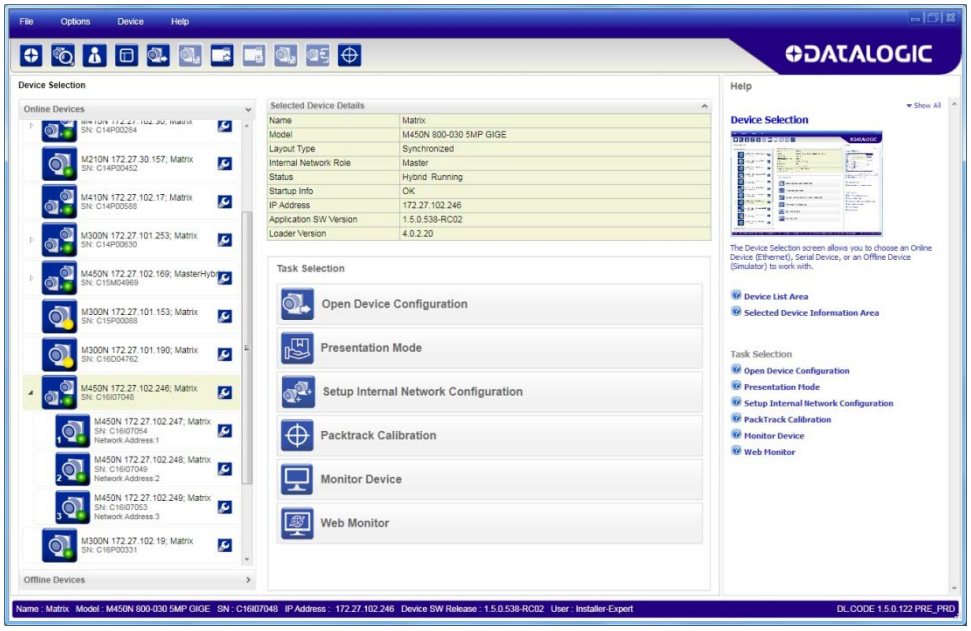
USER'S MANUAL




# > DL.CODE™

DATALOGIC

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# DL.CODE™ User's Manual

Ed.: 10/2017

This manual refers to software version 1.5.0.



26/10/17

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# CONTENTS

# REFERENCES

## CONVENTIONS

This manual uses the following conventions:

"DL.CODE" refers to the Datalogic User Interface client application running on a PC.

"User" or "Installer" refer to anyone using DL.CODE.

"Device" refers to physical devices used in the reading stations: i.e. Matrix readers.

"You" refers to the System Administrator or Technical Support person using this manual to install, configure, operate, maintain or troubleshoot a plant equipped with DL.CODE.

## REFERENCE DOCUMENTATION

The documentation related to DL.CODE is listed below:

- Device specific Help On Line
- This User's Manual

## 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 **SUPPORT** > **Unattended Scanning Systems** category link. From this page you can select your product from the dropdown list which gives you access to:

- Downloads including Data Sheets, Manuals, Software & Utilities, and Drawings;
- Repair Program for On-Line Return Material Authorizations (RMAs) plus Repair Center contact information;
- Service Program containing details about Maintenance Agreements;
- Technical Support through email or phone.

# 1 INTRODUCTION

DL.CODE software is a User Interface client application that provides reading device configuration for Stand Alone, and Master/Slave configurations. It is installed in and runs on Windows-based PCs (usually laptops), and connection takes place through an Ethernet TCP/IP interface.

It also provides visual monitoring of images that can be stored in an Image Database either locally on the device or to the local or a remote PC.

DL.CODE provides PackTrack Calibration for omnidirectional reading and tracking stations used in Logistics applications.

DL.CODE offers statistic and diagnostic information at reading station level whether the station is made up of a single reader or several readers connected in a Master Slave configuration.


**Figure 1 – Main Window Areas**

## 1.1 MAIN FEATURES

A summary of the DL.CODE main features is listed below:

- Simultaneous Device Monitoring from different remote PCs
- 3 different User access levels
- User and Session Language configuration in real time
- System configuration
- Dynamic content and automatic page update

## 1.2 CONFIGURATION AND MONITORING SESSIONS

Device configuration can be performed using DL.CODE running on a remote PC through a single session. Multiple instances of DL.CODE cannot be run on a PC and once a device is connected for configuration it cannot be accessed by another PC running DL.CODE.

However the Monitoring feature can be accessed simultaneously by several PCs running DL.CODE.

## 1.3 SIMULATORS

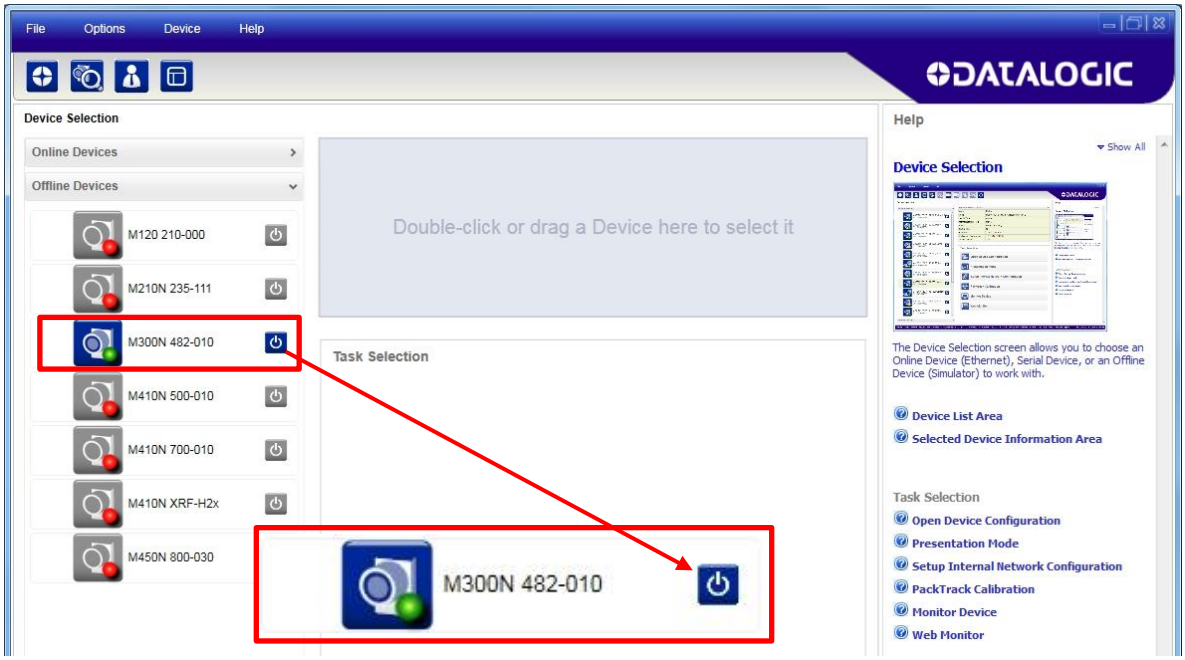
DL.CODE has different device prototypes which can be loaded as Offline devices. This allows offline configurations to be prepared and loaded to a device at a later time.

**NOTE:** Creating and saving offline configuration (.dlcfg) files and then loading them onto physical devices can be done but the following precautions should be followed:

- Due to differences in image sensors, internal memory, etc., it is **strongly** suggested to use the same family product as the device to be configured.
- The following parameter groups may need to be adjusted: Advanced Setup Image Settings, Reading Phase, Output Setup.
- Advanced Setup Code Settings, Good Read, and Data Formatting will be maintained.

To load a Simulator, Click on the *Offline Devices* tab at the bottom of the Device List Area to open the list of available simulators.

All of the simulators are offline by default. To select a reader click its Simulator Power button icon.




Now you can double-click or drag the simulator into the Selected Device Information Area and begin a new configuration. See Chapter 3.

## 1.4 DEVICE CONFIGURATION

DL.CODE is designed to simplify standard configuration by grouping the basic functions into three major parameter groups: Decoding, Operating Mode, and Output.

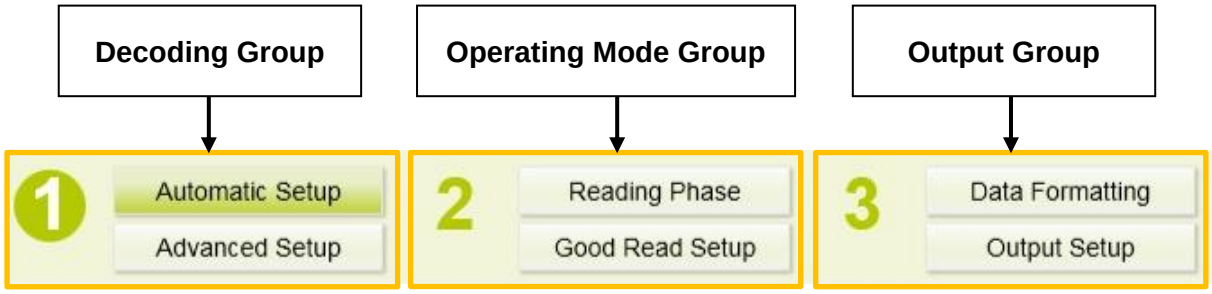



**Figure 2 – DL.CODE Configuration Groups**

Each major group is sub-divided into two parts as follows:

1. **Decoding:**

   - Automatic Setup: this is a new feature that provides a one-step process for automatically setting the photometry for image acquisition (Image Setting) and the code symbology selection (for a single code type). Click on **Start Automatic Setup** to start the procedure. It is particularly useful for DPM applications and requires no calibration. See chapter 12.

   - Advanced Setup: this group completely manages:

     Image Setting parameters, including **Image Auto Setup** for photometry, multiple Image Settings, **Focus Autolearn** for liquid lens models, a **Focus Calibration** tool with oscilloscope for manual focusing and a **PPI** acquisition tool for calibration.

     General Settings including Processing Time and Code Grading parameter management.

     Code Symbology selection and configuration including Code Filtering parameters and a Code Localization tool. It also contains the **Code Autolearn** routine to find one or more unknown code symbologies on an acquired image.

     The image Cropping Region Area tool is available to this group to help speed up decoding.

2. **Operating Mode:**

   - Reading Phase: this group manages the operating mode for image acquisition.

   - Good Read Setup: this group manages data collection: Code Collection, Code Combination, Code Presentation, or Match Code.

3. **Output:**

   - Data Formatting: this group manages the output message to the Host.

   - Output Setup: this group manages the digital outputs as well as the Green/Red Spots.

# 2 INSTALLATION

## 2.1 DL.CODE DISTRIBUTION CONTENTS

The DL.CODE program distribution contains the following:

- Complete Installation of DL.CODE
- .NET Framework (if not already present)
- This manual

## 2.2 HARDWARE REQUIREMENTS

Typical hardware requirements for a DL.CODE Client PC are:

- 2.00 GHz or faster microprocessor
- 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)

## 2.3 SOFTWARE REQUIREMENTS

- One of the following Windows Operating Systems (32 or 64-bit):
  - Windows XP
  - Windows 7
  - Windows 8
  - Windows 10
- Web Browser: Google Chrome, Mozilla Firefox, Microsoft Internet Explorer, Opera, etc.

**NOTE:** The Google Chrome Web Browser is recommended for its superior performance characteristics.

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

## 2.4 INSTALLING DL.CODE

**NOTE:** Starting from version 1.5.0, multiple versions of DL.CODE can be installed on the same PC. Each version will be installed in its own folder **however only one version can be run at a time**.

### 2.4.1 Standard Installation

1. On the PC that will be used for configuration, (running Windows XP SP3, 7, 8; or 10), download the DL.CODE mini-DVD .zip file. Extract the files maintaining the folder structure and run the **start.hta** file to access the installation pop-up. Click on the **Install DL.CODE** link to run the installation program and follow the installation procedure.

**NOTE:** If you need to configure Serial models, check the RS232 Serial Port Driver installation box in the Welcome window of the DL.CODE Installer.

**NOTE:** If you need to configure USB models, check the Matrix USB Driver installation box in the Welcome window of the DL.CODE Installer and follow the procedure given in the specific reader Reference Manual.

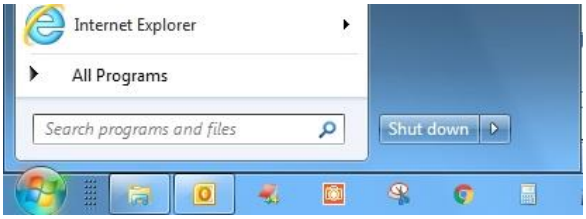
2. When the installation is complete the DL.CODE entry is created in the Start>Programs bar under “Datalogic” as well as a desktop icon. Double-click the desktop icon to run it.

### 2.4.2 Silent Installation

A silent installation which requires no input from the user can be run from a command line prompt. You must have Administrator rights on the PC for this installation. There are two options:

- Quiet: this does not display any user interface.
- Passive: this displays the user interface but proceeds without requiring any user input.

1. Open a command line prompt from the Windows Start Menu by typing “cmd” in the search box:




2. Set the directory to where the extracted DL.CODE setup package is located.

3. Invoke the package with double quotes “ ” and either **/passive** or **/quiet** switches.

## 2.5 UNINSTALLING DL.CODE

To completely uninstall DL.CODE including software drivers from your PC you must use the following sequence:

1. Uninstall all versions of DL.CODE from your PC from the Control Panel.
2. Uninstall the com0com driver from the com0com folder in Windows Start Menu – All Programs.
3. Uninstall the USBCOMInstaller from the Control Panel.
4. Uninstall the cdcecmInstaller from the Control Panel.

**NOTE:** Trying to uninstall software drivers before all versions of DL.CODE are uninstalled will cause an error.

# 3 QUICK START

To help you get started, here is an example configuration demonstrating the basic steps of DL.CODE configuration.

To configure your device for your application using DL.CODE, the following preliminary steps are assumed:

- The reading device(s) are installed and running.
- DL.CODE is installed and running (chapter 2).

## 3.1 ETHERNET DEVICE DISCOVERY

**NOTE:** To discover Serial models see par. 3.2. To discover USB models, see the specific reader Reference Manual for details.

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.

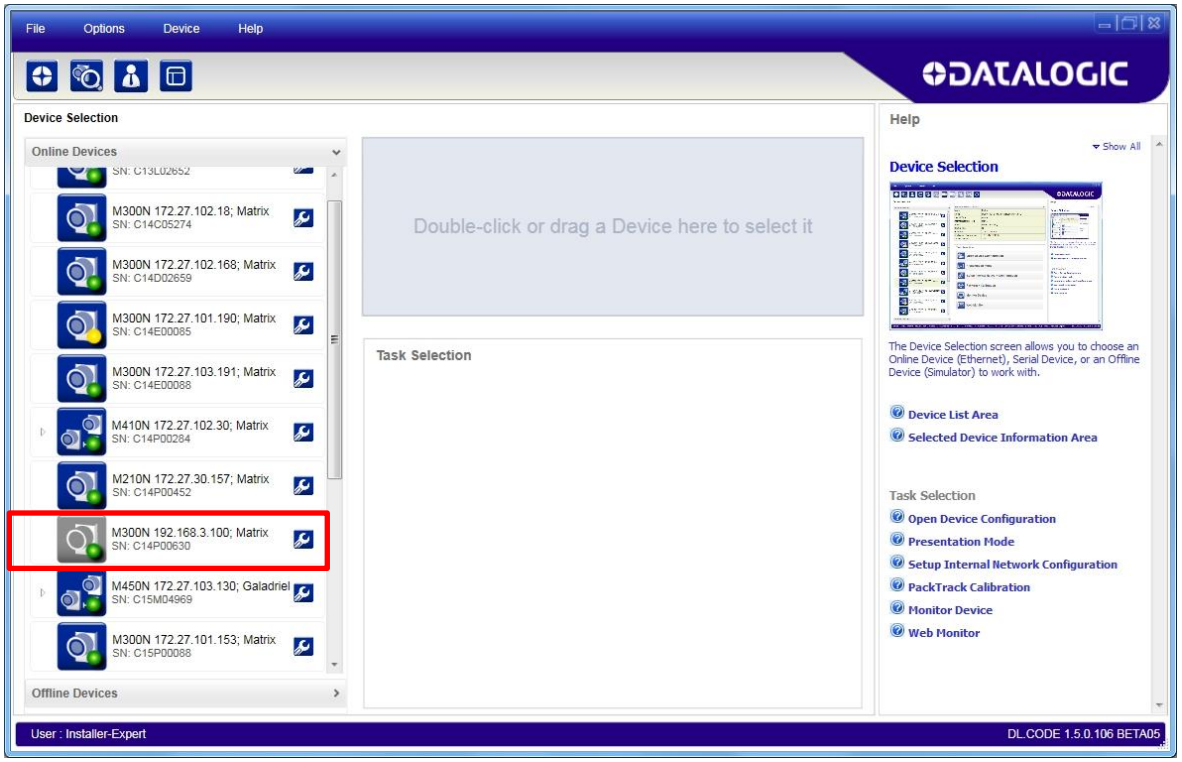



**Figure 3 – Device Discovery**

The discovery feature will also show devices not belonging to the LAN and display them in grey (see Figure 3).

The following procedure will demonstrate an example configuration.

1. 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).

2. Click on the device wrench icon  to open the Device Environment Configuration window.

3. Change the Ethernet Settings (IP Address, Subnet Mask, Gateway Address etc.) according to the network requirements. See also Figure 4 below.

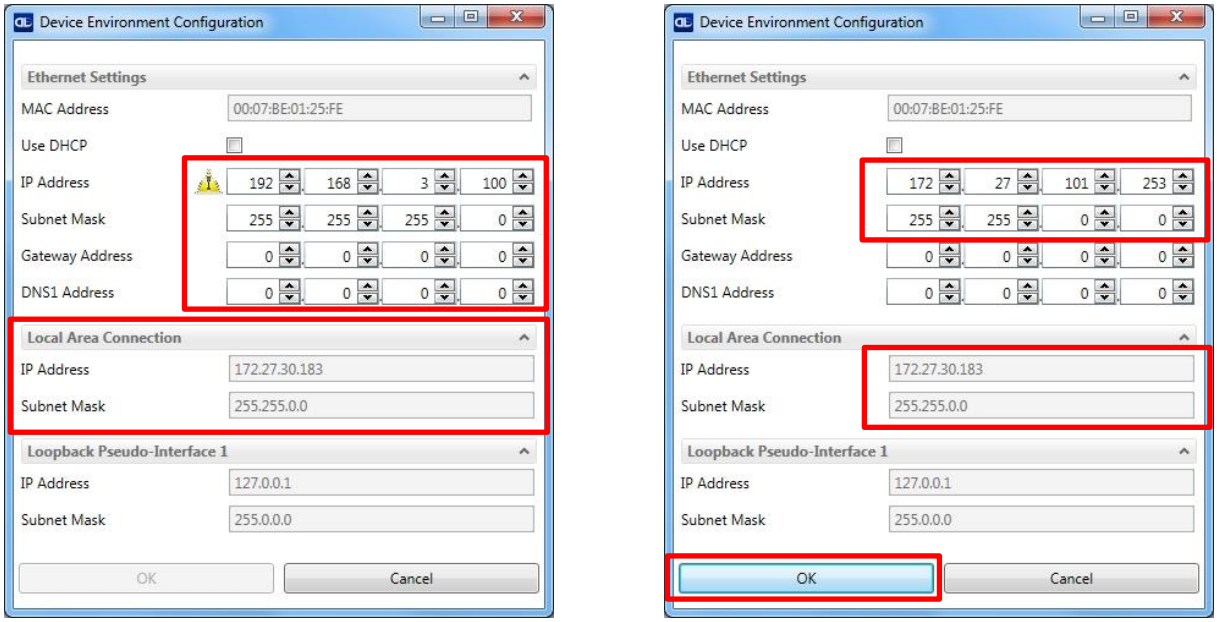
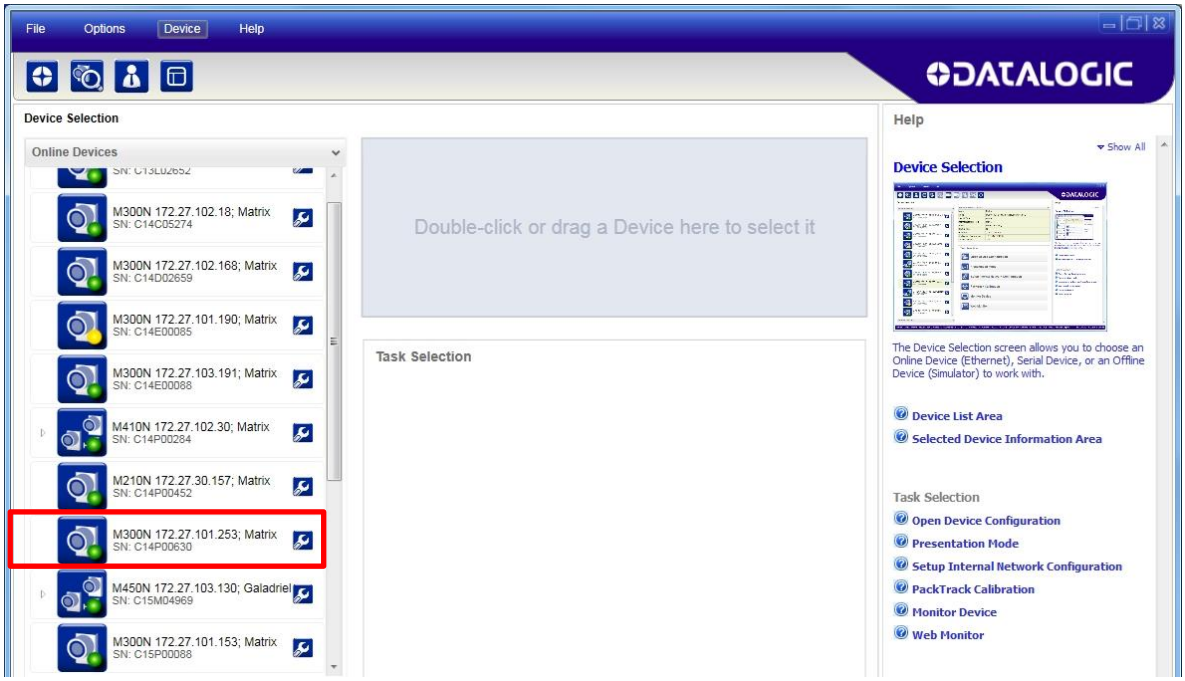
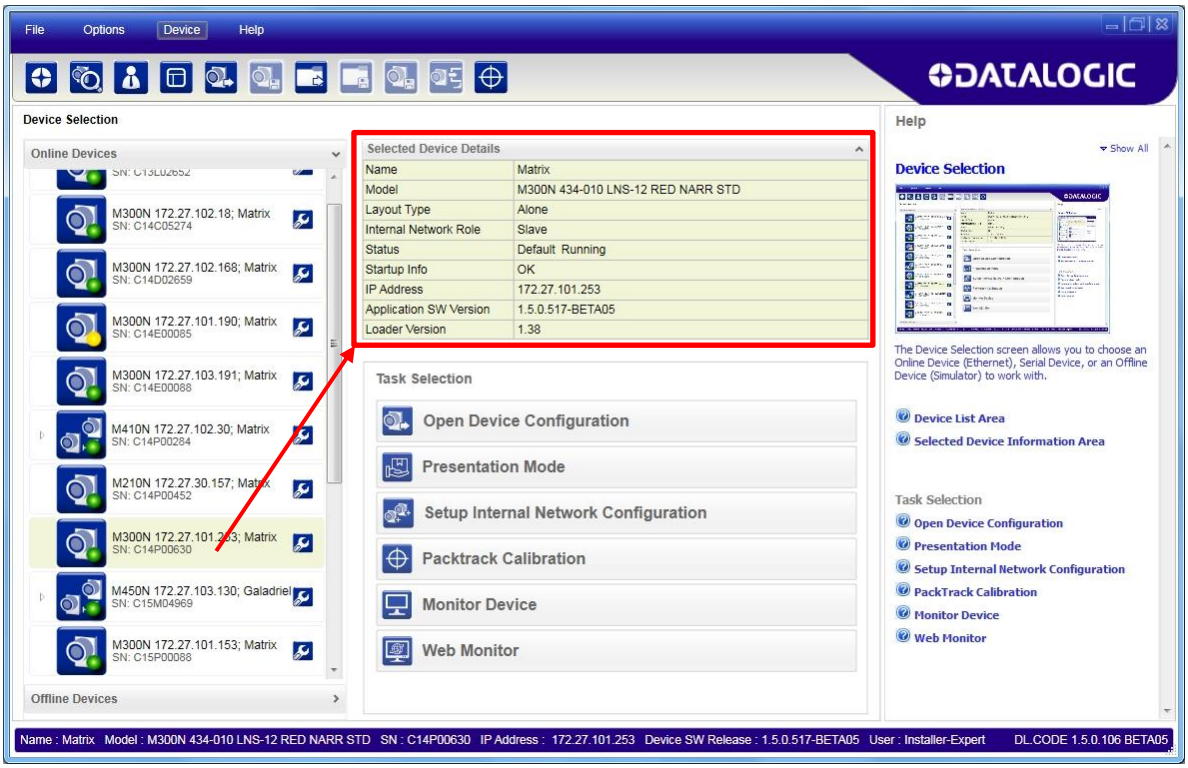



**Figure 4 - Device Environment Configuration Window**

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



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




**NOTE:** After device discovery, configure your device through DL.CODE as described in paragraphs 3.3, 3.4 and 3.5.

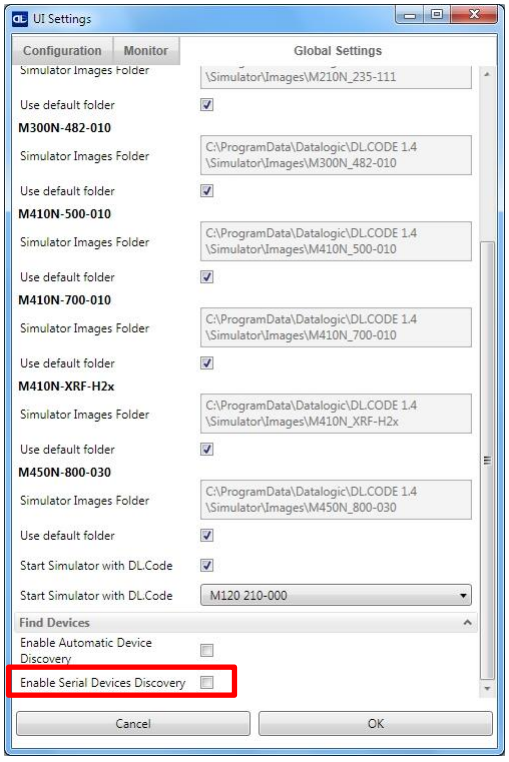
## 3.2 SERIAL DEVICE DISCOVERY

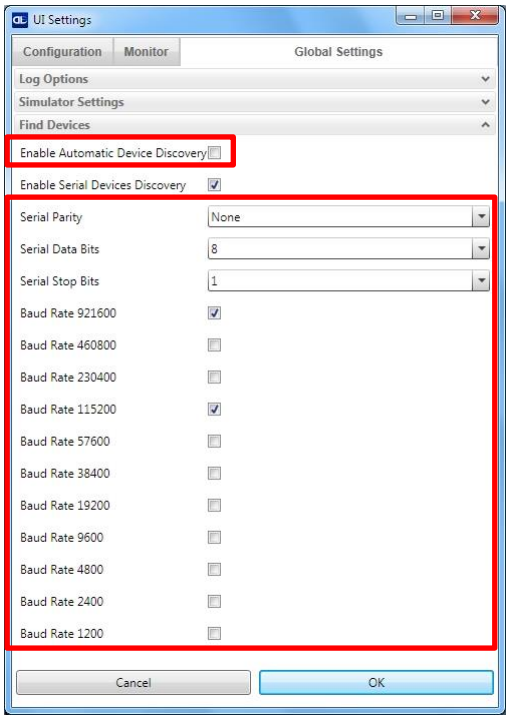
Starting from DL.CODE 1.4.0, serial port communication is supported for device discovery and configuration. This allows dedicated serial communication models to be configured through DL.CODE.

**NOTE:** Although this feature allows all devices to be configured through their Serial Interface, be aware that transmission speeds and some DL.CODE features are limited when using this interface. It is always advised to use the Ethernet interface whenever possible.

**This feature is not enabled by default**, so the first thing to do is to enable it through the UI Settings window.

1. From the main menu open the Options>UI Settings window.
2. Click on the Global Settings menu and scroll down to the Find Devices tab.
3. Check the Enable Serial Device Discovery box. Scroll down to see the following selections.
4. Select the Serial communication parameters according to your application.



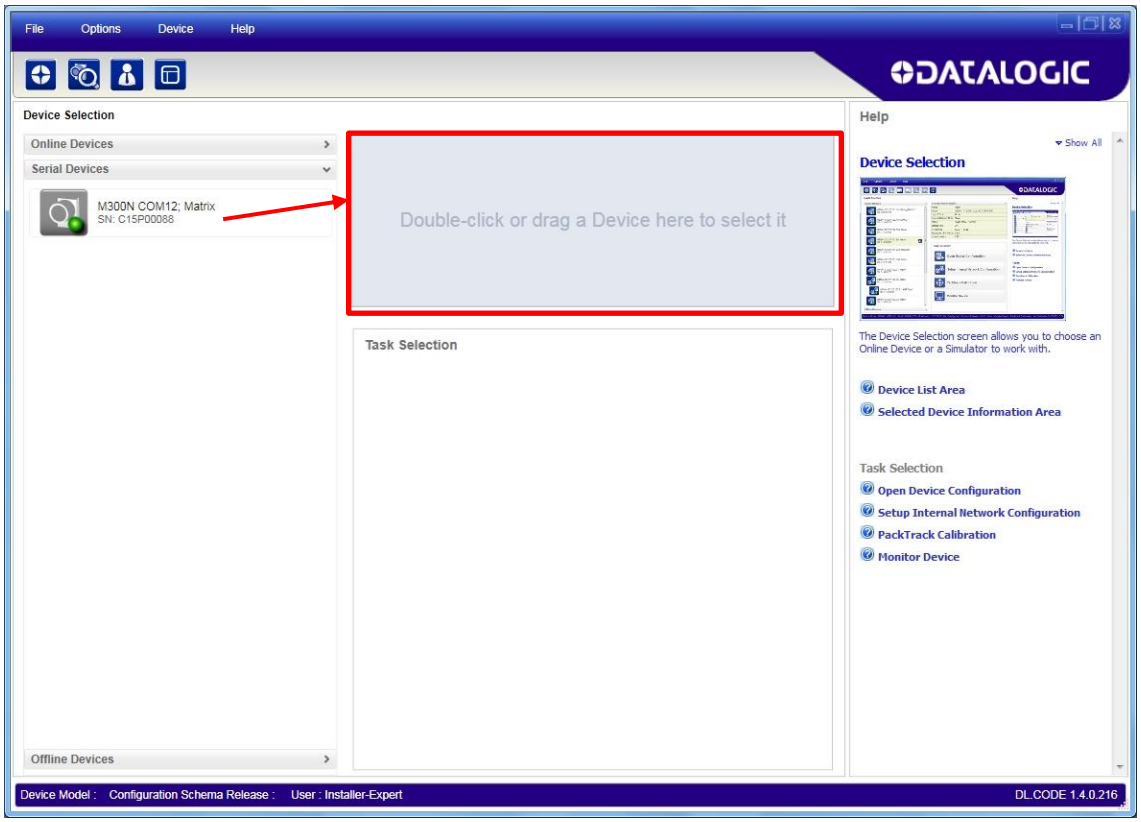




**NOTE:** If you're not sure of the Serial baud rate you can also check the Enable Automatic Device Discovery box which for serial devices will try communication at all baud rates, but only at **N**o parity, **8** data bits;**1** stop bit.

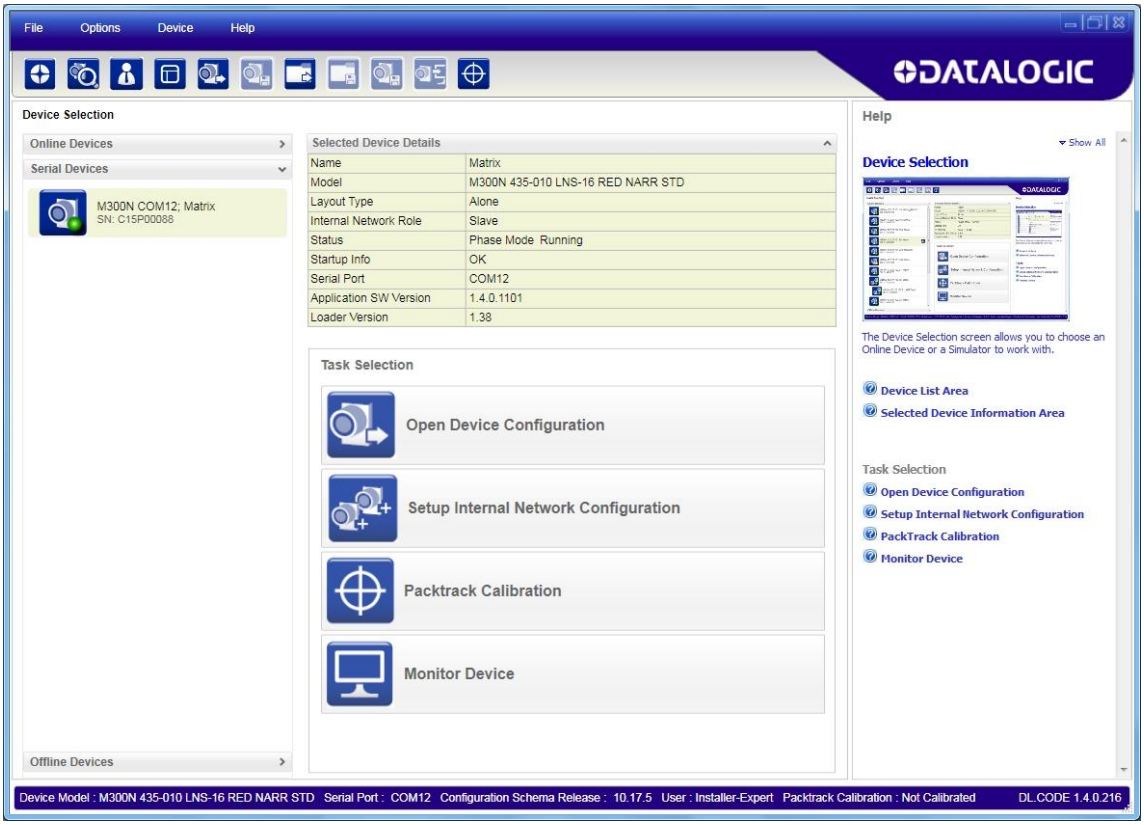
Enabling this parameter can notably lengthen Discovery time, therefore in general it is better to disable it to increase Discovery efficiency.

5. Click OK to return to DL.CODE and click on the Getting Started icon.

6. Open the Serial devices tab and double-click on or drag the device icon into the Selected Device Information Area.




The device is now connected to the DL.CODE Configuration environment. Configure your device through DL.CODE as described in paragraphs 3.3, 3.4 and 3.5.



## 3.3 DECODING CONFIGURATION PARAMETERS

The Decoding Configuration parameters are divided into two groups: **Automatic Setup** and **Advanced Setup**.

- **Automatic Setup** provides an automatic procedure for setting optical/illumination and code definition parameters to obtain the most stable decoding conditions for a single code symbology based on the images presented to the reader. It can be set to include Image Filters if necessary. See the table below for codes and filters managed by Automatic Setup. Automatic Setup is especially useful for DPM applications.

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

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

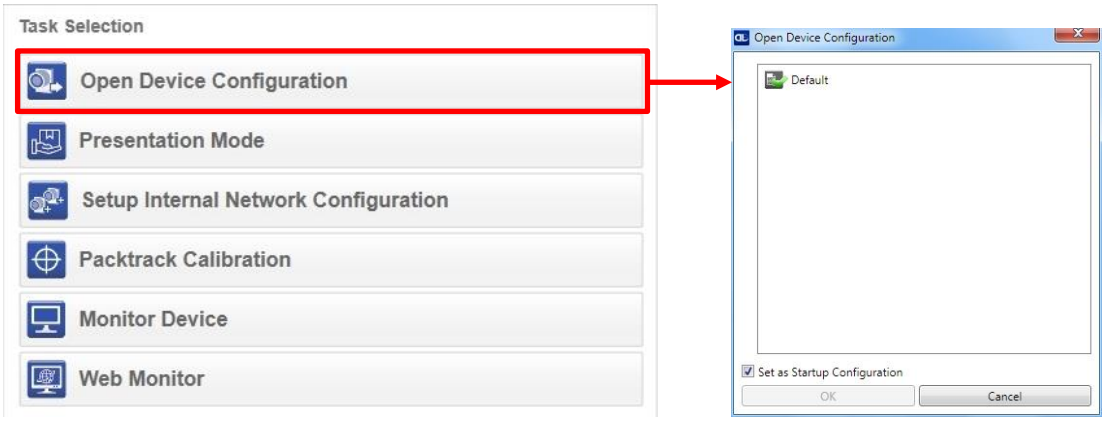

**NOTE:** If your application requires multiple code symbologies, multiple image settings, Code Grading or other parameter settings for decoding, then use the Advanced Setup, see. par. 3.3.2.

### 3.3.1 Automatic Setup

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

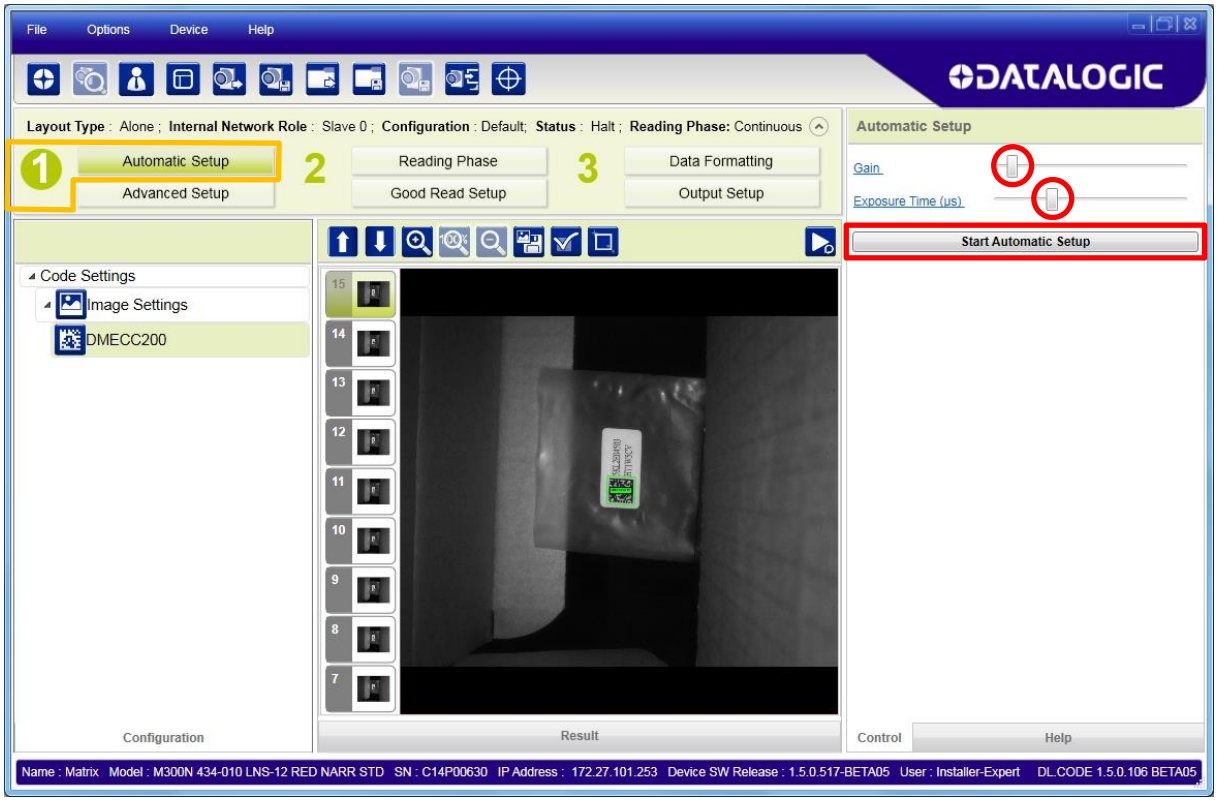
1. From the Task Area select Open Device Configuration.

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



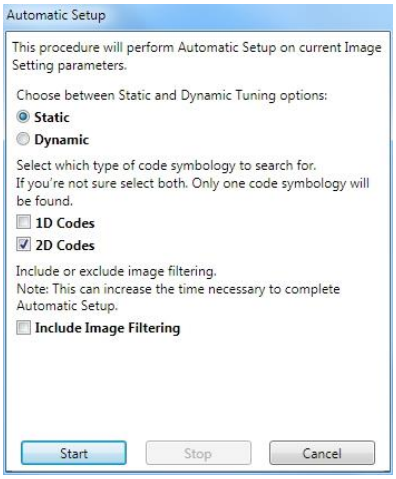

3. Place the application code in front of the reader at the correct application reading distance.

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



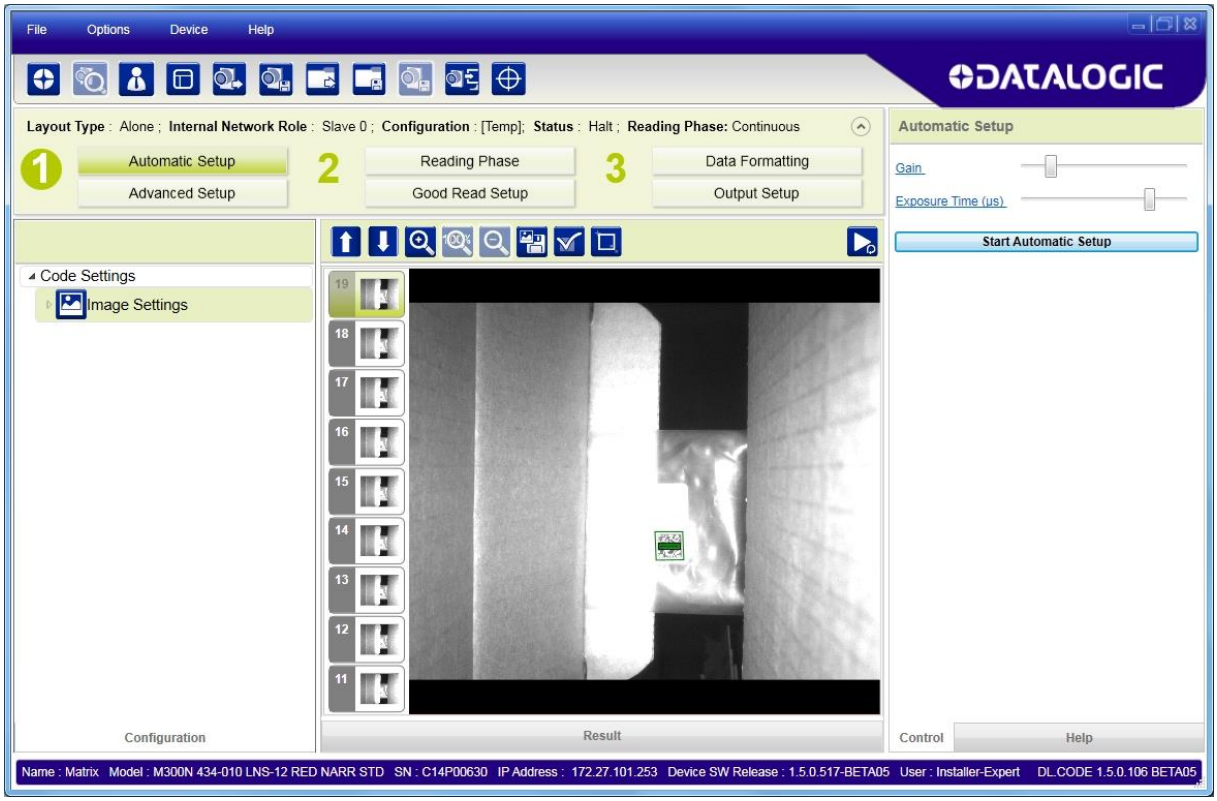

**NOTE:** If the image display area is too dark to see the images being captured, you can drag the Gain and Exposure Time sliders (circled in red in the figure above) to the right to increase visibility. This will not affect Automatic Setup.

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




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

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



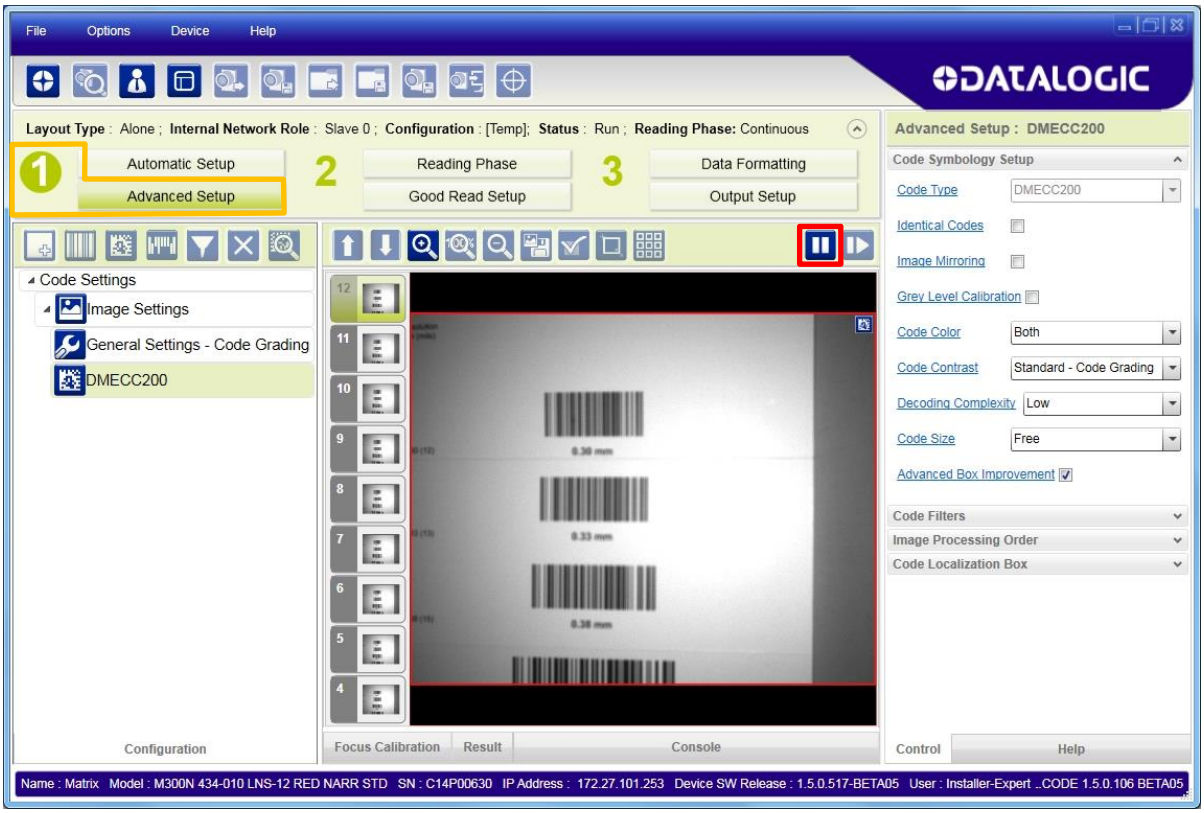

Your reader is now optimized for decoding. Continue with the Operating Mode configuration described in par. 3.4.

### 3.3.2 Advanced Setup

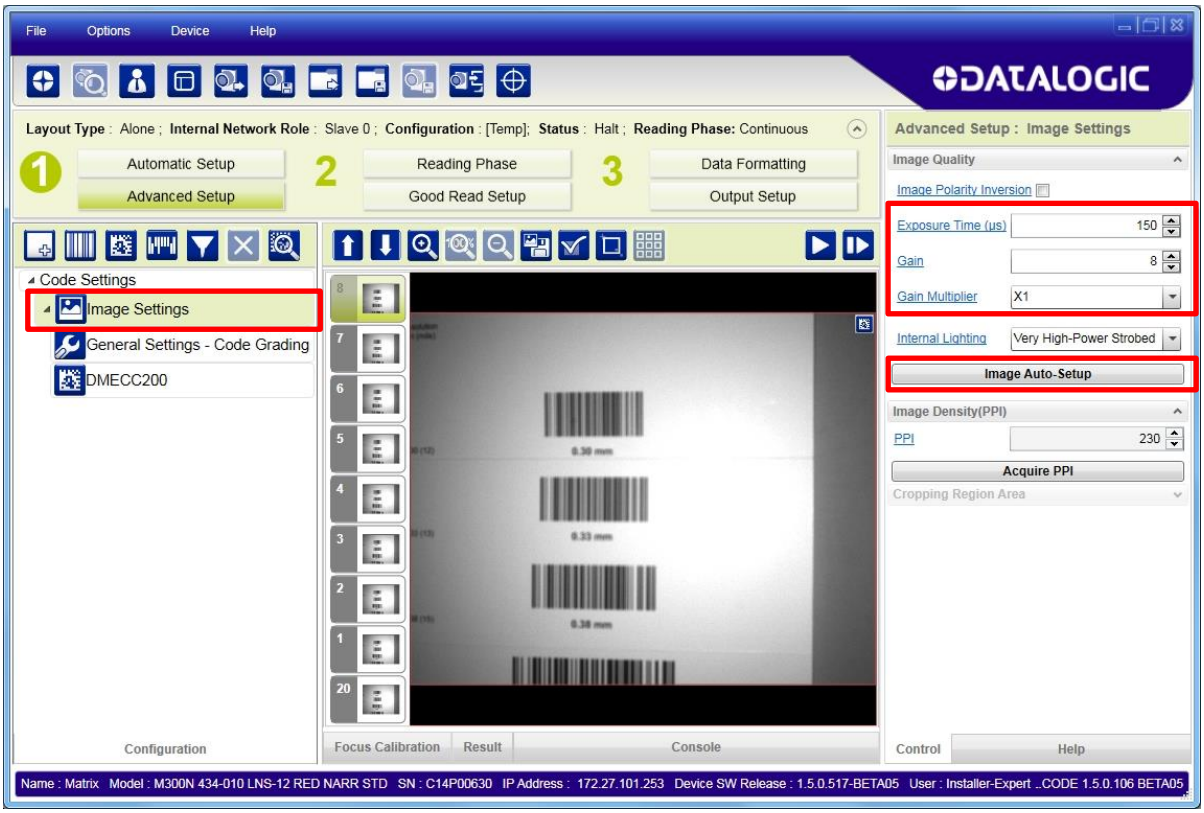
If your application requires multiple code symbologies, multiple image settings or other parameter settings for decoding, then use the Advanced Setup.

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

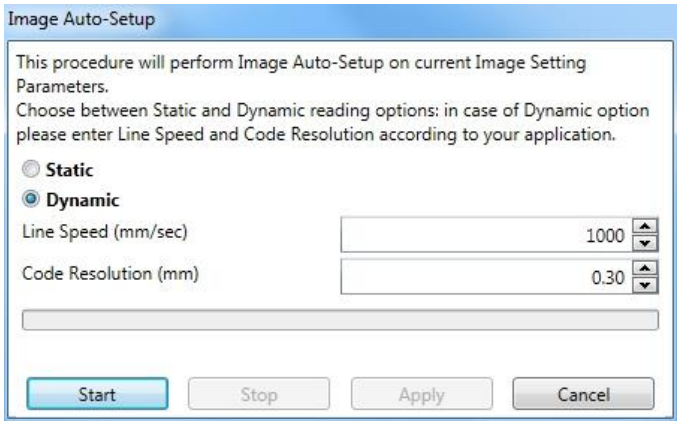
2. Place the **Grade A Barcode Test Chart** in the reading area. Once positioned, stop image acquisition by clicking on the Pause button .

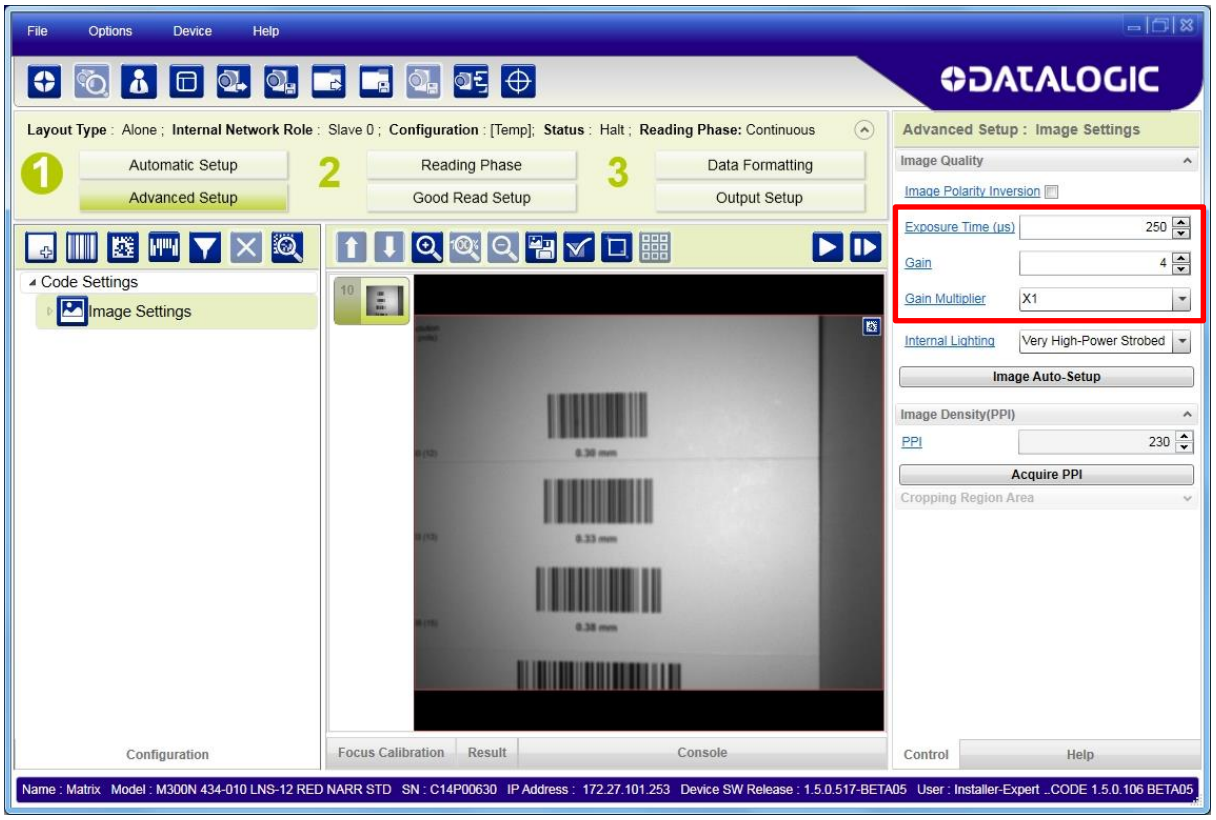



3. Click the Image Settings branch and then click the Image Auto-Setup button to automatically acquire the best exposure time and gain values.



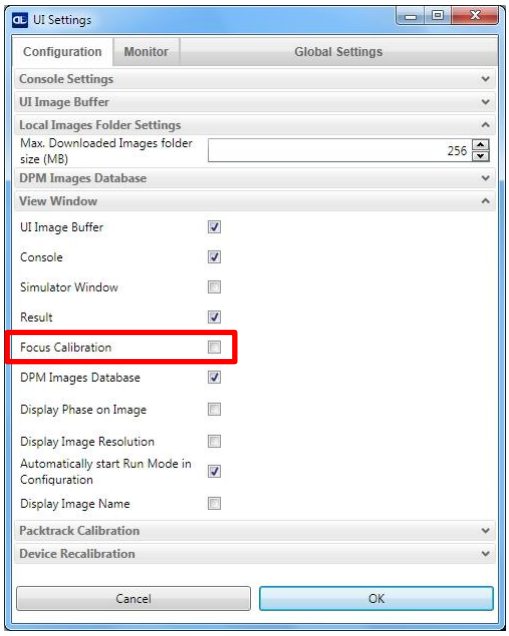

4. Select the Static or Dynamic Self-Tuning option; Start the Image Auto Setup and Apply to the Image Settings.



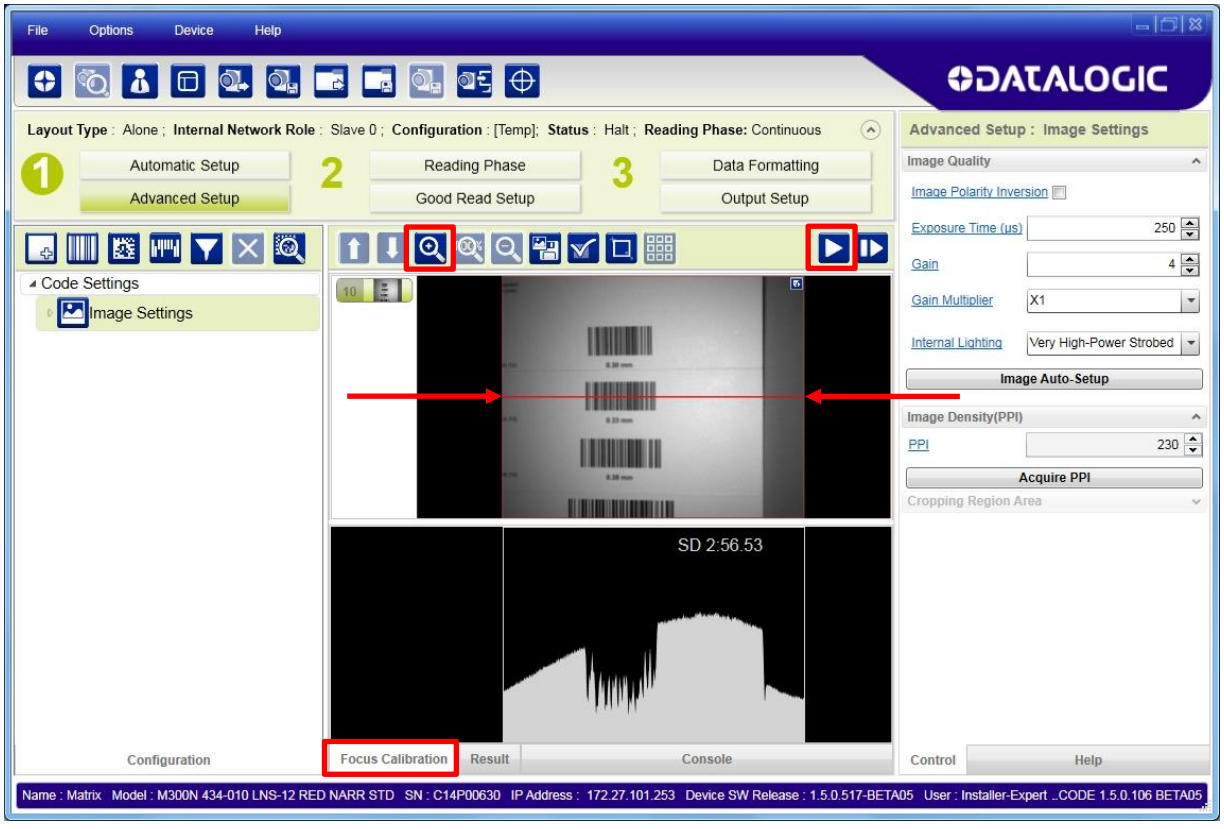



**NOTE:** For applications having multiple lighting or code reading conditions, up to 10 different Image Settings can be configured by adding them with the icon.

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




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



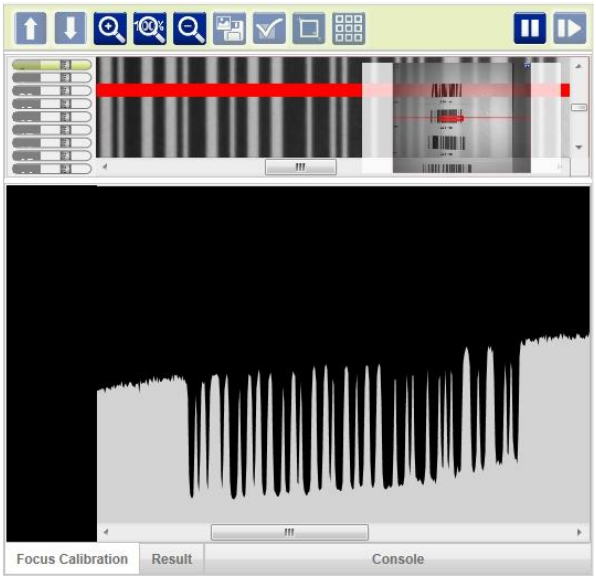

The red line in the image panel above the oscilloscope must pass through the code. You can click and drag the red line vertically to reposition it over the code.

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

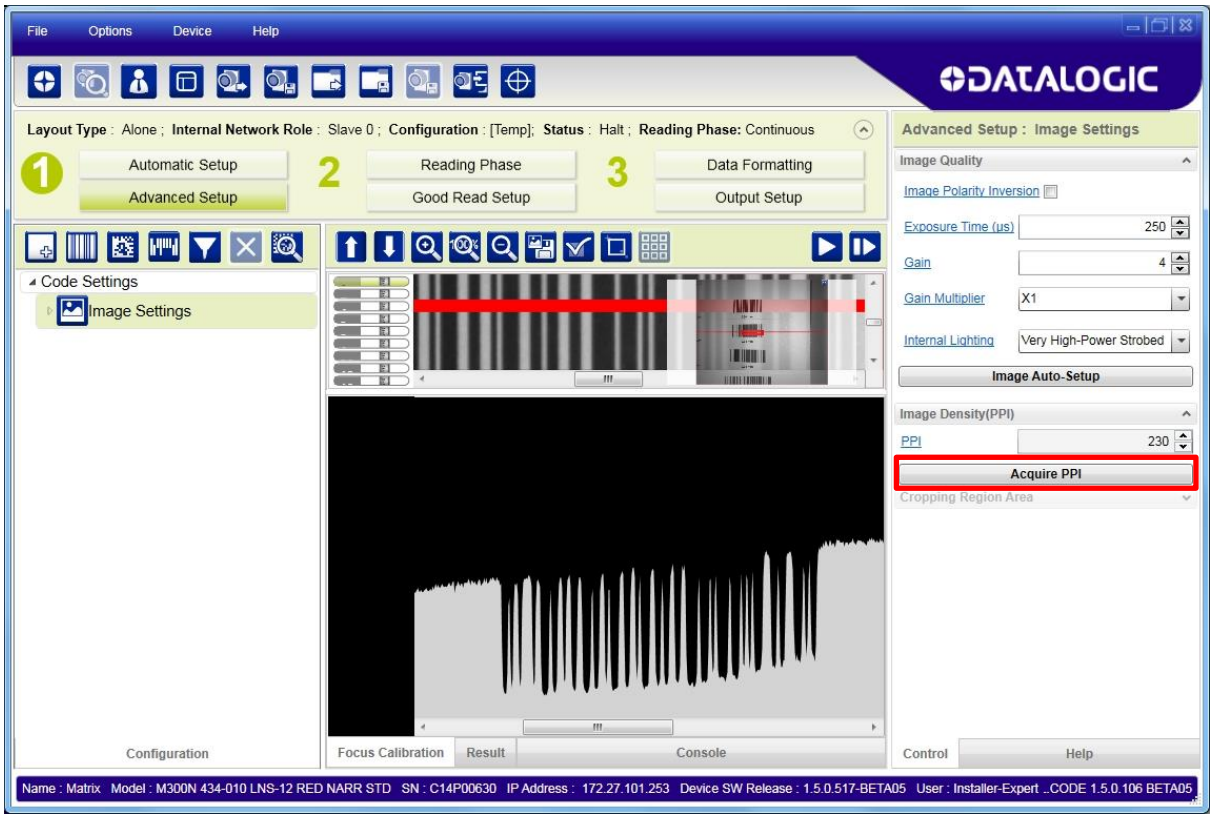
While in run mode, manually adjust the focus until the bars relative to the code in the oscilloscope demonstrate their maximum length (focus).

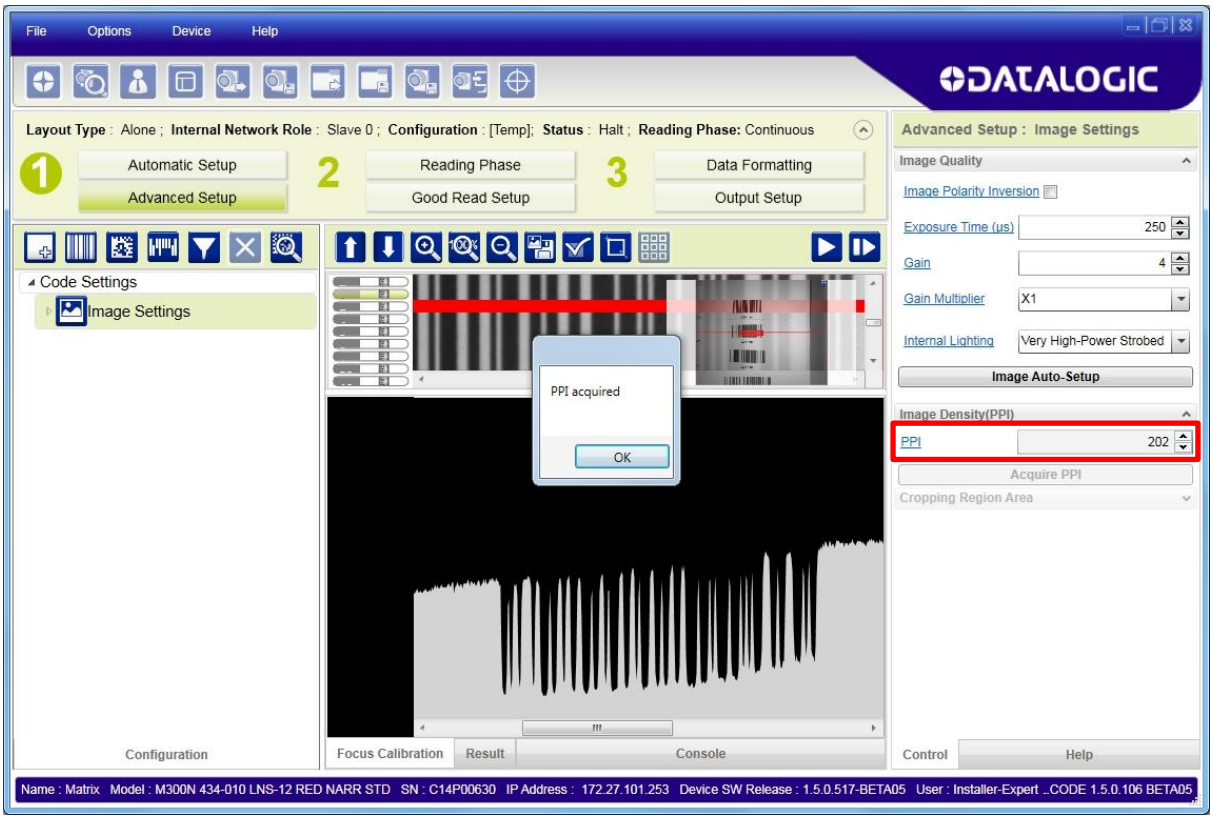
You can also see the visual focus on the code view.

When focused, click Pause to stop image acquisition.

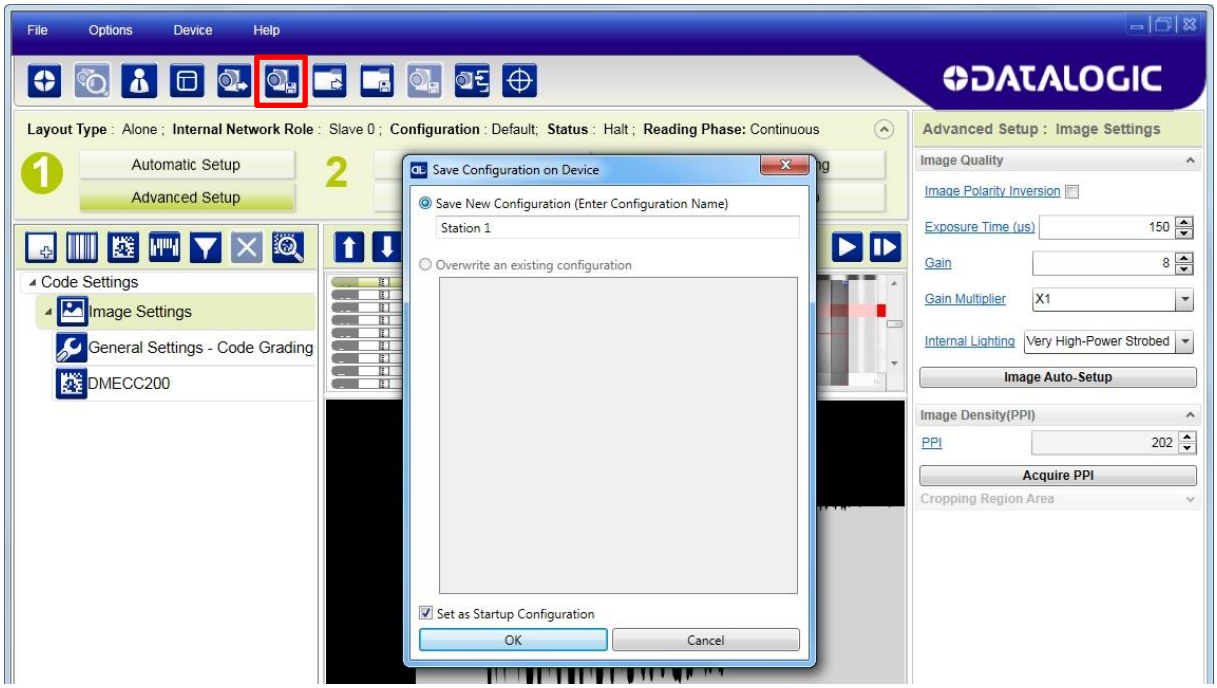



6. Click the **Acquire PPI** button to automatically set Image Density so that reader will function correctly and to the fullest extent of its capabilities. This procedure is necessary for first time installations, or if the focal distance is changed.





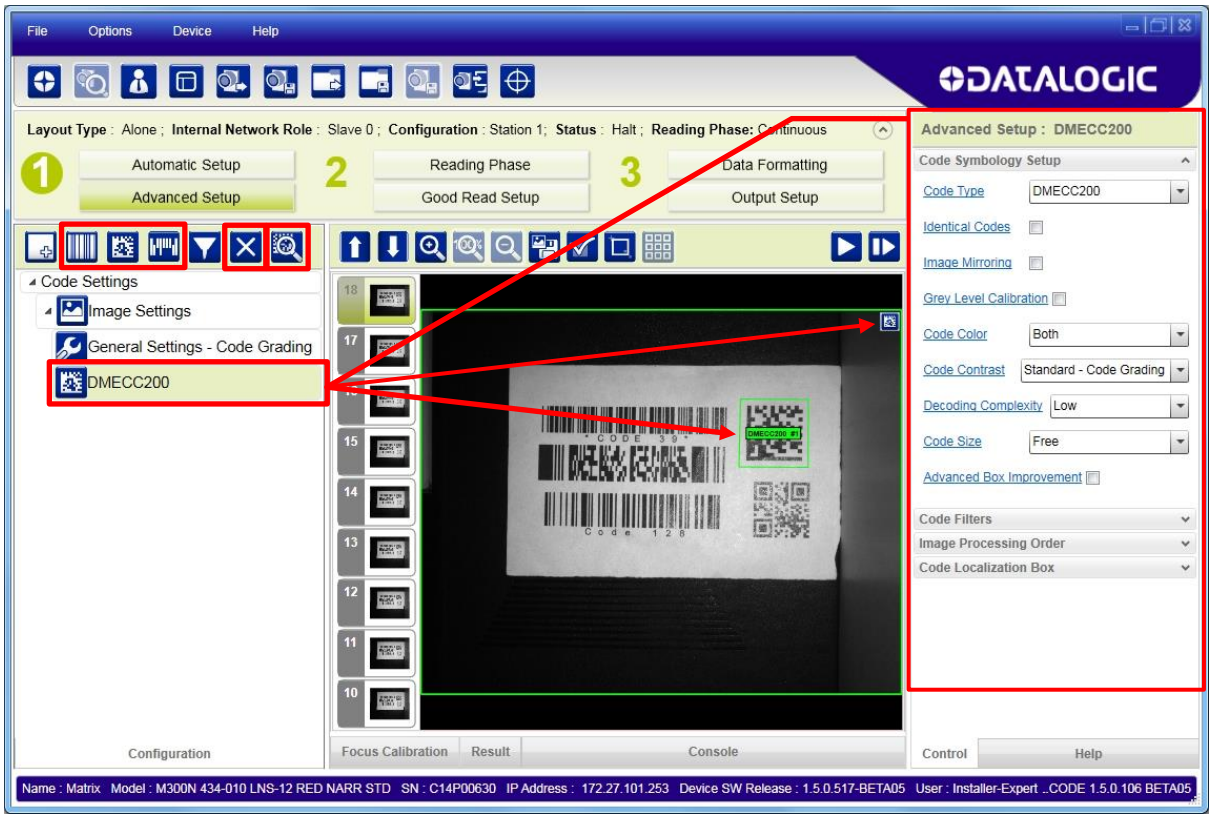

**NOTE:** At this point it is probably a good idea to save the configuration from temporary memory to permanent memory giving it a specific name.




7. 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.**

8. Click on the Data Matrix ECC 200 symbology under the Image Settings branch (enabled by default). If this symbology is among those in your application it will be shown in the image display with its code symbology name and a green box around it indicating it is decoded.




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

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

   If you don't know the code type you can use the Code Autolearn feature by clicking on the icon. See par. 4.5 for details.

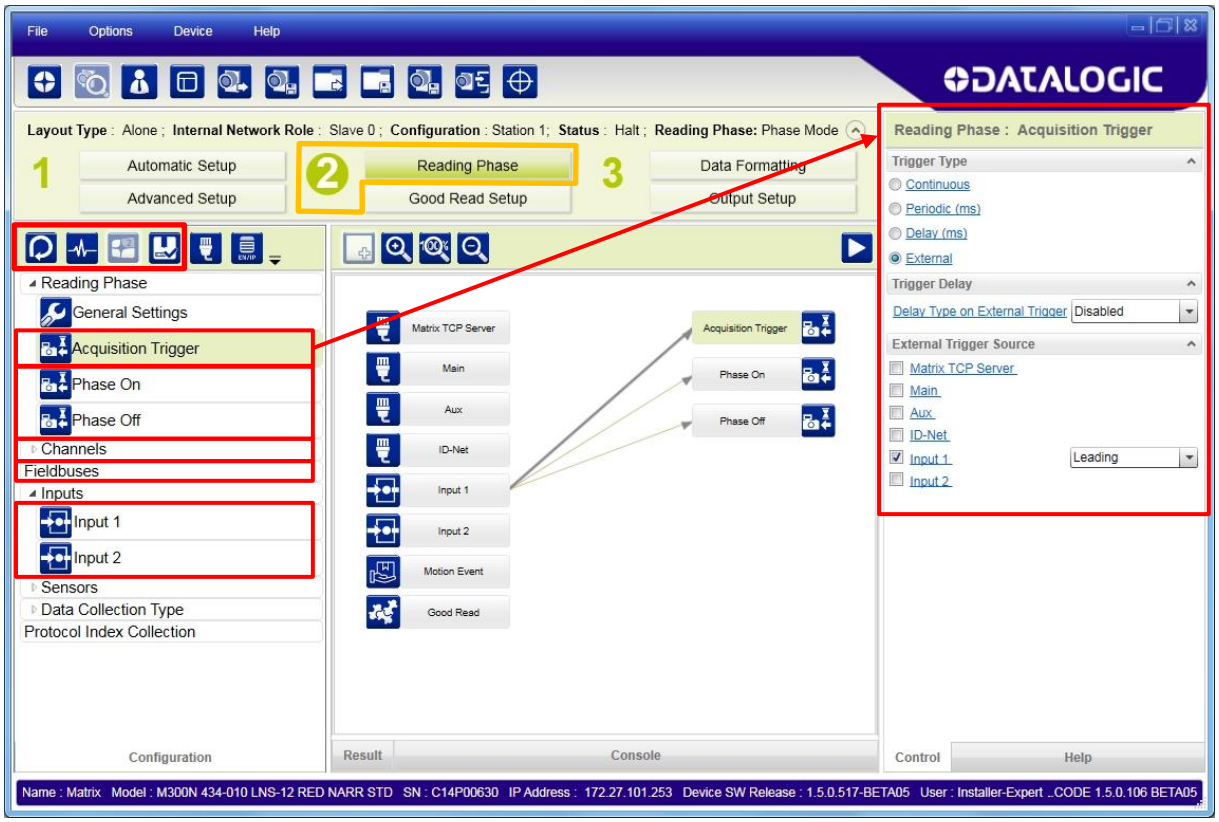
10. For each code symbology set the relative parameters according to your application.

## 3.4 OPERATING MODE CONFIGURATION PARAMETERS

The Operating Mode Configuration parameters are divided into two groups: **Reading Phase** parameters and **Good Read Setup** parameters.


### 3.4.1 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.

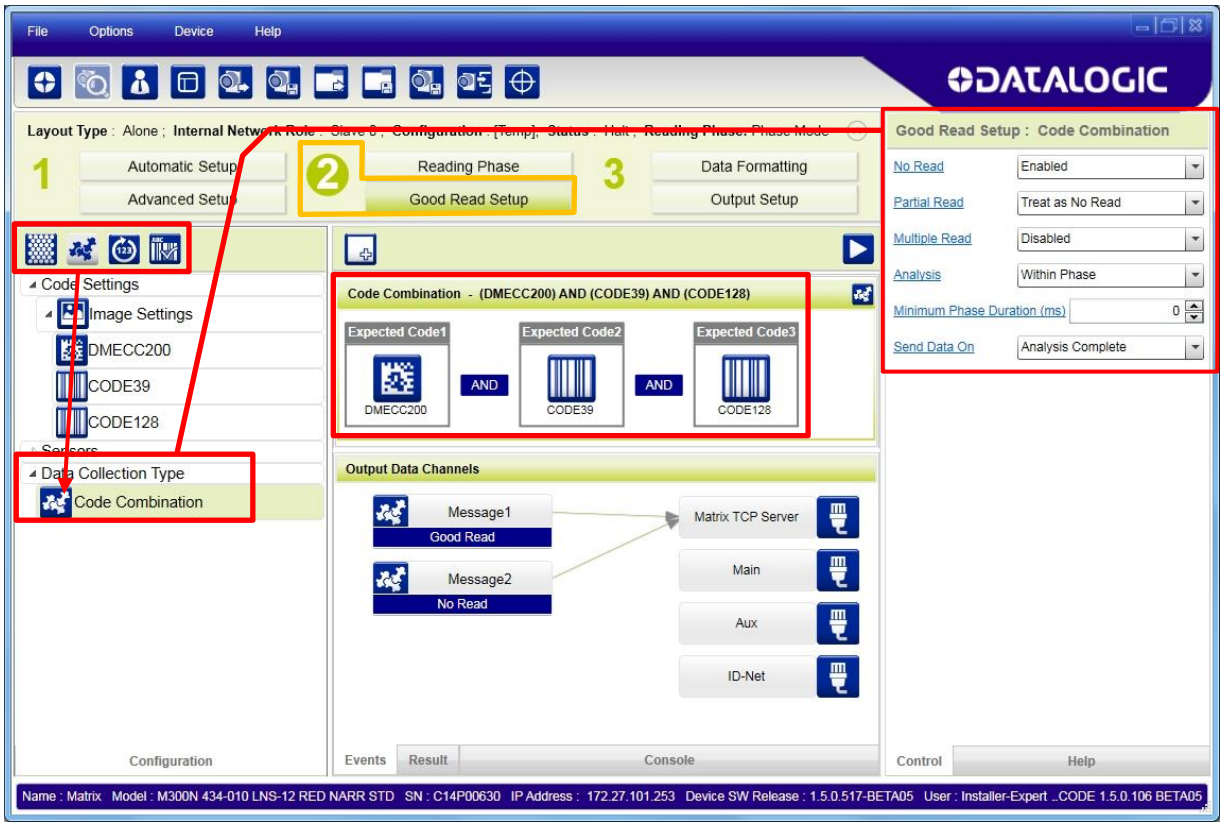



2. Configure the relative Operating Mode parameters from the Reading Phase parameters panel. Different groups will appear in the panel depending on the selected icons over the Configuration Parameters tree area.

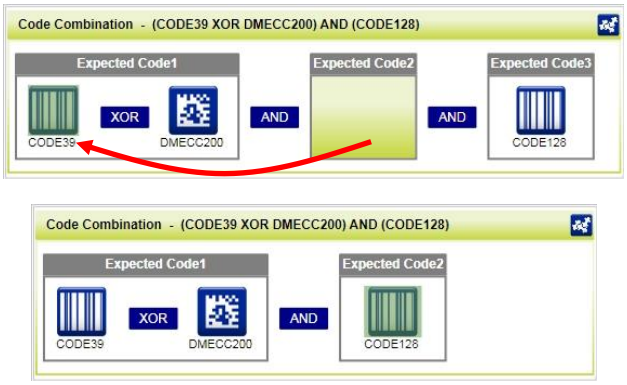
### 3.4.2 Good Read Setup

1. Select your specific data collection type from the icons over the Configuration Parameters tree area: Code Collection, Code Combination, Code 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.

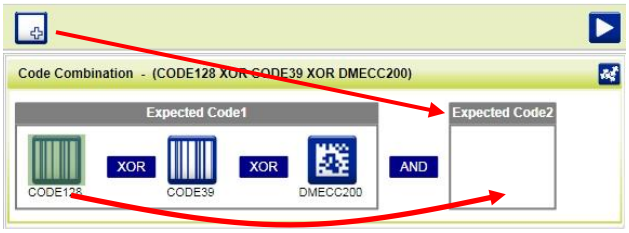
   The following example shows Code Combination. By default, the Expected Codes (when more than one code type is selected), are in logical AND, which means that all codes are required to be decoded to produce a Good Read condition.




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



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

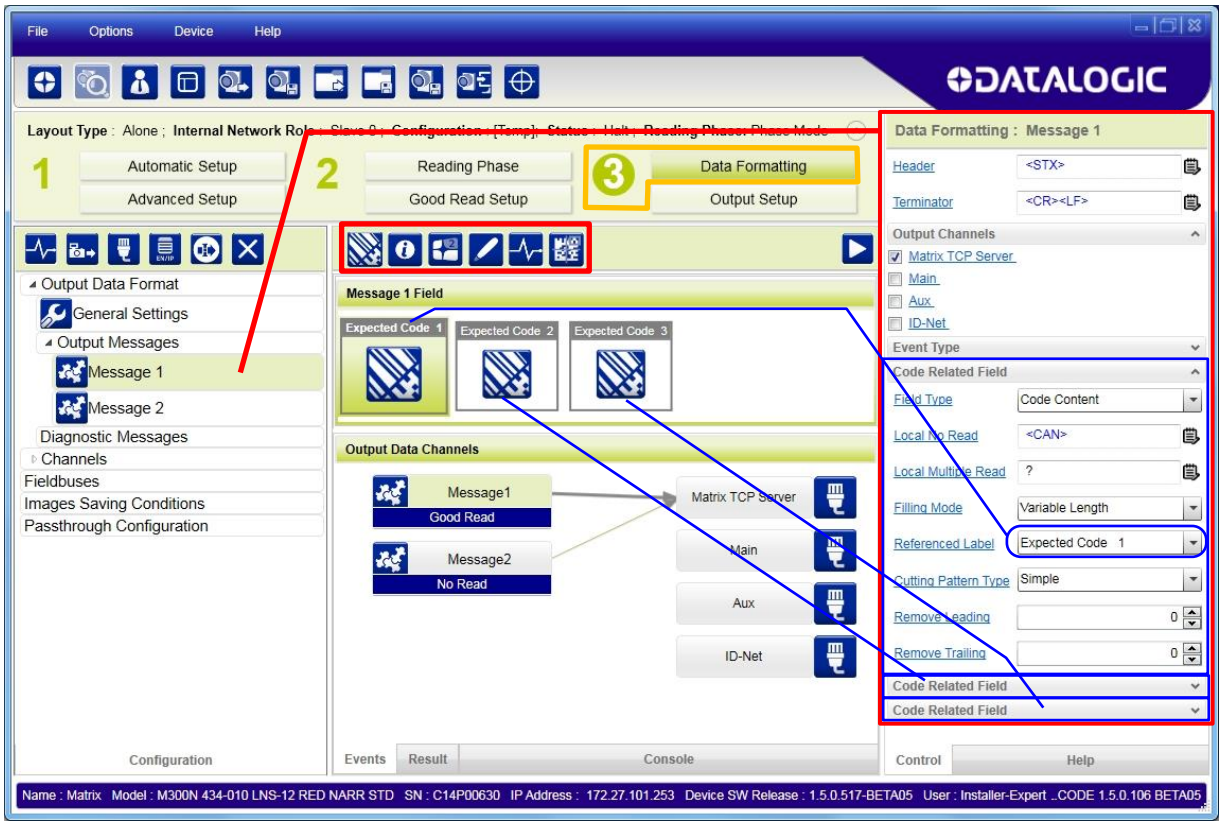



## 3.5 OUTPUT CONFIGURATION PARAMETERS

The Output Configuration parameters are divided into two groups: **Data Formatting** parameters and **Output Setup** parameters.


### 3.5.1 Data Formatting

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

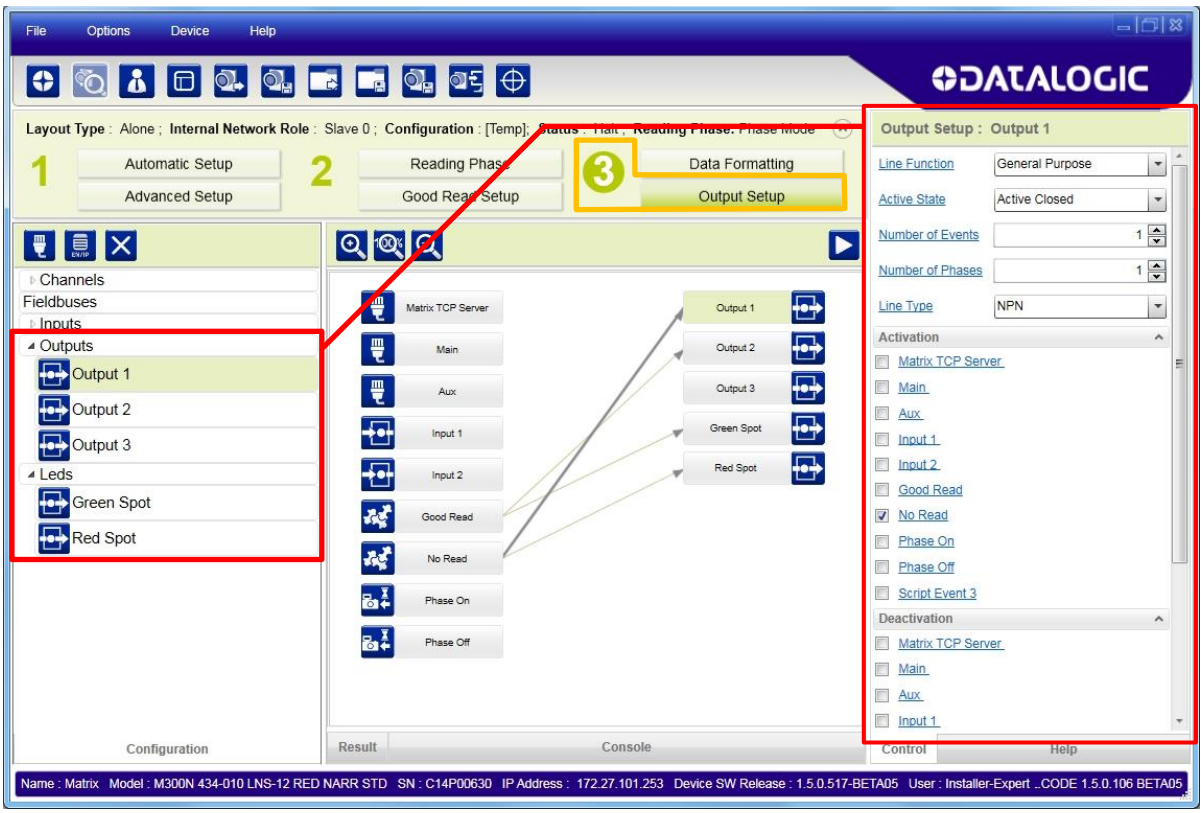


You can add fields to the output message by clicking on the icons above the Message Field area. They will be appended to the message. You can drag them to position them between other fields in the message so that the output message is ordered according to your application requirements.

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

### 3.5.2 Output Setup

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




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

# 4 DL.CODE USER INTERFACE

## 4.1 DL.CODE DEVICE DISCOVERY WINDOW

After loading your specific device from the discovery window (drag & drop from the Device Selection Area), the DL.CODE Device Discovery window presents the following principal areas:

- **Main Menu and Toolbar Area** – allows access to the major program functions and commands. See par. 4.2.
- **Device List Area** – shows all the discovered devices both on and off the LAN. The colored icons next to the device labels indicate network status, see par. 4.1.1. Double-clicking or dragging an available device icon onto the Device Information Area connects it to DL.CODE for configuration.
- **Device Information Area** – this area shows all device specific information: Name, Model, Role, running software and version details.
- **Task Area** – Presents a graphical list of the main features to be performed upon device connection: create a new configuration (Stand Alone or Master/Slave), Open an existing configuration, perform PackTrack calibration, or switch to Monitor mode. These selections are also available in the File and Device Menus.
- **Control/Help Panel** – In the DL.CODE opening window this panel provides a Help description for Device Selection. Once a new or existing configuration is loaded, this is the key area which allows all the individual device configuration parameters to be set. Context sensitive Help is also available from this panel. See par. 4.1.2.
- **Status Bar** – a reserved area that keeps specific information about the connected device: Name, Model, SN, IP Address, Device SW version, user level, and DL.CODE program version always visible.


**Figure 5 – Device Discovery Window Areas**

### 4.1.1 Device List Area

The Device List area shows all the discovered devices both on and off the LAN. The icons indicate the Device status as shown in the table below:

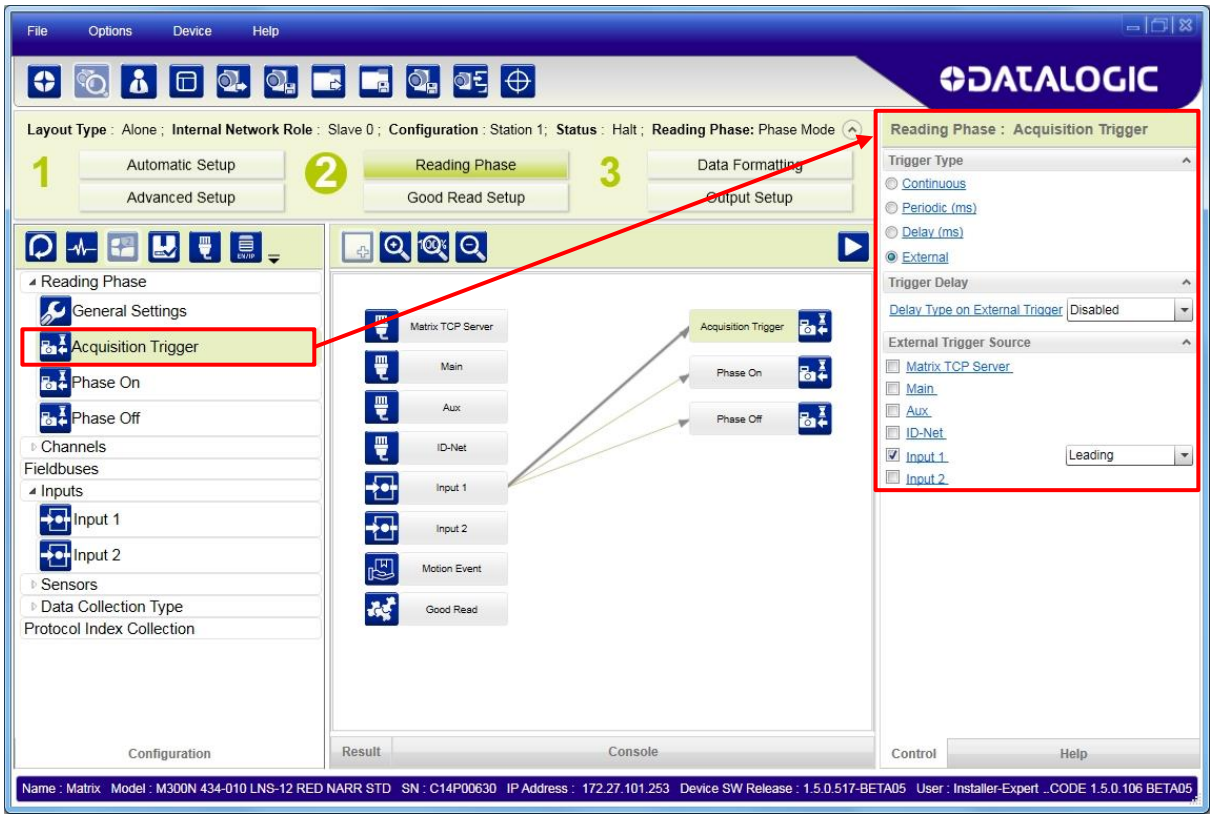
| | |
|---|---|
|  | Stand Alone device connected to the network with a valid LAN IP address. Available for configuration through DL.CODE.<br>Stand Alone device connected to DL.CODE via Serial COM Port. |
|  | Stand Alone device connected to the network with a valid LAN IP address but currently connected to DL.CODE by another User. Not available for configuration through DL.CODE (double-clicking or dragging the icon has no effect). |
|  | Device connected to the network but without a valid LAN IP address (i.e. default IP address). The IP addressing parameters must be modified to connect to the LAN. See par. 3.1.<br>Device connected to a Serial COM port but not to DL.CODE. |
|  | Offline device deactivated. Only one offline device at a time can be activated. |
|  | Master device connected to the network with a valid LAN IP address. Available for configuration through DL.CODE. |
|  | Slave device # connected to the Master via ID-NET and to the network with a valid LAN IP address. Available for configuration directly through DL.CODE. |
|  | Slave device # connected to the Master via ID-NET network but not to the LAN. Available for configuration through the Master connected to DL.CODE. |
|  | Slave device # not connected to the Master via ID-NET. Not available for configuration. |

### 4.1.2 Control/Help Panel

Upon opening DL.CODE, the Device Selection Help Page is displayed with dropdown descriptions briefly explaining how to connect to your device and the various configuration selections. Click on the icon to open the dropdown description.

You can also click on the Show All link at the top of the Help page to open all collapsed text descriptions.


When a new configuration is created or an existing one is opened, the Control page showing all of the configuration parameters for the selected configuration step or item is displayed in the Help/Control area.



By clicking on any parameter name with a hyperlink, the relative contextual help page will open and present the specific parameter description.

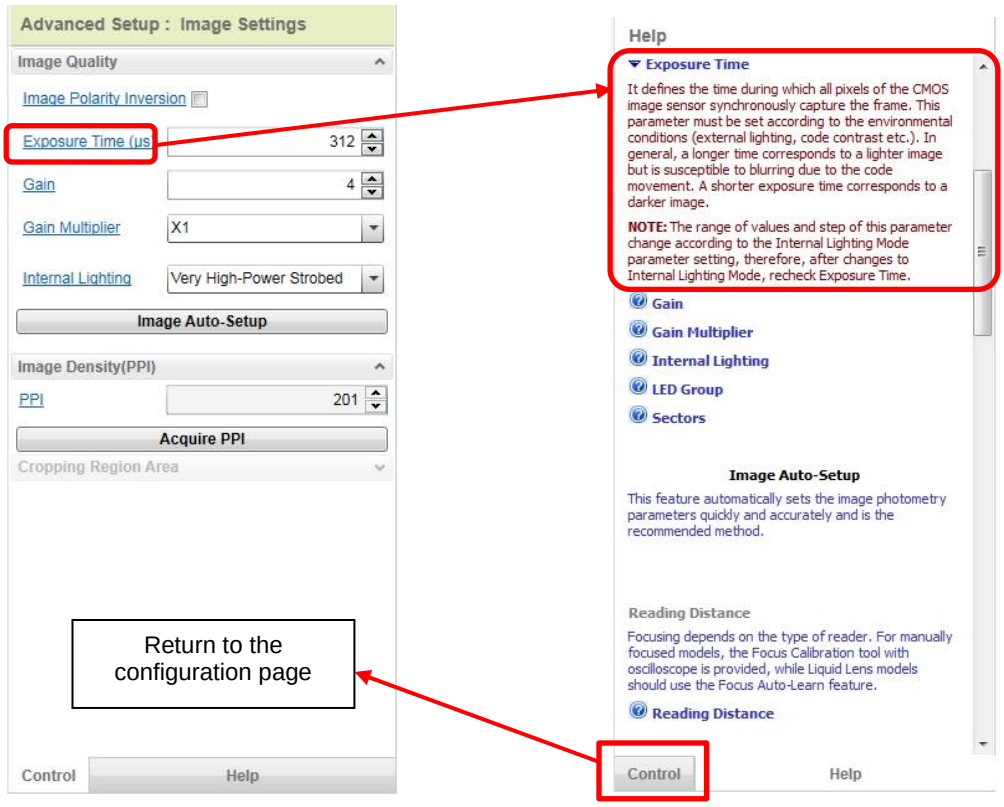



**Figure 6 – Control Panel and Relative Contextual Help Page**

To return to the parameter page, click on the **Control** bar.

## 4.2 DL.CODE MAIN MENU AND TOOLBAR

The Main Menu and Toolbar icons are located at the top of the DL.CODE window as shown below.


The Main Menu presents the following items:

**File:**

- **Getting Started**: returns to the initial Device Discovery window to load a different device. You will be prompted to Save or Discard the current configuration.
- **Open**: load a previously saved configuration from the device memory or from a .dlcfg file selected from a disk/directory of your choice.
- **Save**: save the current configuration to the device memory or to a .dlcfg file selected from a disk/directory of your choice.
- **Setup Internal Network**: sets the current device's internal network Role to Master and performs the Net Auto-set feature to automatically recognize its connected ID-NET Slaves. The Internal Network Configuration window allows ID-NET configuration management. See chapter 10 for details.
- **Monitor**: sets the device to run mode for testing configuration results. An image window is displayed along with Statistics, Diagnostics and a Console for output message verification. See chapter 8 for details on using and configuring the Monitor.
- **Exit**: exits the DL.CODE User Interface.

**Options:**

- **Change Language**: allows you to change the display language used for DL.CODE in real time. The selected language will also be used for successive sessions.
- **UI Settings**: opens a window where various settings can be made regarding DL.CODE presentation on the PC. The following DL.CODE features can be configured: console presentation, Image Buffer positioning and behavior, Simulator Settings, and selecting which features to enable for viewing. The Monitor can also be configured from this window by selecting the Monitor tab.
- **Change Log Level**: allows the configuration log level to be changed between Verbose, Information and Error.
- **Change User**: allows the configuration access level to be changed between Basic-User (no parameters modification allowed), Basic-Installer (medium level of parameter modification allowed) and Expert-Installer (maximum level of parameter modification allowed).
- **Restore UI to Default**: restores all UI panels to their default positions.

**Device:**

- **Connect to Device**: if not already connected to a device, this allows you to connect to a device on the LAN by inputting its IP Address into the dialog box and clicking Connect.
- **Find Devices**: searches for new devices connected to the LAN without disconnecting from the current device.
- **Settings**: opens device configuration windows for configuring Environment parameters (see chp. 14), Advanced Configuration Settings, resetting Statistics and/or Diagnostic counters and viewing HMP shortcuts.
- **Update Package**: allows updating the device firmware (application program, schema, etc.) either upgrading or downgrading to a different version, see also Caution below.
- **Multi-Device Package Update**: allows updating multiple devices simultaneously. This command is only available when no device is currently connected to DL.CODE. Update firmware (application program, schema, etc.) either upgrading or downgrading to a different version, see also Caution below.

  After selecting the software package to update, select the devices from the list in the Mult-Device Package Update window. When updating is completed the window reappears indicating success or failure for each device.
- **Change Current Configuration**:
- **Restart Device**: performs a software reset on the loaded device.
- **Backup/Restore**: manages all the backup and restore options to and from the device as well as restoring the default settings.
- **RAM Image Buffer Settings**: opens the RAM Image Buffer Management window to either save or discard images in the device's RAM Image Buffer.
- **PackTrack Calibration**: launches the Packtrack Calibration procedure. See chapter 11 for details.

**CAUTION:** Before performing any downgrade of device firmware, always restore the reading device default environment parameters using the X-PRESS button procedure on the reading device, (see the device Reference Manual). Alternatively, execute this command from the DL.CODE Device menu: Backup/Restore>Restore Defaults>Restore Default Environment.

**Help:**

- **About**: opens the information window containing the DL.CODE program release version number.
- **DL.CODE User's Manual**: opens this manual.

**Toolbar buttons:**

| | |
|---|---|
|  | Getting Started: Disconnects the current device and returns to the Device Discovery window. If the current configuration hasn't been saved you will be prompted to do so before disconnecting. |
|  | Find Devices: Executes a device discovery to find new or modified devices on the LAN without disconnecting from the current device. |
|  | Change User: Select a different User configuration access level. |
|  | Restore UI to Default Layout: resets all the various DL.CODE resizable graphical areas (window panels) to their default layout positions. |
|  | Open Device Configuration: Open a previously saved configuration from the device memory. You can create a new configuration by opening a configuration in the list and then saving it with a new name. |
|  | Save on Device: Save the current configuration to the device. |
|  | Load from PC: Open a previously saved .dlcfg configuration file from the local PC or from a remote network location. |
|  | Save on PC: Save the current configuration to a .dlcfg file on the local PC or to a remote network location. |
|  | Save Configuration in Temporary Memory: |
|  | Configuration/Monitor Switch: toggles between the Configuration environment and the Monitor environment. See chp. 8 for details. |
|  | PackTrack Calibration: starts the PackTrack Calibration feature. See chapter 11. |

### 4.2.1 User Levels

DL.CODE has a 3-level user interface (**Basic User** level, **Basic Installer** level, **Expert Installer** level).

Each level can be accessed by selecting it from the Options Menu.

The User levels have the following access rights.

**Basic User**: only access to the Monitor feature is given. No device configuration.

**Basic Installer**: a subset of program features and configuration parameters is allowed.
No Master/Slave configuration, no multiple Image Settings configurations, no Postal Codes configuration, no Fieldbus configuration.

**Expert Installer**: access is given to all program features and configuration parameters.

## 4.3 MULTI IMAGE ACQUISITION SETTINGS

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

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

This feature is available for all Operating Modes.

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

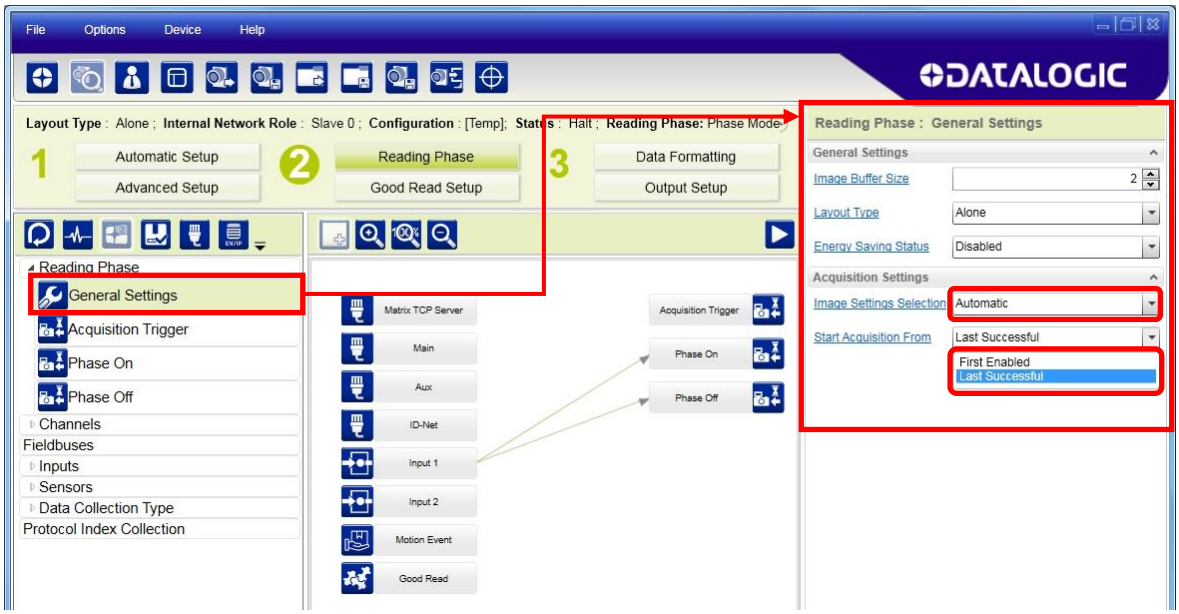

For each Image Setting condition start **Image Auto Setup**, select the Static or Dynamic Self-Tuning option; and Apply it.

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

### 4.3.1 Automatic Image Settings Selection

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

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



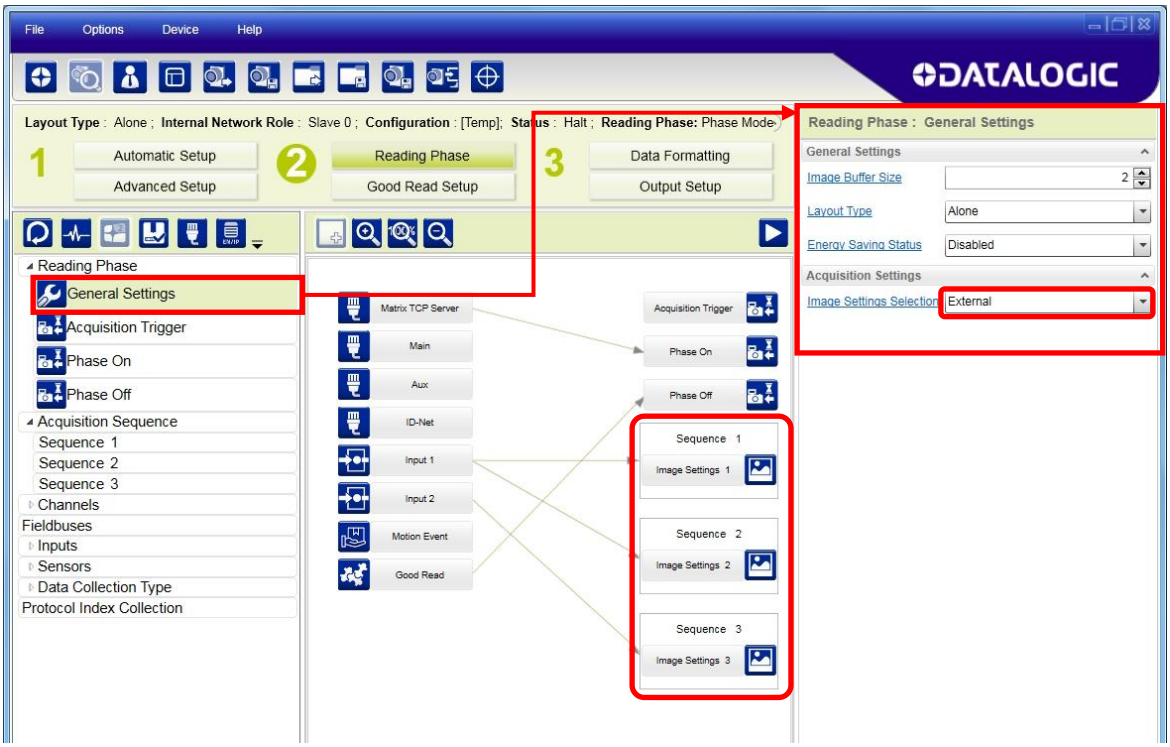

**NOTE:** Applications typically require more than one acquisition to obtain sufficient Good Read percentages. This means that for *N* acquisitions we will surely have captured the correct lighting condition but we will also have captured some acquisitions with the wrong lighting condition. A consequence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

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

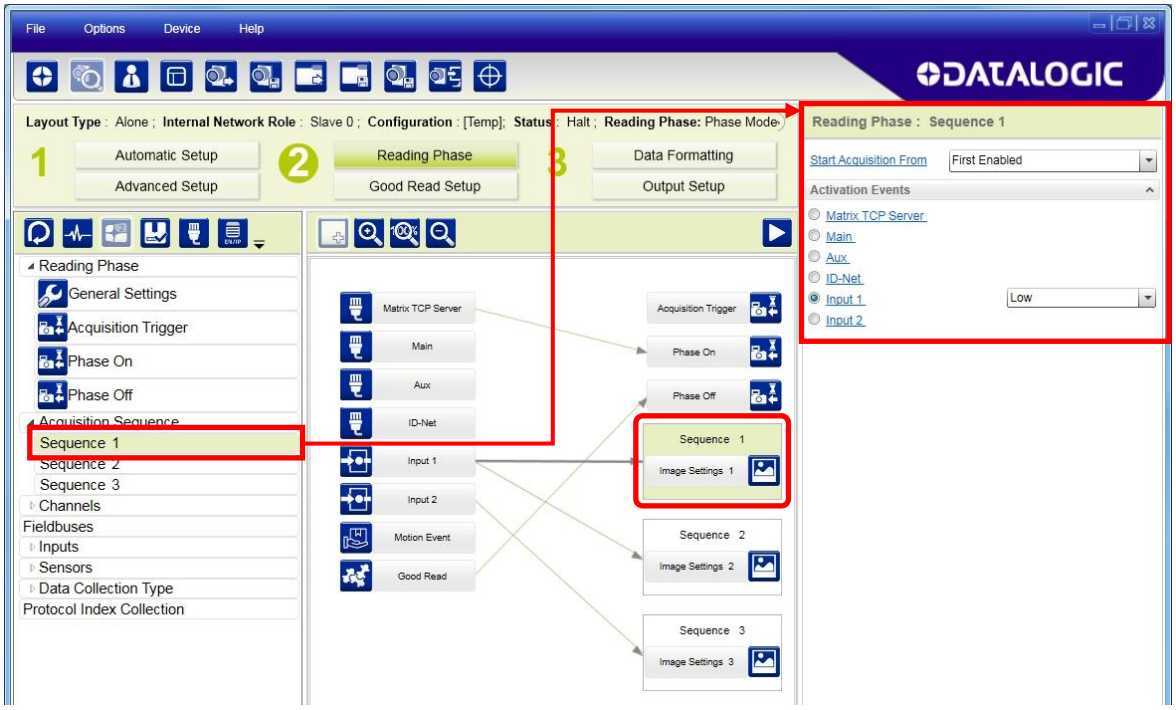
### 4.3.2 External Image Settings Selection

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

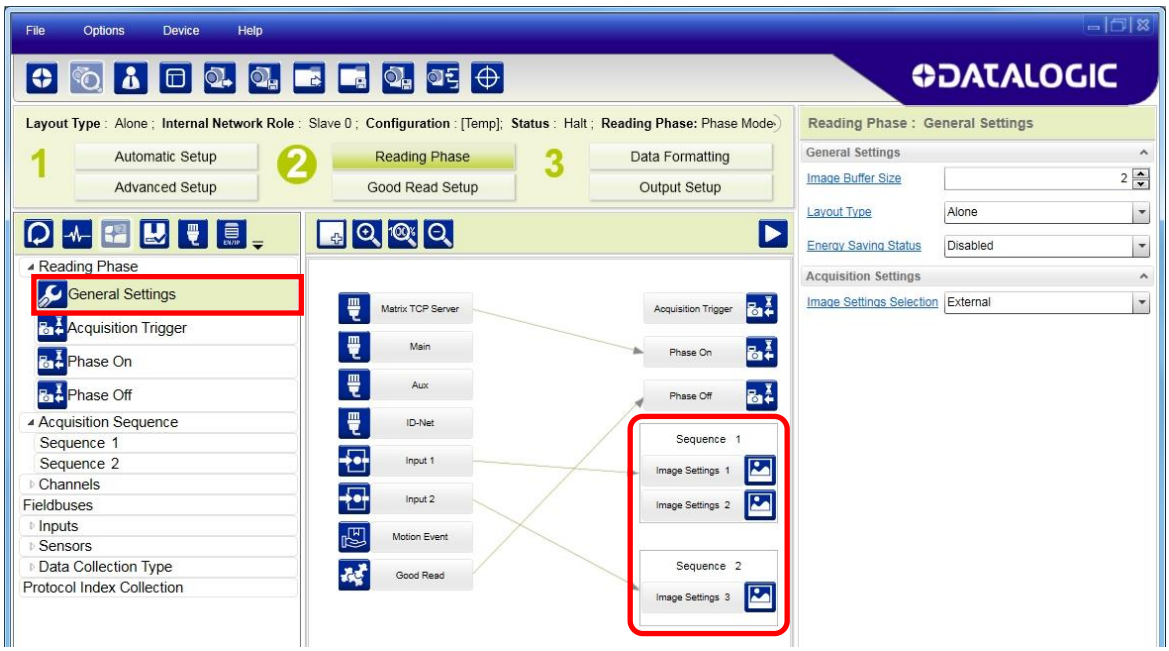
When the **Image Settings Selection** is **External**, Acquisition Sequences are created and by default each Image Setting has its own Acquisition Sequence.




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

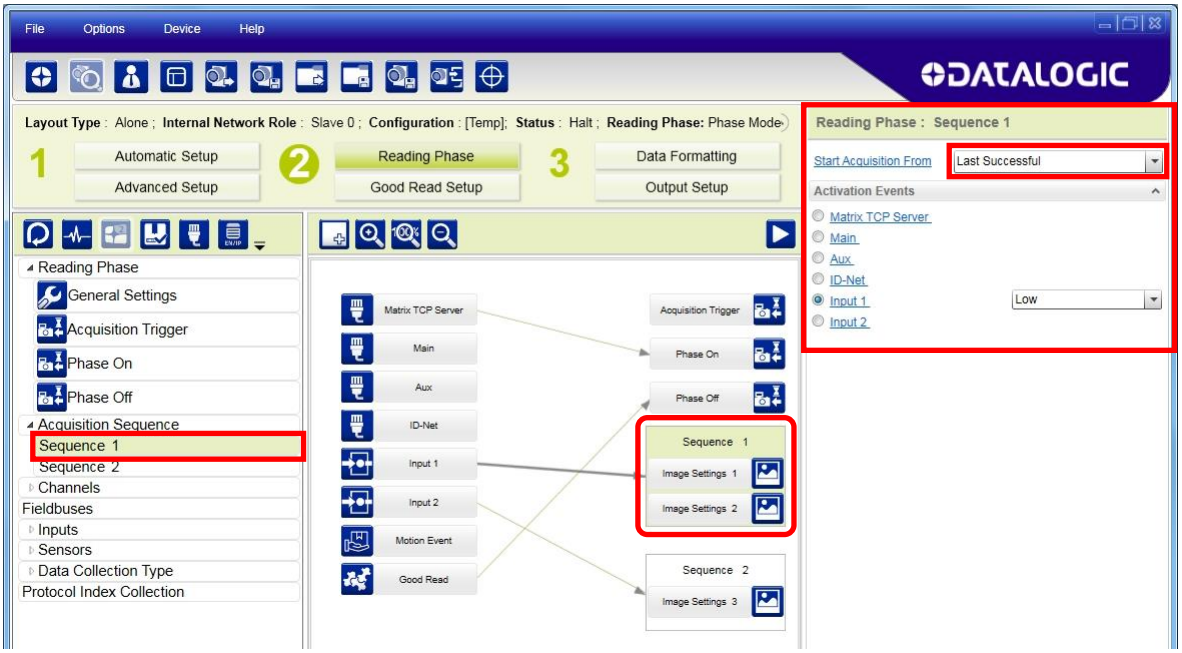


Alternatively a hybrid configuration can be made where more than one **Image Setting** can be grouped into an Acquisition Sequence by dragging it into the desired Sequence box. Select the empty Sequence box and delete it with the delete key.




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

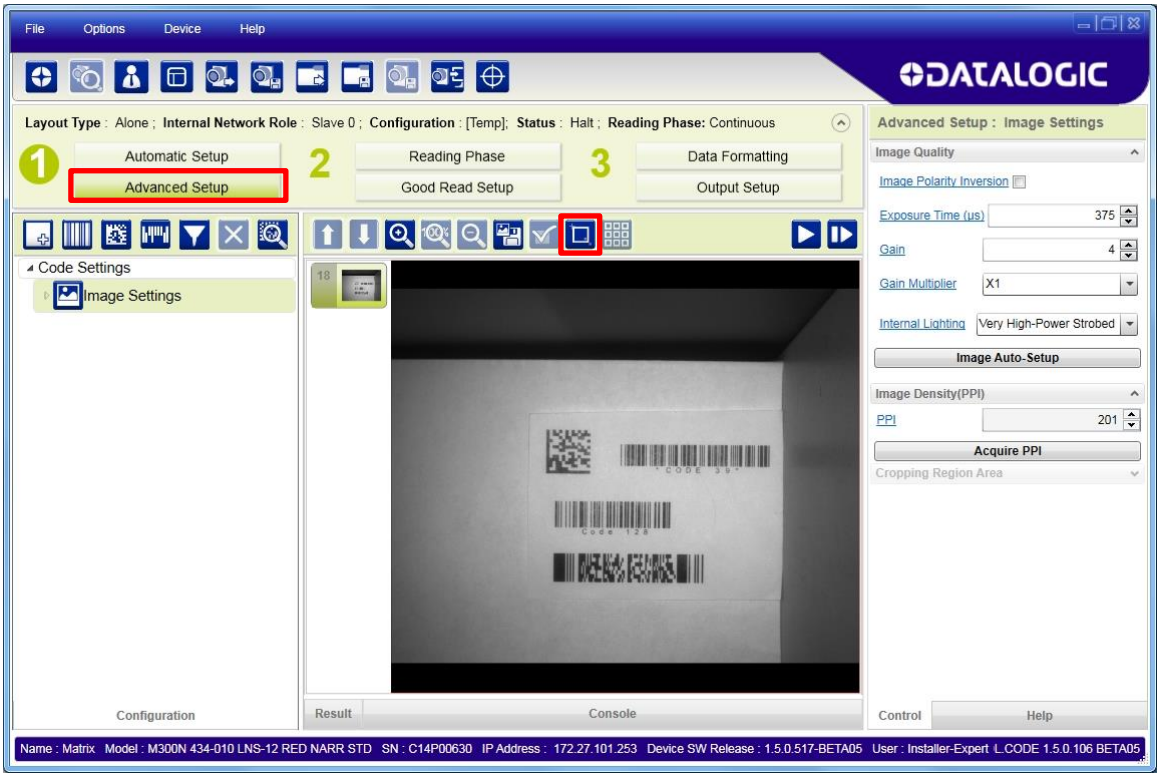
In this case the **Start Acquisition From** parameter can improve the read rate for that Sequence. It has no meaning for a Sequence containing only one Image Setting.



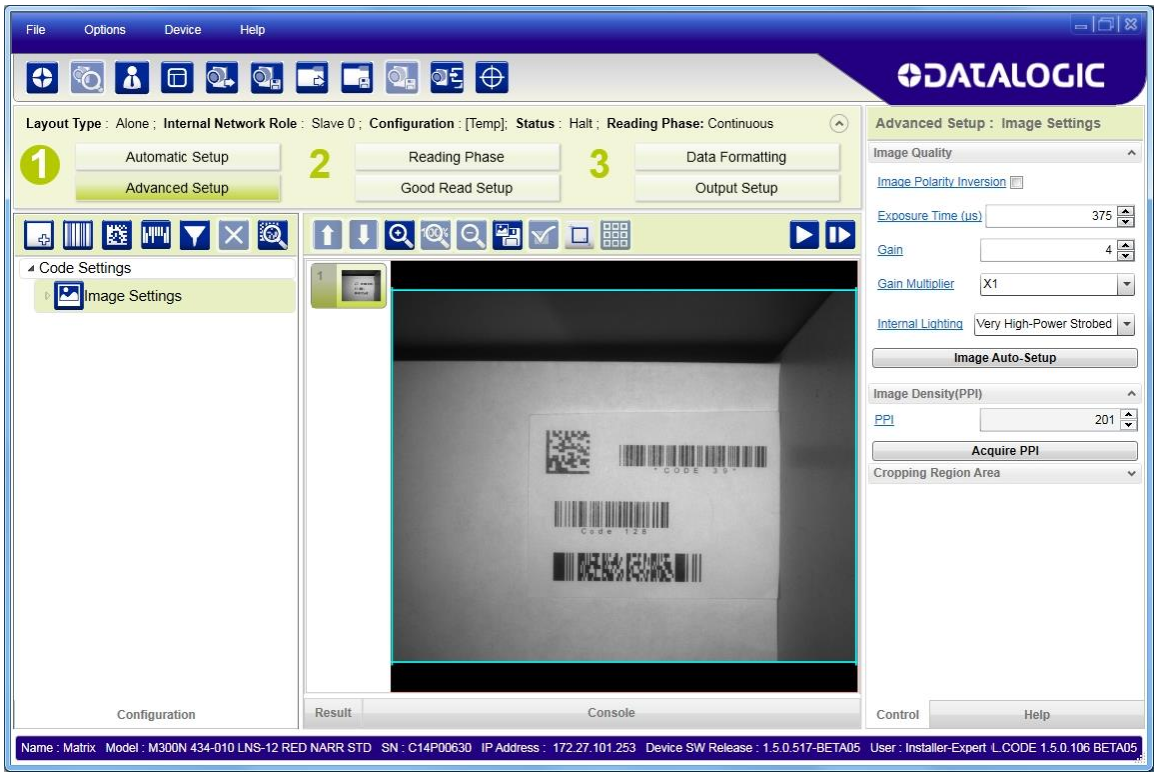
## 4.4 IMAGE CROPPING

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

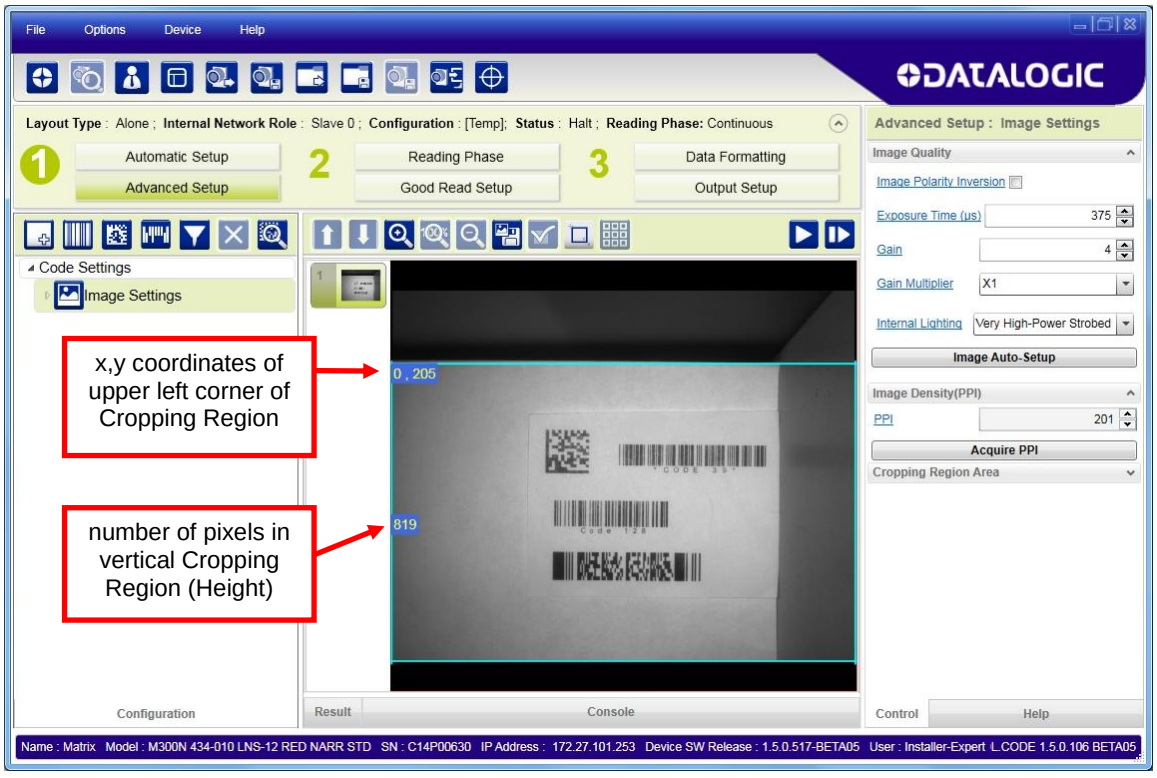
Image cropping allows reducing the Image processing area from the full FoV to a smaller area where codes are present. By excluding portions of the FoV, processing time is reduced.



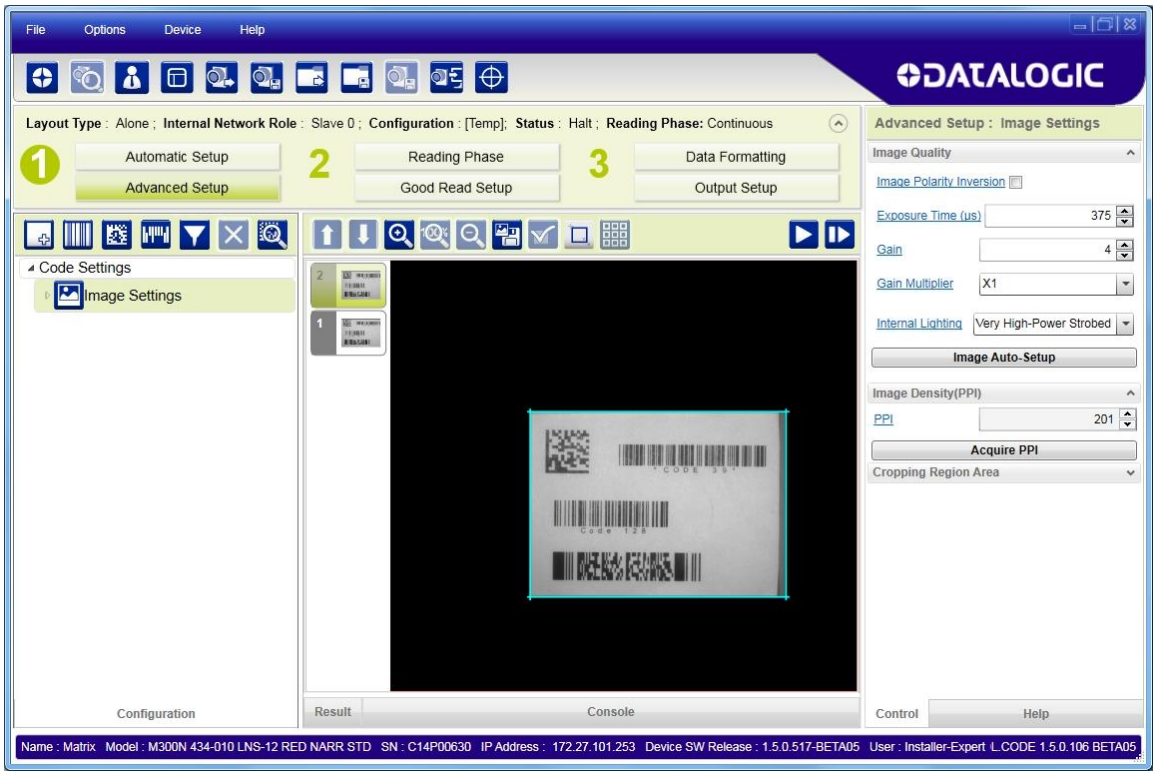
After clicking the Add Cropping Region icon, a blue border appears which by default is equal to the FoV.



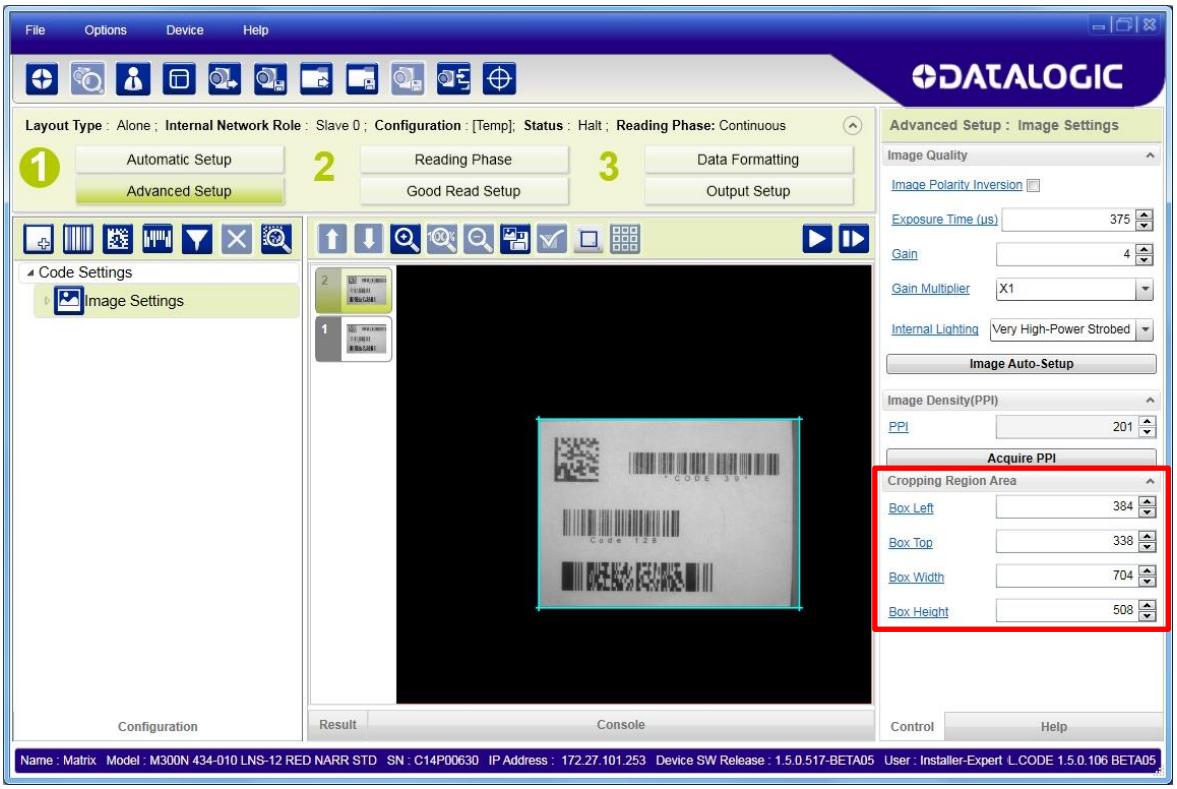

By dragging the edges with the mouse (resizing) you can crop the image to a specific location where codes are present. The numbers in the blue boxes refer to pixel references.



The cropped area can be moved by dragging its center.



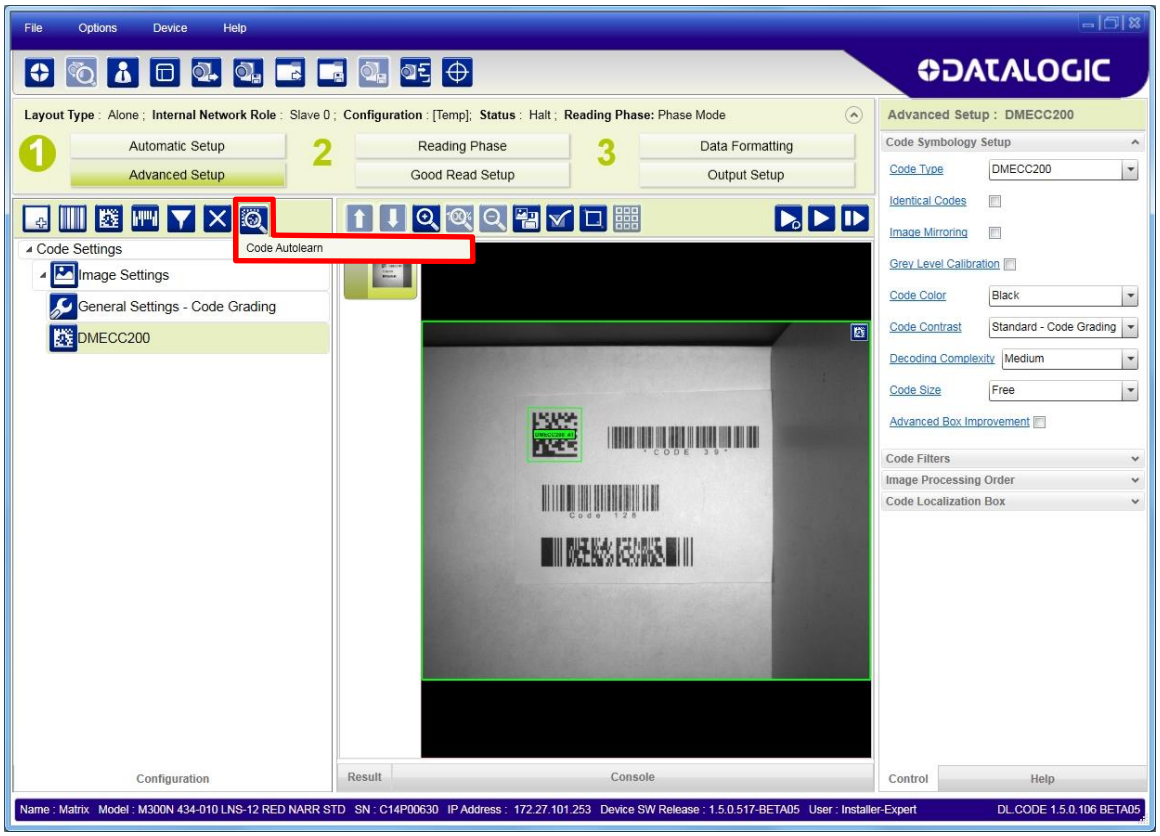

You can also set the cropped image size and position through the Cropping Region Area group of parameters; size = **Width** and **Height**, position = **Left, Top** (x,y) coordinates.



## 4.5 CODE AUTOLEARN FEATURE

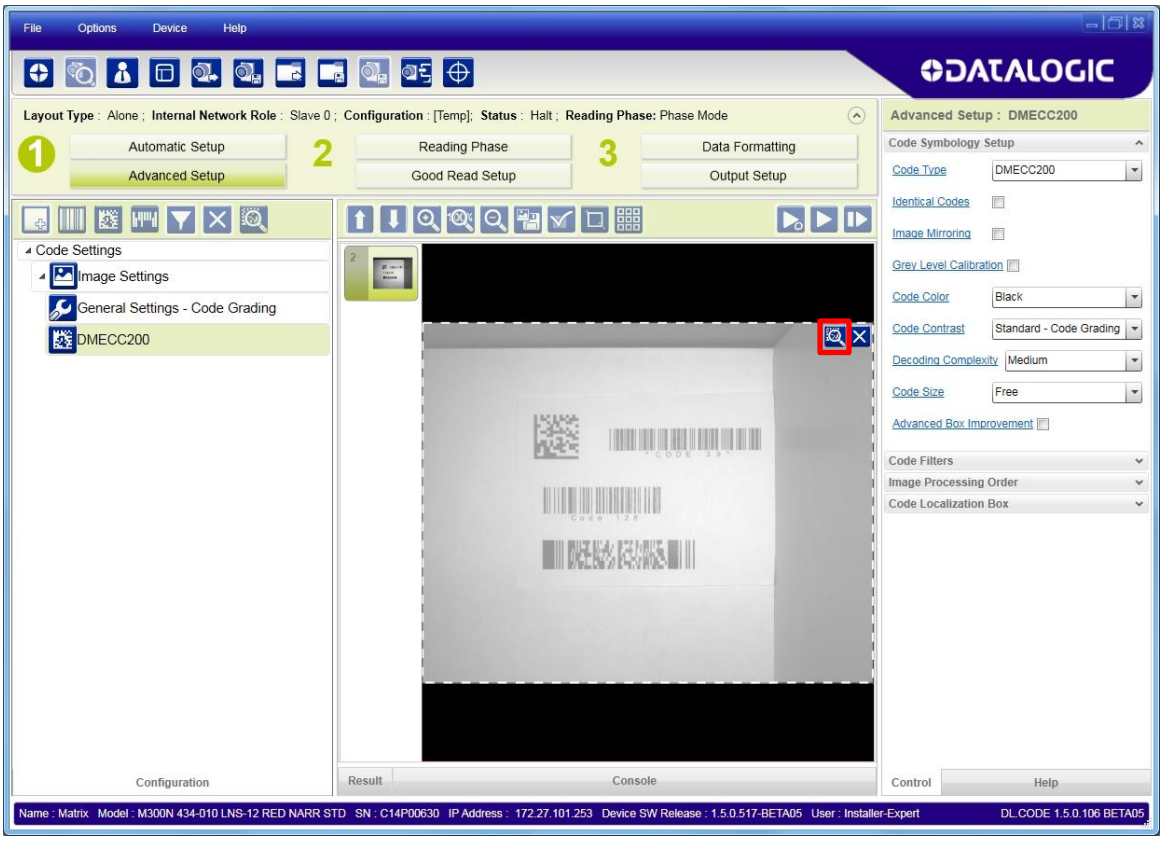
From the Advanced setup page you can run the Code Autolearn feature which will recognize all the codes present in the captured image.

1. From the Advanced Setup Page click on the Autolearn icon and select Code Autolearn.



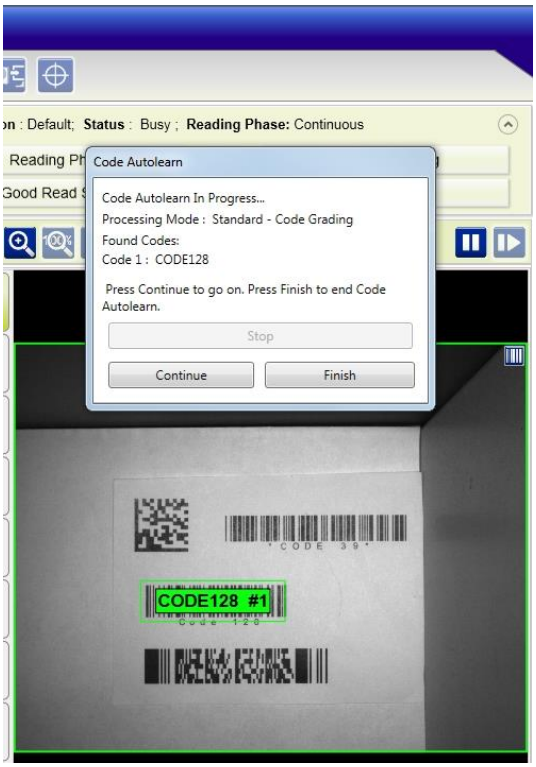
The Autolearn region (equal to the FoV) is shown in grey. You can reduce and/or move the search area by dragging the borders or the center of the area with the mouse.

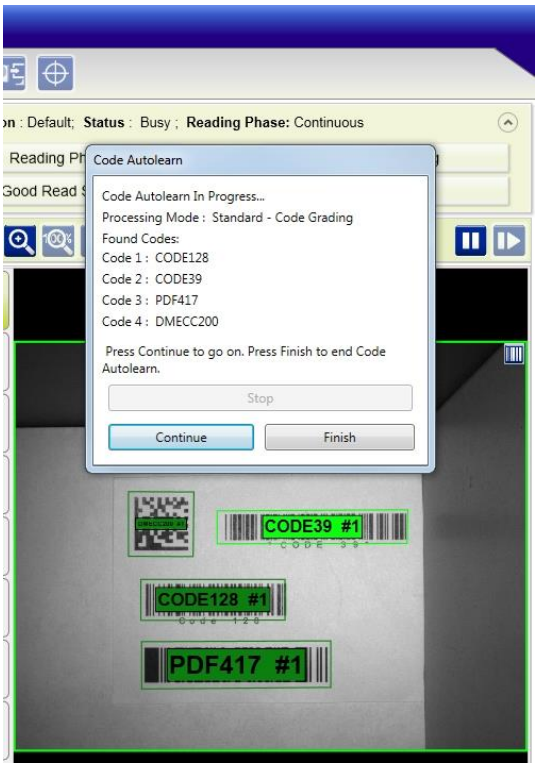
- Reducing the area can reduce the time necessary to find the code(s).
- Moving the search area allows finding specific code(s) in the image.



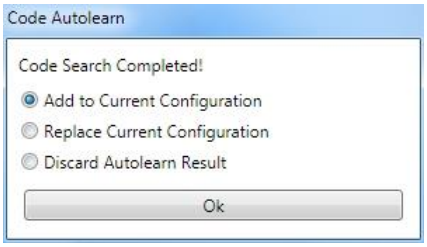

2. Whether the area is reduced or not, you can start the Autolearn feature by clicking on the Autolearn icon in the display area.

   Each autolearn iteration locates a single code symbology and you will be prompted to Continue (if you need to find other codes) or to Finish.




3. When you have located all the code symbologies, click on Finish. You will be prompted to choose a saving selection.



## 4.6 IMAGE FILTERING

Image Filtering is typically done in DPM applications where the marking technique produces module shapes or textures that can make decoding difficult. Special DPM algorithms are provided to improve decoding as well as pre-processing Image Filters which modify the image to compensate for defects.

The following paragraphs detail the DPM parameters used to enhance decoding capabilities.

### 4.6.1 DPM Algorithms

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

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

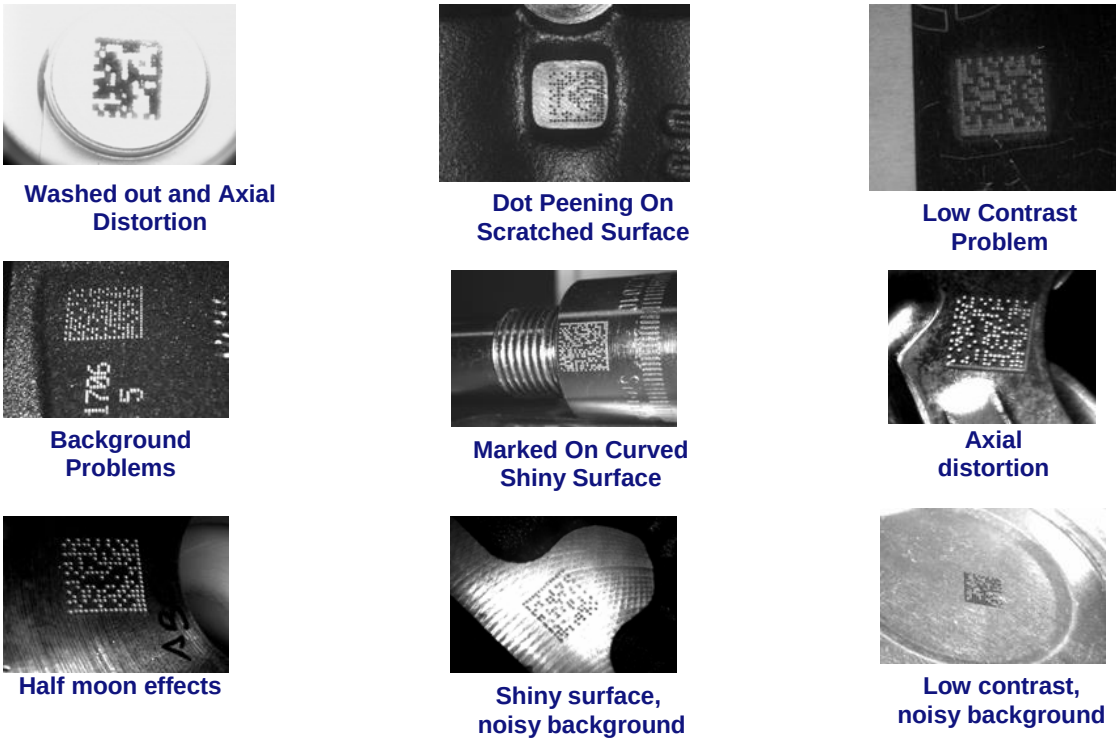



**Figure 7 – Problematic Direct Part Marking Examples**

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.

## 4.6.2 Image Filters

In DL.CODE, when Image Filters are used, they are always applied relative to a specific code symbology or group of symbologies depending on the nesting logic applied to the tree structure. See par. 4.6.3 for examples.

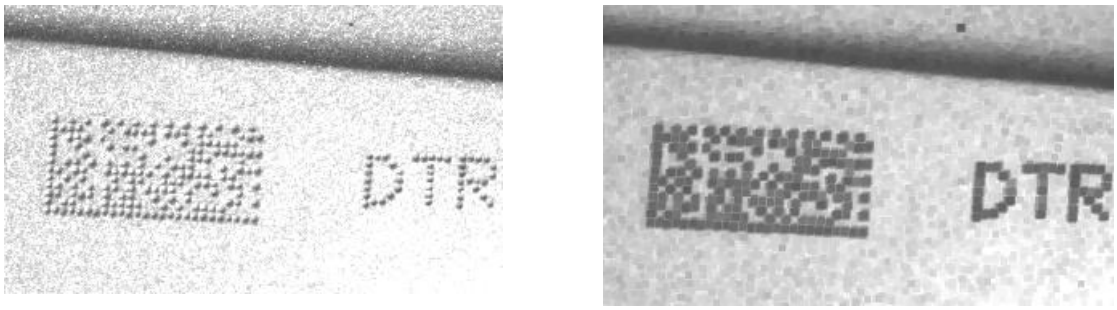
The following Image Filters can be applied to DPM codes to improve decoding.

**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).

Different filters can be applied to a single code or group of codes in one or more *Image Settings*. See par. 4.6.3.

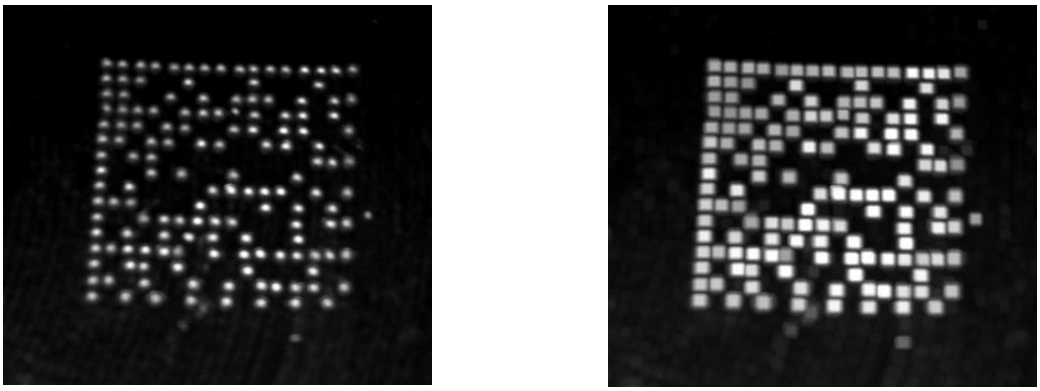
The ***Erode*** Filter enlarges the image dark zones to increase readability.




Before - No Read After - Readable

**Erode**

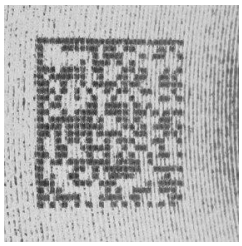
The ***Dilate*** Filter enlarges the image white zones to increase readability.



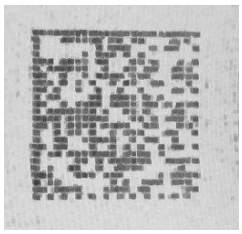
Before - No Read After - Readable

**Dilate**

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



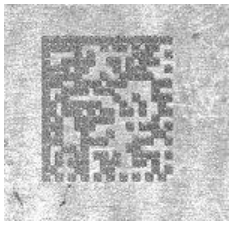
Before - No Read



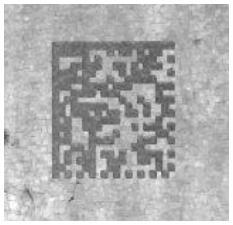
After - Readable

**Close**

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



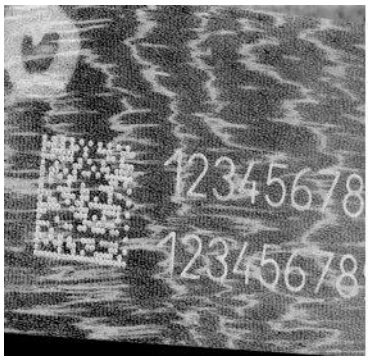
Before - No Read

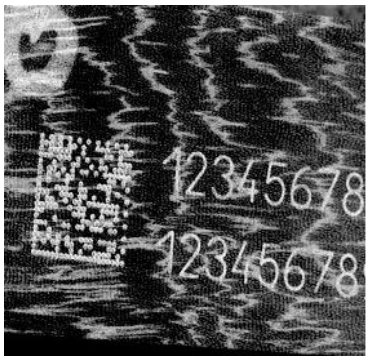


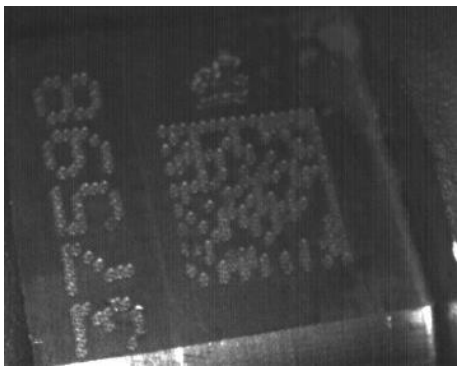
After - Readable

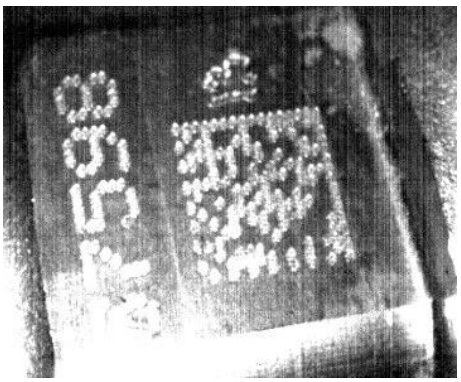
**Open**

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





Before - No Read

After - Readable

**Contrast Stretching**

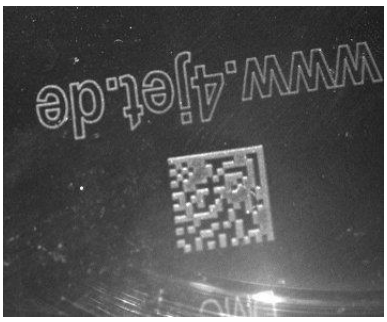
The ***Histogram Equalization*** filter makes the gray level distribution uniform.

Before - No Read

After - Readable

**Histogram Equalization**

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

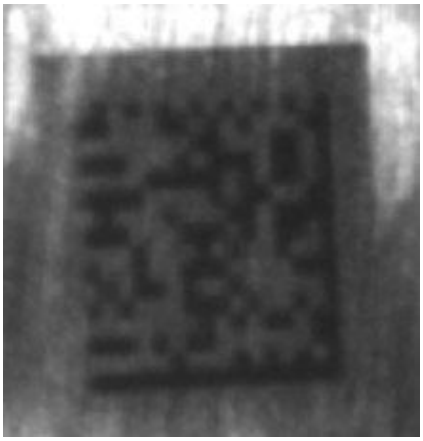


Before - No Read

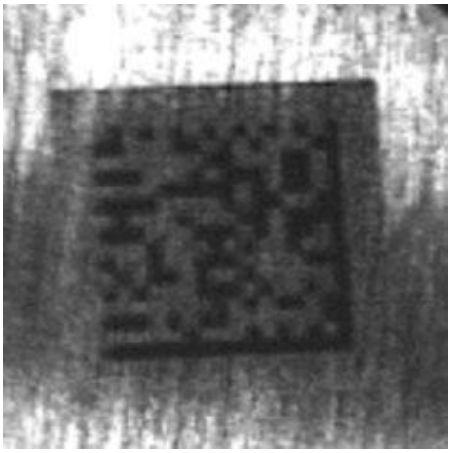
After - Readable

**Smoothing**

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



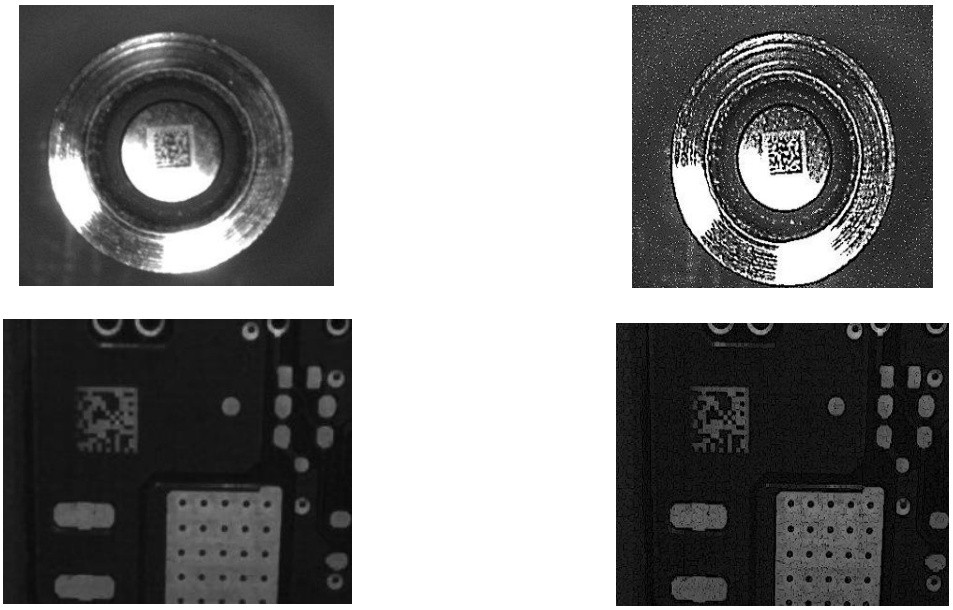
Before - No Read



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**

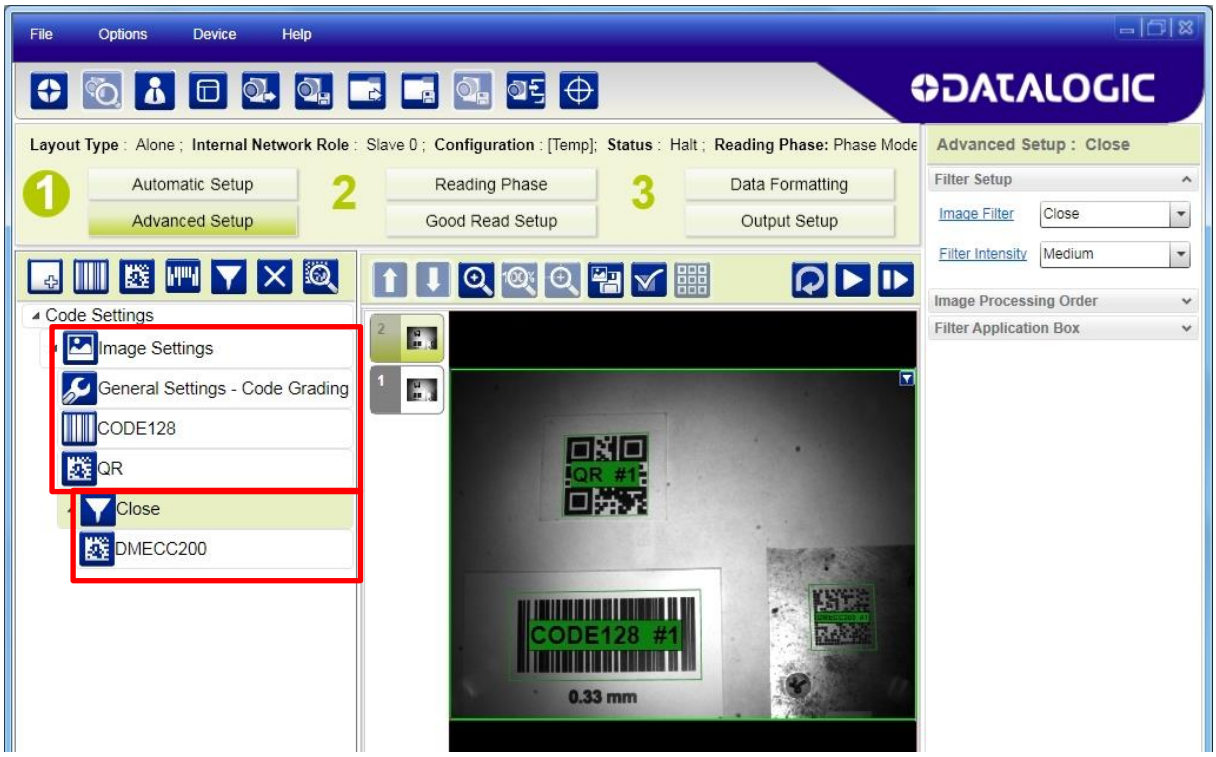
### 4.6.3 Image Filter Setting Examples

## Example 1

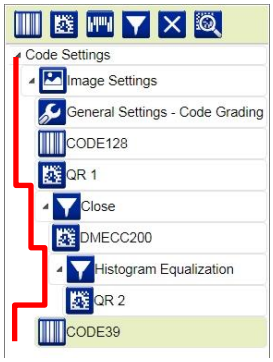
To demonstrate how to apply an Image Filter through DL.CODE, the following example shows a hypothetical application in which a Data Matrix ECC 200 DPM code and printed label codes (QR Code and Code 128) must be decoded in the same image. In this example the codes can be found in any area within the image.

To correctly decode the Data Matrix ECC 200 DPM code, an Image Filter needs to be applied.

Since all codes can be found in any area of the image, both Code Localization and Filter Application boxes will be left at their default values, all covering the entire image area. The resulting image is shown below.




**NOTE:** By leaving the Filter Application box at its default value, covering the entire image area, you will see the visual filter effects on the entire image, seemingly affecting the other codes, however this pre-processing filter is **only** applied to the Data Matrix ECC 200 code as shown in the configuration parameter tree. **The filter is not applied to Code 128 and QR Codes**.

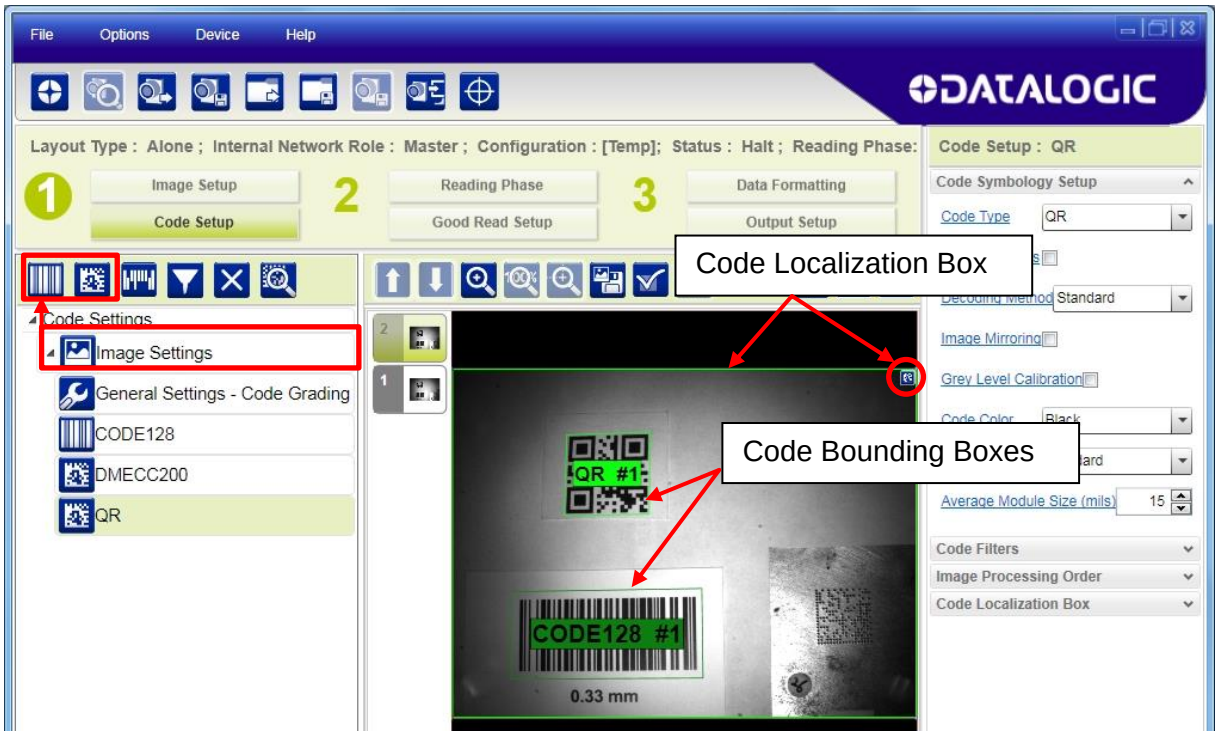



Since the visual effects in the image area are overlapped, you should not use this as a reference to determine how and where Image Filters are applied. You must read Image Filter application from the Tree structure in the configuration parameter tree area. The example in the figure to the left shows:

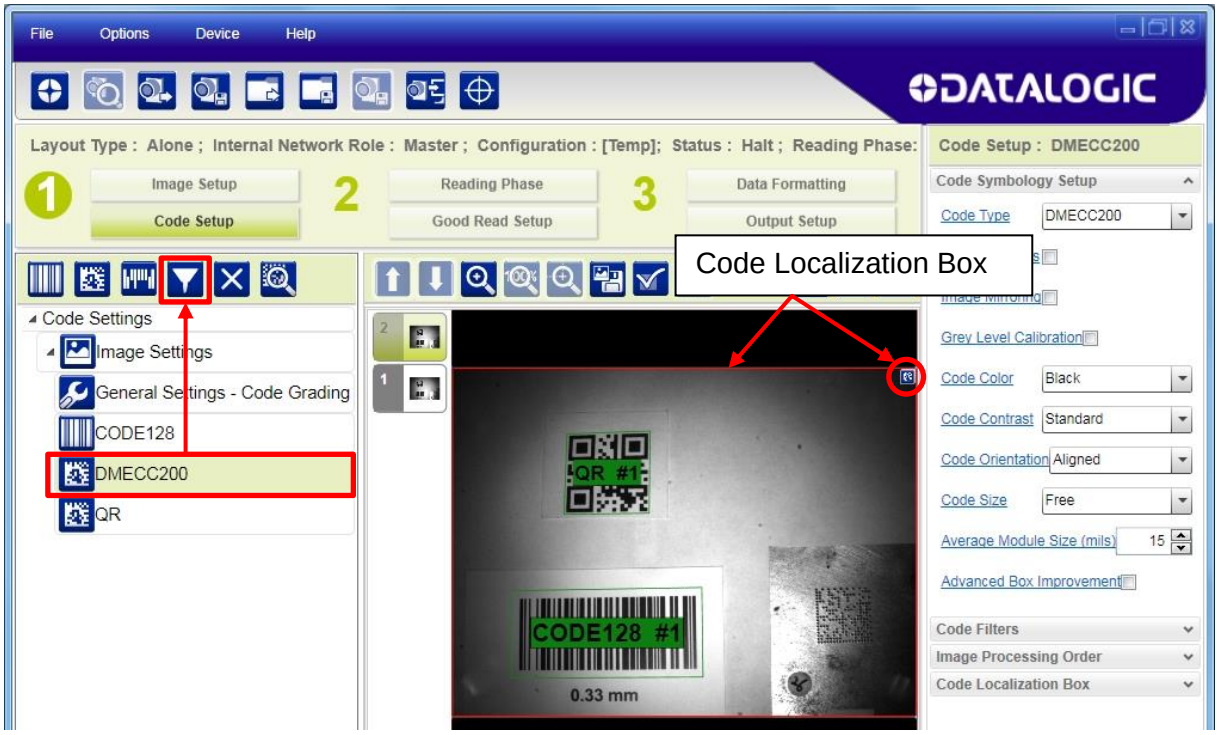
- Code 128, QR1 and Code 39 at the Image Settings level = No Image Filters applied.
- DMECC200 has the Close Filter applied to it.
- QR2 has the Histogram Equalization Filter applied to it and it is also nested under the Close Filter, so both filters apply to QR2.

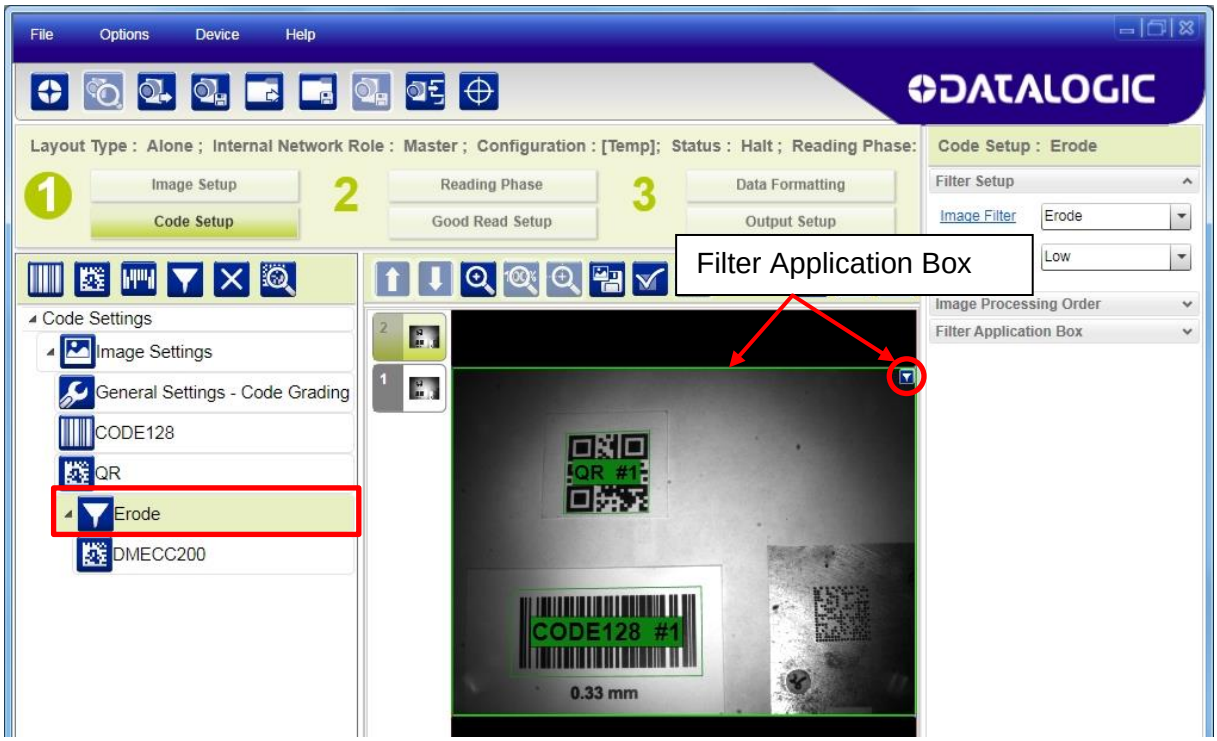
The following steps are taken to apply the Close filter to Example 1:

1. From the Image Settings group, add the Code Symbologies that must be decoded: Code 128, DMECC200 and QR Code. The Code 128 and QR Codes are successfully decoded; Code Localization boxes as well as code bounding boxes are colored green.

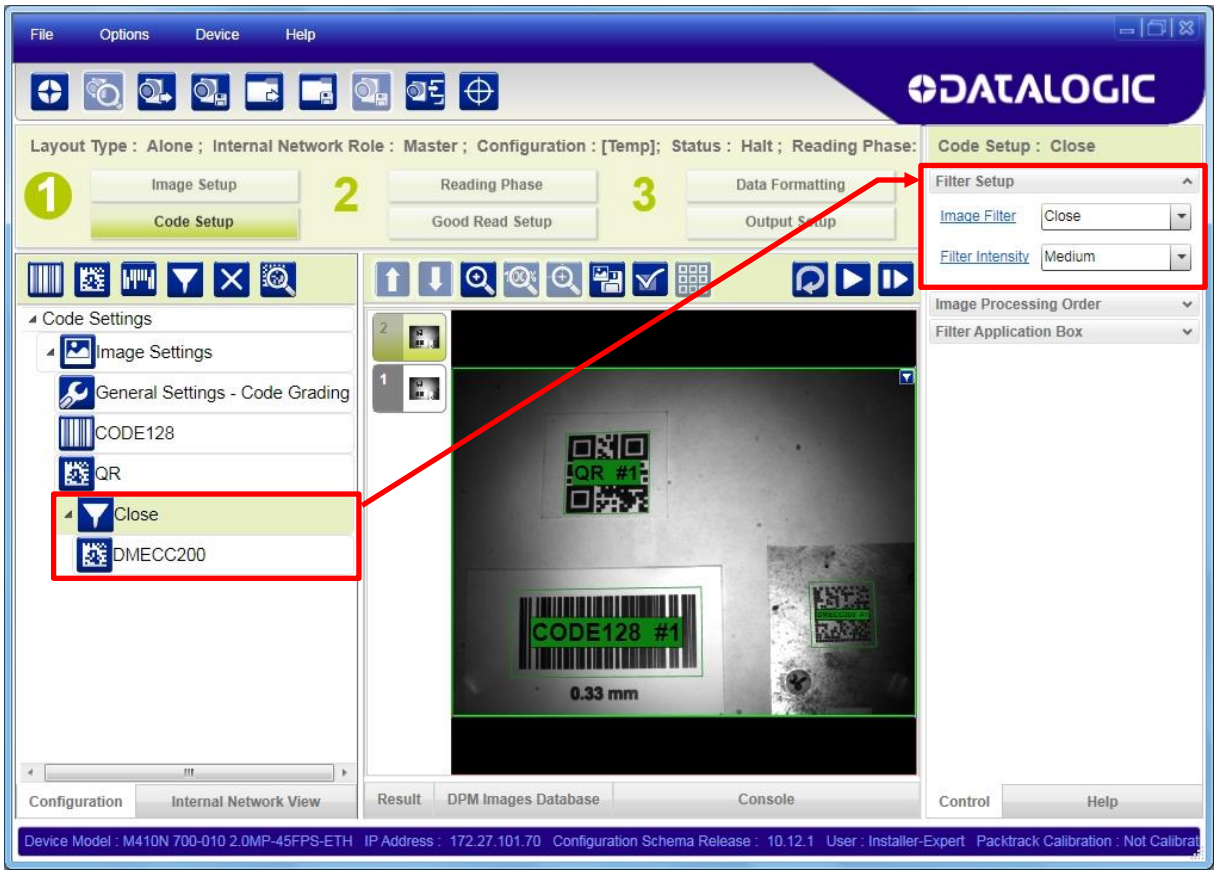



2. Select the Data Matrix ECC 200 code and add the Image Filter. Notice that the Data Matrix DPM code is not successfully decoded, Code Localization box is colored red.






3. Select the desired Image Filter Type and Intensity for correct decoding.

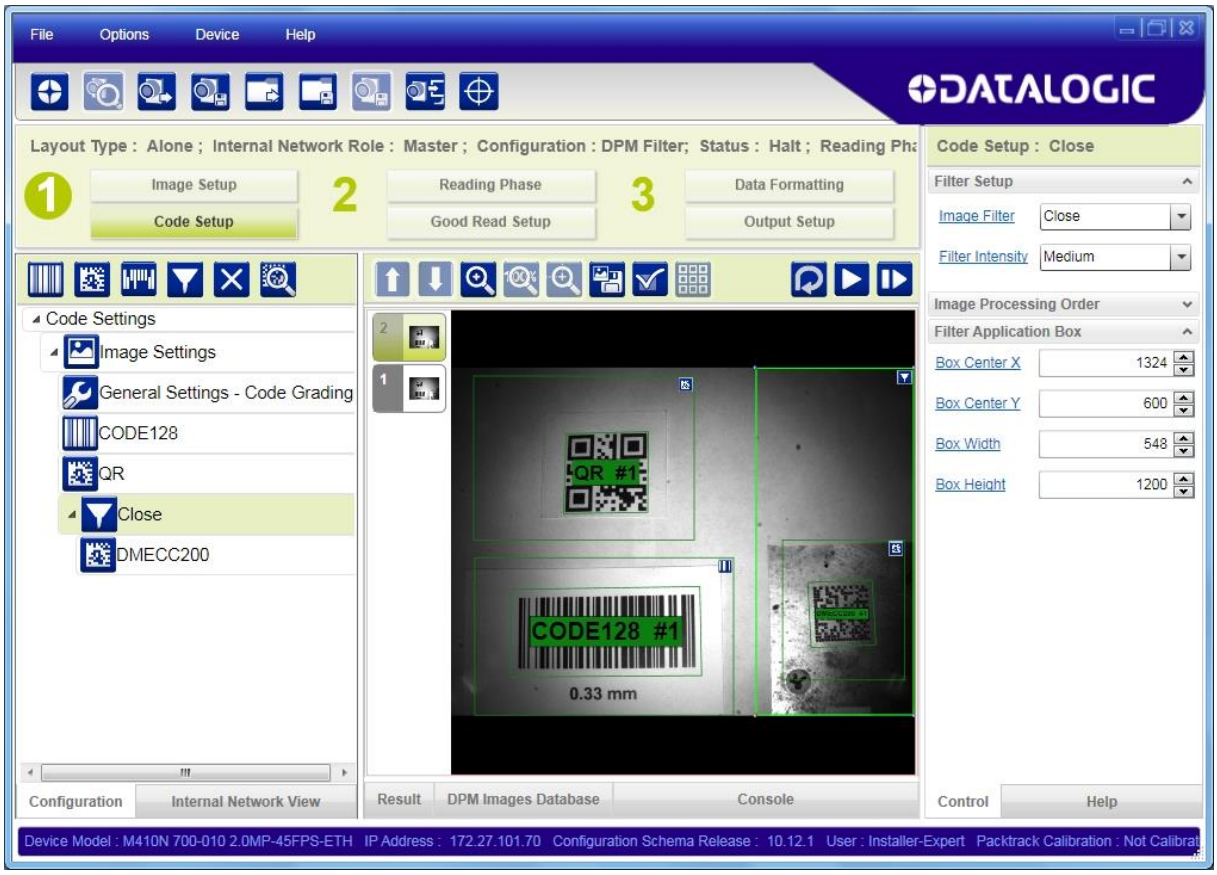



The Data Matrix DPM code is now successfully decoded; Code Localization box as well as code bounding box are colored green.

## Example 2

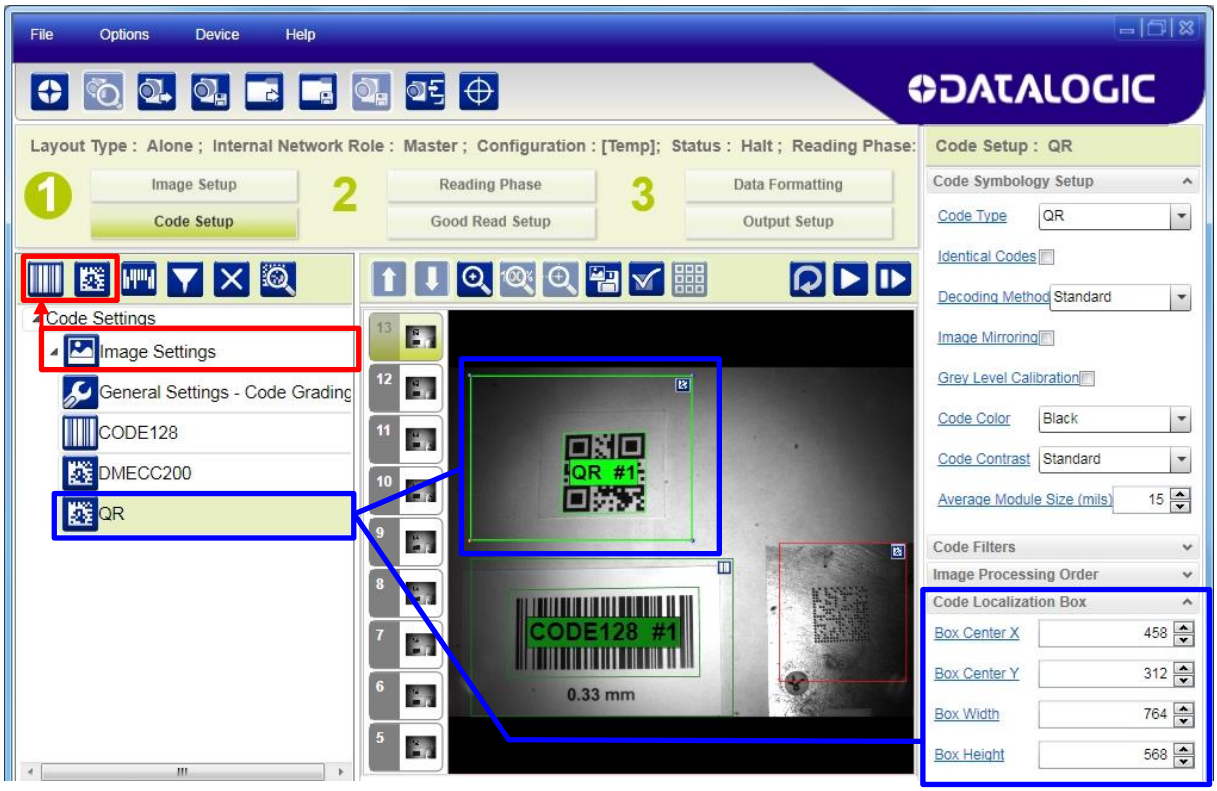
This example is based on the previous one except that each of the three code symbologies will always be located in a specific physical area of the image and must not be decoded out of its expected position.

In this case, not only do we need to apply an Image Filter to the Data Matrix ECC 200 DPM code, but we need to set the Code Localization and Filter Application box sizes and positions to their respective image area to prevent decoding a code if it is in the wrong position.

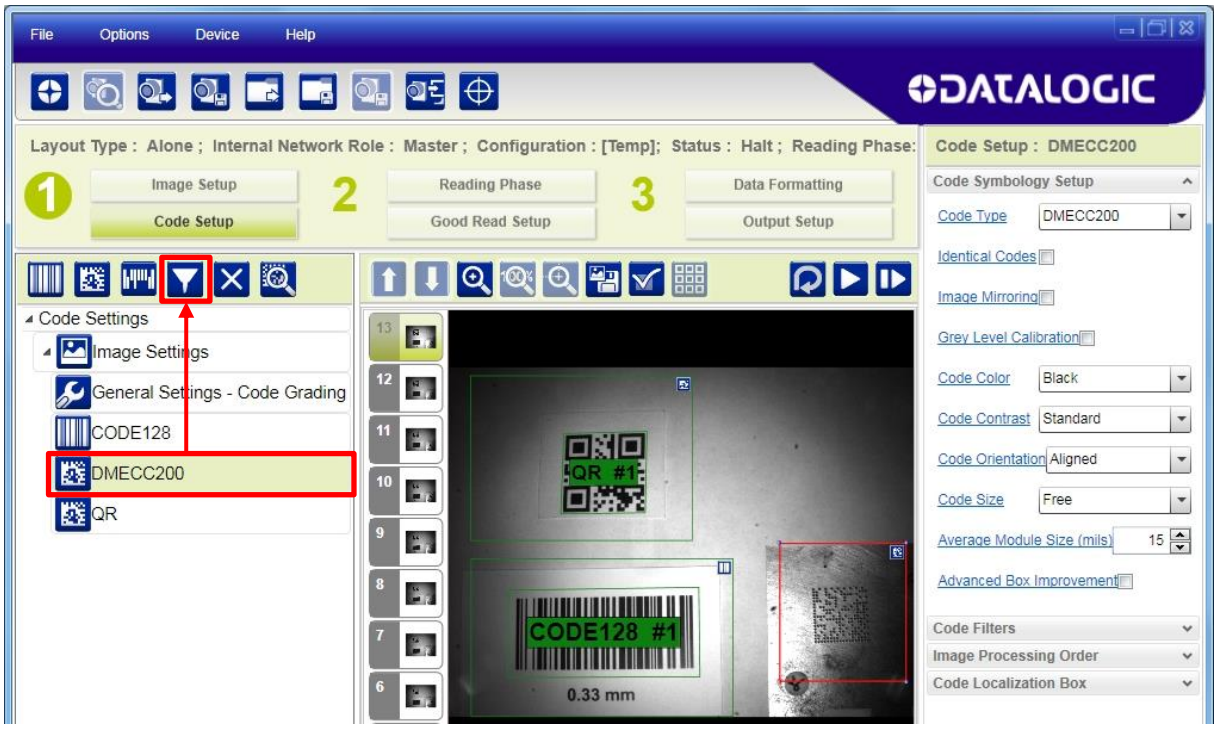


The following steps are taken to apply the Close filter to Example 2:

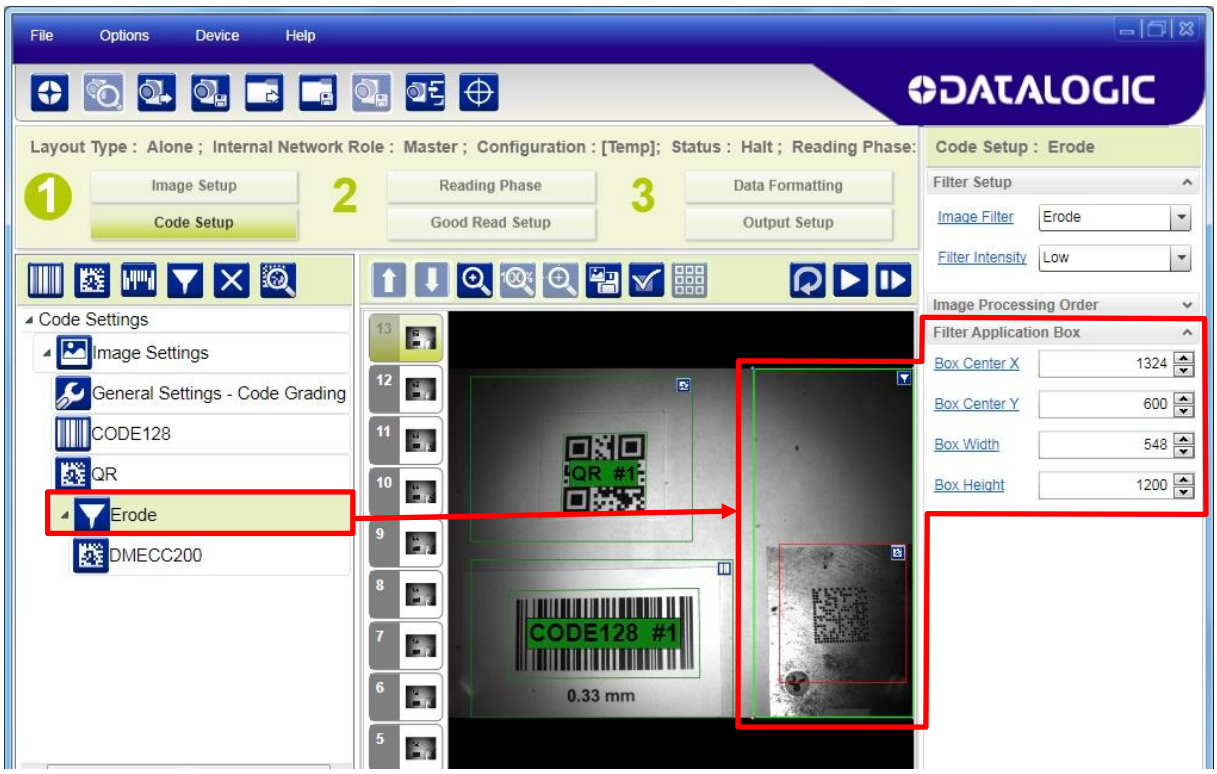
1. From the Image Settings group, add the Code Symbologies that must be decoded: Code 128, DMECC200 and QR Code.
2. For each one of them, resize and position its code localization box (dragging its borders with the mouse or editing the Code Localization Box parameters) to the image area where the code will be found.



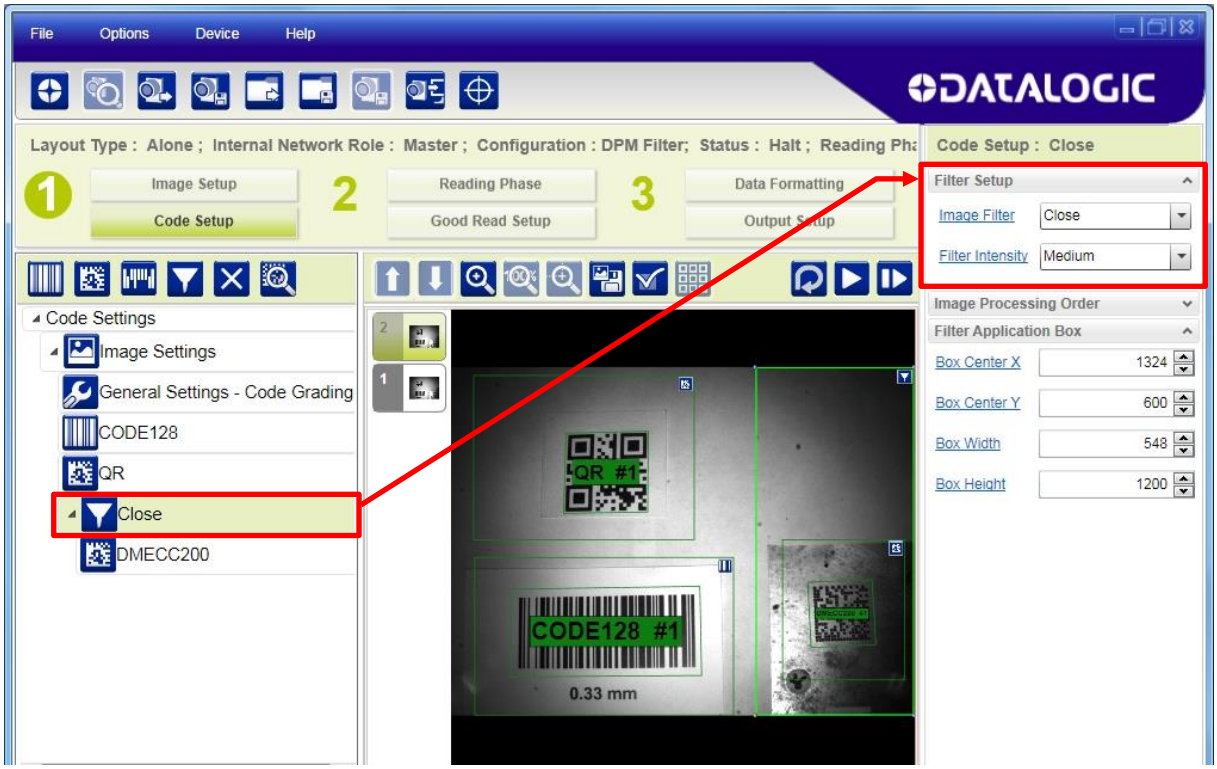

3. Select the Data Matrix ECC 200 code and add the Image Filter.



4. Resize and position the filter application box (dragging its borders with the mouse or editing the Filter Application Box parameters) to the image area where the filter will be applied. The relative Code Localization box must fit inside its Filter Application box.




5. Select the desired Image Filter Type and Intensity for correct decoding.




The Data Matrix DPM code is now successfully decoded only within the expected position; Code Localization box as well as code bounding box are colored green.

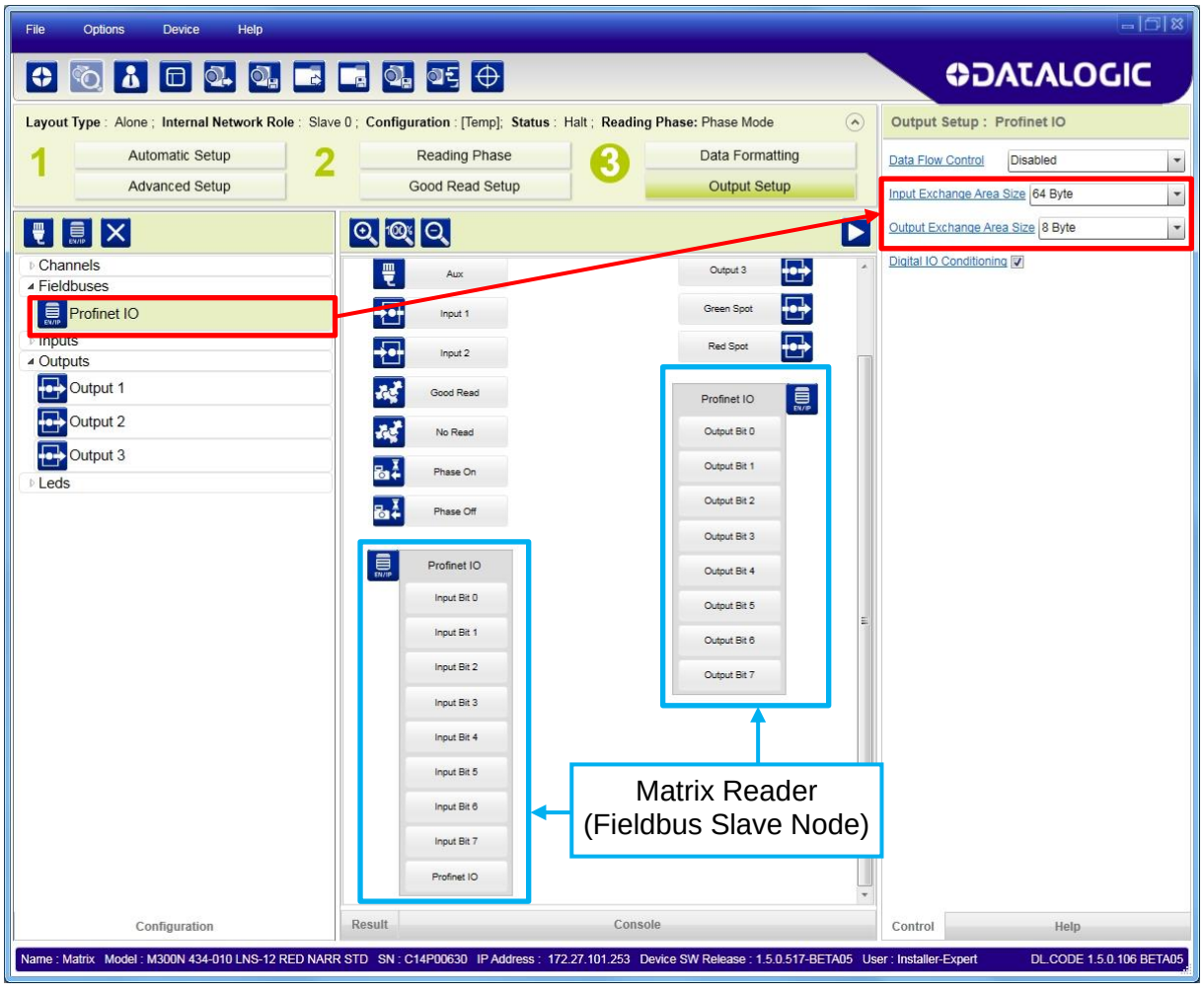
## 4.7 MATRIX CONTROL BY FIELDBUS CHANNEL

The Matrix reader can be controlled by signals coming from the Fieldbus Master as well as echoing its input signals to the Fieldbus Master.

### 4.7.1 Fieldbus Input/Output Representation in DL.CODE

For HMS Fieldbus and the embedded Profinet-IO channels, communication with the Matrix reader takes place through Input/Output Exchange Areas. The size of these areas must be correctly defined in the relative parameters (see below). See also par. 4.7.2 to account for Digital IO Conditioning.

The Input and Output Exchange Area Size parameters refer to the Fieldbus Master.; Input **to** the Master, Output **from** the Master.

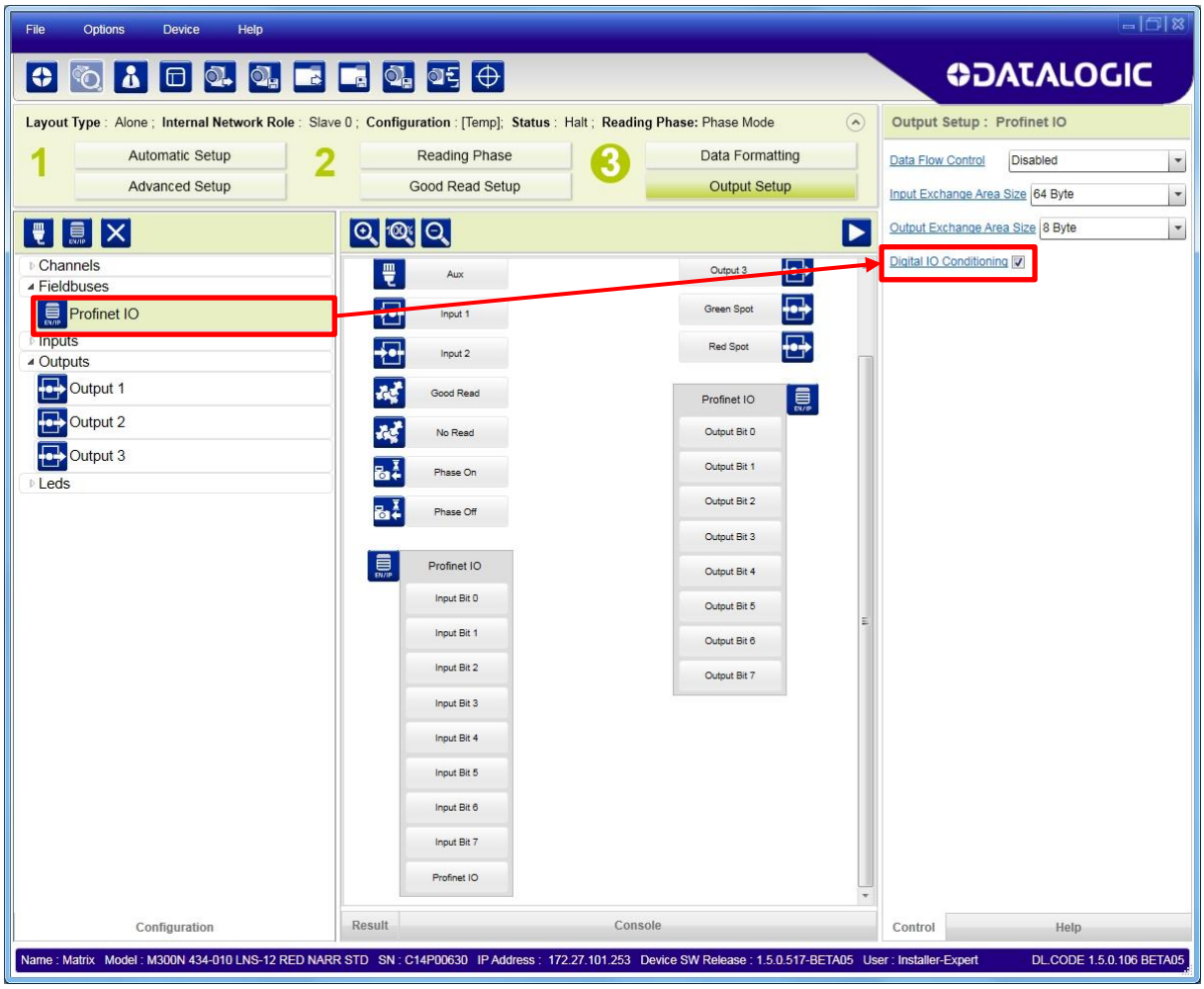



**NOTE:** All other representations in DL.CODE show the fieldbus input and output channels from the Matrix reader perspective (Fieldbus Slave Node). Therefore fieldbus slave node Input Bits are **from** the Fieldbus Master and fieldbus slave node Output Bits are **to** the Fieldbus Master.

### 4.7.2 Digital IO Conditioning

When checked (enabled by default), this parameter reserves the first byte of the Input/Output Areas for the Host to receive device Input echoes, drive the device Reading Phase and/or drive the device Outputs.

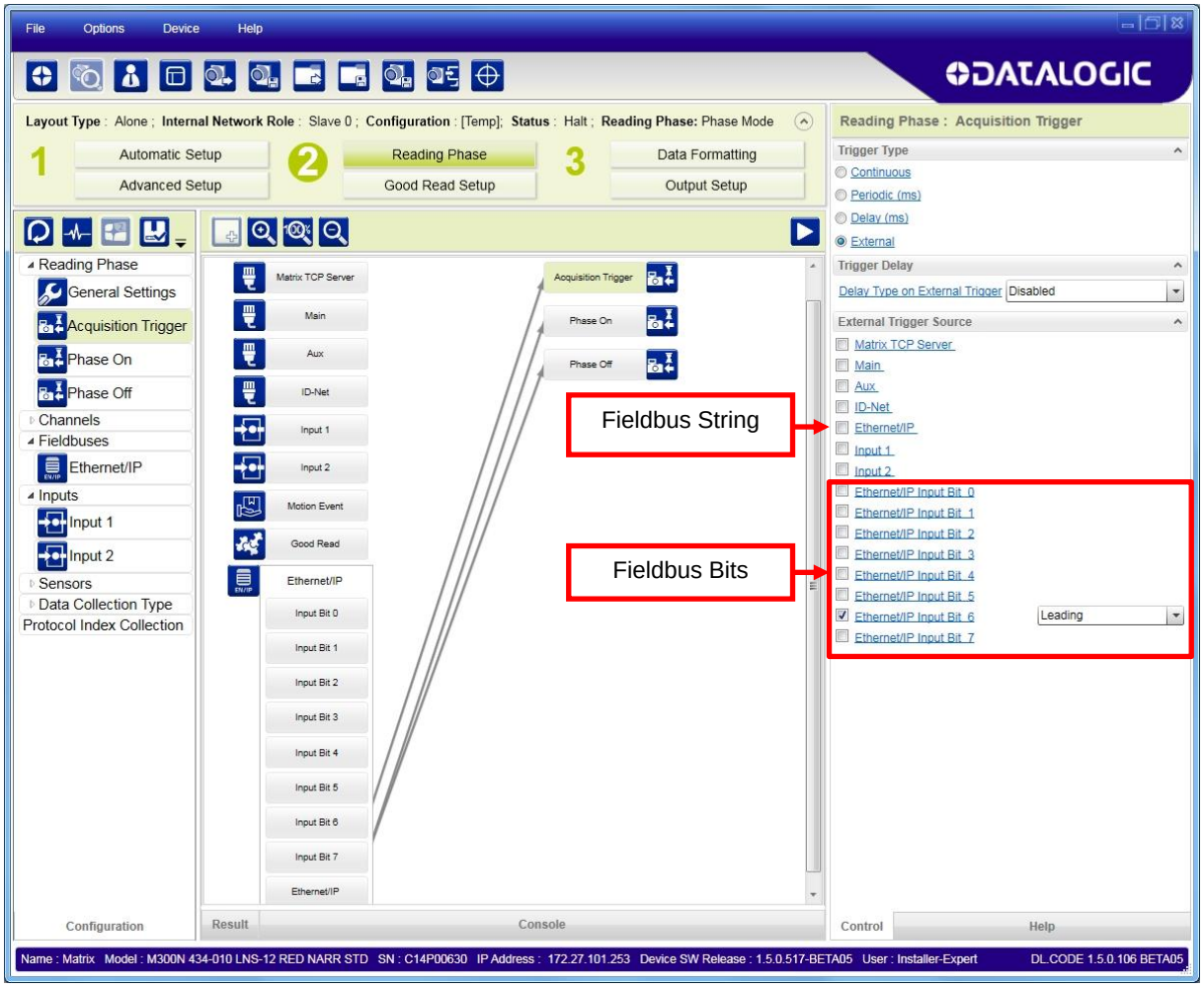
In this case application data or Data Flow Control begin at the second byte of the Input/Output Areas. For more details on Data Flow Control refer to the "DAD Driver" document included in the DL.CODE installation package.




**NOTE:** By disabling Digital IO Conditioning, application data or Data Flow Control begin at the first byte of the Input/Output Areas. Any Digital IO Conditioning configurations (Input echo, Reading Phase or Output control from the Fieldbus Host) will be ignored.

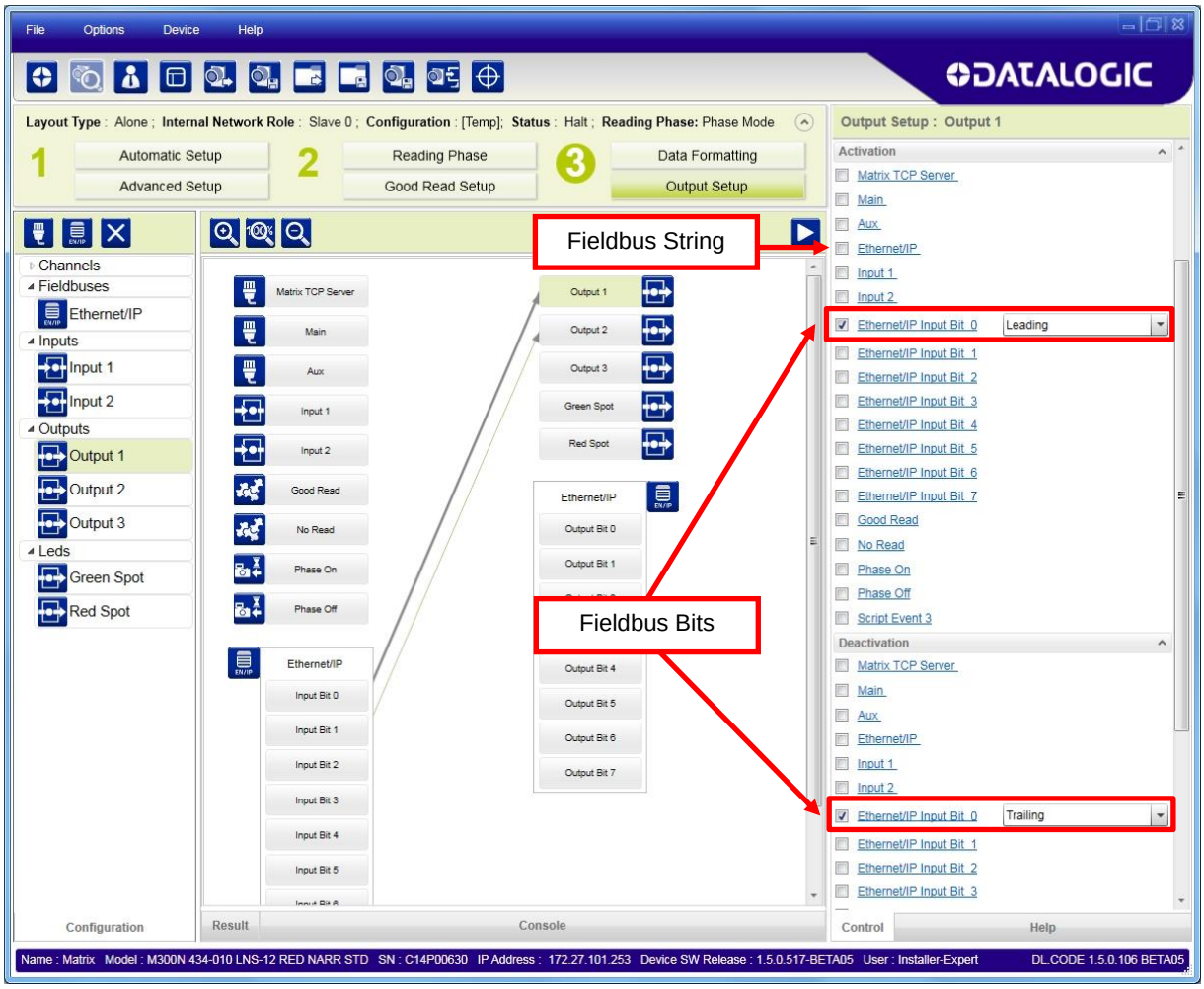
### 4.7.3 Fieldbus Reading Phase Control

The Fieldbus Master can control the reading phase by assigning either communication strings or individual communication bits to reading phase parameters. These bits are received on the Matrix fieldbus channel as Input Bits.



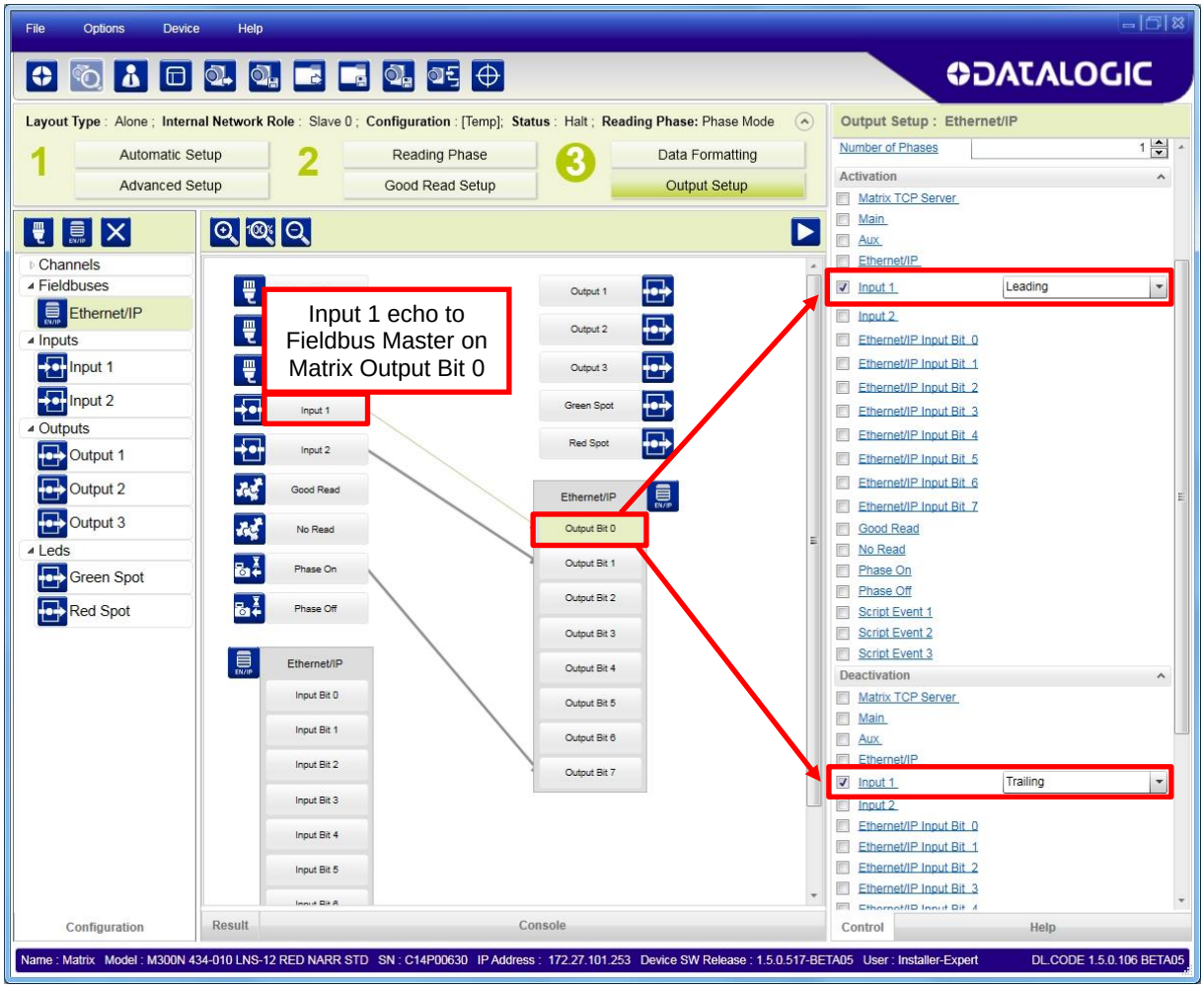
### 4.7.4 Fieldbus Digital Output Control

The Fieldbus Master can also drive the Matrix reader's Digital Outputs by assigning either communication strings or individual communication bits to the Digital Output Activation and Deactivation parameters. These bits are received on the Matrix fieldbus channel as Input Bits.



### 4.7.5 Digital Input Echo to Fieldbus

The Fieldbus Master can receive the Matrix Reading Phase and Input signal echoes by assigning them as sources to the fieldbus individual communication Output Bit Activation and Deactivation parameters. These bits are sent on the Matrix fieldbus channel as Output Bits.



## 4.8 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.

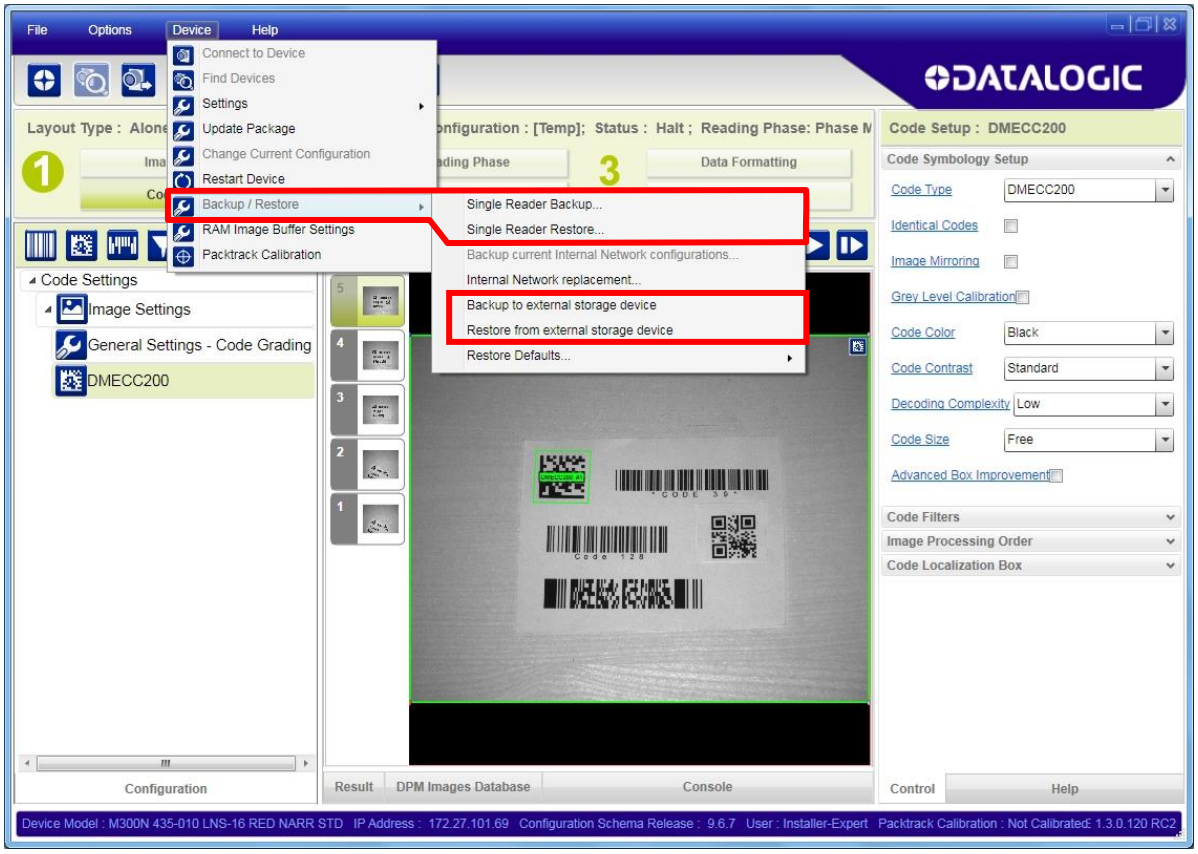
It can be performed for Single Reader and Internal Network (Master/Slave) configurations.

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

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

- CBX + BM100
- QLM-Series Gateways

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



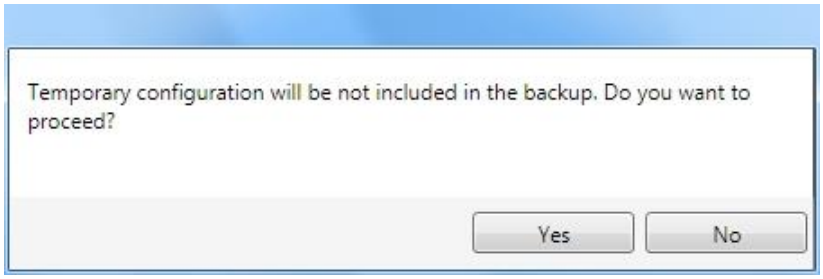
### 4.8.1 Backup

To perform a **Backup**:

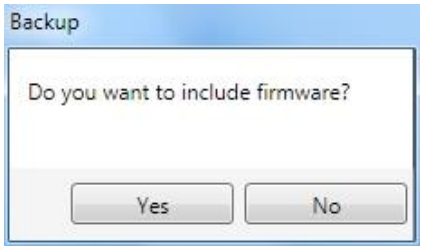
1. From the DL.CODE Device menu, select either **Single Reader Backup** (to file on PC); or **Backup to external storage device**.

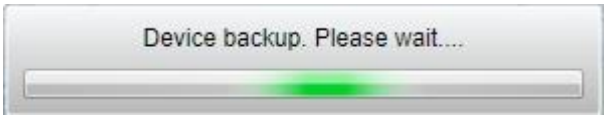
**NOTE:** For ID-NET network Backup, select the **Backup current Internal Network configurations** selection.

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



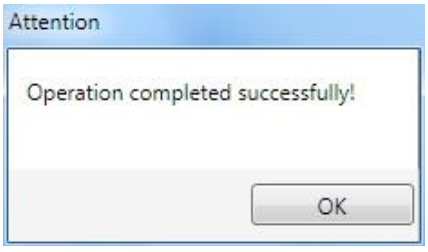

If you are performing a backup to a file you will be asked whether to include the firmware or not.





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



### 4.8.2 Restore

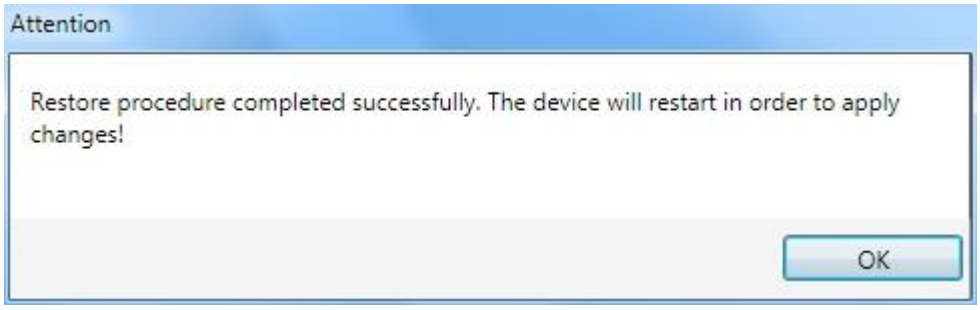
To perform a **Restore**:

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

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


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

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




### 4.8.3 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 **Single Reader Restore** (from file on PC) or **Restore from external storage device** item (see: Restore procedure).

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

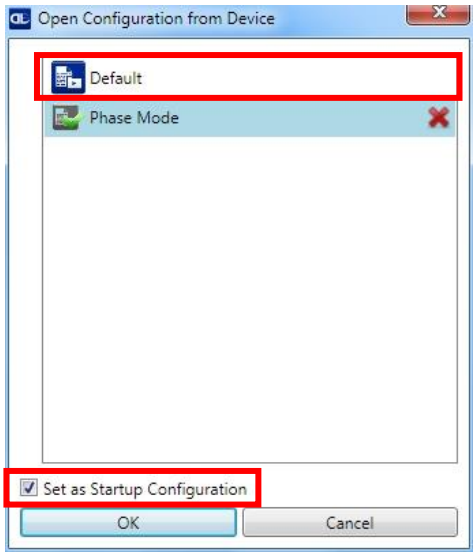
## 4.9 RESTORE DEFAULTS

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

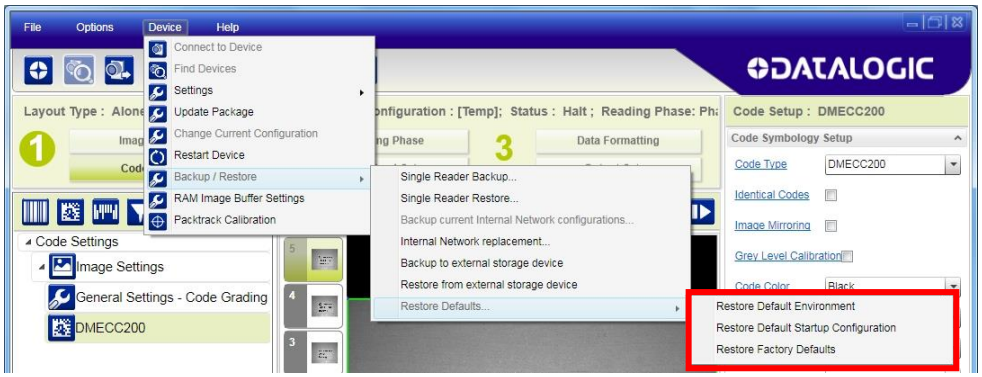
- The Configuration parameters are the ones set in the various steps of the configuration process and are specific to each application. When multiple configurations (jobs) are saved on a single device, these parameters can be different from one configuration to the next.
- Environment parameters regard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

### 4.9.1 Restore Default Startup Configuration

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



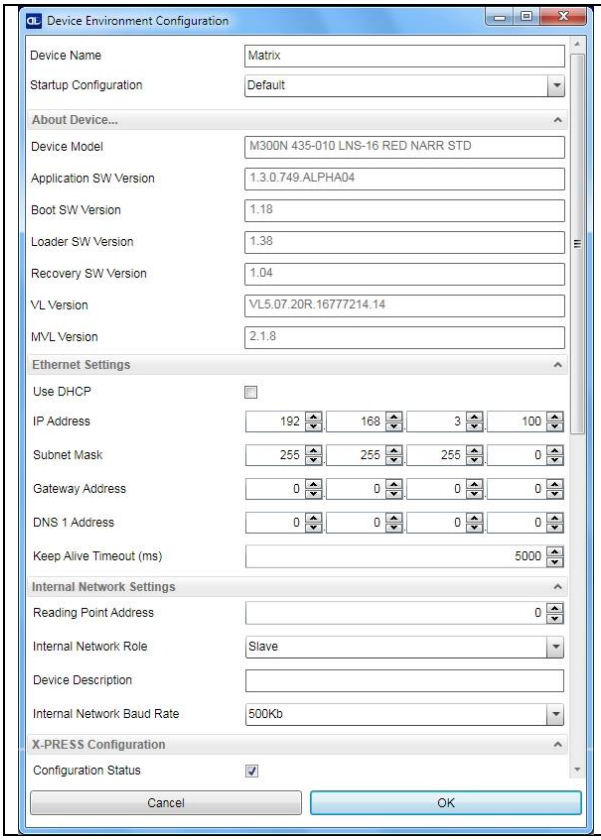

The same action can be performed from the Device menu >Backup/Restore > Restore Defaults > **Restore Default Startup Configuration**. The Default Configuration will be set to run at startup and the reader will be reset.




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

## 4.9.2 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.

## 4.9.3 Restore Factory Defaults

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

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

## 4.10 SOFTWARE RESET

At any time the device can be reset by the Restart Device command ( ) in the DL.CODE Device Menu.

**CAUTION:** Remember to save the current configuration before restarting.

## 4.11 WEB MONITOR

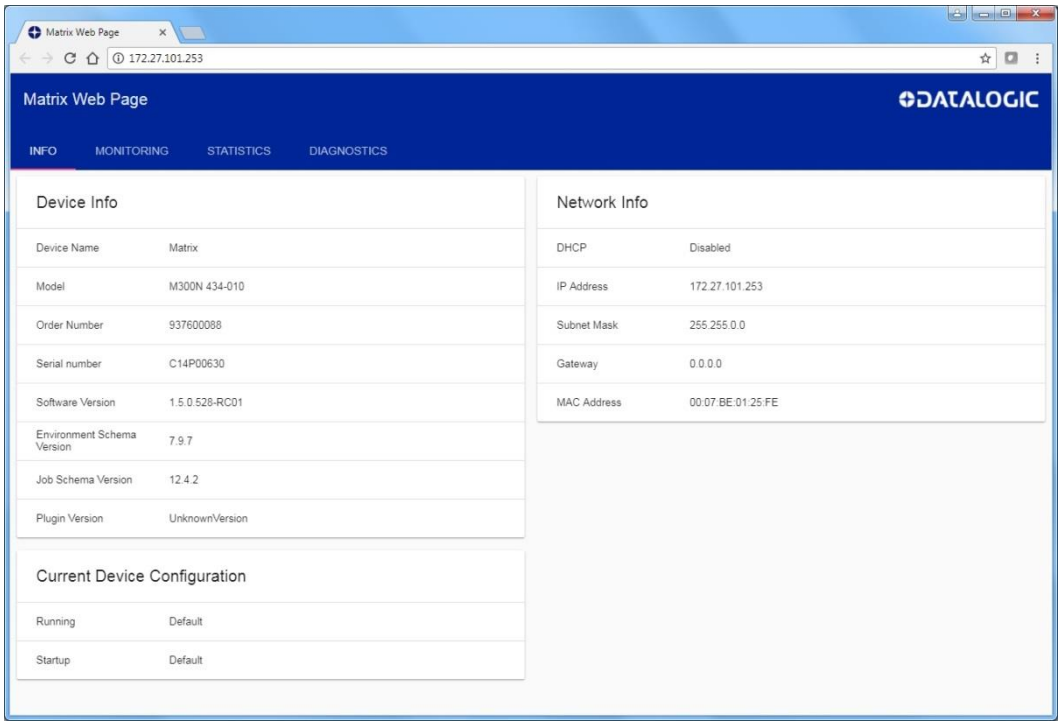
Web Monitor is a remote monitoring tool provided to visualize the Matrix reader in its run-time environment. You can access it from the DL.CODE Task area or directly from your browser by inputting the IP address of the reader. The reader must available on the LAN.

This works on major browsers (also on smartphones and tablets), which support HTML5 (see the table below).

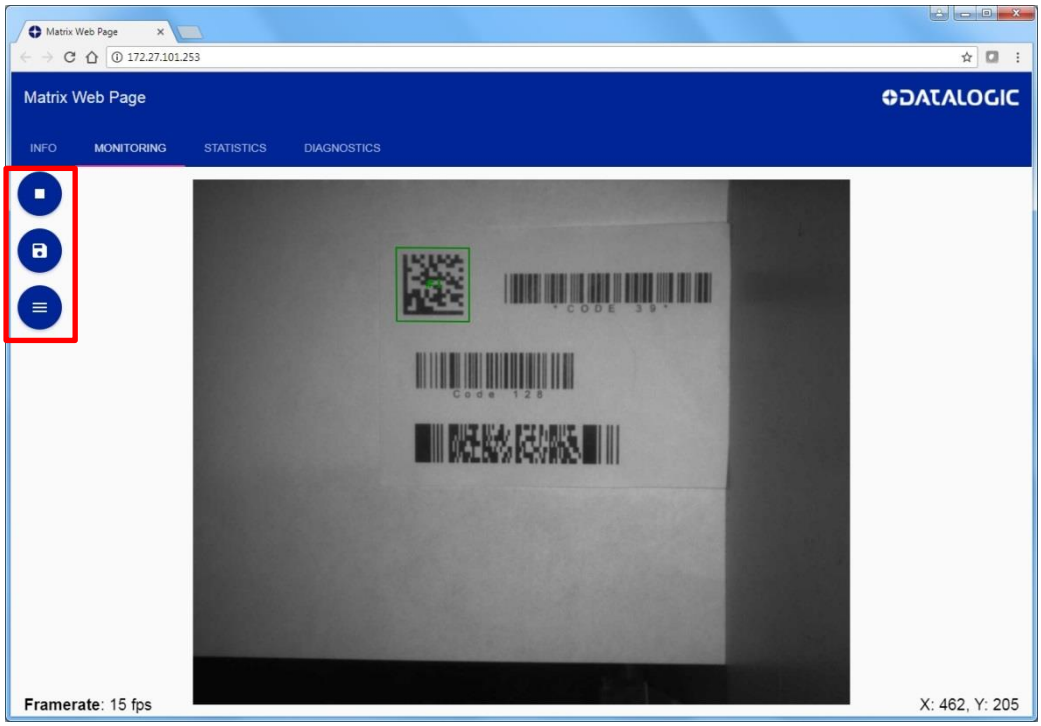
| Chrome | Firefox | Edge | IE | Safari | iOS | Android | IE Mobile |
|---|---|---|---|---|---|---|---|
| latest | latest | 14 | 11 | 10 | 10 | Nougat (7.0)<br>Marshmallow (6.0) | 11 |
| | | 13 | 10 | 9 | 9 | Lollipop (5.0, 5.1) | |
| | | | 9 | 8 | 8 | KitKat (4.4) | |
| | | | | 7 | 7 | Jelly Bean (4.1, 4.2. 4.3) | |

The Matrix Web Page provides the following features:

**Info page:**

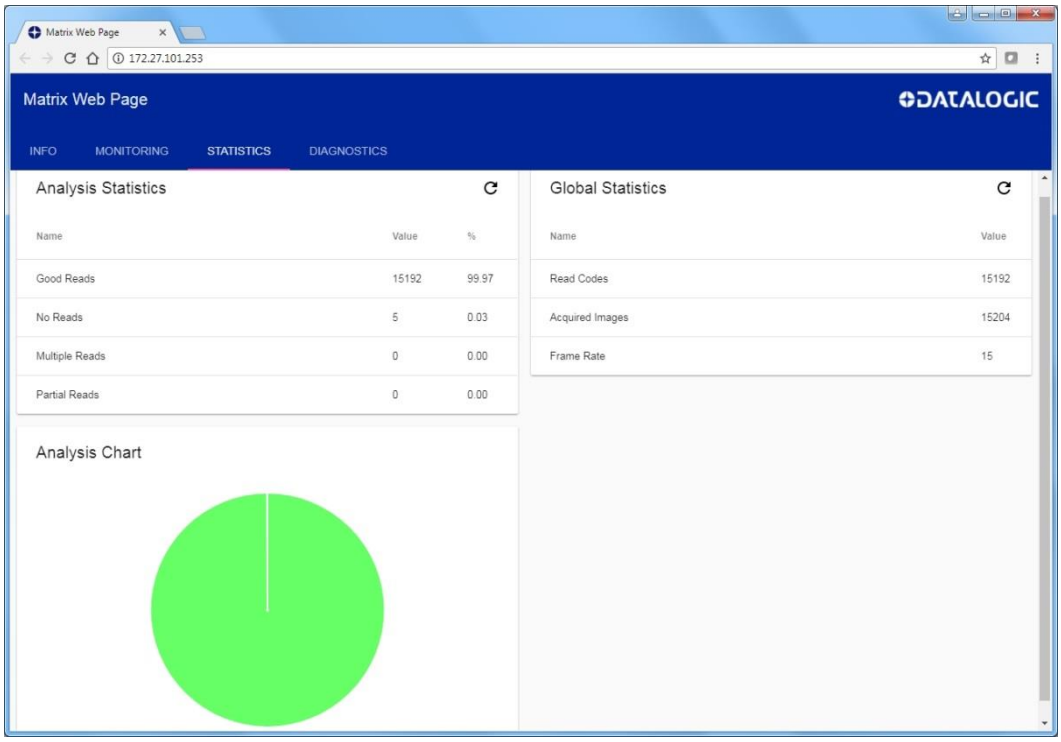


**Monitoring Page:**

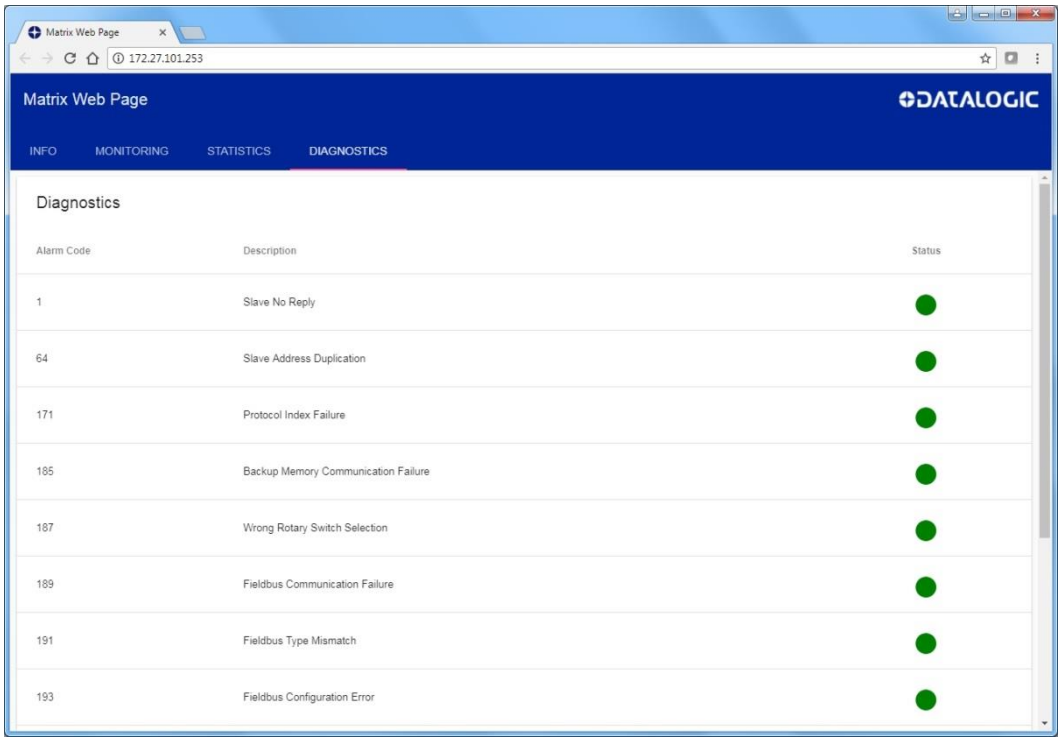



| | |
|---|---|
|  | The Stop/Play button allows you to stop image monitoring to save a particular image. The reader continues to run, only the monitored image is stopped. |
|  | The Save image button automatically downloads the current image as a jpg file to the browser's default Download folder. The default naming syntax is image_*weekday month day year*.jpg (i.e. image_Fri Sep 29 2017.jpg) |
|  | The options button opens an options panel on the Monitoring window which allows setting:<br>• the quality of the image to monitor, (higher quality images reduce framerate)<br>• show only positive results (good read)<br>• add Framerate reporting to the Monitoring window<br>• add x,y Coordinates to the Monitoring window. The coordinates report the mouse position over the monitored image (in pixels).<br><br>To close the options panel, click on the image area. |

## Statistics Page:




## Diagnostics Page:



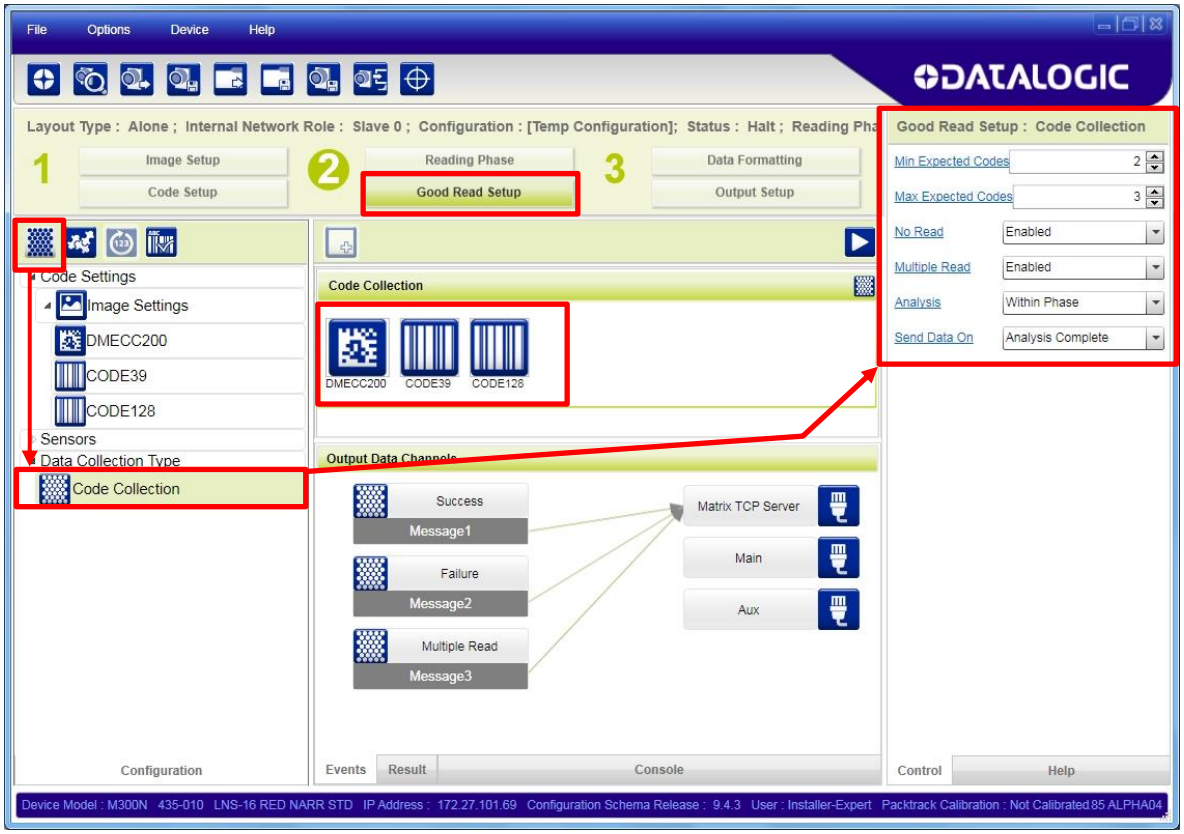
# 5 DATA COLLECTION METHODS

## 5.1 CODE COLLECTION

Valid Operating Modes: Continuous, One Shot, Phase Mode, PackTrack

In Code Collection mode the reader can collect several codes before providing a single output result.
The number of codes to be collected is set by the *Min Expected Codes* and *Max Expected Codes*.
The type of output message sent to the host depends on the *No Read* and *Multiple Read* parameter settings and can be modified and formatted in the Data Formatting Output Group.

**Example:**




As shown in the figure above, the following parameters are set:

The DMECC200, CODE39 and CODE128 code types are enabled and present in the Code Collection.
Min Expected Codes = 2; Max Expected Codes = 3; No Read is Enabled; Multiple Read is Enabled

Case 1: two or three codes (of the enabled code types) are read
Output: the content of **Message 1 Success** is sent to the Host. This corresponds to a Good Read message and by default contains the code content.

Case 2: one code is read
Output: the content of **Message 2 Failure** is sent to the Host. This corresponds to the No Read message because it doesn't satisfy the minimum expected codes criteria.

Case 3: four codes (of the enabled code types) are read
Output: the content of **Message 3 Multiple Read** is sent to the Host. This corresponds to the Multiple Read message because it exceeds the maximum expected codes criteria.

If the Multiple Read parameter is Disabled, then Case 3 is considered a Good Read and the content of **Message 1 Success** is sent to the Host containing the first three decoded codes.

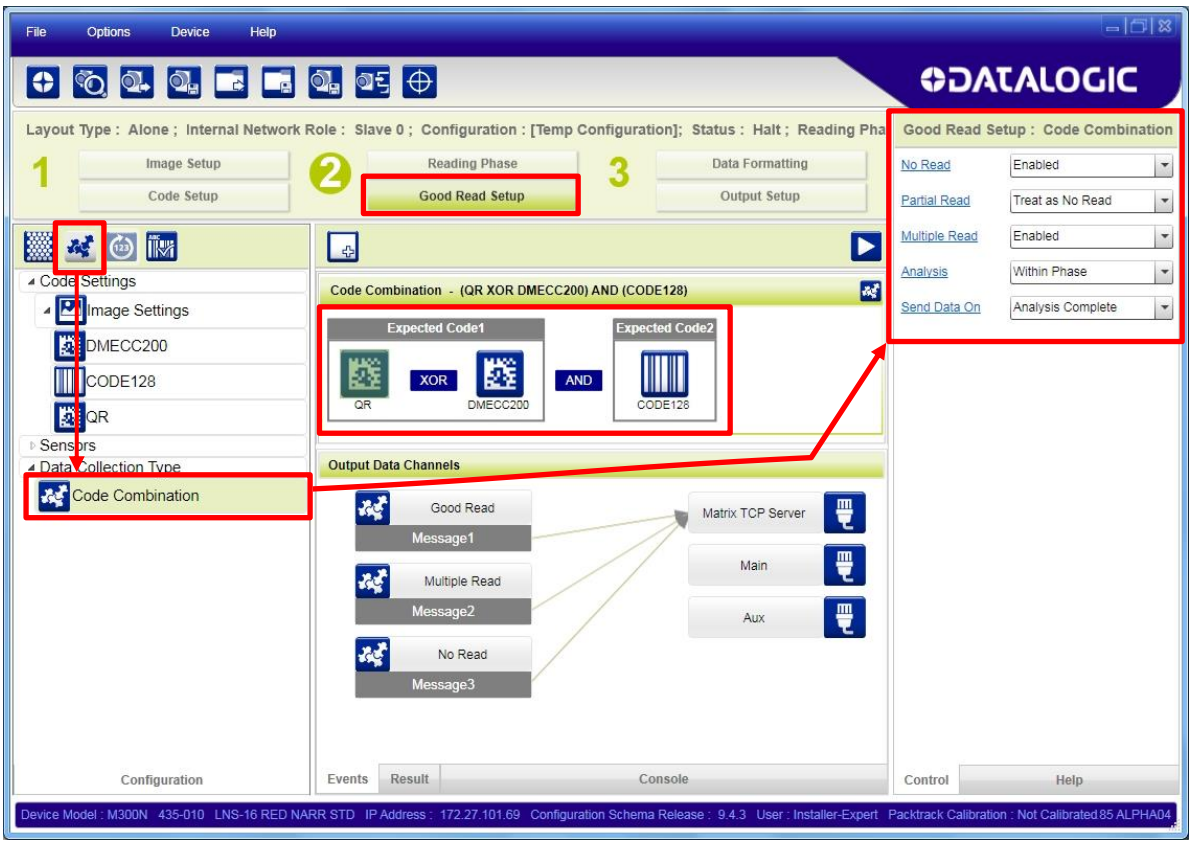
In Phase Mode, by setting ***Analysis*** to *Within Phase* only the reading phase is considered and a single result is provided to the user for each phase. On the other hand, by selecting *Within An Image* the reader searches for the defined number of codes within each acquired image and a result is provided to the user after each image decoding.

## 5.2 CODE COMBINATION

Valid Operating Modes: Continuous, One Shot, Phase Mode, PackTrack

In Code Combination mode the output results sent to the Host depend not only on the codes read but on meeting their configured logical combination criteria.

**Example:**



As shown in the figure above, the following parameters are set:

The DMECC200, QR Code and CODE128 types are enabled and present in the Code Combination with the following logical combination:

DMECC200 OR QRCode AND Code128.

No Read is Enabled; Multiple Read is Enabled; Partial Read is treated as No Read

Case 1: codes (DMECC200 AND Code128) or (QR Code AND Code128) are read
Output: the content of **Message 1 Good Read** is sent to the Host. This message by default contains the code content.

Case 2: only one of the three codes (DMECC200, QR Code or Code128) is read
Output: this is a Partial Read which, in this example, is treated as a No Read. The content of **Message 2 No Read** is sent to the Host.

Case 3: all three codes (DMECC200, QR Code and Code128) or (only DMECC200 and QR Code) are read
Output: the content of **Message 3 Multiple Read** is sent to the Host.

If the Multiple Read parameter is Disabled, then for Case 3:

- all three codes read (DMECC200, QR Code and Code128), is considered a Good Read and the content of **Message 1 Good Read** is sent to the Host containing one of the 2D codes (whichever was decoded first) AND Code128.
- reading (only DMECC200 and QR Code), is considered a Partial Read which, in this example, is treated as a No Read and the content of **Message 2 No Read** is sent to the Host.

In Phase Mode, by setting ***Analysis*** to *Within Phase* only the reading phase is considered and a single result is provided to the user for each phase. On the other hand, by selecting *Within An Image* the reader searches for the defined combination of codes within each acquired image and a result is provided to the user after each image decoding.

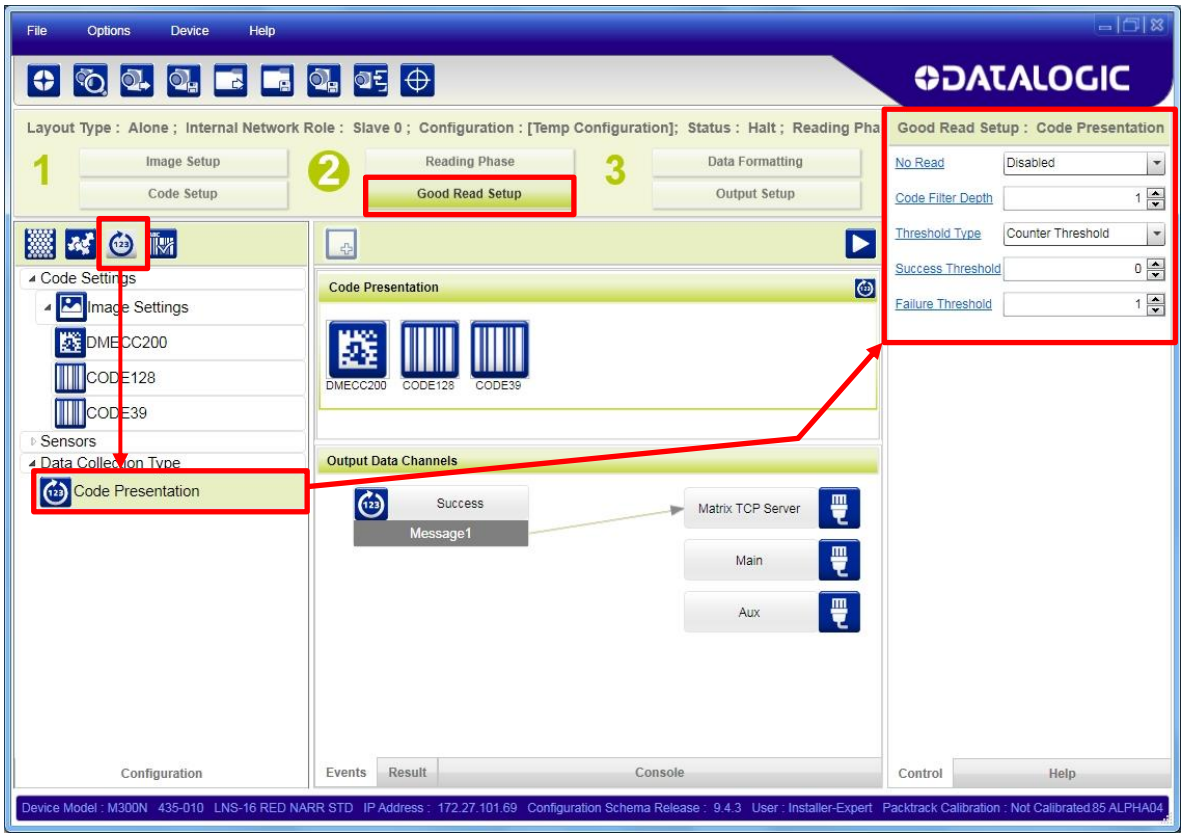
**NOTE:** In Code Combination mode, the configured expression can contain up to a maximum of 50 codes.

## 5.3 CODE PRESENTATION

Valid Operating Modes: Continuous, One Shot, Phase Mode (Motion Sensor)

In Code Presentation mode typically a code is placed in front of the reader manually and the successful output results are sent to the Host. Usually No Reads are disabled and the configuration should correctly manage Multiple Reads.

**Example:**




As shown in the figure above, the following parameters are set:

The DMECC200, CODE128 and CODE39 types are enabled and present in the Code Presentation:
No Read is Disabled; Code Filter Depth is 1, and multiple reads are handled by the Acquisition Counter Threshold: Success Threshold=0, Failure Threshold=1.

Case 1: any code or combination of codes (of the enabled code types) is read in a single acquisition.
Output: the content of **Message 1 Success** is sent to the Host containing one occurrence of all of the decoded codes. This message by default contains the code content.

Case 2: any code or combination of codes is presented to the reader repeatedly
Output: this is a multiple read condition which is managed as follows:

- Success Threshold=0, the same code (by content and type) cannot be read in successive acquisitions.
- Failure Threshold=1, the same code (by content and type) can only be read after at least 1 acquisition without a code.

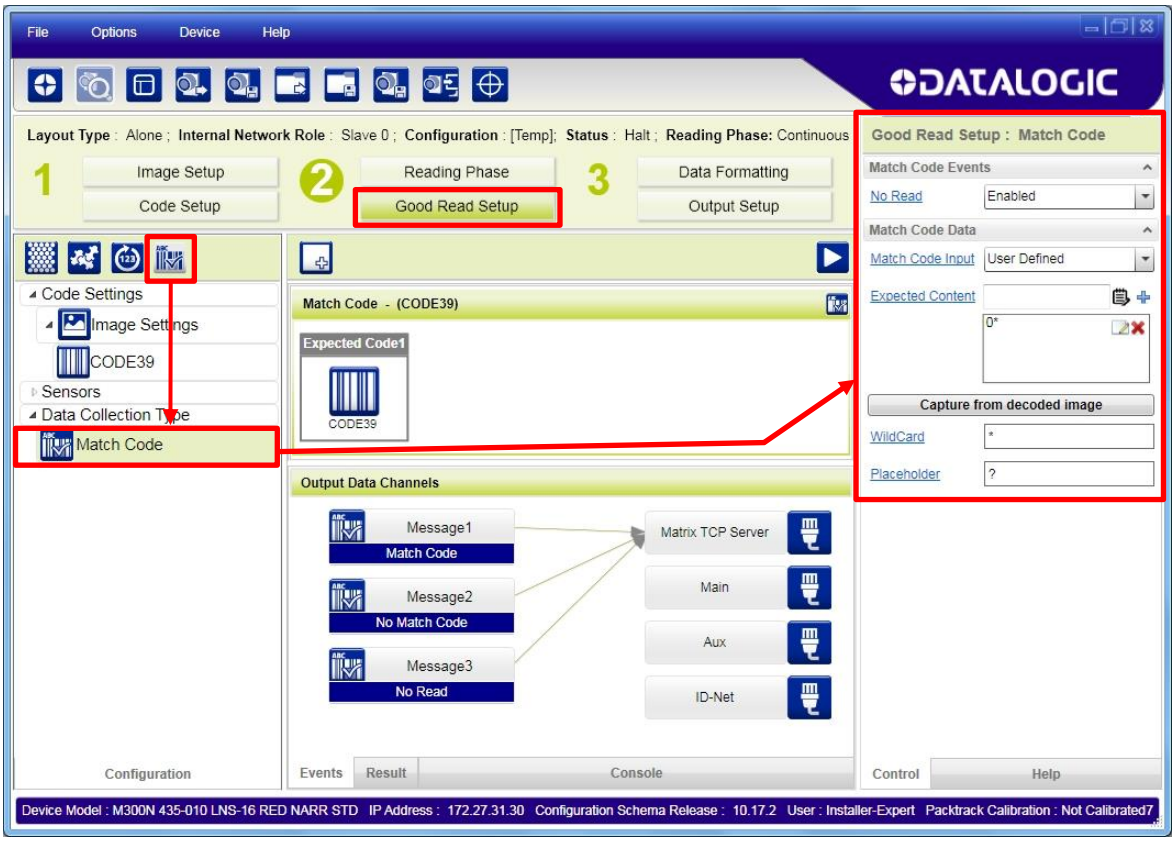
## 5.4 MATCH CODE

In Match Code mode the output results sent to the Host depend on whether the codes read meet the match code criteria or not.

### 5.4.1 User Defined

Valid Operating Modes: Continuous, One Shot, Phase Mode

**Example:**




As shown in the figure above, the following parameters are set:

CODE39 type is enabled and present in the Match Code:
No Read is Enabled; Match Code Input is User Defined where the Expected Content = "0*" (all codes must begin with zero but can be followed by any string – wildcard).

Case 1: a CODE39 type is read and its content begins with 0 (zero).
Output: the content of **Message 1 Match Code** is sent to the Host. This message by default contains the code content.

Case 2: a CODE39 type is read but its content does not begin with 0 (zero).
Output: the content of **Message 2 No Match Code** is sent to the Host.

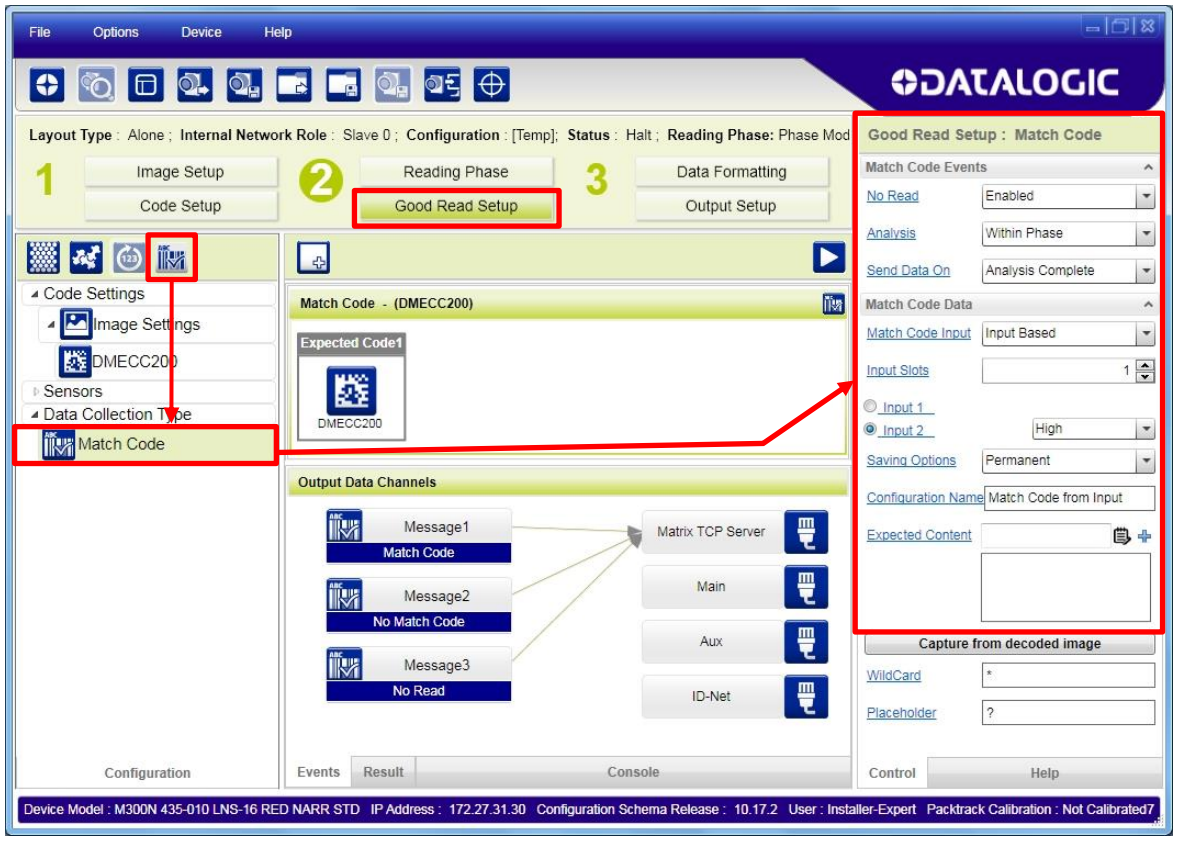
Case 3: no CODE39 type is read.
Output: the content of **Message 3 No Read** is sent to the Host.

### 5.4.2 Input Based

Valid Operating Modes: One Shot, Phase Mode

The reading phase is typically controlled by Input 1 (Trigger) while Input 2 is used for Match Code saving. An alternative is to control the reading Phase by sending strings from one of the available communication Channels.

**Example:**

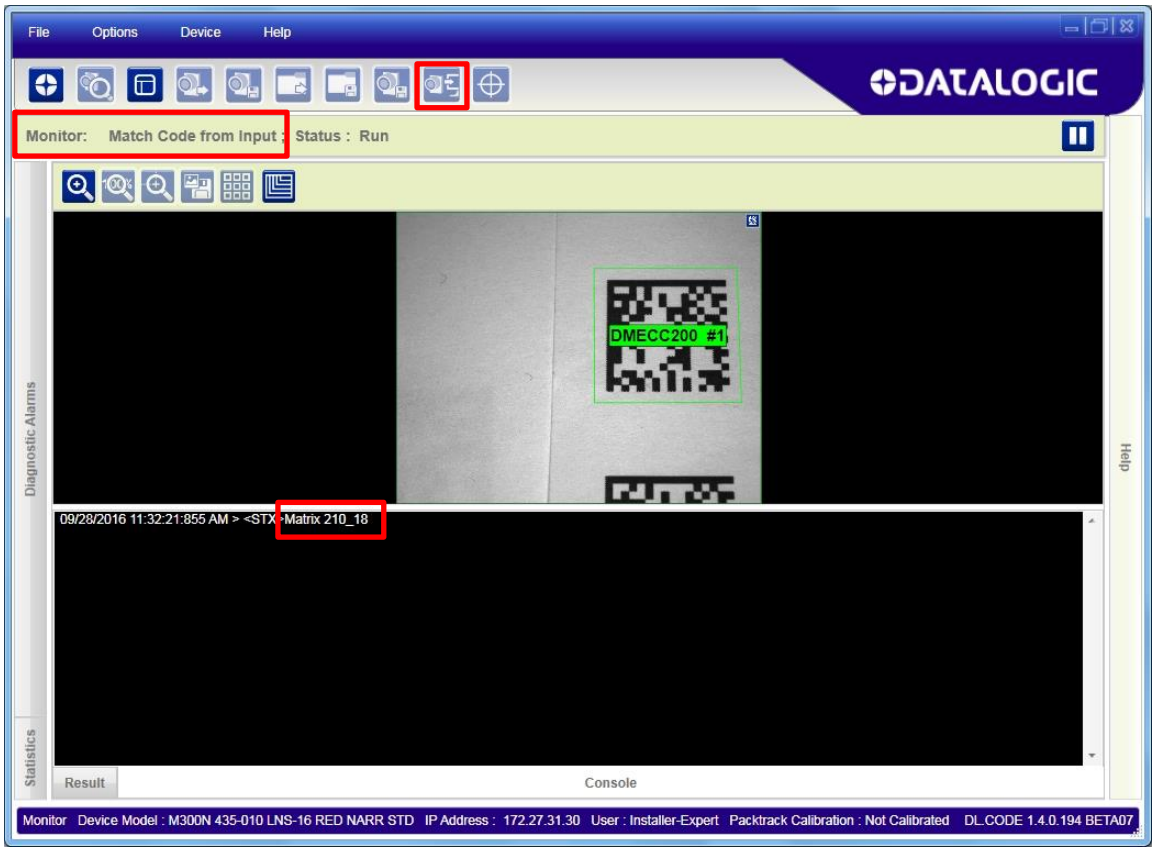



As shown in the figure above, the following parameters are set:

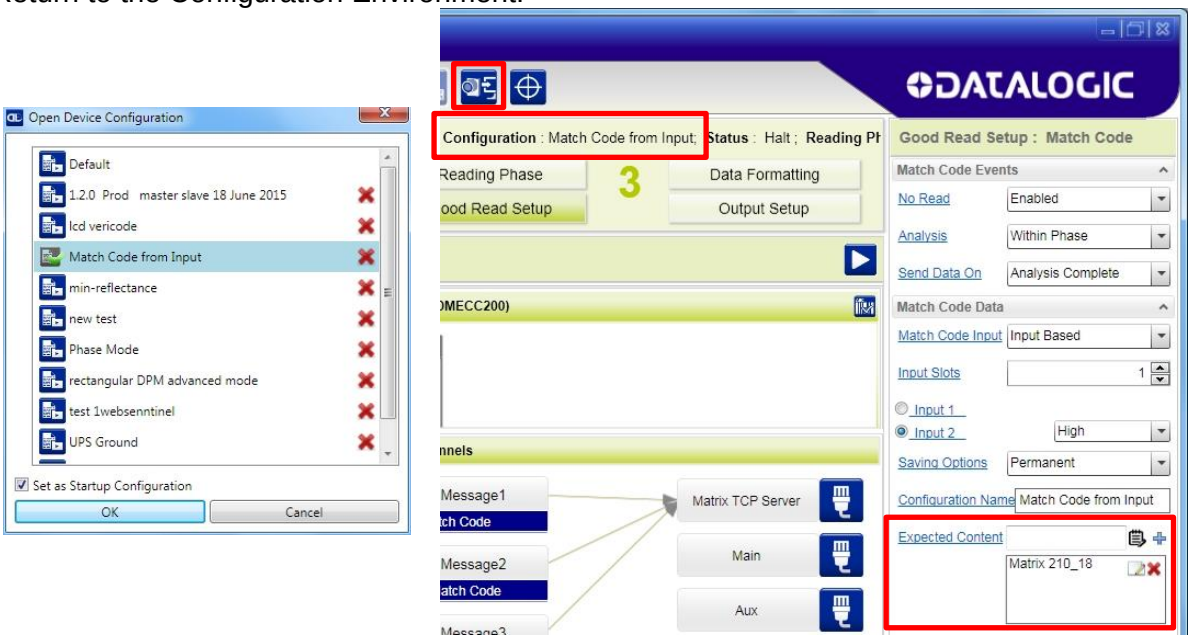
Data Matrix ECC 200 type is enabled and present in the Match Code:
No Read is Enabled; Match Code Input is Input Based (captured by the Input 2 High state), Saved to Permanent memory with configuration job name = "Match Code from Input".

**NOTE:** Capturing the Match Code on Input must be done either in Monitor or in RUN mode (disconnected from DL.CODE). You cannot capture the match code on input from the DL.CODE configuration environment.

Switch to Monitor and trigger a reading phase while Input 2 is in the High state (for this example).
The code will be read, saved in the Expected Content list and the entire job will be saved to the configuration name “Match Code from Input”.




Return to the Configuration Environment.




If you choose the Temporary Saving Option, you will need to save the job manually from the configuration environment as with all other configurations.

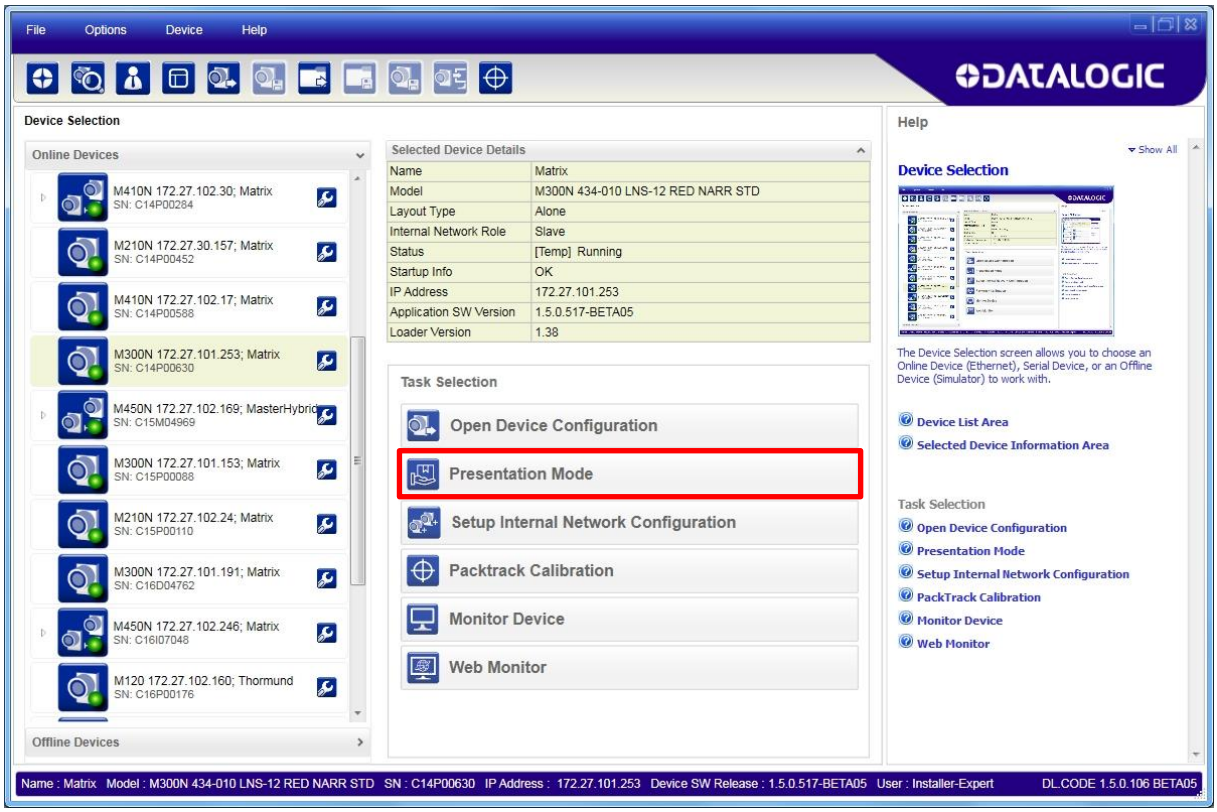
Case 1: a DMECC200 type is read and its content matches a code in the Expected Content list.
Output: the content of **Message 1 Match Code** is sent to the Host. This message by default contains the code content.

Case 2: a DMECC200 type is read but its content does not match a code in the Expected Content list.
Output: the content of **Message 2 No Match Code** is sent to the Host.

Case 3: no DMECC200 type is read.
Output: the content of **Message 3 No Read** is sent to the Host.

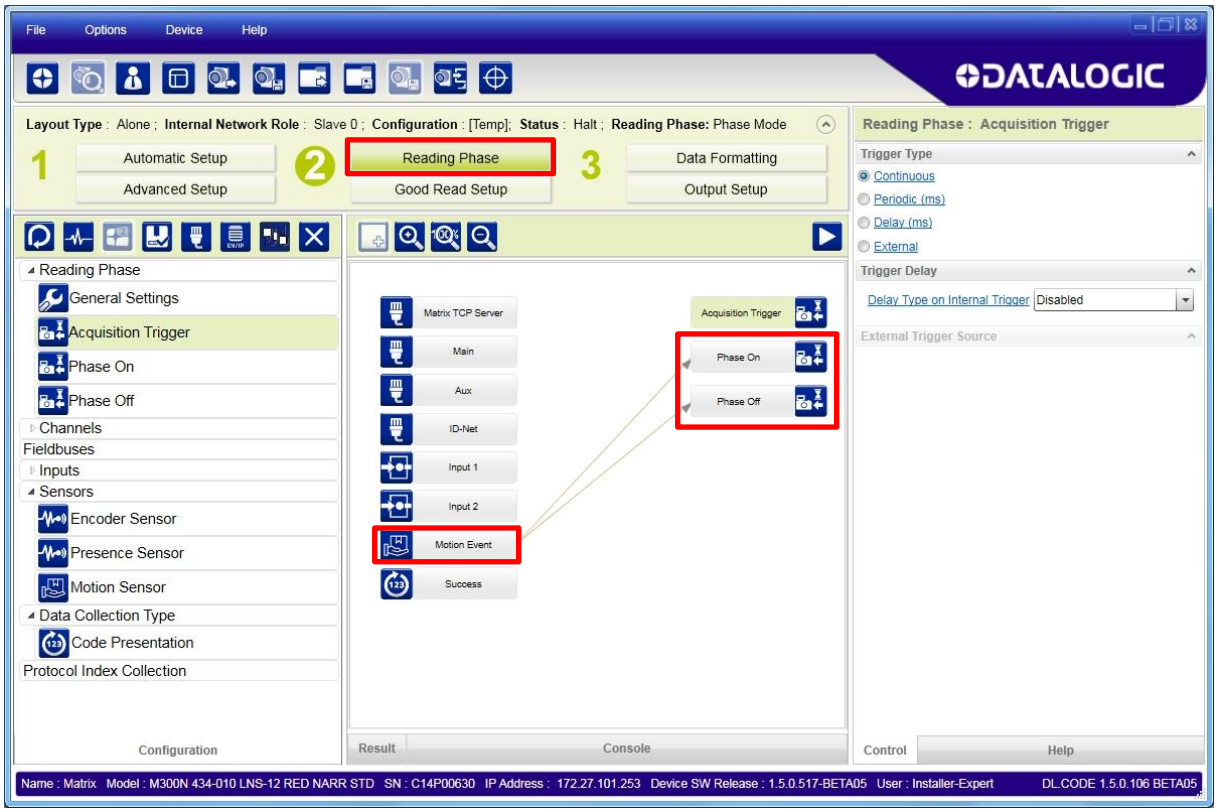
## 5.5 PRESENTATION MODE

Presentation Mode is a pre-configured case of the Phase Mode Operating Mode. It uses a software Motion Sensor to constantly search for changes in the images during the Idle state. When images change (indicating motion), the reading phase is activated to automatically detect any codes that will be presented to the device.




Selecting this task opens DL.CODE with the following default parameter settings:

- Phase Mode Operating Mode
- Phase On and Phase Off connected to Motion Event
- Data Collection Method is Code Presentation
- Code Filter Depth is 1
- Threshold Timeout 2 sec
- Data Matrix symbology enabled.
- Output Message to the Host is sent to the TCP Channel
- Green Spot is illuminated on successful read




This default is useful for kiosk or cash register applications where a single code is presented to the reader one-at-a-time by hand. The movement is typically < 0.5 m/s and the Focusing Pointer system is enabled during the Idle state to show where the code must be presented. The illuminator is off in the Idle state to avoid constant flashing. Either the code is returned or no message is returned.

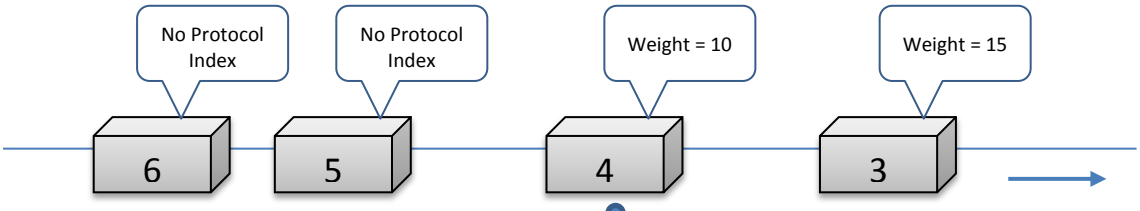
Another type of application is an In-line application where packages are introduced on a relatively slow moving conveyor (< 1 m/s). Typically the Code Combination Data Collection method is used. Either the codes are returned or a No Read message is returned.

The Presentation Mode can also be used with the Code Collection Data Collection method.

# 6 PROTOCOL INDEX

## 6.1 OVERVIEW

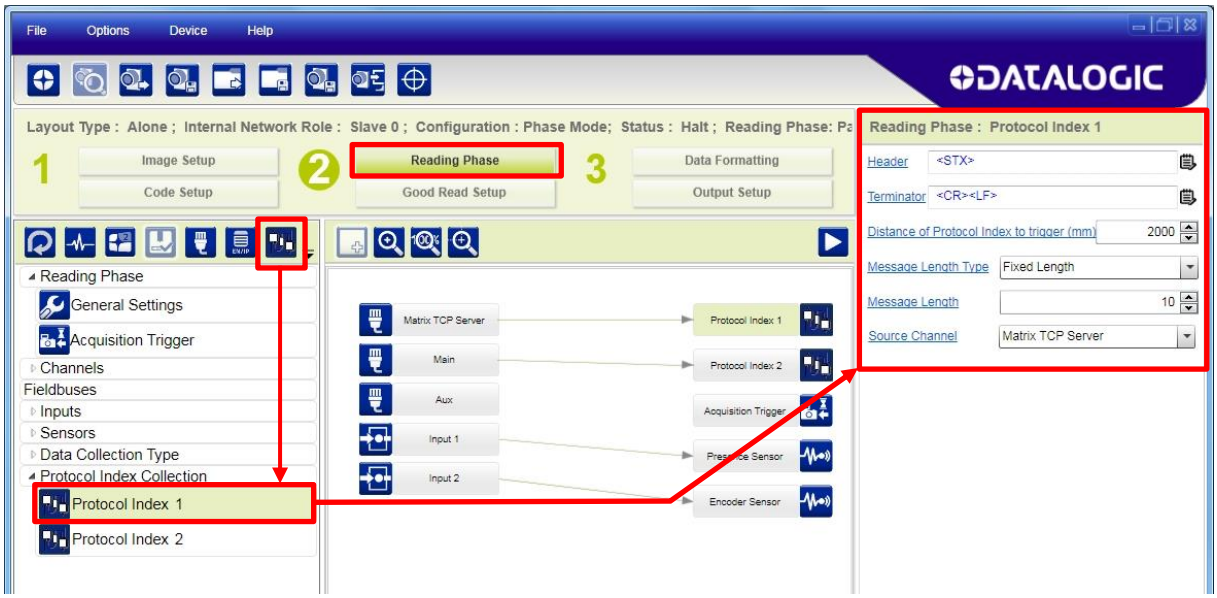
Protocol Index is a feature allowing a custom message (string) sent from a remote Host to be assigned to a specific reading phase or pack. A typical application is assigning a message containing the weight, dimensions, etc., to each package passing through the system.




| Communication Channel | |
|---|---|
| **Destination Pack** | **Message** |
| 4 | “Weight: 10” |
| 5 | “Weight: 20” |
| 6 | “Weight: 200” |
| 7 | “Weight: 25” |

Protocol Index can be used either in Phase Mode (during the active reading phase) or in PackTrack operating mode (between the PS Offset and the Tx Line Distance).

Up to 10 different Protocol Indexes can be configured but each one must be transmitted over a dedicated communication channel (source). They can all transmit at the same or different assignment points.



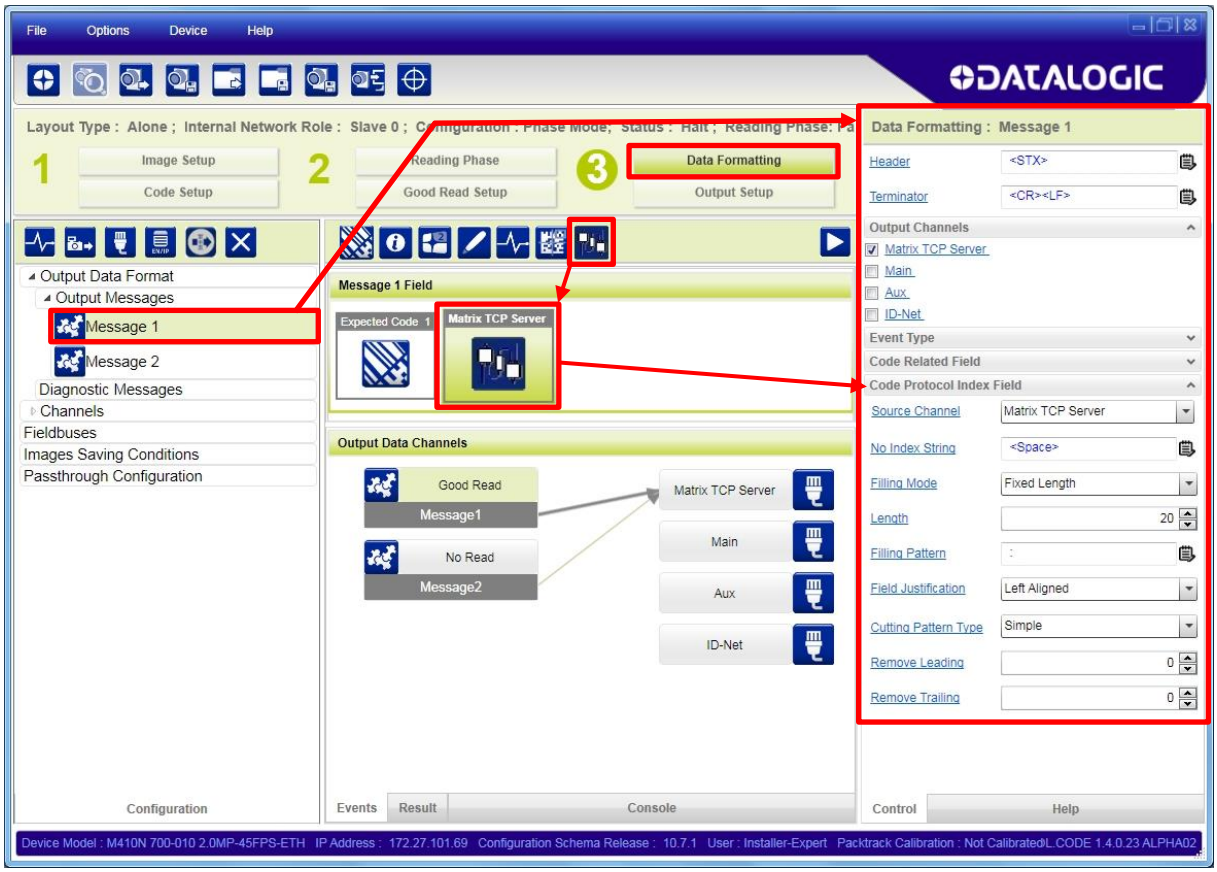
*Header* and *Terminator* strings must be configured whenever a new Protocol Index object is added to a configuration. Either *Header* or *Terminator* can be blank but not both at the same time.

Typically if the Protocol Index Message Length Type is Variable Length, then both Header and Terminator will be needed.

If the Message Length Type is Fixed Length, then at least the Header or the Terminator is necessary.

## 6.2 INCLUDING PROTOCOL INDEX IN THE OUTPUT MESSAGE

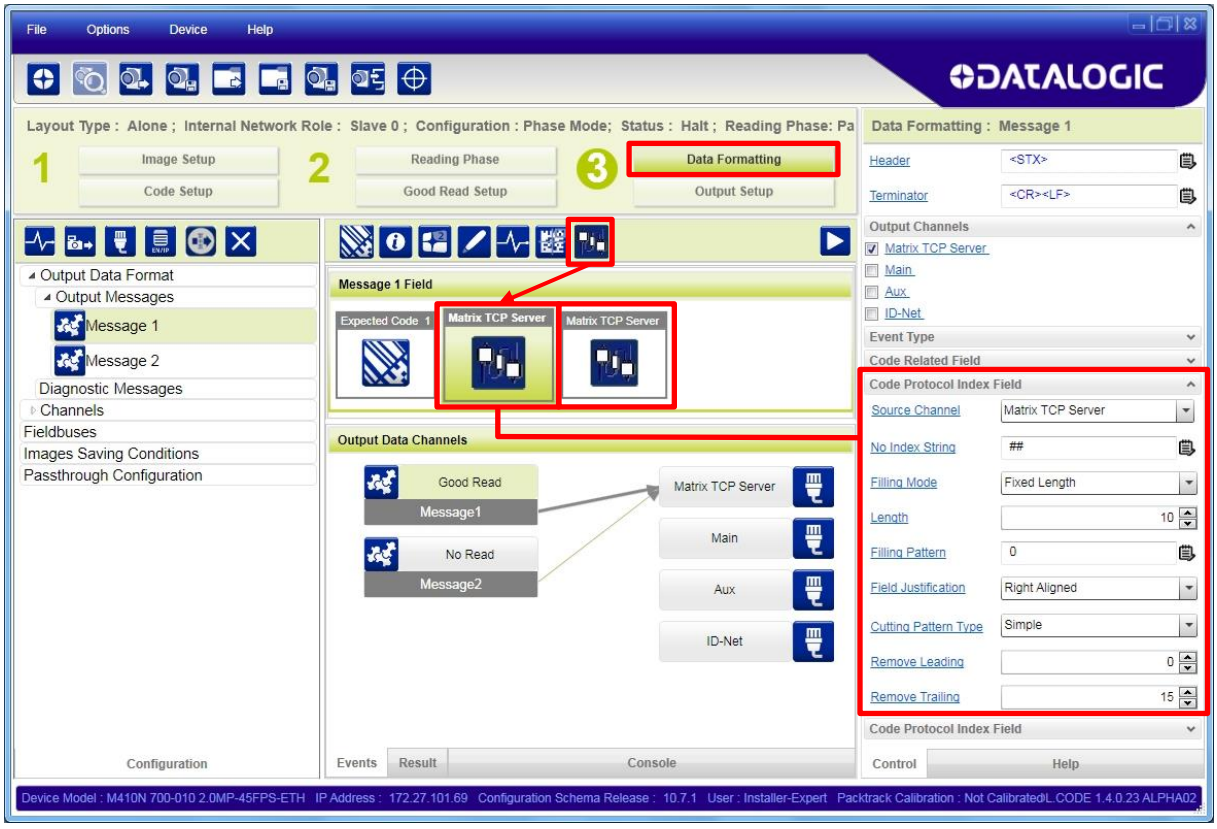
This message (in whole or in part), is also usually included in the output message. Each PI message can be added to the output message by including a Protocol Index Field.

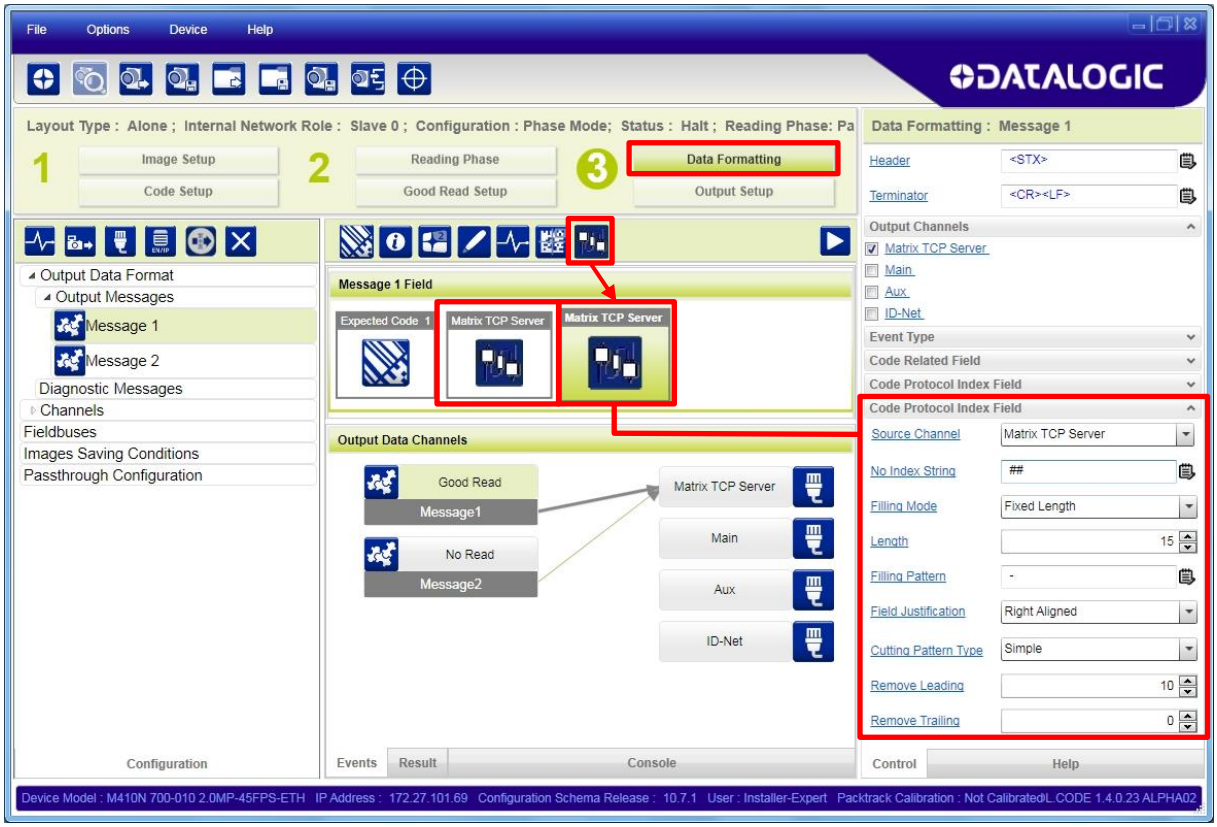



It is usually good practice to add the same PI message to both the Good Read and No Read output messages.

## 6.3 PARSING A COMPLEX PROTOCOL INDEX MESSAGE

A single complex Protocol Index message coming from a single channel can be received from a Host and can be divided into separate Protocol Index messages in the Data Formatting output message.



For further details on the Protocol Index Message, see the parameter descriptions in the DL.CODE Help On Line Protocol Index page.

# 7 MESSAGE FORMATTING

Message Formatting is extremely flexible to allow a high level of customization depending on the application requirements. This however makes formatting more complex.

**NOTE:** A new Script Formatting tool based on javascript is provided to personalize the output message to a higher level than what is available using the standard Output Message tools. This tool is recommended only for people experienced with scripting. For details see par. 7.6.

Here we will break down the main characteristics of the Output Message and describe the standard Output Message tools.

Information relative to code reading is transmitted in standard formats on the device's selected interface. We refer to this as the OUTPUT MESSAGE. The general format of the OUTPUT MESSAGE is:

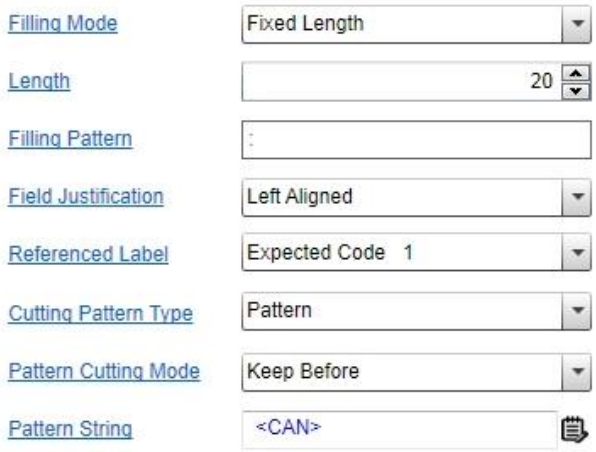
<HEADER><RESULTS><TERMINATOR>

The RESULTS component is composed of several optional fields which are used in different combinations to create different output messages (like Successful Read, No Read, Statistical Data, Diagnostic Data, etc.). These fields can be inserted into the output message in any order. A list of the formatting fields is given in the table below.

| Fields | Icon | Meaning |
|---|---|---|
| Code Related |  | Report various code related information types in the output message: Code Content, Number of Characters, Code Symbology, Pixels Per Element, Average Module Size (mils), Symbol Size, Decoding Time, X-Coordinate, Y-Coordinate, Angle, Slave Number, Bounding Box.<br><br>Each Code Related field can only contain one information type, but you can include multiple Code Related fields in the output message. |
| Global Statistics |  | Include Global Statistical Counters in the output message. |
| Global Reading |  | This field offers different types of information depending on the data collection Analysis Mode and on the Operating Mode.<br>When analyizing within an image, the Image Processing Time can be included in the output message to monitor performance. Typically used for Troubleshooting or fine tuning during installation.<br>For Phase mode, several phase related counters are available.<br>For PackTrack mode you can add the Pack ID to the output message. |
| Custom |  | Define custom strings to be included in the output message. Typically used to customize Failure messages like No Read or Multiple Read. |
| Diagnostics |  | Monitor individual Diagnostic Failure events by including them in the output message. Typically used for Troubleshooting.<br><br>These can also be included independently from the Code Reading events by defining them in the Diagnostic Message. In this case they will be sent at regular intervals depending on the defined timeout. |
| Code Quality Grading |  | Include code quality trending to monitor print quality of code labels. |

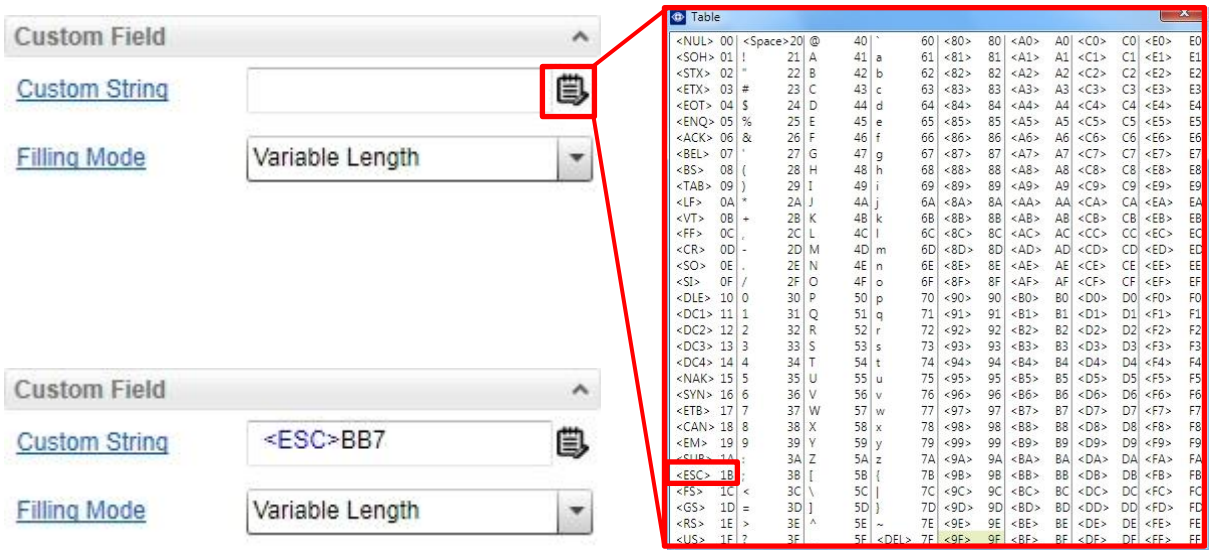
## 7.1 FIELD LENGTH MANAGEMENT

All field types by default are Variable Length fields but they also support Fixed Lengths with cutting and filling mode options.




## 7.2 INPUT STRINGS

All Input String fields have a table icon to the right of the field which allows you to input all ASCII characters including non-printable characters.




Just single-click on the desired character to insert it into the string.

While it is quicker to type normal characters directly from your keyboard, non-printable characters must be entered using the table.

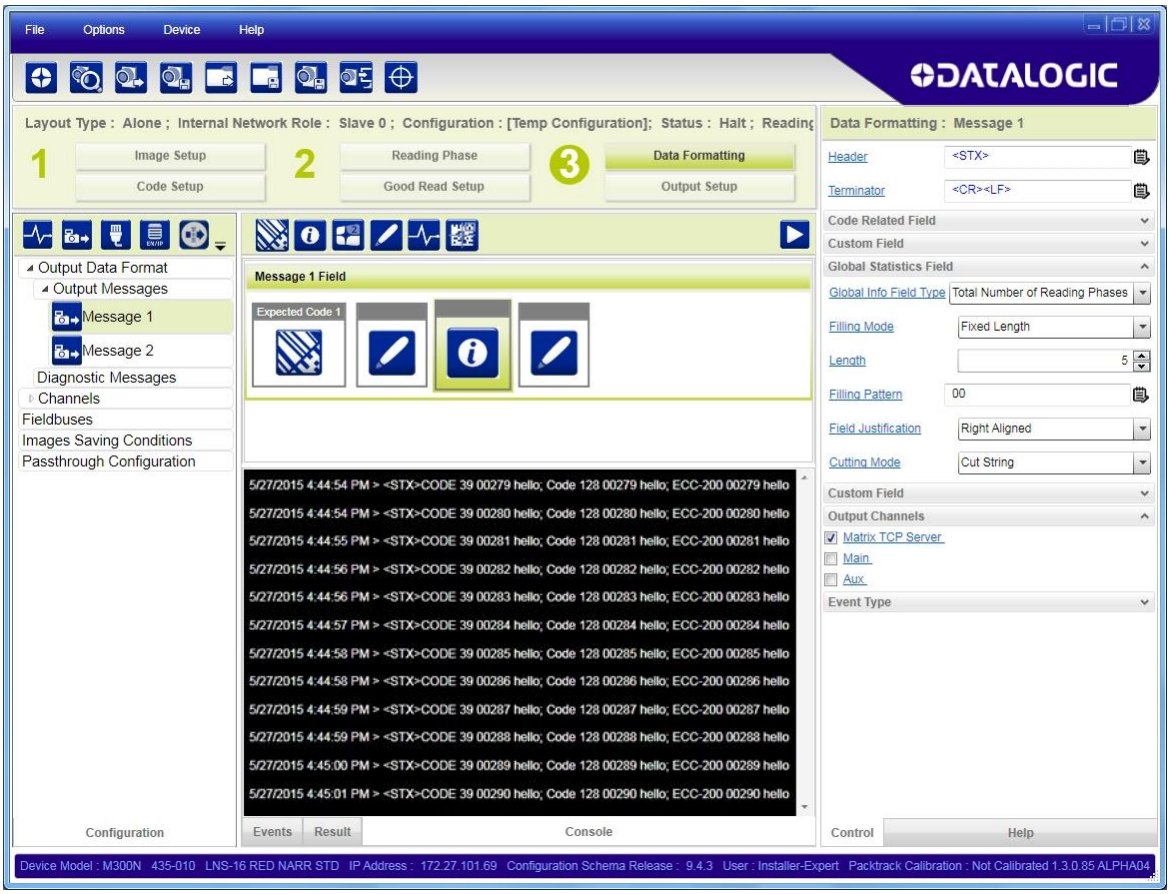
## 7.3 FIELD SEPARATOR

When Operating Mode is set to Code Collection or Code Presentation, the Field Separator character or string is used to separate each formatted code message within the complete output message #n. For example:

**[Header] [formatted Code1] [Field Separator] [formatted Code2] ... [Terminator]**

Each defined message #n can have a different Field Separator.

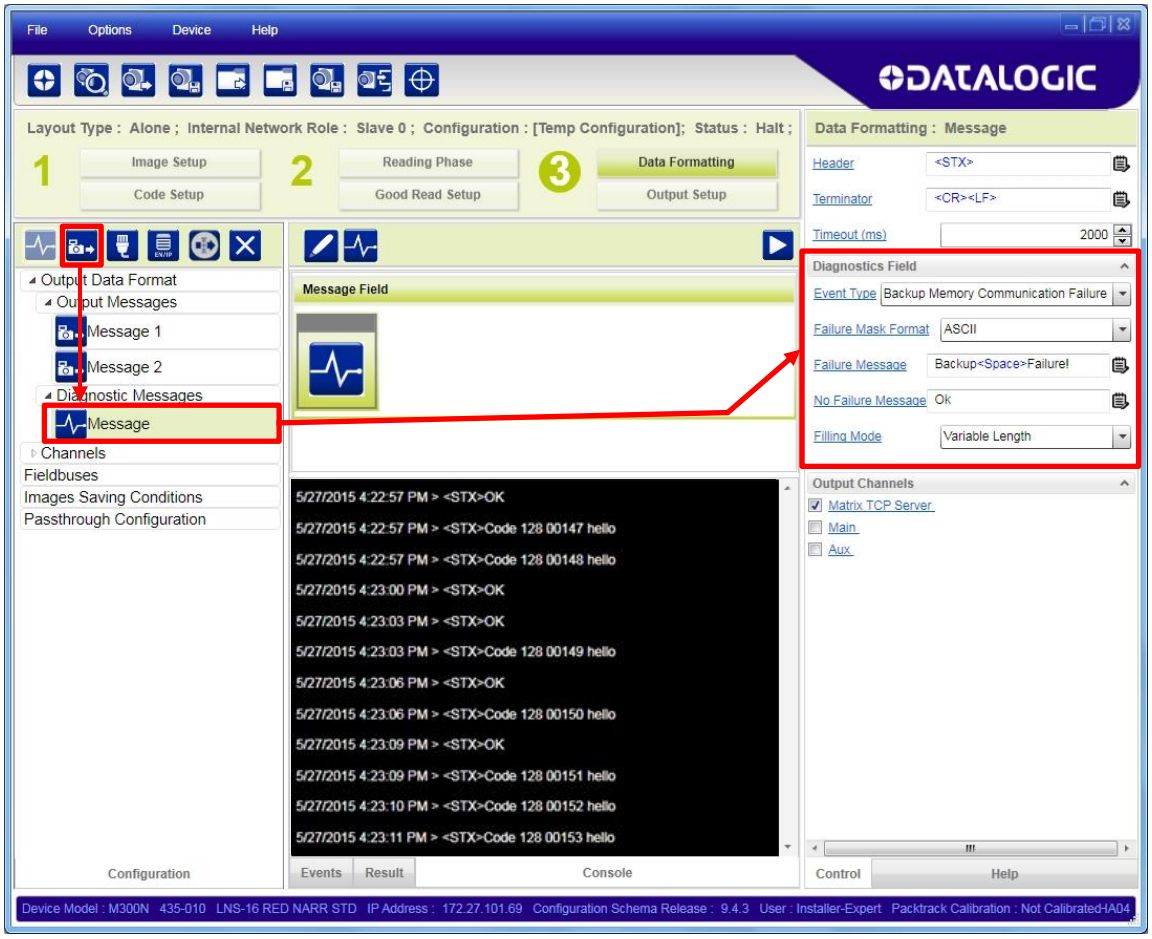
**Example:**



## 7.4 INDEPENDENT DIAGNOSTIC MESSAGES

As a troubleshooting tool or for error monitoring a Diagnostic Message can be sent independently from the code reading message.

For demonstration purposes, the figure below shows the Diagnostic Message for a **Backup Memory Communication Failure** being monitored and sent every 3 seconds on the output independently from the code reading output message.

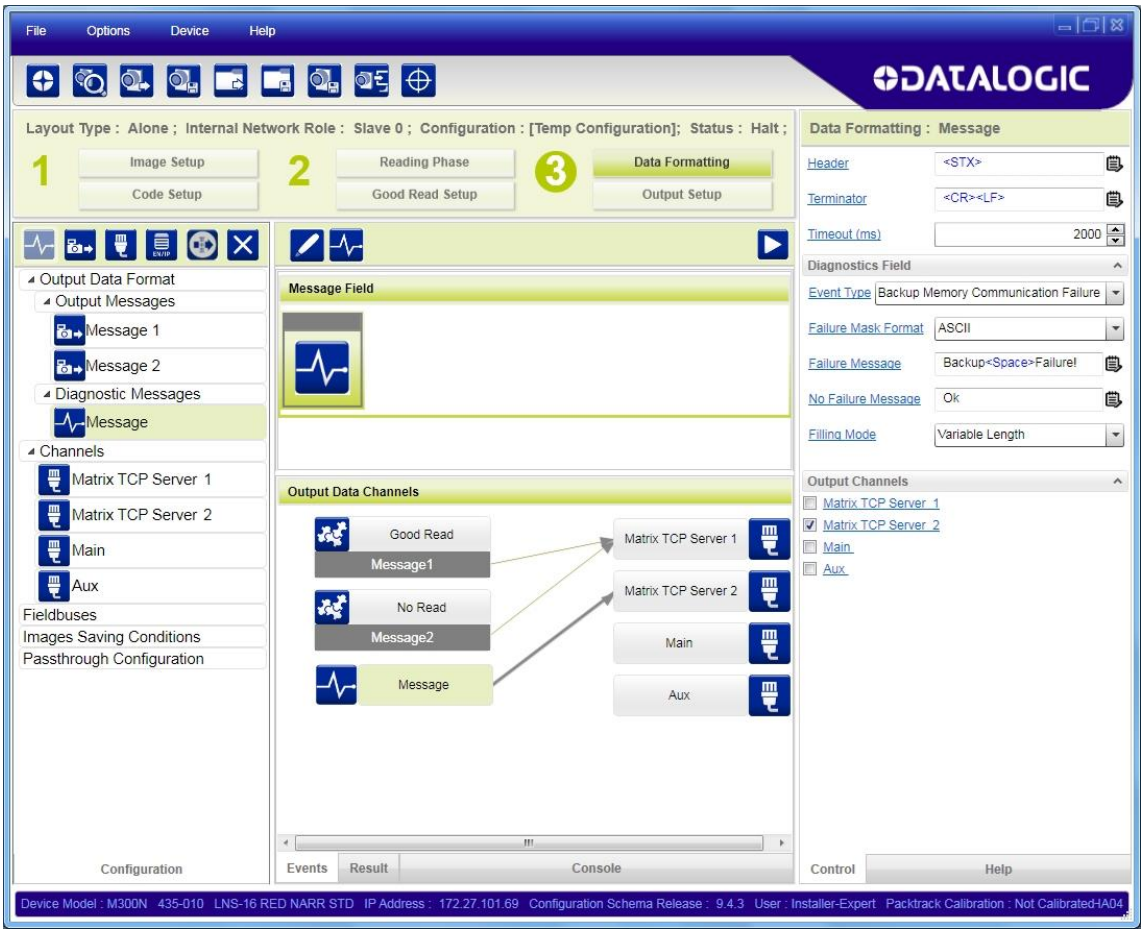



Typically only the Failure string is defined to avoid unnecessary message traffic.

Only upon failures, the Failure Mask sends a fixed 32-character mask. Each character represents the Standalone/Master device + 31 Slaves. The ASCII mask sends 0 =OK and 1 = Failure. The Binary mask sends non-printable characters.

The mask is appended to the Failure Content message (if defined).

This monitoring could be sent to another channel so as not to interfere with data communication, for example to another Matrix TCP Server connection, as shown below.

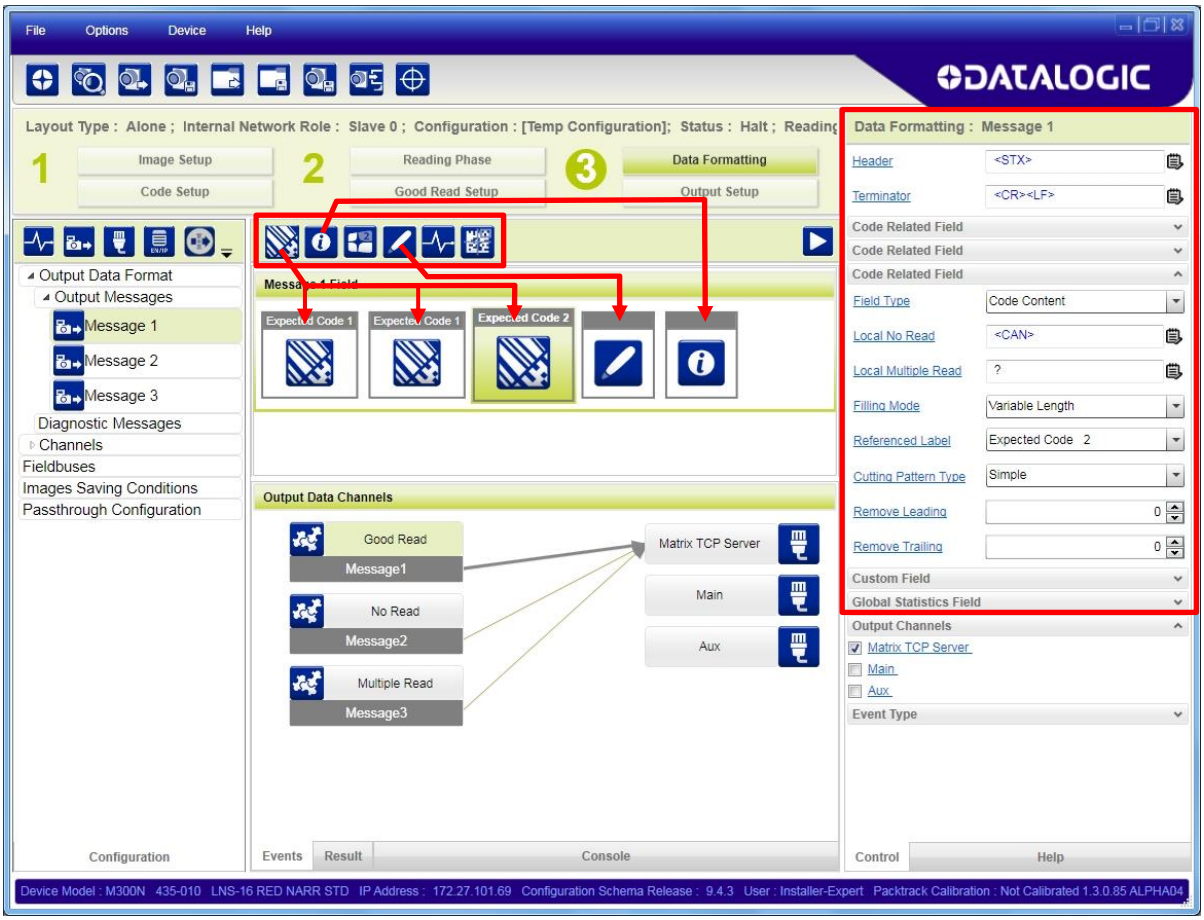



Several Diagnostic fields can be added to the Diagnostic Message for complete monitoring.

## 7.5 CODE COMBINATION MESSAGE FORMATTING EXAMPLE

In Code Combination the expected result is always known in terms of code reading.
To simplify these examples we will not consider Code Cutting or Justification, all fields are considered with the default value as Variable Length fields.

Recalling the example in par. 5.2:




The DMECC200, QR Code and Code128 types are enabled and present in the Code Combination with the following logical combination:
DMECC200 OR QRCode AND Code128.
No Read is Enabled; Multiple Read is Enabled; Partial Read is treated as No Read

Click on the various field icons to add them to the Message Field Area to compose the message.
You can drag them into different positions to change the ordering of the message fields.
You can also delete them by selecting the field with the mouse (highlighted in green), and then delete it using your keyboard.

Then modify the Data Formatting parameters of each field in the parameters panel.

The Data Formatting Parameters are:

**Message 1 = Good Read**
Header String = <STX>
Terminator String = <CR><LF>

Referenced Label = Expected Code 1
**Code Related Field = Code Symbology**
**Code Related Field = Code Content**

Referenced Label = Expected Code 2
**Code Related Field = Code Content**

**Custom Field**
Custom String = <Space>->Space>

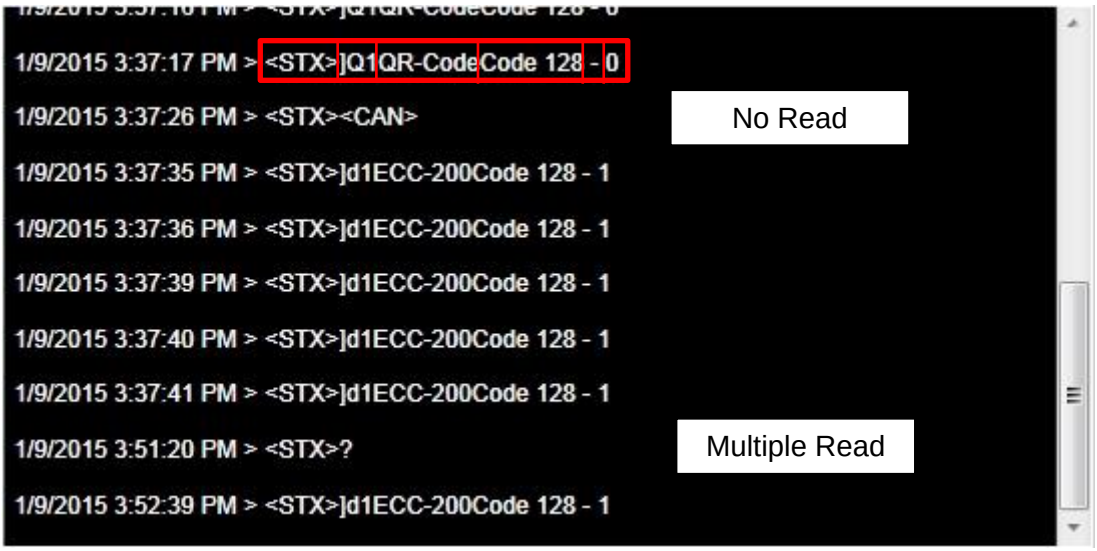
**Global Statistics Field**
Global Info Field Type = Total Number of No Reads

**Message 2 = No Read**
**Custom Field**
Custom String = <CAN>

**Message 3 = Multiple Read**
**Custom Field**
Custom String = <?>

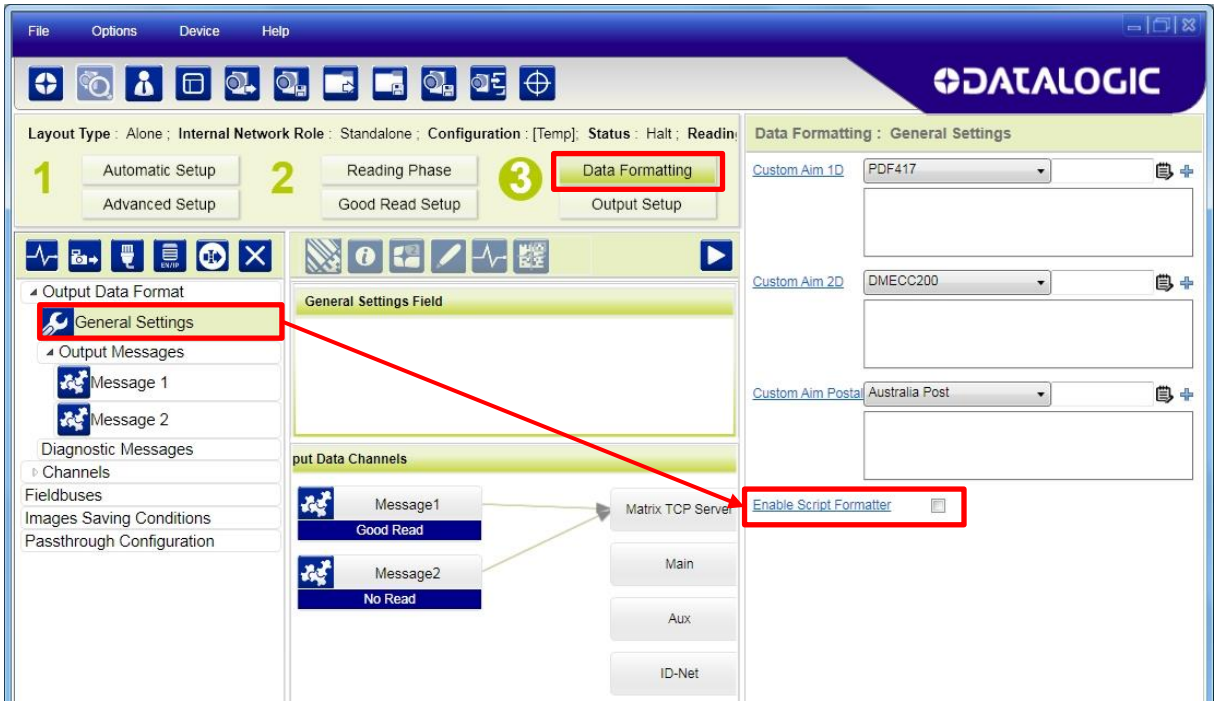
The Output Messages are:

Case 1: codes (DMECC200 AND Code128) or (QR Code AND Code128) are read
Output: the content of **Message 1 Good Read** is sent to the Host.

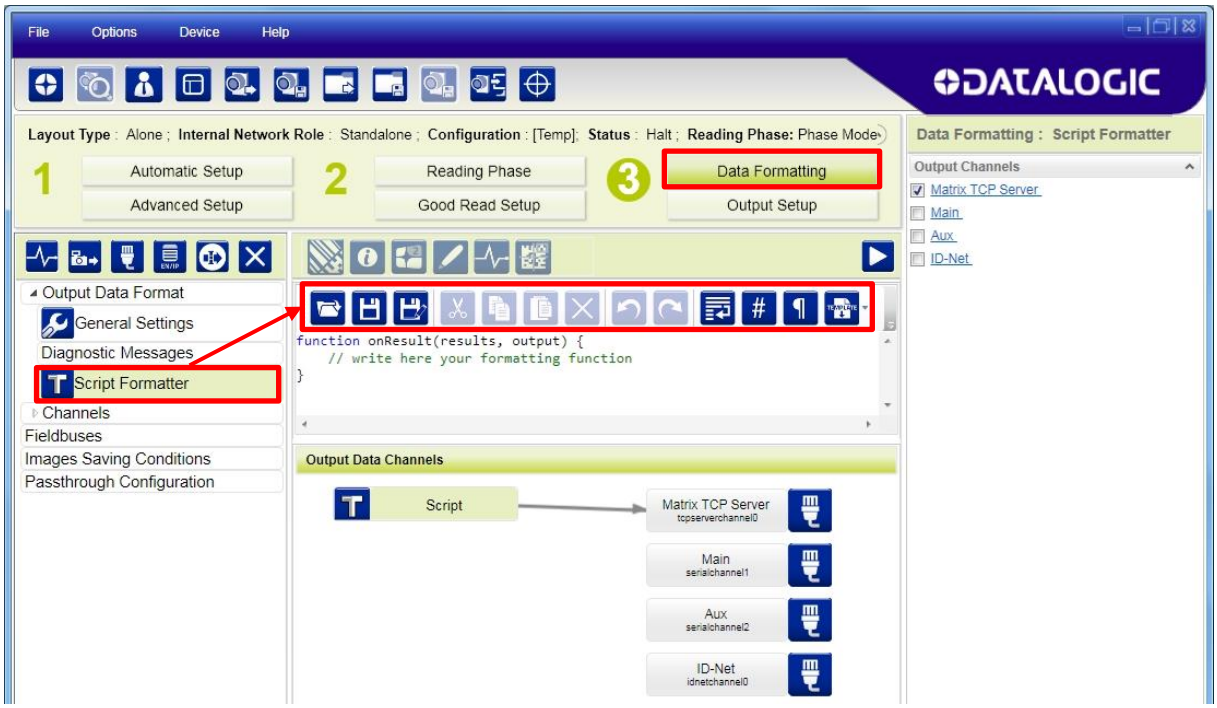


## 7.6 SCRIPT FORMATTER

Script formatting is designed to allow the highest level of output message configuration in place of the standard Output Message tools. It is recommended only for people experienced with scripting and can be enabled from the Data Formatting – General Settings branch.




The Script Formatter will now replace the Output Messages branch. It is complete with several editing tool icons to facilitate scripting within the DL.CODE GUI.



Script Formatter is based on an embedded JavaScript engine. For DL.CODE version 1.5.0 and later, the embedded JavaScript engine conforms to ECMAScript 5.0/5.1 Language Specification.

### 7.6.1 Global Objects

Inside the script engine, the script code makes it possible to access some global objects:

Statistics – an object to access device global reading statistics

Diagnostics– an object to access device diagnostic information

### 7.6.2 Callbacks

## Function: onResult

This callback function is called every time the code analysis completes and allows for program controlled customized formatting of one or more messages based on decoding data results.

| Argument | Type | Description |
|---|---|---|
| result | Result | Allows access to all the decoding data |
| output | Output | Allows access to all the output messages |

Example:

This simple example accesses information wrapped inside the *Result* object to extract the content of all the decoded codes content and concatenate it into a space separated string. The generated string is then used as the output message by accessing the *Output* object.

```
function onResult(result, output) {
        var message = '';
        result.codes.forEach(function(code) {
            message += code.content + ' ';
        });
        output.setMessage(message ? message : 'no_read');
    }
```

### 7.6.3 Objects Reference

## Result Object

Provides functions to access decoding data.

| Property | Type | Description |
|---|---|---|
| **codes** | Array | The array of all the decoded Code objects. |
| **slots** | Array | The array of all the configured Slot objects. The array contains a Slot object for each *Expected Code* in *Code Combination*. If the current Data Collection is not of type *Code Combination*, the property is set to **undefined**. |
| **images** | Array | The array of all the decoded images Image objects. |
| **success** | Boolean | This is set to **true** if the current result is a *Good Read*, *Success* or *Match*, otherwise it is set to **false**. |
| **addresses** | Array | The array of device addresses that decoded at least one code. Address 0 corresponds to the Master address. |
| **readingCount** | Number | The total number of decoded codes in the reading phase. |
| **rejectedCodes** | Number | The number of decoded codes removed from the output based on the analysis. An example is counting multiple read codes when the *Multiple Read* event is disabled. |
| **imageProcessingTime** | Number | Average time used to decode an image. |
| **imageId** | Number | The current image identifier. This is meaningful only if *Analysis* is *Within An Image*. |
| **phaseId** | Number | The current phase identifier. This is meaningful only if *Reading Phase* is set to *Phase Mode* and *Analysis* is *Within Phase*. |
| **phaseDuration** | Number | The duration of the last phase. |
| **phaseOffDuration** | Number | The duration of the last phase off period. |
| **packId** | Number | The current pack identifier. This is meaningful only if *Reading Phase* is set to *PackTrack Mode*. |

## Code Object

Provides access to the data of a single decoded code.

| Property | Type | Description |
|---|---|---|
| **content** | String | The content of a code as a String. |
| **center** | Point | The center position of the code inside the image. |
| **corners** | Array | The four corners of the bounding box of the code as an array of Point objects. |
| **addresses** | Array | The array of device addresses that decoded this code. Address 0 corresponds to the Master address. |
| **binaryContent** | Uint8Array | The content of the code as an *Uint8Array*. |
| **symbology** | String | The code symbology name. |
| **aimId** | String | The AIM identifier of the code symbology. |
| **angle** | Number | The code angle. |
| **ppe** | Number | The code pixels per element. |
| **moduleSize** | Number | The code module size. |
| **decodingTime** | Number | The decoding time in microseconds. |
| **symbolSize** | String | The code symbol size (if applicable). |
| **quality** | QualityMetrics | The Quality Metrics object that contains all the quality metrics info for the code. |
| **imageIndex** | Number | The index number of the image containing the code. This value is **undefined** if the code has been decoded on a slave device. |

## Quality Metrics Object

Provides access to the quality metrics of a single decoded code. Each metric returns an object with two properties:

**grade** – a string representing the quality grade (A, B, C, etc.)

**value** – a numeric representation of the quality.

| Property | Type | Description |
|---|---|---|
| **overall** | Object | Overall quality grade. |
| **decode** | Object | Decode grade and value. |
| **contrast** | Object | Contrast grade and value. |
| **modulation** | Object | Modulation grade and value. |
| **decodability** | Object | Decodability grade and value. |
| **meanEdgeContrast** | Object | Mean Edge Contrast grade and value. |
| **axialNonUniformity** | Object | Axial Non Uniformity grade and value. |
| **uec** | Object | Unused Error Correction grade and value. |
| **printGrowth** | Object | Print Growth grade and value. |
| **minReflectance** | Object | Minimum Reflectance grade and value. |
| **defects** | Object | Defects grade and value. |
| **fixedPatternDamage** | Object | Fixed Pattern Damage grade and value. |
| **gridNonUniformity** | Object | Grid Non Uniformity grade and value. |

## Point Object

This is an object with the *x* and *y* pixel coordinates of a point on an image. Values are relative to the upper left corner of the image (0,0).

| Property | Type | Description |
|---|---|---|
| **x** | Number | The *x* coordinate (increases from left to right). |
| **y** | Number | The *y* coordinate (increases from top to bottom). |

## Slot Object

A slot corresponds to a single *Expected Code* in *Code Combination*. This object provides functions to access the Code objects associated with the Expected Code.

| Property | Type | Description |
|---|---|---|
| **codes** | Array | The array of all the Code objects assigned to this slot. |

## Image Object

Provides access to the data of a single decoded image.

| Property | Type | Description |
|---|---|---|
| **processingTime** | Number | The decoding time in microseconds. |
| **imageId** | Number | The current image identifier. |

## Output Object

Provides a function to set the output message to be sent on the output channel(s).

| Function | Arguments | Description |
|---|---|---|
| **setMessage** | string, channel_id (optional) | Sets the output message. If no *channel_id* is specified, the message is sent to all connected channels, otherwise it is sent only to the specified channel (which has to be connected to the script message in any case). At the end of the formatting script execution, for each channel, the system sends its specific message, if it exists, otherwise it sends out the generic message. |
| **setEvent1** | none | Set Script Event 1. If called, the event will be generated at the end of the script execution. From the Output Setup group, the event can be linked to any available output. |
| **setEvent2** | none | Set Script Event 2. If called, the event will be generated at the end of the script execution. From the Output Setup group, the event can be linked to any available output. |
| **setEvent3** | none | Set Script Event 3. If called, the event will be generated at the end of the script execution. From the Output Setup group, the event can be linked to any available output. |

## Statistics Object

Provides access to global device statistics.

| Property | Type | Description |
|---|---|---|
| **phases** | Number | Number of Reading Phases. |
| **goodReads** | Number | Number of Good Reads. |
| **noReads** | Number | Number of No Reads. |
| **multipleReads** | Number | Number of Multiple Reads. |
| **partialReads** | Number | Number of Partial Reads. |
| **phaseOverrun** | Number | Number of Phase Overruns. |
| **triggerOverrun** | Number | Number of Trigger Overruns. |
| **unexpectedPhaseOn** | Number | Number of Unexpected Phase Ons. |
| **images** | Number | Number of Image Acquisitions. |
| **fps** | Number | Current frames per second. |

## Diagnostics Object

Provides access to global device diagnostics. Each diagnostic returns an object with the following properties:

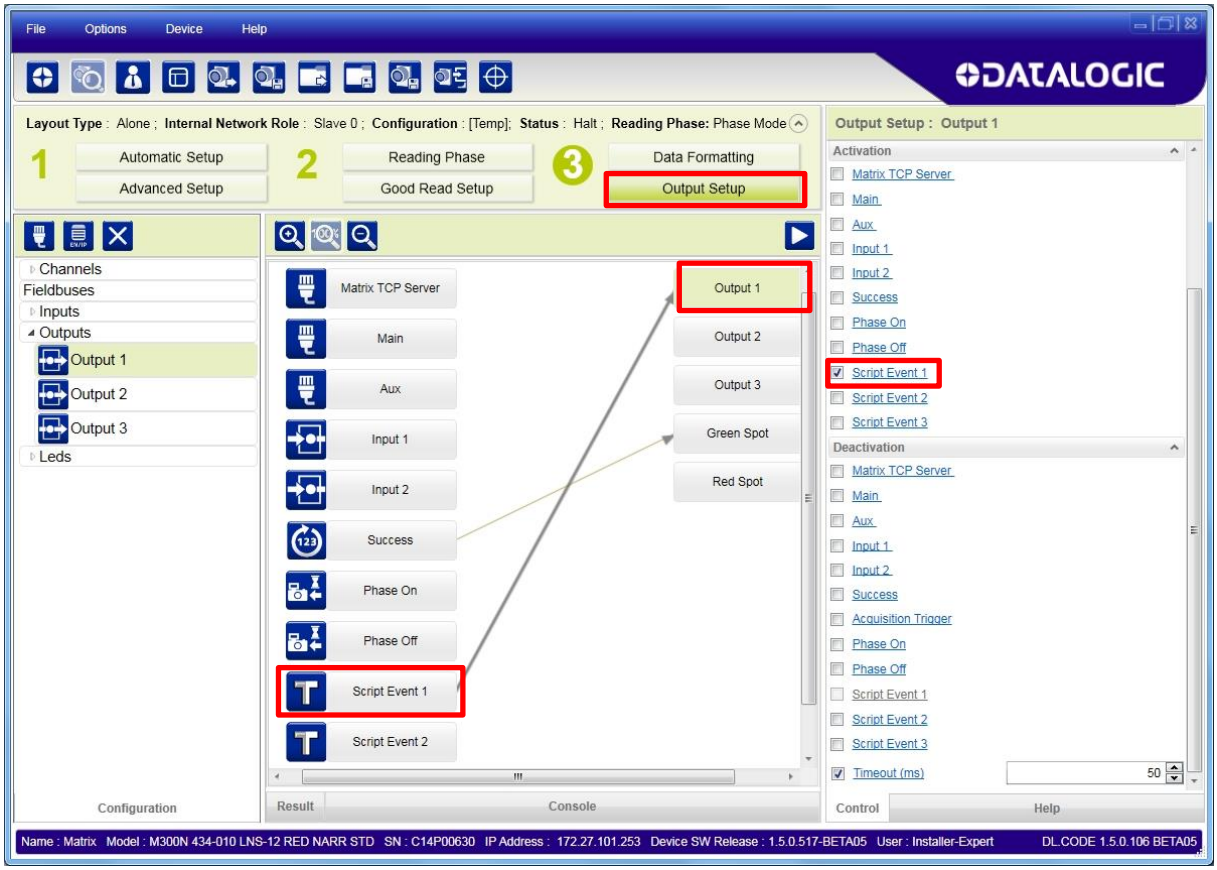
**alarm** – a flag set to **true** if the alarm is currently active, otherwise it is set to **false**.

**addresses** – an array of numbers where every number is the address of the device that has activated the alarm. If the alarm equals **false**, the array is empty. Address 0 corresponds to the Master address.

| Property | Type | Description |
|---|---|---|
| **slaveNoReplay** | Object | Slave No Reply diagnostic alarm. |
| **slaveAddressDuplication** | Object | Slave Address Duplication diagnostic alarm. |
| **fieldbusCommunicationFailure** | Object | Fieldbus Communication Failure diagnostic alarm. |
| **fieldbusDHCPFailure** | Object | Fieldbus DHCP Failure diagnostic alarm. |
| **fieldbusConfigurationFailure** | Object | Fieldbus Configuration Failure diagnostic alarm. |
| **fieldbusTypeMismatch** | Object | Fieldbus Type Mismatch diagnostic alarm. |
| **wrongRotarySwitch** | Object | Wrong Rotary Switch diagnostic alarm. |
| **backupMemoryCommunicationFailure** | Object | Backup Memory Communication Failure diagnostic alarm. |
| **xrfSlaveNotDetected** | Object | XRF Slave Not Detected diagnostic alarm. |
| **protocolIndexFailure** | Object | Protocol Index Failure diagnostic alarm. |
| **sc5000CommunicationFailure** | Object | SC5000 Communication Failure diagnostic alarm. |
| **sc5000PresentationMessageResponseFailure** | Object | SC5000 Presentation Message Response Failure diagnostic alarm. |
| **noCameraHeadFailure** | Object | No Camera Head Failure diagnostic alarm. |

## 7.6.4 Script Event Digital Output Control

As well as the output message configuration, the script can also contain Output object functions that can drive the reader's outputs.



# 8 MONITOR

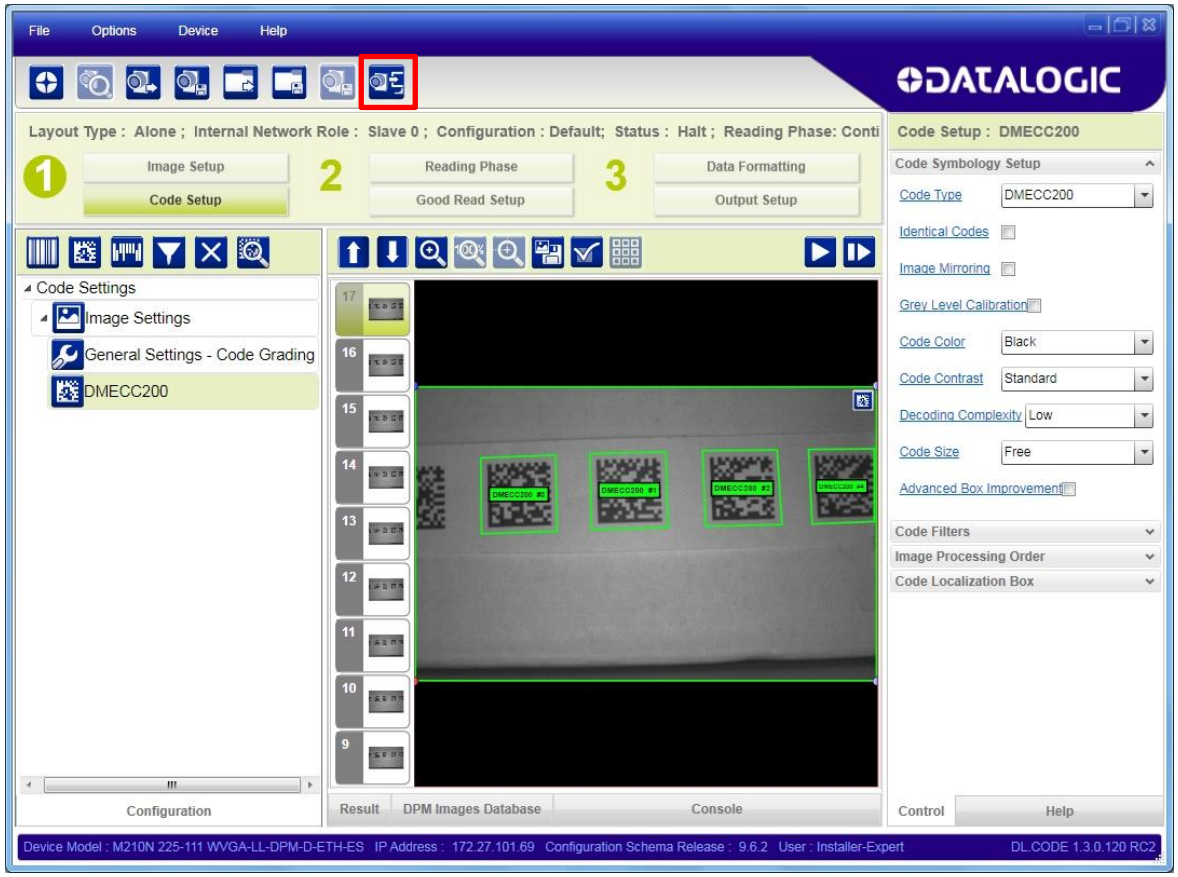
The Monitor feature is designed to check device operation from a remote PC even simultaneously with other monitoring PCs.

It can be used during installation or troubleshooting to check the device operation. The device operates with a minimum of DL.CODE overhead and therefore reading results are much closer to real-time performance.

Monitor also provides diagnostic alarm feedback.

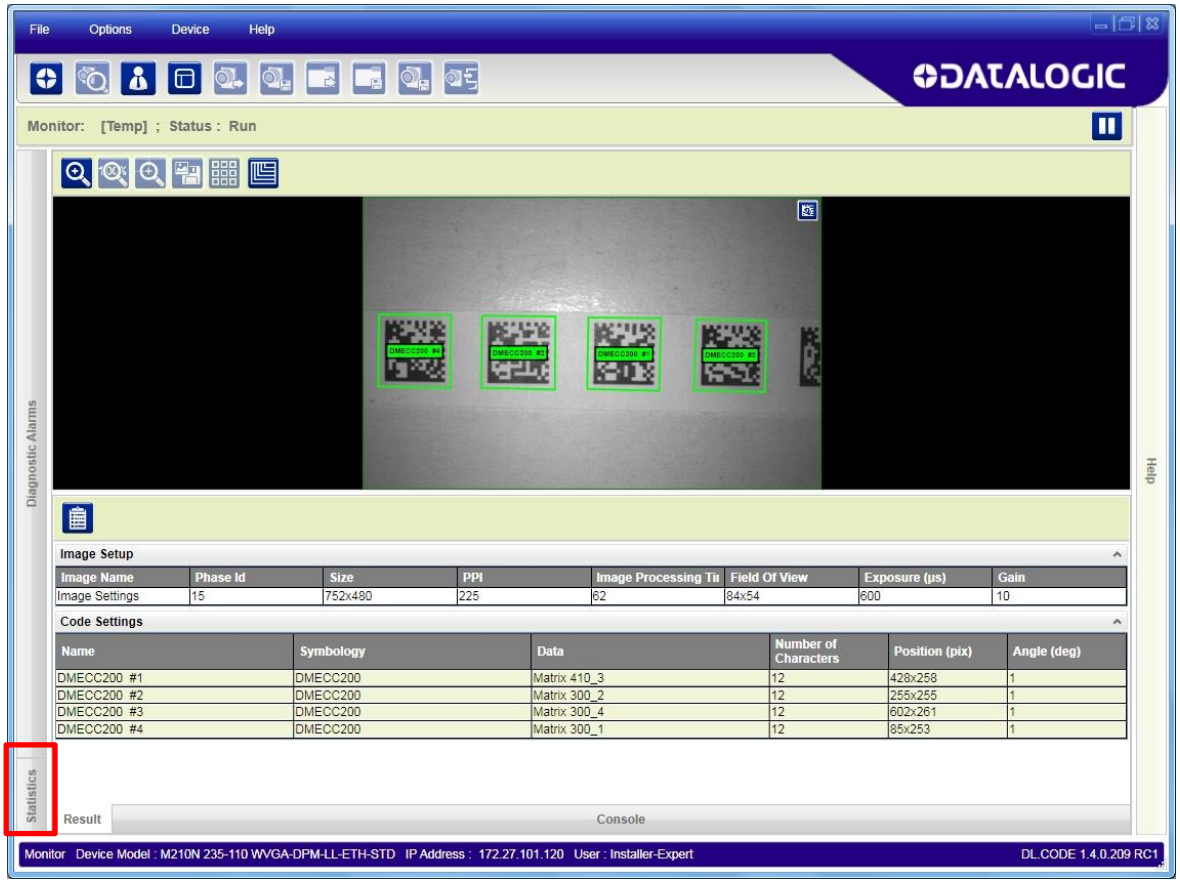
## 8.1 ACESSING THE MONITOR

You can access the Monitor page through the File menu or the Monitor icon.



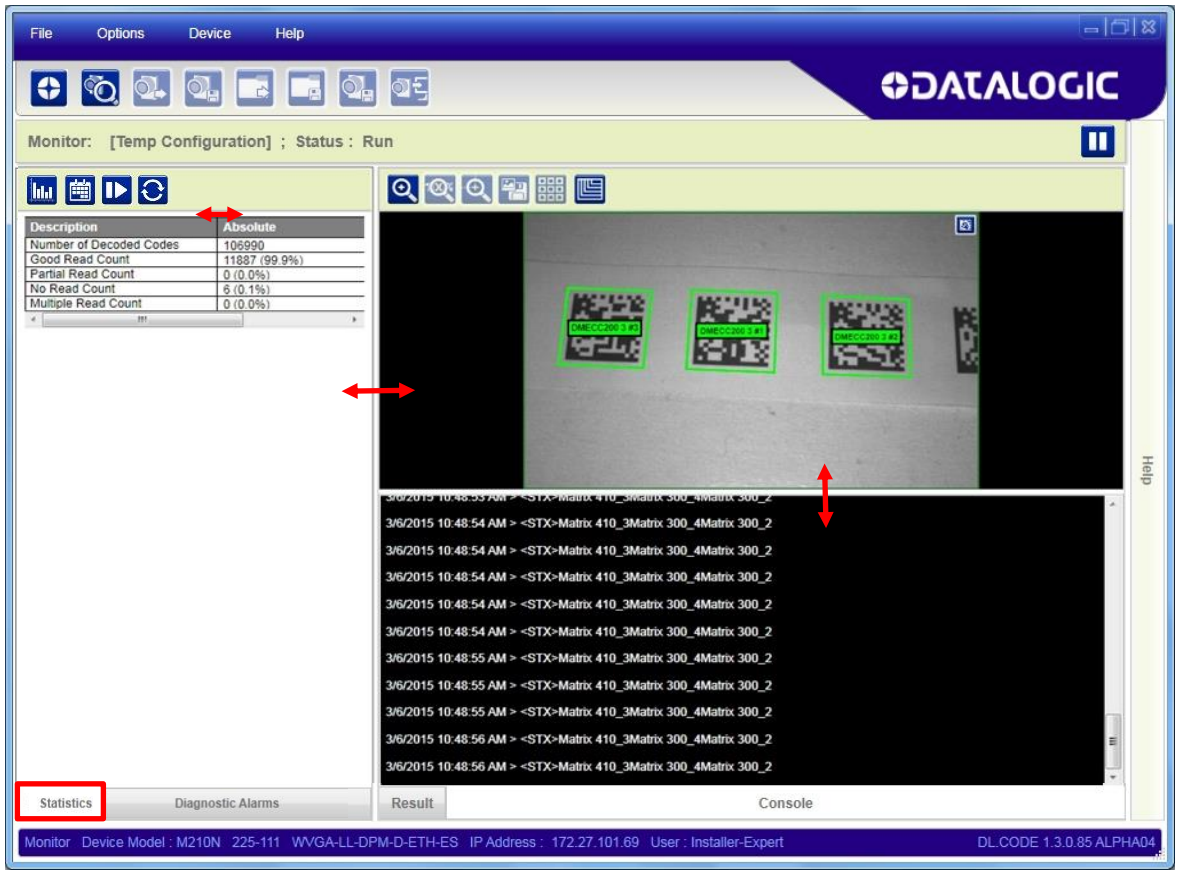
## 8.2 MONITORING STATISTICS

The Monitor loads with the reader in run mode. If the device is reading (in Continuous operating mode or One Shot/Phase Mode with trigger active), the reader will show image acquisition. The Results area underneath the image gives feedback on decoding results.

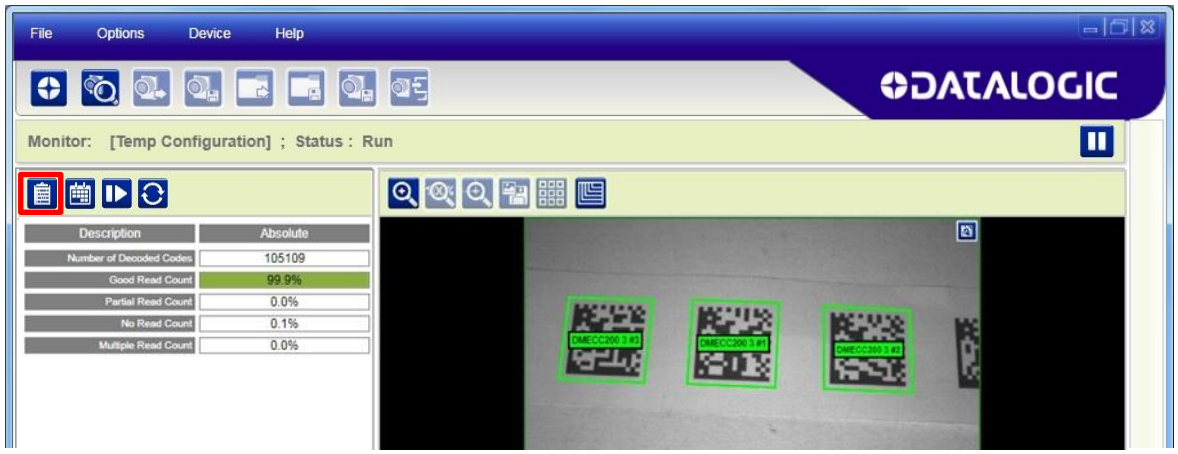



The Statistics page is collapsed to the left side of the DL.CODE window and can be opened by clicking on the its tab.

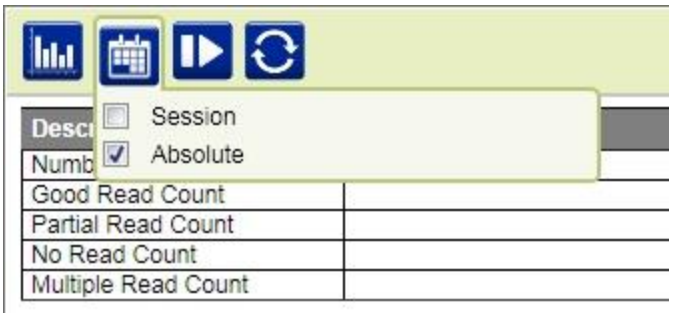
You can resize the various windows by dragging the edges with the mouse.




You can toggle between table view and chart view statistics by clicking on the icon.




You can also switch between Session and Absolute statistics.



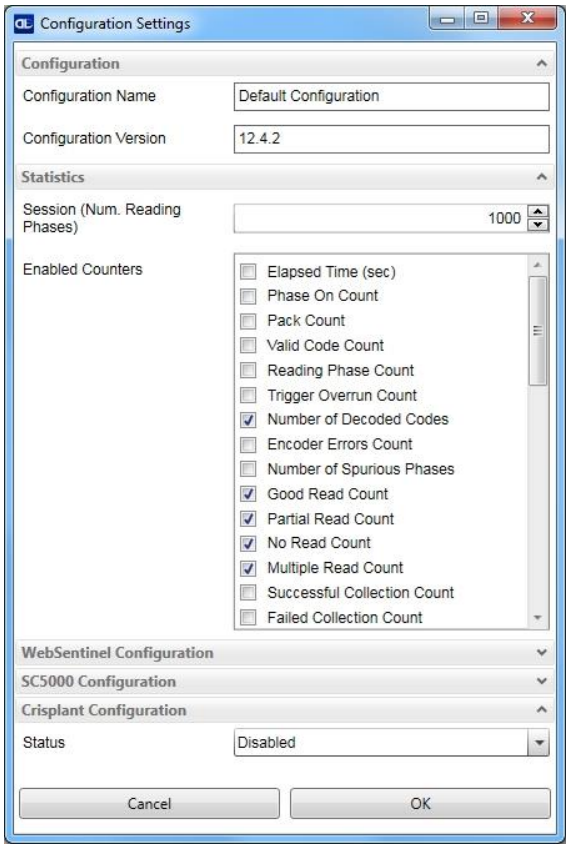

- **Session Statistics**: show only the fields selected that are represented as a percentage, rate, or average (i.e. Good Read, Partial Read, No Read, Average Pack Size, etc.) and refer to the last session or the last time the Statistics were reset up to the maximum Session number of reading phases. See below. A session ends if the device is connected to the DL.CODE configuration environment.

- **Absolute Statistics**: show all the fields selected in the Device menu > Settings > Configuration Settings > Statistics > Enabled Counters list from the last device power on or the last time the Statistics were reset.

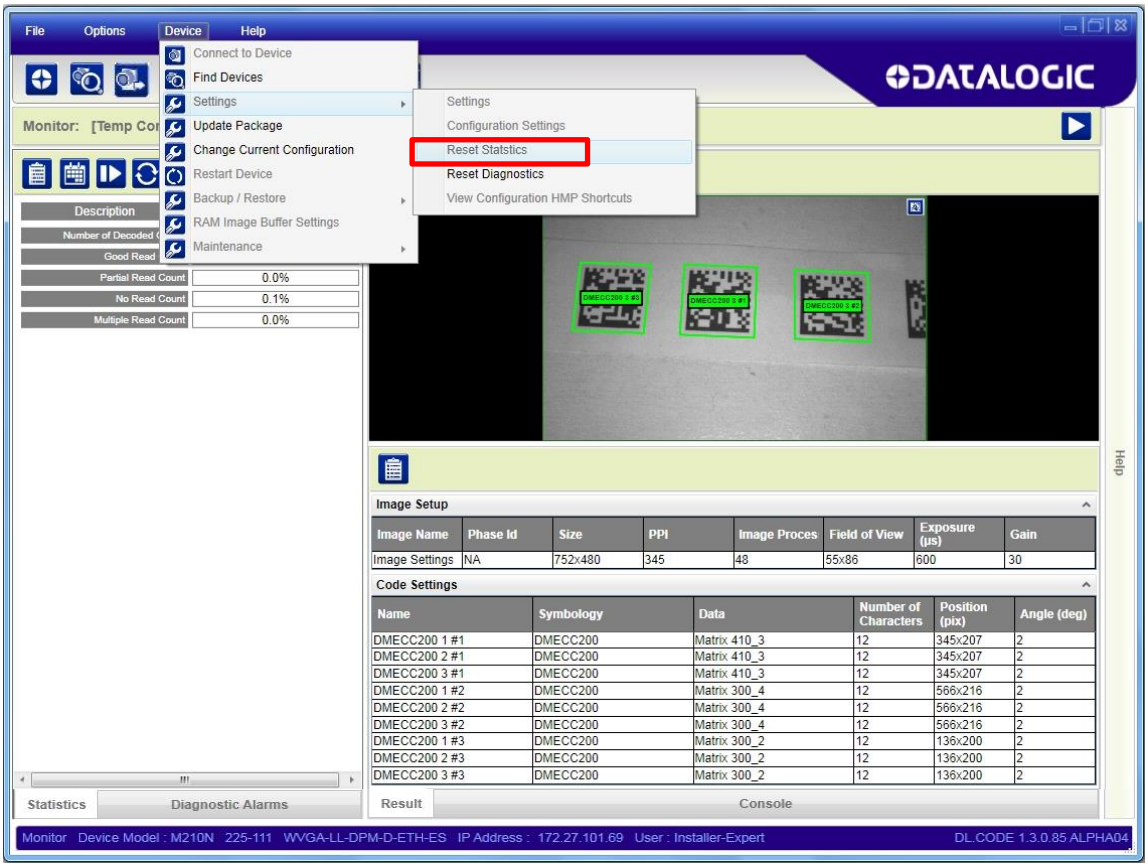
### 8.2.1 Statistics Settings

From the Device menu > Settings > Configuration Settings you can set the number of reading phases to monitor for a Session (from 10 to 1000).

You can also choose which fields to visualize in the Monitor Statistics page.

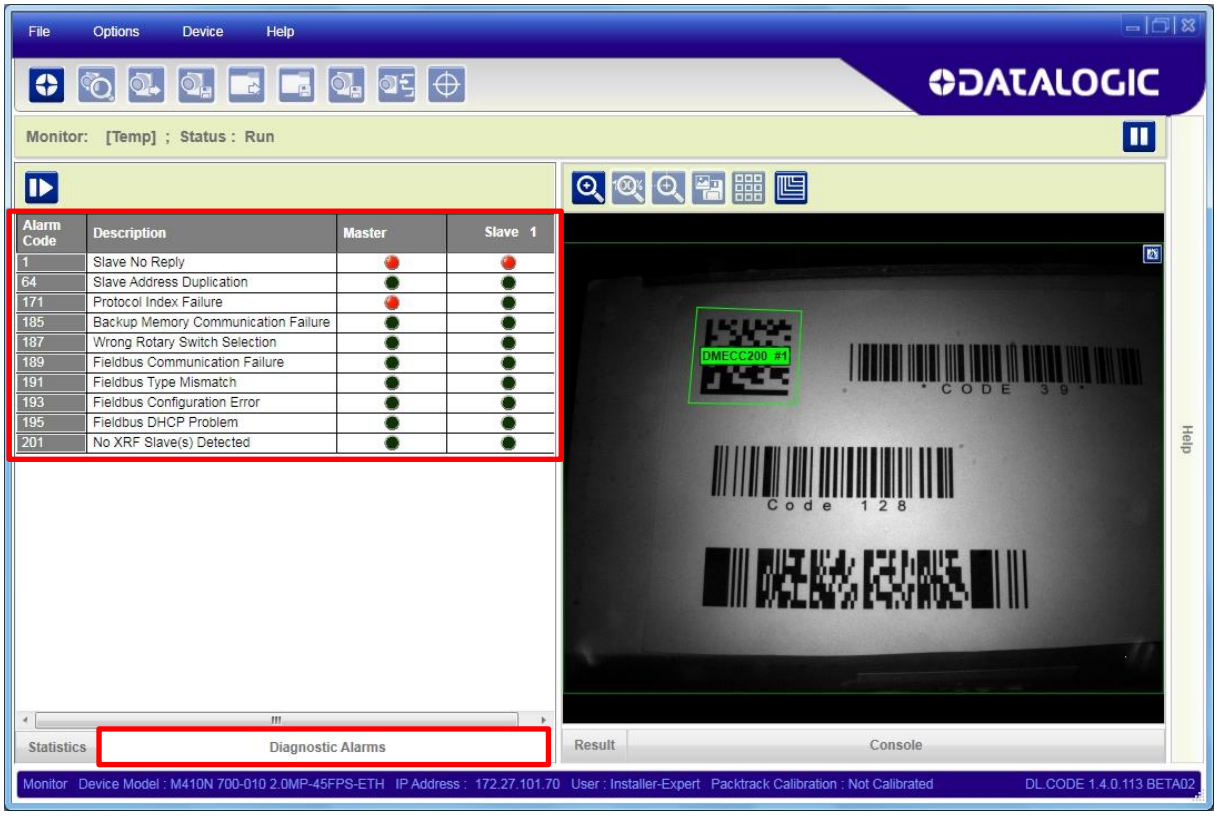


You can reset all the statistics (both Session and Absolute) clicking on the Reset Statistics icon or by selecting the Reset Statistics command from the Device menu > Settings.



## 8.3 MONITORING DIAGNOSTIC ALARMS

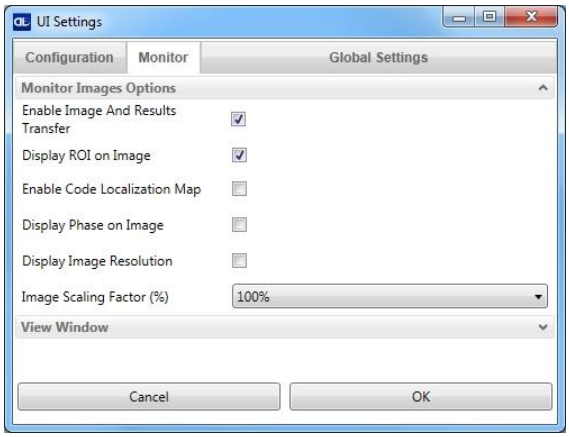
Any Diagnostic Alarms will show up as a warning light on the alarm panel. Most Alarms are relative only to Standalone or Master readers.




| Alarm Code | Description | Meaning |
|---|---|---|
| 1 | Slave No Reply | No response to master from slave (shown in slave column) |
| 64 | Slave Address Duplication | Two or more slaves have the same address |
| 171 | Protocol Index Failure | The expected Protocol Index is not received |
| 185 | Backup Memory Communication Failure | There is a communication error between the reader and the external memory (BM100 module inside the CBX connection box or QLM Gateway). |
| 187 | Wrong Rotary Switch Selection | One or more of the selected BM100 Rotary Switch settings inside the CBX doesn't match the reader configuration memory. |
| 189 | Fieldbus Communication Failure | There is a communication error between the reader and the Fieldbus module inside the CBX connection box or QLM Gateway. |
| 191 | Fieldbus Type Mismatch | The Fieldbus module inside the CBX doesn't match the one saved in the reader configuration memory. |
| 193 | Fieldbus Configuration Error | A configuration error has occurred between the reader and the Fieldbus module inside the CBX connection box. |
| 195 | Fieldbus DHCP Problem | A communication problem has occurred between the DHCP server and the Fieldbus module inside the CBX connection box or QLM Gateway. |
| 201 | No XRF Slave(s) Detected | The XRF Master must have at least one XRF Slave. |
| 301 | SC5000 Communication Failure | There is a communication error between the reader and the SC5000 Controller |
| 302 | SC5000 Presentation Message Response Failure | There is a configuration error between the reader and the SC5000 Controller, typically TX Line position or start position (address). |
| 999998 | Camera Head Failure | There is a communication error between the reader and its internal camera module. |

## 8.4 MONITOR SETTINGS

### 8.4.1 Monitor Images Options




Several options can be set for the Monitor window. They are set in the Options>UI Settings menu on the Monitor tab.

**Enable Image and Results Transfer**: enables the image feedback in the Monitor window.

**Display ROI on Image**: shows the bounding box around each code on the image.

**Enable Code Localization Map** shows…

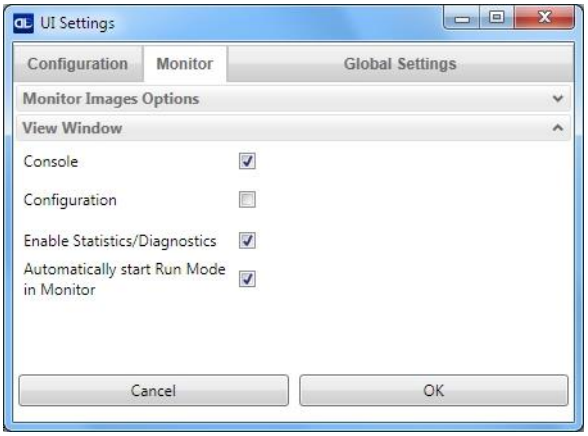
**Display Phase on Image**: shows the Phase identification number in white letters over the upper left-hand side of the image.

**Display Image Resolution**: shows the Image resolution in white letters over the upper left-hand side of the image.

**Image Scaling Factor**: allows downsizing the image subsampling to increase the visualization performance.

### 8.4.2 View Window

You can select several options to view in the Monitor window.




**Console**: shows the Console panel to view output messages.

**Configuration**: shows the Configuration panel to allow viewing the configuration parameters (read-only). Configuration cannot be performed from the Monitor window.

**Statistics/Diagnostics**: shows the Statistics and Diagnostic Alarms panels.

**Automatically start Run Mode in Monitor**: when launching Monitor the window opens with the device in Run Mode. This is the default setting.

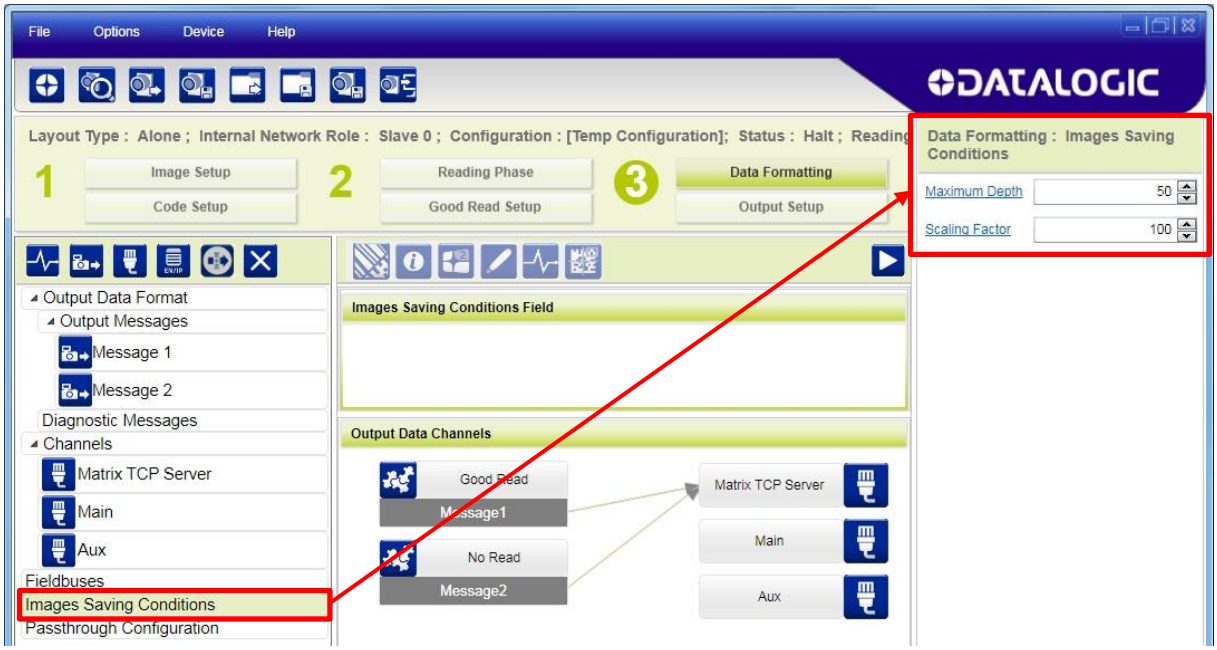
# 9 IMAGE SAVING

## 9.1 DEVICE IMAGE BUFFER

The Device Image Buffer allows saving captured images to the internal device memory (RAM) for data collection analysis. These images can either be sent to a remote or local PC or an FTP server at run time; or they can be downloaded from the buffer when the device is offline (not in run mode).

**CAUTION:** The internal device memory has a circular buffer to avoid overrunning the available memory. To save images correctly to the internal buffer, you need to calculate the number of images the buffer can hold based on the image resolution for your device model.

More images can be stored in memory by scaling down the image size.




**NOTE:** Transferring images remotely may slightly reduce the decoding rate. It is recommended to use this feature only when enough time is available to guarantee the decoding of all images.

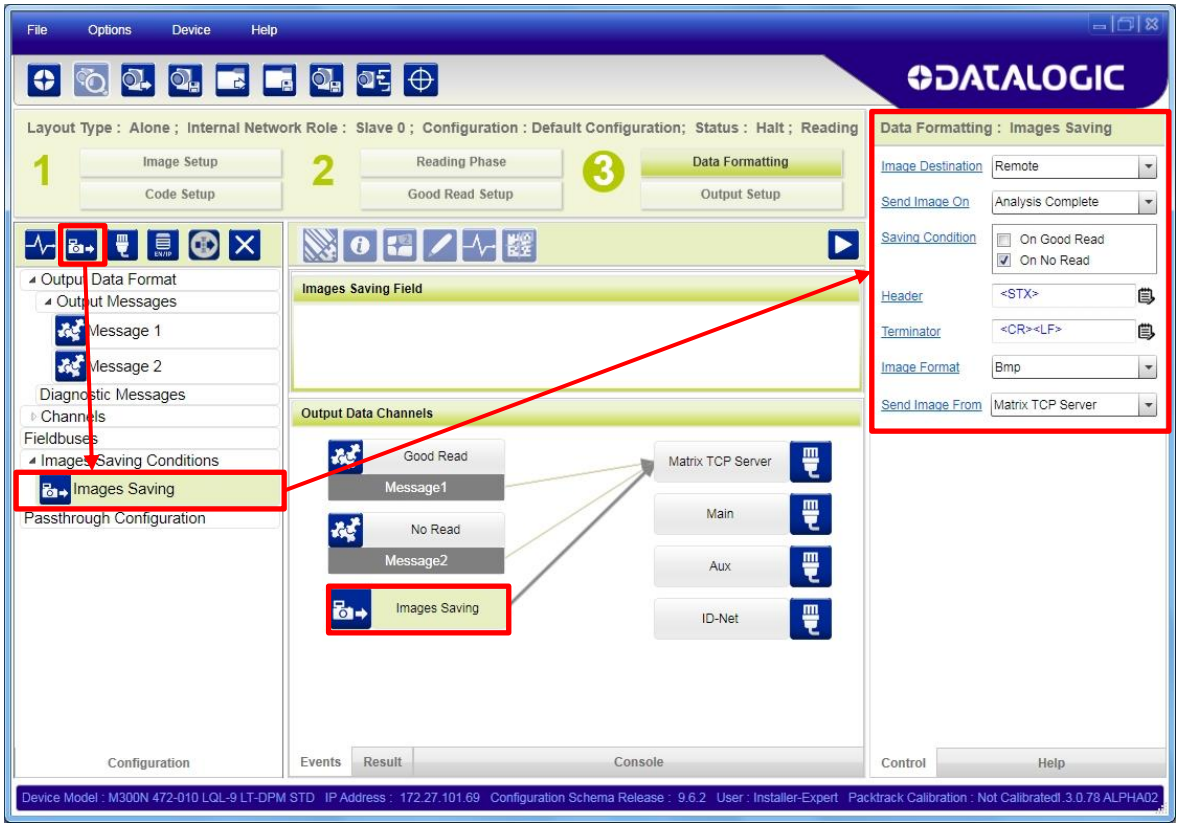
### Image Saving Conditions

**Maximum Depth** sets the total number of images that can be sent from or saved to the Device Image Buffer. Set this figure to a practical value taking into consideration the above mentioned CAUTION.

**Scaling Factor** allows reducing the size of images to be saved so that a greater number of images can be saved in the Device Image Buffer.

### 9.1.1 Image Saving Using Matrix TCP Server/Client

To add an image saving condition to the configuration, click on the Add Image Saving Condition icon.




When selecting a Remote **Image Destination**, the default value is **Send Image From** Matrix TCP Server (on-board Ethernet) channel to an external TCP Client. If desired, a different dedicated Matrix channel can be added for image transfer.

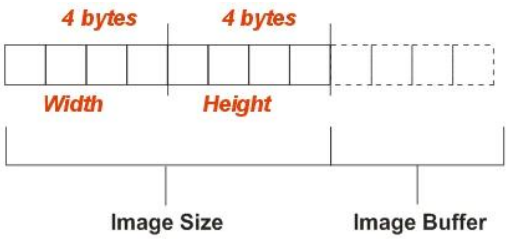
According to the selected **Saving Condition** parameter, after data collection analysis is complete, images can be sent at run time directly from the Device Image Buffer to a remote or local PC.

The Image Saving format is:

[Header] [Image Buffer] [Terminator]

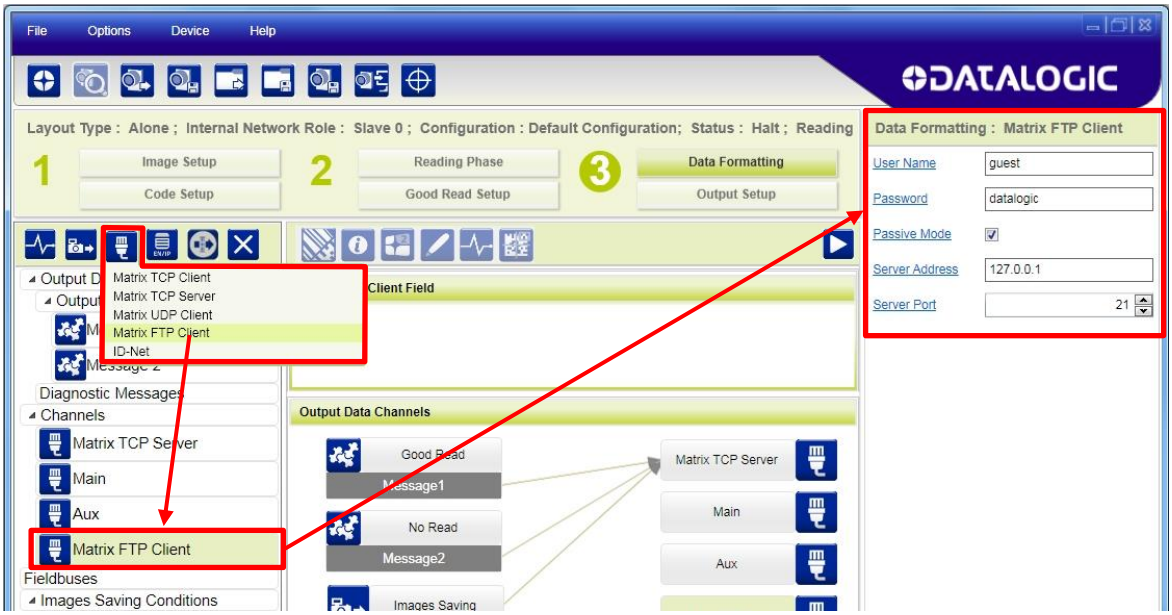
The Image Buffer contains the image data in the selected format (.bmp, .jpg, .png, .tif).

If the RAW data format is selected, the Image Buffer data is preceded by 8 bytes which indicate the image size: the first 4 bytes indicate the image columns (width) while the last 4 bytes indicate the image lines (height) in little-endian ordering.



### 9.1.2 Image Saving Using Matrix FTP Client

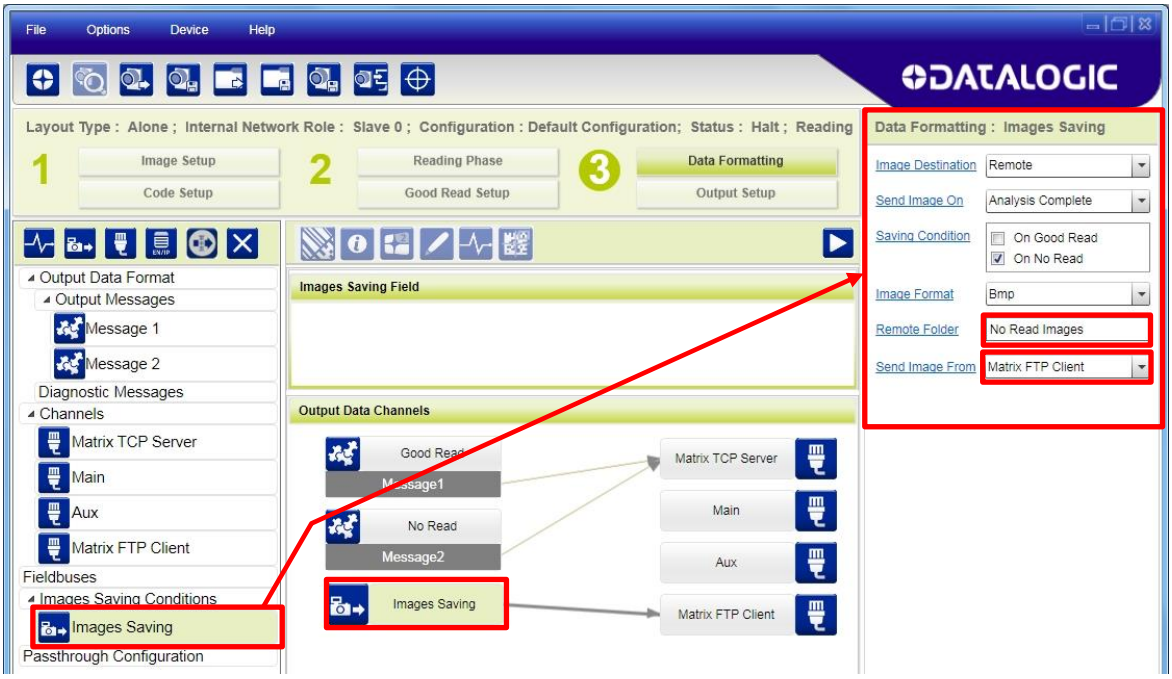
Images can be sent at run time directly from the device image buffer to an external FTP Server through a Matrix FTP Client channel. The Matrix FTP Client must be added as a new communication channel since it is disabled by default. Do this by selecting the channel icon.




- The Server Address must match the external FTP Server PC.
- The Username and Password must match the ones required by the external FTP Server PC.

Now select Images Saving and set the **Send Image From** parameter to Matrix FTP Client.

Input the name of the Remote Folder on the FTP Server to which the image files must be saved.

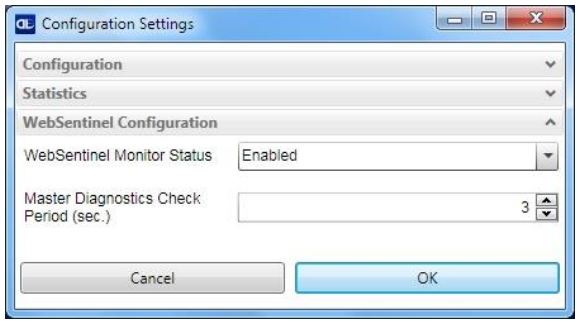


### 9.1.3 Image Saving On Demand to WebSentinel FTP Server

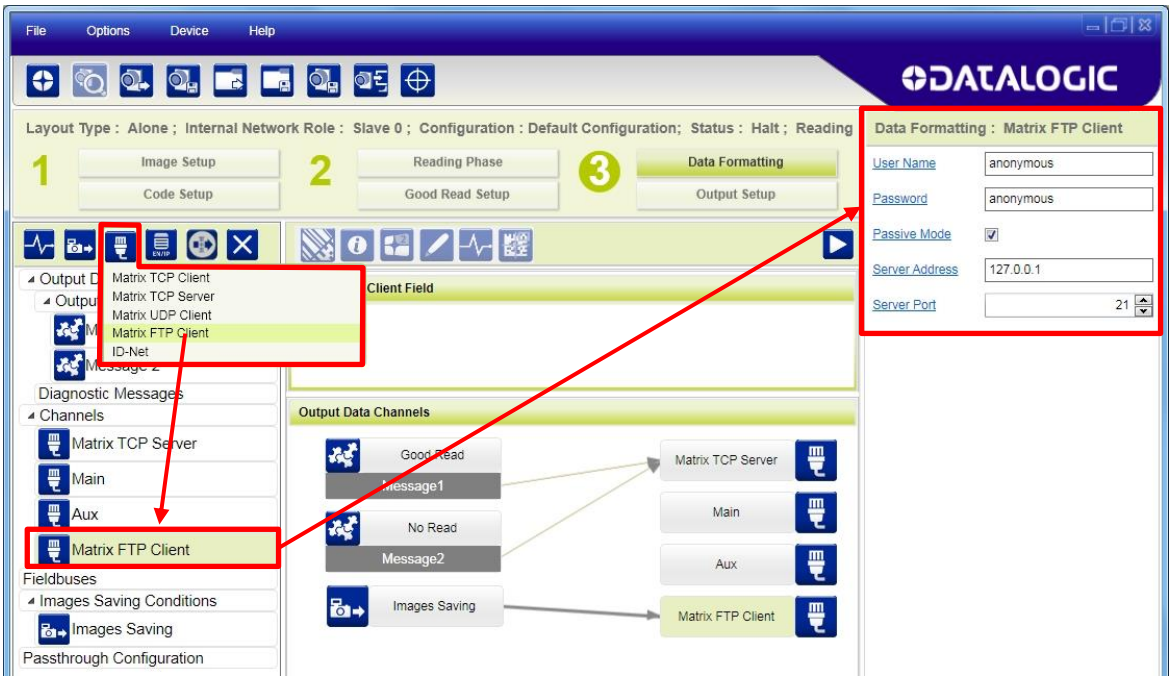
Images can be sent to the WebSentinel FTP Server through a Matrix FTP Client channel upon receiving a Download command from Datalogic WebSentinel™ through the Download buttons in the Event Search tab. See the description in the Datalogic WebSentinal User's Manual.

This selection applies only to One Shot and Phase Mode Operating Modes.

**NOTE:** In order for Datalogic WebSentinel to communicate with the Matrix array you must enable WebSentinel Monitor Status in the DL.CODE Device>Settings>Configuration Settings menu.



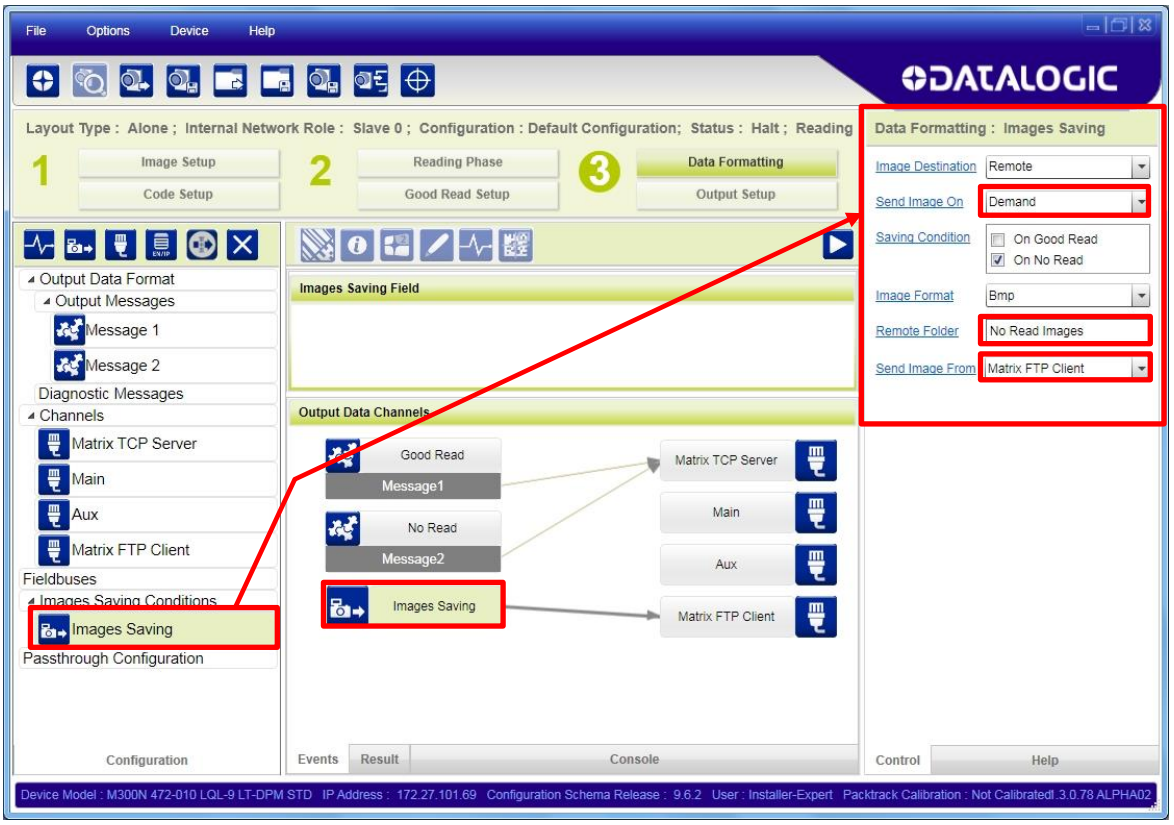

The Matrix FTP Client must be added as a new communication channel since it is disabled by default. Do this by selecting the channel icon.




- The Server Address must match the external WebSentinel FTP Server PC.
- The Username and Password must match the ones required by the external WebSentinel FTP Server PC. For WebSentinel the defaults are **anonymous**, **anonymous**.

Now select Images Saving and set **Send Image On** to Demand and set the **Send Image From** parameter to Matrix FTP Client.

Input the name of the Remote Folder on the FTP Server to which the image files must be saved.



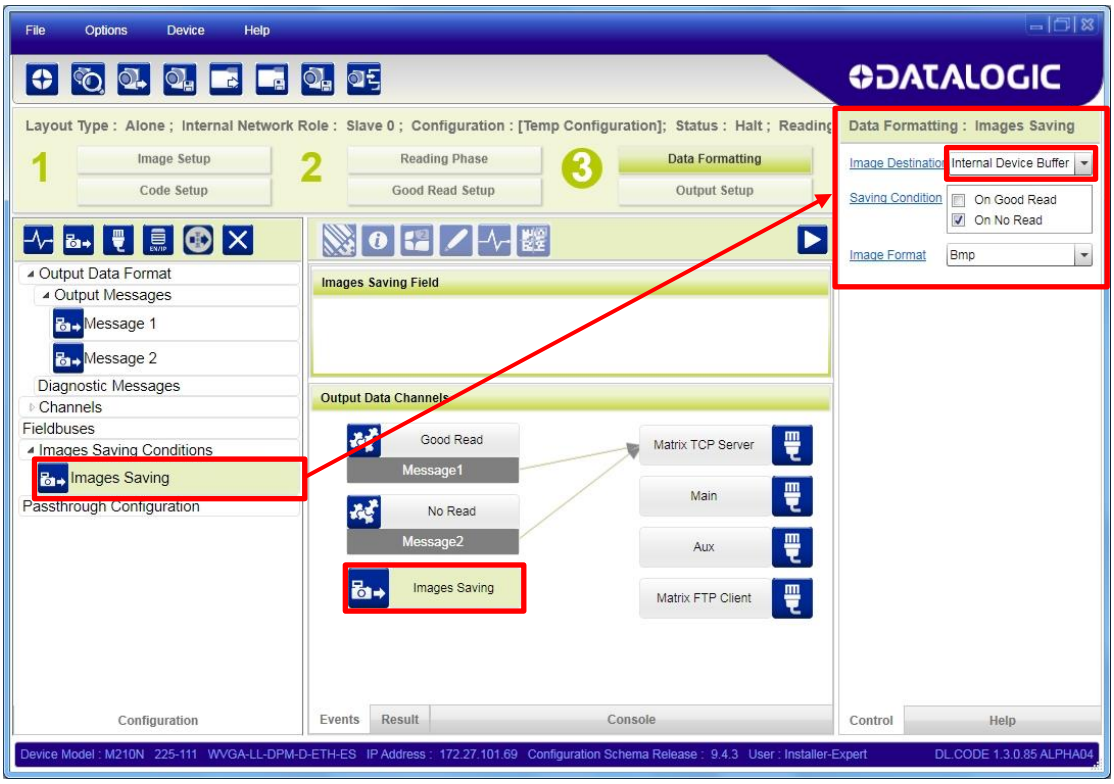

## 9.1.4 Image Saving On Demand Using Send Images HMP Command

Images can also be sent to a remote destination through a Matrix communication channel (typically to an FTP Server through a Matrix FTP Client channel), upon receiving a **Send Images** command from the Host. See the Matrix N Family Host Mode Programming manual for details on this command.

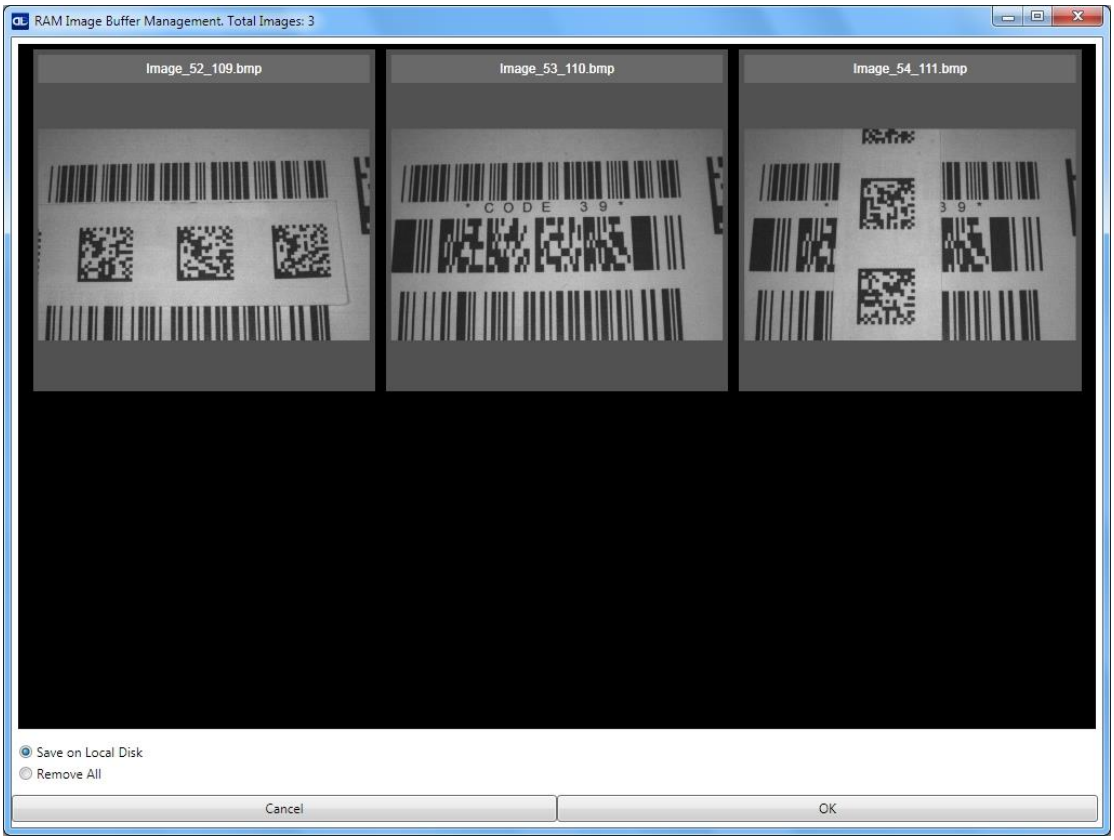
This selection applies only to One Shot and Phase Mode Operating Modes.

### 9.1.5 Image Saving Using Internal Buffer

Images can be saved to the Device Image Buffer and be downloaded to a PC when the device is offline.




To download the saved images, the device must be in offline mode. Through the Device menu>RAM Image Buffer you can access the **Image Buffer Management** window.

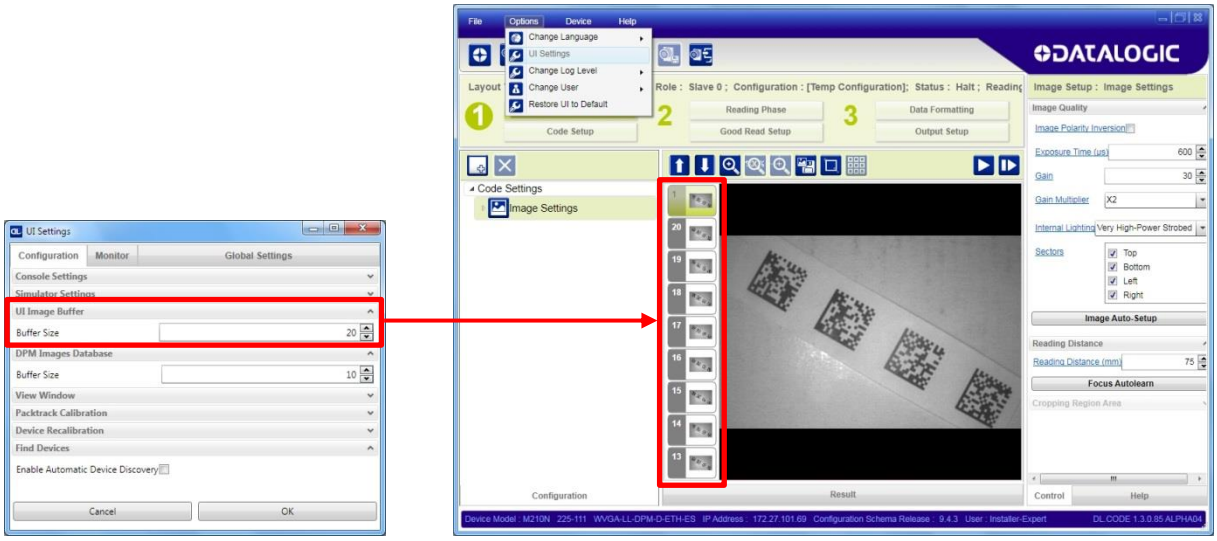



Upon opening this window, the images in the Device Image Buffer (RAM) are transferred to the DL.CODE Device Image Buffer Management window and the images are deleted from the device RAM.

You can save all the images in a zip file to the PC or you can delete the images from the DL.CODE Image Buffer Management memory.

## 9.2 UI IMAGE BUFFER

The UI Image Buffer manages the images captured through the DL.CODE Play and Capture features.



# 10 MULTI DEVICE CONFIGURATION OPTIONS

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

## 10.1 PASS-THROUGH CONFIGURATIONS

Starting from software version 1.3.0, DL.CODE and Matrix N family readers support pass-through multi device configurations.

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

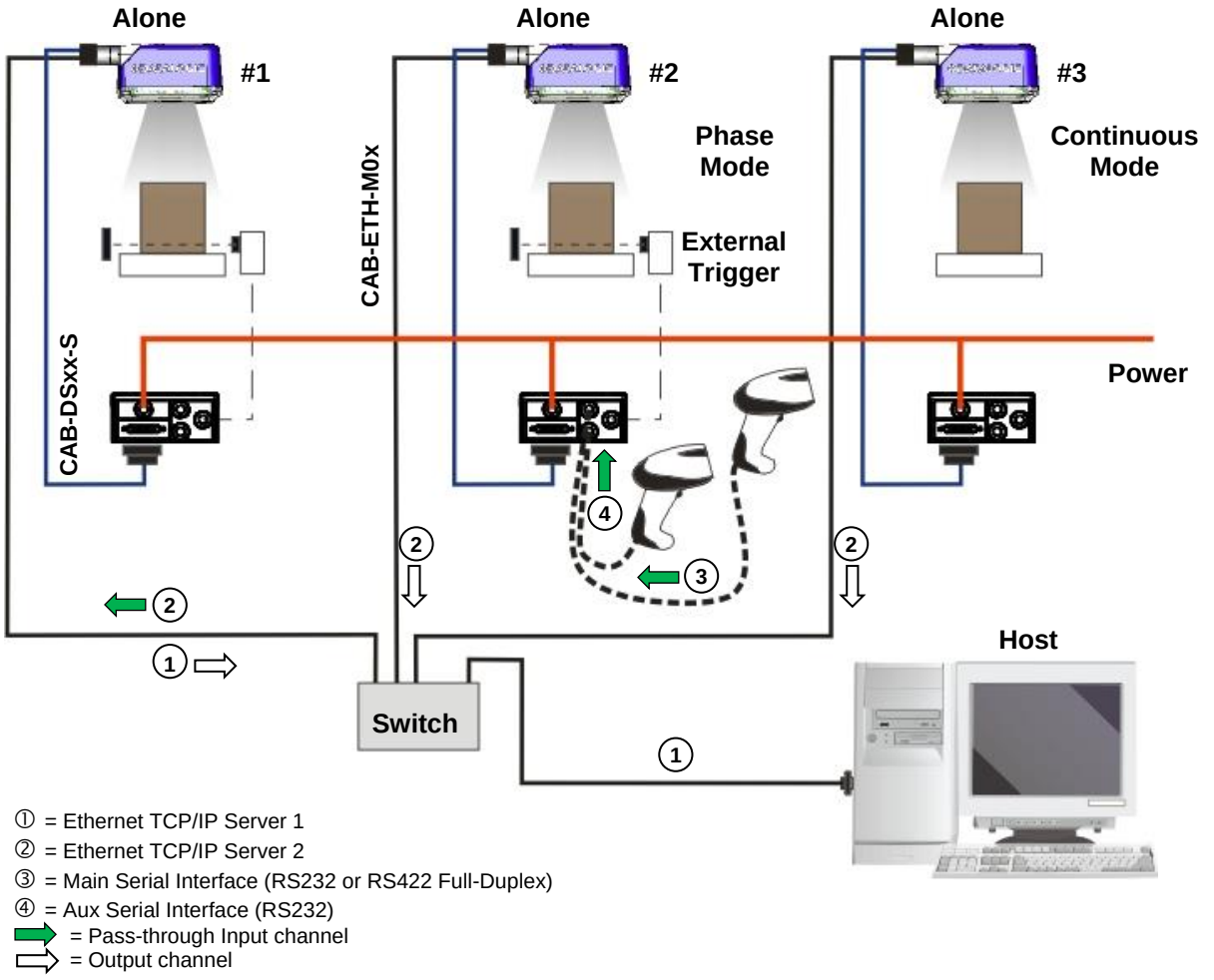
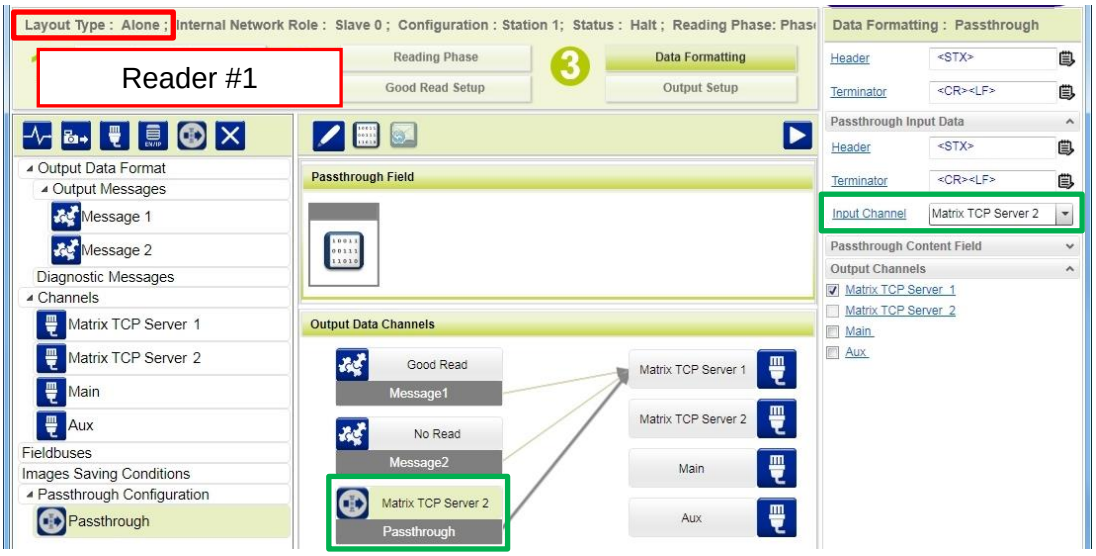
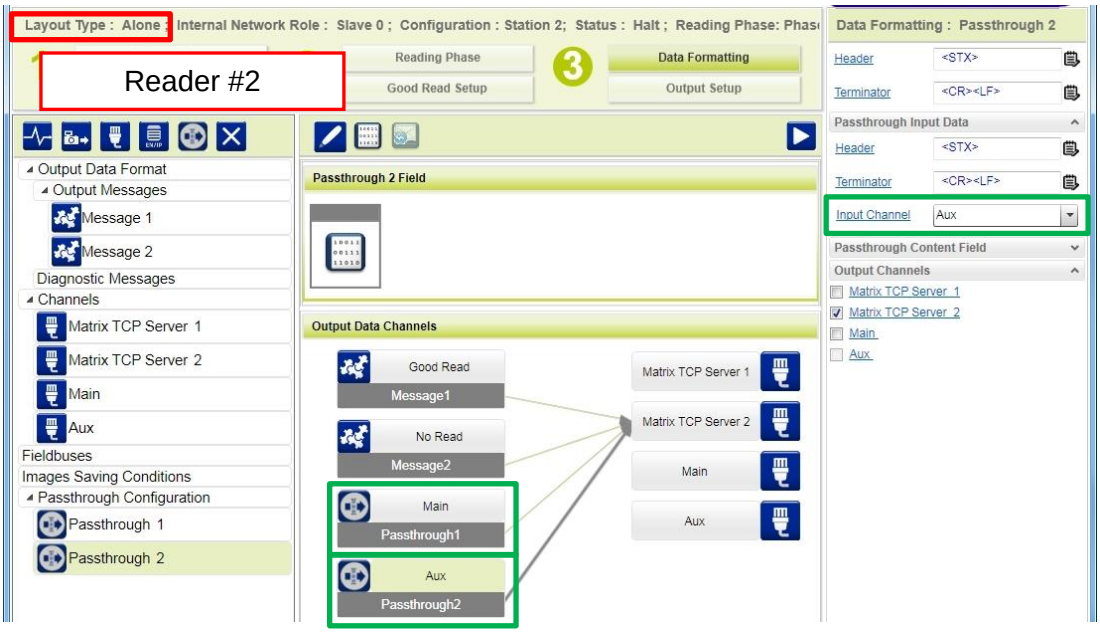



**Figure 8 – Example Pass-through Layout**

The following screenshots show the configuration settings for the three devices in the example above.


Layout Type : Alone ; Internal Network Role : Slave 0 ; Configuration : Station 1; Status : Halt ; Reading Phase: Phas
Reader #1
Reading Phase
Good Read Setup
3
Data Formatting
Output Setup
Output Data Format
Output Messages
Message 1
Message 2
Diagnostic Messages
Channels
Matrix TCP Server 1
Matrix TCP Server 2
Main
Aux
Fieldbuses
Images Saving Conditions
Passthrough Configuration
Passthrough
Passthrough Field
Output Data Channels
Good Read
Message1
No Read
Message2
Matrix TCP Server 2
Passthrough
Matrix TCP Server 1
Matrix TCP Server 2
Main
Aux
Data Formatting : Passthrough
Header
<STX>
Terminator
<CR><LF>
Passthrough Input Data
Header
<STX>
Terminator
<CR><LF>
Input Channel
Matrix TCP Server 2
Passthrough Content Field
Output Channels
Matrix TCP Server 1
Matrix TCP Server 2
Main
Aux


Layout Type : Alone ; Internal Network Role : Slave 0 ; Configuration : Station 2; Status : Halt ; Reading Phase: Phas
Reader #2
Reading Phase
Good Read Setup
3
Data Formatting
Output Setup
Output Data Format
Output Messages
Message 1
Message 2
Diagnostic Messages
Channels
Matrix TCP Server 1
Matrix TCP Server 2
Main
Aux
Fieldbuses
Images Saving Conditions
Passthrough Configuration
Passthrough 1
Passthrough 2
Passthrough 2 Field
Output Data Channels
Good Read
Message1
No Read
Message2
Main
Passthrough1
Aux
Passthrough2
Matrix TCP Server 1
Matrix TCP Server 2
Main
Aux
Data Formatting : Passthrough 2
Header
<STX>
Terminator
<CR><LF>
Passthrough Input Data
Header
<STX>
Terminator
<CR><LF>
Input Channel
Aux
Passthrough Content Field
Output Channels
Matrix TCP Server 1
Matrix TCP Server 2
Main
Aux


Layout Type : Alone ; Internal Network Role : Slave 0 ; Configuration : Station 3; Status : Halt ; Reading Phase: Conti
Reader #3
Reading Phase
Good Read Setup
3
Data Formatting
Output Setup
Output Data Format
Output Messages
Message 1
Message 2
Diagnostic Messages
Channels
Fieldbuses
Images Saving Conditions
Passthrough Configuration
Message 1 Field
Expected Code 1
Output Data Channels
Good Read
Message1
No Read
Message2
Matrix TCP Server 1
Matrix TCP Server 2
Main
Aux
Data Formatting : Message 1
Header
<STX>
Terminator
<CR><LF>
Code Related Field
Output Channels
Matrix TCP Server 1
Matrix TCP Server 2
Main
Aux
Event Type

## 10.2 INTERNAL NETWORK CONFIGURATIONS

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

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

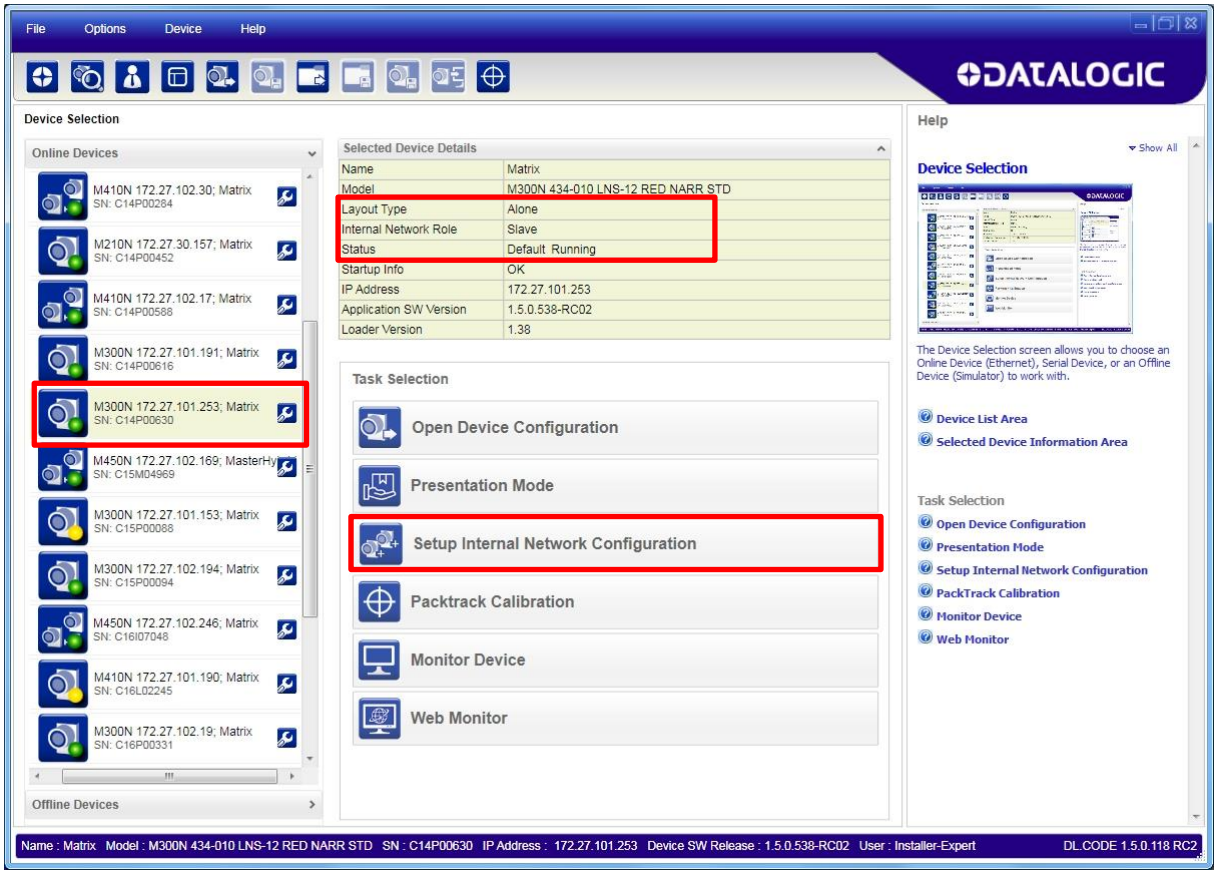
In order to automatically recognize the ID-NET Slaves, all devices must be physically installed and electrically connected (including ID-NET network wiring).

The general procedure is to:

1. Mount all the readers (mechanical and electrical installation) with factory default settings (Layout Type = Alone, Internal Network Role = Slave).
2. Connect to the designated Master device in DL.CODE and open the Setup Internal Network Configuration. You will be prompted to change the device to Master. Click OK. The Slave units will automatically be recognized.
3. Depending on the application, select Multidata, Synchronized Phase Mode or Synchronized PackTrack Configuration.

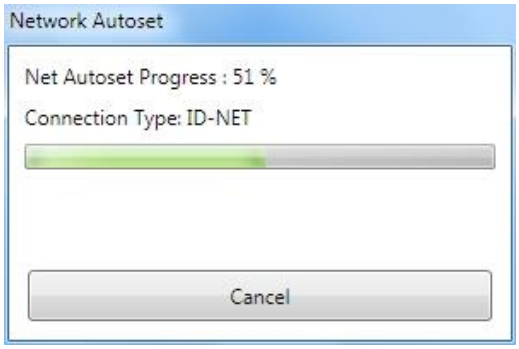
### Master Configuration

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

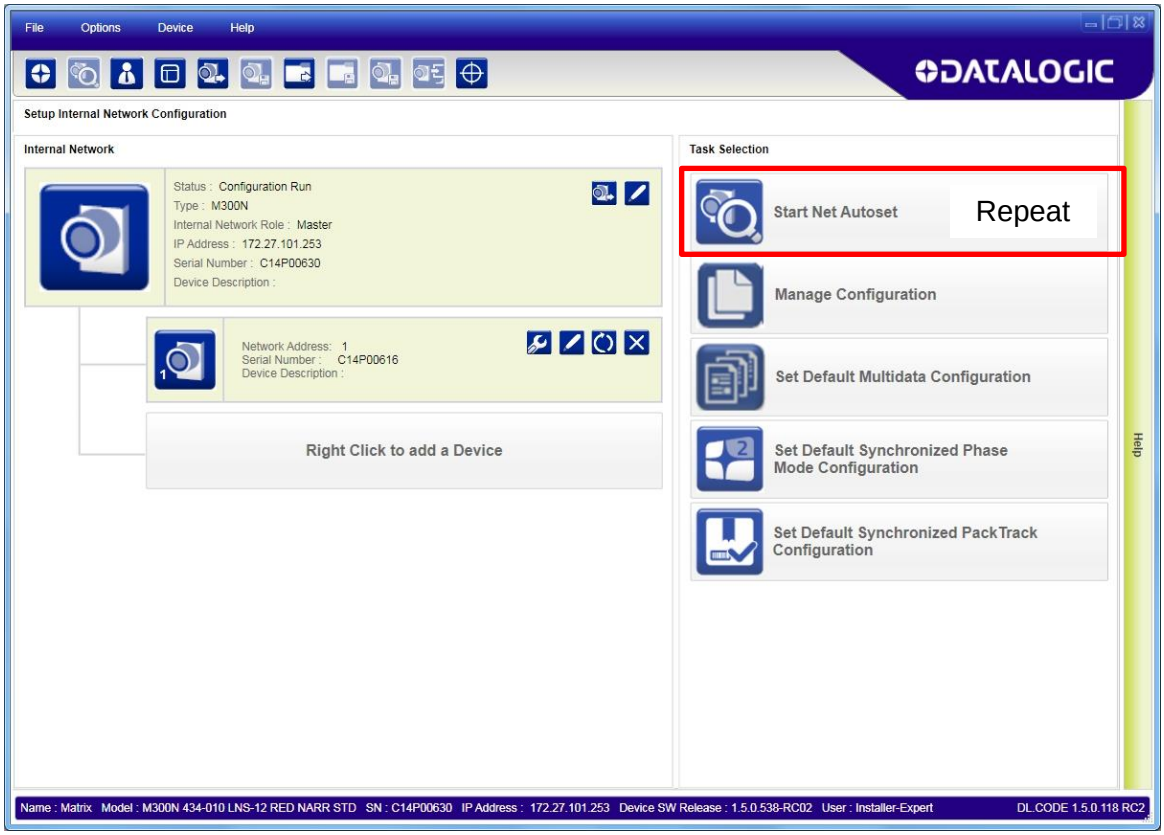


You will be advised that the device role will be changed to Master.


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




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



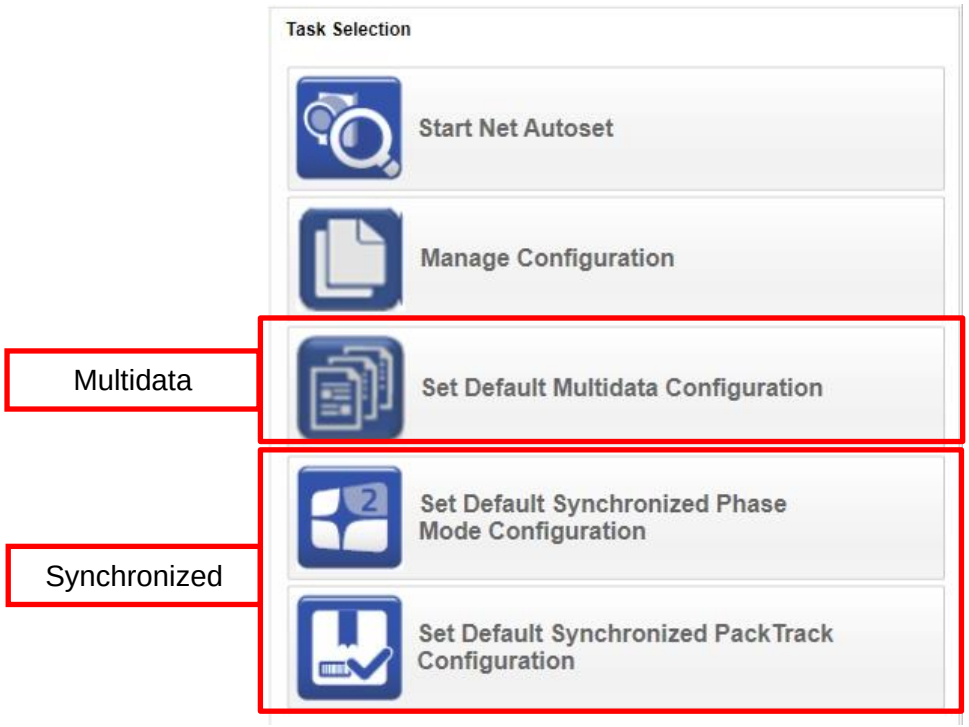
**Internal Network Icons**

| | | |
|---|---|---|
|  | Open Device Configuration | Go directly to the Master device configuration without setting one of the default network configurations. |
|  | Edit Device Description | Set a descriptive name for the device in the **internal** network, for example a position name: Top, Left, Right, etc. It will be shown in the Internal Network panel. This is not the same as the Device Name in the Settings menu. |
|  | Edit Environment | Go directly to the Slave device environment parameters window. |
|  | Reset Device | Reset the Slave device. |
|  | Delete Slave | Delete the Slave device from the list. |

**NOTE:** The internal network can be pre-configured by right-clicking (and waiting), on the "add a Device" button under the last slave. Placeholder slave device(s) will be added to the list and a new slave network address for each will be assigned to them. When a device is physically revealed, through the Start Net Autoset button, it will be associated with the first placeholder in the list.

While the entire internal network can be pre-configured, each device must be physically added to the network one-at-a-time in order to be correctly recognized by the network.

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




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

### 10.2.1 Multidata ID-NET Network Configurations

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

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

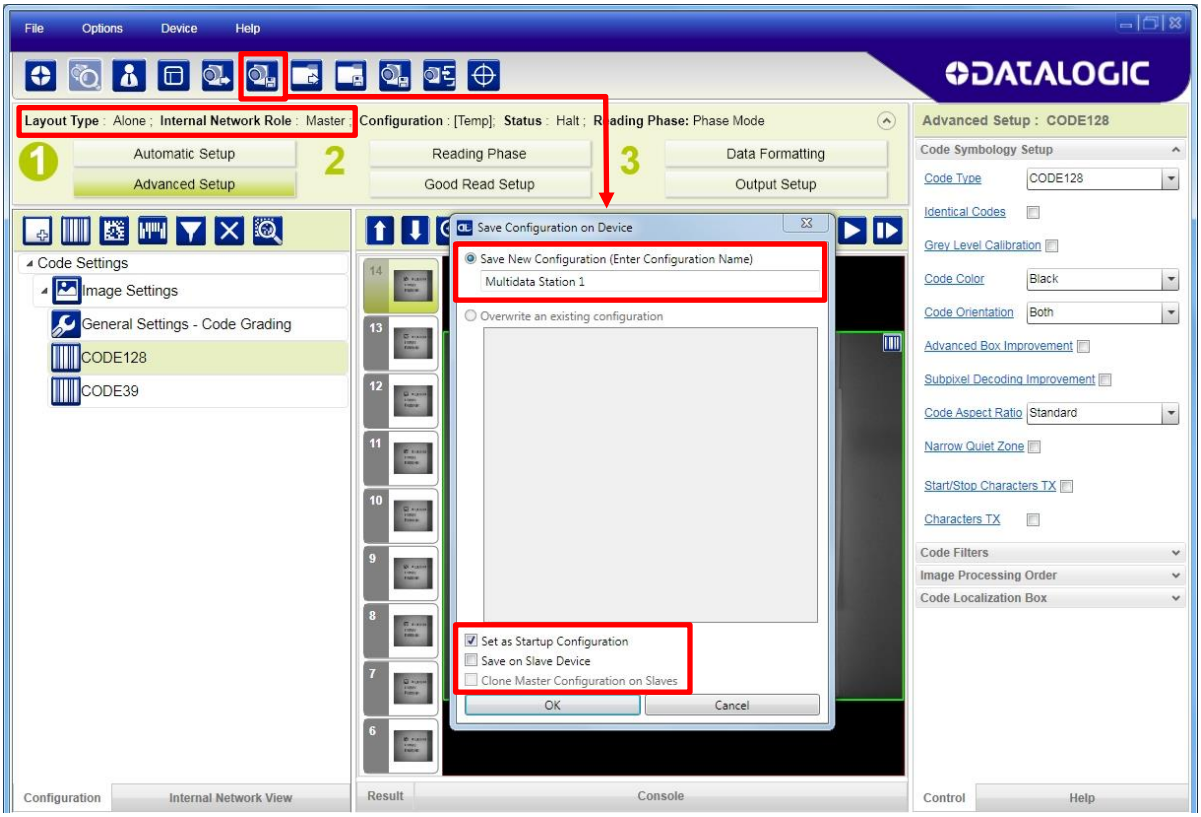
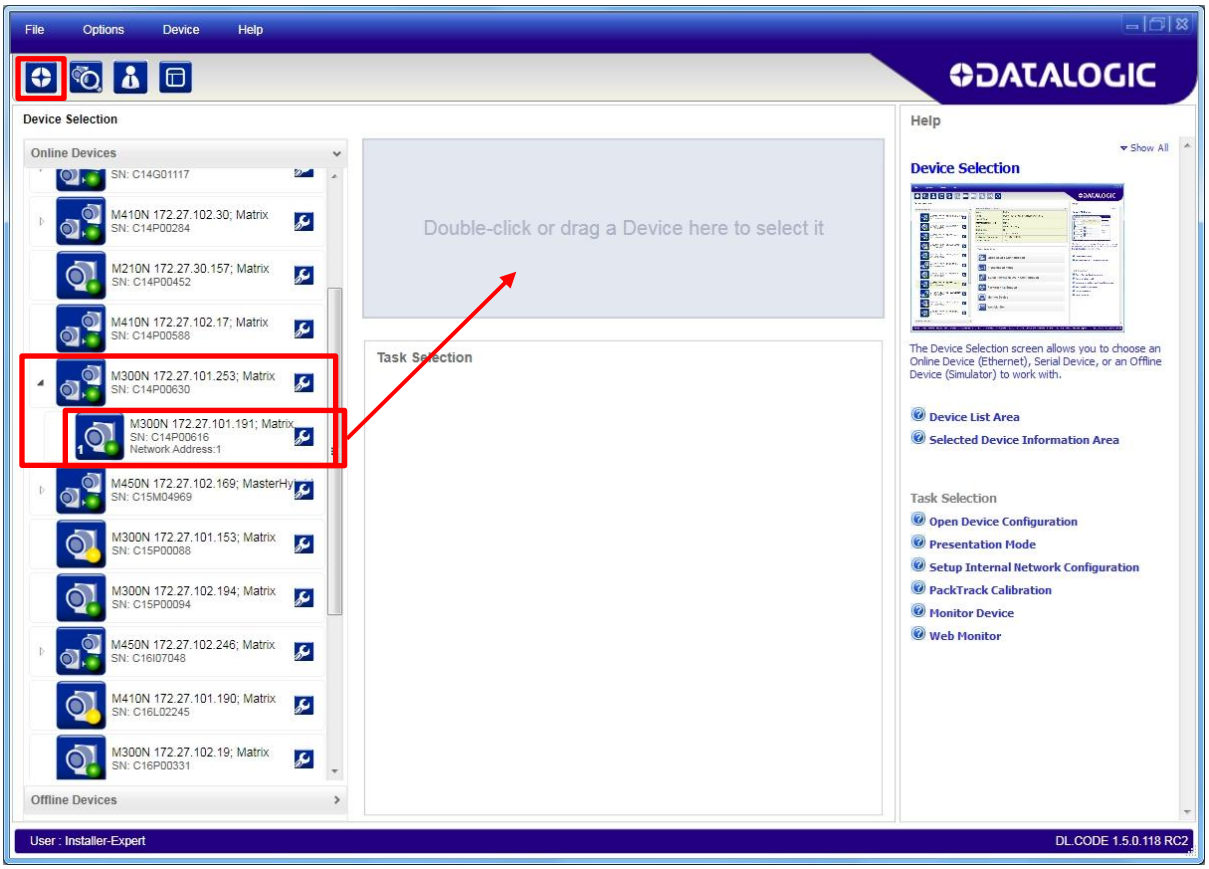



**Figure 9 – Saving Multidata Configuration to Master**

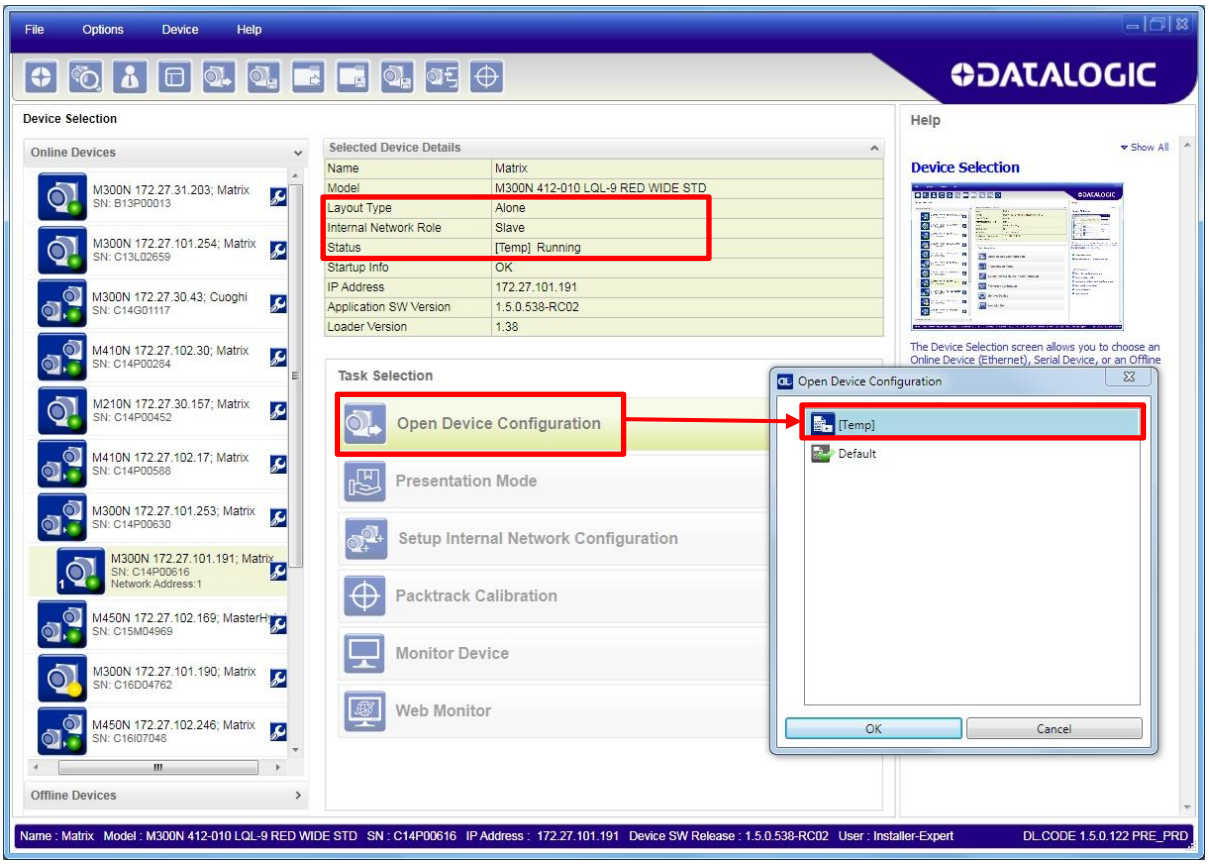
The jobs must not be cloned because the Master and Slaves have different input/output communication channels. The readers are also working independently from each other, often on separate stations with different code reading requirements, different operating modes, etc.

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

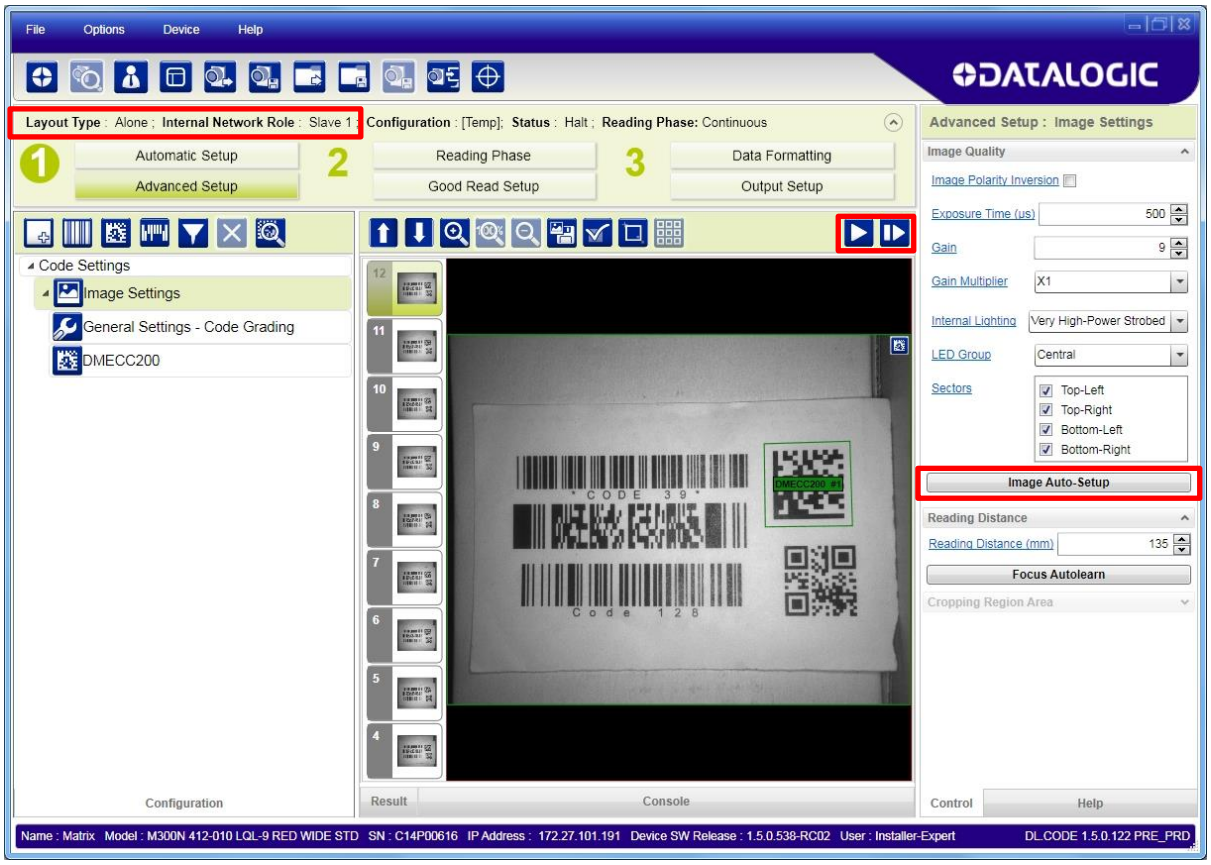
**NOTE:** If necessary, Slave device photometric (Image Settings) parameters must be configured separately through DL.CODE. This is preferably done through each device's Ethernet TCP/IP channel. If Slave devices are not connected to Ethernet you must temporarily (manually) connect them one by one to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




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



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




Verify the focus and decoding with the capture image .

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

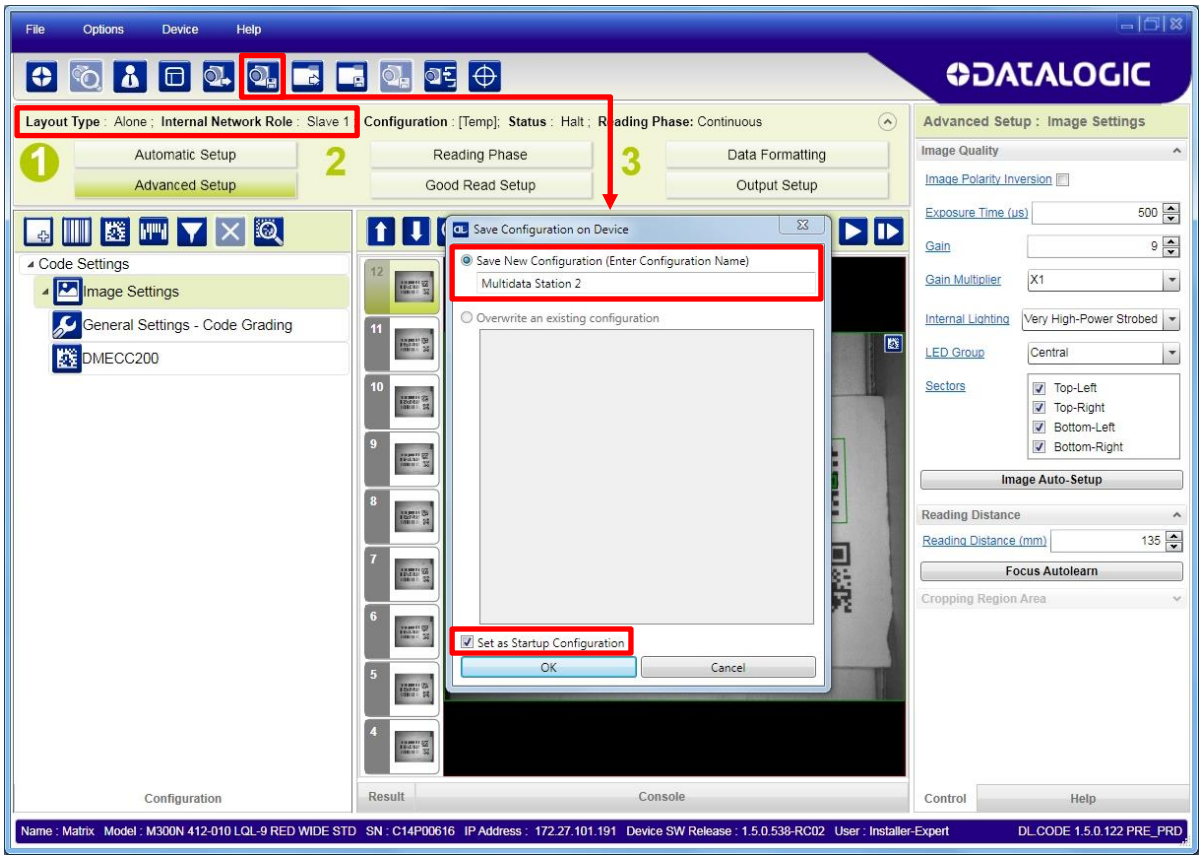



**Figure 10 – Saving Multidata Configuration to Slave 1**

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

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

## Example Multidata ID-NET Configuration

The Multidata ID-NET network takes advantage of the pass-through configuration to allow all the connected readers to work independently from each other (Layout Type = Alone).

In this way data is collected over the ID-NET network and passed–through the Master to the Host system on a different communication channel. See the figure below as an example.

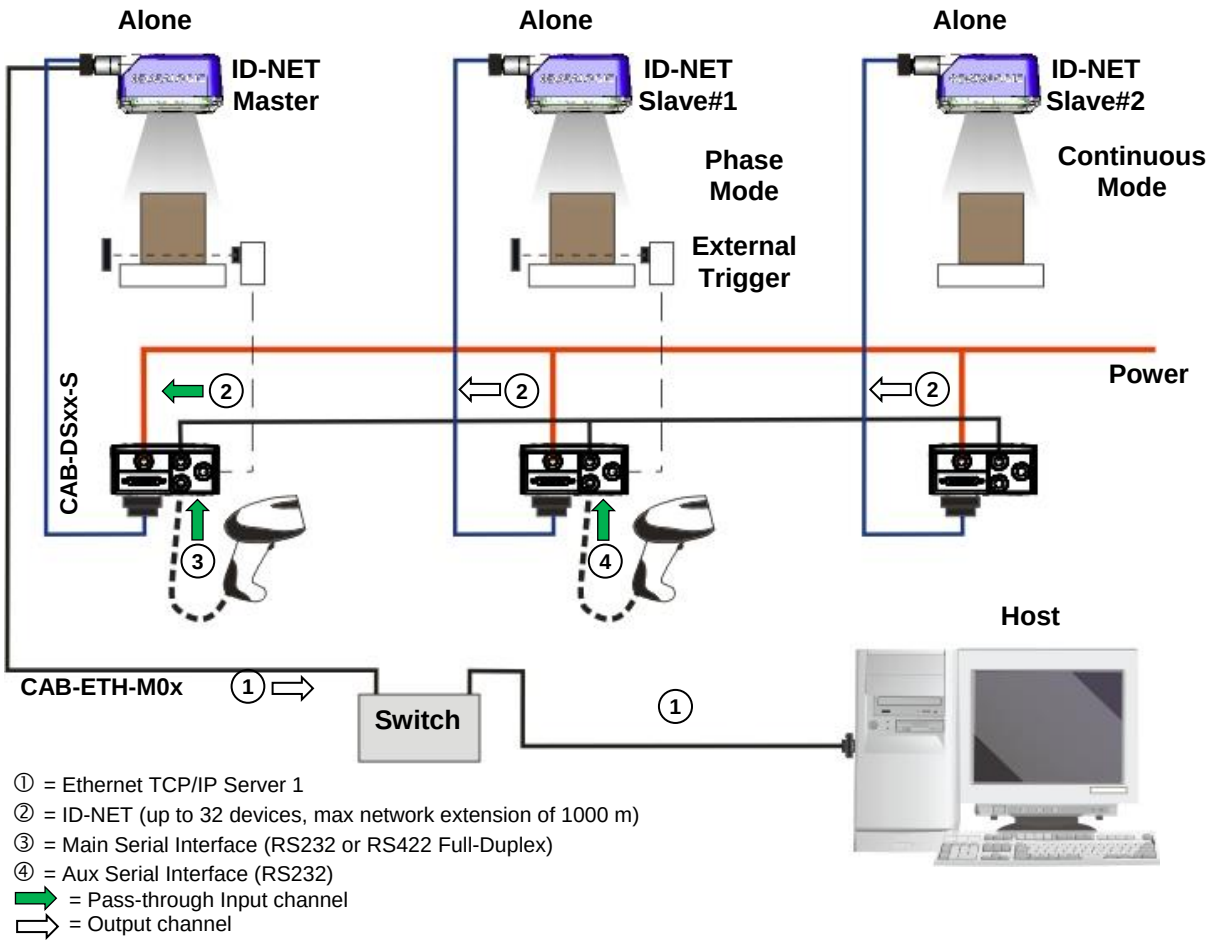
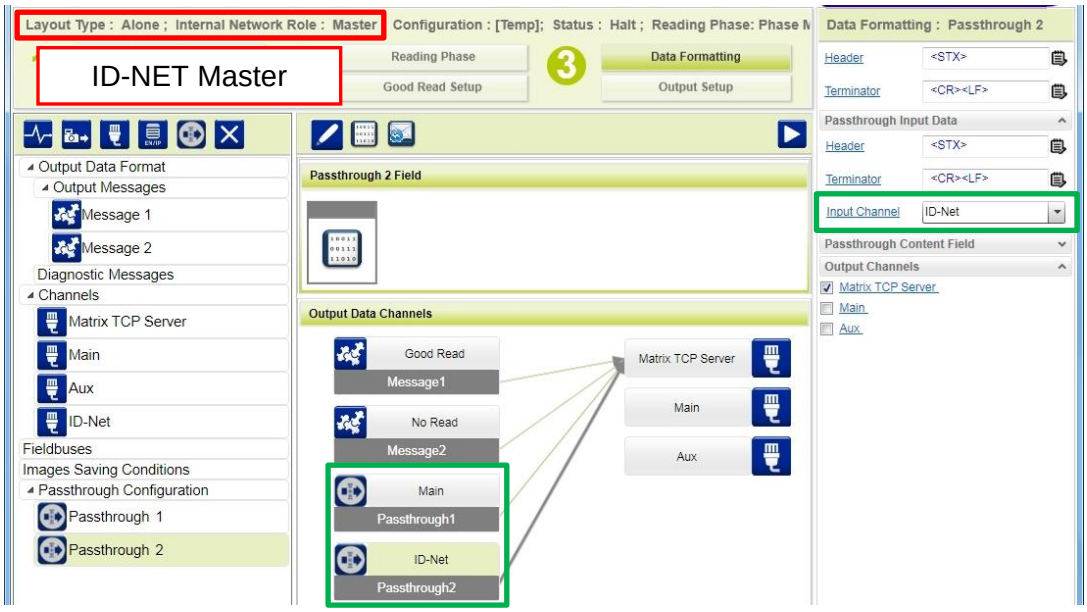
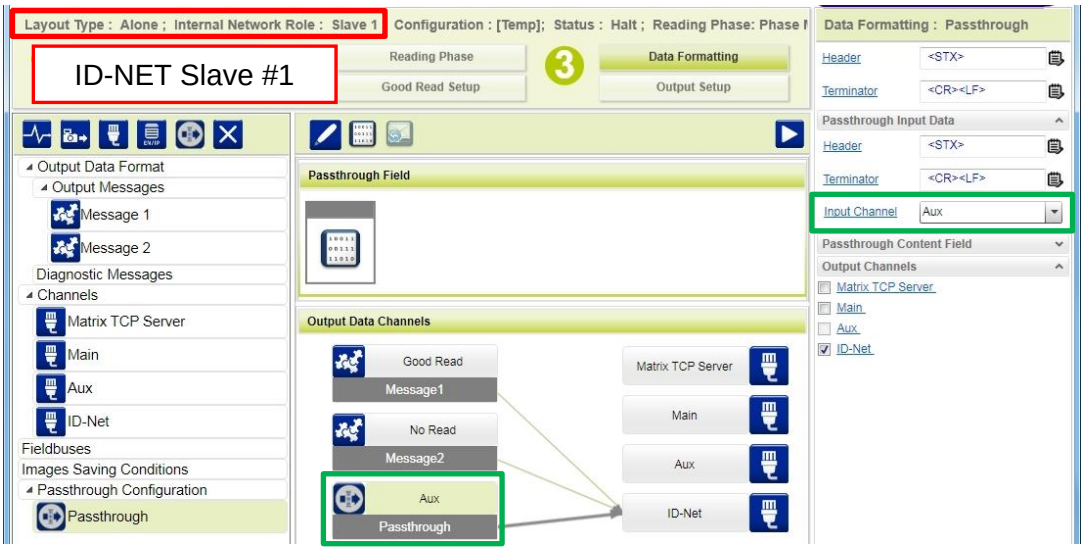
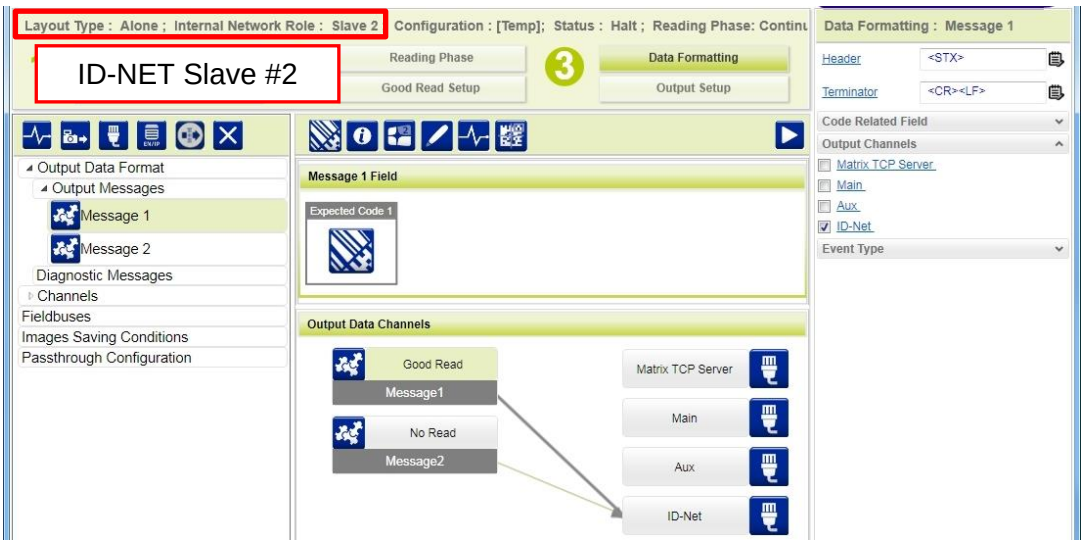



**Figure 11 – ID-NET Multidata Layout (Pass-through)**

The following screenshots show the pass-through configuration settings for the three devices in the example above.


Layout Type : Alone ; Internal Network Role : Master
Configuration : [Temp]; Status : Halt ; Reading Phase: Phase N
ID-NET Master
Reading Phase
Good Read Setup
3
Data Formatting
Output Setup
Output Data Format
Output Messages
Message 1
Message 2
Diagnostic Messages
Channels
Matrix TCP Server
Main
Aux
ID-Net
Fieldbuses
Images Saving Conditions
Passthrough Configuration
Passthrough 1
Passthrough 2
Passthrough 2 Field
Output Data Channels
Good Read
Message1
No Read
Message2
Main
Passthrough1
ID-Net
Passthrough2
Matrix TCP Server
Main
Aux
Data Formatting : Passthrough 2
Header
<STX>
Terminator
<CR><LF>
Passthrough Input Data
Header
<STX>
Terminator
<CR><LF>
Input Channel
ID-Net
Passthrough Content Field
Output Channels
Matrix TCP Server
Main
Aux


Layout Type : Alone ; Internal Network Role : Slave 1
Configuration : [Temp]; Status : Halt ; Reading Phase: Phase I
ID-NET Slave #1
Reading Phase
Good Read Setup
3
Data Formatting
Output Setup
Output Data Format
Output Messages
Message 1
Message 2
Diagnostic Messages
Channels
Matrix TCP Server
Main
Aux
ID-Net
Fieldbuses
Images Saving Conditions
Passthrough Configuration
Passthrough
Passthrough Field
Output Data Channels
Good Read
Message1
No Read
Message2
Aux
Passthrough
Matrix TCP Server
Main
Aux
ID-Net
Data Formatting : Passthrough
Header
<STX>
Terminator
<CR><LF>
Passthrough Input Data
Header
<STX>
Terminator
<CR><LF>
Input Channel
Aux
Passthrough Content Field
Output Channels
Matrix TCP Server
Main
Aux
ID-Net


Layout Type : Alone ; Internal Network Role : Slave 2
Configuration : [Temp]; Status : Halt ; Reading Phase: Continu
ID-NET Slave #2
Reading Phase
Good Read Setup
3
Data Formatting
Output Setup
Output Data Format
Output Messages
Message 1
Message 2
Diagnostic Messages
Channels
Fieldbuses
Images Saving Conditions
Passthrough Configuration
Message 1 Field
Expected Code 1
Output Data Channels
Good Read
Message1
No Read
Message2
Matrix TCP Server
Main
Aux
ID-Net
Data Formatting : Message 1
Header
<STX>
Terminator
<CR><LF>
Code Related Field
Output Channels
Matrix TCP Server
Main
Aux
ID-Net
Event Type

## 10.2.2 Synchronized ID-NET Network Configurations

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

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

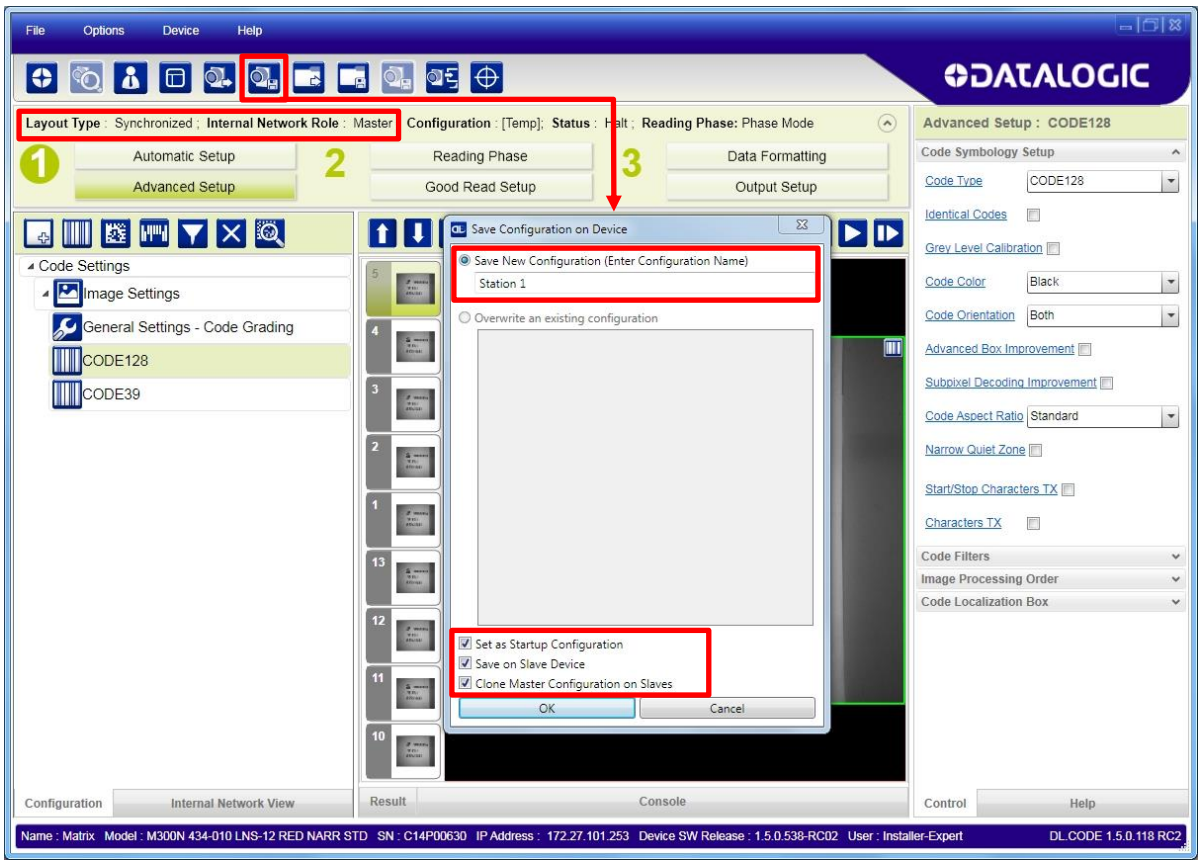
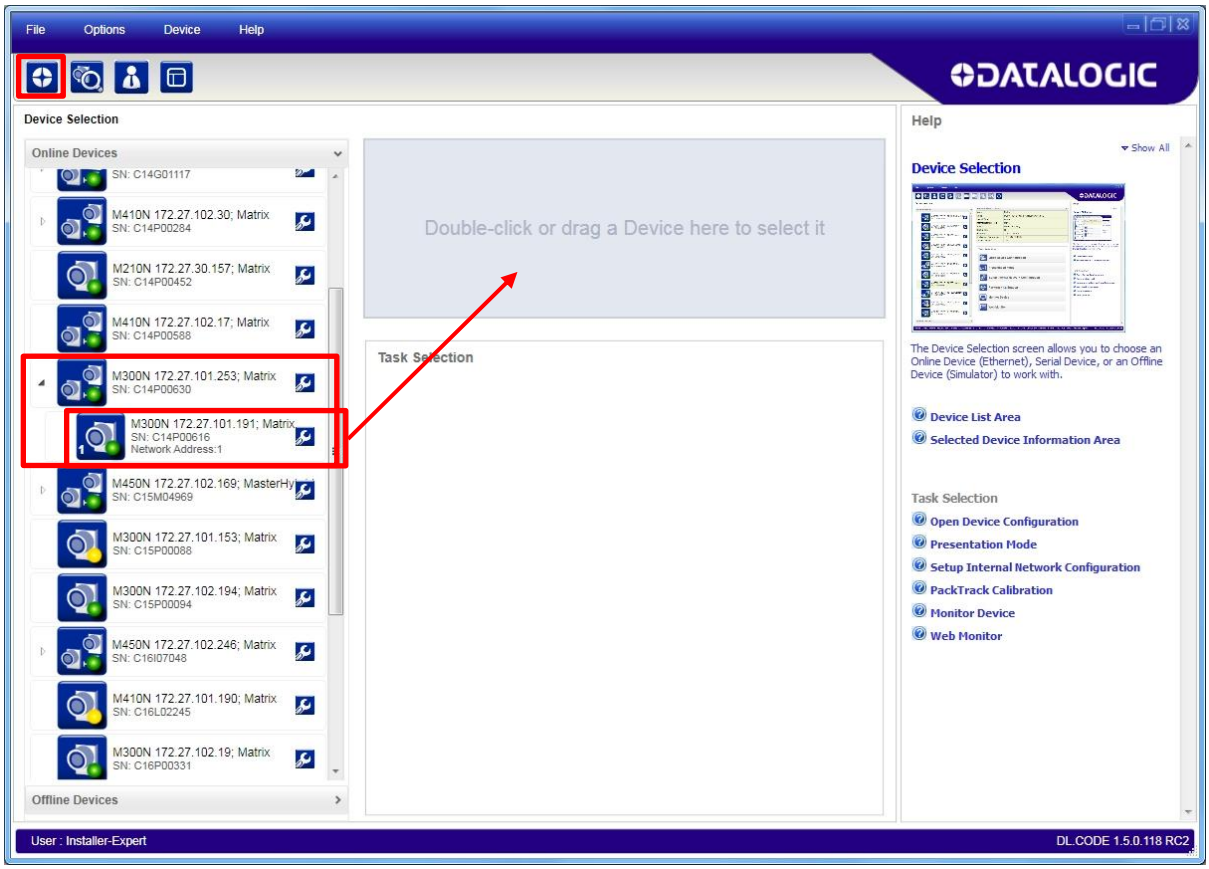


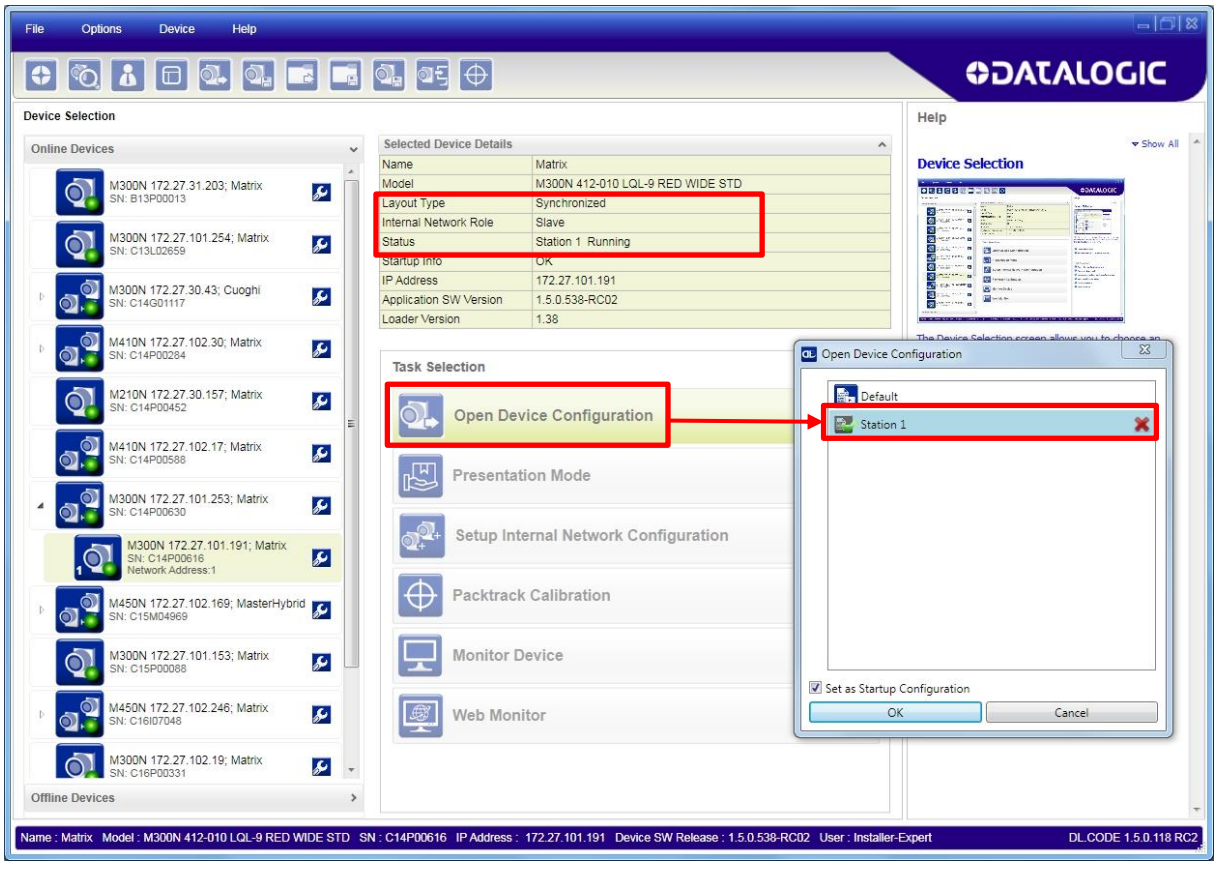

**Figure 12 – Saving Synchronized Phase Mode Configuration to Master**

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

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

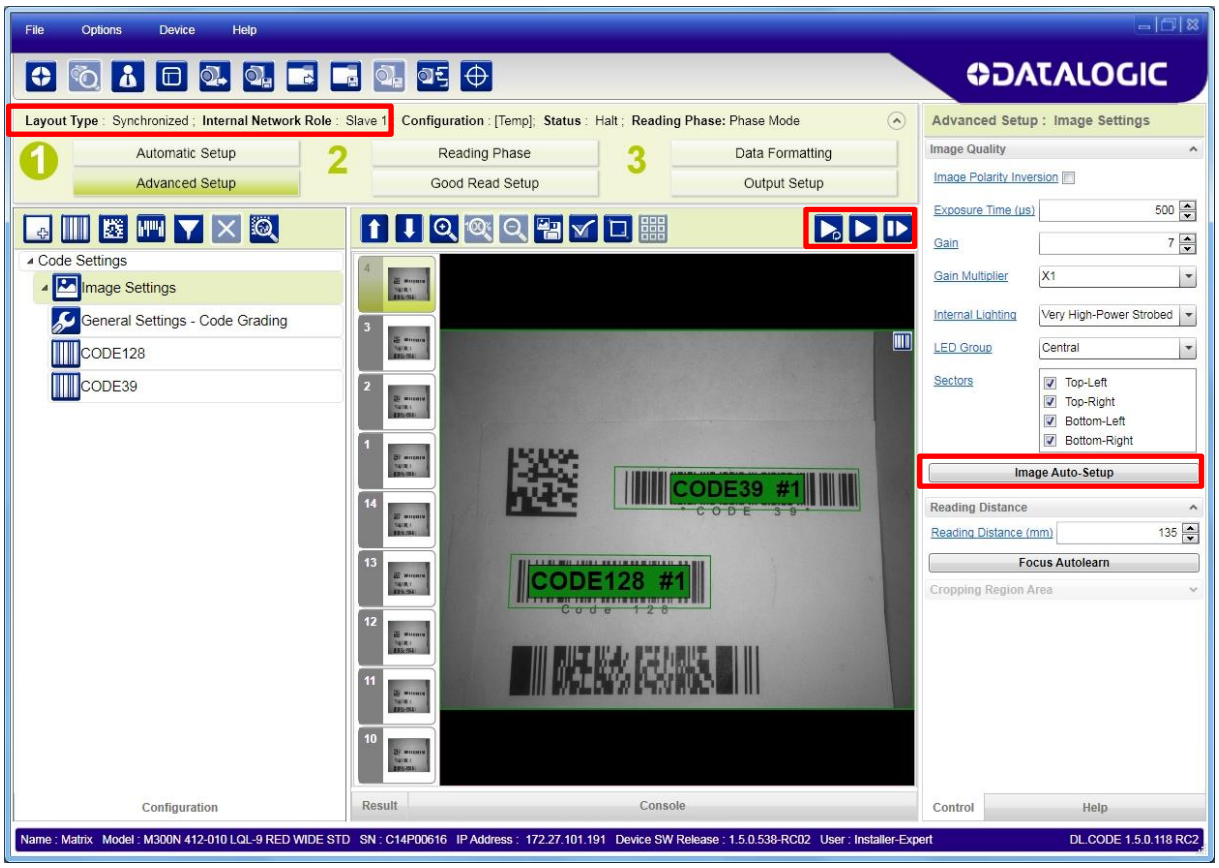



Open the cloned application job.



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

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




Verify the focus and decoding with the capture image .

3. Now save them, overwriting the cloned application job[2].


**Figure 13 – Saving Synchronized Phase Mode Configuration to Slave**

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

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

## Example Synchronized ID-NET Configuration

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

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

The Master reader is also connected to the Host on one of its communication channels. In the following example the TCP/IP on-board Ethernet interface is used.

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

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

The TCP/IP and ID-NET interfaces are connected as shown in the following figures.

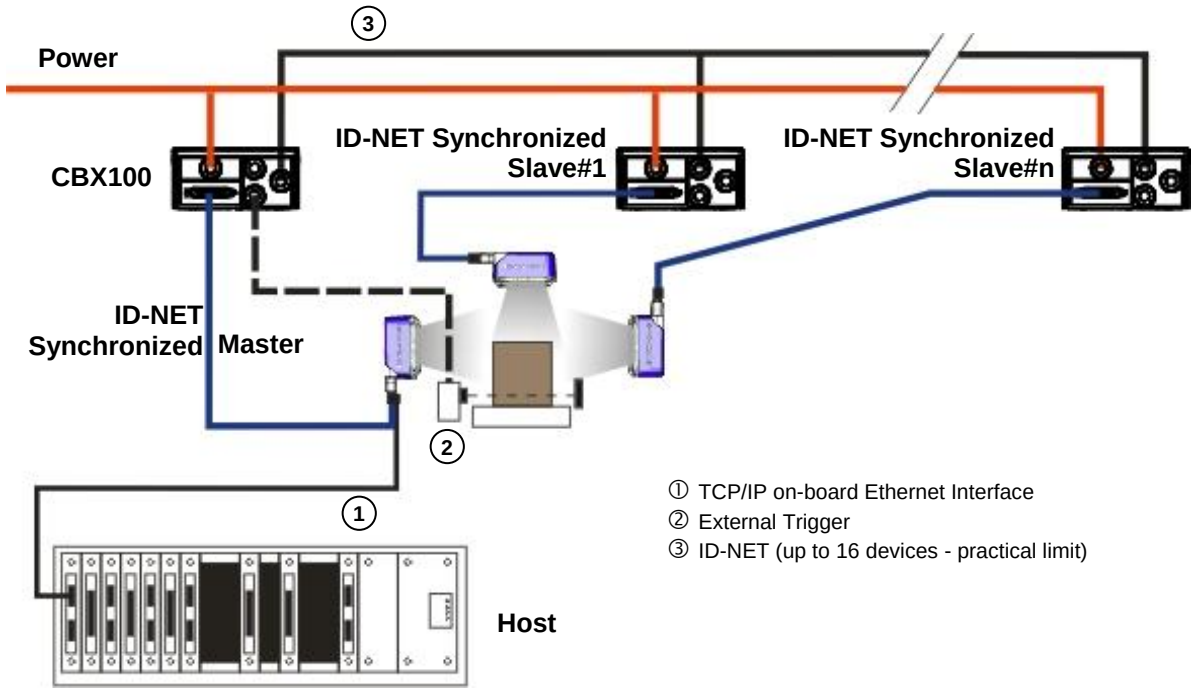



**Figure 14 – Example ID-NET Synchronized Layout with Master on-board TCP/IP Ethernet Interface to Host**

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

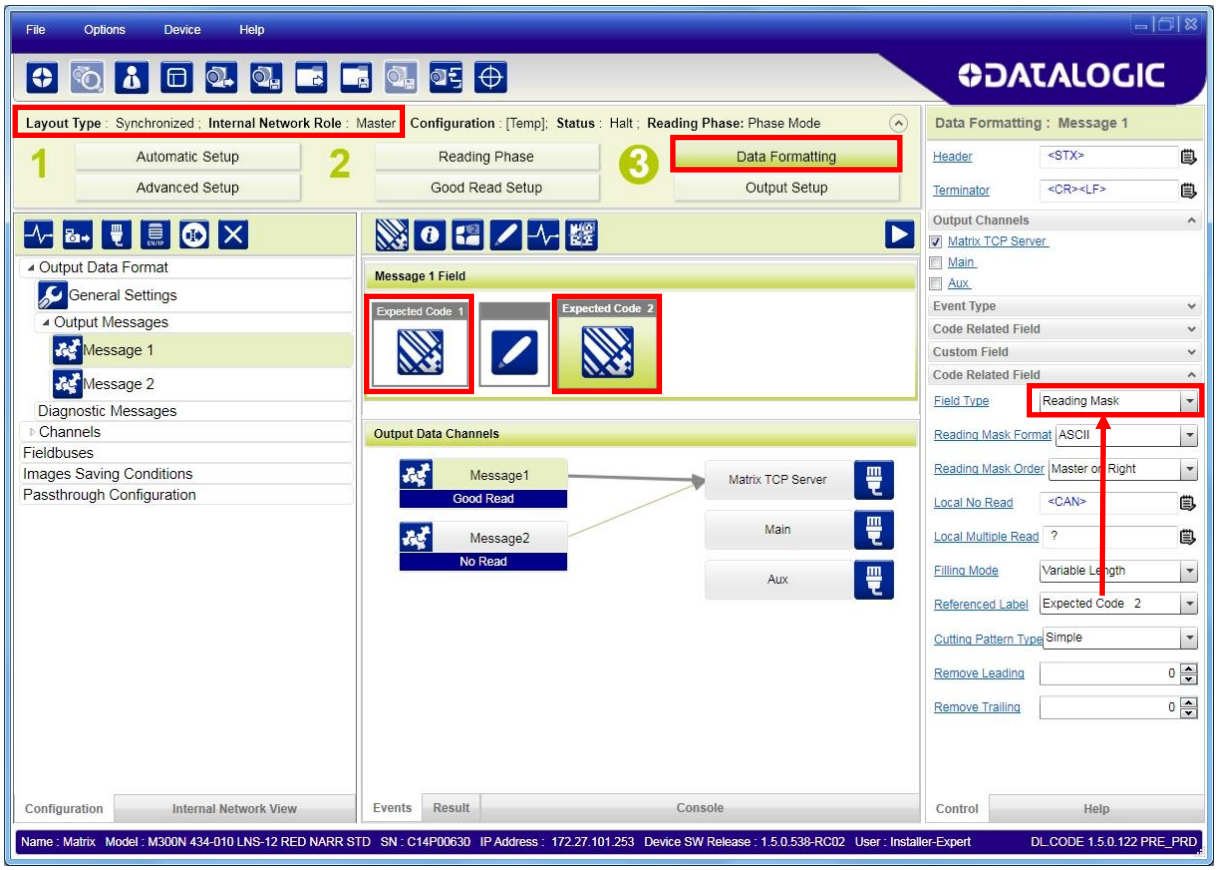
All devices always support multiple output channels (i.e. for data monitoring).

### 10.2.3 Verify Master/Slave Synchronized Configuration

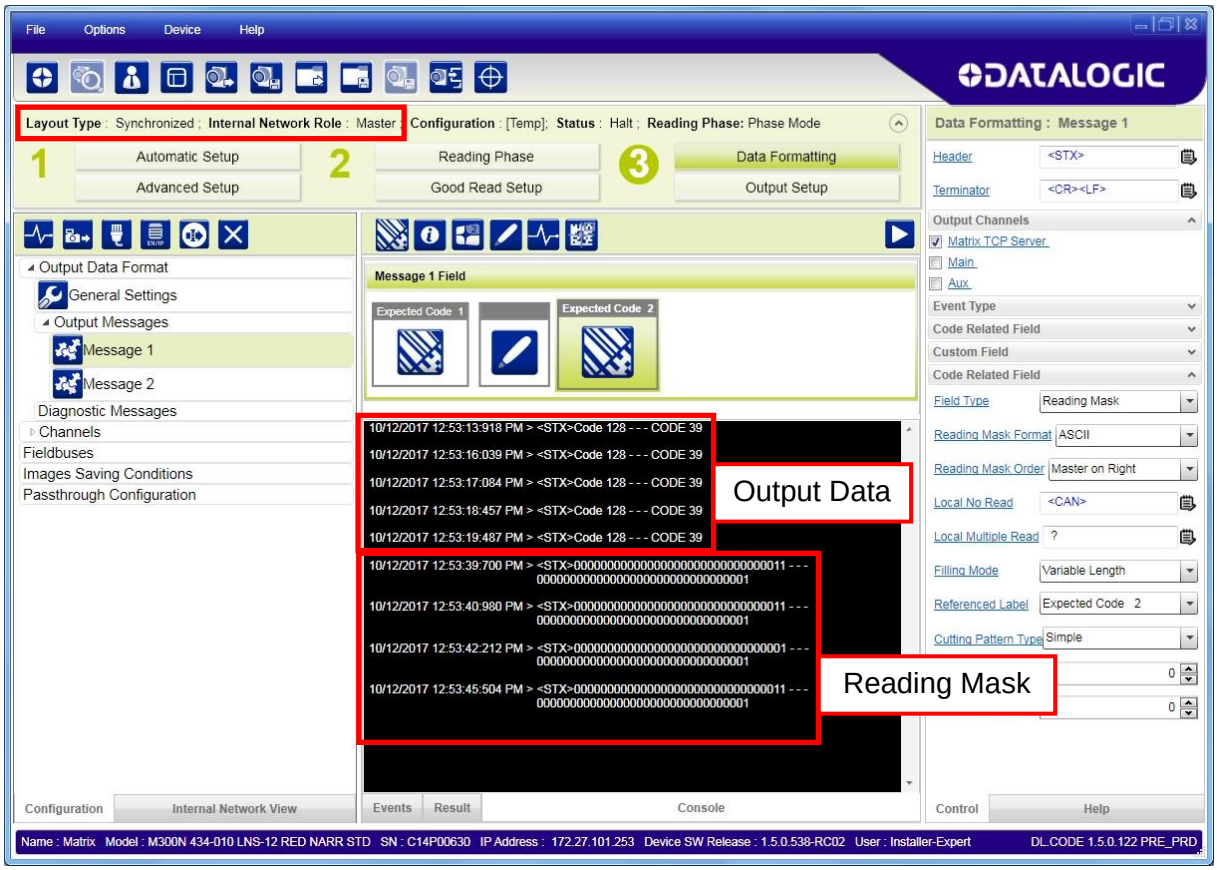
From the Master configuration, run the application and monitor the output data from the DL.CODE Console or a configured channel terminal.

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

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



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




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

**Example**: Master + Slave 1 = 00000000000000000000000000000011

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

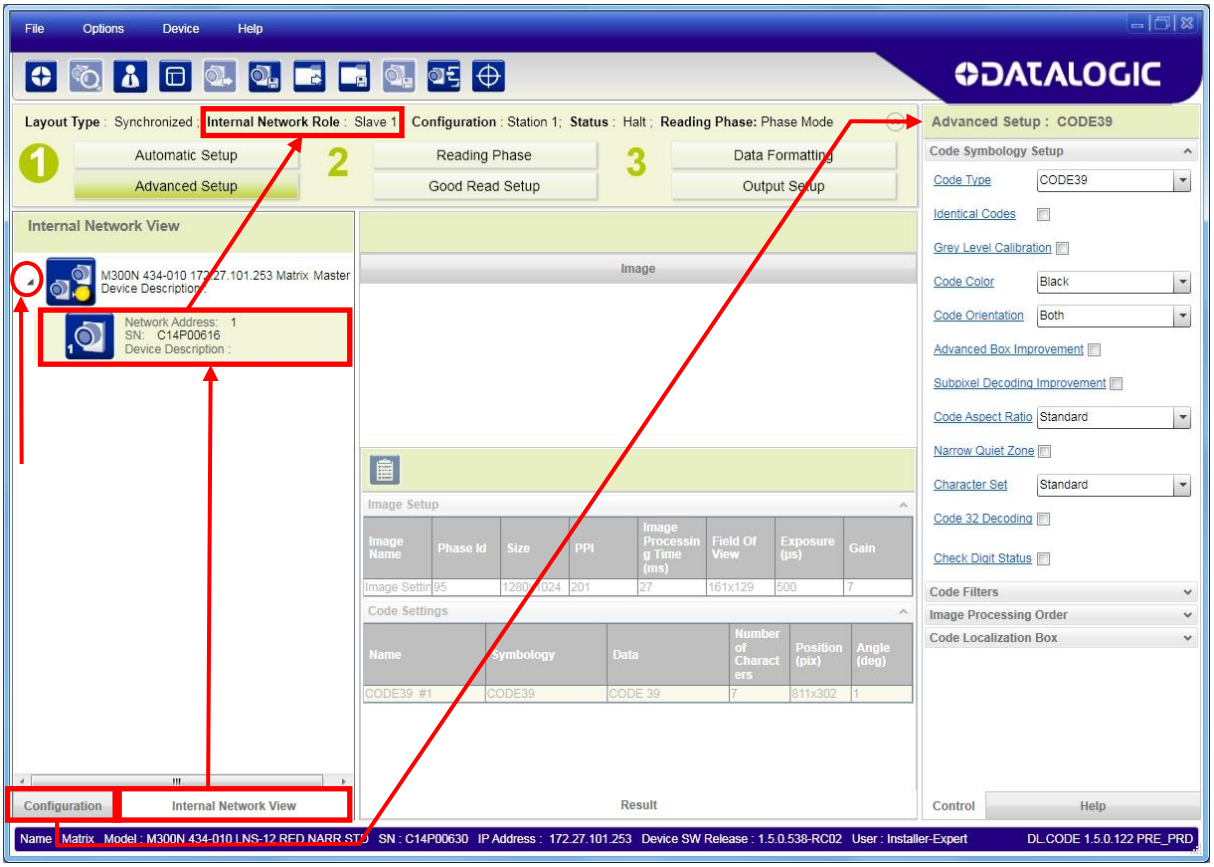
3. After verifying correct functioning of the reading devices, return the Expected Code fields from Reading Mask to Code Content.

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

To view the connected Slave configurations:

1. Click on the Internal Network View tab at the bottom of the screen
2. Open the Master branch by clicking on the arrow to the left of the Master icon.
3. Select any slave. Wait for the configuration to load.
4. Click The Configuration tab at the bottom of the screen.

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



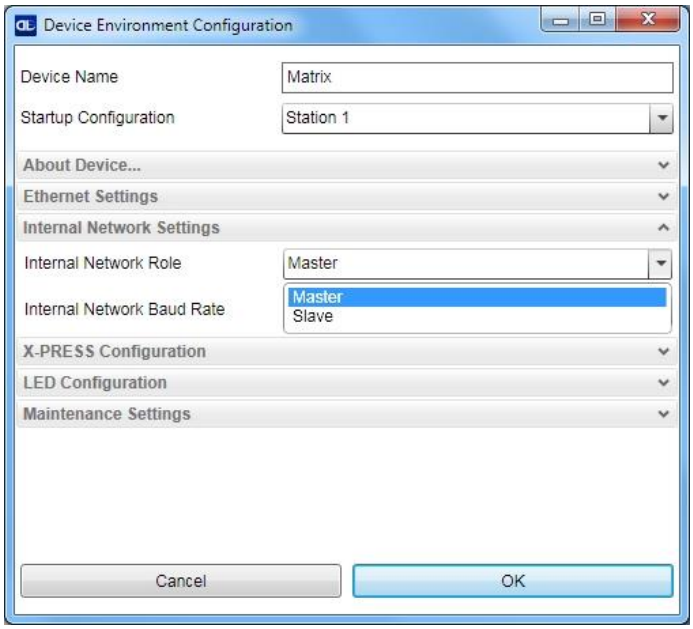

**NOTE:** You can modify some Slave Synchronized parameters from this view but you cannot save them here.

To save changed slave parameters here, you must click on the Master and Save the configuration overwriting it, making sure to select **Save on Slave Device** but **without Clone Master Configuration on Slaves**, otherwise all the Slave configuration parameters will be overwritten by the Master configuration.

### 10.2.4 Alternative Device Role Selection

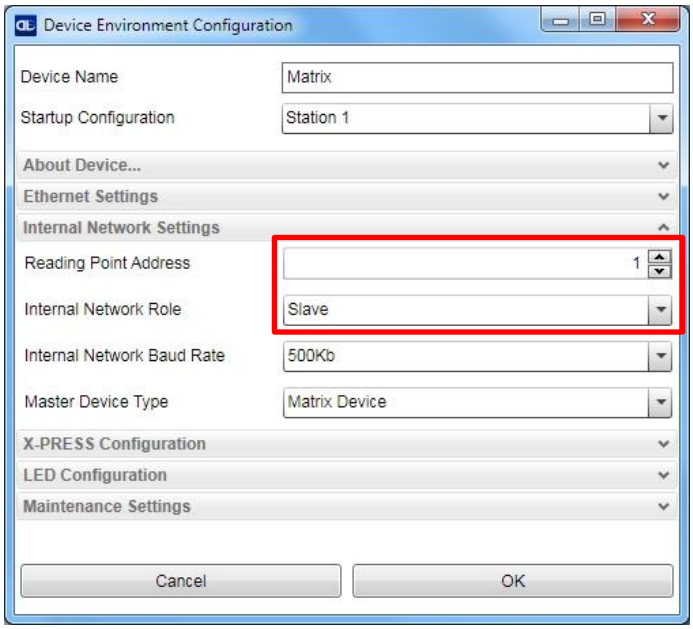
To set up a Master/Slave Internal Network Role you can also enter the Device Environment settings from the Device menu>Settings>Settings and open the Internal Network Settings group.

Change the Internal Network Role to Master or Slave accordingly.




Wait for the device to reset. It may be necessary to wait several seconds and then perform a Discovery to refresh the device list area. You should now see the Master device with its relative icon.

Likewise you can set the device **Internal Network Role** to Slave and the **Reading Point Address** (ID-NET address) according to the network configuration.




Complete the Slave configuration and save it to the device.

Complete all the ID-NET Slaves in the same way.

The Master must be set to expect the same number of slaves as foreseen by the application. Now by simply making the electrical connections the network will be automatically recognized upon power up.

# 11 PACKTRACK CALIBRATION

PackTrack Calibration can be performed on all Standalone or Master Matrix N family readers that support this feature.

## 11.1 OVERVIEW

PackTrack Operating Mode is a method used to correctly assign codes read to their corresponding parcel or pack in systems where multiple packs are simultaneously present in the reading area.

The figure below illustrates the main concepts defining a PackTrack system. The main hardware parts are: conveyor, Matrix N reader(s), encoder (tach), and presence sensor (photocell).

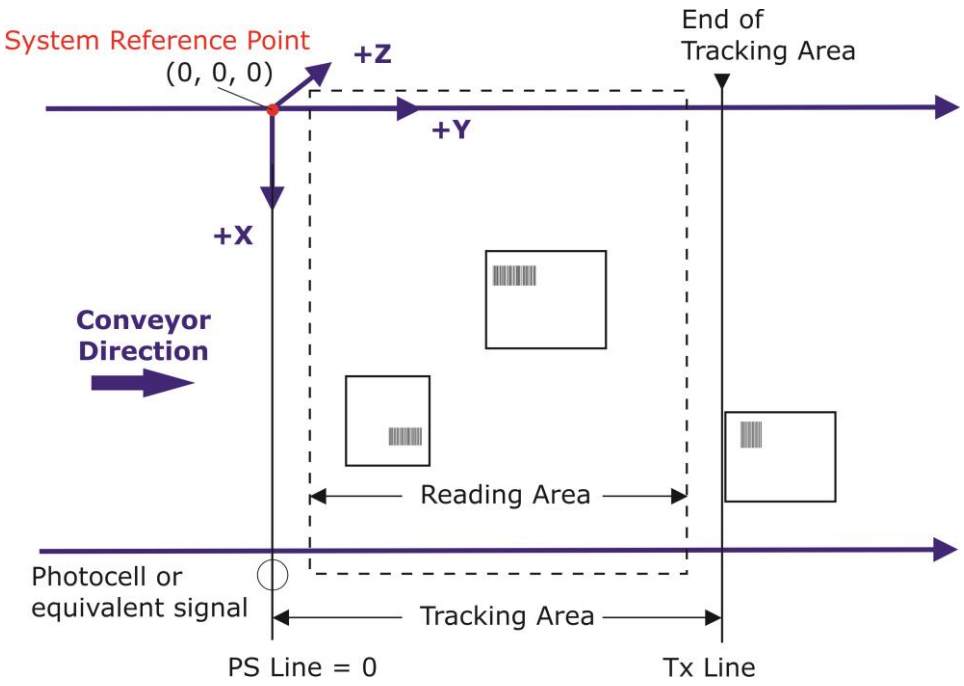
The Reading Area corresponds to the Field Of View of the Matrix N reader.

An area called the Tracking Area is defined between the System Reference Point and the Transmission Line (Tx Line) and obviously includes the Reading Area. All packs passing through the system will have their position tracked.

The System Reference Point is defined as the point where the coordinates (X, Y, Z = 0). The Presence Sensor is normally aligned at the Y = 0 coordinate. If necessary, (after first-time calibration), it can be offset using the PS Line parameter.

The Encoder signal (Encoder Step), together with the Presence sensor is used to track the length of the pack as it passes through the system. The physical encoder can be replaced by an internal signal representing a constant speed conveyor, depending on the application.

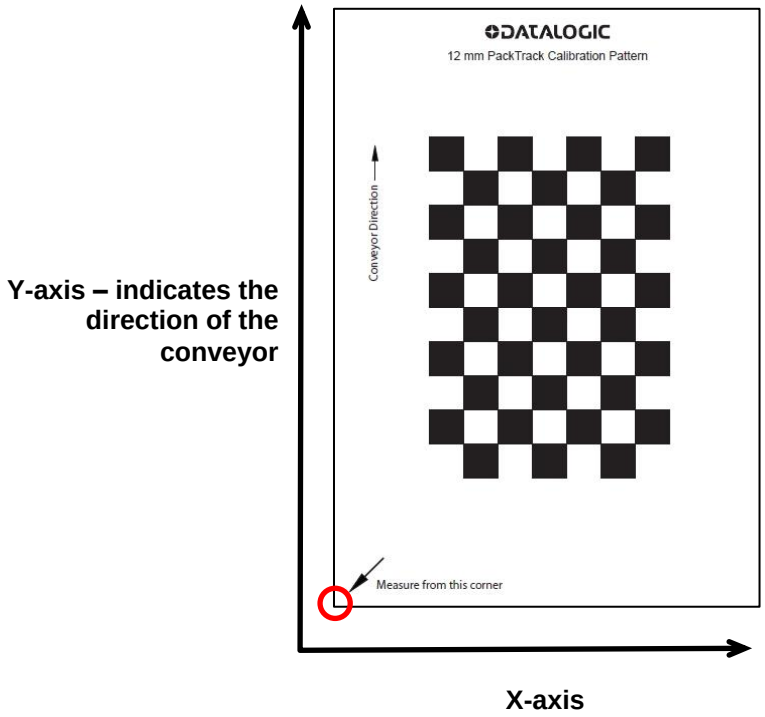
When the pack transits the Tx Line its message is sent to the Host.



## 11.2 CALIBRATION PATTERN

### 11.2.1 Top/Bottom Orientation

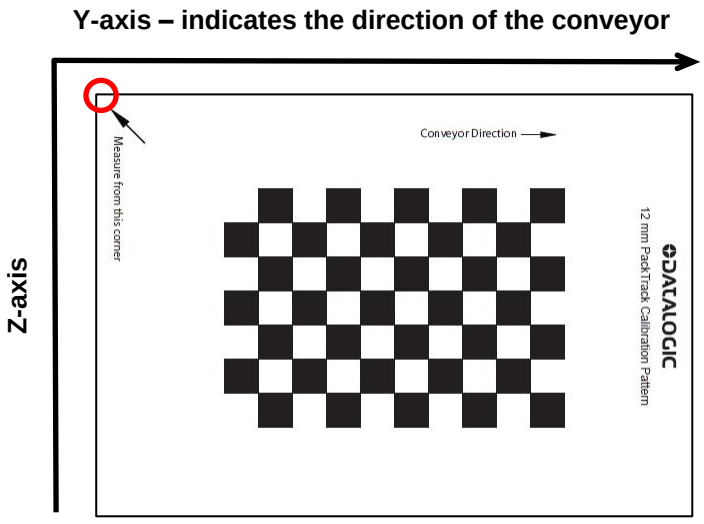
The Calibration Pattern has a precise orientation as shown in the image. The top has 4 black squares and the bottom has 3 black squares.




During the calibration process the user has to input the coordinates measured from the System Reference Point to the **lower left corner of the Calibration Pattern** indicated by the red circle.

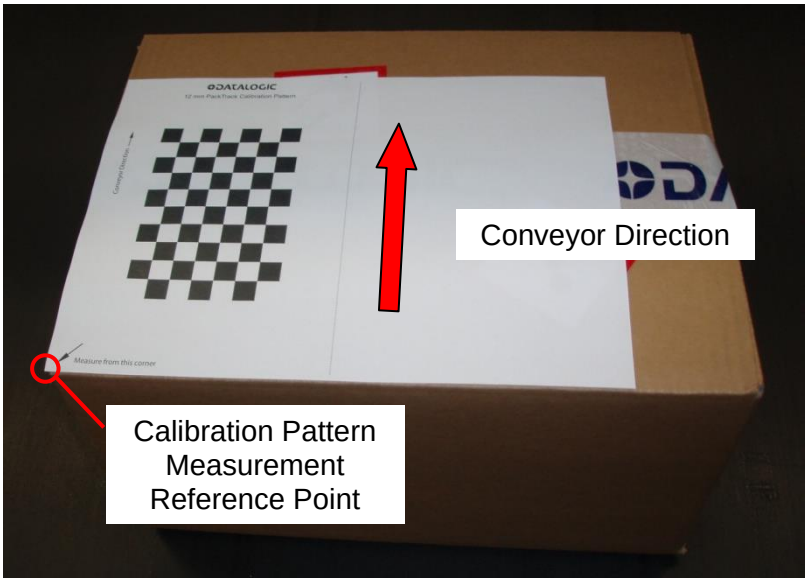
### 11.2.2 Left/Right Orientation

When calibrating left/right side readers, the Calibration Pattern is aligned to match the Y-axis (rotated 90° or 270°). This means the short side of the pattern is now aligned with the Z-axis.



### 11.2.3 Top/Bottom Calibration Chart Positioning

For Top/Bottom readers, the pattern should be aligned with the lower left corner of the pack as shown below so that measurements can easily be taken from the pack itself. **The Conveyor Direction Arrow must always be aligned with the conveyor direction.**

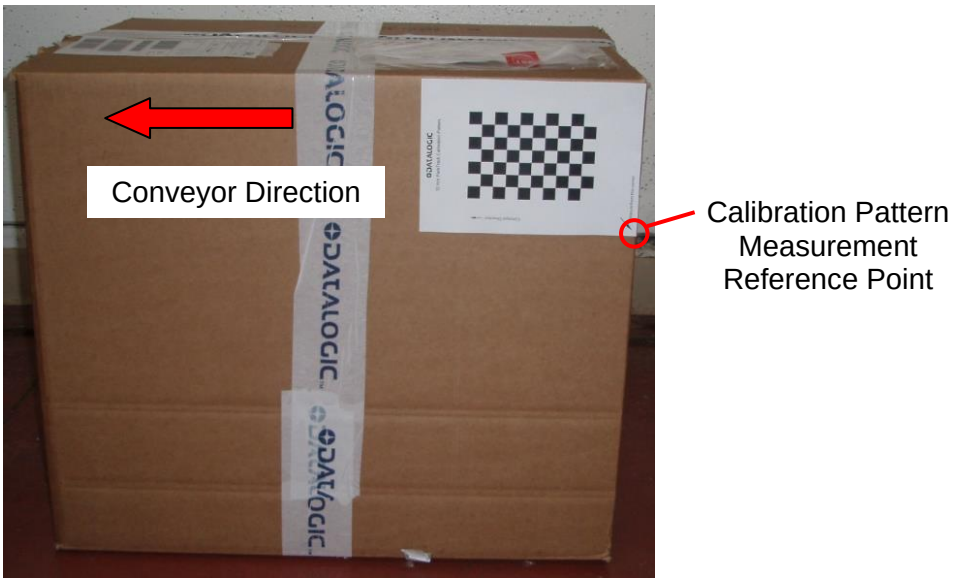



### 11.2.4 Right Side Calibration Chart Positioning

For Right side readers, the pattern should be placed as shown below so that measurements can easily be taken from the pack itself. **The Conveyor Direction Arrow must always be aligned with the conveyor direction.**

### 11.2.5 Left Side Calibration Chart Positioning

For Left side readers, the pattern should be placed as shown below so that measurements can easily be taken from the pack itself. **The Conveyor Direction Arrow must always be aligned with the conveyor direction.**



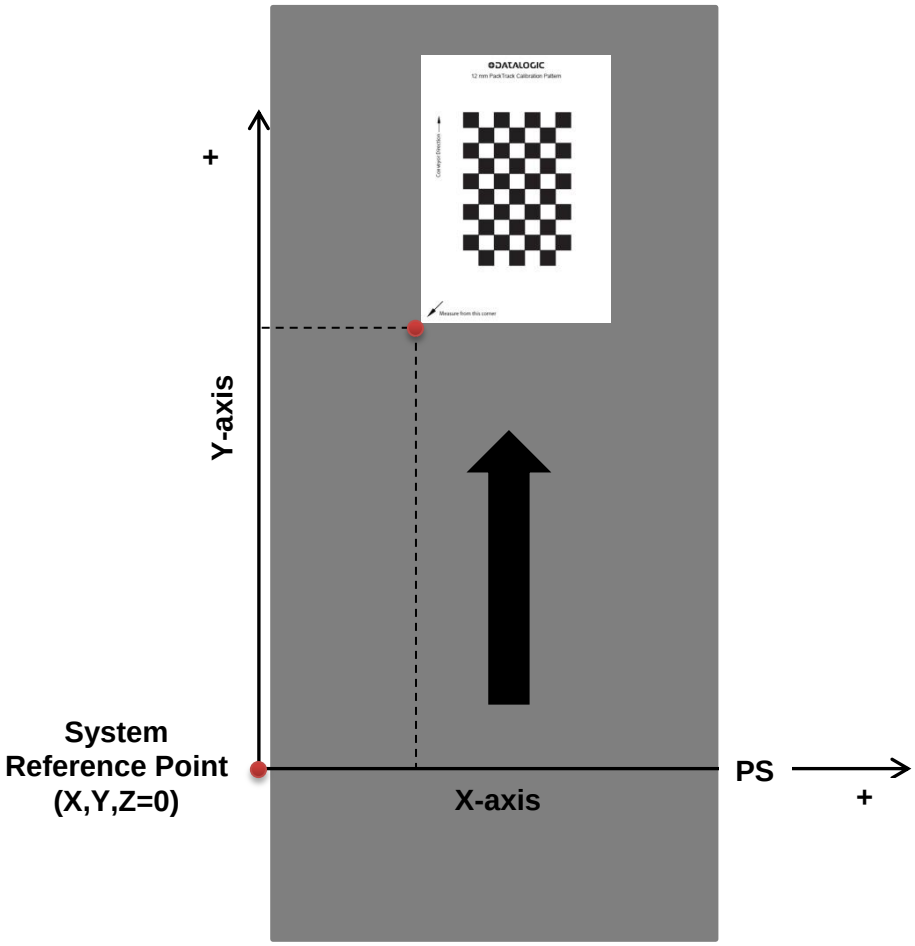
## 11.3 REFERENCE SYSTEM

The image below shows the coordinate reference system on the conveyor: the origin of the coordinate reference system is the System Reference Point.

The Y-axis runs parallel to the conveyor movement direction. So the Y coordinate of a point is measured as the distance between that point the and the System Reference Point along the conveyor direction.

The X-axis runs perpendicular to the conveyor movement direction. The X coordinate is measured as the distance between the point and the System Reference Point across the conveyor.

The Z-axis runs vertically through the conveyor plane with the positive direction above the conveyor.



## 11.4 REQUIREMENTS

The following is a list of required hardware/software that supports PackTrack for Matrix and is necessary for performing the PackTrack Calibration.

- DL.CODE release: 1.00 or later
- Matrix N Standard Application Program Software: 1.00 or later
- Products: Matrix 300N™ Matrix 410N™, Matrix 450N™, XRF410N™[3]
- PackTrack Calibration Pattern

**CAUTION:** print either the **A4** or **Letter** size pdf file according to the paper size you are using. Printing on the wrong size paper or rescaling the Calibration Pattern will cause PackTrack calibration errors.

- Tape Measure
- These instructions

## 11.5 TOP CALIBRATION USING DL.CODE

**CAUTION:** The conveyor must be STOPPED while performing this procedure!

**NOTE:** Standard Setup including optical Calibration must be completed before performing PackTrack Calibration.

Calibration is performed using the Calibration Pattern positioned on the plane corresponding to the tallest pack, (Near Plane, i.e. closest to the Matrix reader) and on the plane corresponding to the shortest pack, (Far Plane, i.e. farthest from the Matrix reader).

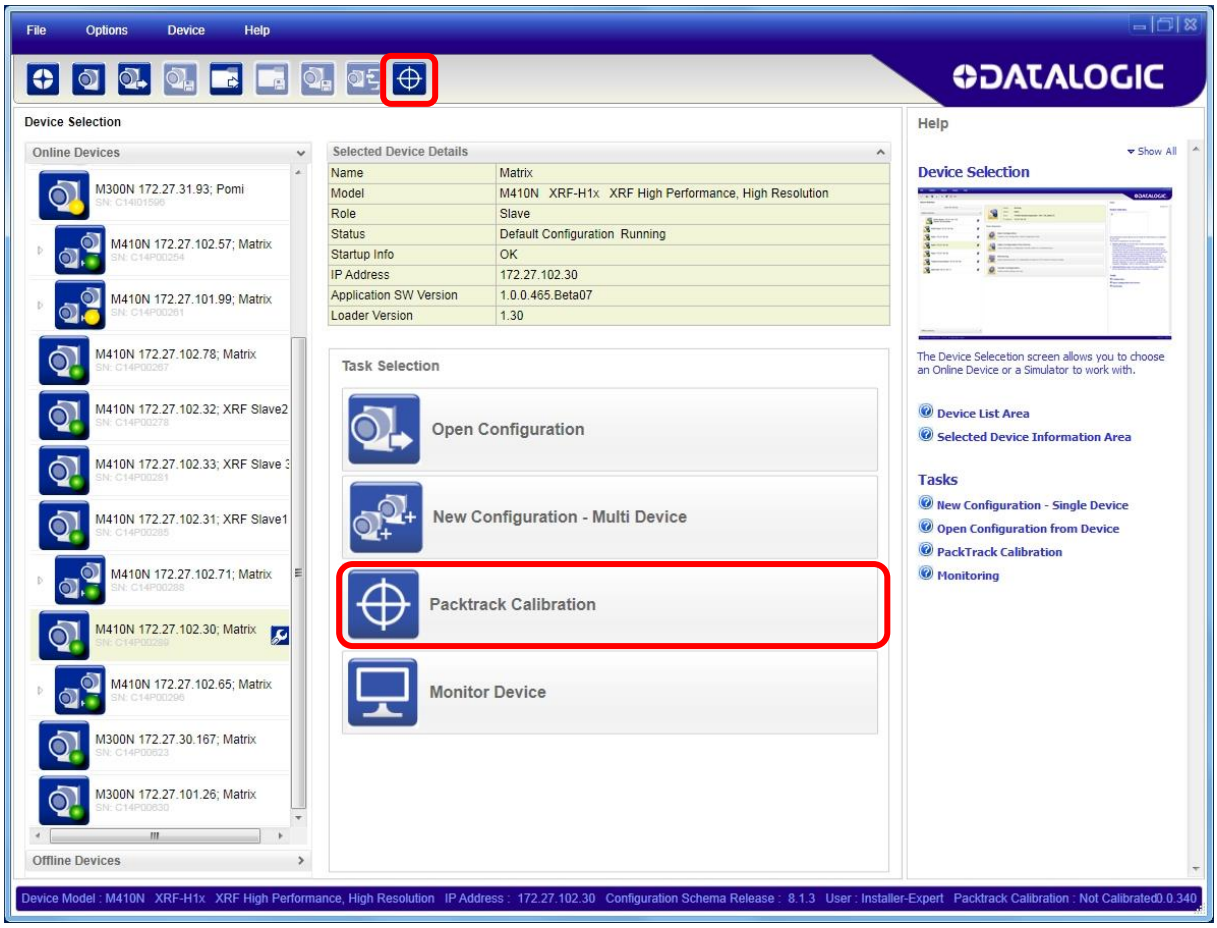
The PackTrack Calibration is completed only after both planes have been calibrated and saved in Flash.

**NOTE:** Once a completed calibration is performed, it is not possible to perform calibration on a single plane, for example modifying one plane while maintaining the previous parameters of the other plane. The PackTrack Calibration always requires both steps to be completed.

[3] For XRF410N products, PackTrack Calibration must be performed separately for all the readers, first the Master and then the Slave (or Slaves in the case of Extended models).

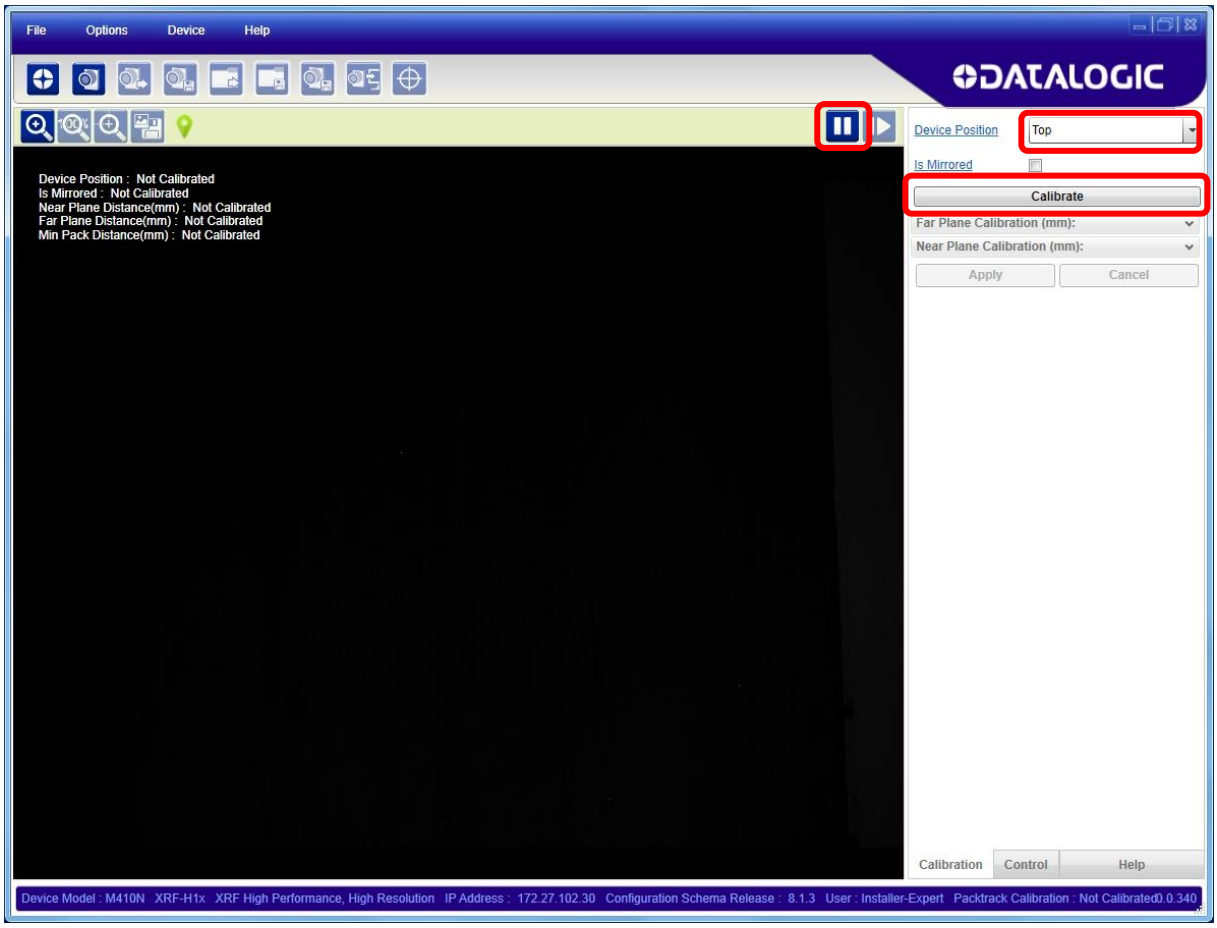
**STEP 1 – Run PackTrack Calibration:**

a) Select **PackTrack Calibration** from the toolbar icon or item in the DL.CODE Task Area.



b) Set the Device Position to **Top** from the dropdown list.

c) Click on the **Calibrate** button to open the Calibration Planes panel for co-ordinate input.




**STEP 2 – Determine the PackTrack System Reference Point:**

a) Determine the PackTrack System Reference Point, if possible **on the conveyor frame surface**, where the X, Y, Z co-ordinates = (0,0,0). Visibly mark this point on a piece of tape or other surface, so that it can be used to make the measurements necessary for calibration. The Y = 0 value **normally** corresponds to the PS Line position.

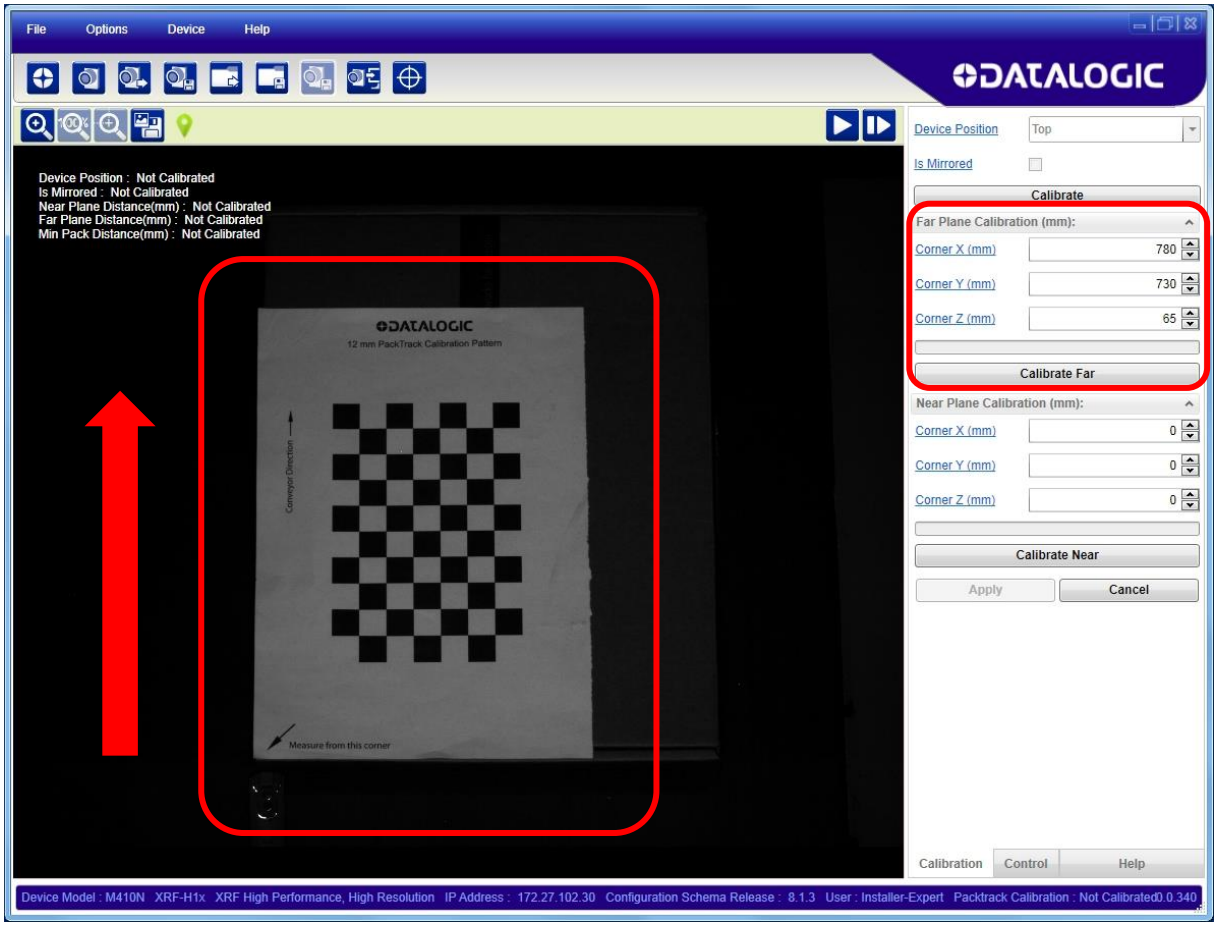
**STEP 3 – Far Plane Calibration**:

**NOTE:** Step 3 and Step 4 can be inverted.

a) The reader should already be running (illuminator flashing and acquiring images) so that positioning can be seen on the monitor. The pause button should be shown indicating the reader is running.

b) Place the Calibration Pattern so that it is completely visible in the monitor window and it corresponds to the plane representing the lowest pack allowed to pass through the system on the conveyor. This is the Far Plane which can also be on the conveyor surface.

**NOTE:** the Calibration Pattern must be aligned so that the y-axis is parallel to the conveyor movement direction.

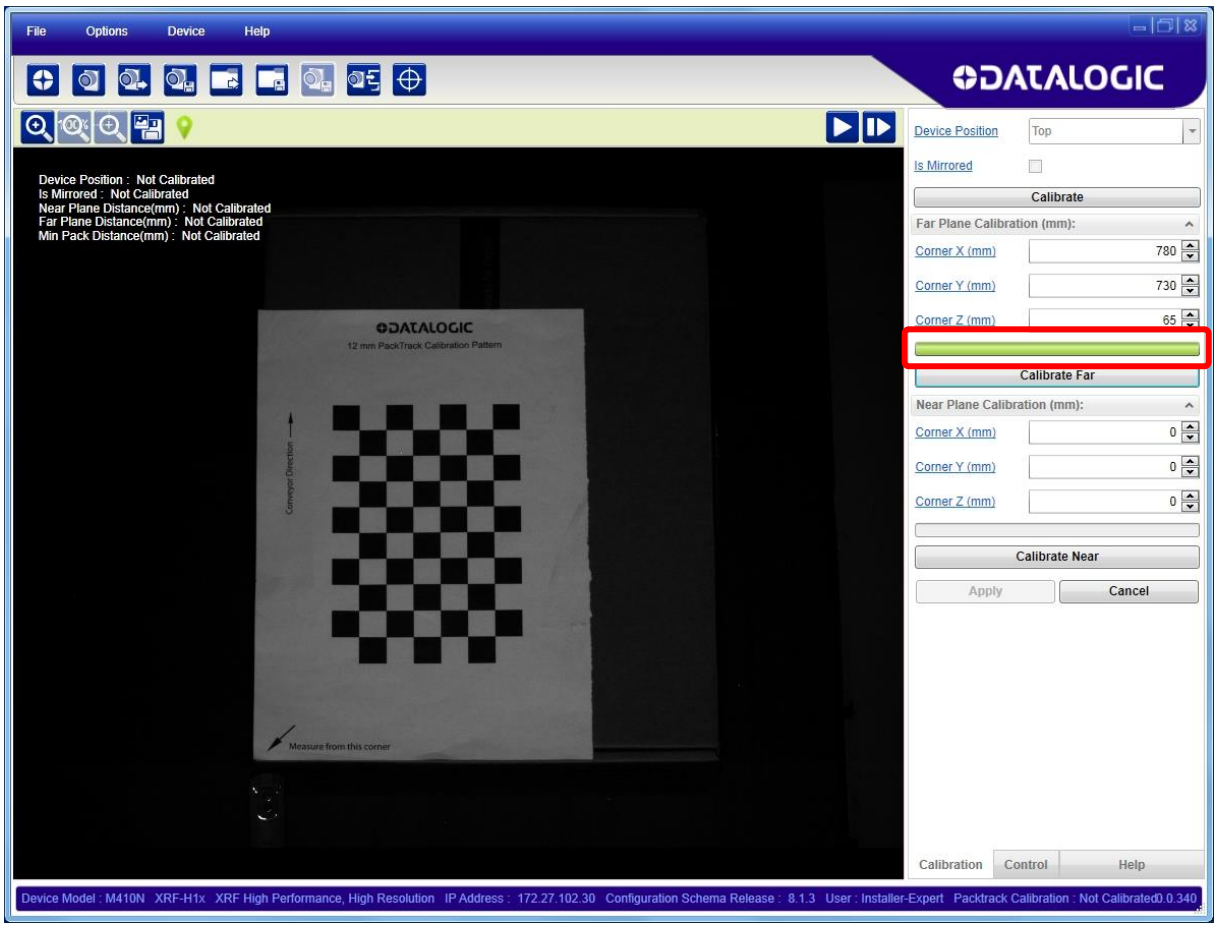



c) Press the **Pause** button.

d) Using the tape measure, physically measure the X, Y and Z offsets from the System Reference Point to the lower left corner of the Calibration Pattern and input this data **(mm)** into the Far Plane Calibration boxes.

e) Press the **Calibrate Far** button for start Far Calibration.

f) Wait until the operation finishes. An orange progression bar runs above the **Calibrate Far** button and should end in a solid green bar indicating successful calibration of the far plane.




**Possible Error Causes:**

- Calibration Pattern is not completely contained in the Field of View.
- Calibration Pattern is partially obscured by objects covering it

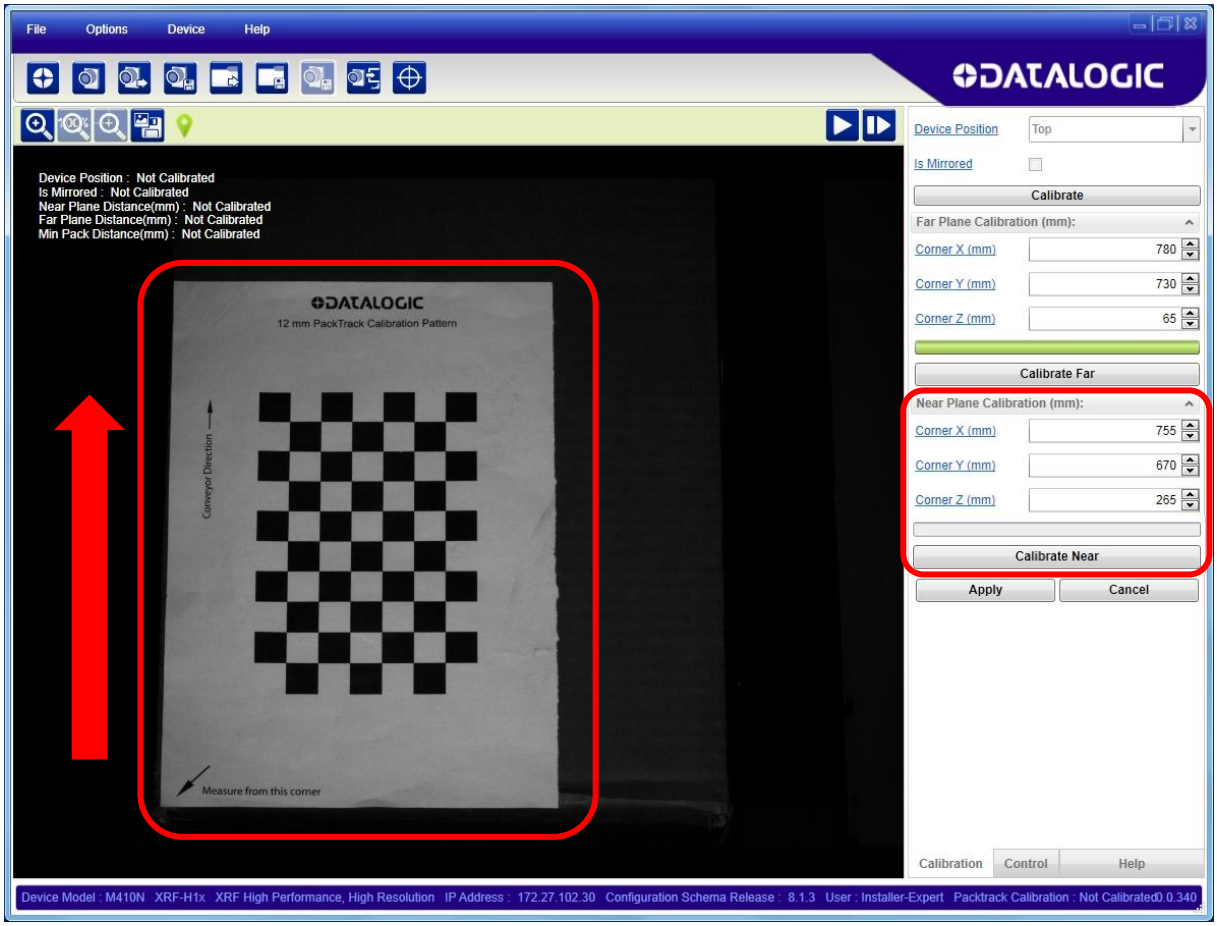
**STEP 4 – Near Plane Calibration**:

**NOTE:** Step 3 and Step 4 can be inverted.

a) Press the **Play** button. The reader again begins to acquire images.

b) Place the Calibration Pattern on a pack so that it is completely visible in the monitor window and it corresponds to the plane representing the tallest pack allowed to pass through the system on the conveyor. This is the Near Plane.

**NOTE:** the Calibration Pattern must be aligned so that the y-axis is parallel to the conveyor movement direction.

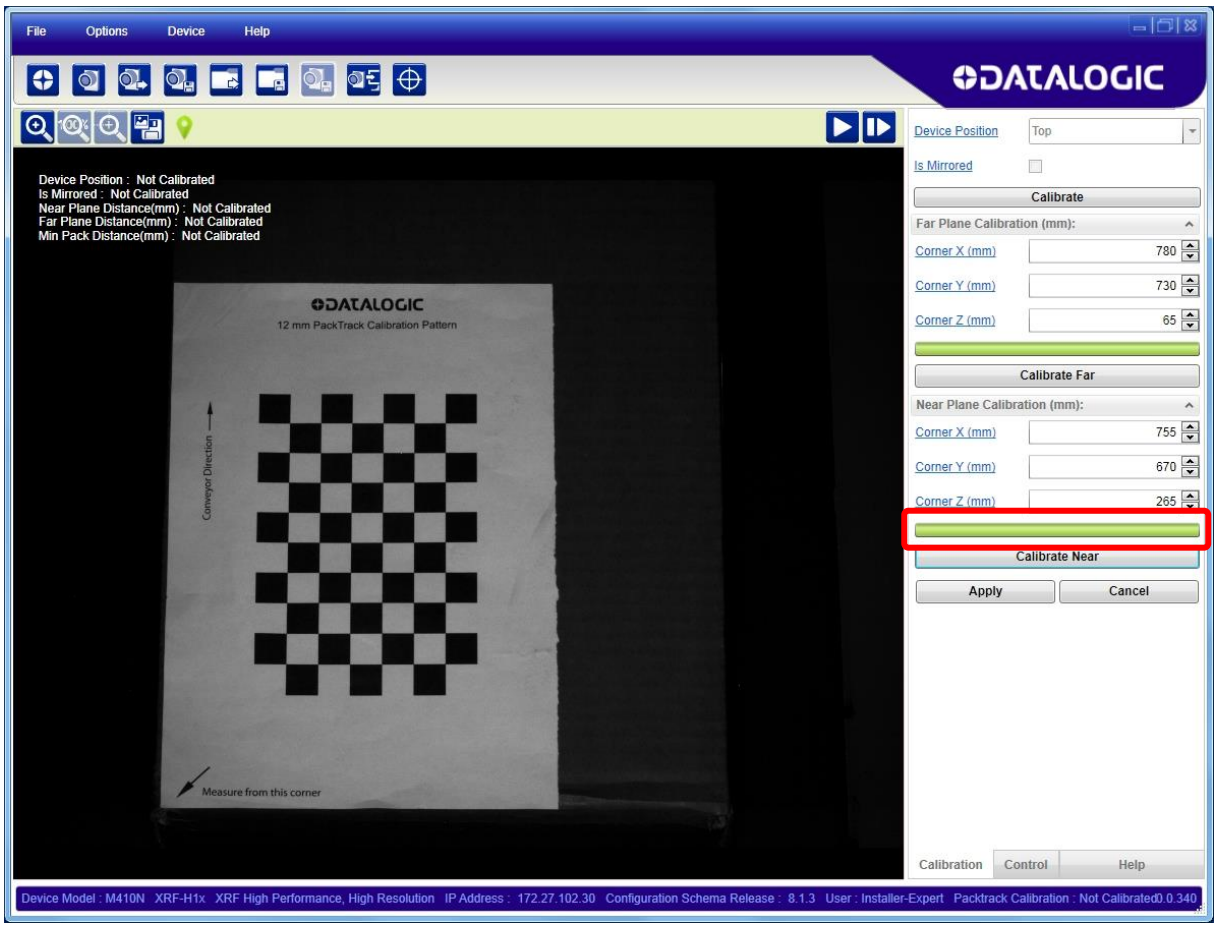



c) Press the **Pause** button.

d) Using the tape measure, physically measure the X, Y and Z offsets from the System Reference Point to the lower left corner of the pack (aligned with the Calibration Pattern) and input this data **(mm)** into the Near Plane Calibration boxes.

e) Press the **Start** button for Near Calibration.

f) Wait until the operation finishes. An orange progression bar runs above the **Calibrate Near** button and should end in a solid green bar indicating successful calibration of the near plane.




**Possible Error Causes:**

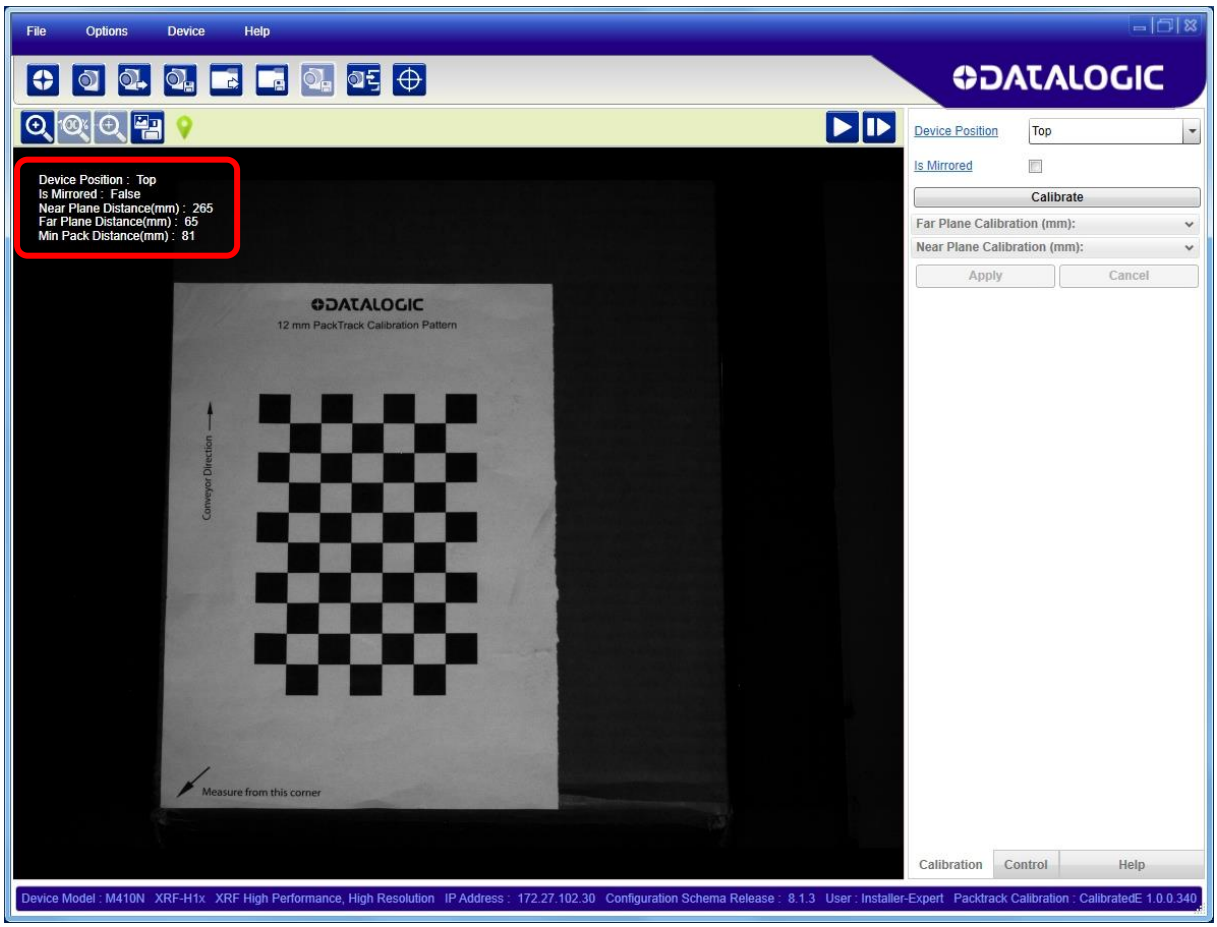
- Calibration Pattern is not completely contained in the Field of View.
- Calibration Pattern is partially obscured by objects covering it

*In this case (first time calibration), it is possible to repeat the Near Calibration without losing the previously completed Far Calibration.*

**NOTE:** the items in the monitor window are still shown as “Not Calibrated” because the calibration has not been saved yet.

**STEP 5 – Saving Calibration**:

g) Click on the **Apply** button to save the calibration values in the reader's flash memory.




**The calibration also advises the minimum distance between packs (Min Pack Distance), for which correct code to pack assignment can be guaranteed.**

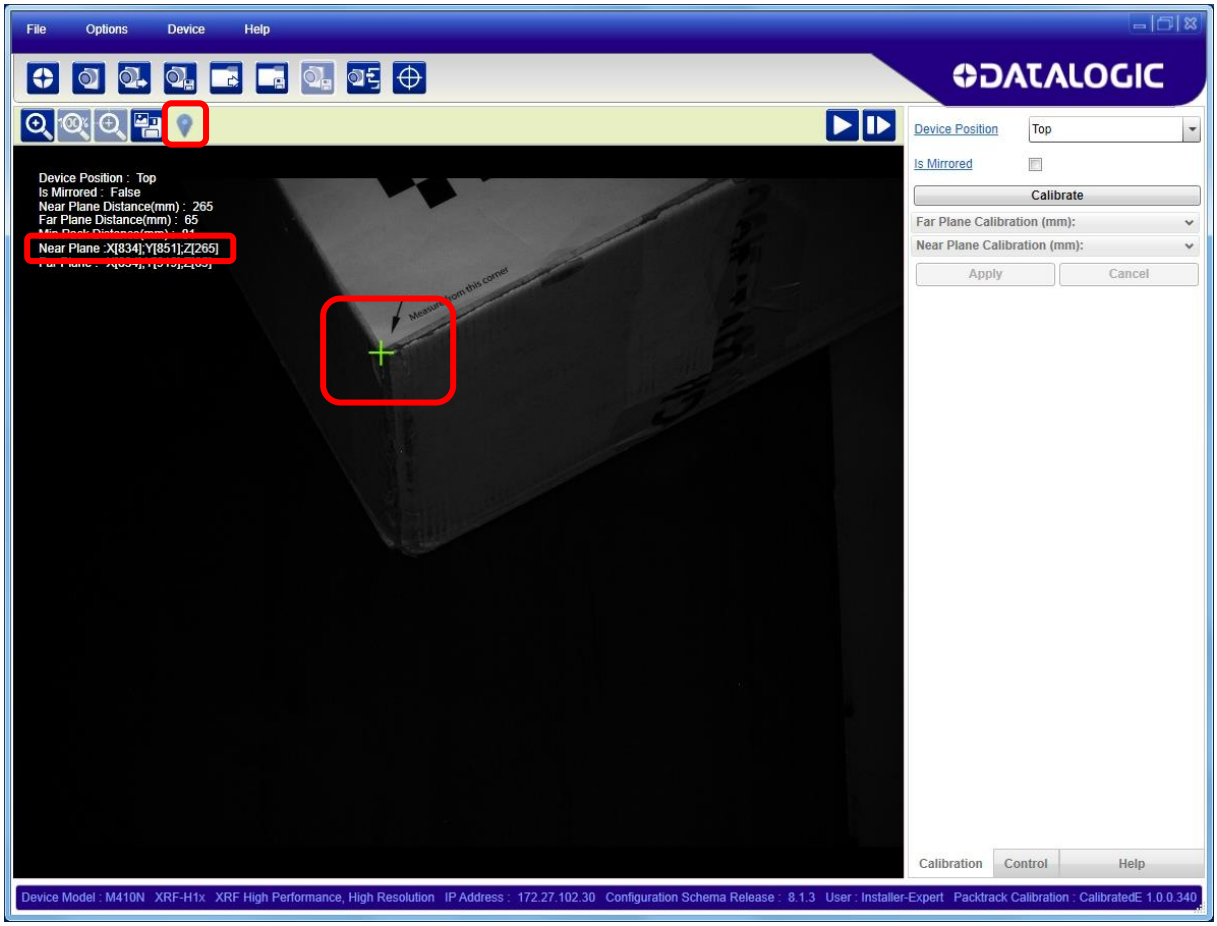
At this point PackTrack Calibration has been successfully completed.

**STEP 6 – Verify Calibration Results**:

a) Place a pack, code or other object onto either the Near or Far plane at a different coordinate from the calibration, however it must be visible in the monitor window.

b) Click on the **Show Real World Coordinates** icon. A green cross will appear in the monitor window. Drag this cross with the mouse to an easy-to-measure reference point (i.e. pack edge).

c) Using the tape measure, physically measure the X and Y coordinates from the System Reference Point and compare them to the data shown in the monitor window for the reference plane you are measuring.



# 12 DPM

## 12.1 DPM AUTOLEARN

In DL.CODE 1.5.0 the DPM Autolearn feature has been replaced by the Automatic Setup, see par. 3.3.1.

If you load devices with software application programs having previous versions and you don't want to upgrade, then you will need to consult the specific software version documentation for the DPM Autolearn feature.

## 12.2 PRE CONFIGURATION

Before performing Automatic Setup the following factors require attention in order to produce the best decoding results for DPM code reading applications.

1. The best reading results occur in static applications (no code movement during image acquisition).
2. When using internal illumination, reduce skew angle to minimum to allow uniform lighting on the code surface.
3. The code should be placed as close as possible to the center of the FoV.
4. Reduce reading distance to reduce ambient lighting interference.
5. The best internal illumination chain combination in part depends on the reading distance. More light is applied to the surface at closer distances.

# 13 CODE GRADING

## 13.1 SYMBOL VERIFICATION VERSUS CODE GRADING

**Symbol Verification** involves completely testing the adherence of 2D and 1D codes to the parameters defined in specific International Standards in order to guarantee their reliability and therefore ability to be correctly decoded. In Symbol Verification the (Overall) Symbol Grade is only meaningful if it is expressed in conjunction with the measurement wavelength and aperture used. It should be shown in the format:
Grade / Aperture / Wavelength [ / Angle ]
Where:
“Grade” is the overall symbol grade (i.e. the arithmetic mean of the individual Scan Grades for a number of tested images of the symbol).
“Aperture” is the aperture reference number or the diameter in thousandths of an inch (to the nearest thousandth) of the synthetized aperture.
“Wavelength” is the peak light wavelength in nanometers.
“Angle” is the angle of incidence of the illumination relative to the plane of the symbol of the illumination (if 45° it is omitted).

**Code Grading** for the Matrix N family reader is a feature used to evaluate the quality of a code within a specific application based only on the Scan Grade parameters defined in certain International Standards. **It does not take into consideration the external environmental lighting parameters such as Aperture, Wavelength and Illumination Angle which can in any case affect the Scan Grade.**

The Overall Code Grade is determined by the lowest resulting Scan Grade within the evaluated set of individual Scan Grade parameters.

Through DL.CODE you can also configure the Matrix N reader to perform Code Grading on a specific sub-set of parameters for evaluation. For example, it may be that you are only interested in grading the Print Growth and Symbol Contrast parameters as a function of symbol print quality and therefore only want to monitor these two parameters. Only these two parameters then will contribute to the Overall Code Grade. See also par. 13.8.

**NOTE:** Overall Code Grading cannot be equated with and should not be confused with Symbol Verification.

## 13.2 INTERNATIONAL STANDARDS APPLIED TO CODE GRADING

Matrix N family readers can be used to evaluate printed or marked symbols according to the ISO/IEC 16022, 18004, AIM DPM, and ISO/IEC 15416 standards.

ISO-IEC 16022
**(Data Matrix - International Symbology Specification)**
The ISO-IEC 16022 Standard specifies general requirements (data character encoding, error correction rul
es, decoding algorithm, etc.) for Data Matrix symbology.

ISO-IEC 18004
**(QR Code - International Symbology Specification)**
The ISO-IEC 18004 Standard specifies general requirements (data character encoding, error correction rules, decoding algorithm, etc.) for QR Code symbology.

ISO-IEC TR 29158 (AIM DPM 2006)
**(Direct Part Mark Quality Guideline)**
The AIM DPM Quality Guideline is applicable to the symbol quality assessment of direct parts marking performed in using two-dimensional bar code symbols. It defines modifications to the measurement and grading of several symbol quality parameters.

The marking processes covered by this guideline are as follows: Dot Peening, Ink Jet, Laser Etching and Electro-Chemical Etching.

ISO-IEC 15415
**(Two-Dimensional Symbols - Print Quality Test Specification)**
The ISO-IEC 15415 Standard specifies the methodologies for the measurement of specific attributes of two-dimensional bar code symbols, and methods for evaluating and grading these measurements and deriving an overall assessment of symbol quality.

ISO-IEC 15416
**(Linear Symbols - Print Quality Test Specification)**
The ISO-IEC 15416 Standard specifies the methodologies for the measurement of specific attributes of linear bar code symbols, and methods for evaluating and grading these measurements and deriving an overall assessment of symbol quality.

## 13.3 PARAMETERS OVERVIEW

| Standards / Parameters | ISO/IEC 16022 | ISO/IEC 18004 | ISO/IEC TR 29158 | ISO/IEC 15415 | ISO/IEC 15416 |
|---|---|---|---|---|---|
| | Data Matrix | QR | 2D DPM | 2D | 1D |
| Print Growth | ✓ | ✓ | Non Graded | ✓ | Non Graded |
| Axial Non Uniformity | ✓ | ✓ | ✓ | ✓ | |
| Unused Error Correction | ✓ | ✓ | ✓ | ✓ | |
| Symbol Contrast | ✓ | ✓ | | ✓ | ✓ |
| Cell Contrast | | | ✓ | | |
| Cell Modulation | | | ✓ | | |
| Decode | | | ✓ | ✓ | ✓ |
| Fixed Pattern Damage | | | ✓ | ✓ | |
| Grid Non Uniformity | | | ✓ | ✓ | |
| Minimum Reflectance | | | ✓ | | ✓ |
| Minimum Edge Contrast | | | | | ✓ |
| Decodability | | | | | ✓ |
| Modulation | | | | ✓ | ✓ |
| Defects | | | | | ✓ |

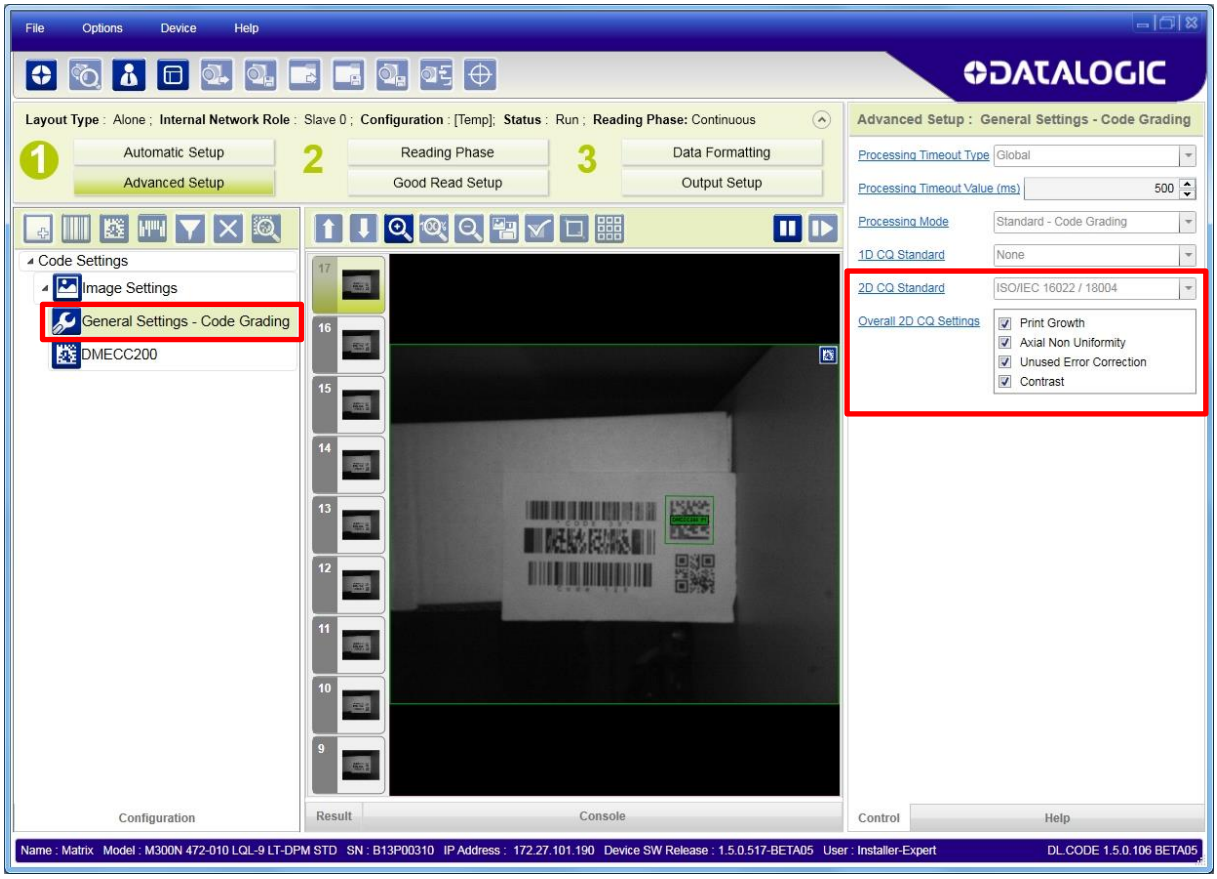
You can enable Code Grading by selecting the International Code Quality (CQ) Standard from the Advanced Setup General Settings menu.

1. Set the Processing Mode parameter to Standard – Code Grading.
2. Select the 1D or 2D Code Quality Standard from the drop down lists:

   1D: None, ISO/IEC 15416

   2D: None, ISO/IEC 16022 / 18004, ISO/IEC 29158 (AIM DPM), ISO/IEC 15415

Depending on the selection, the relative Overall Code Quality Settings box is displayed that allows you to select which parameters to use to determine the overall grading.



## 13.4 ISO/IEC 16022 AND ISO/IEC 18004 STANDARDS

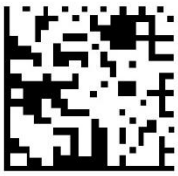
The ISO-IEC 16022 and ISO-IEC 18004 Standards specify the methodologies for the measurement of specific attributes respectively for **Data Matrix** and **QR** code symbols, and methods for evaluating and grading these measurements and deriving an overall assessment of symbol quality.

Each quality parameter shall be measured and a grade on a descending scale of integers from 4 to 0 shall be allocated to it. The grade 4 represents the highest quality, while the grade 0 represents failure.

### 13.4.1 Code Quality Scan Grade Parameters

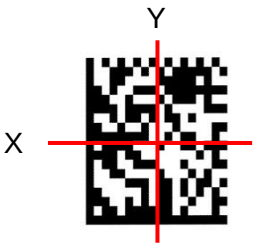
The following scan grade parameters can be evaluated for the ISO-IEC 16022 and ISO-IEC 18004 Standards:

**Print Growth**
Measures the deviation of actual elements dimension from the expected element dimension due to printing problems (i.e. overprint or underprint).


Underprinting

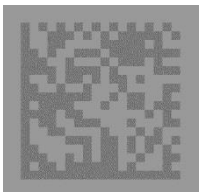

Overprinting

**Axial Non-Uniformity (ANU)**
Measures and grades the squareness of all modules in the direction of each of the symbol's major axes (X-axis and Y-axis) by applying the decode algorithm to the binarized image.




**Unused Error Correction (UEC)**
This parameter tests and grade the extent to which regional or spot damage in the symbol has eroded the information redundancy margin that error correction provides. 100% Unused Error Correction Capacity is the ideal condition.

**Symbol Contrast (SC)**
Symbol Contrast tests that the two reflective states in the symbol, namely Light and Dark, are sufficiently distinct within the symbol.



The Overall Code Grade is determined by the lowest resulting Scan Grade within the evaluated set of individual Scan Grade parameters.

## 13.5 ISO/IEC TR 29158 (AIM DPM 2006) QUALITY GUIDELINE

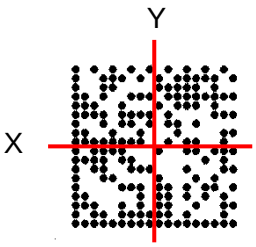
The AIM DPM Quality Guideline is applicable to the symbol quality assessment of direct parts marking performed in using two-dimensional bar code symbols. It defines modifications to the measurement and grading of several symbol quality parameters.
The marking processes covered by this guideline are as follows: Dot Peening, Ink Jet, Laser Etching and Electro-Chemical Etching.

Each quality parameter shall be measured and a grade on a descending scale of integers from 4 to 0 shall be allocated to it. The grade 4 represents the highest quality, while the grade 0 represents failure.

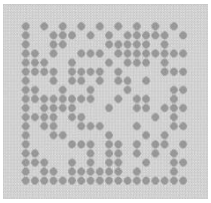
### 13.5.1 Code Quality Scan Grade Parameters

The following scan grade parameters can be evaluated for the AIM DPM Standard:

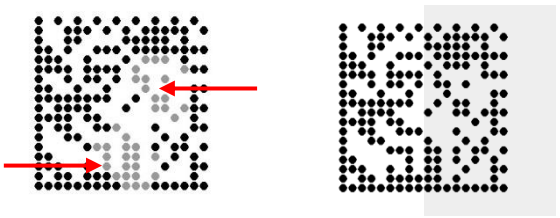
**Axial Non-Uniformity (ANU)**
Measures and grades the squareness of all modules in the direction of each of the symbol's major axes (X-axis and Y-axis) by applying the decode algorithm to the binarized image.



**Cell Contrast (CC)**
Measures and grades the difference between the means of brightest and darkest values of the symbol (instead of determining differences between the brightest and darkest values).

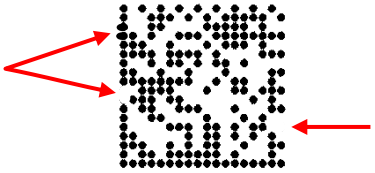


**Cell Modulation (CM)**
Cell modulation analyzes the grid center points within the data region to determine the reflectance uniformity of light and dark elements after considering the amount of error correction available in the code.

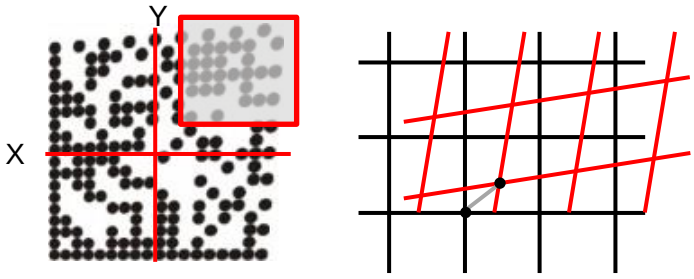


**Decode**
The Decode parameter tests, on a Pass/Fail basis, whether the symbol has all its features sufficiently correct to be readable. If the image cannot be decoded using the symbology reference decode algorithm, then it shall receive the failing grade 0. Otherwise, it shall receive the grade 4.
This parameter then will always produce Grade A for good reads. If the code cannot be decoded, then a No Read result will be produced by the reader so you will never have a Grade F result for this parameter.

**Fixed Pattern Damage (FPD)**
This metric is similar to Cell Modulation, but it analyzes the finder pattern and clock pattern as well as the quiet zone around the code instead of the data region.

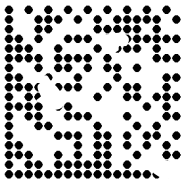


**Grid Non-Uniformity (GNU)**
Measures and grades the largest vector deviation of the grid intersections, determined by the reference decode algorithm from the binarized image of a given symbol, from their "ideal" theoretical position. Assuming a grid on which the ideal angle of intersection is 90°, any angle deviation from 90° constitutes Grid Non-Uniformity.



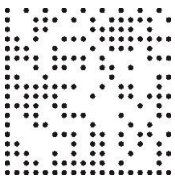

**Minimum Reflectance (MR)**
The image brightness is adjusted on a reference part, after which this calibrated value is compared with the reflectance of that part. Minimum Reflectance is the ratio of the parts reflectance to the calibrated reflectance.

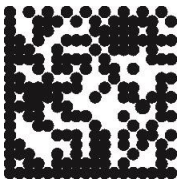
**Unused Error Correction (UEC)**
This parameter tests and grade the extent to which regional or spot damage in the symbol has eroded the information redundancy margin that error correction provides.
100% Unused Error Correction Capacity is the ideal condition.



**NON GRADED PARAMETERS**

**Print Growth**
Measures the deviation of actual elements dimension from the expected element dimension due to printing problems (i.e. overprint or underprint).


Underprinting


Overprinting

## 13.6 ISO/IEC 15415 STANDARD

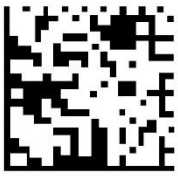
The ISO-IEC 15415 Standard specifies the methodologies for the measurement of specific attributes two-dimensional bar code symbols, and methods for evaluating and grading these measurements and deriving an overall assessment of symbol quality.

Each quality parameter shall be measured and a grade on a descending scale of integers from 4 to 0 shall be allocated to it. The grade 4 represents the highest quality, while the grade 0 represents failure.

### 13.6.1 Code Quality Scan Grade Parameters

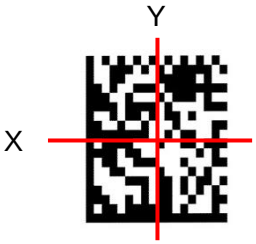
The following scan grade parameters can be evaluated for the ISO-IEC 15415 Standard:

**Print Growth**
Measures the deviation of actual elements dimension from the expected element dimension due to printing problems (i.e. overprint or underprint).


Underprinting

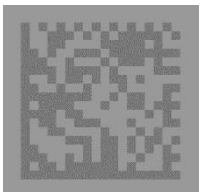

Overprinting

**Axial Non-Uniformity (ANU)**
Measures and grades the squareness of all modules in the direction of each of the symbol's major axes (X-axis and Y-axis) by applying the decode algorithm to the binarized image.



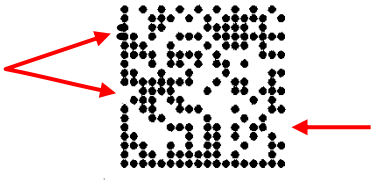

**Unused Error Correction (UEC)**
This parameter tests and grade the extent to which regional or spot damage in the symbol has eroded the information redundancy margin that error correction provides. 100% Unused Error Correction Capacity is the ideal condition.

**Symbol Contrast (SC)**
Symbol Contrast tests that the two reflective states in the symbol, namely Light and Dark, are sufficiently distinct within the symbol.

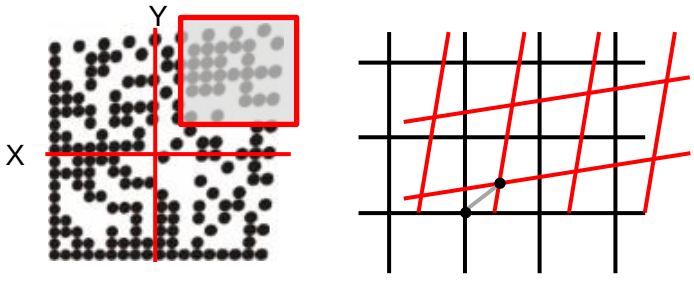


**Decode**
The Decode parameter tests, on a Pass/Fail basis, whether the symbol has all its features sufficiently correct to be readable. If the image cannot be decoded using the symbology reference decode algorithm, then it shall receive the failing grade 0. Otherwise, it shall receive the grade 4.
This parameter then will always produce Grade A for good reads. If the code cannot be decoded, then a No Read result will be produced by the reader so you will never have a Grade F result for this parameter.

**Fixed Pattern Damage (FPD)**
This metric is similar to Cell Modulation, but it analyzes the finder pattern and clock pattern as well as the quiet zone around the code instead of the data region.



**Grid Non-Uniformity (GNU)**
Measures and grades the largest vector deviation of the grid intersections, determined by the reference decode algorithm from the binarized image of a given symbol, from their "ideal" theoretical position. Assuming a grid on which the ideal angle of intersection is 90°, any angle deviation from 90° constitutes Grid Non-Uniformity.




**Modulation (MOD)**
Modulation is the ratio of the minimum edge contrast to Symbol Contrast. It can be considered as the quality of the Analog signal related to the printing contrast.

The Overall Code Grade is determined by the lowest resulting Scan Grade within the evaluated set of individual Scan Grade parameters.

## 13.7 ISO/IEC 15416 1D STANDARD

The ISO-IEC 15416 Standard specifies the methodologies for the measurement of specific attributes of linear bar code symbols, and methods for evaluating and grading these measurements and deriving an overall assessment of symbol quality.

Bar code symbol quality assessment shall be based on an analysis of the Scan Reflectance profiles. The scan reflectance profile is a record of the Reflectance values measured on a single line across the entire width of the barcode.

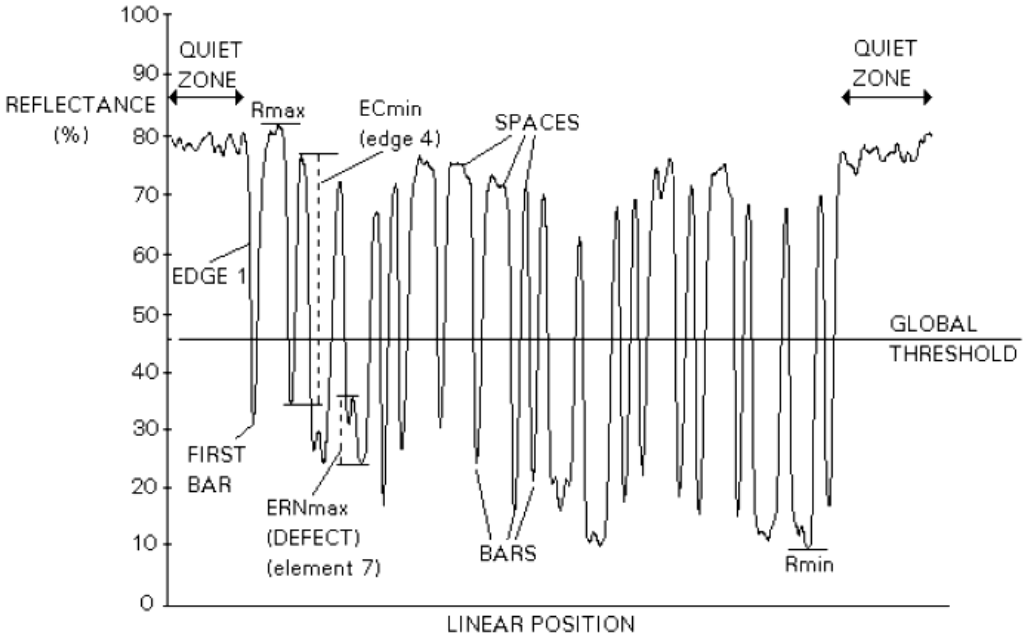



**Figure 15 – Scan Reflectance Profile**

Symbol Quality grading shall be used to derive a relative measure of symbol quality under the measurement conditions used. Each scan reflectance profile shall be analyzed and a grade on a descending scale of integers from 4 to 0 shall be allocated to each of the parameters evaluated.

### 13.7.1 Code Quality Scan Grade Parameters

The following scan grade parameters can be evaluated for the ISO-IEC 15416 Standard:

**Decode**
The symbology reference decode algorithm shall be used to decode the symbol using the element edges determined on the Scan Reflectance profile. This algorithm may be found in the symbology specification.

**Decodability**
The decodability of a bar code symbol is a measure of the accuracy of its production in relation to the appropriate reference decode algorithm.

**Defects**
Defects are irregularities found within elements and quiet zones, and are measured in terms of element reflectance non-uniformity.
Element reflectance non-uniformity within an individual element or quiet zone is the difference between the reflectance of the highest peak and the reflectance of the lowest valley.
Defect measurement is expressed as the ratio of the maximum element Reflectance Non-Uniformity (ERNmax) to Symbol Contrast.

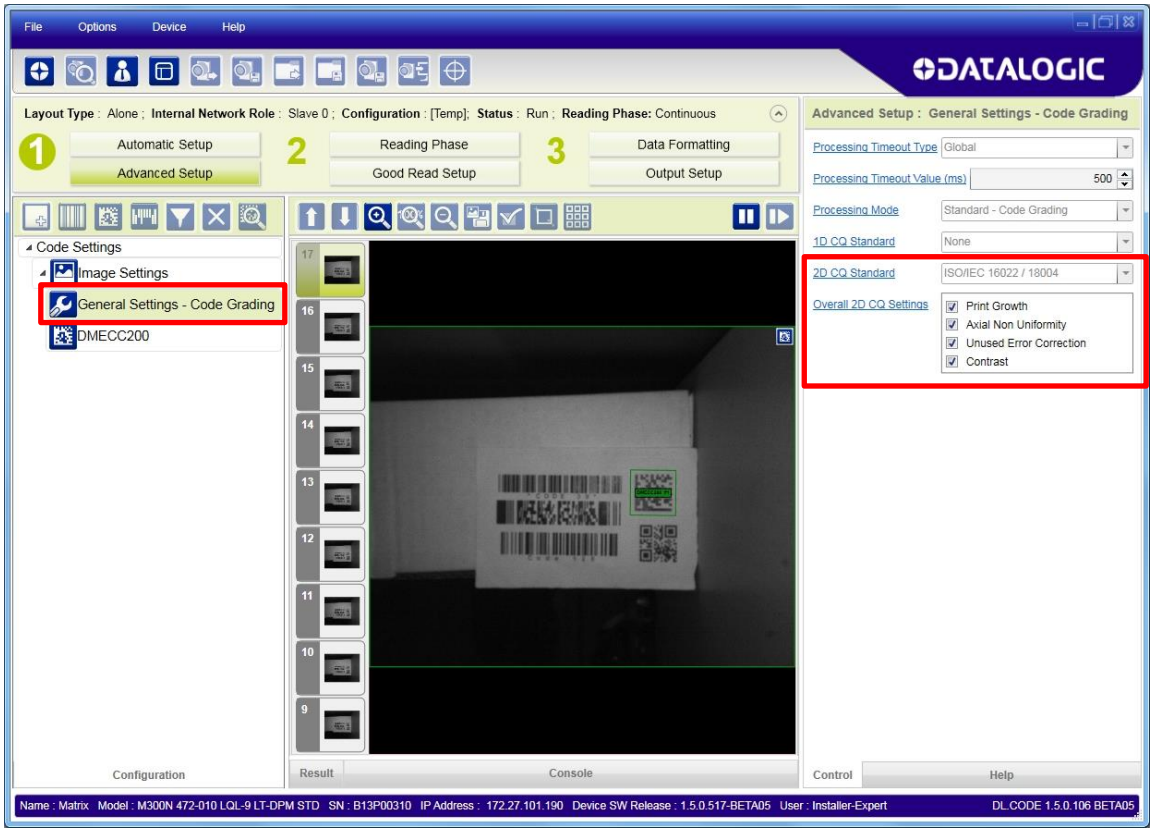
**Minimum Edge Contrast (EC)**
Edge contrast is the difference between the Rs (Space Reflectance) and Rb (Bar Reflectance) of adjoining elements including quiet zones.
The lowest value of edge contrast found in the scan reflectance profile is the minimum edge contrast, ECmin.

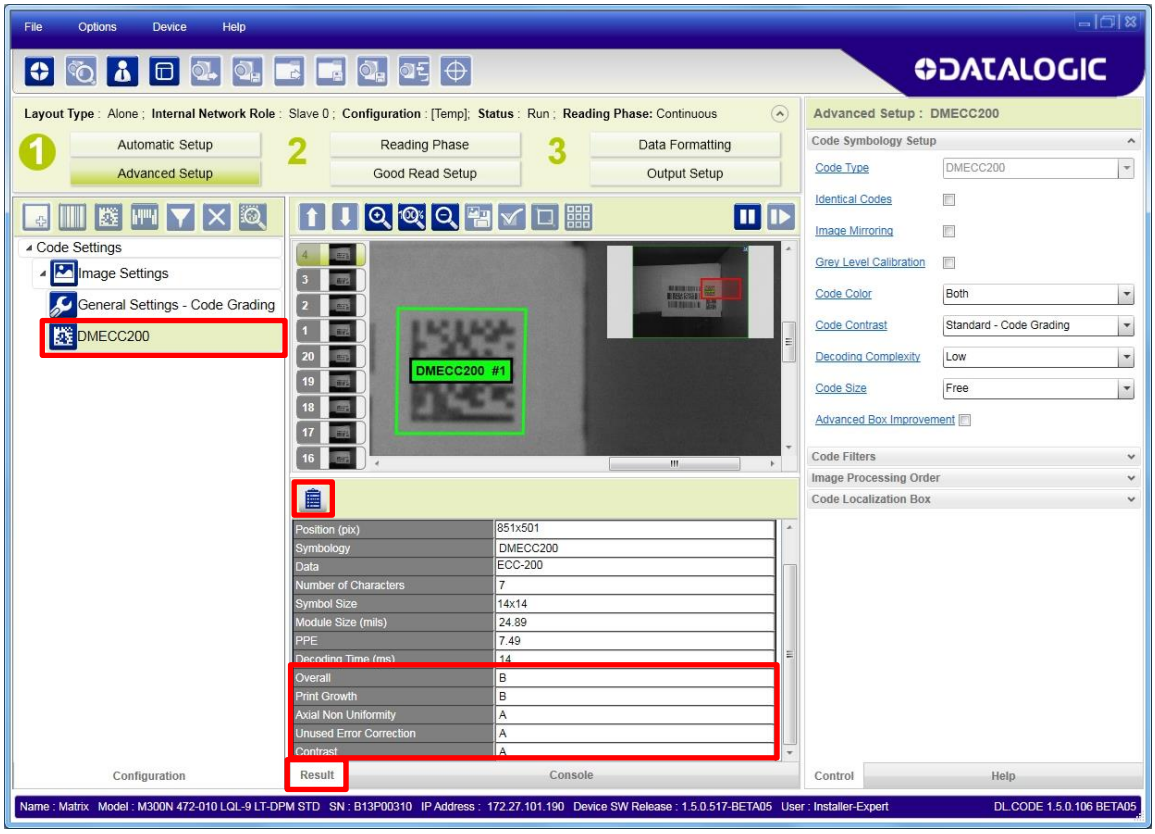
**Minimum Reflectance (Rmin)**
Rmin is the lowest reflectance value in the scan reflectance profile. Rmin shall not be higher than 0,5 x Rmax. This parameter is intended to ensure that Rmin shall not be too high, especially when the value of Rmax is high.

**Modulation (MOD)**
Modulation is the ratio of the minimum edge contrast to Symbol Contrast. It can be considered as the quality of the Analog signal related to the printing contrast.

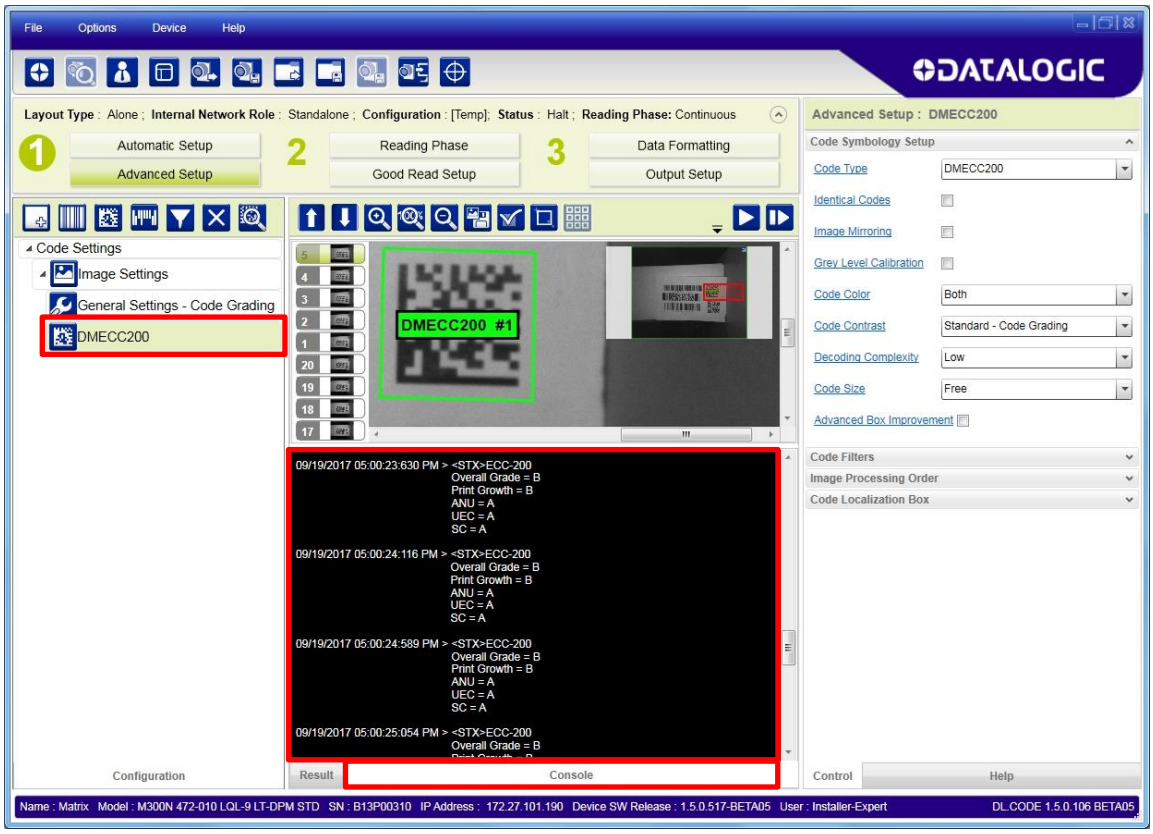
**Symbol Contrast (SC)**
Symbol contrast is the difference between the highest and lowest reflectance values in a scan reflectance profile.

## 13.8 CODE GRADING EXAMPLE USING ISO/IEC 16022 AND ISO/IEC 18004 STANDARDS



The output message can also be defined to include the scan grade parameters.



# 14 DEVICE CONFIGURATION SETTINGS

The Statistics behavior for the DL.CODE Monitor is managed through the Configuration Settings window.

The other configuration groups manage some special application parameters for hybrid systems where Matrix readers are used in combination with other devices and monitoring software.

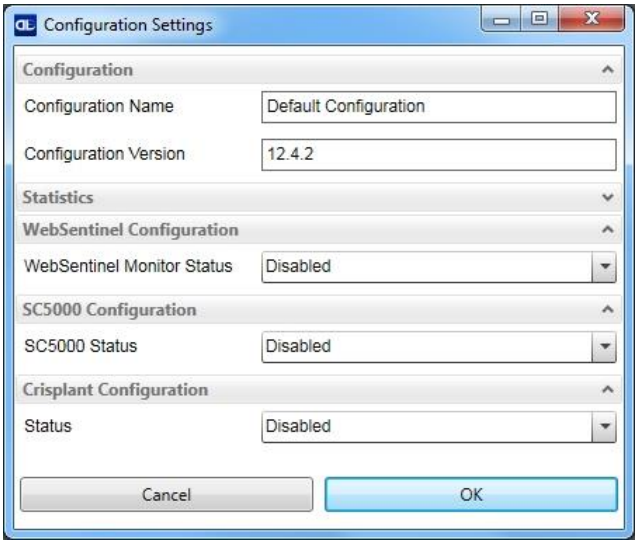
## 14.1 ACCESSING DEVICE CONFIGURATION SETTINGS

To access the device configuration settings obviously the device must be connected to DL.CODE. From the Device>Settings>Configuration Settings menu open the Configuration Settings window.

This window presents the following fields:

The configuration **Name** and **Version** of the Default Configuration are reported in the first group (read-only).

This is independent from the actual configuration currently running on the connected device.

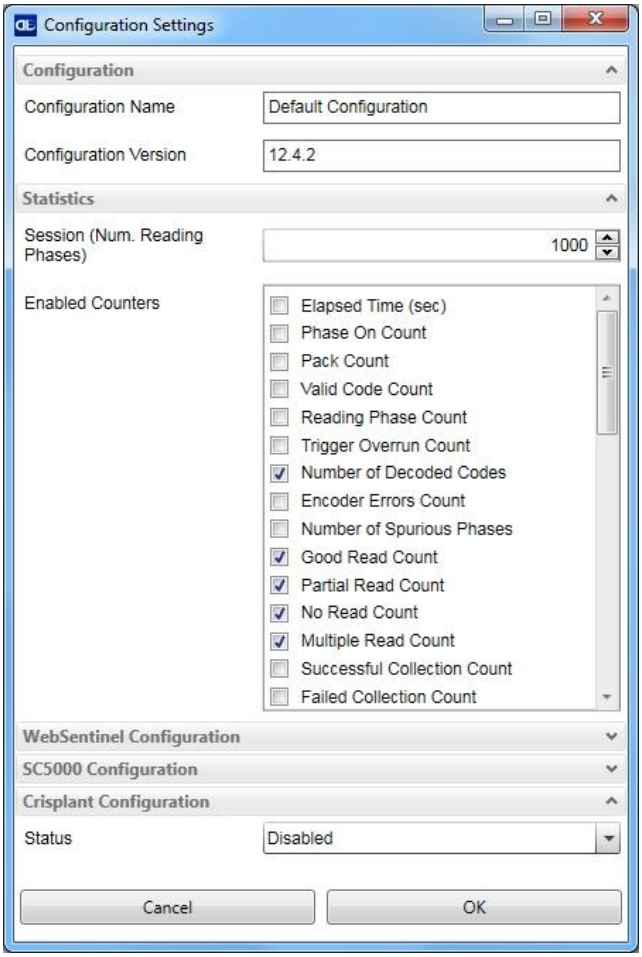


## 14.2 STATISTICS

This group manages the statistics reporting behavior in the Monitor Statistics page. See also par. 8.2.

**Session** lets you set the number of reading phases to monitor for a Session (from 10 to 1000).

**Enabled Counters** lets you choose which counter fields to visualize in the Monitor Statistics page.

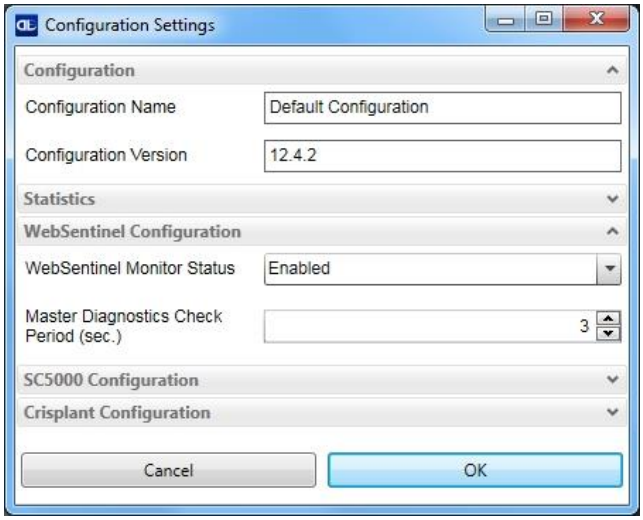



## 14.3 WEBSENTINEL CONFIGURATION

This group manages configuration to the WebSentinel PLUS Monitoring software program.

**WebSentinel Monitor Status** enables or disables connection to the WebSentinel PLUS Monitor program.

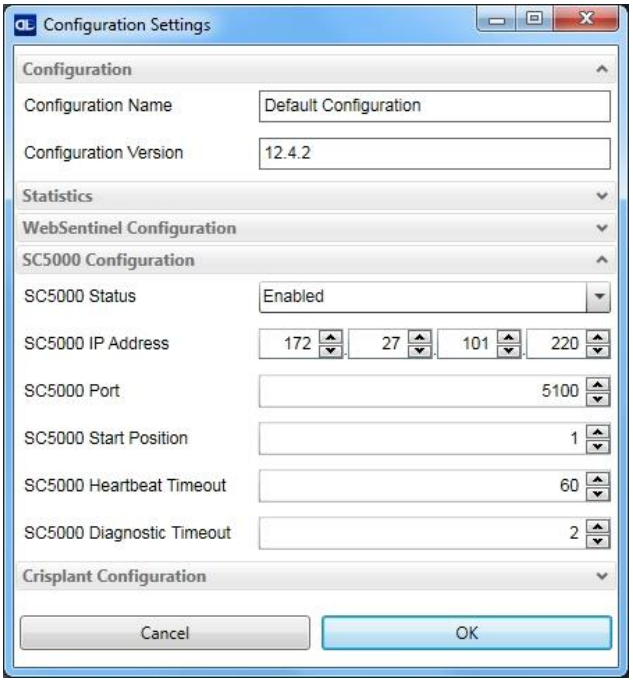
**Master Diagnostics Check Period** sets the polling frequency for Diagnostic messages to be reported to WebSentinel PLUS.



## 14.4 SC5000 CONFIGURATION

**NOTE:** This configuration can only be used in PackTrack operating mode and Code Combination data collection method.

This group manages the configuration of the Matrix device to the SC5000 Controller in a Hybrid configuration.




**SC5000 Status** enables or disables connection to the SC5000 Controller.

**SC5000 IP Address** must match the SC5000 Controller.

**SC5000 Port** must match the SC5000 Controller.

**Start Position** is the address number (1 to 31) of the Matrix Master or Stand Alone reader which acts as a Slave to the SC5000. The Matrix Master reader has its own slaves (ID-NET network) whose addresses will automatically be assigned by the SC5000 in consecutive order to the Matrix Start Position address.

**SC5000 Heartbeat Timeout** must match the SC5000 Controller. A value of 1 to 180 seconds can be configured for the Heartbeat.

**SC5000 Diagnostic Timeout** sets the polling frequency (in seconds) for Diagnostic messages to be reported to the SC5000 Controller.

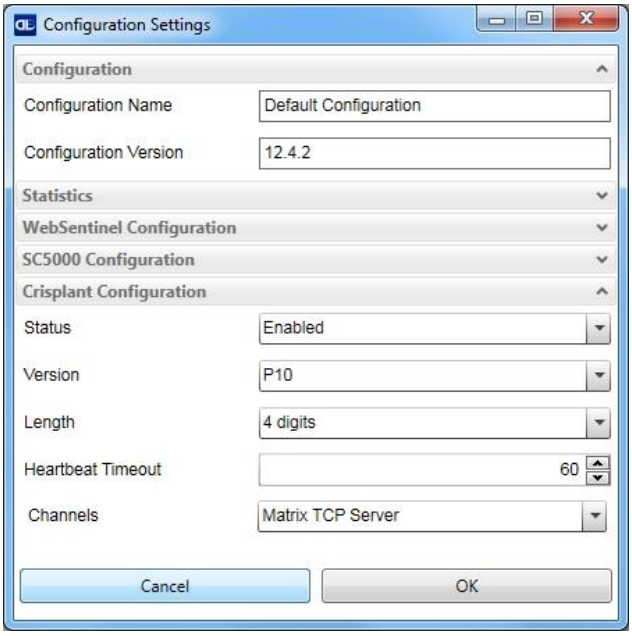
**NOTE:** Since messages sent to the SC5000 on the selected communication channel will be formatted by the SC5000, DL.CODE message Data Formatting for this channel is ignored. This is not graphically indicated in DL.CODE, however do not disable Message Output Channels.

If necessary Image Saving can be applied, see chp. 9.

See the Matrix-SC5000 Hybrid System Application Note for complete setup and configuration.

## 14.5 CRISPLANT PROTOCOL CONFIGURATION

**NOTE:** This protocol can only be used in Phase Mode or PackTrack operating modes.




This group manages configuration for the Crisplant Protocol.

**Status** enables or disables Crisplant protocol configuration.

**Version (Type)** selects the Crisplant protocol type. Currently only **P10** is supported. The <CR><LF> characters appear at the end of transmitted/received telegrams.

**Length** (**Index**) selects between a 4-bit or a 6-bit index applied to the beginning of the telegram. This must match the incoming Crisplant index type.

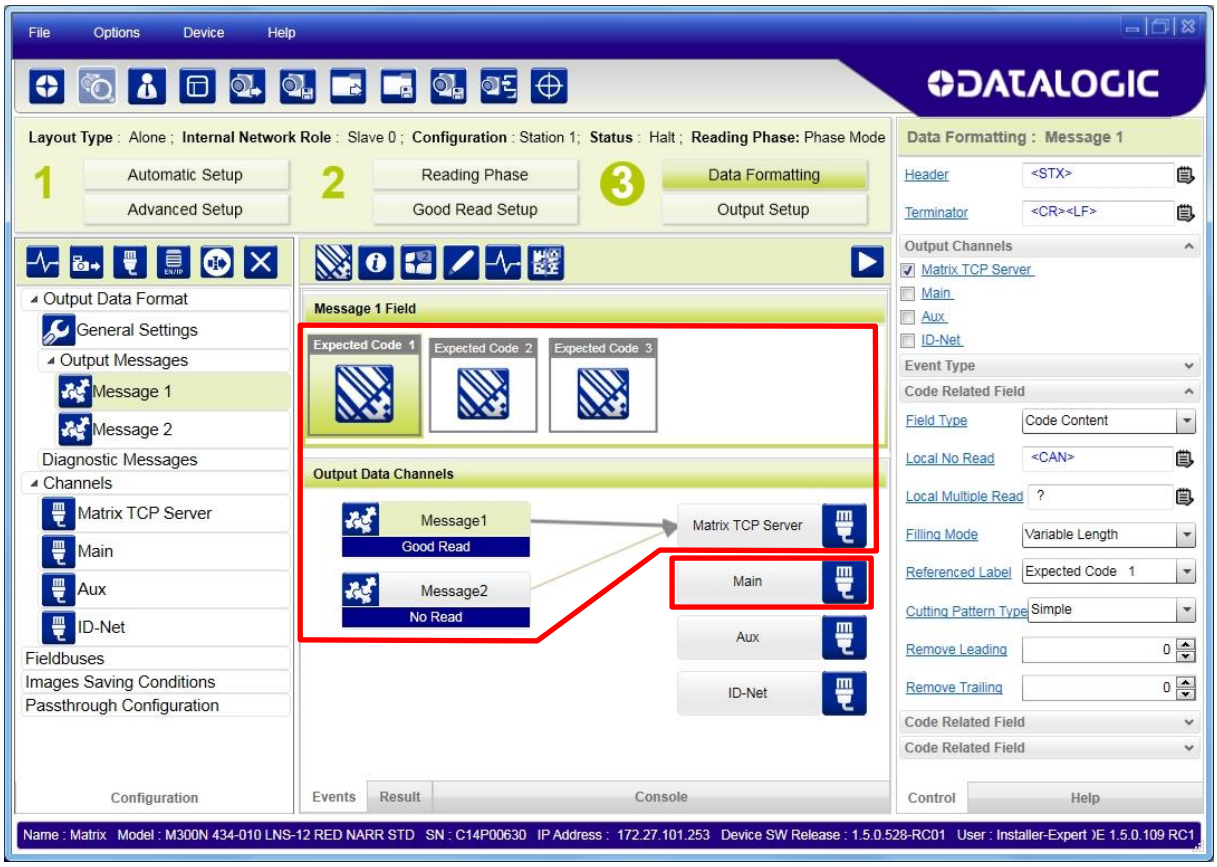
**Heartbeat Timeout** must match the Crisplant protocol. A value of 1 to 180 seconds can be configured for the Heartbeat. A value of 0 means Heartbeat is disabled.

**Channel** selects which Matrix channel the Crisplant protocol is sent over. This should be a dedicated channel whose communication parameters match the Crisplant Host channel. Matrix Channel parameters are set in the Channels branch of the Configuration Parameters tree area.

**NOTE:** Since messages sent to the Crisplant Host on the selected communication channel will be formatted with the Crisplant Protocol, DL.CODE message Data Formatting for the this channel is ignored. This is not graphically indicated in DL.CODE, however do not disable Message Output Channels. See following example.

**Example**: Crisplant Protocol Communication on Matrix Main Serial port

For this port the messages will be sent according to the Crisplant protocol and ignore the Data Formatting applied to the TCP Server Port. Even if not used, do not disable the Matrix TCP Server Message Output Channel.

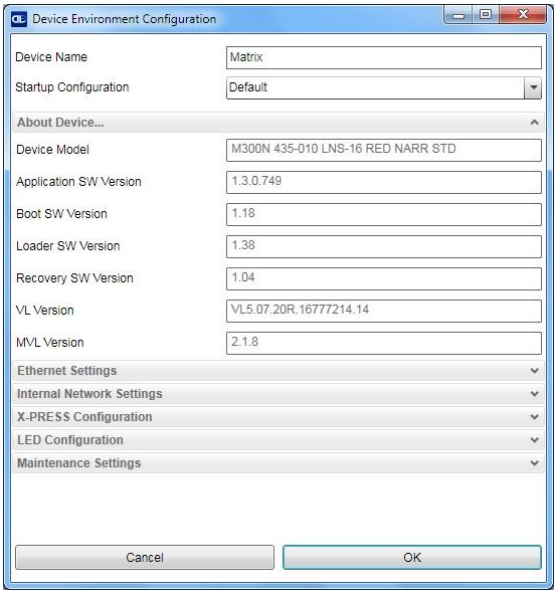


# 15 DEVICE ENVIRONMENT SETTINGS

## 15.1 ACCESSING DEVICE ENVIRONMENT SETTINGS

To access the device environment settings obviously the device must be connected to DL.CODE. From the Device>Settings>Settings menu open the Device Environment Configuration window.

The following fields are presented:




**Device Name** (default "Matrix") can be personalized by typing a new name in this field. This can be used to distinguish this device from others in the network (i.e. a name to indicate the device position in the network).

This name also shows up in the Device List Area.

See also note below for use with embedded Profinet-IO communication.

**Startup Configuration** which can be changed by selecting a different configuration from the dropdown list (if any).

**About Device** gives details about the various software components currently loaded and running on this device. This data is important to know for troubleshooting purposes.

**NOTE:** When using embedded Profinet IO Fieldbus communication, **Device Name** coincides with the **Station Name** parameter and therefore must adhere to the following rules in order to be recognized by the Profinet Master (Host).

Station Name is a string (max 240 characters) which identifies the node on the Profinet IO network as an alternative to the IP address. The syntax is:

- one or more "labels" separated by the **.** (dot) character
- max label length is 63 characters
- valid characters are lower case letters (a..z), numbers (0-9) and - (dash) characters
- the **.** (dot) and **-** (dash) characters cannot be used as the first or last character in the name.

Example name showing four labels: **device-1.machine-8.plant-234.vendor**

If the Station Name is changed by the host application during runtime, a reset is required in order for changes to have effect.

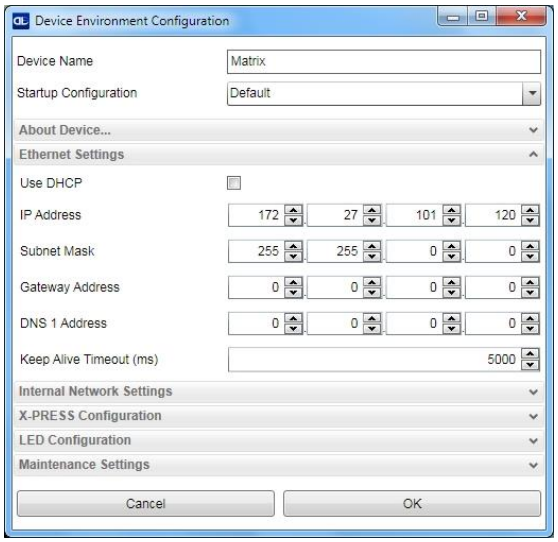
## 15.2 ETHERNET SETTINGS

This group presents all the Ethernet Settings for correct device connection to the LAN.

It can also be accessed directly by clicking on the wrench icon in the device list area as shown in par. 3.1.

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

The **Keep Alive Timeout** parameter selects the period for which a signal is sent from the device to maintain the Ethernet connection with the DL.CODE UI configuration environment.




**NOTE:** When using DHCP, if there is a communication loss (i.e. cable disconnect), the reader will take about 40 seconds to boot.

**NOTE:** If using DHCP with the embedded Profinet IO interface, the Profinet IO Host will not be able to change the IP address. For this interface it is suggested to use Static IP addressing.

## 15.3 INTERNAL NETWORK SETTINGS

**NOTE:** All devices are pre-assigned an Internal Network Role independent from their use. If the device is not used in an ID-NET network then this setting can be ignored.

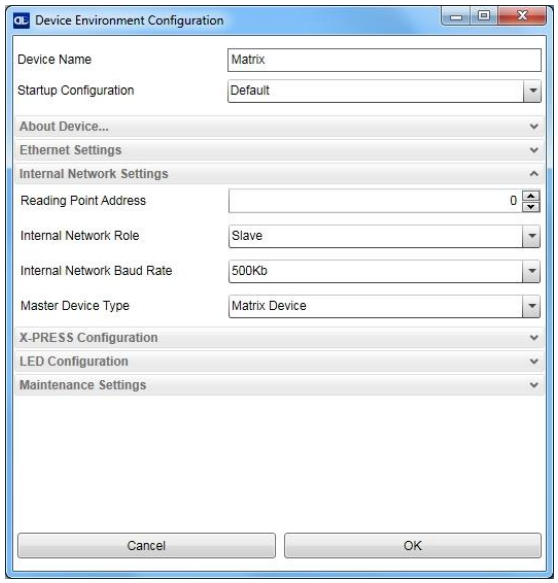
This group allows managing the device role in an ID-NET network (Master or Slave).

The **Reading Point Address** indicates the address of the slave reader. This address is set automatically through the Setup Internal Network Configuration procedure but it can also be set here manually (1-31 for ID-NET Slaves).

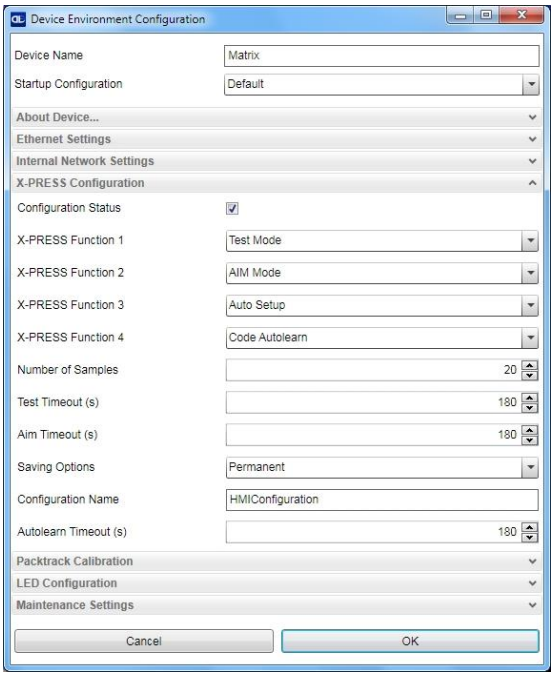
The ID-NET Baud Rate is selected here and must be common to all devices in the network.

For a Matrix Slave Reader the **Master Device Type** parameter can be selected between Matrix Device or SC4000 ID-NET Controller.

See the device Reference Manual for details on ID-NET network configuration.



## 15.4 X-PRESS CONFIGURATION




This group allows managing the HMI X-PRESS™ behaviour. See the device Reference Manual for more details on the X-PRESS features.

**Configuration Status** enables/disables the X-PRESS features available through the multifunction key on the device.

**X-PRESS Function (1-4)** assigns an HMI function selected from the list to each one of the X-PRESS keys on the device.

**Number of Samples** selects the number of samples to analyze for the Test percentage.

**Test Timeout** sets when the expired timeout causes the Test feature to exit.

**Aim Timeout** sets when the expired timeout causes the Aim/Autofocus feature to exit.

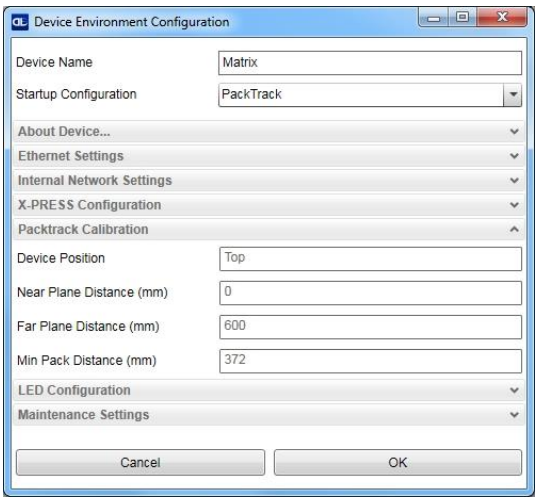
**Saving Options** selects whether the X-PRESS Setup and Learn features will save their results to Permanent or Temporary memory. If set to Permanent memory, the configuration will be saved as the default configuration in the job list having the Configuration Name.

**Configuration Name** is the name given to the configuration saved to permanent memory by the X-PRESS Setup and Learn procedures.

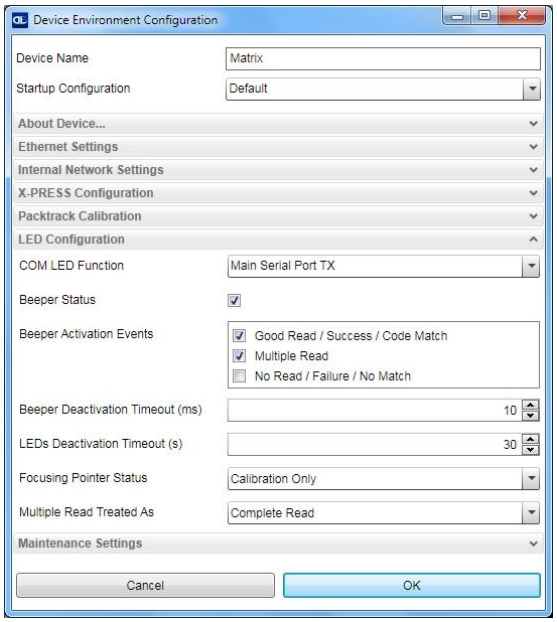
**Autolearn Timeout** sets when the expired timeout causes the Learn feature to exit.

## 15.5 PACKTRACK CALIBRATION

This group shows the PackTrack Calibration parameter settings (read-only) for a device that has already been calibrated.



## 15.6 LED CONFIGURATION




This group manages the device LEDs and Beeper behaviour.

**COM LED Function** selects whether the COM LED on the device (which signals activity on the Main Serial port) is ON when data is transmitted by the device (TX) or received from the Host (RX).

**Beeper Status** enables/disables the device beeper.

**Beeper Activation Events** selects which events will trigger the beeper.

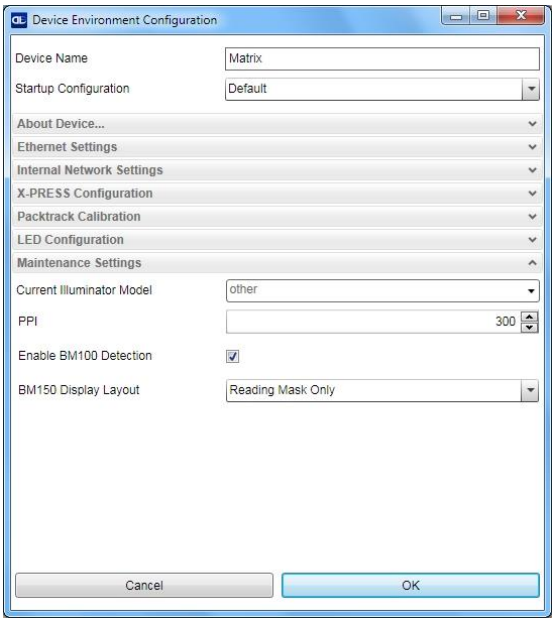
**Beeper Deactivation Timeout** determines the length of the beeper signal.

**LEDs Deactivation Timeout** determines the length of time the LED signals are ON.

**Focusing Pointer Status** (for devices with laser pointers) sets the aiming system management: **Disabled** - laser pointers always OFF; **Always On** - laser pointers always ON; **Calibration Only** - laser pointers only ON during calibration procedures.

**Multiple Read Treated As** determines which device LED will be activated on a Multiple Read event: **Complete Read** – the Good Read LED will be activated; **No Read** – the Status LED will be activated.

## 15.7 MAINTENANCE SETTINGS




**Current Illuminator Model** shows the internal illuminator model associated with this device.

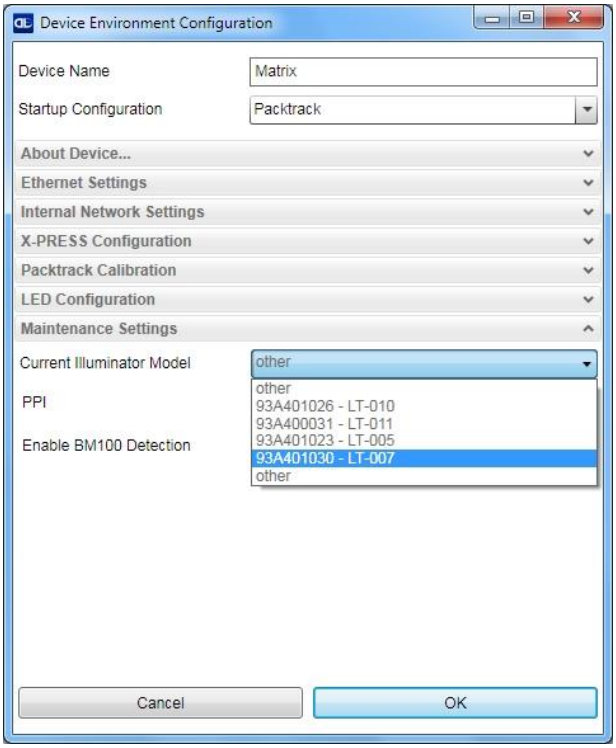
If the device is not correctly associated with its internal illuminator incorrect functioning and/or damage can occur. For Matrix 410N devices see the following Illuminator Management procedure.

**PPI** is the same value saved in the **Acquire PPI** image density setting procedure located in the Advanced Setup – Image Settings branch. Here it can be set manually although it is advised to use the Acquire PPI procedure.

**Enable BM100 Detection** if enabled, at startup, the reader sends a message to recognize the presence of, and communicate with, the External Backup Memory (BM100 Backup Module or integrated QLM-Series accessories). If using the Backup Memory, this parameter must be enabled.

**BM150 Display Layout** selects which information layout to display on the BM150 accessory display for CBX500 connection boxes. See the Matrix N Reference Manual for more details.

## DL.CODE Illuminator Management Procedure for Matrix 410N




1. In the DL.CODE Maintenance Settings > Current Illuminator Model item, select the correct Illuminator being used from the dropdown list.
2. 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.

# 16 MAINTENANCE

As with nearly all electronic components, performance may drift over time making it necessary to calibrate the device at periodic intervals for optimal reading performance. There is a Recalibration Tool provided in DL.CODE which performs the recalibration procedure. If it ever becomes necessary to perform this procedure, contact our Technical Support team for assistance.

**This procedure is intended to be performed by trained technicians and not performed frequently (i.e. only after several years of operation and only if the focus level adversely affects decoding).**

# 17 TROUBLESHOOTING

| Problem | Solution |
|---|---|
| Online Device is not displayed in the Device Selection Area | In order to be found by DL.CODE, Online devices must be powered on and connected to the Local Area Network; if you don't see the desired device within this list, please verify its connections to the LAN and assure it is powered on; then click on the Discovery icon to run a new device search. |
| Serial Device is not displayed in the Device Selection Area | In order to be found by DL.CODE, Serial devices must be powered on, connected a Serial port of the configuration PC and have the serial port driver installed. if you don't see the desired device within the Serial Devices list, please verify its connections and assure it is powered on and the serial port driver is installed; then click on the Discovery icon to run a new device search. |
| Cannot open a device configuration<br>DL.CODE Selected Device Information area shows a yellow background | Exit DL.CODE and cycle power to the device. Run DL.CODE and reselect the device. The background should now be green and device configurations can be opened. |
| Cannot Configure the Device (parameters and icons appear in grey) | The device is in run mode. Click on the Pause button to exit run mode. |
| Connection problem between DL.CODE and Online Device | If more than one LAN card is present on the local PC and a Simulator (offline device) is enabled in DL.CODE (disabled by default), the program can freeze up. Either disable the simulators in DL.CODE or disable the other LAN cards on the PC. |
| The User is not able to download images | the FTP Username and FTP Password must be the same as the ones defined in the FTP Client. |
| Some Images are missing | Image availability depends heavily on the number of images transferred and the rate of transfer, (system throughput and network bandwidth). Since Image downloading is usually based on specific criteria (i.e. No Read or Multiple Read conditions) the FTP Server is adequate to handle most applications.<br>In extreme cases where a high throughput application requires all images to be downloaded it is possible that some images may not be available on the reader having been overwritten in the device's circular buffer. |

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