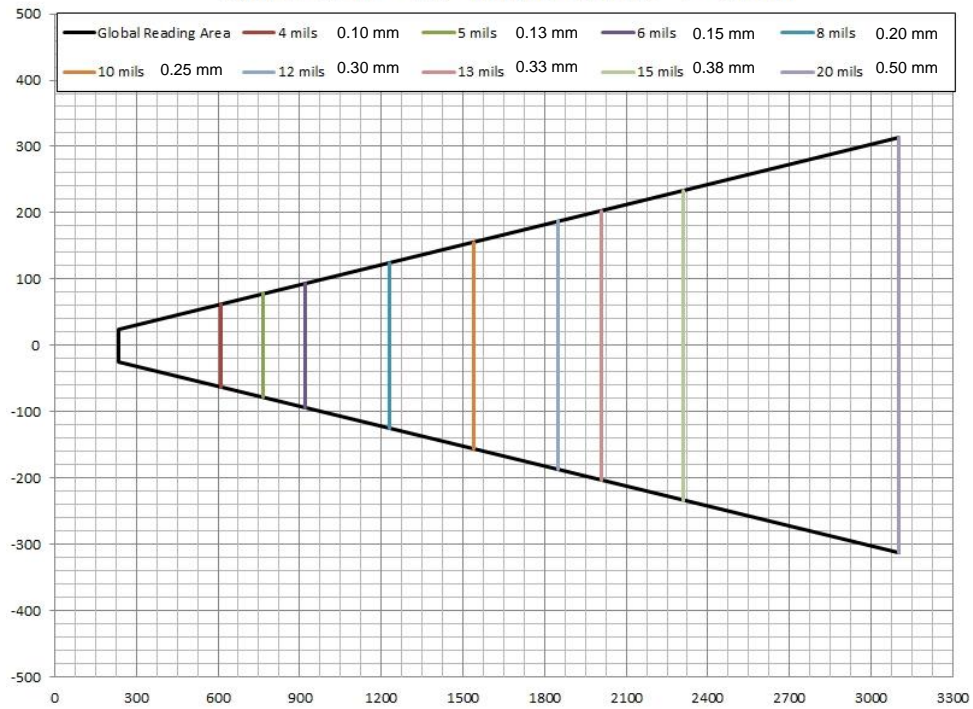




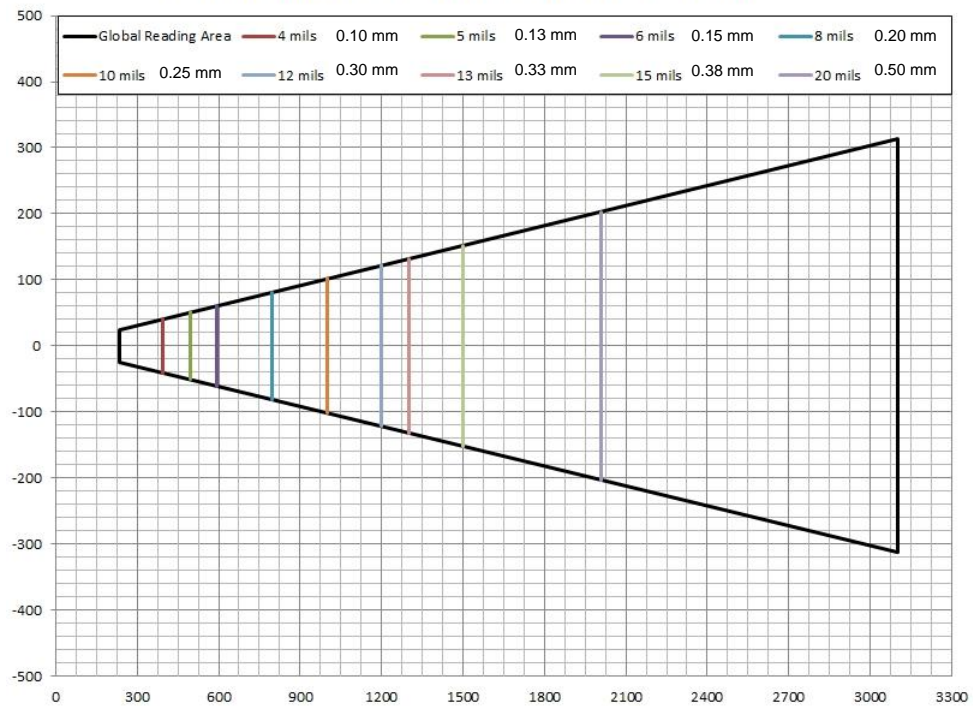
Code 128 PPE = 1.3 - M410N 2MPixel - f = 16mm**Data Matrix PPE = 2 - M410N 2MPixel - f = 16mm**

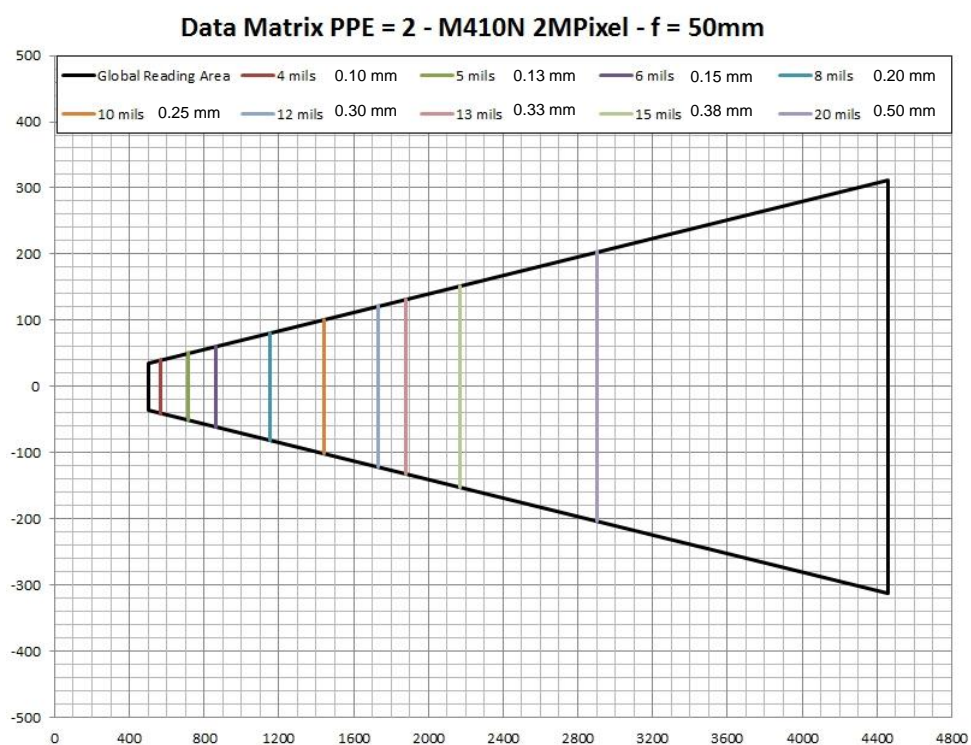
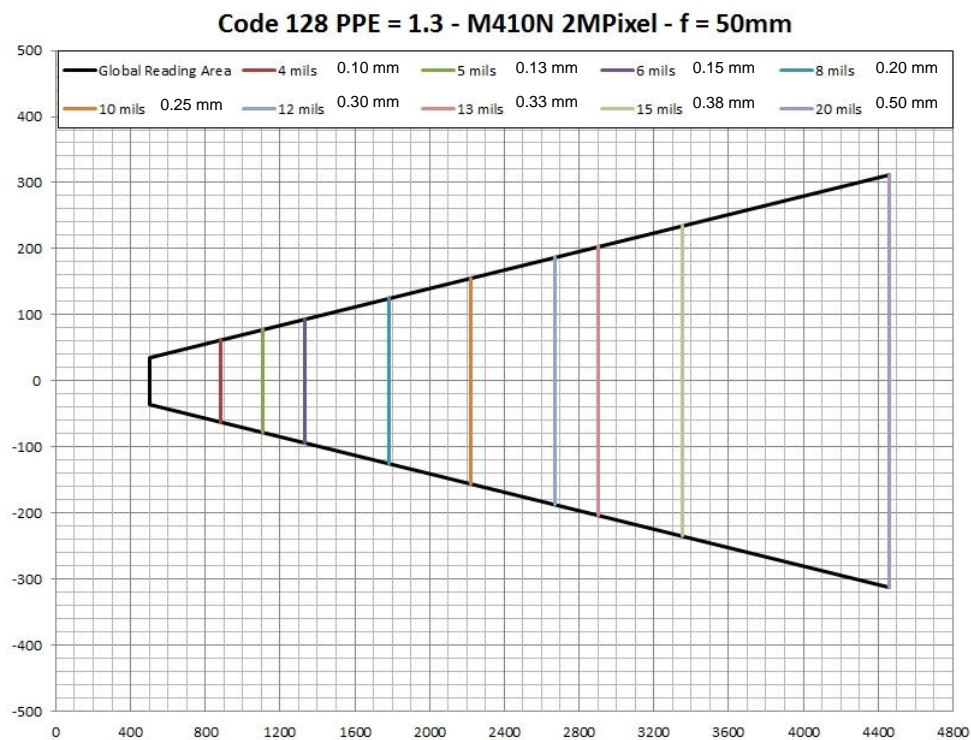


Code 128 PPE = 1.3 - M410N 2MPixel - f = 35mm



Data Matrix PPE = 2 - M410N 2MPixel - f = 35mm





6.3 MAXIMUM LINE SPEED AND EXPOSURE TIME CALCULATIONS

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

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



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

Assuming:

- **X**: Code Resolution (mm)
- **T_{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:

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

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

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

Example:

A Matrix 410N™ 700-010 using:

Internal Lighting Mode = Very High Power Strobe

Exposure Time (μs) = 100 μs

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

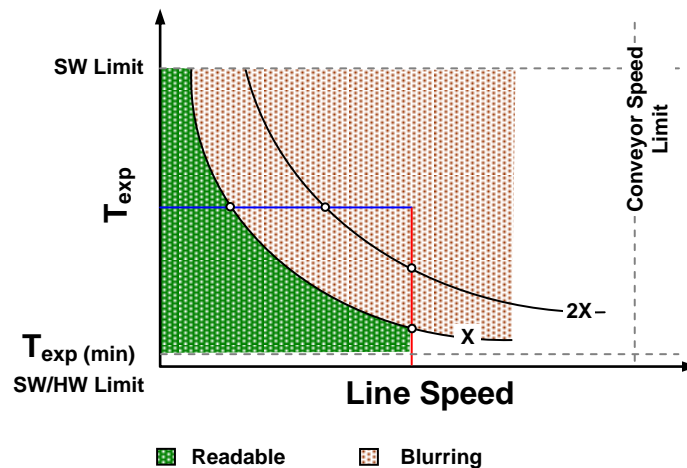
has a maximum line speed of:

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

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

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

$T_{\text{exp (max)}}$ and $LS_{\text{(max)}}$ 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).

$T_{\text{exp (min)}}$ 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, diaphragm aperture, reading distance) and on any external lighting system. It may also depend on code printing quality, and reader position.

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

- *Disabled*: the built-in LED array is turned off all the time. This option can be useful if using an external lighting system;
- *Always ON*: the built-in LED array is turned on all the time at the lowest power level. This option is useful if the LED-array blinking (Strobed operating mode) disturbs the operator.
- *Very High/High/Medium-Power Strobed*: the built-in LED array is on only during the image exposure time. Three different 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 Mode, recheck **Exposure Time**.

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



CAUTION: To avoid damage to the devices, for **LT-010** and **LT-011** illuminators you must correctly associate the illuminator to the Matrix 410N™ through the Current Illuminator Model item in the DL.CODE™ Device menu (Settings > Settings > Maintenance Settings). DL.CODE™ will correctly manage the following settings for these illuminators:

- Continuous High-Power mode is not allowed.
- When using Power Strobed modes, the application program imposes protective limits on the frame rate to avoid overheating.

7 SOFTWARE CONFIGURATION

Software configuration of your Matrix 410N™ 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 4-6.

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

7.1 DL.CODE™ SYSTEM REQUIREMENTS

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: XP, Vista, or 7
- 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)

7.2 READER CONFIGURATION

For an example of Matrix device configuration see the example in chapter 1 Steps 7-8.



NOTE: Especially for lengthy configurations, it is always good practice to periodically save the configuration to permanent memory (**Save on Device**)



to avoid losing the configuration in Temporary Memory. You must give a name to the new configuration or overwrite an existing one (except for Default which cannot be modified).

When all the configuration parameters are set correctly and saved to the device, you can perform a Backup to File and/or to an External storage device (BM100, etc.). See par. 2.4.



NOTE: An improvement in the Matrix N Family readers allows them to contain several configurations or jobs in permanent memory.

This means that 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.

7.2.1 Restore Configuration

You can load/restore a previously saved configuration from file or external storage device to your reader by using the Restore commands. See par. 2.4.

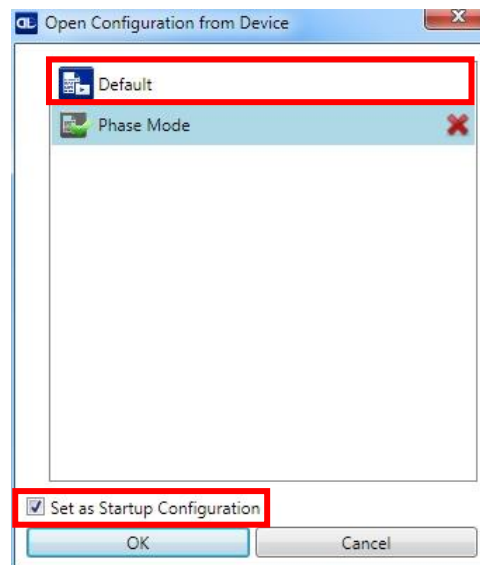
7.2.2 Restore Defaults

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

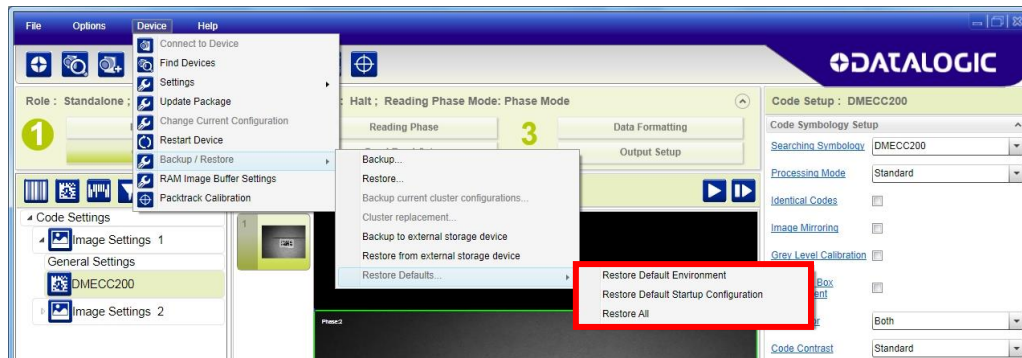
- The Configuration parameters are the ones set in the various steps of the configuration process and are specific to each application. When multiple configurations (jobs) are saved on a single device, these parameters can be different from one configuration to the next.
- Environment parameters regard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



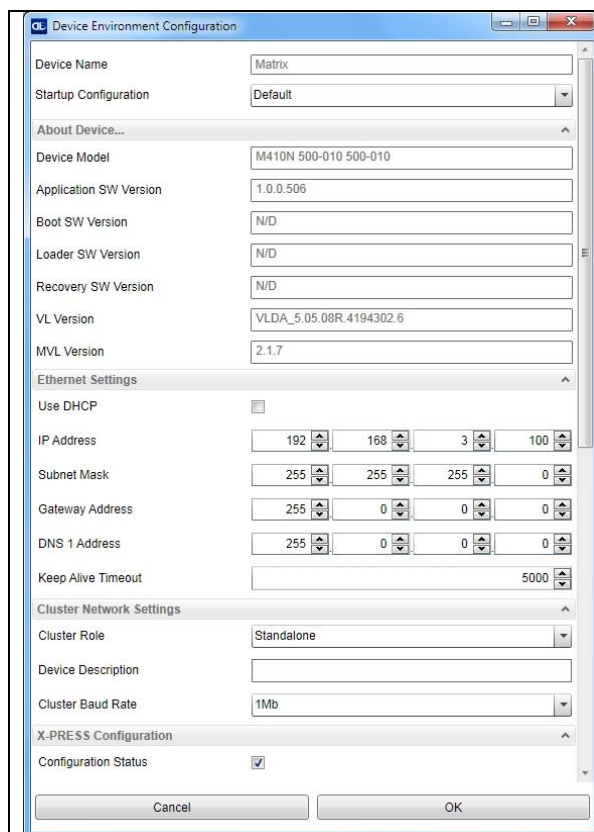
The same action can be performed from the Device menu >Settings > Restore Defaults > **Restore Default Startup Configuration**. The Default Configuration will be set to run at startup and the reader will be reset.



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 All

In order to return a device to its absolute Factory default parameters (for example device replacement) it is necessary to use the **Restore All** 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.

7.2.3 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 Setup step, the following window appears:

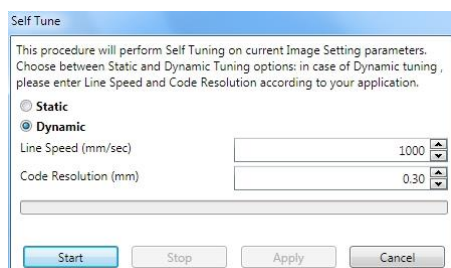


Figure 76 – Image Auto-Setup

Select the Static or Dynamic Self-Tuning option; Start Autolearn and Apply to the Image Setup. The Image Setup window works interactively so that you can see the results of the parameter setting changes as well as the decoding results (Results panel). When switching to the Code Setup step you can also see the decoding results displayed on the image.



Figure 77 – Decoding Results OK

7.2.4 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.

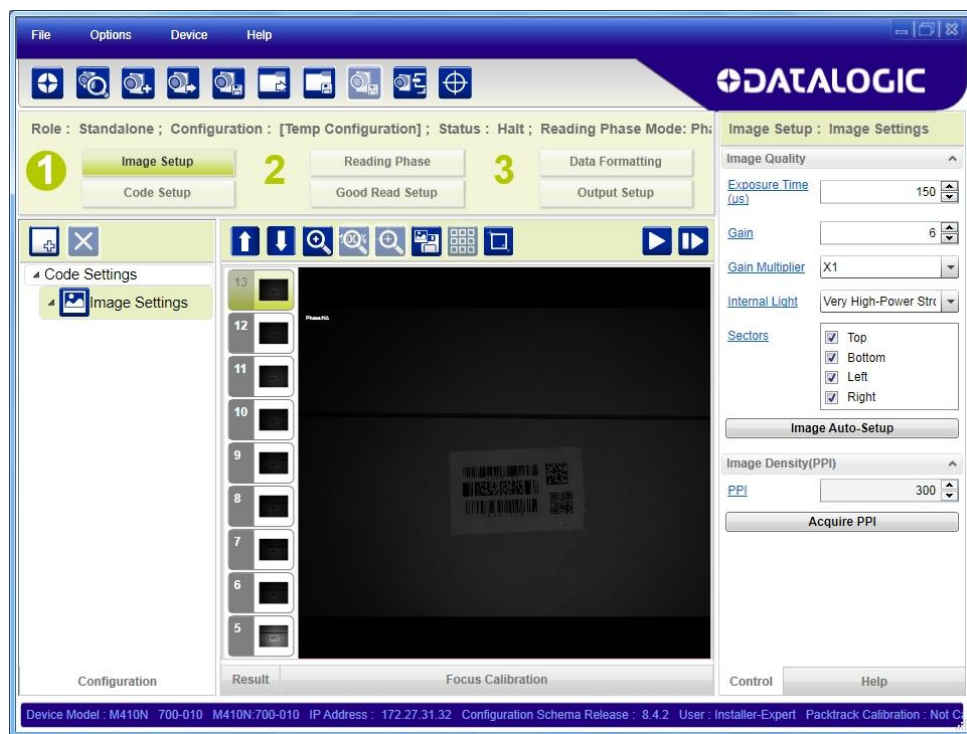


Figure 78 - Example Under Exposure: Too Dark

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 79 - 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 value (μ s).

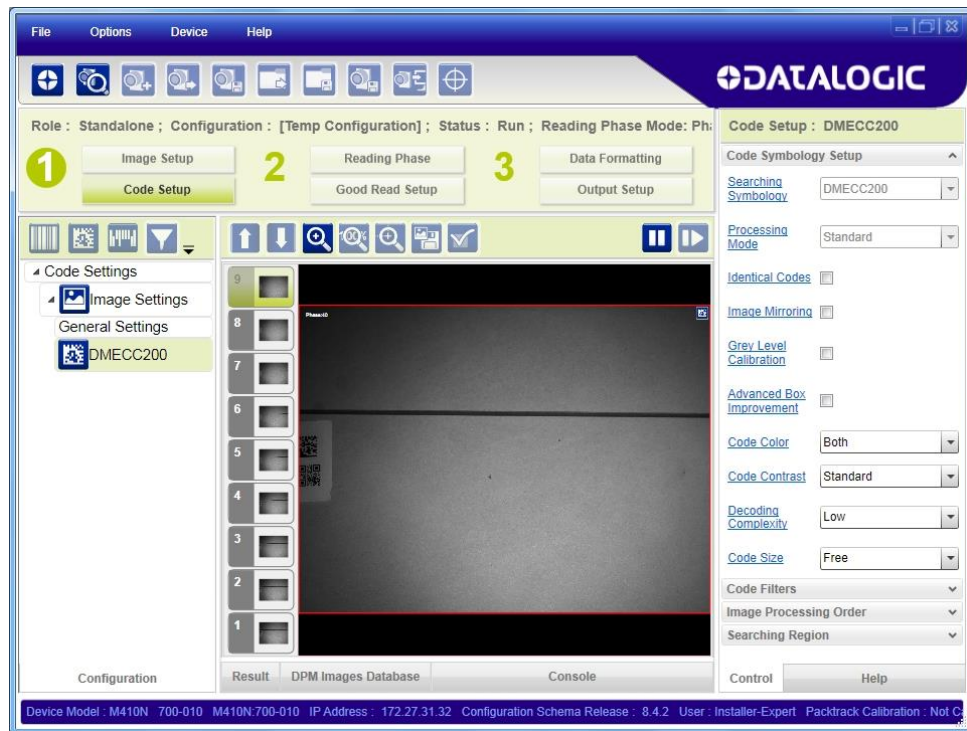



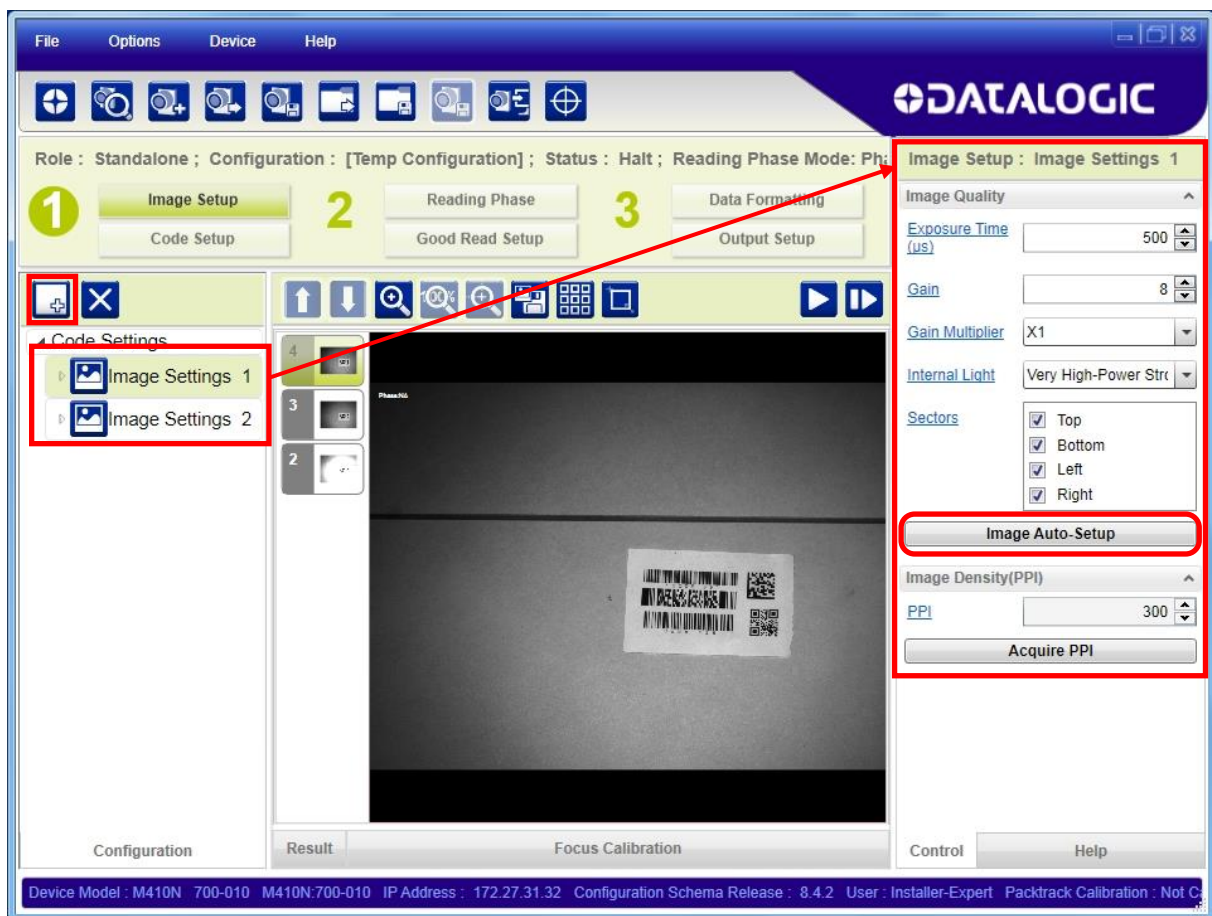
Figure 80 - Example out of FOV

7.2.5 Multi Image Acquisition Settings

When controlled variable conditions occur in the application, Multiple **Image Acquisition Setups** can be defined to create a database of parameter groups that handle each specific application condition. This database of pre-defined settings functions cyclically and therefore automatically improves system flexibility and readiness.

For example, an application may have two stable but different lighting conditions which require different lighting options. One Image Acquisition Setting could enable and use an internal illuminator and a second setting could enable and use an external lighting system. These two groups will be used cyclically on each acquisition in order to automatically capture the correctly lighted image.

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

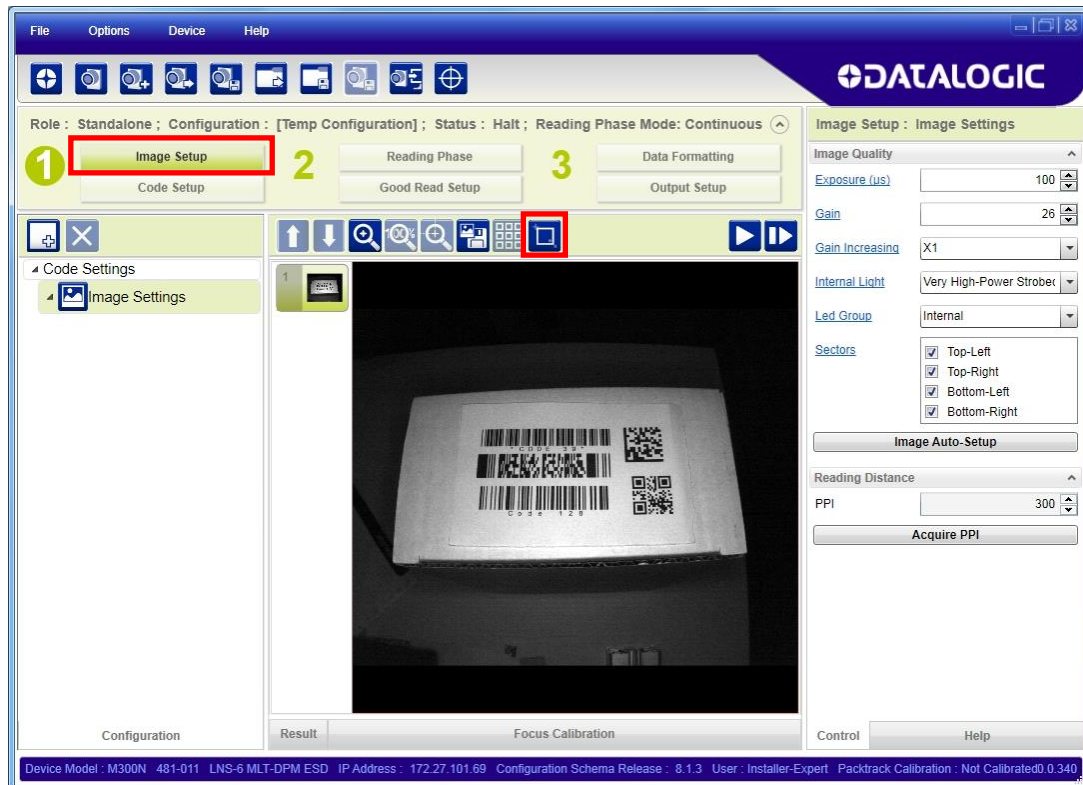


For each Image Setup condition start **Image Auto Setup**, select the Static or Dynamic Self-Tuning option; and Apply it.

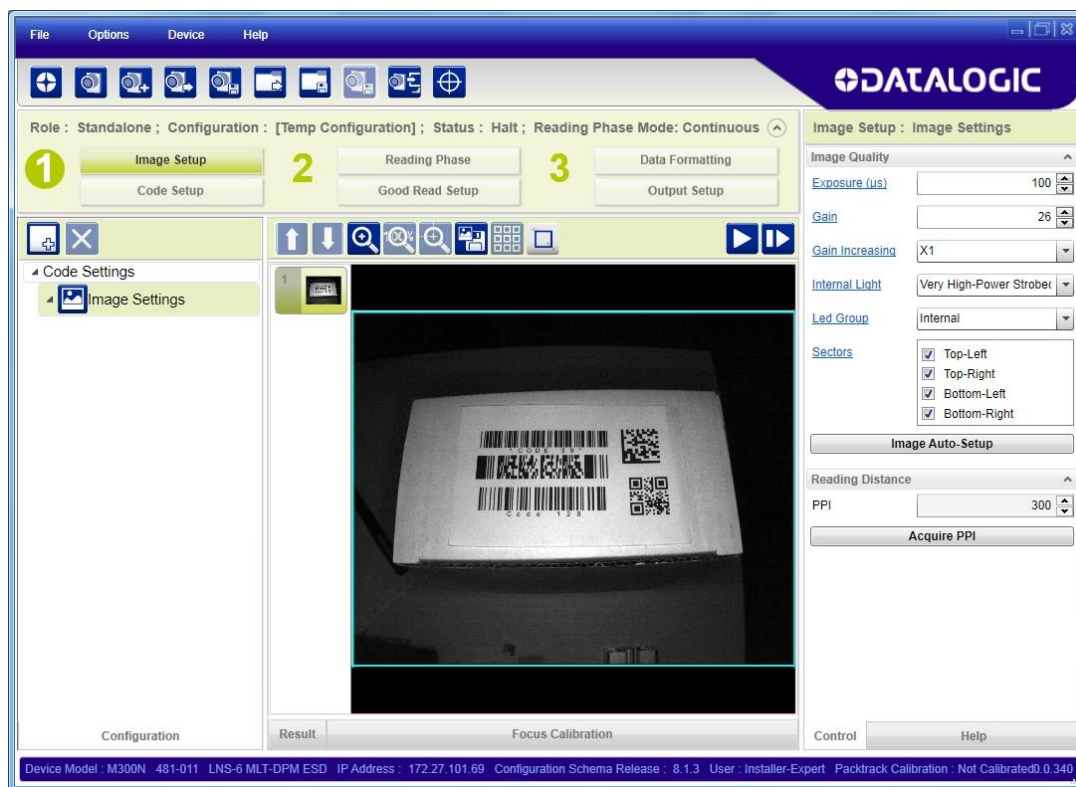
7.2.6 Image Cropping

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

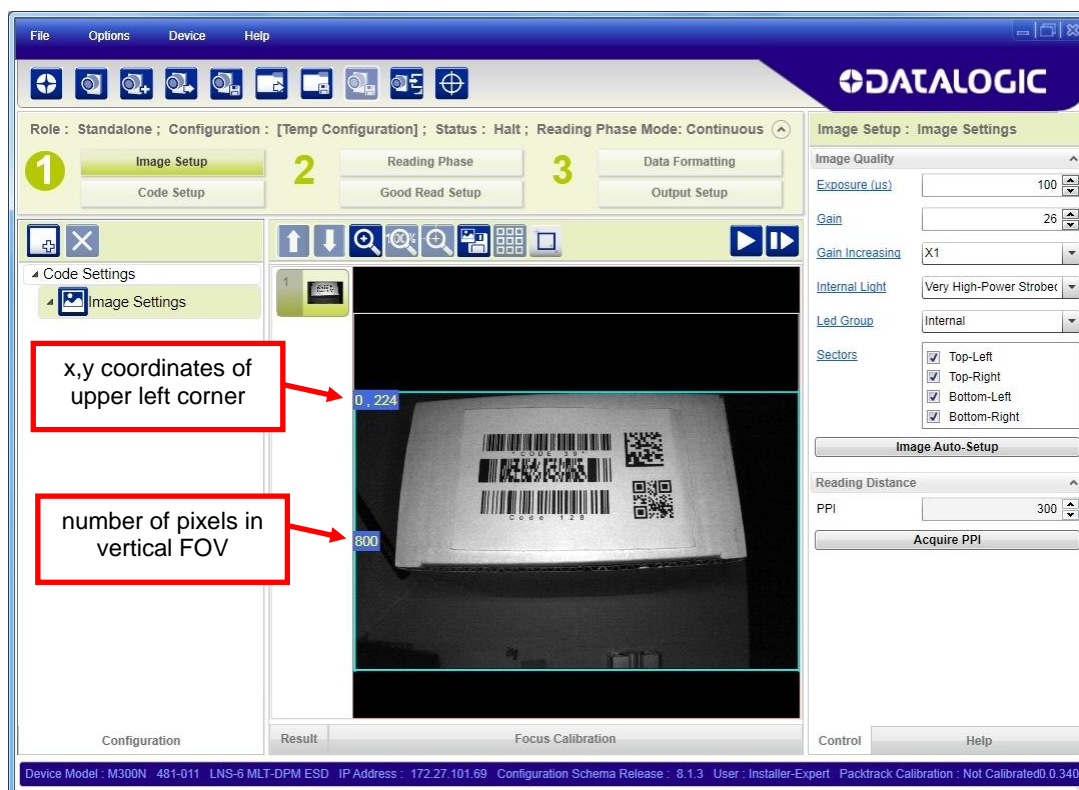
In Matrix 410N™ the frame rate is dependent on the number of rows and columns in the defined window. Image cropping allows reducing the Image processing area from the full FoV to a smaller area where codes are present. By excluding portions of the FoV, processing time is reduced.



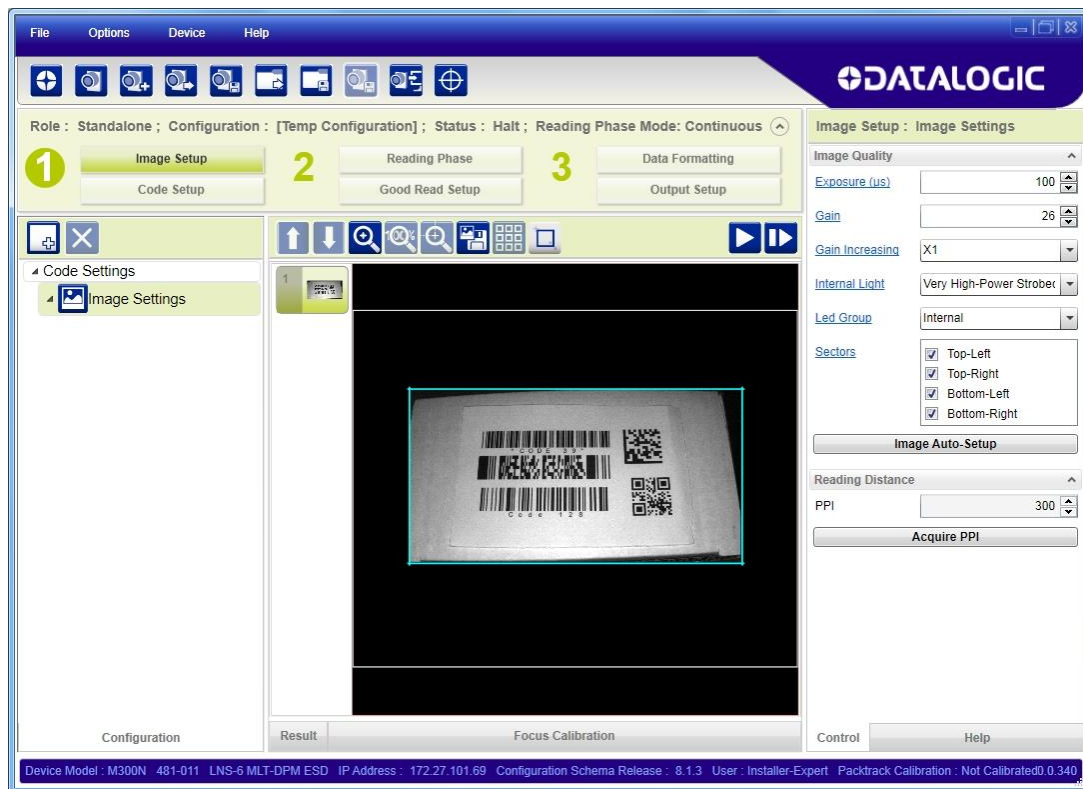
After clicking the Add Cropping Region icon, a blue border appears which by default is equal to the FoV.



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 also be moved by dragging the center.



7.2.7 Direct Part Marking Applications

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

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



Washed out and Axial Distortion



Dot Peening On Scratched Surface



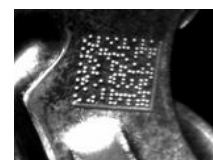
Low Contrast Problem



Background Problems



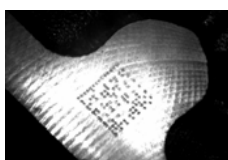
Marked On Curved Shiny Surface



Axial distortion



Half moon effects



Shiny surface, noisy background



Low contrast, noisy background

Figure 81 – Problematic Direct Part Marking Examples

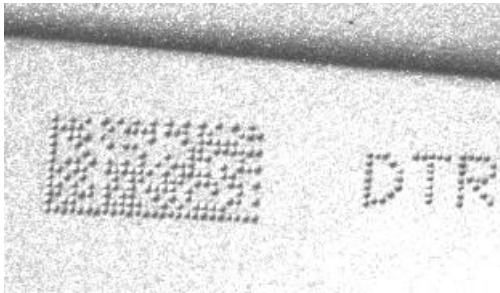
For **QR** code the **Decoding Method** parameter allows the Dot Peen Decoding algorithm to be selected which improves the decode rate for low quality Direct Part Mark codes and in general for Direct Part Mark codes with dot peening type module shapes.

Image Filter

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

A different filter can be applied to each **Image Acquisition Setup**.

The **Erode** Filter enlarges the image dark zones to increase readability.



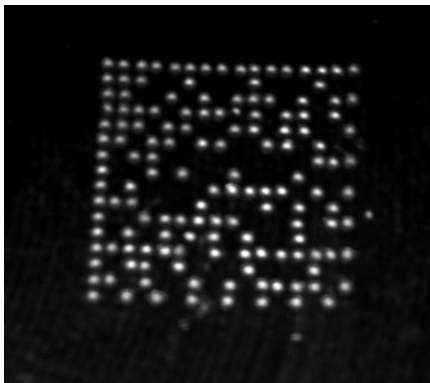
Before - No Read



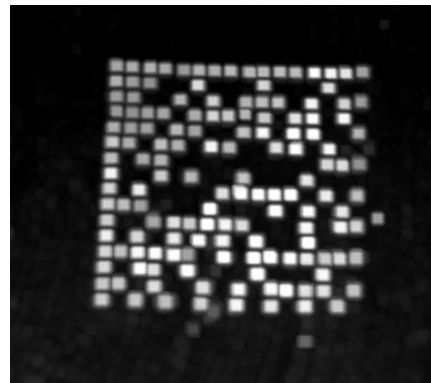
After - Readable

Erode

The **Dilate** Filter enlarges the image white zones to increase readability.



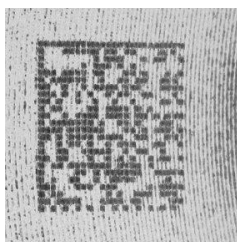
Before - No Read



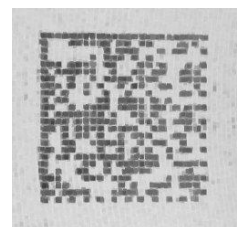
After - Readable

Dilate

The **Close** filter eliminates dark areas (defects) in the white zones of the image.



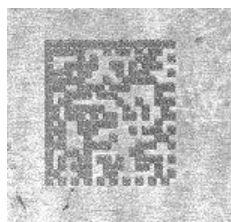
Before - No Read



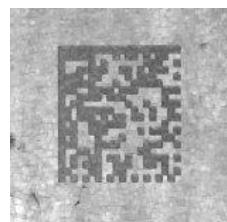
After - Readable

Close

The **Open** filter eliminates white areas (defects) in the dark zones of the image.



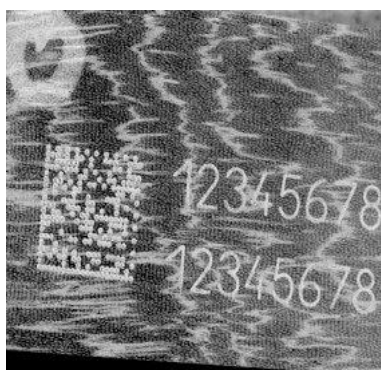
Before - No Read



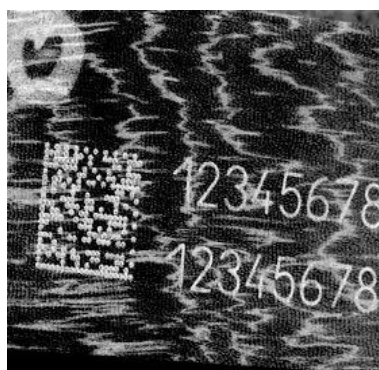
After - Readable

Open

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



Before - No Read



After - Readable

Contrast Stretching

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



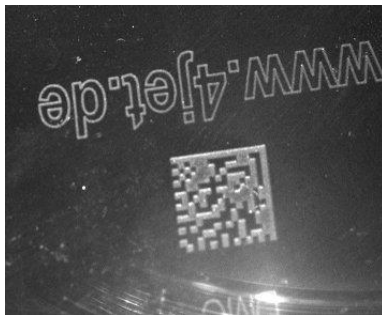
Before - No Read



After - Readable

Histogram Equalization

The **Smoothing** filter deletes small (insignificant) details in the center of the image.



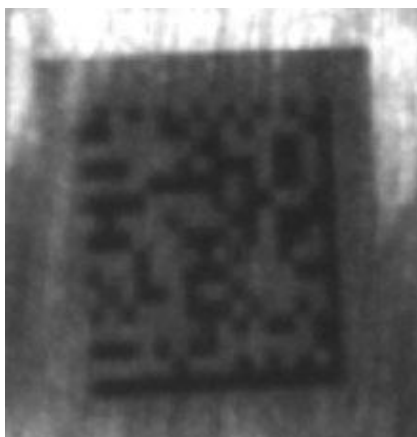
Before - No Read



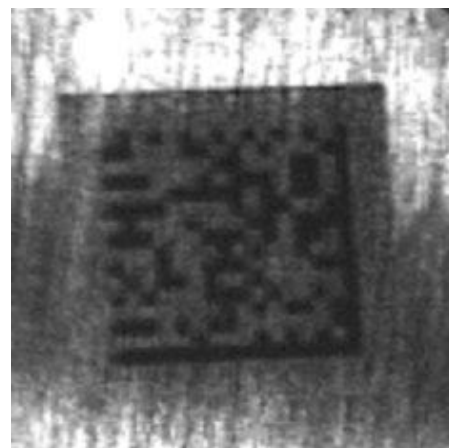
After - Readable

Smoothing

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



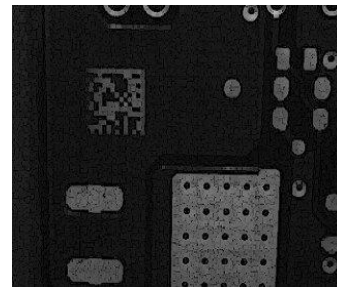
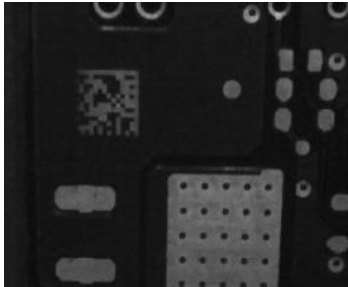
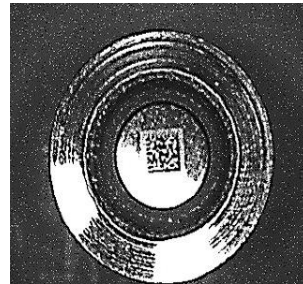
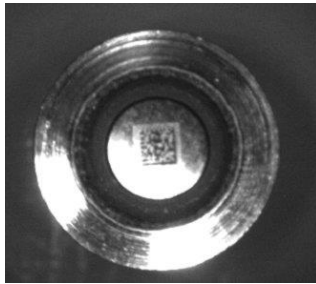
Before - No Read



After - Readable

Sharpening

The **Deblurring** filter improves blurred images.

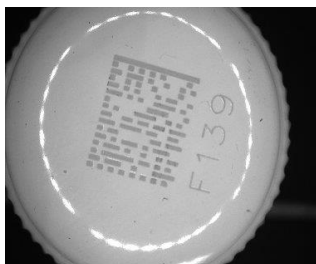


Before - No Read

After - Readable

Deblurring

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

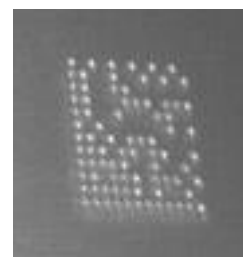


Before - No Read

After - Readable

Black Enhancement

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



Before - No Read

After - Readable

White Enhancement

7.3 DIAGNOSTICS

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.

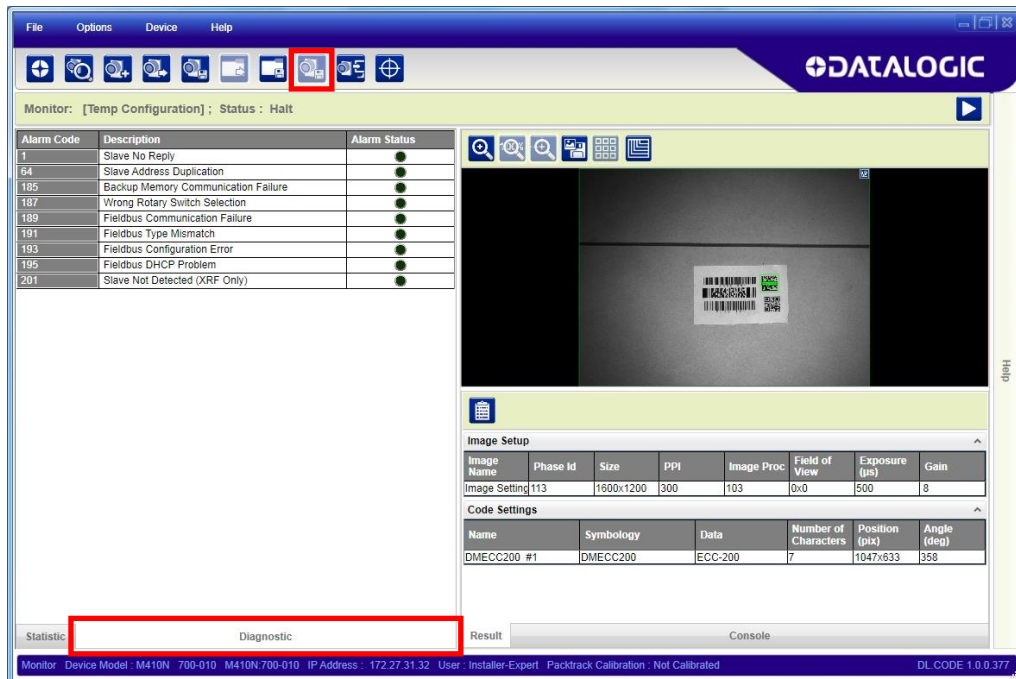


Figure 82 - Diagnostic Functions

7.4 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).

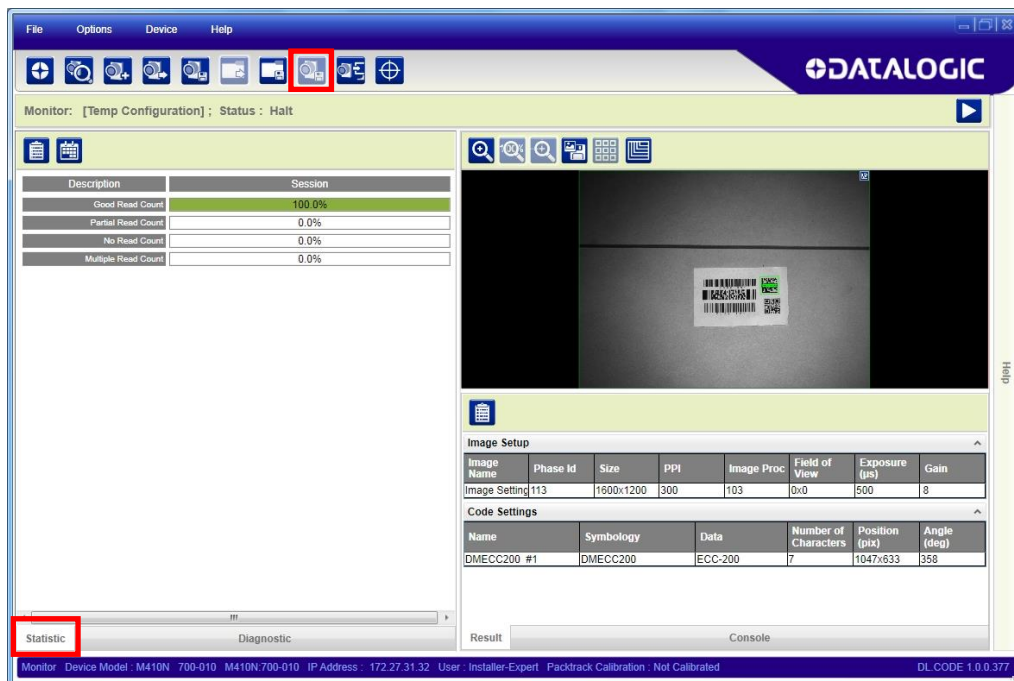
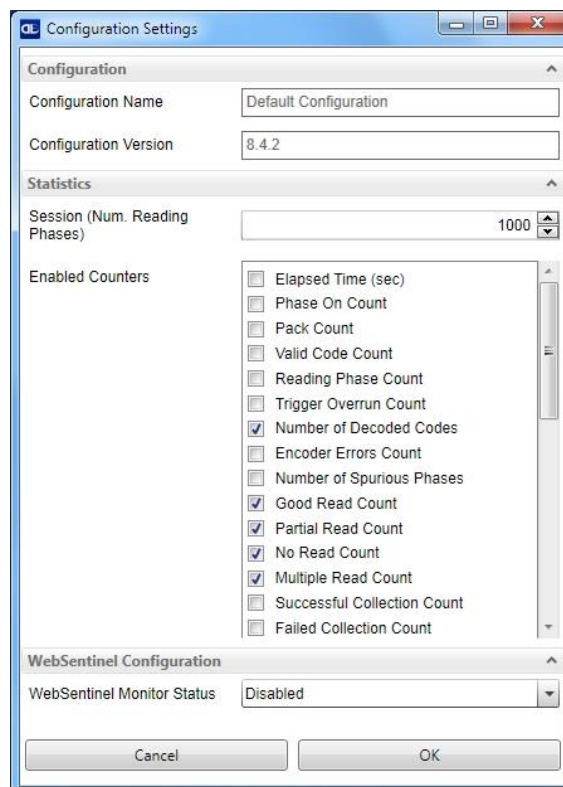


Figure 83 - Reading Statistics

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



8 MAINTENANCE

8.1 CLEANING

Clean the lens cover (see Figure A, 3) periodically for continued correct operation of the reader.

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.

9 TROUBLESHOOTING

9.1 GENERAL GUIDELINES

- When wiring the device, pay careful attention to the signal name (acronym) on the CBX100/500 spring clamp connectors (chp. 4). If you are connecting directly to the Matrix 410N™ M12 17-pin connector pay attention to the pin number of the signals (Appendix A).
- If you need information about a certain reader parameter you can refer to the DL.CODE™ help on line. Connect the device and click on the link to the parameter you're interested in.
- If you're unable to fix the problem and you're going to contact your local Datalogic office or Datalogic Partner or ARC, we suggest providing (if possible): Application Program version, Parameter Configuration file, Serial Number and Order Number of your reader. You can get most of this information while DL.CODE™ is connected to the reader.

| TROUBLESHOOTING GUIDE | |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Problem | Suggestion |
| Power ON: the "POWER" LED is not lit. | <ul style="list-style-type: none"> • 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). |
| 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. | <ul style="list-style-type: none"> • Check if you are referring to the 17-pin connector or to the CBX spring clamp connectors. • Is the sensor connected to the 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. |

| TROUBLESHOOTING GUIDE | |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Problem | Suggestion |
| One Shot or Phase Mode using serial trigger source: the "TRIGGER" LED is not blinking. | <ul style="list-style-type: none"> 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. | <ul style="list-style-type: none"> Is the Phase frequency lower than the maximum frame rate? |
| Continuous Mode: the "TRIGGER" LED is not blinking. | <ul style="list-style-type: none"> 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. | <ul style="list-style-type: none"> Check the Code Collection parameters on the Reading Phase step and the Data Formatting parameters on the data Formatting step. |
| Image not clear: | <ul style="list-style-type: none"> verify the Focus procedure |
| Image focused but not decoded: | <ul style="list-style-type: none"> verify the Calibrate Image Density procedure. |
| Reading: the reader always transmits the No Read Message | <ul style="list-style-type: none"> Run the Rapid Configuration procedure in chapter 1. Position the reader as described in par. 3.3 and through DL.CODE™: <ul style="list-style-type: none"> 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; Fine tune the Image Setup to improve the code image quality; Check the code parameter settings in the Code 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. | <ul style="list-style-type: none"> 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. |

| TROUBLESHOOTING GUIDE | |
|-----------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Problem | Suggestion |
| Communication: data transferred to the host are incorrect, corrupted or incomplete. | <ul style="list-style-type: none"> • 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. |
| How do I obtain my reader Serial Number? | <ul style="list-style-type: none"> • 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 on the bottom case near the reading window. • The Serial Number is also visible from the DL.CODE™ Device List Area. |
| How do I obtain my reader Order Number? | <ul style="list-style-type: none"> • 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. |

10 TECHNICAL FEATURES

| ELECTRICAL FEATURES | | |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| Power Supply Voltage Consumption | 10 to 30 Vdc 0.8 to 0.27 A, 8 W max.; 0.5 to 0.17 A, 5 W typical | |
| Communication Interfaces Main - RS232 - RS422 full-duplex Auxiliary - RS232 ID-NET™ Ethernet (Built-in) supported application protocols | 2400 to 115200 bit/s 2400 to 115200 bit/s 2400 to 115200 bit/s Up to 1MBaud 10/100 Mbit/s TCP/IP, EtherNet/IP, Modbus TCP, PROFINET-IO | |
| Inputs Input 1(External Trigger) and Input 2 Max. Voltage Max. Input Current | Opto-isolated and polarity insensitive 30 Vdc 10 mA | |
| Outputs * Outputs 1, 2 and 3 V _{OUT} (I _{LOAD} = 0 mA) Max. V _{OUT} (I _{LOAD} = 100 mA) Max. I _{LOAD} Max. | NPN or PNP short-circuit protected 30 Vdc 3 Vdc 100 mA | |
| OPTICAL FEATURES | 5xx-0x0 models | 7xx-0x0 models |
| Image Sensor | CMOS | CMOS |
| Image Format | 1.3 M pixels | 2.0 M pixels |
| Frame Rate | 60 frames/sec. | 43 frames/sec. |
| Pitch | ± 35° | |
| Tilt | 0° - 360° | |
| LED Safety | to EN 62471 | |
| Lenses | LNS (accessories) | |
| Lighting System | Internal or External Illuminator (accessories) | |
| ENVIRONMENTAL FEATURES | | |
| Operating Temperature ** | 0 to 50 °C (32 to 122 °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 *** EN 60529 | IP65 and IP67 | |
| PHYSICAL FEATURES | | |
| Dimensions (with lens cover) | 125 x 65 x 87 mm (4.9 x 2.6 x 3.4 in.) | |
| Weight (with lens and internal illuminator) | 482 g. (17 oz.) | |
| Material | Aluminium | |

* 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.

** high ambient temperature applications should use metal mounting bracket for heat dissipation

*** when correctly connected to IP67 cables with seals and the Lens Cover is correctly mounted.

| SOFTWARE FEATURES | | |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Readable Code Symbologies | | |
| 1-D and stacked | 2-D | POSTAL |
| <ul style="list-style-type: none">• PDF417 Standard and Micro PDF417• Code 128 (GS1-128)• Code 39 (Standard and Full ASCII)• Code 32• MSI• Standard 2 of 5• Matrix 2 of 5• Interleaved 2 of 5• Codabar• Code 93• Pharmacode• EAN-8/13 - UPC-A/E (including Addon 2 and Addon 5)• GS1 DataBar Family• Composite Symbologies | <ul style="list-style-type: none">• Data Matrix ECC 200 (Standard, GS1 and Direct Marking)• QR Code (Standard and Direct Marking)• Micro QR Code• MAXICODE• Aztec Code | <ul style="list-style-type: none">• 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 link Serial Host Mode Programming sequences | |
| Parameter Storage | Permanent memory (Flash) | |
| CODE QUALITY METRICS | | |
| Standard | Supported Symbologies | |
| ISO/IEC 16022 (always enabled) | Data Matrix ECC 200 | |
| ISO/IEC 18004 (always enabled) | QR Code | |
| AIM DPM | Data Matrix ECC 200, QR Code | |
| ISO/IEC 15416 | Code 128, Code 39, Interleaved 2 of 5, Codabar, Code 93, EAN-8/13, UPC-A/E | |
| USER INTERFACE | | |
| LED Indicators | Power, Ready, Good; Trigger; Com, Status, (Ethernet Network); Good Read (Green Spot) | |
| Keypad Button | Configurable via DL.CODE™ | |

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 410N™ 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:

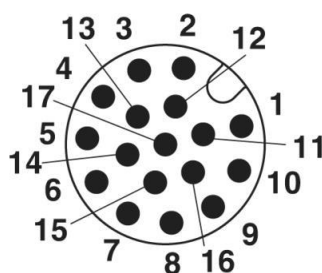


Figure 84 – M12 17-pin male COM, I/O and Power Connector

| Power, COM and I/O Connector Pinout | | | |
|-------------------------------------|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
| Pin | Name | Function | |
| 1 2 Connector case | Vdc GND CHASSIS | Power supply input voltage + Power supply input voltage - Connector case provides electrical connection to the chassis | |
| 6 5 13 3 | I1A I1B I2A I2B | External Trigger A (polarity insensitive) External Trigger B (polarity insensitive) Input 2 A (polarity insensitive) Input 2 B (polarity insensitive) | |
| 9 8 16 | O1 O2 O3 | Output 1 Output 2 (NPN or PNP short circuit protected and software programmable) Output 3 | |
| 14 4 | RX TX | Auxiliary RS232 RX Auxiliary RS232 TX | |
| 7 15 | ID+ ID- | ID-NET™ network + ID-NET™ network - | |
| Pin | Name | RS232 | RS422 Full-Duplex |
| 17 | MAIN | TX | TX+ |
| 11 | INTERFACE | RX | *RX+ |
| 12 | (SW | - | TX- |
| 10 | SELECTABLE) | - | *RX- |

* Do not leave floating, see par. 4.2.2 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.

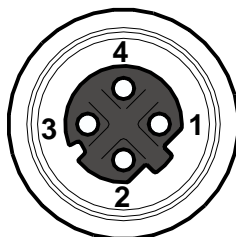


Figure 85 - M12 D-Coded Female Ethernet Network Connector

| On-Board Ethernet Network Connector Pinout | | |
|--------------------------------------------|------|----------------------|
| Pin | Name | Function |
| 1 | TX + | Transmitted data (+) |
| 2 | RX + | Received data (+) |
| 3 | TX - | Transmitted data (-) |
| 4 | RX - | Received data (-) |

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 par. 4.5 for more details.

The electrical features of both inputs are:

| INPUT | V _{AB} Min. | V _{AB} Max. | I _{IN} Max. |
|--------|------------------------|------------------------|----------------------|
| Open | 0 V | 2 V | 0 mA |
| Closed | 4.5 V | 30 V | 10 mA |

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

| Pin | Name | Function |
|-----|------|-------------------------------------------|
| 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:

| Pin | Name | Function |
|-----|------|-------------------------------|
| 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™.

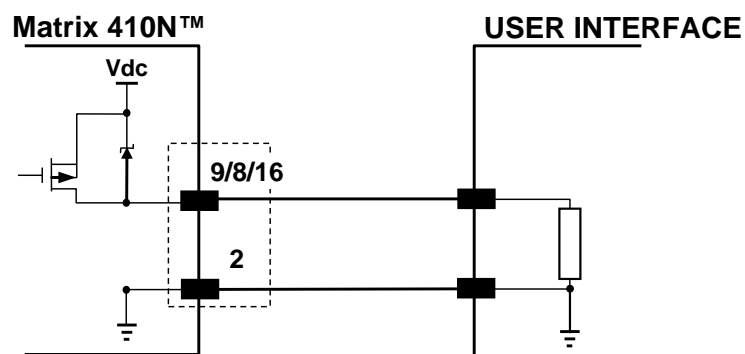


Figure 86 - PNP Output Connection

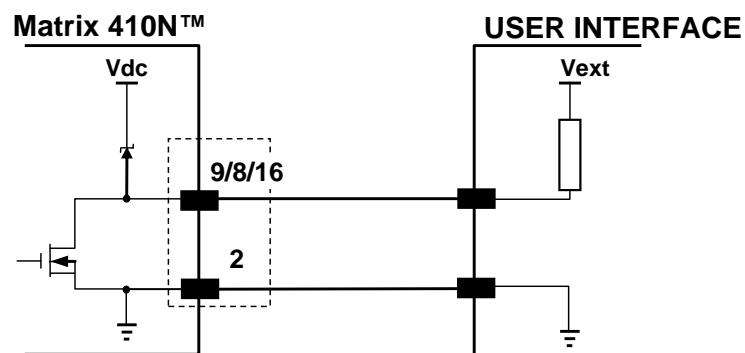


Figure 87 - NPN Output Connection



CAUTION: For NPN output connections, the external interface voltage (V_{ext}) must not exceed the Matrix 410N™ power supply source voltage (V_{dc}) otherwise correct output functioning cannot be guaranteed.

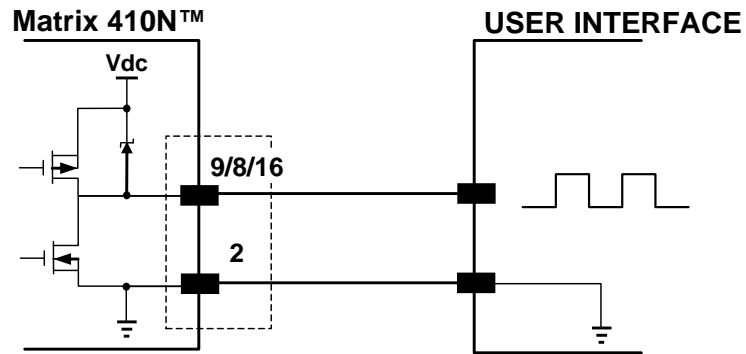
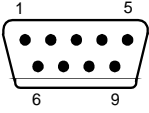
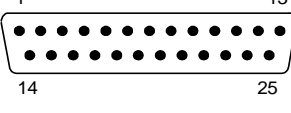


Figure 88 - Push-Pull Output Connection

USER INTERFACE - SERIAL HOST

| RS232 PC-side connections | | | |
|-----------------------------------------------------------------------------------------------------------|------|-------------------------------------------------------------------------------------------------------------|------|
|  9-pin male connector | |  25-pin male connector | |
| Pin | Name | Pin | Name |
| 2 | RX | 3 | RX |
| 3 | TX | 2 | TX |
| 5 | GND | 7 | GND |

How To Build A Simple Interface Test Cable:

The following wiring diagram shows a simple test cable including power, external (push-button) trigger and PC RS232 COM port connections.

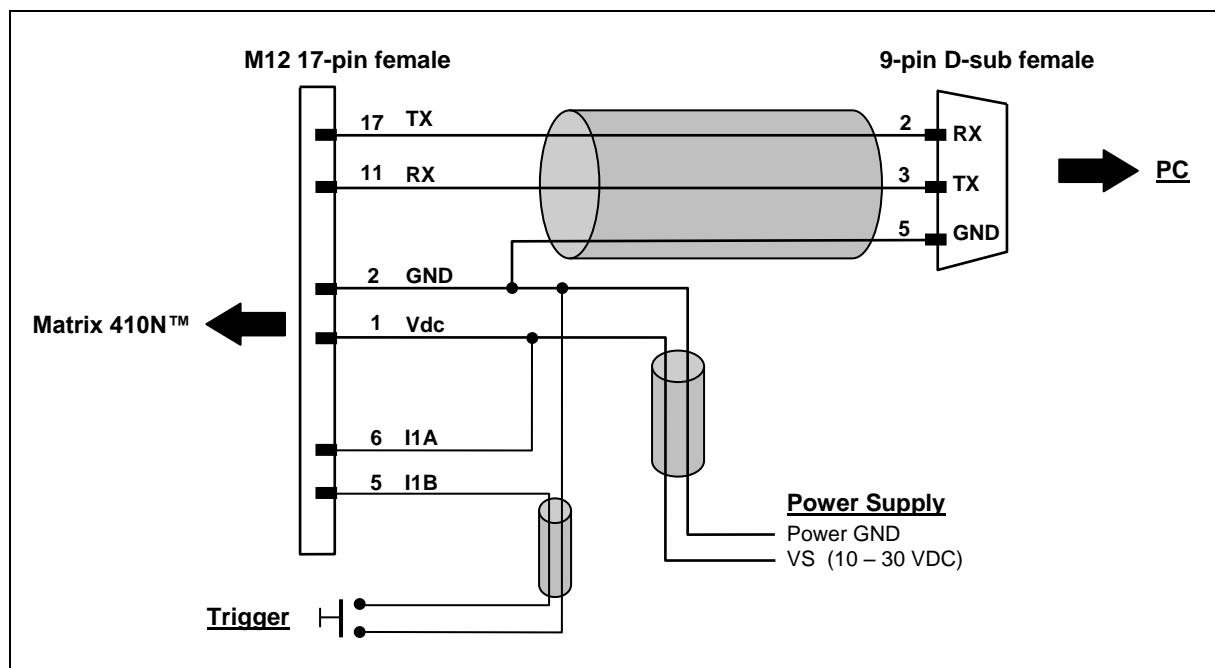


Figure 89- Test Cable for Matrix 410N™

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.

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 low angles used to avoid direct reflection of the light in the reader's lens.

Decode

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

Depth of Field

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

Diffused Illumination

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

Direct Part Mark (DPM)

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

EEPROM

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

Element

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

Exposure Time

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

Flash

Non-volatile memory for storing application and configuration files.

Host

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

Image Processing

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

Image Resolution

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

Image Sensor

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

IEC

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

IP Address

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

ISO

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

LED (Light Emitting Diode)

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

LED Illuminator

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

Matrix Symbolologies (2D Codes)

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

Multidrop

A communication protocol for connecting two or more readers in a network with a concentrator (or controller) and characterized by the use of individual device addresses.

Multi-row (or Stacked) Symbolologies

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

RAM

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

Symbol Verification

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

Transmission Control Protocol/Internet Protocol (TCP/IP)

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

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declares that the

**MATRIX 410; 2D Imager
MATRIX 410N; 2D Imager**

and all its models

are in conformity with the requirements of the European Council Directives listed below:

2004 / 108 / EC EMC Directive

This Declaration is based upon compliance of the products to the following standards:

EN 55022 (CLASS A ITE), DECEMBER 2010:

INFORMATION TECHNOLOGY EQUIPMENT
RADIO DISTURBANCE CHARACTERISTICS
LIMITS AND METHODS OF MEASUREMENTS

EN 61000-6-2, SEPTEMBER 2005:

ELECTROMAGNETIC COMPATIBILITY (EMC)
PART 6-2: GENERIC STANDARDS - IMMUNITY FOR INDUSTRIAL
ENVIRONMENTS

Monte San Pietro, September 23th, 2014

Paolo Morselli
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