

# OMRON

## Auto Focus Multi Code Reader **V430-F-series**

### User's Manual



Z392-E1-08

# Introduction

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Thank you for purchasing the V430.

This manual provides information regarding functions, performance and operating methods that are required for using the V430.

When using the V430, be sure to observe the following:

- The V430 must be operated by personnel knowledgeable in electrical engineering.
- To ensure correct use, please read this manual thoroughly to deepen your understanding of the product.
- Please keep this manual in a safe place so that it can be referred to whenever necessary.

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# Terms and Conditions Agreement

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## Warranty, Limitations of Liability

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- **Exclusive Warranty**

Omron's exclusive warranty is that the Products will be free from defects in materials and workmanship for a period of twelve months from the date of sale by Omron (or such other period expressed in writing by Omron). Omron disclaims all other warranties, express or implied.

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## Change in Specifications

Product specifications and accessories may be changed at any time based on improvements and other reasons. It is our practice to change part numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the Product may be changed without any notice. When in doubt, special part numbers may be assigned to fix or establish key specifications for your application. Please consult with your Omron's representative at any time to confirm actual specifications of purchased Product.


## Errors and Omissions


Information presented by Omron Companies has been checked and is believed to be accurate; however, no responsibility is assumed for clerical, typographical or proofreading errors or omissions.

# Safety Precautions





- **Symbols and the meanings for safety precautions described in this manual.**

In order for the product to be used safely, the following indications are used in this book to draw your attention to the cautions. The cautions with the indications describe the important contents for safety.

 <b>WARNING</b>	Indicates a potentially hazardous situation which, if not avoided, will result in minor or moderate injury, or may result in serious injury or death. Additionally there may be significant property damage.
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 <b>CAUTION</b>	Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury or in property damage.
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- **Meanings of Alert Symbols**

	<b>General Prohibition</b> Indicates general prohibitions, including warnings, for which there is no specific symbol.
	<b>General Caution</b> Indicates general cautions, including warnings, for which there is no specific symbol.
	<b>Electrical Hazard</b> Indicates the possible danger of electric shock under specific conditions.
	<b>High Temperature Caution</b> Indicates the possible danger of injury by high temperature under specific conditions.

● Alert statements in this Manual

 **WARNING**

This product must be used according to this manual or Instruction sheet.

Failure to observe this may result in impairment of functions and performance of the product.



This product is not designed or rated for ensuring safety of persons. Do not use it for such purposes.



Never connect the AC power supply with this product.

When the AC power supply is connected, it causes the electric shock and a fire.



Since camera that can be connected with this product emits a visible light that may have an adverse effect on the eyes, do not stare directly into the light emitted from the LED. If a specular object is used, take care not to allow reflected light enter your eyes.



Please take external safety measures so that the system as a whole should be on the safe side even if a failure of a this product or an error due to an external factor occurred. An abnormal operation may result in serious accident.



Please take fail-safe measures on your side in preparation for an abnormal signal due to signal conductor disconnection and/or momentary power interruption. An abnormal operation may result in a serious accident.



 **CAUTION**

Danger of burns. Do not touch the case while the reader is running or just after power is turned OFF, since it remains extremely hot.



# Precautions for Safe Use

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## Condition of the fitness of OMRON products

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- Please do not use this product to directly or indirectly use to detect the human body for the purpose of ensuring the safety. In the same application, please use the safety sensor that is published on our sensor catalog.
- Omron products are designed and manufactured as general-purpose products for use in general industrial applications. They are not intended to be used in the following critical applications. If you are using Omron products in the following applications, Omron shall not provide any warranty for such Omron products, unless otherwise specifically agreed or unless the specific applications are intended by Omron.
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  - (b) Applications that require high reliability, including but not limited to supply systems for gas, water and electricity, etc., 24 hour continuous operating systems, financial settlement systems and other applications that handle rights and property
  - (c) Applications under severe condition or in severe environment, including but not limited to outdoor equipment, equipment exposed to chemical contamination, equipment exposed to electromagnetic interference and equipment exposed to vibration and shocks
  - (d) Applications under conditions and environment not described in specifications
- \*1. In addition to the applications listed from (a) to (d) above, Omron products (see definition) are not intended for use in vehicles designed human transport (including two wheel vehicles). Please do NOT use Omron products for vehicles designed human transport. Please contact the Omron sales staff for information on our automotive line of products.
- \*2. The above is part of the Terms and Conditions Agreement. Please use carefully read the contents of the guarantee and disclaimers described in our latest version of the catalog, data sheets and manuals.

## Installation Environment

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- Do not use the product in areas where flammable or explosive gases are present.
- Be careful when unpacking this product, please. Injury may occur if the reader falls and strikes a person.
- Do not install the product close to high-voltage devices and power devices in order to secure the safety of operation and maintenance.
- Make sure to tighten all installation screws securely.

## Power Supply and Wiring

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- Make sure to use the product with the power supply voltage specified by this manual.
- Do not connect AC power source to Sensor Controller. If connects AC power source, it might be a cause of the failure.
- Use the wire of a suitable size (AWG 16 to 12) according to the current consumption.
- Use a DC power supply with safety measures against high-voltage spikes (safety extra low-voltage circuits on the secondary side).
- Keep the power supply wires as short as possible.
- Do the following confirmations again before turning on the power supply.
  - Is the voltage and polarity of the power supply correct?
  - Is not the load of the output signal short-circuited?
  - Is the load current of the output signal appropriate?
  - Is not the mistake found in wiring?
- The recommended power supply for V430 is the S8VS-□□□24 (manufactured by OMRON) or S8VK-G-□□□24 (manufactured by OMRON).

## Ground

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- Check wiring again before turning on the V430 reader.

## Other

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- Use only the cables (V430-W□: sold separately) designed specifically for the product. Use of other products may result in malfunction or damage of the product.
- Always turn OFF the power of the reader and peripheral devices before connecting or disconnecting a cable. Connecting the cable with power supplied may result in damage of the reader or peripheral devices.
- Do not apply torsion stress to the cable. It may damage the cable.
- Secure the minimum bending radius of the cable. Otherwise the cable may be damaged.
- Do not attempt to dismantle, repair, or modify the product.
- Should you notice any abnormalities, immediately stop use, turn OFF the power supply, and contact your OMRON representative.
- While the power is ON or immediately after the power is turned OFF, the case are still hot. Do not touch the case.
- The reader must be used with the special mounting bracket (V430-AM0 or V430-AM1: sold separately), or the reader may generate heat.
- When disposing of the product, treat it as an industrial waste.
- Do not drop the product nor apply excessive vibration or shock to the product. Doing so may cause malfunction or burning.
- When controlling stages and robots using the read results (axis movement output based on calibration and alignment measurement), always take fail-safe measures within the stage and robot systems, such as checking whether the data obtained from the read results is within the range of movement of the stages and robots.

# Precautions for Correct Use

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## Installation and Storage Sites

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Install and store the product in a location that meets the following conditions:

- Surrounding temperature of 0 to +40°C (-50 to +75°C in storage)
- No rapid changes in temperature (place where dew does not form)
- Relative humidity of between 5 to 85%
- No presence of corrosive or flammable gases
- Place free of dust, salts and iron particles
- Place free of vibration and shock
- Place out of direct sunlight
- Place where it will not come into contact with water, oils or chemicals
- Place not affected by strong electro-magnetic waves
- Place not near to high-voltage, or high-power equipment

## Ambient Temperature

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- For good heat dissipation, keep the distance.
- Do not install the product immediately above significant heat sources, such as heaters, transformers, or large-capacity resistors.
- Do not let the ambient temperature exceed an operating temperature range.
- Provide a forced-air fan cooling or air conditioning if the ambient temperature is near the upper range of operating temperature range so that the ambient temperature never exceeds the upper range of operating temperature range.

## Noise Resistance

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- Do not install the product in a cabinet containing high-voltage equipment.
- Do not install the reader within 200 mm of power cables.

## Component Installation and Handling

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- Turning OFF the Power  
When a message is displayed indicating that a task is in progress, do not turn OFF the power. Doing so causes the data in the memory to be corrupted, resulting in the product not operating properly upon the next start-up.  
When turns OFF, conform the followings proceedings have completed. and then operate again.
  - When saves using the reader:  
Confirm the save processing is completed and next operation is possible.
  - When saves using communication command:  
Intended command is completed.
- Setting of Power Source  
The power source need to be supplied from DC power source apparatus which is taken a save ultra-low voltage circuit: to protect high voltage.

## Maintenance

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- Turn OFF the power and ensure the safety before maintenance.
- Clean the lens with a lens-cleaning cloth or air brush.
- Lightly wipe off dirt with a soft cloth.
- Do not use thinners or benzene.
- To ensure safe access for operation and maintenance, separate the reader as much as possible from high-voltage equipment and power machinery.

## Communication with High-order Device

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- After confirming that this product is started up, communicate with the high-order device. When this product has started up, an indefinite signal may be output from the high-order interface. To avoid this problem, clear the receiving buffer of your device at initial operations.

## Other

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- For symbols with a highly gloss surface, reading errors may occur because of regular reflection of the LED light. If this occurs, provide a skew angle of 15° against the symbol.
- Do not look into the light emitted from the LED directly. When this products has started up, the LED flashes.
- Under an environment with high humidity and rapid changes in temperature, the inside of the front plate might fog up. When the read rates lower due to the fog, leave the device with turned it on for 30 minutes to 2 hours. Use it again after checking there is no fog on the front plate.

# Regulations and Standards

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## Using Product Outside Japan

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This regulation applies to V430 reader and peripheral devices.

If you export (or provide a non-resident with) this product or a part of this product that falls under the category of goods (or technologies) specified by the Foreign Exchange and Foreign Trade Control Law as those which require permission or approval for export, you must obtain permission or approval or service transaction permission) pursuant to the law.

## Conformance to EC/EU Directives

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This regulation applies to V430 reader and peripheral devices.

The V430 reader is compliant with the standards below:

- EC Directive 2004/108/EC (Until April 19 2016) / EU Directive 2014/30/EU (After April 20 2016)  
EN61326-1  
Electromagnetic environment: Industrial electromagnetic environment (EN/IEC 61326-1 Table 2)
- This product complies with EC/EU Directives. EMC-related performance of the OMRON devices that comply with EC/EU Directives will vary depending on the configuration, wiring, and other conditions of the equipment or control panel on which the OMRON devices are installed.
- The customer must, therefore, perform the final check to confirm that devices and the overall machine conform to EMC standards.

## Conformance to UL Standards

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This regulation applies to V430 reader and peripheral devices.

This product complies with UL Standards.

- UL60950-1 2<sup>nd</sup>-edition, 2014 (Class III)

## Conformance to KC Certification

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This regulation applies to V430 reader and peripheral devices.

Observe the following precaution if you use this product in Korea.

**A 급 기기 (업무용 방송통신기자재)**

이 기기는 업무용(A 급) 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다.

- Class A Device (Broadcasting Communications Device for Office Use)  
This device obtained EMC registration for office use (Class A), and it is intended to be used in places other than homes.  
Sellers and/or users need to take note of this.

# Revision History

A manual revision code appears as a suffix to the catalog number on the front and back covers of the manual.

<b>Cat. No.</b>	<b>Z392-E1-08</b>
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↑  
Revision code

Revision code	Date	Revised content
01	March 2018	Original production.
02	April 2018	Corrected mistakes.
03	August 2018	<ul style="list-style-type: none"> <li>• Added information on the safety standards.</li> <li>• Added information on the Q&amp;A.</li> <li>• Corrected mistakes.</li> </ul>
04	November 2018	<ul style="list-style-type: none"> <li>• Additions for software version upgrade.</li> <li>• Corrected mistakes.</li> </ul>
05	December 2018	<ul style="list-style-type: none"> <li>• Additions for WebLink.</li> <li>• Moved ESP and command information to Appendix.</li> </ul>
06	March 2019	<ul style="list-style-type: none"> <li>• Added information on the safety standards.</li> <li>• Additions for PROFINET.</li> <li>• Added information on the Q&amp;A and ESP Software Operation Guide.</li> <li>• Corrected mistakes.</li> </ul>
07	June 2019	Corrected mistakes.
08	October 2019	Corrected mistakes.

# 1 Overview

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The browser-based **WebLink** interface enables quick and easy configuration and testing of V430 readers without the need to install or access files on a host system.

WebLink is reliable, lightweight, and operating-system-independent without compromising the power and depth of its tool set.

WebLink offers novice users an intuitive way to connect, configure, monitor, and troubleshoot a V430 reader, and provides the power and flexibility expected by advanced users.

## Splash Screen

After you open a browser and **enter your reader's IP address**, the first thing you will see is the **splash screen**, a portion of which is shown below. You will also see a progress bar as your WebLink session starts.



## Navigation Bar

The **navigation bar** at the top of the WebLink interface features buttons for three primary views: **Start**, **Setup**, and **Run**.



## Flash Icon

The **flash icon** allows you to save current settings to the reader for reboot. When the current reader settings match those saved in flash memory, the disk icon changes from **red** to **blue**.

### *Save to Flash Memory*

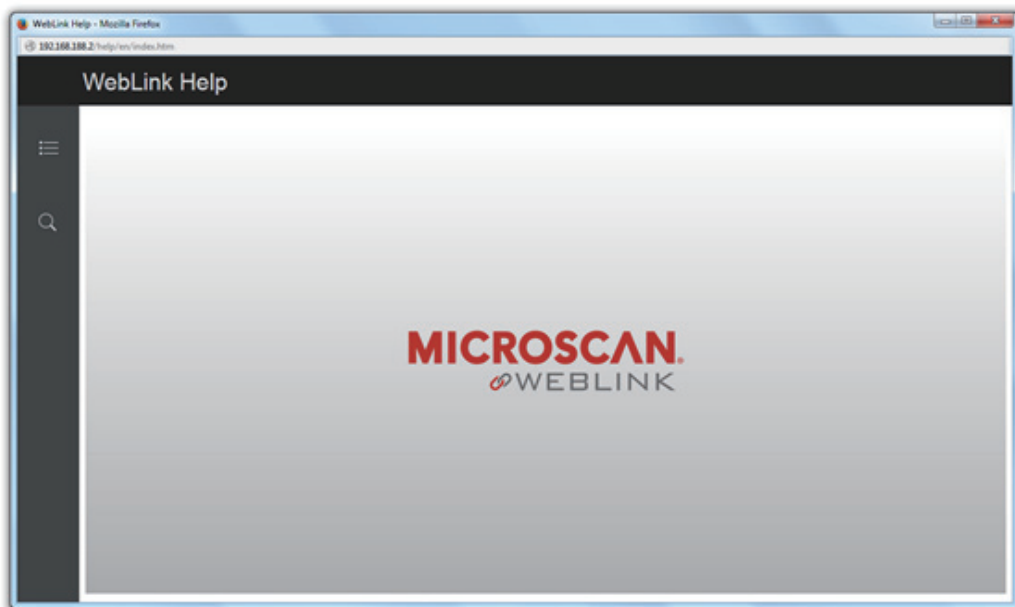


### *Saved to Flash Memory*



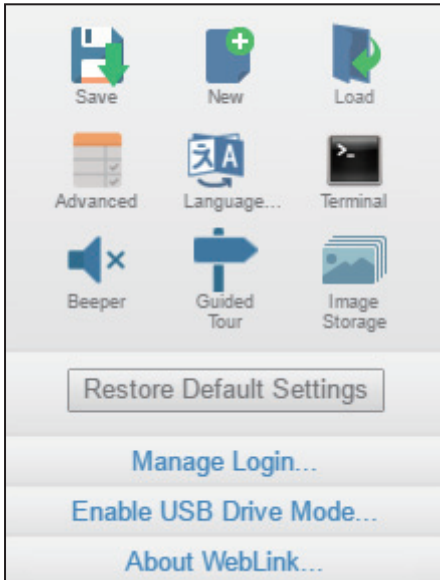
## Help Icon

The **help icon** is located to the right of the flash icon. Click this icon to open **WebLink Help**.



# Application Settings Icon

Click the **gear icon** to the right of the help icon to open the **Application Settings** menu.



**Note:** The **Enable USB Drive Mode** option only appears when you are using a reader, which support USB connectivity.

## Left Panel

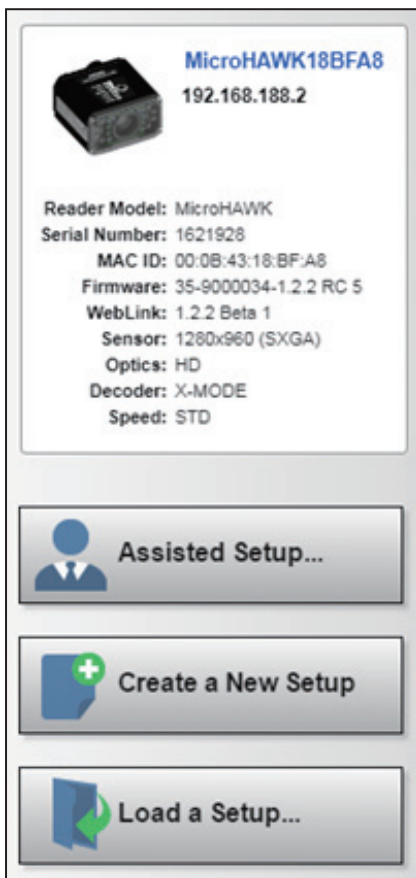
The area to the left of the **Image Area** is different depending on whether you are in the **Start** or **Setup** view. (In the **Run** view, the Image Area expands and the left panel is not present.)

### *Left Panel in Start View*

In the **Start** view, the left panel shows your reader's **user-defined name**, **IP address**, **Reader Model**, **Serial Number**, **MAC ID**, **Firmware version**, **WebLink version**, **Sensor**, **Optics**, **Decoder**, and **Speed**.

**Note:** The **user-defined name** must be **19** characters or fewer.

The left panel in the Start view also contains buttons for **Assisted Setup**, **Create a New Setup**, and **Load a Setup**.



## Left Panel in Setup View

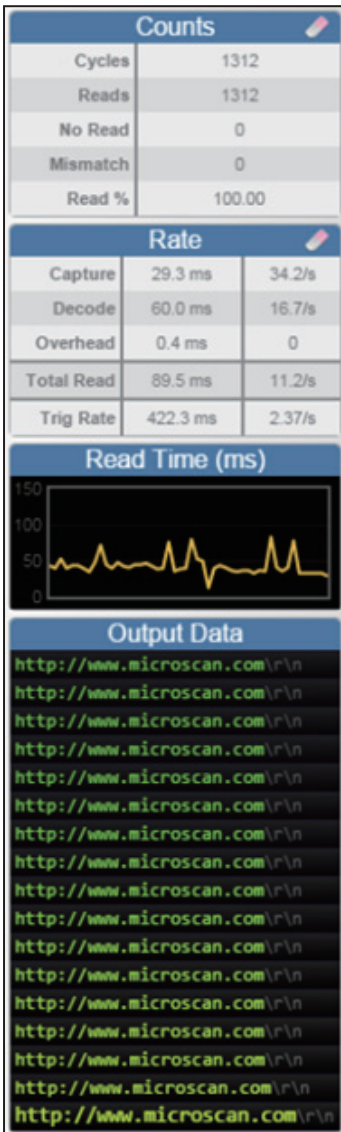
In the **Setup** view, the left panel contains the majority of WebLink's configuration tools: **Cycle**, which allows you to set the trigger mode; **Acquire**, which allows you to set the camera's exposure and gain; **Decode**, which allows you to select which code types are required in your application; **Match String**, which allows you to set the match code mode, wildcard, text output, new master, and match string database; **Format Output**, which allows you to determine the ways in which barcode data can be formatted before it is output as a data string; **Outputs**, which allows you to determine output conditions, the output mode, the pulse width, and the output state (normally open or normally closed); and **Favorites**, which allows you to define the commands you use most frequently and gives you quick access to their command parameters.



## Right Panel

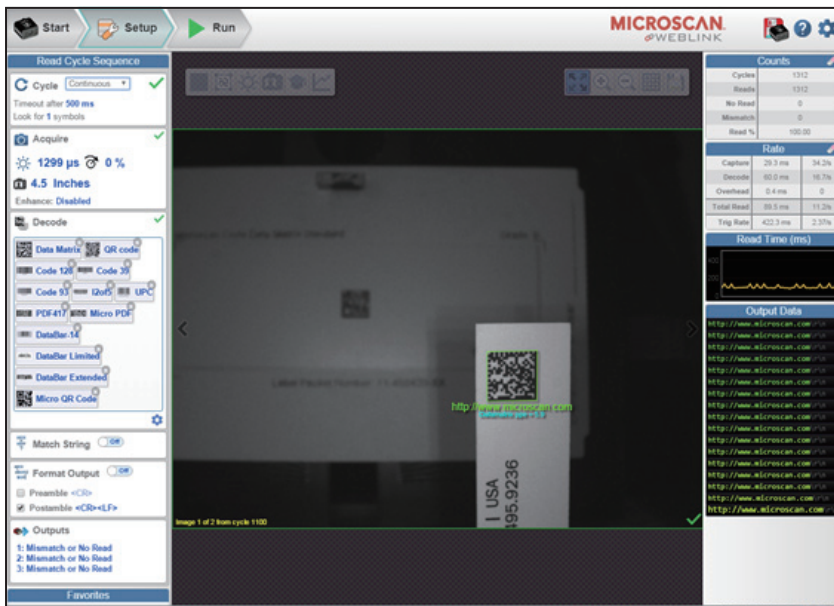
The area to the right of the **Image Area** shows counters for **Cycles**, **Reads**, **No Reads**, and **Mismatches** (which only applies if you have defined a match string); **statistics** for the rate of **Capture**, **Decode**, **Overhead**, **Total Read**, and **Trigger Rate**; a line graph representation of **read time**; and a display area for the **output of decoded data**.

You may find the information displayed on this panel to be most useful in the **Run** view, but it appears in all three of WebLink's primary views.



# Image Area

The **Image Area** is the main focus of WebLink. This area allows you to see what currently falls within the reader's field of view, and offers several image control tools.



## Device Control Toolbar

The **Device Control** buttons are a convenient way to enable and disable multiple triggering methods and image processing settings in the camera directly from the **Image Area**.

### Start Read Cycle

Starts the camera's read cycle.



### Stop Read Cycle

Stops the camera's read cycle.



## Send a Serial Trigger to the Reader

Sends a **Serial Trigger** to the camera.



## Set Window of Interest

Allows you to define the **Window of Interest** directly in the Image Area interface.

**Note:** When using an SXGA reader with Auto Photometry enabled, the Window of Interest cannot be set to a width less than 640.



## Auto Photometry On

Turns **Auto Photometry** on. The camera's Auto Photometry settings defined in the **Acquire** section of the **Setup** interface are applied to the image when Auto Photometry is on.

When the reader is in **Triggered** mode and Auto Photometry is on, the best **Exposure** and **Gain** settings are determined for the next captured image. Auto Photometry functions differently in Triggered mode than in **Continuous** mode or **Presentation** mode: when Auto Photometry is on in Triggered mode, it is only a one-time setting. Exposure and Gain are not adjusted dynamically with each trigger as they would be in Continuous mode or Presentation mode.

When the reader is in Continuous mode or Presentation mode and you click the Auto Photometry button, the reader maintains optimal self-adjusting photometry and focus parameters until you click the button again to turn Auto Photometry off. Symbol data is decoded and symbol information is transmitted repeatedly as long as the symbol is within the reader's field of view and read range.



## Auto Photometry Off

Turns **Auto Photometry** off.



Image Area

### Autofocus On

Turns **Autofocus** on. The camera's Autofocus settings defined in the **Acquire** section of the **Setup** interface are applied to the image when Autofocus is on.



### Autofocus Off

Turns **Autofocus** off.



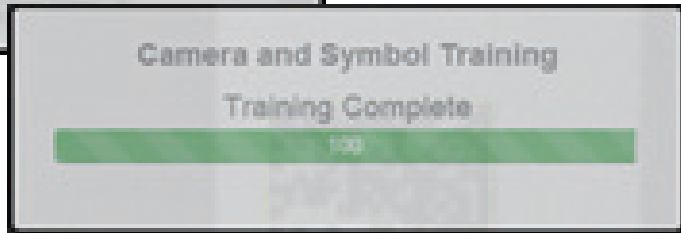
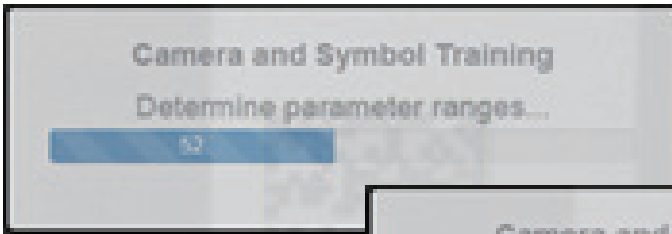
### Train

**Important:** The **Train** command does not function with **Pharmacode**.

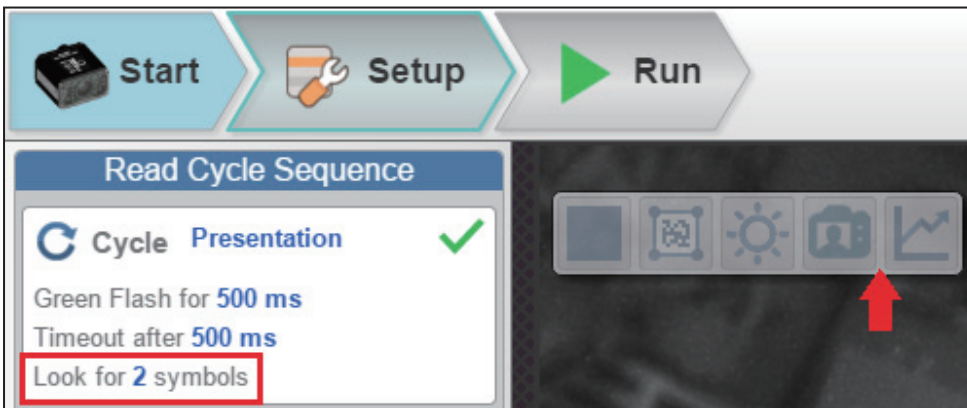
Performs a full symbol calibration to find the best **Focus**, **Exposure**, and **Gain**, and saves relevant information regarding the decoded target symbol to allow greater decodability of similar symbols.

You will see the **Determine parameter ranges...** and **Training Complete** messages shown in the examples below during the Train operation.

**Note:** The Train operation will un-optimize the system once an image is processed, but you can optimize the system again after a Train operation.



**Note:** The **Train** button only appears in the **Device Control Toolbar** when the **Read Cycle** is configured to look for **only 1 symbol**.



## Optimize

Saves relevant information about the target symbol, allowing the subsequent symbols to be processed more quickly and consistently.

The reader has three optimization states: **un-optimized**, **optimizing**, and **optimized**.

When the reader is in the **un-optimized** state and the Optimize button is clicked, the reader enters the **optimizing** state until a symbol is decoded or until the Optimize button is clicked again to deactivate the optimizing state. When a symbol is decoded during the **optimizing** state, the reader enters the **optimized** state.

**Note:** A Train operation can reduce decode performance. It will un-optimize the system when an image is processed. You can re-optimize the system after a Train operation.



## Image Control Toolbar

### Fit Image to Window

Fits the captured image to the Image Area window.



### Zoom In

Zooms in on the desired area of the captured image.



### Zoom Out

Zooms out and decreases the size of the captured image.



**Note:** You can also zoom in and out by scrolling up or down with your mouse, and you can move the image around by clicking and dragging.

### Show All Images Used in Read Cycle

Shows all the images that have been captured during the most recent read cycle.



### Save Current Image

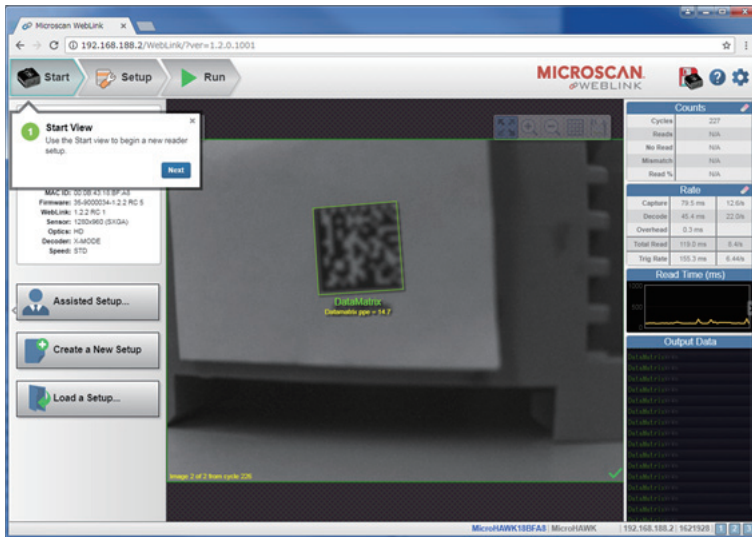
Allows you to save the current captured image to the location of your choice on your PC.



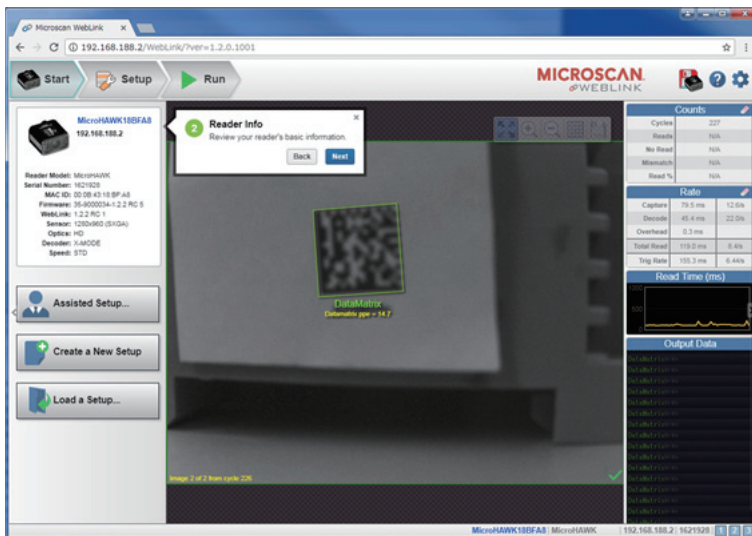
# Guided Tour

The Guided Tour is a multi-step tutorial that explains the functions of the various areas of the WebLink user interface.

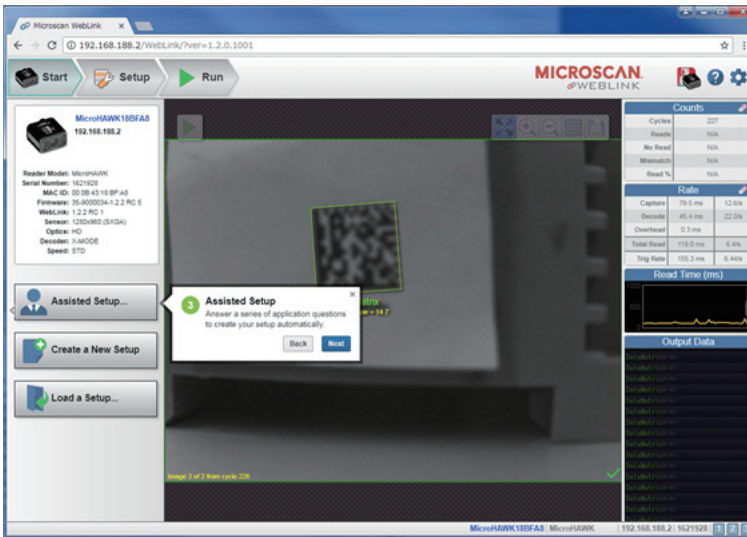
## Start View



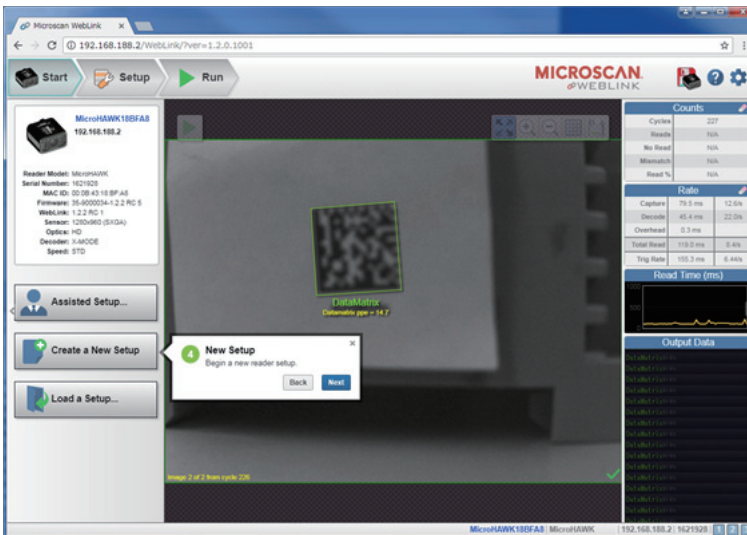
## Reader Info



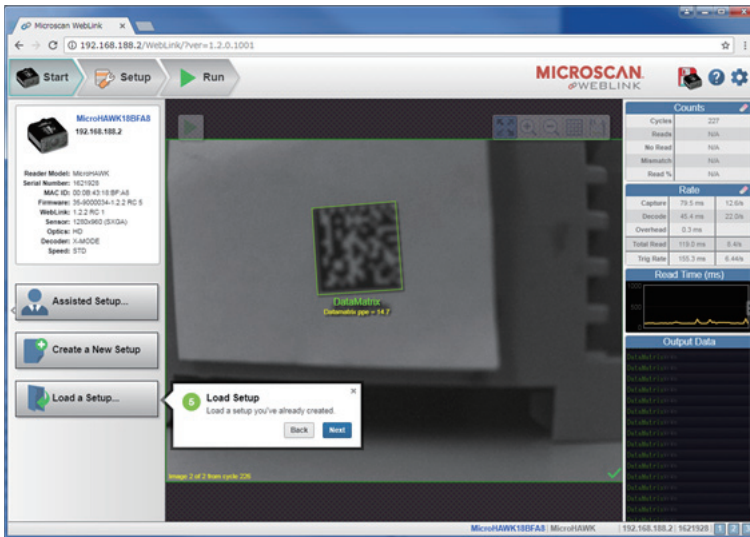
# Assisted Setup



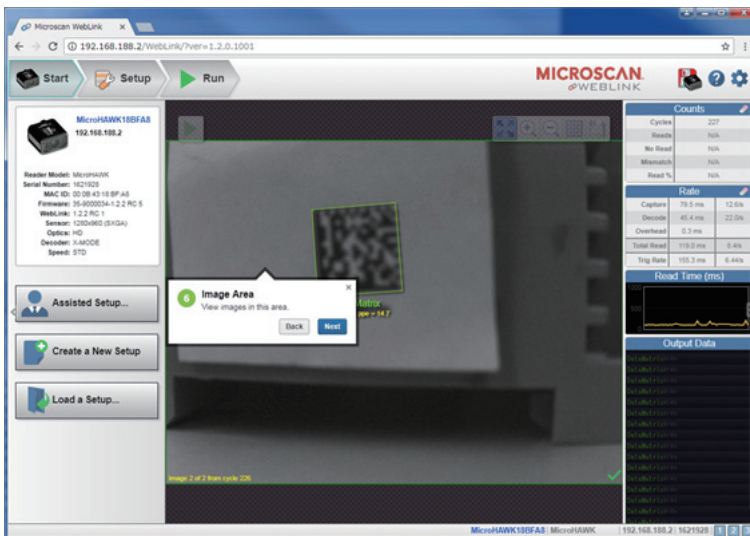
# New Setup



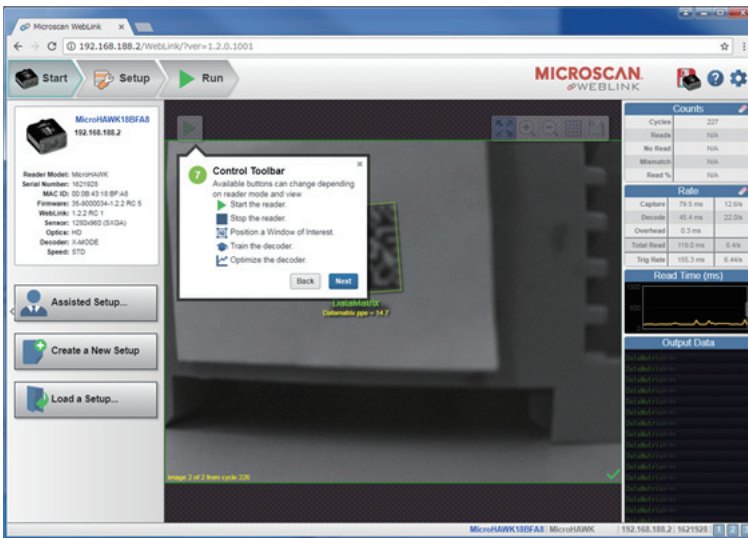
# Load Setup



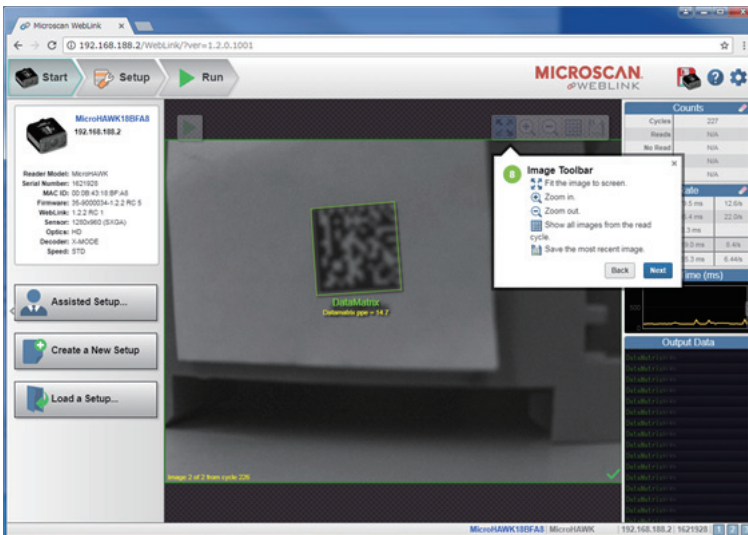
# Image Area



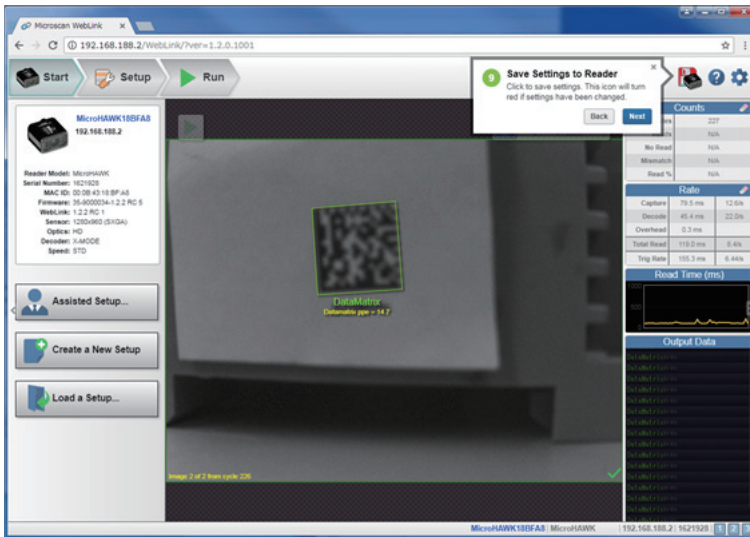
## Control Toolbar



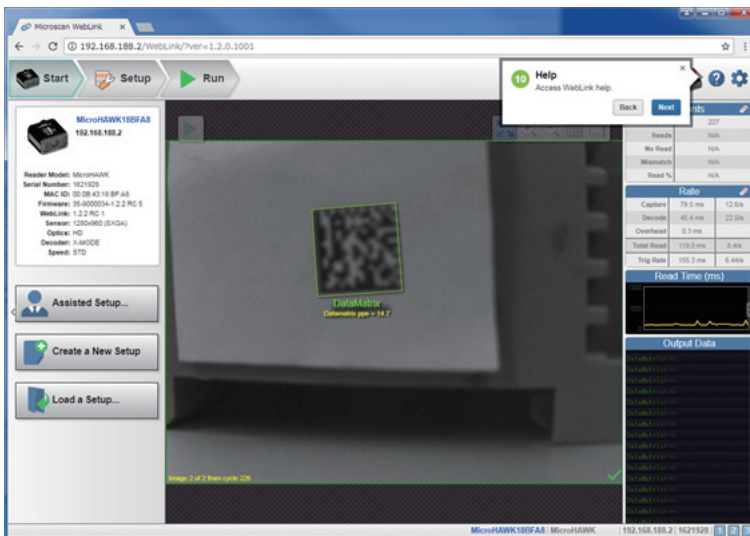
## Image Toolbar



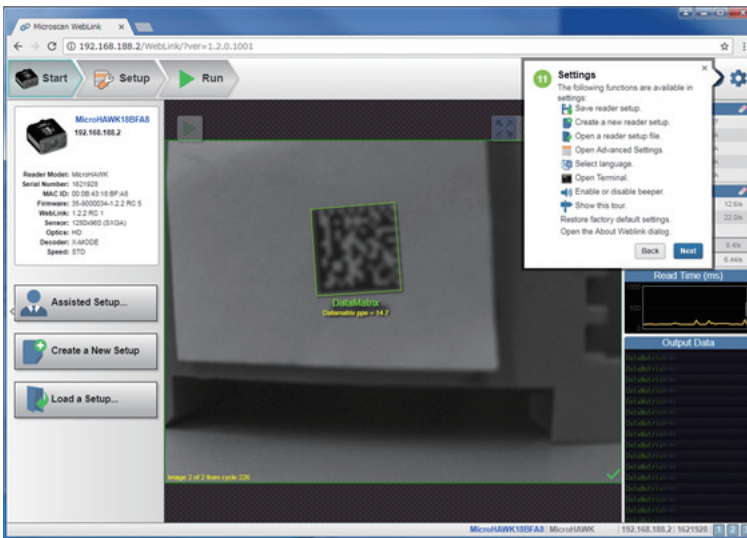
# Save Settings to Reader



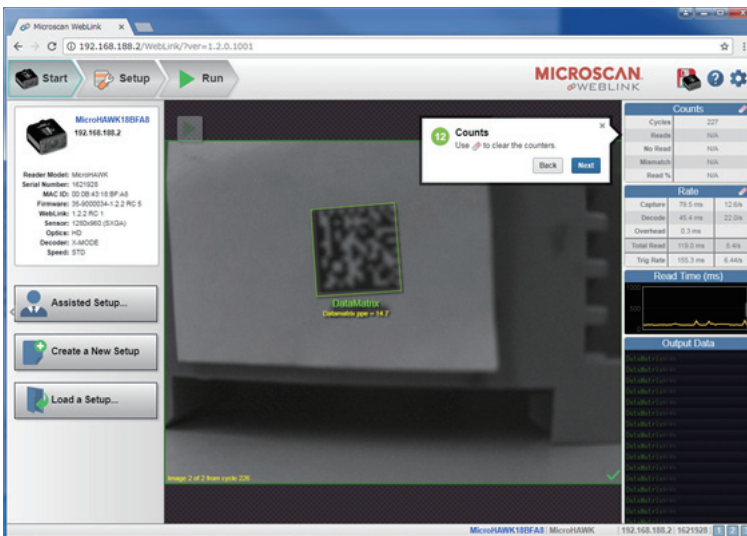
# Help



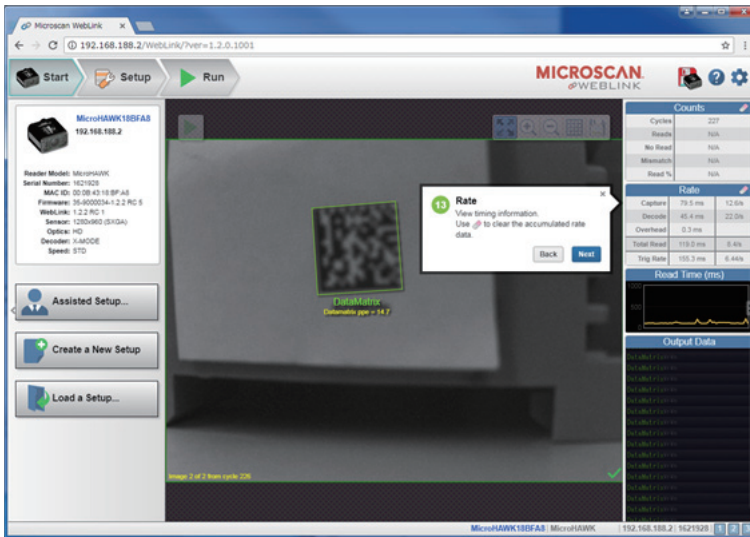
# Settings



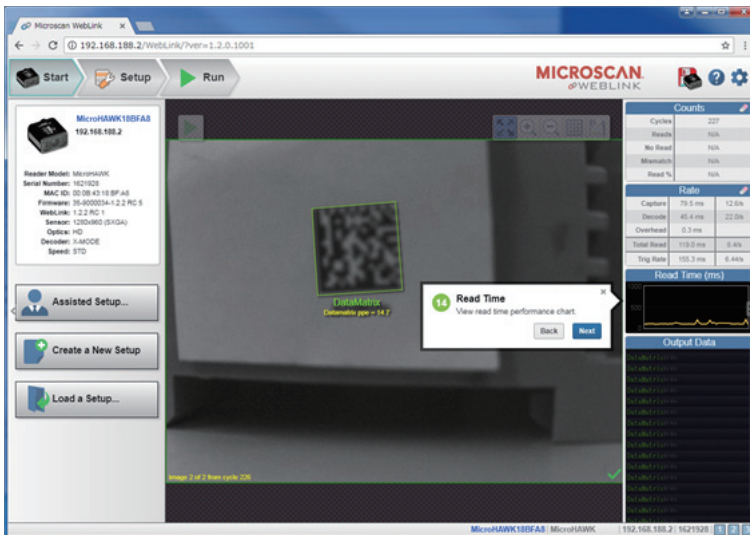
# Counts



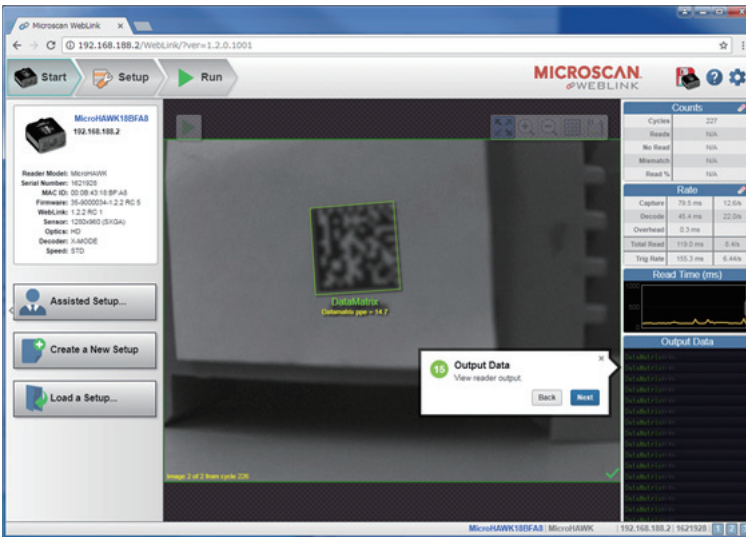
# Rate



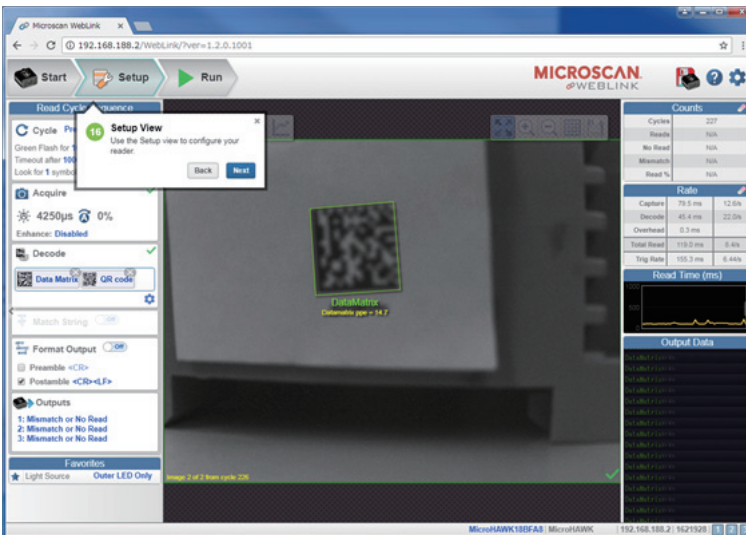
# Read Time



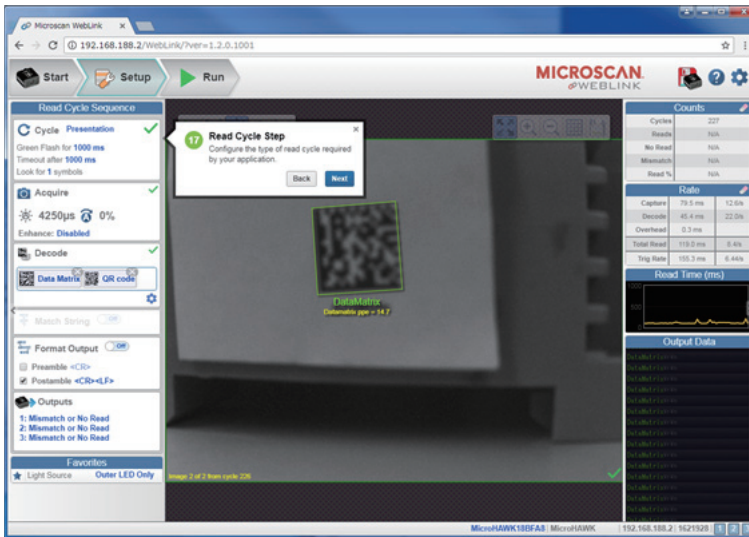
# Output Data



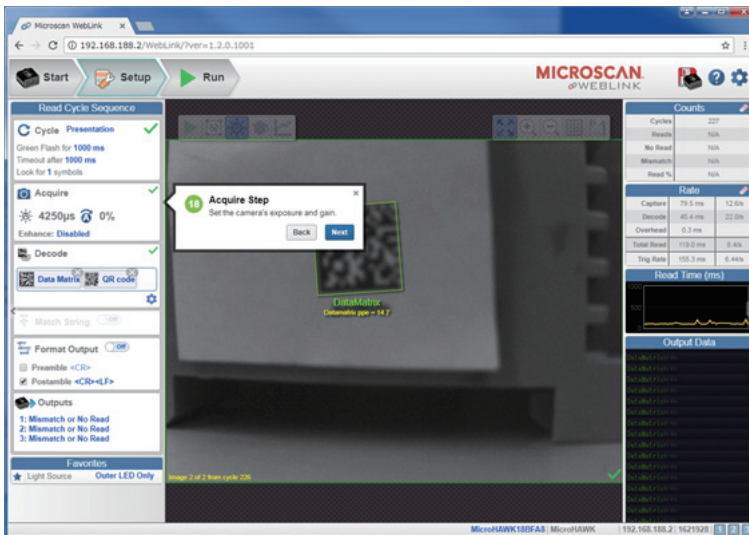
# Setup View



# Read Cycle Step



# Acquire Step



## Decode Step

**19 Decode Step**  
Select the code types and any decode enhancements required for your application.

**Read Cycle Sequence**

- Cycle Presentation**
  - Green Flash for 1000 ms
  - Timeout after 1000 ms
  - Look for 1 symbols
- Acquire**
  - 4250µs
  - 0%
  - Enhance: Disabled
- Decode**
  - Data Matrix
  - QR code
- Match String**
- Format Output**
  - Preamble <CR>
  - Postamble <CR><LF>
- Outputs**
  - 1: Mismatch or No Read
  - 2: Mismatch or No Read
  - 3: Mismatch or No Read
- Favorites**
  - Light Source
  - Outer LED Only

**Counts**

Cycles	227
Stalls	N/A
No Read	N/A
Mismatch	N/A
Read %	N/A

**Ratio**

Capture	79.5 ms	12.6%
Decode	85.4 ms	22.0%
Overhead	0.3 ms	
Total Read	119.0 ms	0.4%
Trig Rate	155.3 ms	6.44%

**Read Time (ms)**

**Output Data**

## Match Step

**20 Match Step**  
Define a character string that barcode data must match to pass.

**Read Cycle Sequence**

- Cycle Presentation**
  - Green Flash for 1000 ms
  - Timeout after 1000 ms
  - Look for 1 symbols
- Acquire**
  - 4250µs
  - 0%
  - Enhance: Disabled
- Decode**
  - Data Matrix
  - QR code
- Match String**
- Format Output**
  - Preamble <CR>
  - Postamble <CR><LF>
- Outputs**
  - 1: Mismatch or No Read
  - 2: Mismatch or No Read
  - 3: Mismatch or No Read
- Favorites**
  - Light Source
  - Outer LED Only

**Counts**

Cycles	227
Stalls	N/A
No Read	N/A
Mismatch	N/A
Read %	N/A

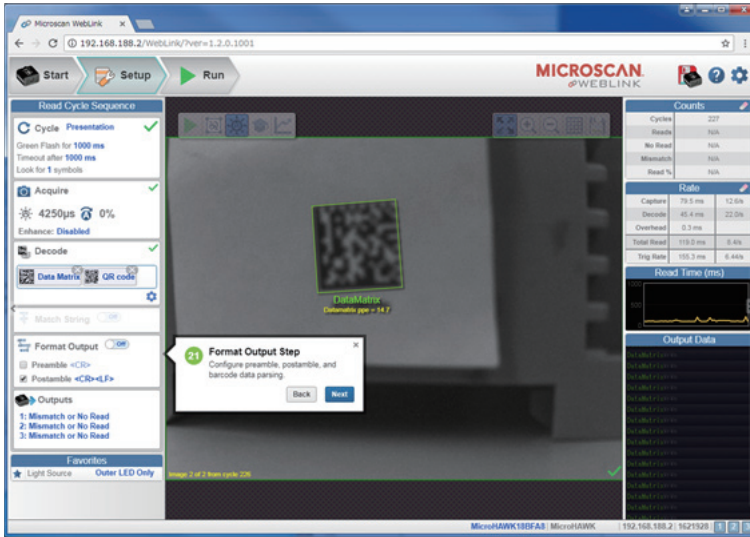
**Ratio**

Capture	79.5 ms	12.6%
Decode	85.4 ms	22.0%
Overhead	0.3 ms	
Total Read	119.0 ms	0.4%
Trig Rate	155.3 ms	6.44%

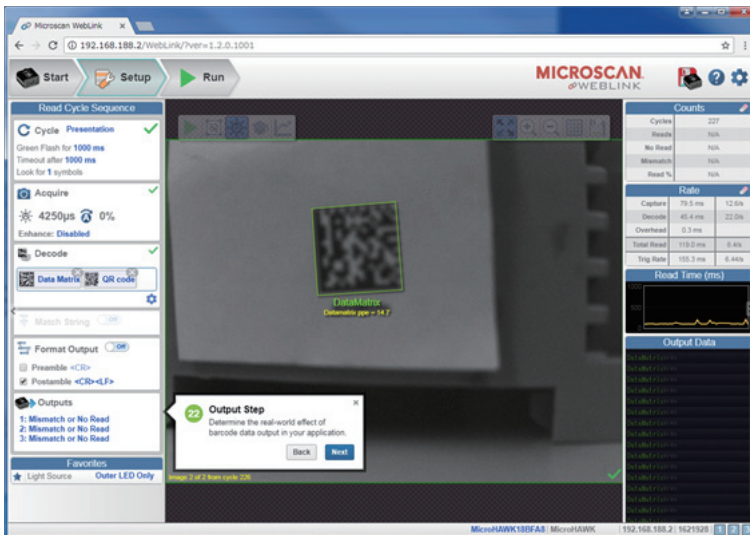
**Read Time (ms)**

**Output Data**

# Format Output Step



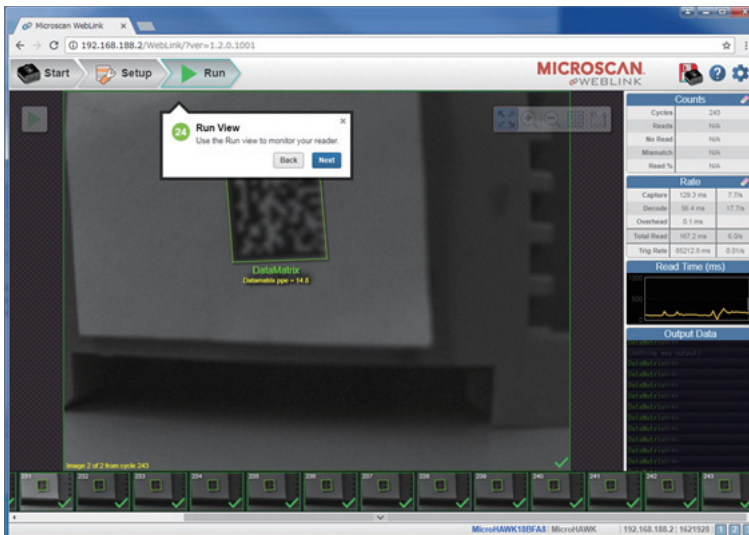
# Output step



# Favorites



# Run View/Filmstrip





# 2 V430-F-series and WebLink Quick Start

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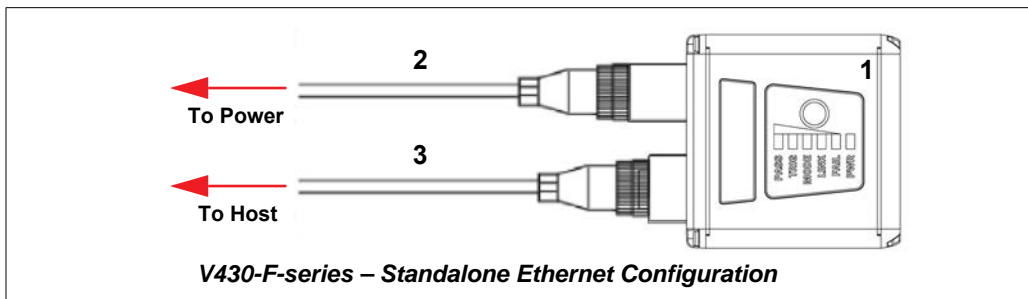
This section is designed to get your V430-F-series up and running quickly with **WebLink**. Following these steps will allow you to get a sense of the reader's capabilities and to test sample symbols.

There are three ways to configure and test the V430-F-series:

- Omron Microscan's browser-based WebLink user interface, which enables you to access, configure, and test your reader without having to install software or access files on a host system(recommended);
- Omron Microscan's ESP Software, which allows you to configure your reader using simple tree controls and UI elements;
- Serial commands that can be sent from the Terminal in WebLink or ESP, or from another terminal program.

# Step1 — Check Hardware and Connect the System

<i>Item</i>	<i>Description</i>	<i>Model Number</i>
1	V430-F	V430-F□
2	Power Supply, 100-240VAC, +24VDC, M12 12-Pin Socket	V430-W8-3M
3	Cordset, Host, Ethernet, M12 8-Pin Plug (Screw-On) to RJ45, 3 m.	V430-WE-3M

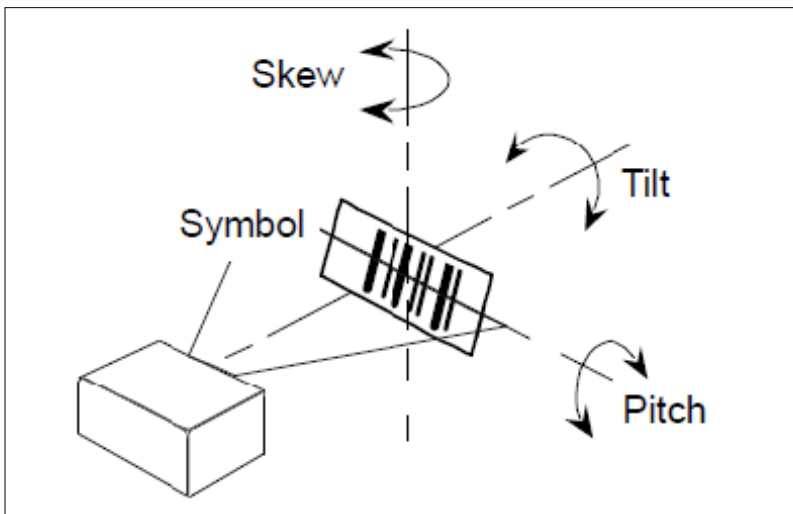


**Note:** The V430-F-series can be configured as an RS-232 reader with the V430-W2-3M cable.

## Step2 — Mount and Position the Reader

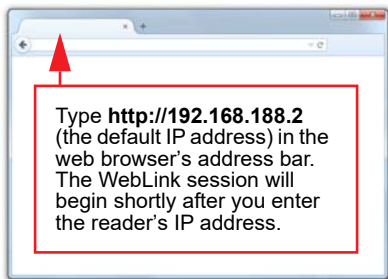
- Position the reader several inches from the symbol. You may need to reposition the reader a few times to find the ideal distance.
- Tip the reader relative to the symbol to avoid the glare of direct (specular) reflection.
- Symbols can be rotated (tilted) at any angle; however, for best results symbols should be aligned with the field of view. In the case of linear symbols, aligning the bars in the direction of their movement (ladder orientation) will minimize the chances of blurring and will result in more consistent decodes.

**Important:** Avoid excessive skew or pitch. Maximum skew is  $\pm 30^\circ$ ; maximum pitch is  $\pm 30^\circ$ . The illustration below shows approximate skew axis, pitch axis, and tilt axis.



**Reader and Symbol Orientation**

## Step3 — Connect to WebLink



### V430-F-series (Static Connection)

1. Navigate to **Control Panel > Network and Sharing Center** on your PC.
2. Click **Local Area Connection 4**. In the **Status** dialog, click **Properties**.
3. In the **Local Area Connection Properties** dialog, select **Internet Protocol Version 4 (TCP/IPv4)** and click **Properties** again. Set your PC to a **192.168.188.X** IP address (**192.168.188.5**, for example).
4. Click **OK**.
5. Open a web browser and type the reader's default IP address (**http://192.168.188.2**) in the web browser's address bar.  
The reader will connect to WebLink.

### V430-F-series (DHCP Network Connection)

1. Plug your reader into the your network adapter.
2. Open **DDU(Device Discovery Utility) Software** and connect to the **V430-F-series** via **Ethernet TCP/IP**. DDU can be used to confirm and change of the connected reader information and communication setting.
3. When the V430 is found on DDU, note the new IP address.
4. Open a browser and type the new IP address.  
WebLink will load.

## **WebLink operating environment**

OS:

Windows 7 (32 bits / 64 bits)

Windows 10 (32 bits / 64 bits)

Browser:

Google Chrome

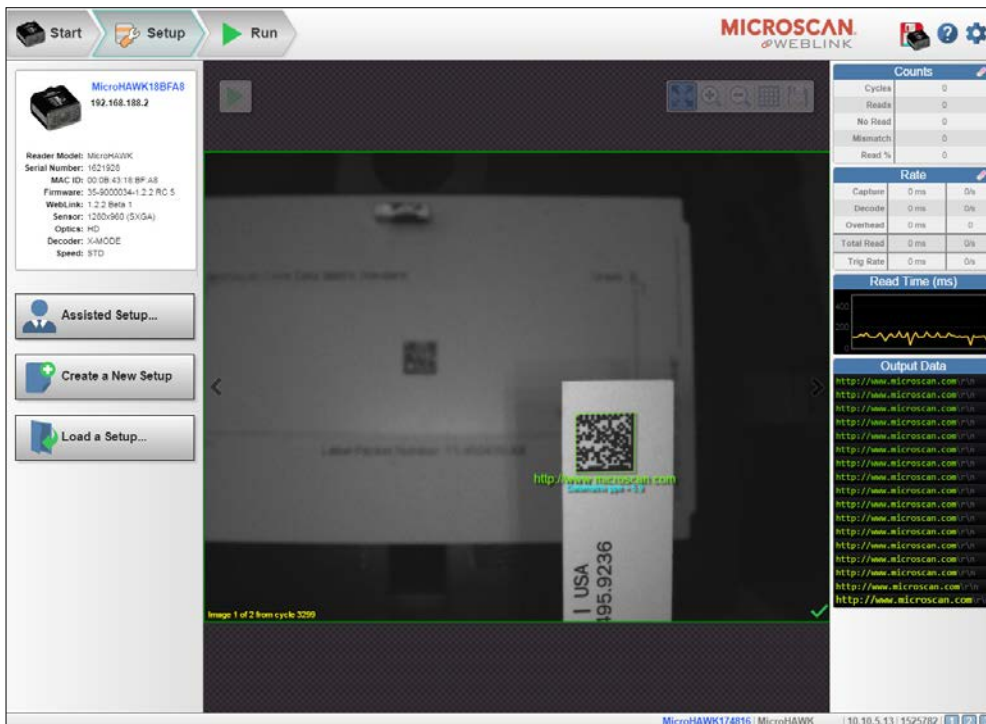
Internet Explorer 11

FireFox

Microsoft Edge

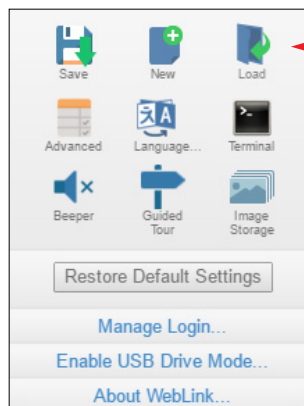
## Step4 — Explore the Start View

The **Start** view is the initial view you will see when the session begins. The connected reader is shown, along with its **user-defined name** (19 characters or fewer), **IP address**, **Reader Model**, **Serial Number**, **MAC ID**, **Firmware Version**, **Sensor**, **Optics**, **Decoder**, and **Speed**. This view allows you to choose **Assisted Setup**, to **Create a New Setup**, or to **Load a Setup**.



Click the gear icon to open the **Application Settings** menu, which gives you access to several functions: **Save**, **New**, **Load**, **Advanced**, **Language**, **Terminal**, **Beeper**, **Guided Tour**, **Image Storage**, **Restore Default Settings**, **Manage Login**, **Enable USB Drive Mode**, and **About WebLink**.

**Note:** The **Enable USB Drive Mode** option only appears when you are using a reader, which support USB connectivity.



## Step5 — Create a New Setup or Load an Existing Setup

### Assisted Setup

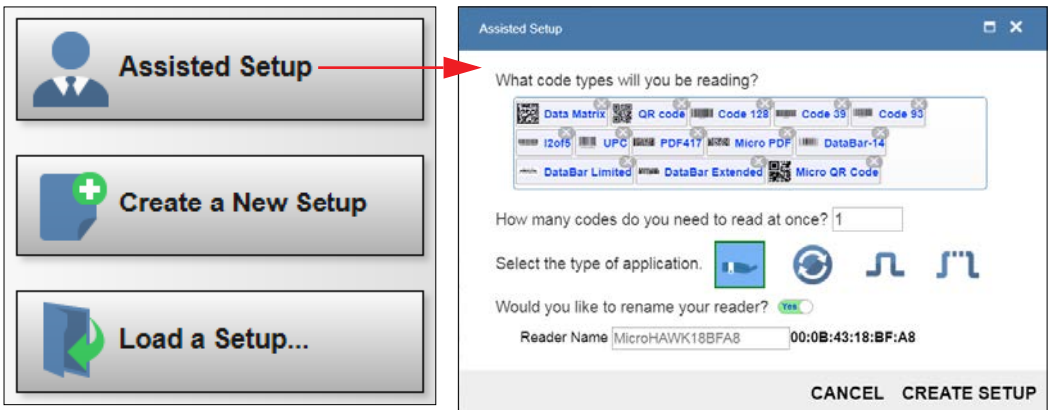
When you click the **Assisted Setup** button in the **Start** view, a dialog will appear asking you a series of application-based questions. Based on your answers, WebLink generates your initial setup automatically. Once the setup is created, you can fine-tune its parameters in the **Setup** view.

### Create a New Setup

The Start view also allows you to **Create a New Setup** without using Assisted Setup. When you click the Create a New Setup button, WebLink searches for any differences from default in the reader parameters. If no differences from default are found, you will see the Setup view. If differences from default are found, an alert will appear asking if you want to restore default settings.

### Load a Setup

Select **Load a Setup** to load an existing. WebLink setup file.



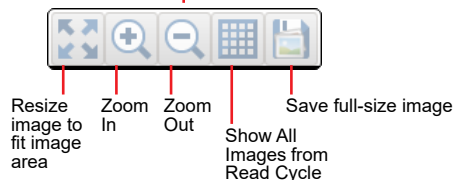
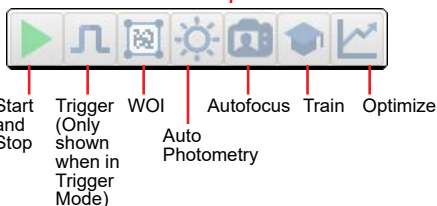
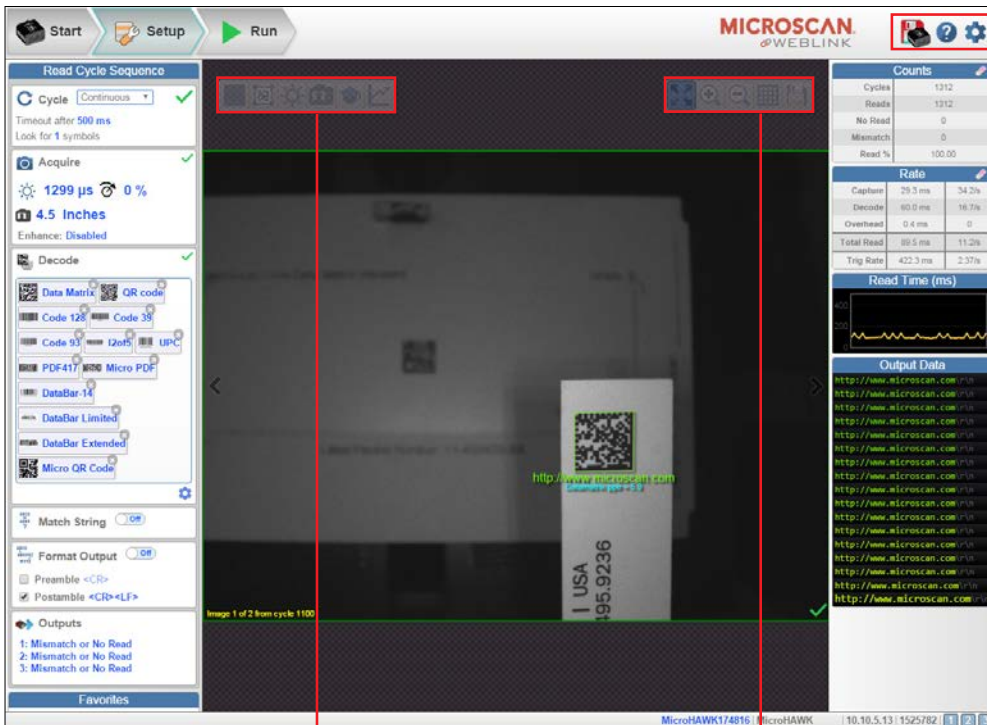
## Step6 — Explore the Setup View

The **Setup** view allows you to configure all aspects of a setup. Multiple discrete sections of the interface give you the ability to set **Cycle**, **Acquire**, **Decode**, **Match String**, **Format Output**, **Output parameters**, and **Favorites**.

Clicking the **Save** icon at the upper right saves current settings to the reader's flash memory so the settings will be available when the reader is rebooted.

The **question mark** icon at the upper right opens **WebLink Help**.

The **gear** icon at the upper right brings up the **Application Settings** menu.

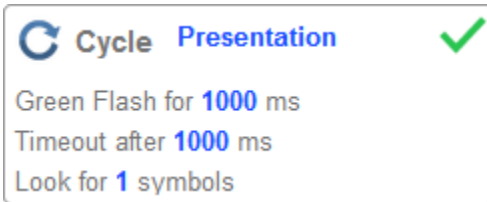


## Step7 — Configure Read Cycle Settings

The **Cycle** section of the **Setup** view allows you to modify the trigger, determine the number of symbols for the reader to expect, and set **Read Cycle Timeout**. A dropdown menu of various Cycle types provides a variety of options, each with configurable parameters.

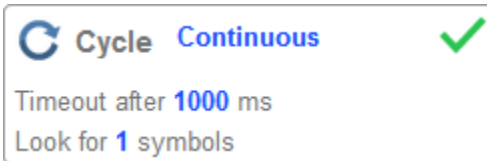
### Presentation

This mode uses **Continuous Read Auto** along with **Continuous Capture Mode** and a **Timeout at End of Read Cycle**. **Green Flash Mode** is set to **Static Presentation** and the **Green Flash Duration** is set to **1 second**.



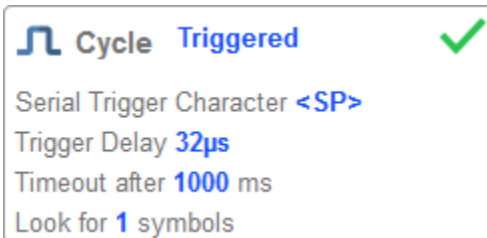
### Continuous

This mode allows you to set the **Read Cycle Timeout** and the expected **Number of Symbols** from **1** to **100**.



### Triggered

This mode sets the read cycle to **Serial Data and Edge**, **End of Read Cycle** is set to **Timeout or New Trigger**, and **Capture Mode** is set to **Rapid Capture** with **1 capture**. You can adjust the **Serial Trigger**, **Trigger Delay**, **Timeout**, and **Number of Symbols**.



## Start / Stop

This mode uses **External Level** with a **Read Cycle Timeout** and **Continuous Capture**, allowing you to set **Leading Edge** and **Trailing Edge** as well as the **Serial Trigger** and the **Start** and **Stop** characters.

### **Serial Trigger (Non-Delimited) Off**

When **Serial Trigger** is set to **Off**, the start and stop characters are set to **NULL**, meaning that the trigger is disabled.

### **Serial Trigger (Non-Delimited) On**

When **Serial Trigger** is set to **On**, the start and stop characters are set to **S** and **E**. When the trigger button is clicked, it will use the current start and stop non-delimited triggers.



## Custom

This mode allows you a wider variety of read cycle scenarios, including **Continuous Read Auto**. Use this mode to select **Trigger** mode and to set **Serial Trigger Character** and **Trigger Delay**; to select **Capture** mode and to set **Number of Captures**, **Rapid Capture** mode, and **Delay between Images**; and to select the **End Cycle On** setting as well as **Timeout** and **Number of Symbols**.

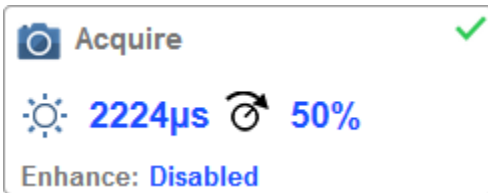


## Step8 — Configure Acquire Settings

**Acquire** settings allow you to set **Exposure** (signified by the sun icon) and **Gain** (signified by the dial and right-pointing arrow icon) in real time. Clicking any of these settings will cause a control to appear, allowing you to modify that setting. Settings take effect immediately.

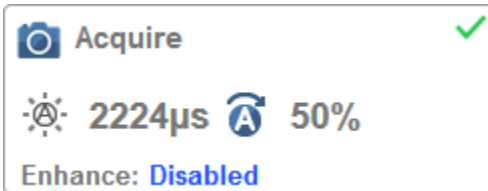
**Important:** There are 4 levels of Gain in SXGA readers. Each level corresponds to 25 percentage points, or one quarter turn of the Gain dial shown at left.

- Level 1 = 0 to 24%
- Level 2 = 25 to 49%
- Level 3 = 50 to 74%
- Level 4 = 75 to 100%



### **Standard**

When **Auto Photometry** is enabled instead of **Standard**, Exposure and Gain are read-only. The **A** shown on the sun and dial icons signifies that Auto Photometry is enabled. Auto Photometry constantly determines the best Exposure and Gain settings during each read cycle.





### **Auto Photometry**

## Autofocus

**Autofocus** can be enabled and disabled in the **Image Area** using the focus button in the **Device Control Toolbar**, and can be configured in the **Acquire** section of the **Setup** view. While in **Continuous** mode or **Continuous Auto** mode, the camera can enable or disable Autofocus functionality, allowing it to refocus after a number of no reads. The focus button shows an **A** when Autofocus is enabled. The focus distance is updated on the fly based on the latest refocus settings.






 Acquire ✓



 2674  $\mu\text{s}$   0 %

 123 Millimeters

Enhance: Disabled

 Acquire

 6774  $\mu\text{s}$   0 %

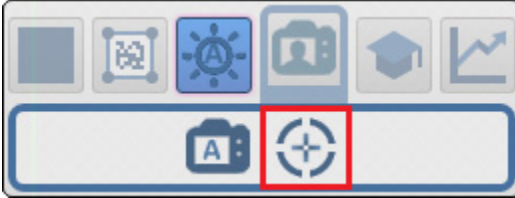
  Millimeters

Enhance: Disabled

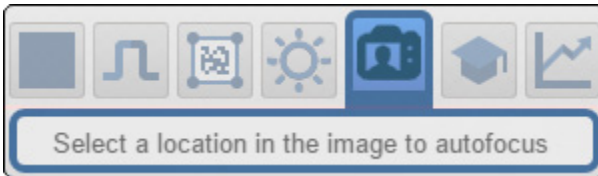
## Spot Focus

If the camera is in **Continuous** mode or **Continuous Auto** (Continuous mode with **Auto Photometry** enabled), you can perform a localized quick focus in the image.

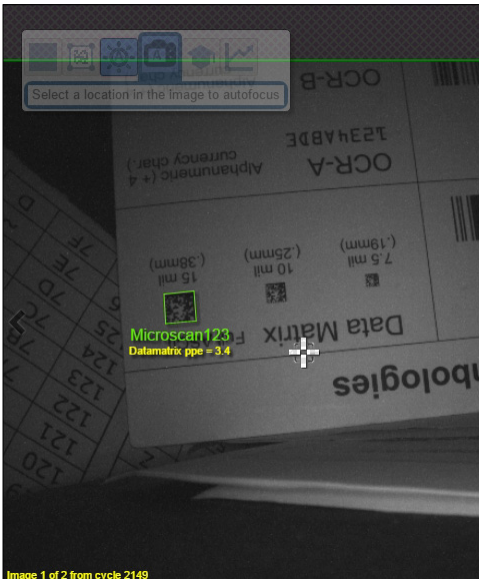
If you click the focus button, the **Autofocus** and **Spot Focus** icons appear:



When you click the Spot Focus icon, the **Select a location in the image to autofocus** message appears:



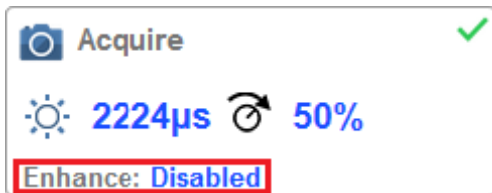
The cursor transforms into crosshairs as shown in the example below. This allows you to select the section of the image in which you want to perform a quick focus.



**Note:** If you click the Autofocus button to the left of the Spot Focus button, the reader will switch from Spot Focus to regular Autofocus functionality. If the reader is in **Triggered** mode, only the Spot Focus icon will appear.

## Enhance

The **Enhance** dropdown menu at the bottom of the **Acquire** settings editor allows you to select the method for processing captured images.



### **Grow Dark**

**Grow Dark** increases the dark cell size of a symbol. It is useful for increasing the dark cell size of a dark-on-light Data Matrix symbol.

### **Shrink Dark**

**Shrink Dark** increases the light cell size of a symbol. It is useful for increasing the light cell size of a light-on-dark Data Matrix symbol.

### **Connect Dark**

**Connect Dark** removes minor light defects of dark cells.

### **Separate Dark**

**Separate Dark** removes minor dark defects of light cells.

## Operator Size

The **Operator Size** dropdown menu determines the size of the area or “pixel neighborhood” in which the enhance operation is being performed.

### **Small**

**Small** corresponds to an area of **3 pixels by 3 pixels**.

### **Medium**

**Medium** corresponds to an area of **5 pixels by 5 pixels**.

### **Large**

**Large** corresponds to an area of **7 pixels by 7 pixels**.

## Step9 — Configure Symbology Settings

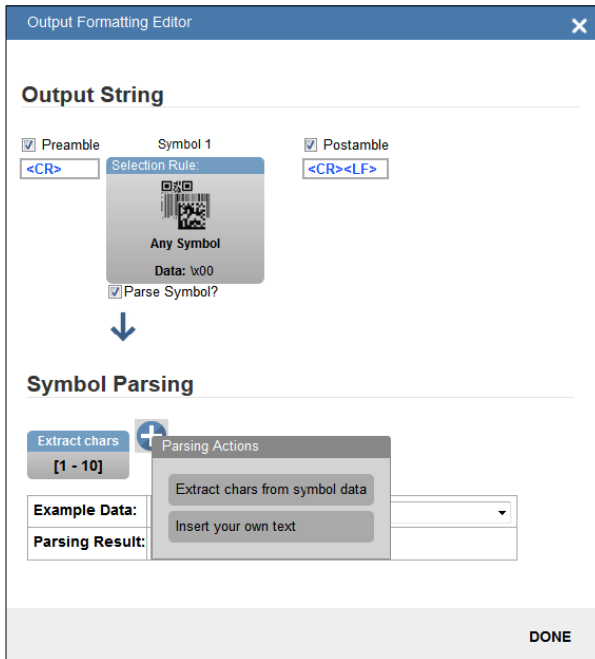
Clicking the gear icon at the bottom of the **Decode** dialog brings up **Symbology Settings**. This allows you to configure every parameter for every available code type.

Symbology Settings		
Data Matrix	☆	ECC 200 Status <b>Enabled</b>
Code 128	☆	ECC 000 Status <b>Disabled</b>
Code 39	☆	ECC 050 Status <b>Disabled</b>
Codabar	☆	ECC 080 Status <b>Disabled</b>
Code 93	☆	ECC 100 Status <b>Disabled</b>
Interleaved 2 of 5	☆	ECC 140 Status <b>Disabled</b>
UPC/EAN	☆	ECC 120 Status <b>Disabled</b>
PDF417	☆	ECC 130 Status <b>Disabled</b>
Micro PDF417		
BC412		
Pharmacode		
DataBar Expanded		
Postal Symbologies		

Data Matrix error correction parameters are shown in this example, but you can configure any parameter for any of the code types supported by WebLink. All parameter changes for all code types take effect immediately.

# Step10 — Format Output and Configure Match String

**Format Output**, when enabled in the **Setup** view, allows you to determine the many ways in which barcode data can be formatted and parsed before it is output as a data string. You can also set **Preamble** and **Postamble** in this dialog.

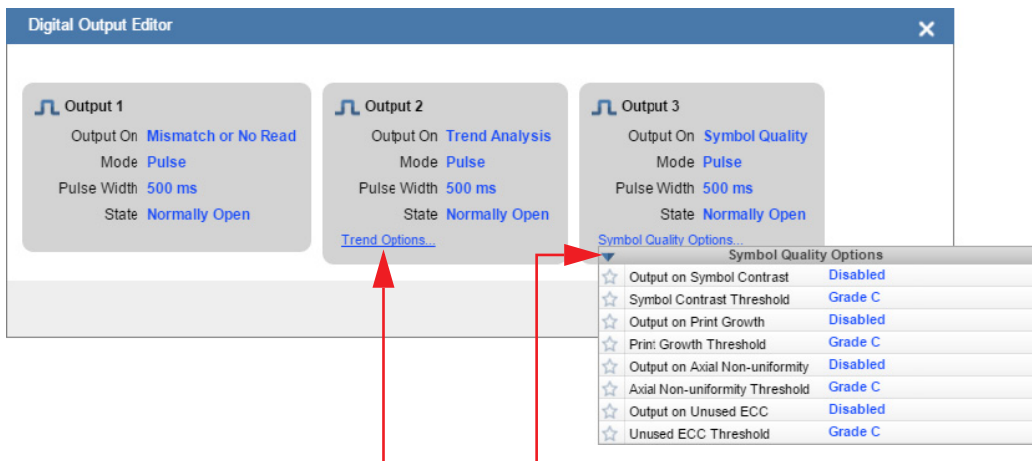


**Match Options** and **Match String Database**, accessible by clicking the **Match String** section in the **Setup** view, allow you to set the match code mode, text output, new master, and match string database.

The screenshot shows the 'Match String Editor' window. It is divided into two main sections: 'Match Options' on the left and 'Match String Database' on the right. The 'Match Options' section includes a 'Mode' dropdown set to 'Standard', 'Settings for Match String' with radio buttons for 'Match All' (selected) and 'Partial Match: Start: 0 Length: 1', 'Text Output Options' with checked boxes for 'Match Replace' (set to 'MATCH') and 'Mismatch Replace' (set to 'MISMATCH'), and 'Train Match String on New Master Input' with 'New Master Pin' set to 'Enabled'. The 'Match String Database' section shows a list with one entry: '1 MICROSCAN123' and a plus sign icon below it. A 'DONE' button is located at the bottom right of the window.

## Step11 — Configure Output 1, 2, and 3 Settings

Bring up the **Output 1**, **Output 2**, and **Output 3** dialogs by clicking on the **Outputs** section at the lower left of the **Setup** view. For each output you can determine the **Output On** behavior, **Mode**, **Pulse Width**, and **State**. Outputs 2 and 3 also allow you to determine output behavior based on **Trend Options** parameters or **Verification Options** parameters.



This example shows the dialog that appears when you click **Symbol Quality Options**. A similar dialog would appear for **Trend Options** under **Output 2**.

## Step12 — Run the Application

In the **Run** view, you can observe the progress of the setup as it follows the parameters you have defined. The right panel of the UI shows **Counts for Cycles, Reads, No Reads, and Mismatches**, as well as **Rate** information for **Capture, Decode, Overhead, Total Read, and Trigger Rate**, as well as **Output Data**. A "filmstrip" below the **Image Area** shows each image capture with a **green check mark** for a good read and a **red x** for a no-read.

The screenshot displays the Microscan WebLink interface in the **Run** view. The main window shows a live image of a document with a QR code and the text "USA 195.9236". The right sidebar displays performance metrics:

Counts	
Cycles	1338
Reads	1335
No Read	0
Mismatch	0
Read %	100.00

Rate		
Capture	38.8 ms	17.1%
Decode	64.1 ms	15.6%
Overhead	0.0 ms	0
Total Read	93.8 ms	10.7%
Trig Rate	95.7 ms	10.45%

Below the graph is the **Output Data** section showing a list of URLs:

```

http://www.microscan.com/...
http://www.microscan.com/...
http://www.microscan.com/...
http://www.microscan.com/...
http://www.microscan.com/...
http://www.microscan.com/...
http://www.microscan.com/...
http://www.microscan.com/...
http://www.microscan.com/...
http://www.microscan.com/...
http://www.microscan.com/...
http://www.microscan.com/...
http://www.microscan.com/...
http://www.microscan.com/...
http://www.microscan.com/...
http://www.microscan.com/...
http://www.microscan.com/...
http://www.microscan.com/...
http://www.microscan.com/...

```

At the bottom, a filmstrip shows a sequence of image captures, each with a green checkmark indicating a successful read.

# How to Read Model Numbers

V430-F000W12M

Auto Focus Multi Code Reader

V430-F-series

Focal Distance (WD)

000: Auto Focus

050: 50 mm

081: 81 mm

102: 102 mm

Optics

W: Standard Density, Wide View

M: High Density, Middle View

N: Ultrahigh Density, Narrow View

Effective pixels

50: 5.0 Megapixel, QSXGA 2592 x 1944

12: 1.2 Megapixel, SXGA 1280 x 960

03: 0.34 Megapixel, WVGA 752 x 480

Color/Monochrome

M: Monochrome

C: Color



# 3 Start

**Contents**

Overview ..... 3-2  
Assisted Setup ..... 3-4  
Reader Information ..... 3-5  
Setup Buttons ..... 3-6

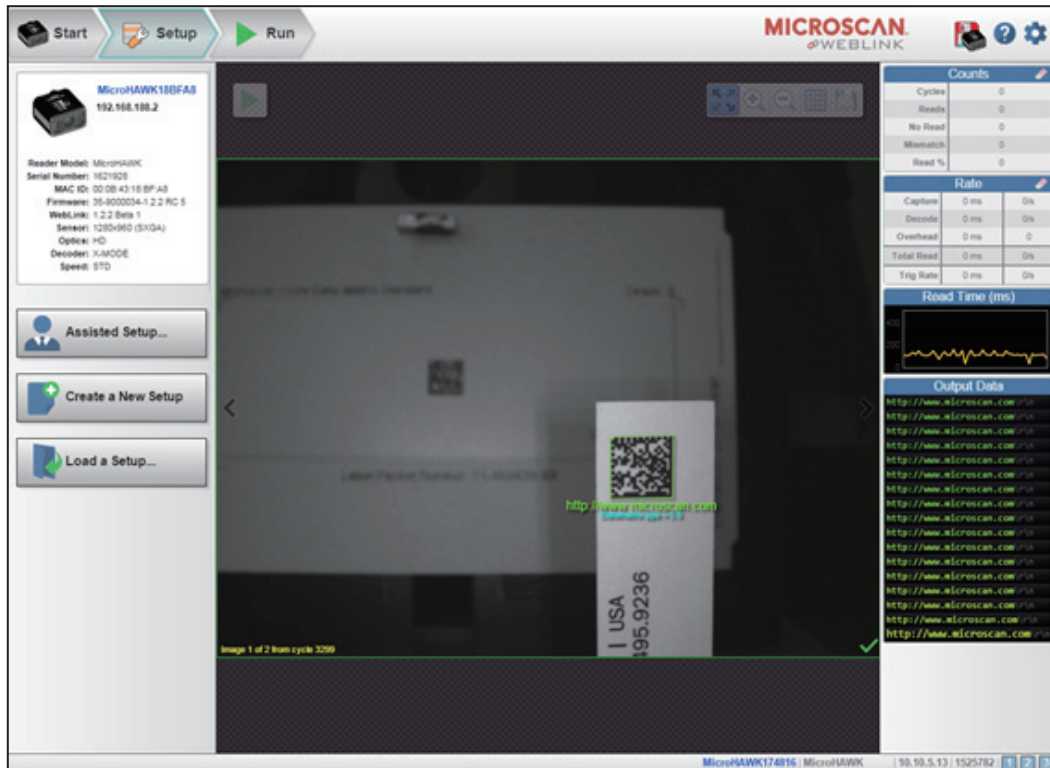
The **Start** view is the initial view you will see when the **WebLink** session begins.

# Overview

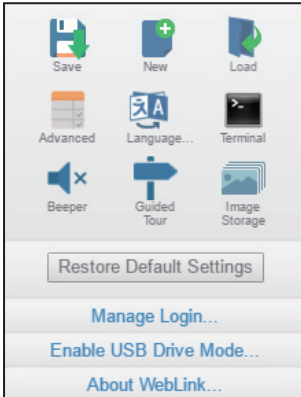
The connected reader is shown, along with its **user-defined name**, **IP address**, **Reader Model**, **Serial Number**, **MAC ID**, **Firmware version**, **WebLink version**, **Sensor**, **Optics**, **Decoder**, and **Speed**.

**Note:** The **user-defined name** must be **19** characters or fewer.

This view also allows you to choose **Assisted Setup**, to **Create a New Setup**, or to **Load a Setup**.



Click the gear icon at the upper right to bring up the **Application Settings** menu. This menu includes several functions: **Save, New, Load, Advanced, Language, Terminal, Beeper, Guided Tour, Image Storage, Restore Default Settings, Manage Login, Enable USB Drive Mode** and **About WebLink**.



**Note:** The **Enable USB Drive Mode** option only appears when you are using a reader, which support USB connectivity.

Clicking **About WebLink** opens the dialog shown below, which shows the current **WebLink version, Reader Model, Serial Number, Part Number, MAC ID, Sensor, Firmware version, Boot version, Browser, Operating System, and Screen Resolution**.

**Note:** The information in this dialog is selectable so that you can copy it to a clipboard. Clicking **Contact us...** takes you to the Omron website.



# Assisted Setup

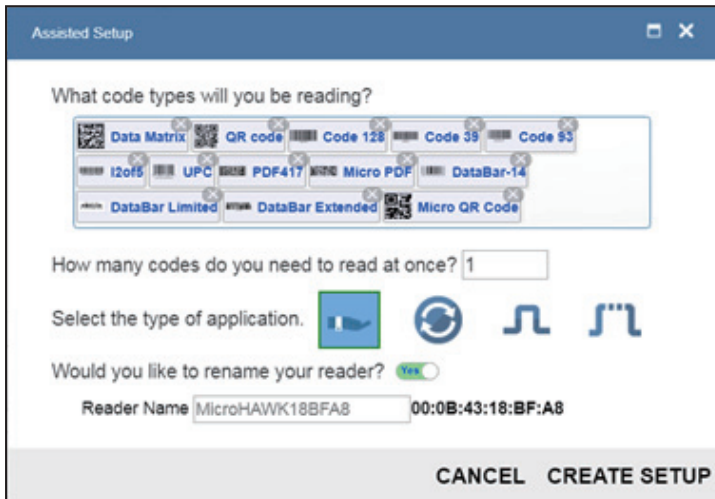
When you click the **Assisted Setup** button in the **Start** view, a dialog will appear asking you a series of application-based questions. Based on your answers, WebLink generates your initial setup automatically. Once the setup is created, you can fine-tune its parameters in the **Setup** view.

The Assisted Setup dialog is designed to be logical and intuitive, and follows this sequence:

- You are asked which code types you will be reading in your application. Code types can be added by clicking directly in the code type field and selecting them from a dropdown menu.
- Then you are asked how many codes you need to read at once (in a single read cycle).
- Type the number of codes you need to read directly in the text field or select a number using the up and down arrows.
- You are then given a selection of four application types, which represent the available selections in the **Cycle** area of the **left panel** in the Setup view. The icons represent the **Presentation**, **Continuous**, **Triggered**, and **Start/Stop** Cycle Types.
- Finally, you are asked if you want to rename the reader. If **Yes**, a text field appears in which you can type the reader's new name. The reader's MAC ID is also shown to the right of the text field.

Click **Create Setup** to configure your WebLink setup automatically based on your answers to the Assisted Setup questions.


**Note:** Reader settings are defaulted when Assisted Setup settings take effect.



## Reader Information

The **Reader Information** section of the left panel of the **Start** view shows your reader's **user-defined name**, **IP address**, **Reader Model**, **Serial Number**, **MAC ID**, **Firmware version**, **WebLink version**, **Sensor**, **Optics**, **Decoder**, and **Speed**.

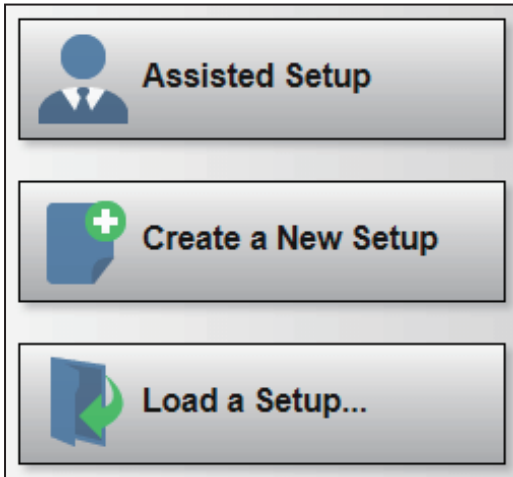
**Note:** The **user-defined name** must be **19** characters or fewer.



**MicroHAWK18BFA8**  
192.168.188.2

**Reader Model:** MicroHAWK  
**Serial Number:** 1621928  
**MAC ID:** 00:DB:43:18:BF:A8  
**Firmware:** 35-9000034-1.2.2 RC 5  
**WebLink:** 1.2.2 Beta 1  
**Sensor:** 1280x960 (SXGA)  
**Optics:** HD  
**Decoder:** X-MODE  
**Speed:** STD

## Setup Buttons



### ***Assisted Setup***

When you click the **Assisted Setup** button in the **Start** view, a dialog with a **series of questions** about your application will appear. Answering these simple questions allows WebLink to configure your setup for you.

### ***Create a New Setup***

**New Setup** allows you to create a new setup without using Assisted Setup. When you click the New Setup button, WebLink searches for any differences from default in the reader parameters. If no differences from default are found, you will see the **Setup** view. If differences from default are found, the following alert will appear, allowing you to choose whether to restore the reader to default settings or to cancel the New Setup.



### ***Load a Setup***

Select **Load Setup** to load an existing WebLink setup file.







# 4 Setup

## Contents

Cycle .....	4-2
Acquire .....	4-4
Decode .....	4-8
Match String.....	4-10
Format Output.....	4-11
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The **Setup** view allows you to configure all aspects of a setup. Multiple discrete sections of the **WebLink** interface give you the ability to set **Cycle**, **Acquire**, **Decode**, **Match String**, **Format Output**, Output parameters, and **Favorites**.

## Cycle

The **Cycle** section of the **Setup** view allows you to modify the trigger, determine the number of symbols for the reader to expect, and set **Read Cycle Timeout**. A dropdown menu of various Cycle types provides a variety of options, each with configurable parameters.



### Presentation

This mode uses **Continuous Read Auto** along with **Continuous Capture Mode** and a **Timeout at End of Read Cycle**. **Green Flash Mode** is set to **Static Presentation** and the **Green Flash Duration** is set to **250 ms**.

 **Cycle** **Presentation**   
Green Flash for **1000 ms**  
Timeout after **1000 ms**  
Look for **1** symbols

### Continuous



This mode allows you to set the **Read Cycle Timeout** and the expected **Number of Symbols** from **1** to **100**.

 **Cycle** **Continuous**   
Timeout after **1000 ms**  
Look for **1** symbols

### Triggered

This mode sets the read cycle to **Serial Data** and **Edge**, **End of Read Cycle** is set to **Timeout or New Trigger**, and **Capture Mode** is set to **Rapid Capture** with **1 capture**.

You can adjust the **Serial Trigger**, **Trigger Delay**, **Timeout**, and **Number of Symbols**.

 **Cycle** **Triggered**   
Serial Trigger Character **<SP>**  
Trigger Delay **32μs**  
Timeout after **1000 ms**  
Look for **1** symbols

## Start/Stop

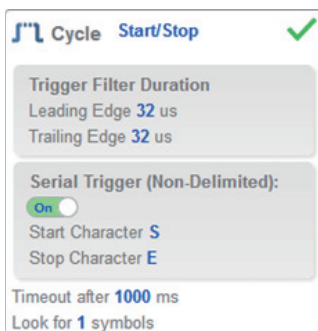
This mode uses **External Level** with a **Read Cycle Timeout** and **Continuous Capture**, allowing you to set **Leading Edge** and **Trailing Edge** as well as the **Serial Trigger** and the **Start and Stop Characters**.

### Serial Trigger (Non-Delimited) Off

When **Serial Trigger** is set to **Off**, the start and stop characters are set to **NULL**, meaning that the trigger is disabled.

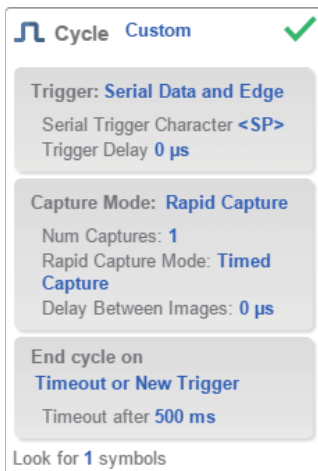
### Serial Trigger (Non-Delimited) On

When **Serial Trigger** is set to **On**, the start and stop characters are set to **S** and **E**. When the trigger button is clicked, it will use the current start and stop non-delimited triggers.



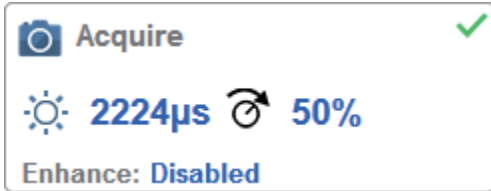
## Custom

This mode allows you a wider variety of read cycle scenarios, including **Continuous Read Auto**. Use this mode to select **Trigger mode** and to set **Serial Trigger Character** and **Trigger Delay**; to select **Capture Mode** and to set **Number of Captures**, **Rapid Capture Mode**, and **Delay between Images**; and to select the **End Cycle On** setting as well as **Timeout** and **Number of Symbols**.



# Acquire

**Acquire** settings allow you to set **Exposure** (signified by the sun icon) and **Gain** (signified by the dial and right-pointing arrow icon) in real time. Clicking any of these settings will cause a control to appear, allowing you to modify that setting. Settings take effect immediately.

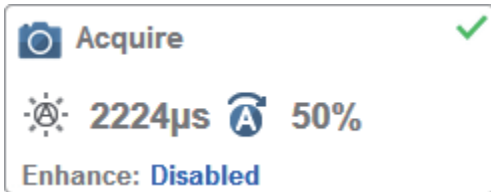


**Standard**

**Important:** There are 4 levels of Gain in SXGA V430 readers. Each level corresponds to 25 percentage points, or one quarter turn of the Gain dial shown at left.

- Level 1 = 0% to 24%
- Level 2 = 25% to 49%
- Level 3 = 50% to 74%
- Level 4 = 75% to 100%

When **Auto Photometry** is enabled instead of **Standard**, Exposure and Gain are read-only. The **A** shown on the sun and dial icons signifies that Auto Photometry is enabled. Auto Photometry constantly determines the best Exposure and Gain settings during each read cycle.

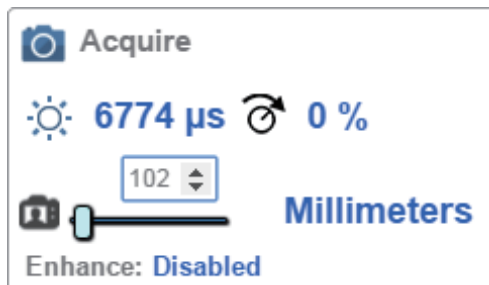


**Auto Photometry**

## Autofocus

**Autofocus** can be enabled and disabled in the **Image Area** using the focus button in the **Device Control Toolbar**, and can be configured in the **Acquire** section of the **Setup** view.

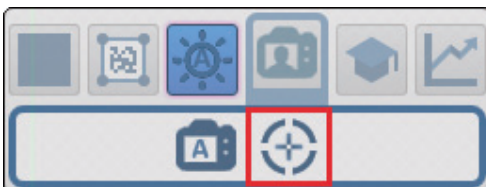
While in **Continuous** mode or **Continuous Auto** mode, the camera can enable or disable Autofocus functionality, allowing it to refocus after a number of no reads. The focus button shows an **A** when Autofocus is enabled. The focus distance is updated on the fly based on the latest refocus settings.



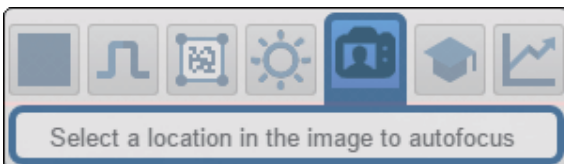
## Spot Focus

If the camera is in **Continuous** mode or **Continuous Auto** (Continuous mode with **Auto Photometry** enabled), you can perform a localized quick focus in the image.

If you click the focus button, the **Autofocus** and Spot Focus icons appear:

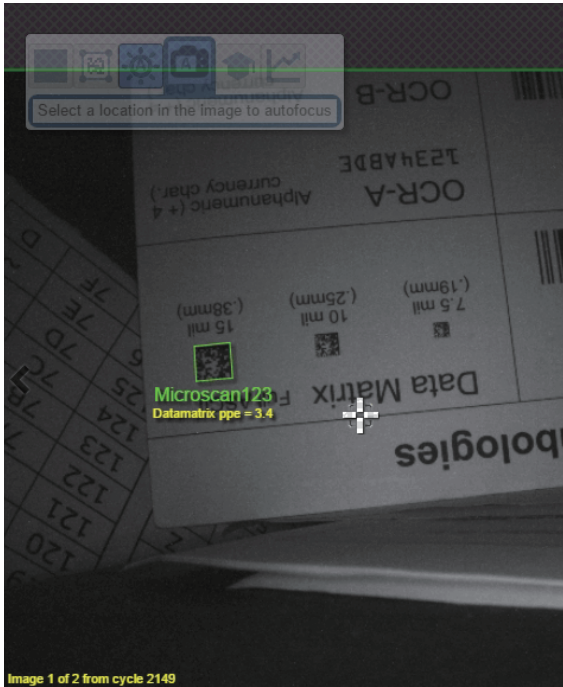


When you click the Spot Focus icon, the **Select a location in the image to autofocus** message appears.



## Acquire

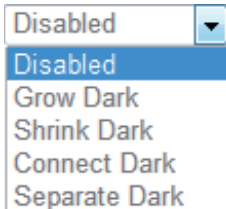
The cursor transforms into crosshairs as shown in the example below. This allows you to select the section of the image in which you want to perform a quick focus.



**Note:** If you click the Autofocus button to the left of the Spot Focus button, the reader will switch from Spot Focus to regular Autofocus functionality. If the reader is in **Triggered** mode, only the Spot Focus icon will appear.

## Enhance

The **Enhance** dropdown menu at the bottom of the **Acquire** editor allows you to select the method for processing captured images.



### Grow Dark

**Grow Dark** increases the dark cell size of a symbol. It is useful for increasing the dark cell size of a dark-on-light DataMatrix symbol.

## Shrink Dark

**Shrink Dark** increases the light cell size of a symbol. It is useful for increasing the light cell size of a light-on-dark DataMatrix symbol.

## Connect Dark

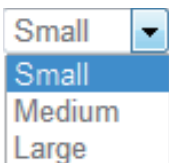
**Connect Dark** removes minor light defects of dark cells.

## Separate Dark

**Separate Dark** removes minor dark defects of light cells.

## Operator Size

The **Operator Size** dropdown menu determines the size of the area or "pixel neighborhood" in which the enhance operation is being performed.



### Small

**Small** corresponds to an area of **3 pixels by 3 pixels**.

### Medium

**Medium** corresponds to an area of **5 pixels by 5 pixels**.

### Large

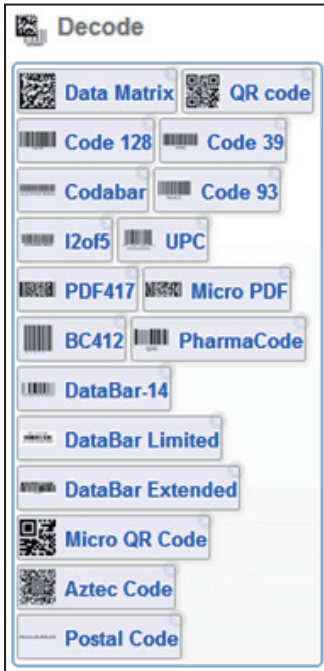
**Large** corresponds to an area of **7 pixels by 7 pixels**.

# Decode

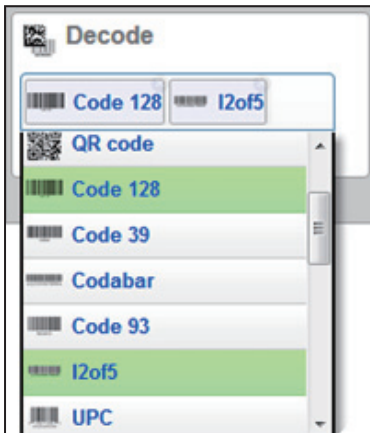
The **Decode** area of the **Setup** view allows you to choose which code types you want to enable, and to configure the parameters for those code types.

## Code Types and Symbology Settings

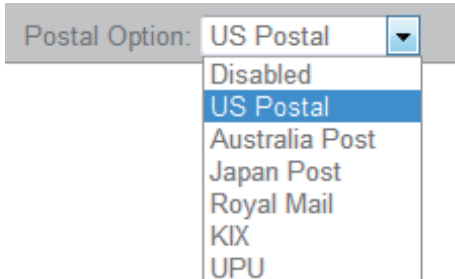
In the example below, all code types are enabled.



You can add code types by clicking in an empty section of the field where code types are displayed, and then selecting the desired code types from the dropdown menu.



You can also enable one of several postal code options using the **Postal Option** drop-down menu shown below.



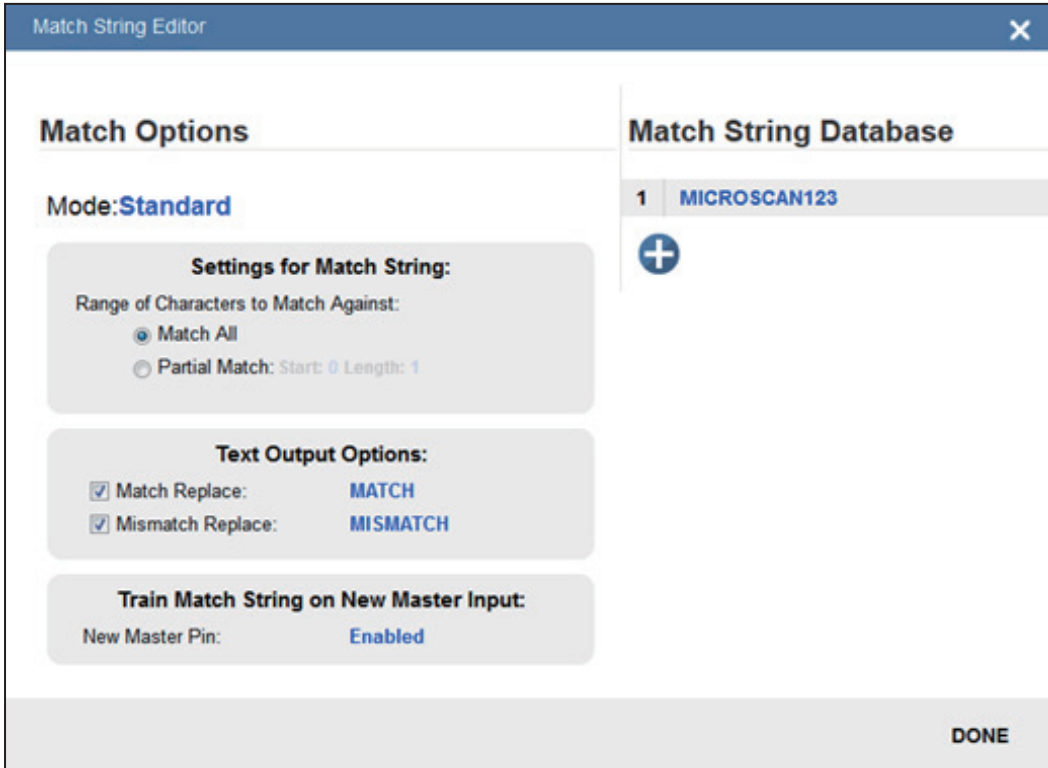
Clicking the **gear icon** at the bottom of the **Decode** section brings up **Symbology Settings**. This allows you to configure every parameter for every available code type.

DataMatrix error correction parameters are shown in this example, but you can configure any parameter for any of the code types in the list shown below. All parameter changes for all code types take effect immediately.

Symbology Settings		
<b>Data Matrix</b>	☆ ECC 200 Status	<b>Enabled</b>
Code 128	☆ ECC 000 Status	<b>Disabled</b>
Code 39	☆ ECC 050 Status	<b>Disabled</b>
Codabar	☆ ECC 080 Status	<b>Disabled</b>
Code 93	☆ ECC 100 Status	<b>Disabled</b>
Interleaved 2 of 5	☆ ECC 140 Status	<b>Disabled</b>
UPC/EAN	☆ ECC 120 Status	<b>Disabled</b>
PDF417	☆ ECC 130 Status	<b>Disabled</b>
Micro PDF417		
BC412		
Pharmacode		
DataBar Expanded		
Postal Symbologies		

# Match String

**Match Options** and **Match String Database**, accessible by clicking the **Match String** section in the **Setup** view, allow you to set the match code mode, text output, new master, and match string database.



## Format Output

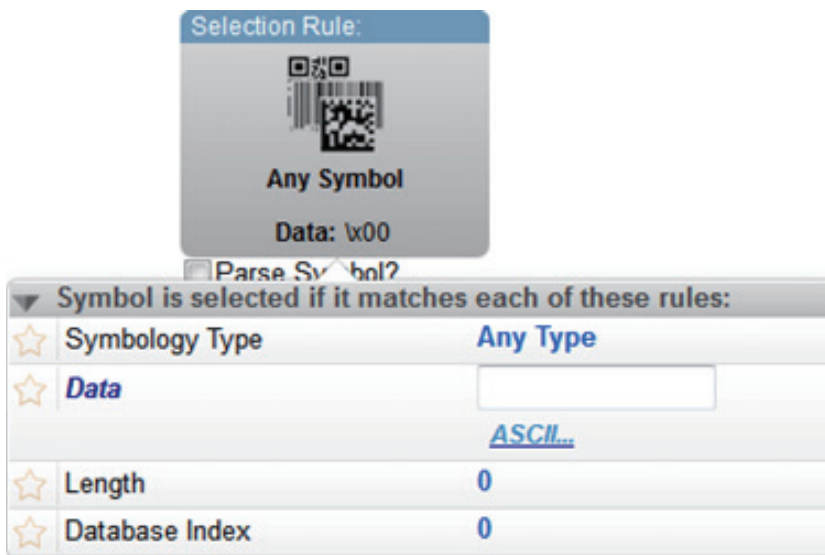
Format Output, when enabled in the **Setup** view, allows you to determine how symbol data is formatted and parsed before being output as a data string.

### Output String

The **Output String** section of the **Output Formatting Editor** gives you the ability to set a preamble and postamble for symbol data output, and to define the character that is used to separate output for each read cycle.

You can also set multiple **selection rules** that determine whether or not a particular symbol's data is selected or not.

- **Symbology Type** lets you select any of the available **code types** from a dropdown menu.
- **Data** lets you determine what characters must be encoded in the symbol for it to be selected.
- **Length** lets you determine the number of characters the symbol must have to be selected, using either a spin box or a slider.
- **Database Index** lets you choose which match string database number the symbol data must match to be selected.

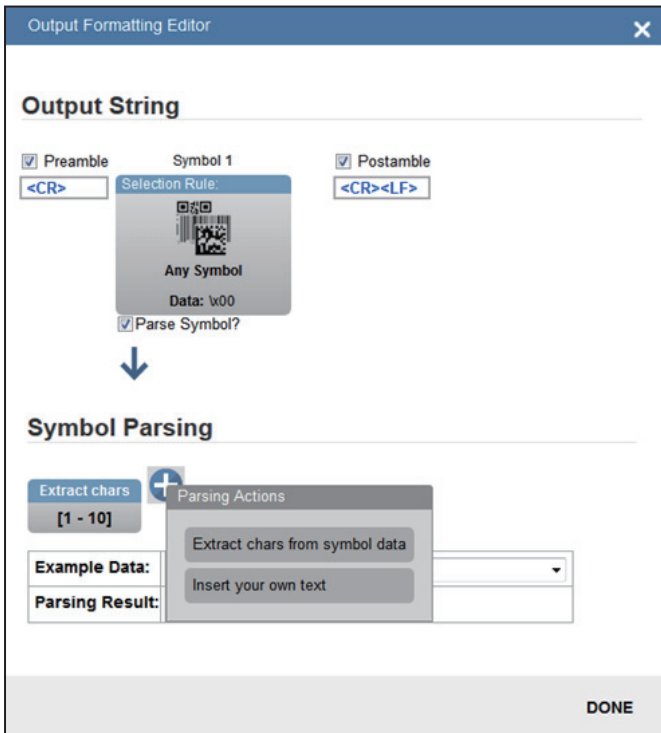


## Symbol Parsing

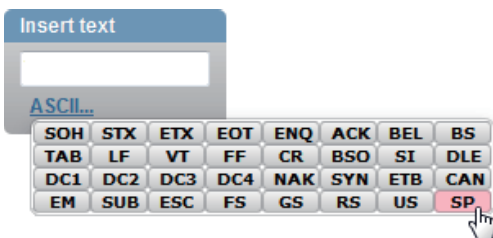
When you check the **Parse Symbol** box, the **Symbol Parsing** section of the **Output Formatting Editor** is illuminated.

In the example shown below, an **extract** operation is performed on the symbol data. The extract range is set as **1 - 3**. The result is that three characters are extracted from the example data and output as the parsing result, which in this case is **123**.

You can set multiple parsing operations to occur in sequence. When you click the **add** button, a popup appears giving you two choices: **Extract chars from symbol data** or **Insert your own text**.



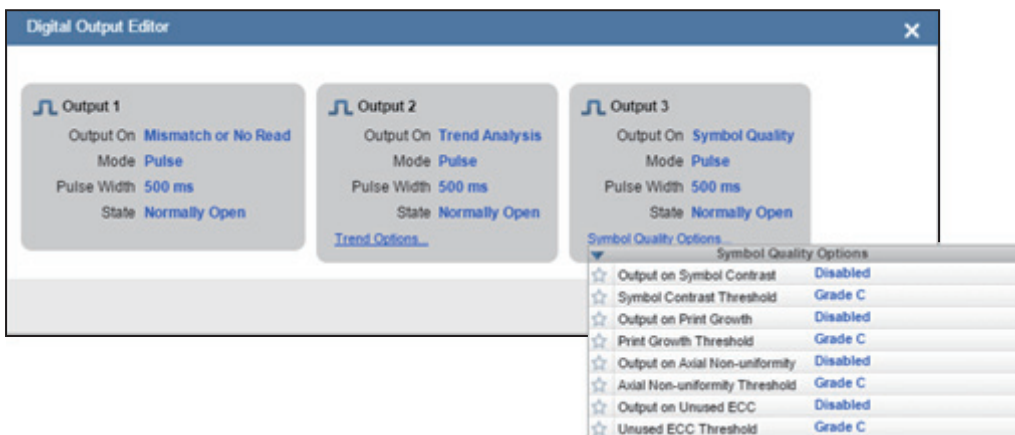
If you select **Insert your own text**, the **Insert text** box will appear, providing a text box in which you can enter characters. If you click the **ASCII** link, a matrix of buttons with standard ASCII control codes will appear.



# Outputs

Bring up the **Output 1**, **Output 2**, and **Output 3** dialogs by clicking on the **Outputs** section at the lower left of the **Setup** view. For each output you can determine the **Output On** behavior, **Mode**, **Pulse Width**, and **State**. **Outputs 2** and **3** also allow you to determine output behavior based on **Trend Options** parameters or **Symbol Quality Options** parameters.

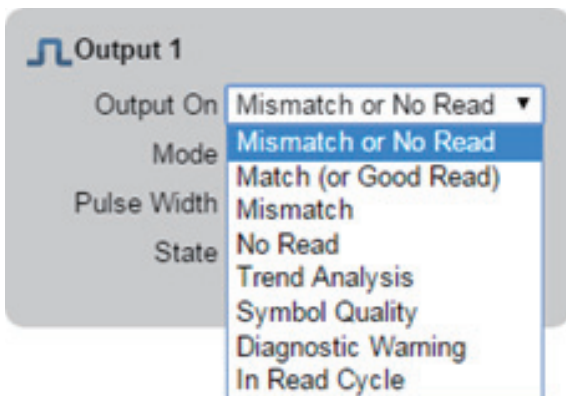
This example shows the dialog that appears when you click **Symbol Quality Options**. A similar dialog would also appear for **Trend Options** under **Output 2**.



**Note:** The **1**, **2**, and **3** output indicators at the lower right of the screen display the results of the last read cycle.

## Output On

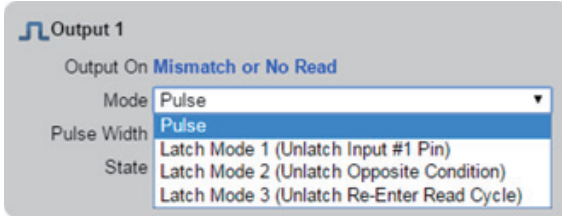
**Output On** provides discrete signaling to host software to control external devices such as PLCs and relays. It is useful for routing, sorting, and to prevent mis-packaging and mis-routing. This option allows you to set the conditions under which an output (or outputs) will be activated.



## Outputs

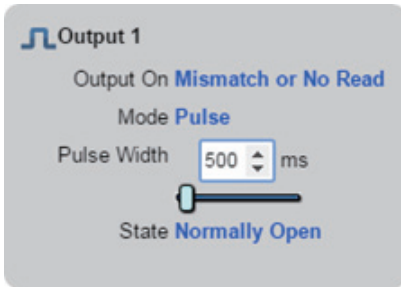
### Mode

**Output Mode** sets the condition in which the discrete output is de-activated.



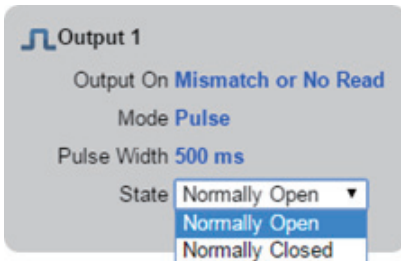
### Pulse Width

**Pulse Width** sets the time in milliseconds that the discrete output remains active.



### State

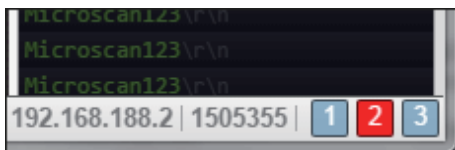
Output **State** allows you to set the active electrical state of the discrete output to **Normally Open** or **Normally Closed**.



## Triggered Outputs

**Triggered Outputs** show when outputs are triggered and give you the ability to trigger outputs manually.

Outputs 1 - 3 are located in the lower right corner of the user interface. They function both as buttons that trigger whichever output you click, and as a display that shows which output is currently being triggered. In the example below, output 2 is being triggered.

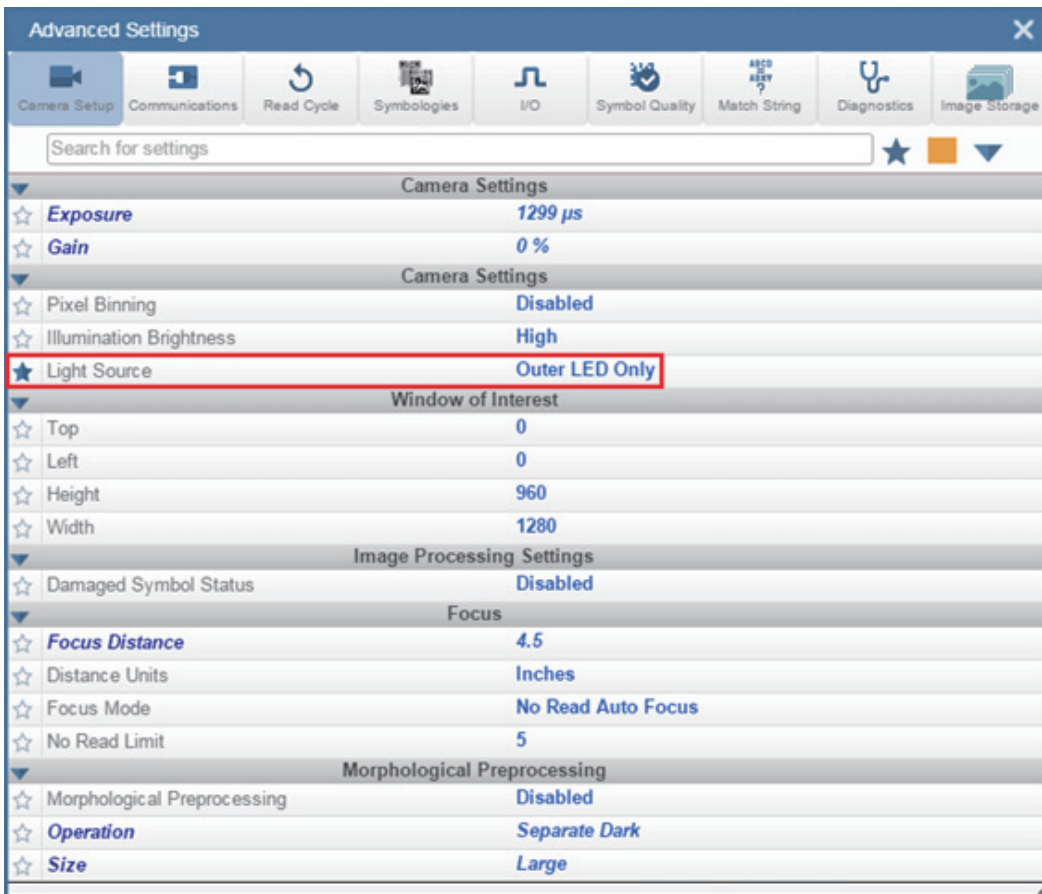
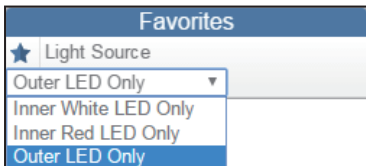


**Note:** These three output indicators display the results of the last read cycle.

# Favorites

The **Favorites** dropdown menu displays commands that you have selected as favorites by clicking the star icons next to command names in the **Advanced Settings** menus. This is useful because it allows you to change the parameters of frequently-used commands without returning to the **Advanced Settings** menus.

In the example below, notice that the star icon next to the **Light Source** command in the **Camera Setup** menu is selected. This causes that command to appear in the **Favorites** editor in the **left panel** of WebLink's **Setup** view. Commands that are displayed in **Favorites** can be configured in the same way as commands in Advanced Settings.



# 5 *Run*

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In the **Run** view, you can observe the progress of the setup as it follows the parameters you have defined. The **right panel** of the **WebLink** UI shows **Counts** for **Cycles**, **Reads**, **No Reads**, and **Mismatches**, as well as **Rate** information for **Capture**, **Decode**, **Overhead**, **Total Read**, and **Trigger Rate**, as well as **Output Data**. A “filmstrip” below the **Image Area** shows each image capture with a **green check mark** for a good read and a **red x** for a No Read.

# Counts

The **Counts** area of the **right panel** provides five data points:

- **Cycles** shows the total number of captures that have occurred.
- **Reads** shows how many decode attempts have been successful.
- **No Read** shows how many decode attempts have been unsuccessful.
- **Mismatch** shows how many times decoded symbol data has not matched a user-defined character string (if a **Match String** is defined).
- **Read %** shows the percentage of decode attempts that have been successful.


Counts 	
Cycles	174
Reads	174
No Read	0
Mismatch	0
Read %	100.00

You can reset all counts by clicking the **eraser icon**.

# Rate

The **Rate** area of the **right panel** provides five data points:

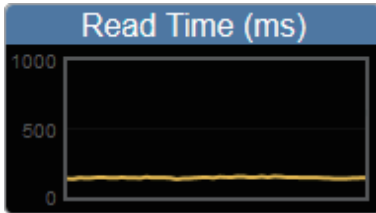
- **Capture** shows the average image capture rate per second.
- **Decode** shows the average decode rate per second.
- **Overhead** shows the average of excess processing time required to achieve captures and decodes.
- **Total Read** shows the total average time required for image capture, decoding, and overhead per second.
- **Trig Rate** shows the average number of triggers per second.

Rate 		
Capture	244.6 ms	4.1/s
Decode	405.1 ms	2.5/s
Overhead	1.0 ms	
Total Read	650.6 ms	1.5/s
Trig Rate	1688.0 ms	0.59/s

You can reset all rate data by clicking the **eraser icon**.

## Read Time

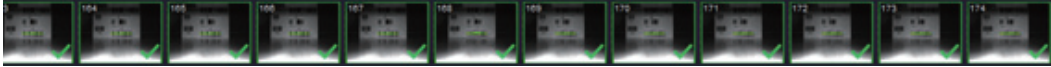
**Read Time (ms)** is a real-time line graph representation of the read time data point in the **Rate** area of the **right panel**.





## Image History

**Image History** is a series of thumbnail representations of each image capture. The Image History appears below the Image Area in the **Run** view. Each image capture thumbnail shows a **green check mark** for a good read and a **red x** for a no read.



# ■ 6 Application Settings

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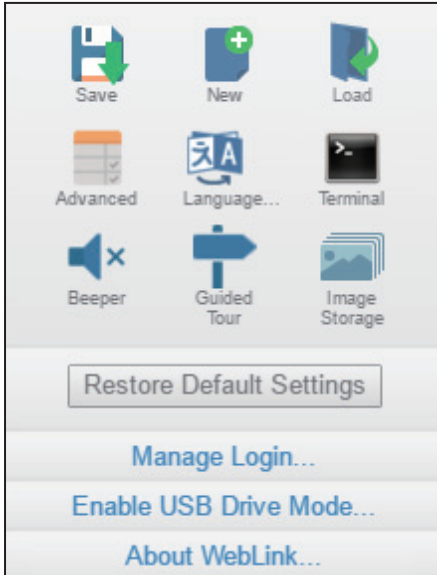
This section describes the **Application Settings** menu, which enables you to control a wide array of **WebLink** and V430 functions.

# Application Settings Menu

Click the **gear icon** to the right of the **help icon** to open the **Application Settings** menu.



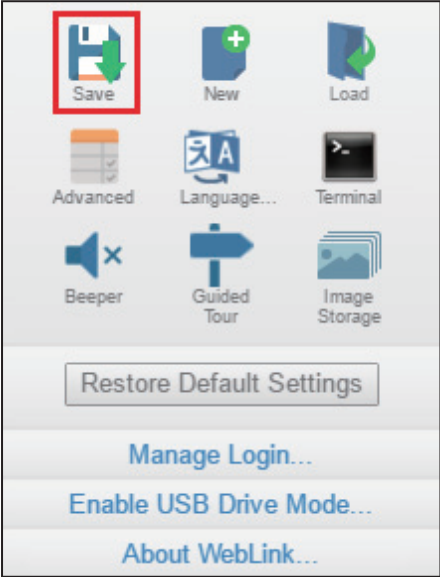
The **Application Settings** menu includes several functions: **Save**, **New**, **Load**, **Advanced**, **Language**, **Terminal**, **Beeper**, **Guided Tour**, **Image Storage**, **Restore Default Settings**, **Manage Login**, **Enable USB Drive Mode** and **About WebLink**.



**Note:** The **Enable USB Drive Mode** option only appears when you are using a reader, which support USB connectivity.

# Save

**Save** saves the current configuration.

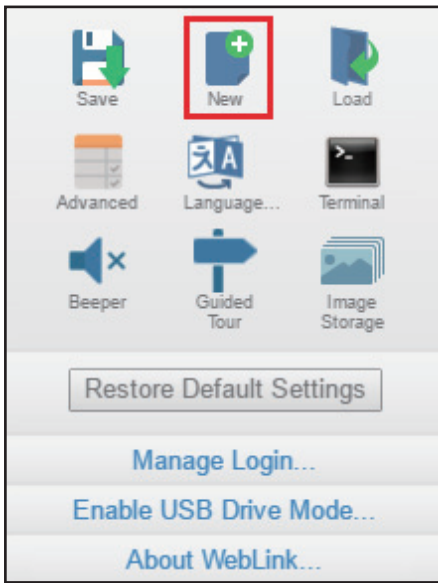


---

New

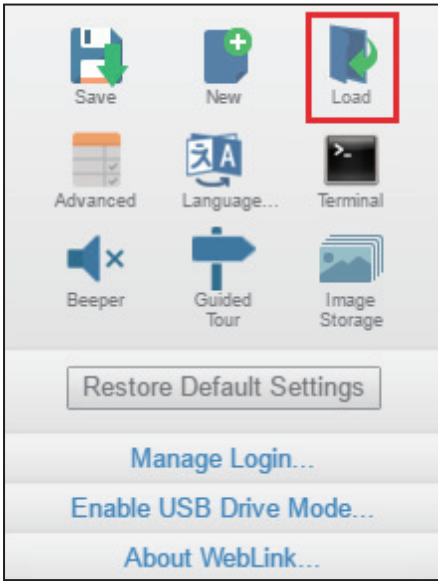
# New

**New** opens a completely new WebLink session.



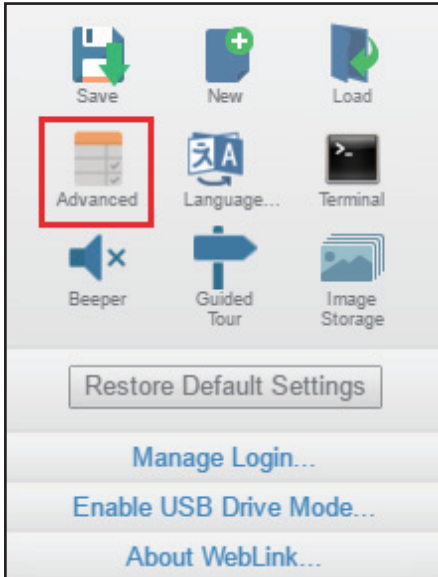
# Load

**Load** allows you to open an existing configuration.



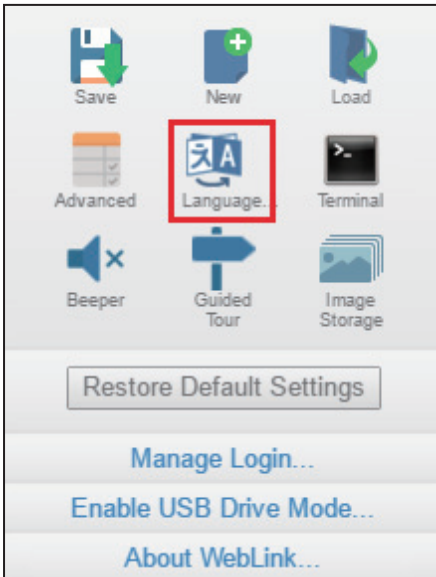
# Advanced

**Advanced** allows you to make precise adjustments to every category of reader functionality: **Camera Setup**, **Communications**, **Read Cycle**, **Symbologies**, **I/O**, **Symbol Quality**, **Match String**, **Diagnostics**, and **Image Storage**.

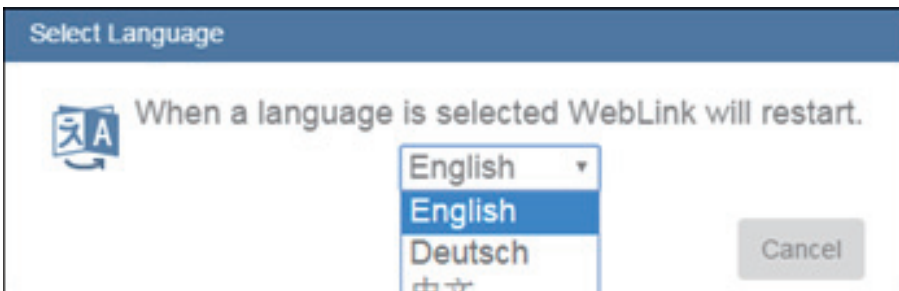


# Language

**Language** allows you to choose the language in which you prefer to use the WebLink interface.



**Important:** The reader will restart when a different language is selected.

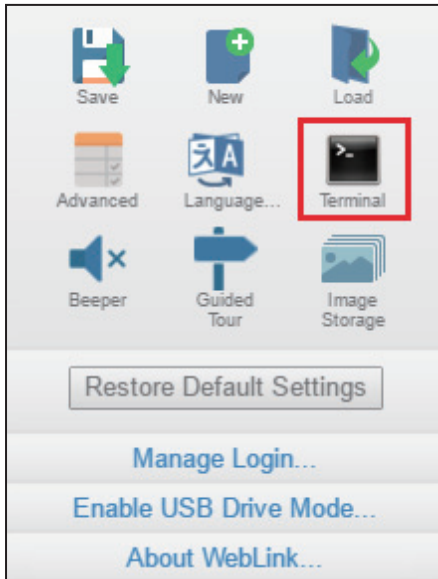


**Available languages:**

- English
- German
- Chinese (Simplified and Traditional)
- Spanish
- Japanese
- Korean
- French
- Portuguese
- Italian

# Terminal

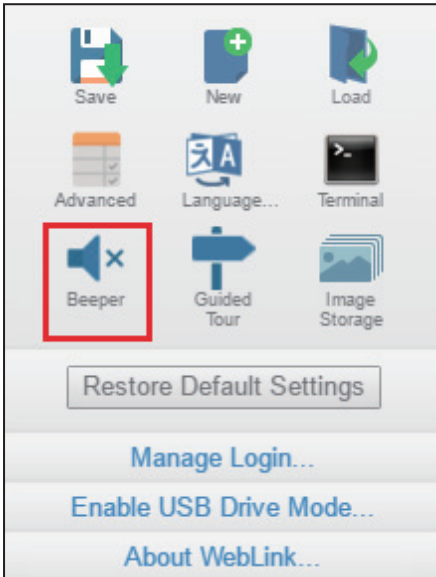
**Terminal** opens WebLink's Terminal interface, where serial commands can be sent, responses from the reader can be shown, and reader output can be displayed.



# Beeper

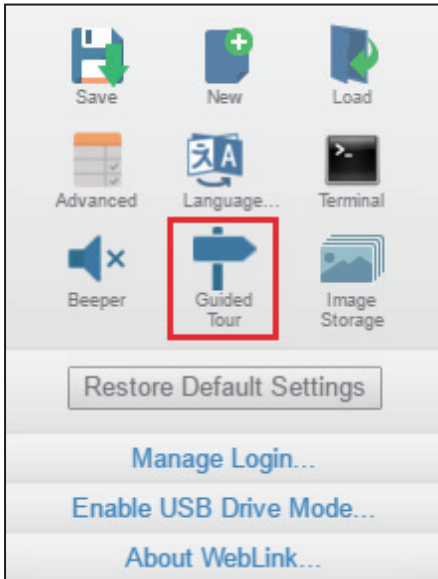
Enabling **Beeper** causes your PC to beep when WebLink receives a decode from the reader.

**Note:** There is no beeper in V430 reader hardware.

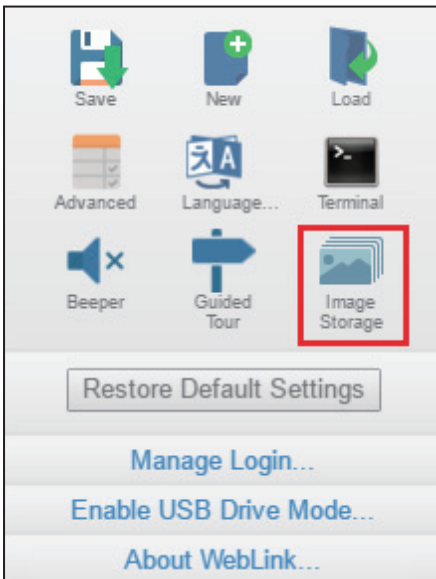


# Guided Tour

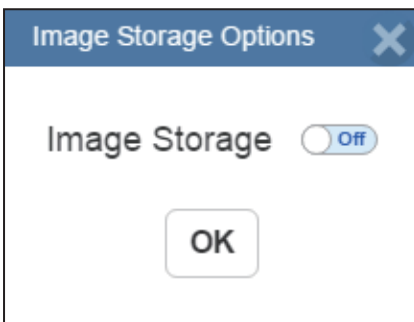
Clicking **Guided Tour** launches a tutorial that explains the functions of the various areas of the WebLink user interface.



## Image Storage

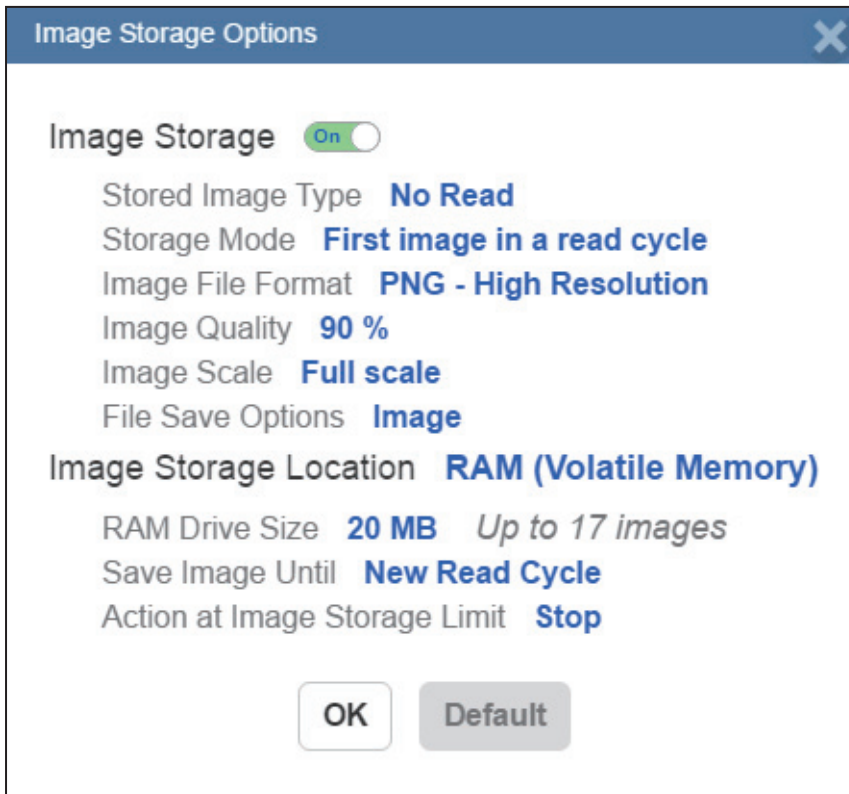


When you click the **Image Storage** icon in the **Application Settings** menu, you will see this dialog:



## Image Storage

When you turn Image Storage on and click **OK**, the dialog will expand as shown below. The **Image Storage Options** dialog shows commands that allow you to control how, when, and where images captured by the camera are stored.



If **Image Storage Location** is set to **Remote (FTP)**, the **FTP Address** will appear, allowing you to input the user ID, password, and address of the applicable FTP server.

**Image Storage Options**

Image Storage  On

Stored Image Type **No Read**

Storage Mode **First image in a read cycle**

Image File Format **PNG - High Resolution**

Image Quality **90 %**

Image Scale **Full scale**

File Save Options **Image**

Image Storage Location **Remote (FTP)**

FTP Address **userid:pass@xxx.xxx.xxx.xxx**

Transfer Optimization **Speed**

Transfer Buffer Size **20 MB** *Up to 17 images per read cycle*

**OK** **Default**

If the RAM drive size changes, the message shown below will appear in the **Image Storage Location** dialog.

If you click **Revert**, the RAM drive size returns to its previous size.

**Image Storage Location Remote (FTP)**

FTP Address **userid|pass@xxx.xxx.xxx.xxx:21**

Transfer Optimization **Accuracy**

RAM Drive Size **35 MB** *Up to 30 images per read cycle*

*Resizing the RAM drive will require a reader reboot* **Revert**

All Image Storage settings can also be configured in **Advanced Settings**.

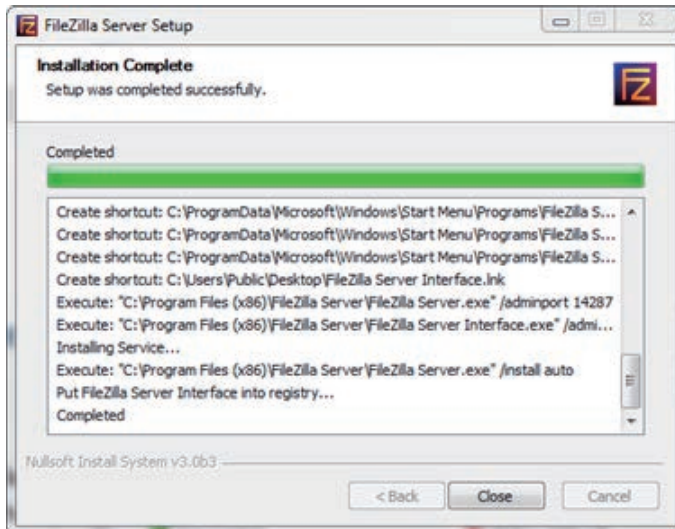
## Image Storage by External FTP Server

An external FTP server can be used to store images captured by the V430. The reader can connect to an FTP server and can send images and cycle reports to that server for storage. The following procedure describes how to set up an external FTP server.

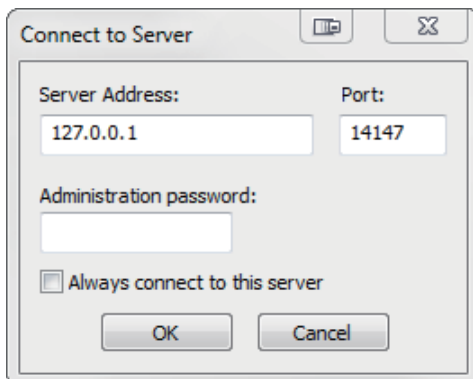
The example procedure shown here uses **FileZilla Server**, which can be downloaded at <https://filezilla-project.org/>.

Note that FileZilla is a Windows-only utility.

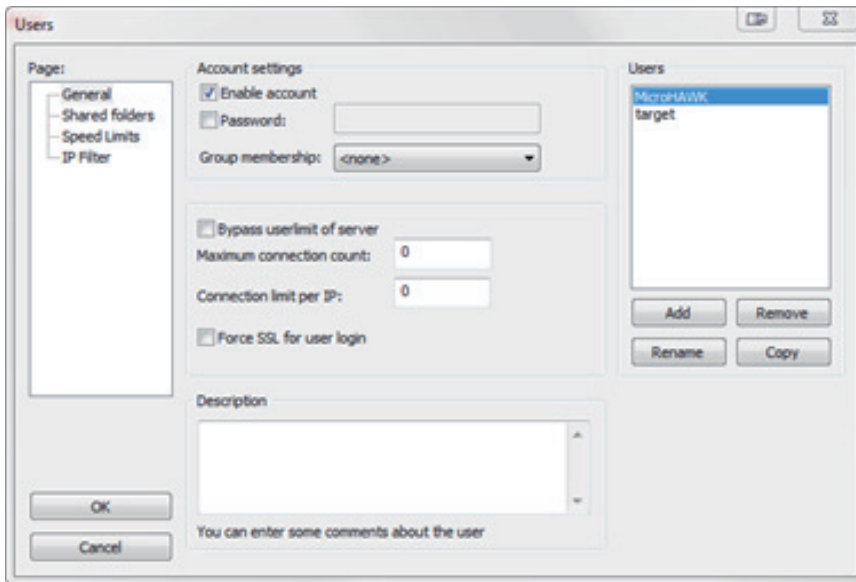
- Download and install FileZilla Server.



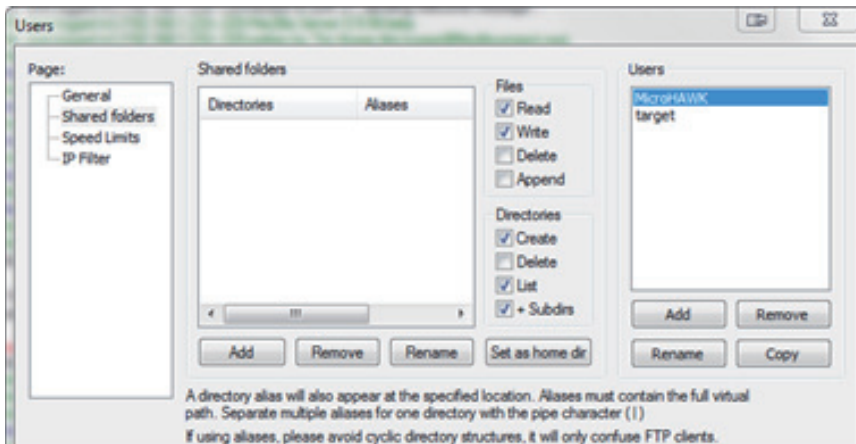
- Connect to the server. Use the **127.0.0.1** server address if you are setting up the server on your PC. Note the port that you use - **14147** in the example shown here - as the port number will be required when you log back into the server.



- Configure the settings on the **General** page of the **Users** dialog.

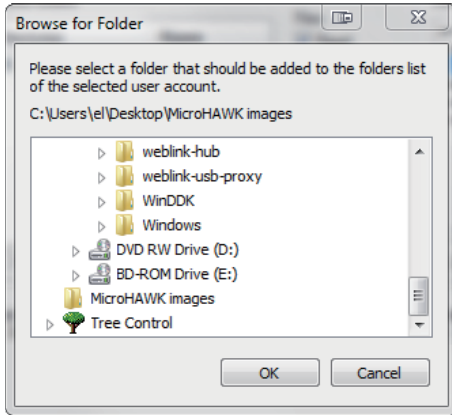


- Navigate to **Shared folders** under **Page**: in the left panel. Be sure that **Write** (under **Files**) is checked and that **Create** (under **Directories**) is checked. Add a new user group - **MicroHAWK** in this example.

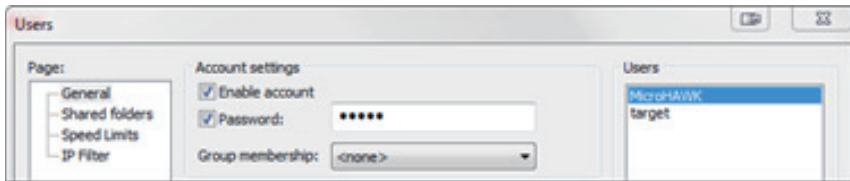


## Image Storage

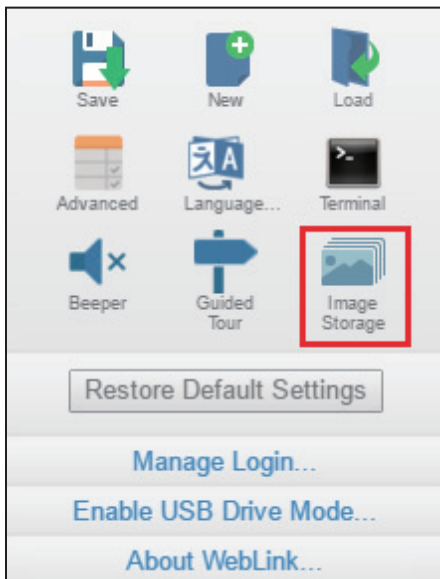
- Browse for the folder on your PC where you want to store images. In this example, the folder is called **C:\Users\el\Desktop\MicroHAWK images**.



- Return to the **General** page and set a password.



- Click **OK** and connect to your V430 reader.
- Open **Application Settings** and click the **Image Storage** icon.



- Update your **Image Storage Options**, including your FTP Address.

**Note:** **pwd** represents the password you set on the **General** page of the FileZilla Server interface.



- If you are changing the RAM drive size, the reader may reboot.

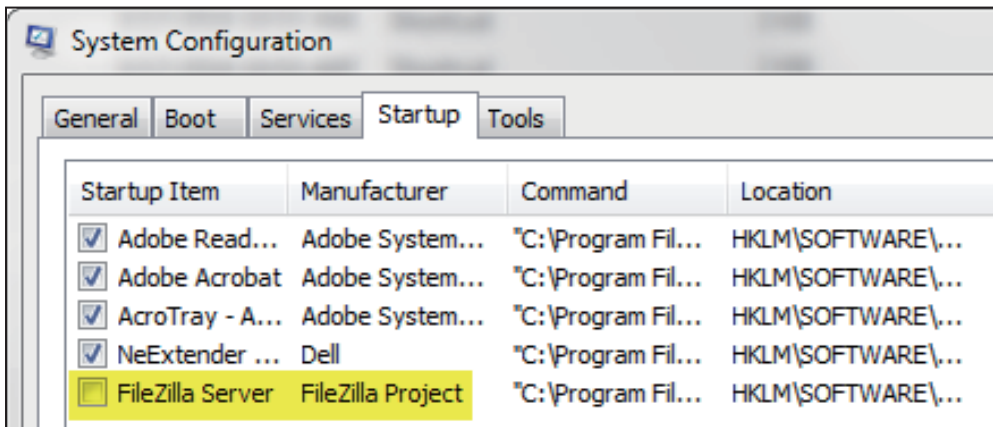
## Start and Stop FileZilla Server

During FileZilla installation, you have the option of configuring FileZilla Server to auto-start each time the MicroHAWK is powered on. You can also start and stop the server manually via the **Start FileZilla Server** and **Stop FileZilla Server** shortcuts shown here.



To disable FileZilla Server's auto-start feature:

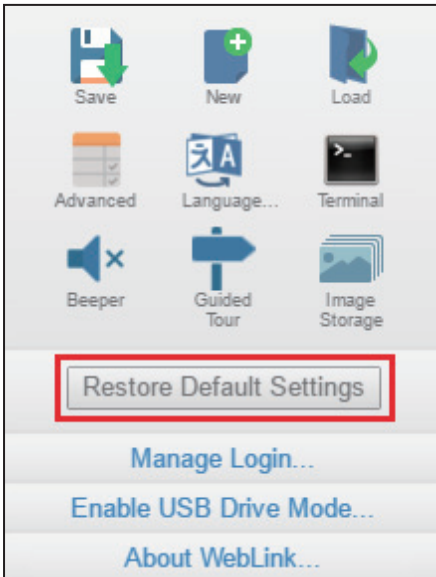
- Type the **Windows button + the 'R' key** to bring up the **Run** dialog.
- In the **Run** dialog's **Open:** field, type **msconfig** and then **Enter**.
- Click the **Startup** tab as shown below.
- Uncheck **FileZilla Server** so it won't launch on startup.



- Click **OK**.
- When prompted, **restart** your computer.

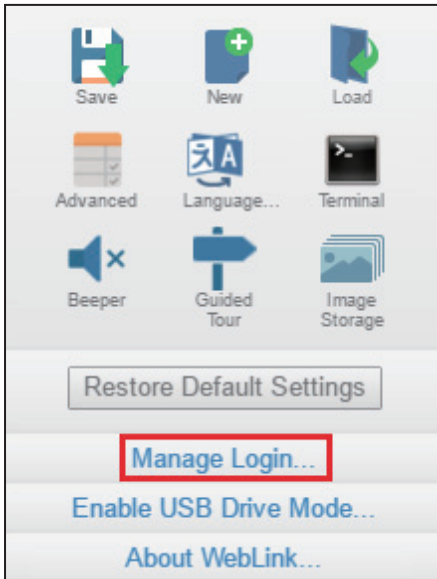
## Restore Default Settings

**Restore Default Settings** returns the reader to the default state in which it was shipped from the manufacturer.

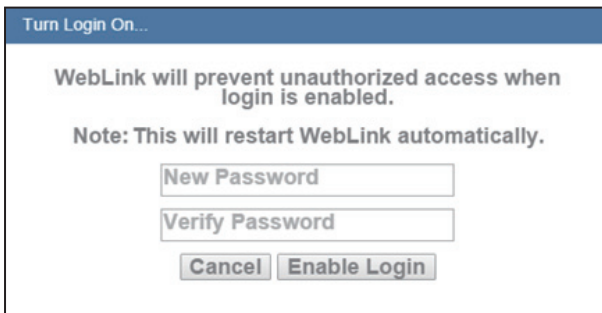


# Manage Login

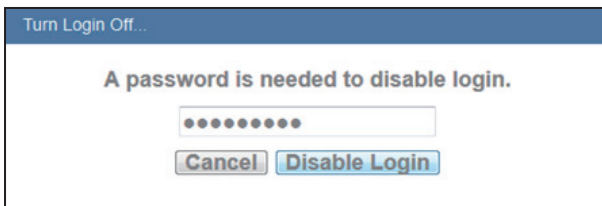
**Manage Login** allows you to set a password that will be required to open a WebLink session.



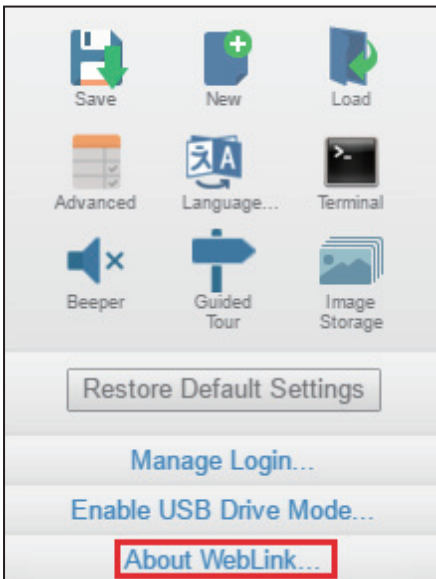
Enter and verify a new password and then click **Enable Login** to password-protect the WebLink configuration.



Enter your password and click **Disable Login** to turn off password protection.



## About WebLink



**About WebLink** opens the dialog shown below, which shows the current **WebLink version**, **Reader Model**, **Serial Number**, **Part Number**, **MAC ID**, **Sensor**, **Firmware version**, **Boot version**, **Browser**, **Operating System**, and **Screen Resolution**.

**Note:** The information in this dialog is selectable so that you can copy it to a clipboard. Clicking **Contact us...** takes you to the **Omron website**.





# 7 WebLink Terminal

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The **Terminal** provides immediate visibility of decode output, allows you to send serial commands to the reader, and allows you to find specific strings within large amounts of data.

---

Send

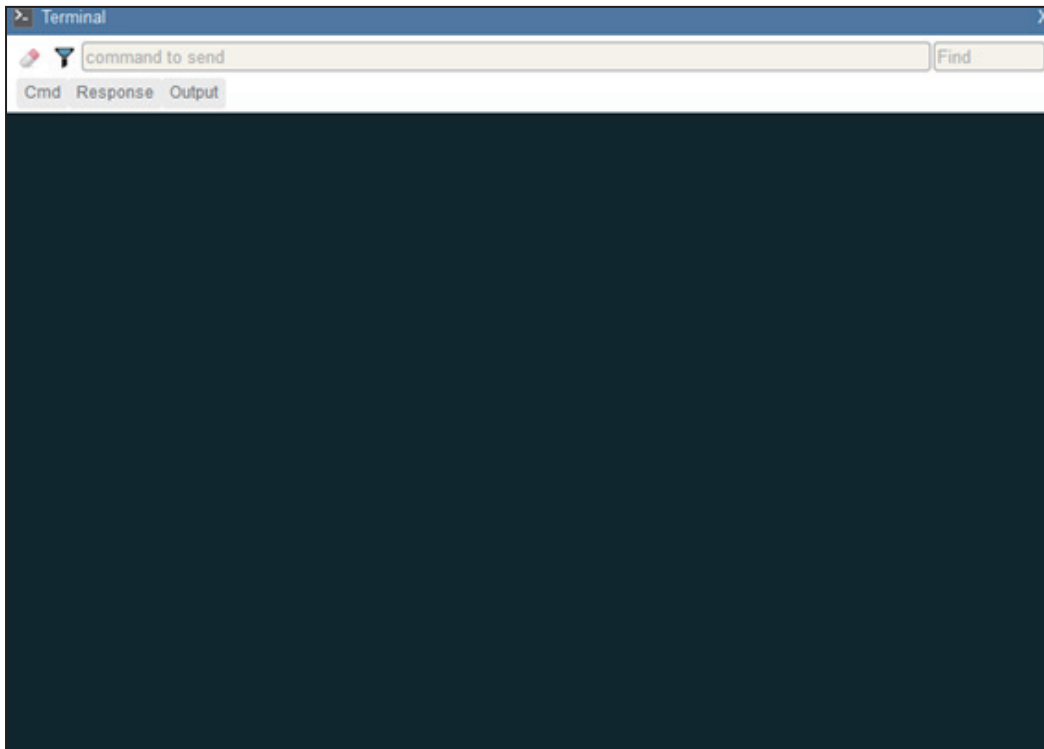
## Send

The Terminal features an auto-complete function that shows several common serial command options as soon as you start typing in the **command to send** field.

The Terminal automatically adds the < and > characters to commands entered in the **command to send** field.

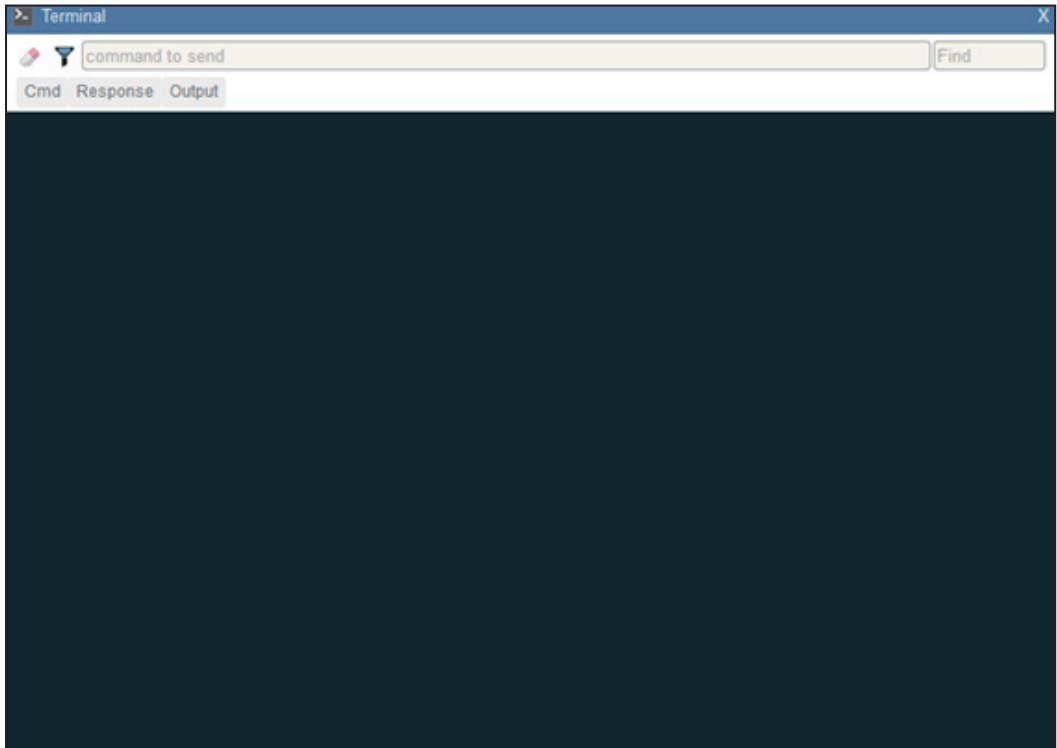
Serial commands sent from the Terminal appear in yellow text and reader output is returned in white text.

Click the **eraser icon** to clear the Terminal screen of all commands, reader responses, and decode output.



# Find

The **Find** field in the top right of the window allows you to enter a specific character string to locate within the data on the Terminal screen.

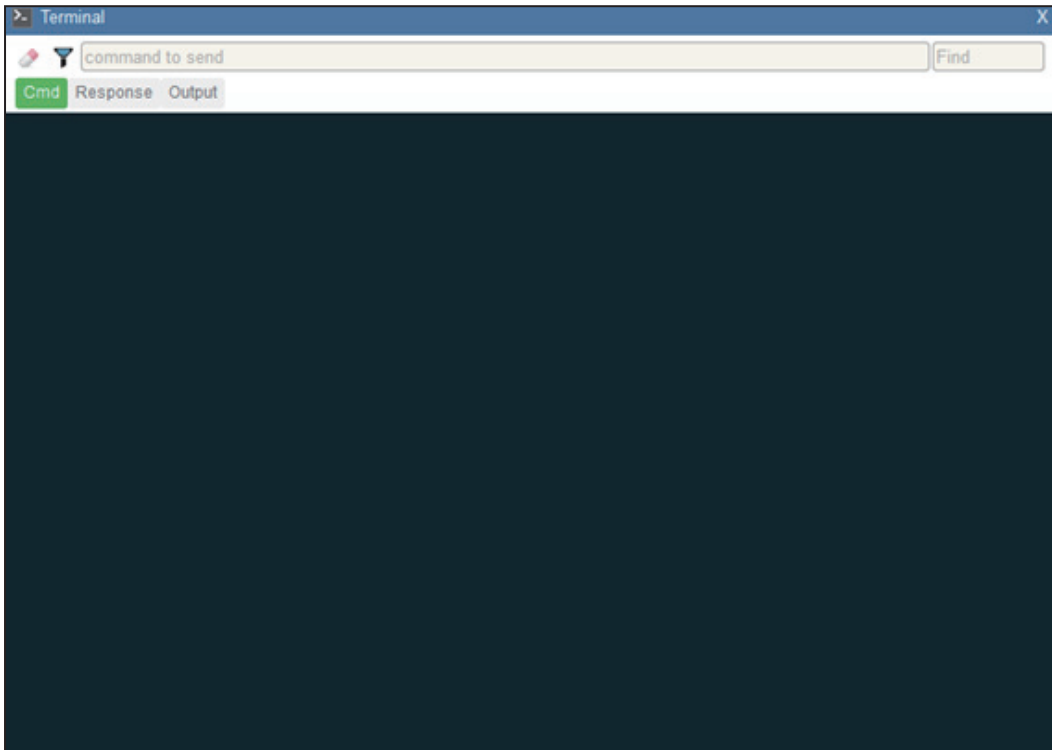


## Filters

Click the **filter icon** to the right of the erase icon to display the three filter buttons.

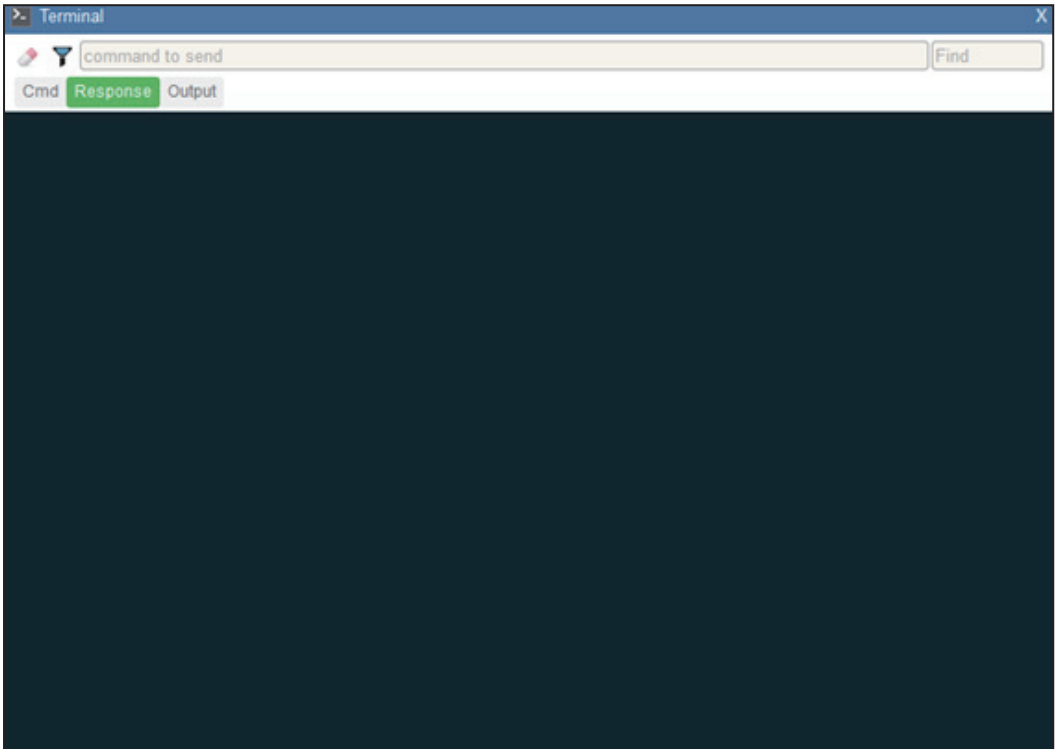
### ***Cmd***

When the **Cmd** filter button is selected, serial commands sent from the **Terminal** are shown. When only the Cmd button is selected, only serial commands are shown.



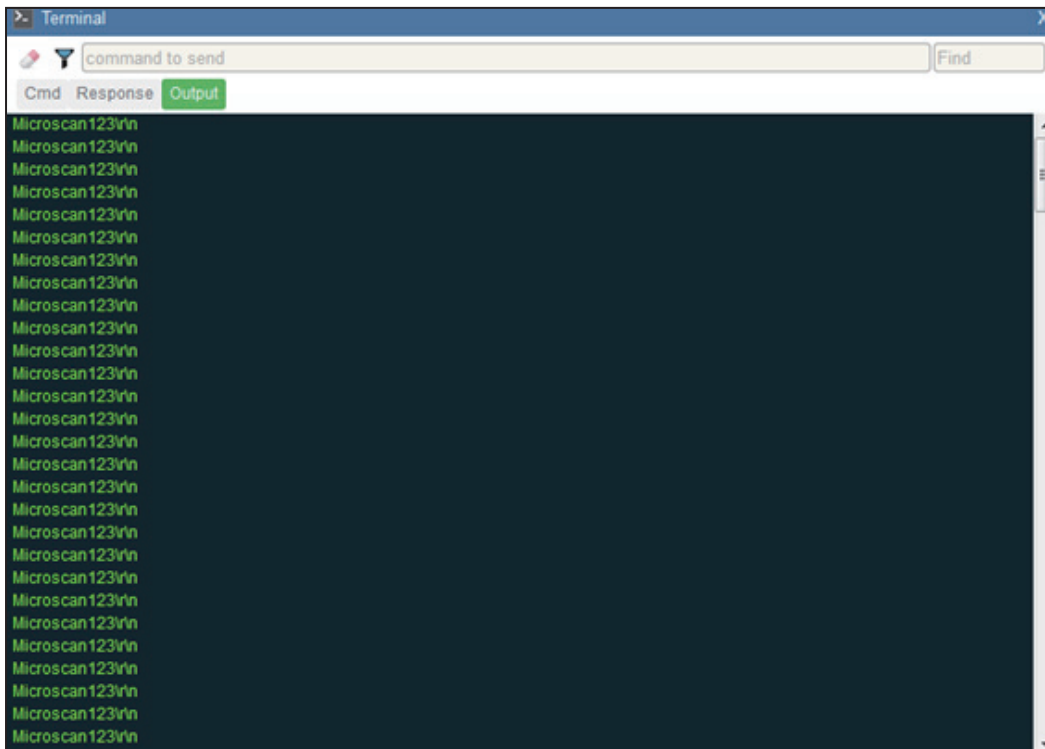
## Response

When the **Response** filter button is selected, responses sent back from the reader are shown. When only the Response button is selected, only responses sent back from the reader are shown.



## Output

When the **Output** filter button is selected, decode output from the reader is shown. When only the Output button is selected, only decode output from the reader is shown.



## Notifications

If character strings searched for in the **Find** field are found but hidden by a disabled filter, a notification like the one shown below will appear above the applicable filter button. If you click that filter button, the results will be displayed in the Terminal and the notification will disappear.



# 8 *Advanced Settings*

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When you click the **gear icon** to bring up the **Application Settings** menu, one of the options you will see is **Advanced**.

WebLink's **Advanced Settings** allow you to make fine adjustments to individual command parameters in all areas of your reader's functionality: **Camera Setup**, **Communications**, **Read Cycle**, **Symbologies**, **I/O**, **Symbol Quality**, **Match String**, **Diagnostics**, and **Image Storage**. Many of these commands can be configured directly in the WebLink user interface, but all parameters can be configured and examined in Advanced Settings.

The Advanced Settings are based on Omron Microscan's proprietary K commands, which are an efficient way to transmit complex commands with multiple parameters to the reader via a serial interface such as WebLink's **Terminal**.

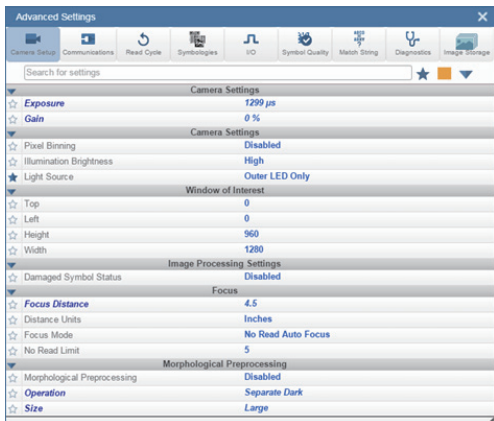
Each menu of Advanced Settings commands is shown in the following nine sections, and an additional section is included that shows an example of the **Differences from Default** menu, which shows only commands that are different from WebLink defaults.

# Camera Setup

The **Camera Setup** menu shows all the commands that control the function of the reader's camera. Many of these command settings can also be controlled from the WebLink user interface. For example, the **Exposure** and **Gain** settings in the **Camera Settings** command can be configured in the **Acquire** section located in the left panel of the **Setup** view.

## Camera Setup Menu

Command parameters can be changed directly from this menu.



## Power Strobe Mode and External Strobe



### Power Strobe Mode

Activate **Power Strobe** mode by setting **Illumination Brightness** (<K536>) to **Extreme** and setting **Light Source** to **External Strobe**.

### External Strobe

**External Strobe** is part of the **Light Source** parameter.

### Fixed Light On Time and Fixed Light Delay Time

**Fixed Light On Time** and **Fixed Light Delay Time** are only valid when **Illumination Brightness** is set to **Extreme**.

## Use as External Illumination Strobe

**Use as External Illumination Strobe** is available in the **Output On** parameter of the **Output 3** command (<K812>) in **I/O Parameters**. **External Strobe** must be enabled for this parameter to function.



# Communications

The **Communications** menu shows all the commands that control the V430's connectivity to the host and to your application's network. These commands also control **Preamble** and **Postamble** settings for decoded data output, **Response Timeout**, **LRC Status**, **ACK/NAK Options**, and **Polling Mode Options**.

Command parameters can be changed directly from this menu.

## Communications Menu



# Read Cycle

The **Read Cycle** menu shows all the commands that control all aspects of read cycle, including triggering, read cycle timing, and image processing.

Command parameters can be changed directly from this menu.

## Read Cycle Menu



# Symbologies

The **Symbologies** menu shows all the commands that allow you precise control of the parameters of all enabled code types. Parameters differ depending on the unique standards of each code type.

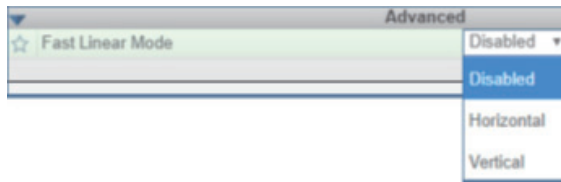
Command parameters can be changed directly from this menu.

## Symbologies Menu



## Fast Linear Mode

**Fast Linear Mode**, located in the **Advanced** section of the **Symbologies** menu, optimizes 1D symbol decoding.



**Note:** If you know the direction the application's symbols will be oriented relative to the reader, set Fast Linear Mode to match that direction.

**Horizontal** requires that the entire symbol be oriented horizontally in the reader's field of view.



**Vertical** requires that the entire symbol be oriented vertically in the reader's field of view.



# I/O

The I/O menu shows all the commands that control a wide range of real-world reader behavior, including the enabling or disabling of messages about various reader states, the configuration of the LEDs, the enabling or disabling of messages about symbol quality, and the sending of signals to external systems such as conveyors and light stacks. Command parameters can be changed directly from this menu.

## I/O Menu



# Symbol Grading

## Grading Overview

The symbol grading features presented in this document are not intended and should not be confused with symbol verification. Verifier and symbol verification is beyond the scope of this document but there are a few points worth noting to aide in understanding the features and operation provided.

Verifiers are systems designed to meet the rigorous standards within the verification specifications. To provide compliant verification verifier systems are not only designed with required features and functionality from the supported standard but also provide many general design features that help eliminate sources of variability that can impact measurements. In contrast readers are designed to provide maximum product flexibility for integration into systems that require reading for traceability. Key reader design specifications such as size, cost, reading range, and reading speed are a few items that drive differences between verifier and reader designs. Understanding these tradeoffs in design can help users optimize reader systems to provide better accuracy and repeatability in grading implementation.

## Calibration

Compliant verification requires verifiers have calibration processes. These processes are required to ensure proper references for grading metrics. The V430 provides no calibration features. It is the user's responsibility to understand how lack of calibration may impact their grading measurements. In addition, some metrics in verification such as Minimum Reflectance in ISO 29158 are directly calculated using data only provide through calibration and have no means of representation without such a process.

## Optical Positioning and Illumination Response

The presentation of the symbol to the reader can have numerous different impacts on grading performance. Verifiers are designed to provide an image with sharp focus, high resolution, and low optical distortion. These items allow verifiers to provide an environment that produces measurements with consistent results. When selecting and positioning a reader for grading it is important that the optical setup provide enough resolution to meet the minimum resolution requirements for that standard (reference standard section for resolution requirements). Although resolution is important the working distance from the imaging optics also plays a significant role in the light collection and optical distortion characteristics of the image system. Further away provides less optical distortion over the field of view but also will have significant impact on the distribution of light depending on the source of illumination. When preparing a system for a grading implementation you must take these items under consideration. First identify the allowable working distances that will provide the target symbols in focus and above the minimum required resolution. Next attempt to provide the most consistent illumination response over the inspection field at the farthest distance. The change in illumination response over distance will be very dependent on the illumination source and environment. Finally, the orientation and consistency of the symbol presentation within the field of view can also impact repeatability. If the illumination response is uneven in the field and the symbol rotated or moves throughout

the field you can expect variability.

## **General Grading Functionality**

### ***Process Overview***

The three specification grading functions described in this document are independent of each other as an inspection process but are dependent on the X Mode decoder being properly setup to read the symbol type provided. The grading evaluation process does not take place until a symbol has first been identified by the X Mode decoder. Once a symbol supported by an enabled grading specification has been identified by the decoder a separate grading inspection will commence. Note this inspection process can add significant processing time to the overall process and each specification requires independent processing. Furthermore, enabling any single parameter within a given specification requires the complete grading process for that specification.

## **Grading - ISO 15416**

### ***Overview***

This section outlines the grading implementation for ISO 15416 available in the V430 firmware. Please refer to the free AIM guide "The Layman's Guide to ANSI, CEN and ISO/IEC Linear Bar Code Print Quality Documents" or the ISO specification documents for additional detail related print quality subject matter.

### ***Supported Symbolologies***

- Code 128 / GS1-128
- UPC-A / UPC-E / EAN-13 / EAN-8
- Interleaved 2 of 5 / ITF-14
- Code 39
- Code 93
- Codabar

### ***Minimum Resolution***

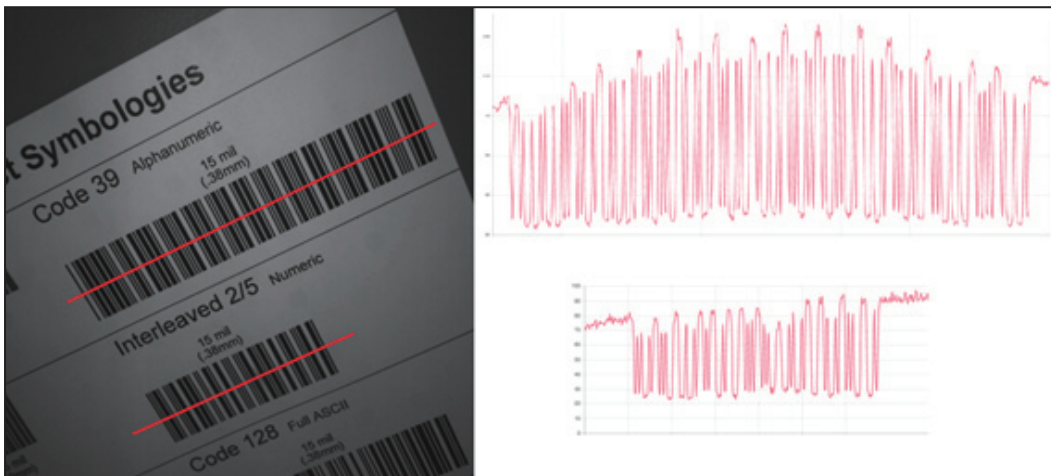
- 4.0 Pixels Per Element (Element = Nominal X Dimension)

## Usage/Notes

### ***Illumination and the Scan Reflectance Profile***

The accuracy and consistency of ISO 15416 grading depends greatly upon the illumination in the field of view. The ISO 15416 specification is evaluated by analyzing individual scan lines applied across the imaged symbol. These scan lines generate a signal called the scan reflectance profile which is the basis of the scan line grading methodology. This scan line grading methodology uses a fixed threshold to determine whether the signal state represents a bar or a space. Verification systems are designed to create a very flat relative signal response across the field of view. For reading a symbol there is a high tolerance to variability in the response. When grading or verifying a symbol a flat relative response is what allows the symbol to be precisely measured. Different optical configurations and illumination sources can create a wide range of responses that can impact measurements in a variety of ways.

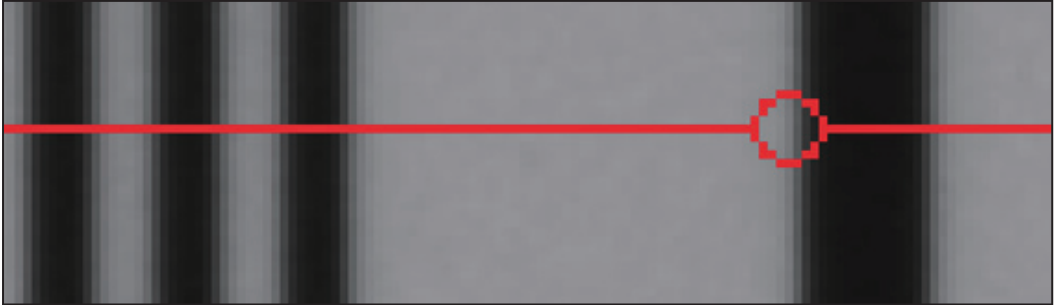
To illustrate how variation that appears subtle to the eye can have a large impact on grading performance consider the following image from a standard reader using internal illumination. The scan reflectance profile for two line scans in the image are shown to the right of the imaged symbols. The larger symbol which spans the entire field of view shows dramatic differences. The spaces in the center of the symbol are providing 50% more signal response than the quiet zones at either edge of the field of view. Similarly, the smaller symbol lower in the field of view provides a much lower overall response throughout its region. Scenarios like this will create low modulation scores and differences in defect scores depending on the physical location of the defect. Worse yet if the symbol is moved within the field of view it will receive different scores. It is recommended that external illumination is used and evaluated closely for response characteristics when using ISO 15416 grading.



**Uneven Illumination**

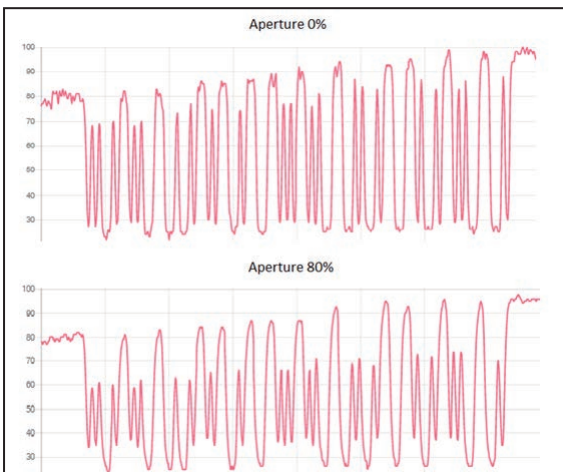
## Synthetic Aperture

The synthetic aperture is a process in ISO 15416 that is applied to the image when extracting the scan line profile for grading. The aperture is an averaging process using a circular region along the scan line shown below.



## Scan Line Aperture

This averaging provides a generalization of the information in the image consistent with typical reading equipment acquisition techniques. Verification systems implement the aperture based on the physical dimension of the symbol under test and the application standard guidelines such as GS1. In a reader with varying optical setup and no calibration process there is no means to know the size of the symbol under inspection. Because of this the aperture is a configurable parameter as a percentage of the narrow element of the symbol under evaluation. The default value provides a general use case similar to application standards, but it is the users responsibility to ensure this percentage matches the grading objectives. A representation of the effects of the aperture is shown below. Selecting a larger aperture creates more of an averaging effect that is less sensitive to defects but may lower modulation.



## Aperture Effects

## ***Overall, Scan, and Individual Parameter Grades***

The overall grade is calculated in accordance with the process defined in ISO 15416. This is often misunderstood so a review is provided here. The overall grade is an average of the individual scan grades that are applied over the inspection region. The individual scan grades are not provided but these are calculated internally as the lowest of grade of any single parameter grade evaluated in that scan or zero if the scan fails the edge determination or quiet zone requirements. The individual parameter grades provided are averages of only those parameters grades where they are evaluated. These individual average parameter grades available are not themselves part of the overall grade calculation but can be helpful information for diagnosing degrading overall grades. This creates some circumstances where the overall grade can be lower than the lowest average grade particularly when there are degrading features in the symbol from different parameters.

## **Configuration**

### ***15416 Grading Serial Output***

Enable or disable the output the grading value. The output is either in value 1 to 100, or in letter grade A to F.

### ***Aperture***

The size of aperture to use for grading configured as a percentage of the nominal narrow element width for the symbol under evaluation. For example, if you have a 13 mil UPC symbol and you wish to grade using a 6 mil aperture you would configure the aperture to 46% ( $6/13 = 0.46$ ).

### ***Overall***

#### **Disabled**

The overall grade is not formatted as part of the symbol output.

#### **Enabled**

The overall grade is formatted and attached to the decoded data as a value.

### ***Edge Determination***

#### **Disabled**

The edge determination is not formatted as part of the symbol output.

#### **Enabled**

The edge determination is formatted and attached to the decoded data as a value.

## ***Decode***

### **Disabled**

The Decode is not formatted as part of the symbol output.

### **Enabled**

The Decode is formatted and attached to the decoded data as a value.

## ***Contrast***

### **Disabled**

The Contrast is not formatted as part of the symbol output.

### **Enabled**

The Contrast is formatted and attached to the decoded data as a value.

## ***Minimum Reflectance***

### **Disabled**

The minimum reflectance is not formatted as part of the symbol output.

### **Enabled**

The minimum reflectance is formatted and attached to the decoded data as a value.

## ***Minimum Edge Contrast***

### **Disabled**

The minimum edge contrast is not formatted as part of the symbol output.

### **Enabled**

The minimum edge contrast is formatted and attached to the decoded data as a value.

## ***Modulation***

### **Disabled**

The Modulation is not formatted as part of the symbol output.

### **Enabled**

The Modulation is formatted and attached to the decoded data as a value.

### ***Defects***

#### **Disabled**

The Defects is not formatted as part of the symbol output.

#### **Enabled**

The Defects is formatted and attached to the decoded data as a value.

### ***Decodability***

#### **Disabled**

The Decodability is not formatted as part of the symbol output.

#### **Enabled**

The Decodability is formatted and attached to the decoded data as a value.

### ***Quiet Zone***

#### **Disabled**

The Quiet Zone is not formatted as part of the symbol output.

#### **Enabled**

The Quiet Zone is formatted and attached to the decoded data as a value.

### ***15416 Grading Logic Output and Threshold 1 - 3***

This parameter defines the 15416 parameter and threshold that if fallen below will assert the appropriate output. The output must be configured to output on 15416 validation before these settings apply.

### ***Output on Overall Grade***

#### **Disabled**

This will not be evaluated to drive the output.

#### **Enabled**

This will be evaluated against the corresponding threshold to drive the output.

### ***Overall Grade Threshold***

This is to use as a threshold for driving the output. Output will be driven if grade is under the threshold.

### ***Edge Determination***

#### **Disabled**

This will not be evaluated to drive the output.

#### **Enabled**

This will be evaluated against the corresponding threshold to drive the output.

### ***Edge Determination Threshold***

This is to use as a threshold for driving the output. Output will be driven if grade is under the threshold.

### ***Decode***

#### **Disabled**

This will not be evaluated to drive the output.

#### **Enabled**

This will be evaluated against the corresponding threshold to drive the output.

### ***Decode Threshold***

This is to use as a threshold for driving the output. Output will be driven if grade is under the threshold.

### ***Contrast***

#### **Disabled**

This will not be evaluated to drive the output.

#### **Enabled**

This will be evaluated against the corresponding threshold to drive the output.

### ***Contrast Threshold***

This is to use as a threshold for driving the output. Output will be driven if grade is under the threshold.

### ***Min Reflectance***

#### **Disabled**

This will not be evaluated to drive the output.

#### **Enabled**

This will be evaluated against the corresponding threshold to drive the output.

### ***Min Reflectance Threshold***

This is to use as a threshold for driving the output. Output will be driven if grade is under the threshold.

### ***Min Edge Contrast***

#### **Disabled**

This will not be evaluated to drive the output.

#### **Enabled**

This will be evaluated against the corresponding threshold to drive the output.

### ***Min Edge Contrast Threshold***

This is to use as a threshold for driving the output. Output will be driven if grade is under the threshold.

### ***Modulation***

#### **Disabled**

This will not be evaluated to drive the output.

#### **Enabled**

This will be evaluated against the corresponding threshold to drive the output.

### ***Modulation Threshold***

This is to use as a threshold for driving the output. Output will be driven if grade is under the threshold.

### ***Defects***

#### **Disabled**

This will not be evaluated to drive the output.

#### **Enabled**

This will be evaluated against the corresponding threshold to drive the output.

### ***Defects Threshold***

This is to use as a threshold for driving the output. Output will be driven if grade is under the threshold.

## ***Decodability***

### **Disabled**

This will not be evaluated to drive the output.

### **Enabled**

This will be evaluated against the corresponding threshold to drive the output.

## ***Decodability Threshold***

This is to use as a threshold for driving the output. Output will be driven if grade is under the threshold.

## ***Quiet Zone***

### **Disabled**

This will not be evaluated to drive the output.

### **Enabled**

This will be evaluated against the corresponding threshold to drive the output.

## ***Quiet Zone Threshold***

This is to use as a threshold for driving the output. Output will be driven if grade is under the threshold.

## **Grade Metrics**

### ***Overall Grade***

The overall is calculated in accordance with the ISO 15416 specification. The overall grade is the average of the scan grades applied to the symbol. The individual scan grades are the lowest individual parameter grade seen during the individual scan. These scan grades are not available for output.

### ***Minimum Reflectance***

The Minimum reflectance is calculated and graded for each scan and provided for the overall grade calculation in accordance with the ISO 15416 specification. The minimum reflectance parameter grade and value provided for output is an average value for each measured scan over the entire symbol.

### ***Minimum Edge Contrast***

Contrast measurement assume 8 bit 0-255 grey correlate 0-100% reflectance The Minimum Edge Contrast is calculated and graded for each scan and provided for the overall grade calculation in accordance with the ISO 15416 specification. The parameter grade and value provided for output is an average value for each measured scan over the entire symbol.

### ***Symbol Contrast***

Contrast measurements assume 8 bit 0-255 grey correlate to 0-100% reflectance. Contrast is calculated and graded for each scan and provided for the overall grade calculation in accordance with the ISO 15416 specification. The parameter grade and value provided for output is an average value for each measured scan over the entire symbol.

### ***Modulation***

Modulation is calculated and graded for each scan and provided for the overall grade calculation in accordance with the ISO 15416 specification. The parameter grade and value provided for output is an average value for each measured scan over the entire symbol.

### ***Defects***

Defects are calculated and graded for each scan and provided for the overall grade calculation in accordance with the ISO 15416 specification. The parameter grade and value provided for output is an average value for each measured scan over the entire symbol.

### ***Decodability***

Decodability is calculated and graded for each scan and provided for the overall grade calculation in accordance with the ISO 15416 specification. The parameter grade and value provided for output is an average value for each measured scan over the entire symbol.

### ***Decode***

Decode is calculated and graded for each scan and provided for the overall grade calculation in accordance with the ISO 15416 specification. The parameter grade and value provided for output is an average value for each measured scan over the entire symbol.

### ***Quiet Zone***

Quiet zone is not an individually processed parameter within the ISO 15416 specification but is evaluated as part of the ISO graded decode parameter that feeds into the overall grade. Quiet zone is provided here as average scan result where a passing scan receives a A/4.0 grade and a fail receives a F/0.0.

## Grading - ISO 15415

### **Overview**

This section outlines the grading implementation for ISO 15415 available in the V430 firmware.

### **Supported Symbologies**

- DataMatrix ECC 200 / GS1 DataMatrix
- QR Code

### **Minimum Resolution**

- 6.0 Pixels Per Element (Element = Nominal Cell Dimension)

### **Configuration**

#### **15415 Grading Serial Output**

Enable or disable the output the grading value. The output is either in value 1 to 100, or in letter grade A to F.

### **Aperture**

The size of aperture to use for grading configured as a percentage of the nominal narrow element width for the symbol under evaluation. For example, if you have a 15 mil UPC symbol and you wish to grade using a 10 mil aperture you would configure the aperture to 67% ( $10/15 = 0.67$ ).

### **Overall**

#### **Disabled**

The overall grade is not formatted as part of the symbol output.

#### **Enabled**

The overall grade is formatted and attached to the decoded data as a value.

### **Contrast**

#### **Disabled**

The contrast is not formatted as part of the symbol output.

#### **Enabled**

The contrast is formatted and attached to the decoded data as a value.

### ***Modulation***

#### **Disabled**

The modulation is not formatted as part of the symbol output.

#### **Enabled**

The modulation is formatted and attached to the decoded data as a value.

### ***Reflectance Margin***

#### **Disabled**

The reflectance margin is not formatted as part of the symbol output.

#### **Enabled**

The reflectance margin is formatted and attached to the decoded data as a value.

### ***Fixed Pattern Damage***

#### **Disabled**

The fixed pattern damage is not formatted as part of the symbol output.

#### **Enabled**

The fixed pattern damage is formatted and attached to the decoded data as a value.

### ***Axial Non-Uniformity***

#### **Disabled**

The axial nonuniformity is not formatted as part of the symbol output.

#### **Enabled**

The axial nonuniformity is formatted and attached to the decoded data as a value.

### ***Grid Non-Uniformity***

#### **Disabled**

The grid nonuniformity is not formatted as part of the symbol output.

#### **Enabled**

The grid nonuniformity is formatted and attached to the decoded data as a value.

## **Unused ECC**

### **Disabled**

The unused ECC is not formatted as part of the symbol output.

### **Enabled**

The unused ECC is formatted and attached to the decoded data as a value.

## **15415 Grading Logic Output and Threshold 1 - 3**

This parameter defines the 15415 parameter and threshold that if fallen below will assert the appropriate output. The output must be configured to output on 15415 validation before these settings apply.

### **Output on Overall Grade**

#### **Disabled**

This will not be evaluated to drive the output.

#### **Enabled**

This will be evaluated against the corresponding threshold to drive the output.

### **Overall Grade Threshold**

This is to use as a threshold for driving the output. Output will be driven if grade is under the threshold.

### **Symbol Contrast**

#### **Disabled**

This will not be evaluated to drive the output.

#### **Enabled**

This will be evaluated against the corresponding threshold to drive the output.

### **Symbol Contrast Threshold**

This is to use as a threshold for driving the output. Output will be driven if grade is under the threshold.

### ***Modulation***

#### **Disabled**

This will not be evaluated to drive the output.

#### **Enabled**

This will be evaluated against the corresponding threshold to drive the output.

### ***Modulation Threshold***

This is to use as a threshold for driving the output. Output will be driven if grade is under the threshold.

### ***Reflectance Margin***

#### **Disabled**

This will not be evaluated to drive the output.

#### **Enabled**

This will be evaluated against the corresponding threshold to drive the output.

### ***Reflectance Margin Threshold***

This is to use as a threshold for driving the output. Output will be driven if grade is under the threshold.

### ***Fixed Pattern Damage***

#### **Disabled**

This will not be evaluated to drive the output.

#### **Enabled**

This will be evaluated against the corresponding threshold to drive the output.

### ***Fixed Pattern Damage Threshold***

This is to use as a threshold for driving the output. Output will be driven if grade is under the threshold.

### ***Axial Non-Uniformity***

#### **Disabled**

This will not be evaluated to drive the output.

#### **Enabled**

This will be evaluated against the corresponding threshold to drive the output.

### ***Axial Non-Uniformity Threshold***

This is to use as a threshold for driving the output. Output will be driven if grade is under the threshold.

### ***Grid Non-Uniformity***

#### **Disabled**

This will not be evaluated to drive the output.

#### **Enabled**

This will be evaluated against the corresponding threshold to drive the output.

### ***Grid Non-Uniformity Threshold***

This is to use as a threshold for driving the output. Output will be driven if grade is under the threshold.

### ***Unused ECC***

#### **Disabled**

This will not be evaluated to drive the output.

#### **Enabled**

This will be evaluated against the corresponding threshold to drive the output.

### ***Unused ECC Threshold***

This is to use as a threshold for driving the output. Output will be driven if grade is under the threshold.

## **Grade Metrics**

### ***Overall Grade***

The overall is calculated in accordance with the ISO 15415 specification. The overall grade is the lowest individual parameter grade seen during the individual scan.

### ***Symbol Contrast***

Contrast measurements assume 8 bit 0-255 grey correlate to 0-100% reflectance. Symbol Contrast is calculated in accordance with the ISO 15415 specification.

### ***Modulation***

Reflectance Margin is calculated in accordance with the ISO 15415 specification.

### ***Reflectance Margin***

Reflectance Margin is calculated in accordance with the ISO 15415 specification.

### ***Fixed Pattern Damage***

Fixed Pattern Damage is calculated in accordance with the ISO 15415 specification.

### ***Axial Non-Uniformity***

Axial Non-Uniformity is calculated in accordance with the ISO 15415 specification.

### ***Grid Non-Uniformity***

Grid Non-Uniformity is calculated in accordance with the ISO 15415 specification.

### ***Unused Error Correction***

Unused Error Correction is calculated in accordance with the ISO 15415 specification.

## **Grading - ISO 29158**

### ***Overview***

This section outlines the grading implementation for ISO 29158 available in the V430 firmware.

### ***Supported Symbolologies***

- DataMatrix ECC200/GS1 DataMatrix

### ***Minimum Resolution***

- 6.0 Pixels Per Element (Element = Nominal Cell Dimension)

## **Configuration**

### ***29158 Grading Serial Output***

Enable or disable the output the grading value. The output is either in value 1 to 100, or in letter grade A to F.

### ***Overall***

#### **Disabled**

The overall grade is not formatted as part of the symbol output.

#### **Enabled**

The overall grade is formatted and attached to the decoded data as a value.

### ***Cell Contrast***

#### **Disabled**

The contrast is not formatted as part of the symbol output.

#### **Enabled**

The contrast is formatted and attached to the decoded data as a value.

### ***Cell Modulation***

#### **Disabled**

The modulation is not formatted as part of the symbol output.

#### **Enabled**

The modulation is formatted and attached to the decoded data as a value.

### ***Fixed Pattern Damage***

#### **Disabled**

The fixed pattern damage is not formatted as part of the symbol output.

#### **Enabled**

The fixed pattern damage is formatted and attached to the decoded data as a value.

### ***Axial Non-Uniformity***

#### **Disabled**

The axial nonuniformity is not formatted as part of the symbol output.

#### **Enabled**

The axial nonuniformity is formatted and attached to the decoded data as a value.

### ***Grid Non-Uniformity***

#### **Disabled**

The grid nonuniformity is not formatted as part of the symbol output.

#### **Enabled**

The grid nonuniformity is formatted and attached to the decoded data as a value.

## **Unused ECC**

### **Disabled**

The unused ECC is not formatted as part of the symbol output.

### **Enabled**

The unused ECC is formatted and attached to the decoded data as a value.

## **29158 Grading Logic Output and Threshold 1 - 3**

This parameter defines the 29158 parameter and threshold that if fallen below will assert the appropriate output. The output must be configured to output on 29158 validation before these settings apply.

### **Output on Overall Grade**

#### **Disabled**

This will not be evaluated to drive the output.

#### **Enabled**

This will be evaluated against the corresponding threshold to drive the output.

### **Overall Grade Threshold**

This is to use as a threshold for driving the output. Output will be driven if grade is under the threshold.

### **Cell Contrast**

#### **Disabled**

This will not be evaluated to drive the output.

#### **Enabled**

This will be evaluated against the corresponding threshold to drive the output.

### **Cell Contrast Threshold**

This is to use as a threshold for driving the output. Output will be driven if grade is under the threshold.

### ***Cell Modulation***

#### **Disabled**

This will not be evaluated to drive the output.

#### **Enabled**

This will be evaluated against the corresponding threshold to drive the output.

### ***Cell Modulation Threshold***

This is to use as a threshold for driving the output. Output will be driven if grade is under the threshold.

### ***Fixed Pattern Damage***

#### **Disabled**

This will not be evaluated to drive the output.

#### **Enabled**

This will be evaluated against the corresponding threshold to drive the output.

### ***Fixed Pattern Damage Threshold***

This is to use as a threshold for driving the output. Output will be driven if grade is under the threshold.

### ***Axial Non-Uniformity***

#### **Disabled**

This will not be evaluated to drive the output.

#### **Enabled**

This will be evaluated against the corresponding threshold to drive the output.

### ***Axial Non-Uniformity Threshold***

This is to use as a threshold for driving the output. Output will be driven if grade is under the threshold.

### ***Grid Non-Uniformity***

#### **Disabled**

This will not be evaluated to drive the output.

#### **Enabled**

This will be evaluated against the corresponding threshold to drive the output.

### ***Grid Non-Uniformity Threshold***

This is to use as a threshold for driving the output. Output will be driven if grade is under the threshold.

### ***Unused ECC***

#### **Disabled**

This will not be evaluated to drive the output.

#### **Enabled**

This will be evaluated against the corresponding threshold to drive the output.

### ***Unused ECC Threshold***

This is to use as a threshold for driving the output. Output will be driven if grade is under the threshold.

## **ISO 29158 Metrics**

### ***Overall Grade***

The overall grade is the minimum grade of all evaluated parameters, noting minimum reflectance is not evaluated.

### ***Cell Contrast***

Cell Contrast is calculated in accordance with the ISO 29158 specification.

### ***Cell Modulation***

Cell modulation is calculated in accordance with the ISO 29158 specification. Note the difference in the calculation for Cell Modulation versus Modulation in ISO 15415 eliminated the need for the parameter Reflectance Margin which was added to ISO 15415.

### ***Fixed Pattern Damage***

Fixed Pattern Damage is calculated in accordance with the ISO 29158 specification.

### ***Axial Non-Uniformity***

Axial Non-Uniformity is calculated in accordance with the ISO 29158 specification.

### ***Grid Non-Uniformity***

Grid Non-Uniformity is calculated in accordance with the ISO 29158 specification.

### ***Unused Error Correction***

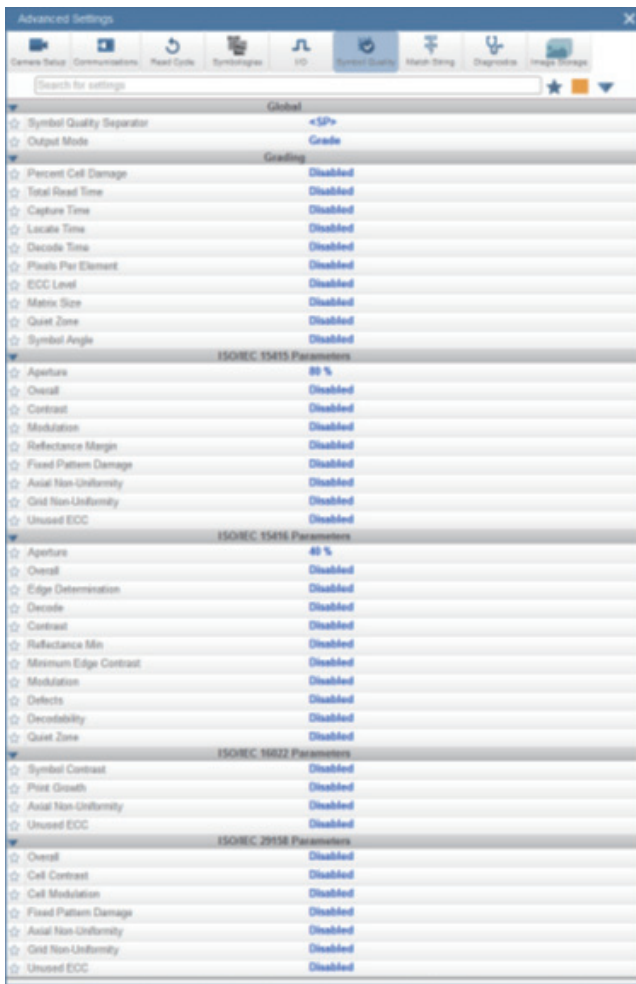
Unused Error Correction is calculated in accordance with the ISO 29158 specification.

# Symbol Quality

The **Symbol Quality** menu shows commands that allow you to define the evaluation of symbols per the ISO/IEC 16022 specification, or by a collection of commonly-used grading parameters. The two Global commands allow you to define the separator that will appear between instances of symbol quality output, and the format in which symbol quality evaluations will be output.

Command parameters can be changed directly from this menu.

## Symbol Quality Menu



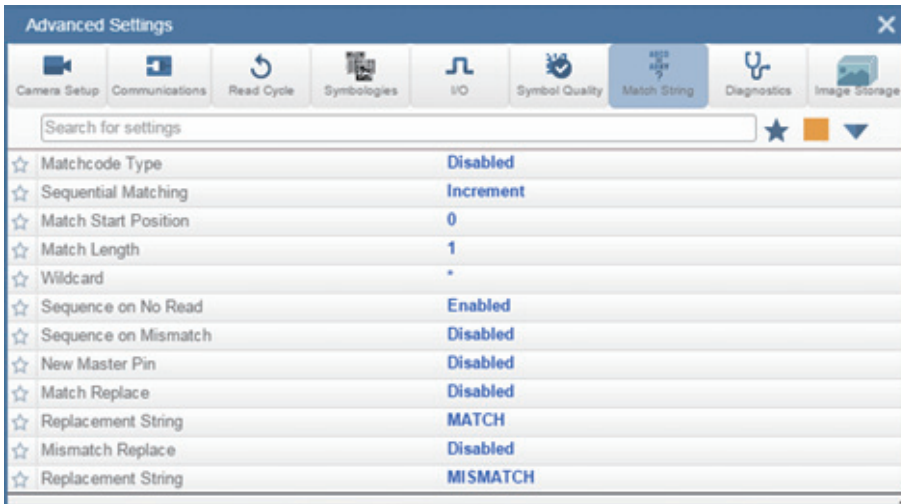
**Important:** For descriptions of symbol grading functionality, refer to the **Symbol Grading** section in [I/O](#).

# Match String

The **Match String** menu shows all the commands that allow you to determine the type of matching behavior required of the reader, as well as new master pin functionality (enabled or disabled), and the character strings intended to replace a string of decoded data that is either a match or mismatch with the user-defined match string.

Command parameters can be changed directly from this menu.

## Match String Menu



# Diagnostics

The **Diagnostics** menu shows commands that allow you to change various service messages as well as the reader's name. It also allows you to examine the read-only count values for multiple reader functions and states.

Command parameters can be changed directly from this menu.

## Diagnostics Menu



# Image Storage

The **Image Storage** menu shows commands that allow you to control how, when, and where images captured by the reader are stored.

The **Image Storage** and **Image Storage Location** commands shown below are functionally identical to those described in **Application Settings**. For example, when you configure the **FTP Address** command as shown below, the outcome is the same as it would have been had you used the graphic user interface accessible from the Application Settings menu.

Image Storage Location			
☆ <b>Image Storage Location</b>	Remote (FTP)		
☆ <b>FTP Address</b>	userid	pass	192.168.1.1 21
☆ Transfer Optimization	Speed		
☆ RAM Drive Size	20 MB		

## Image Storage Menu

Command parameters can be changed directly from this menu.

The screenshot shows the 'Advanced Settings' application with the 'Image Storage' menu selected. The menu is organized into three sections:

- Image Storage**
  - Image Storage Status: Disabled
  - Stored Image Type: No Read
  - Image Storage Mode: First image in a read cycle
  - Image File Format: PNG - High Resolution
  - Image Quality: 90 %
  - Image Scale: Full scale
  - File Save Options: Image
- Image Storage Location**
  - Image Storage Location: RAM (Volatile Memory)
  - RAM Drive Size: 20 MB
  - Save Image Until: New Read Cycle
  - Action at Image Storage Limit: Stop
- Image Output (EZ Trax Compatible)**
  - Image Output: Disabled
  - Comm Port: RS232
  - Stored Image Type: Disabled
  - Image Format: JPG - Low Resolution
  - Image Quality: 90 %
  - Decode Output: Disabled
  - Grade Output: Disabled

# Differences from Default

The **Differences from Default** menu shows only commands whose parameters are not currently set to WebLink defaults. Commands from any of the eight categories may appear in this menu.

Command parameters can be changed directly from this menu.





# Appendices

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# Appendix A — General Specifications

Model		V430-F000□50C	V430-F000□12M	V430-F□□□M03M
Applicable codes *1	Bar code	Code 39, Code 128, BC412, ITF (Interleaved 2 of 5), EAN/UPC, Codabar, Code 93, Pharmacode, PLANET, POSTNET, Japanese Post, Australian Post, Royal Mail, Intelligent Mail, KIX, UPU, GS1 Databar (Composite)		
	2D code	DataMatrix (ECC000-ECC200), GS1 DataMatrix, QR Code, Micro QR Code, Aztec Code, DotCode, PDF417, Micro PDF417, GS1 Databar (Stacked)		
Reading performance *2	Number of reading digits	No upper limit (depends on bar width and reading distance)		
	Aiming light	Two Blue LEDs		
	Light source	• Inner LEDs: Four White and Four Red LEDs (wave length: 625 nm)		
		• Outer LEDs: Eight White LEDs	• Outer LEDs: Eight Red LEDs (wave length: 617 nm)	• Outer LEDs: Eight Red LEDs (wave length: 617 nm)
	Installation distance	*3		
	Field of view	*3		
	Pitch angle ( $\alpha$ )	$\pm 30^\circ$		
	Skew angle ( $\beta$ )	$\pm 30^\circ$		
Tilt angle ( $\gamma$ )	$\pm 180^\circ$			
Image capture device	Effective pixels	2592 (H) x 1944 (V)	1280 (H) x 960 (V)	752 (H) x 480 (V)
	Color/ Monochrome	Color CMOS	Monochrome CMOS	Monochrome CMOS
	Shutter Method	Rolling shutter	Global shutter	Global shutter
	Frame Rate	5 fps	42 fps	60 fps
	Shutter Speed	50 us to 100 ms		
Image logging		FTP		
Reading trigger		External trigger (edge, level), Trigger by command (Ethernet, RS-232C)		
I/O specifications	Input signals	Trigger, New Master: 4.5 to 28V rated (10 mA at 28 VDC)		
	Output signals	Output1, Output2, Output3: 1 to 28V rated (100 mA Max. at 24 VDC)		
	Communication specification	RS-232C, Ethernet TCP/IP, EtherNet/IP*4, PROFINET*4		
	Ethernet specifications	100BASE-TX/10BASE-T		

Model		V430-F000□50C	V430-F000□12M	V430-F□□□M03M
Indicator Lamps *5		PASS (Green), TRIG (Amber), MODE (Amber), LINK (Amber), FAIL (Red), PWR (Green)		
Power voltage		5.0 to 30.0 VDC (including ripple)		
Consumption current		0.18A (max.) / 0.15A (typ.) (at 24 VDC)		
Environmental specifications	Ambient temperature range	Operating: 0 to 40°C, Storage: -50 to +75°C (with no icing or condensation)		
	Ambient humidity range	Operating: 5 to 85%, Storage: 5 to 85% (with no condensation)		
	Ambient atmosphere	No corrosive gases		
	Vibration Resistance (destruction)	10 to 55 Hz, double amplitude: 0.35 mm, X/Y/Z directions, 10 cycles/axis		
	Shock resistance (destruction)	150 m/s <sup>2</sup> , 3 times in each X/Y/Z directions		
	Degree of protection	IEC 60529 IP67		
Weight	Main body only	Approx. 68 g		
	Packing weight	Approx. 174 g (including packing)		
Dimensions	Main body Dimension	44.5 (W) × 44.5 (D) × 25.4 (H) mm		
	Packing Dimension	170 (W) × 117 (D) × 86 (H) mm		
Accessories		Instruction manual ("Read me first"), Compliance Sheet (CE)		
LED class		Risk Group Exempt (IEC 62471-1)		
Safety standards		EN61326-1: 2013 FCC Part 15, Subpart B (Class A) KC CISPR 11, IEC 61000-4-2: 2008 UL60950-1 RCM, EAC, BSMI, BIS		
Material	Case	Aluminum diecast, alumite (black)		
	Reading window	Acrylic		

\*1. These are the code types supported based on Omron's read capability validation standard. It is recommended that the customer do its own validation in its actual work environment.

\*2. Unless otherwise specified, the reading performance is defined with center of field of view, angle R=∞.

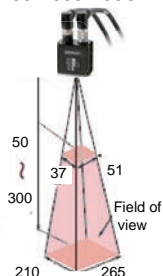
## General Specifications

\*3.

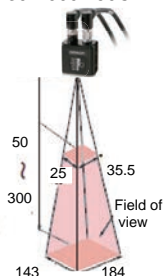
### Field of view / Installation distance

(Unit: mm)

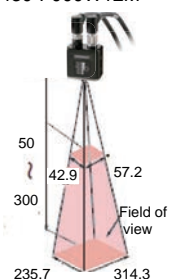
Auto Focus  
QSXGA Wide View  
V430-F000W50C



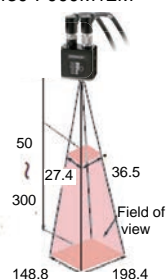
Auto Focus  
QSXGA Middle View  
V430-F000M50C



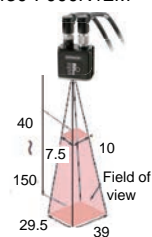
Auto Focus  
SXGA Wide View  
V430-F000W12M



Auto Focus  
SXGA Middle View  
V430-F000M12M



Auto Focus  
SXGA Narrow View  
V430-F000N12M



Fixed Focus  
WVGA Middle View

	V430-F102M03M	V430-F081M03M	V430-F050M03M
Field of view:	65mm	49mm	35mm
Installation distance:	102mm	81mm	50mm

\*4. EtherNet/IP and PROFINET are supported in firmware version 1.3.1 and later.

If an earlier version than 1.3.1 is used, please update the firmware.

Please refer to "Step4 — Explore the Start View" for checking the firmware version, and "How to Update Reader Firmware using ESP" for the updating method.

\*5. The LEDs indicate the following status in default.

PWR (Green): Lit during the power is supplied.

FAIL (Red): Lit when No-Read (Unlit in Read Cycle)

LINK (Orange): Lit in communications established.

MODE (Orange): Lit in Read Cycle

TRIG (Orange): Lit when the TRIG signal (in parallel) is turned on.

PASS (Green): Lit in Good Read (Unlit in Read Cycle).

The following is a different mode in Lit/Unlit status of the LEDs.

- When the Read Rate mode (command) is set, the LED indicator will be lit longer as the Read Rate increases.
- In Bar Code Configuration mode, the LED indicators are flickered in order.

## General Specifications

### Read Ranges

V430-F000W50C  
QSXGA Standard Density, Wide View

Installation Distance (mm)	Field of View (mm)		Read Ranges (mm)		Typical 2D Element Size (mm)
	Horizontal	Vertical	Inside	Outside	
50	51	37	43	59	0.13
102	96	75	80	124	0.19
300	265	210	203	397	0.38

V430-F000M50C  
QSXGA High Density, Middle View

Installation Distance (mm)	Field of View (mm)		Read Ranges (mm)		Typical 2D Element Size (mm)
	Horizontal	Vertical	Inside	Outside	
50	35.5	25	46.5	54.5	0.13
102	66	49	94	110	0.13
300	184	143	227	373	0.38

V430-F000W12M  
SXGA Standard Density, Wide View

Installation Distance (mm)	Field of View (mm)		Read Ranges (mm)		Typical 2D Element Size (mm)
	Horizontal	Vertical	Inside	Outside	
50	57.2	42.9	37	64	0.19
102	109.5	82.2	74	131	0.26
300	314.3	235.7	224	427	0.77

V430-F000M12M  
SXGA High Density, Middle View

Installation Distance (mm)	Field of View (mm)		Read Ranges (mm)		Typical 2D Element Size (mm)
	Horizontal	Vertical	Inside	Outside	
50	36.5	27.4	47.5	55	0.13
102	71.4	53.6	88	116	0.19
300	198.4	148.8	185	400	0.51

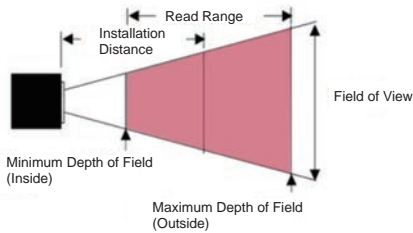
V430-F000N12M  
SXGA Ultra High Density, Narrow View

Installation Distance (mm)	Field of View (mm)		Read Ranges (mm)		Typical 2D Element Size (mm)
	Horizontal	Vertical	Inside	Outside	
40	10.0	7.5	38.5	41.5	0.09
81	20.6	15.4	78.5	83.5	0.09
150	39.0	29.5	132	153	0.13

V430-F□□M03M  
 WVGA High Density, Middle View

Model	Installation Distance (mm)	Field of View (mm)		Read Ranges (mm)		Typical 2D Element Size (mm)
		Horizontal	Vertical	Inside	Outside	
V430-F050M03M	50	35	21.5	43	58	0.19
V430-F081M03M	81	49	33	65	97	0.26
V430-F102M03M	102	65	41	83	121	0.26

Read range specifications are subject to change.



Model	Minimum 2D Element Size (mm)*
V430-F000W50C	0.13
V430-F000M50C	0.09
V430-F000W12M	0.13
V430-F000M12M	0.09
V430-F000N12M	0.05
V430-F050M03M	0.13
V430-F081M03M	0.19
V430-F102M03M	0.26

\*

- V430-F000W50C: Installation distance = 50 mm, Field of view = 51 × 37 mm
- V430-F000M50C: Installation distance = 50 mm, Field of view = 35.5 × 25 mm
- V430-F000W12M: Installation distance = 50 mm, Field of view = 57.2 × 42.9 mm
- V430-F000M12M: Installation distance = 50 mm, Field of view = 36.5 × 27.4 mm
- V430-F000N12M: Installation distance = 40 mm, Field of view = 10 × 7.5 mm
- V430-F050M03M: Installation distance = 50 mm, Field of view = 35 × 21.5 mm
- V430-F081M03M: Installation distance = 81 mm, Field of view = 49 × 33 mm
- V430-F102M03M: Installation distance = 102 mm, Field of view = 65 × 41 mm

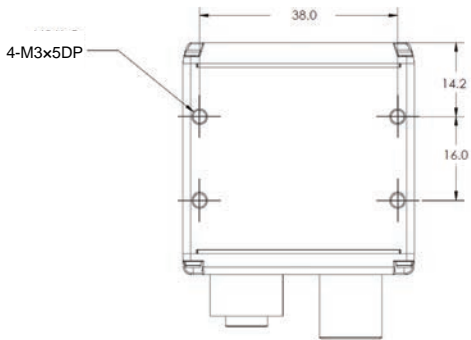
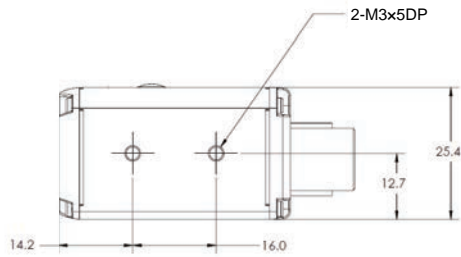
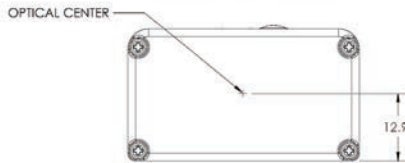
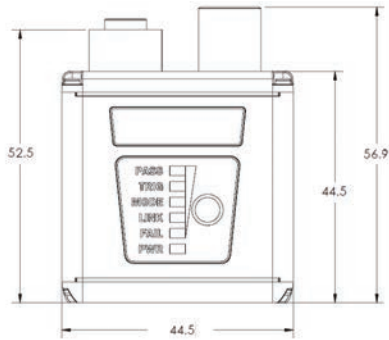
The minimum size is what could be read in ideal conditions.

General Specifications

# Dimensions

Code Reader V430-F

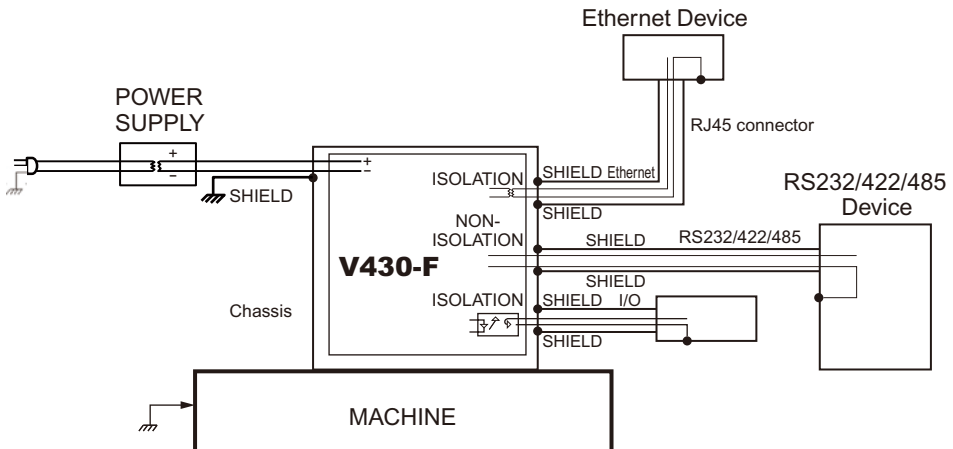
(Unit: mm)



Grounding and Power

**Ground and Shield Considerations**

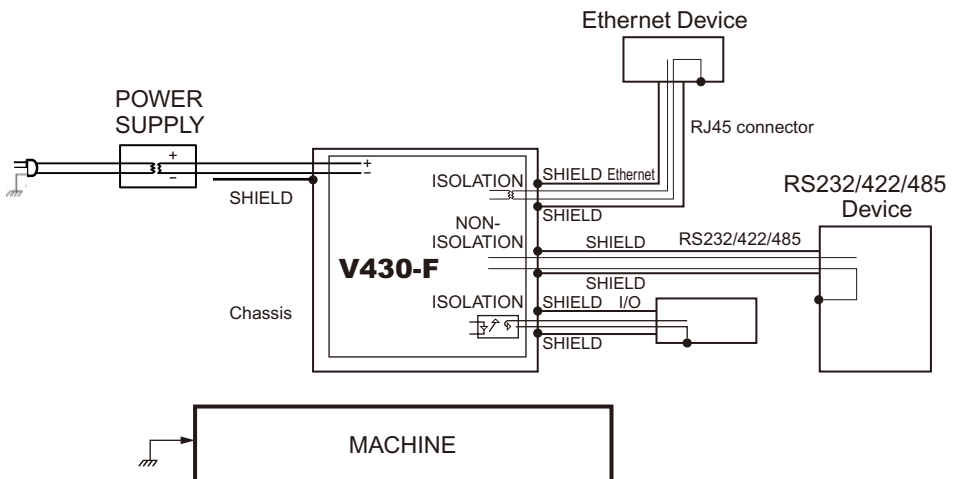
Proper grounding is necessary for operator safety, noise reduction, and the protection of equipment from voltage transients. Buildings, including any steelwork, all circuits, and all junction boxes must be grounded directly to an earth ground in compliance with local and national electrical codes.



*An earth ground is provided through the cable shields and chassis of the camera.*

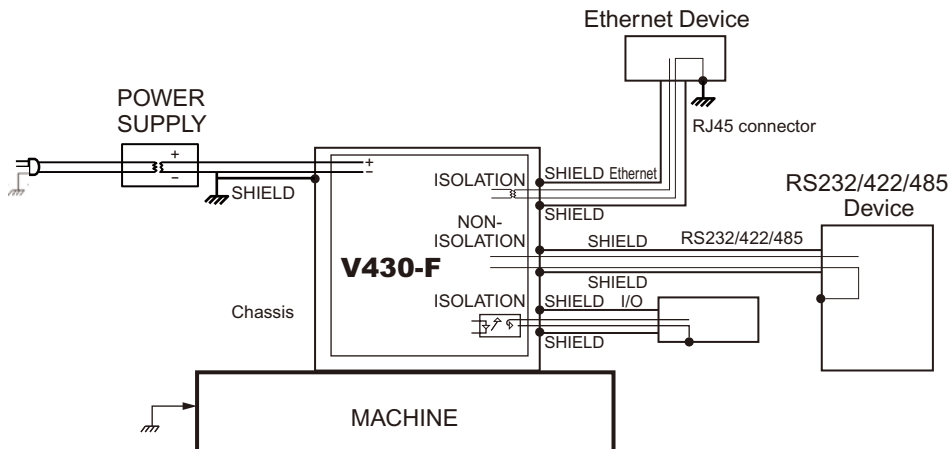
If V430-F malfunctioned due to influence of the environment by shield cables grounded, try any of them below.

- Disconnect the chassis and the shield cable of the power supply from the earth.



## General Specifications

- Ground the shield cable of the power supply to  $-(0V)$ .  
Ground any of one part of the shield cable, chassis, or RJ-45 connector of Ethernet cable to earth with D class grounding. Use a Class 2 power supply for the DC source.

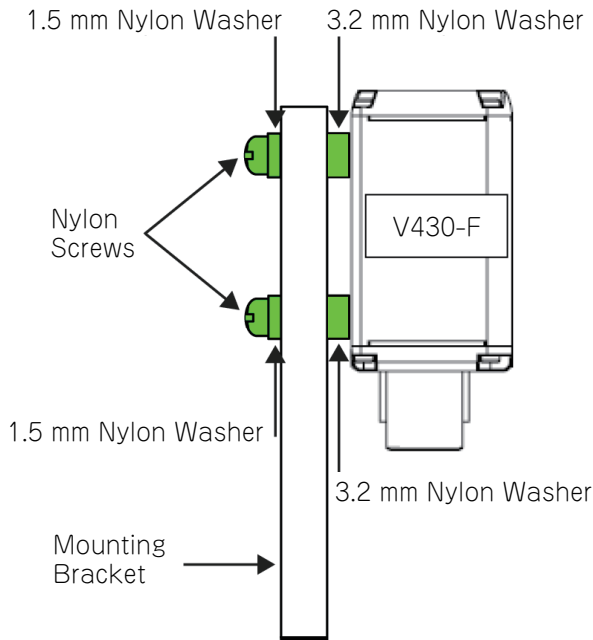


**Note:** In the case of this connection, must not ground the  $+(24V)$  of the power supply. If connected, the device will break down due to a short circuit.

## Grounding and Isolation

**Important:** Mounting an V430 reader to grounded conductive material may cause communication problems or unreliable operation. If you need to mount the reader to a bracket or plate, be sure that a proper ground connection is available. If a proper ground is not available, electrical isolation of the reader should be performed.

Using Omron Microscan's Isolation Mounting Kit (98-9000064-01) will ensure that no ground loop or other external electrical noise can occur through the reader.

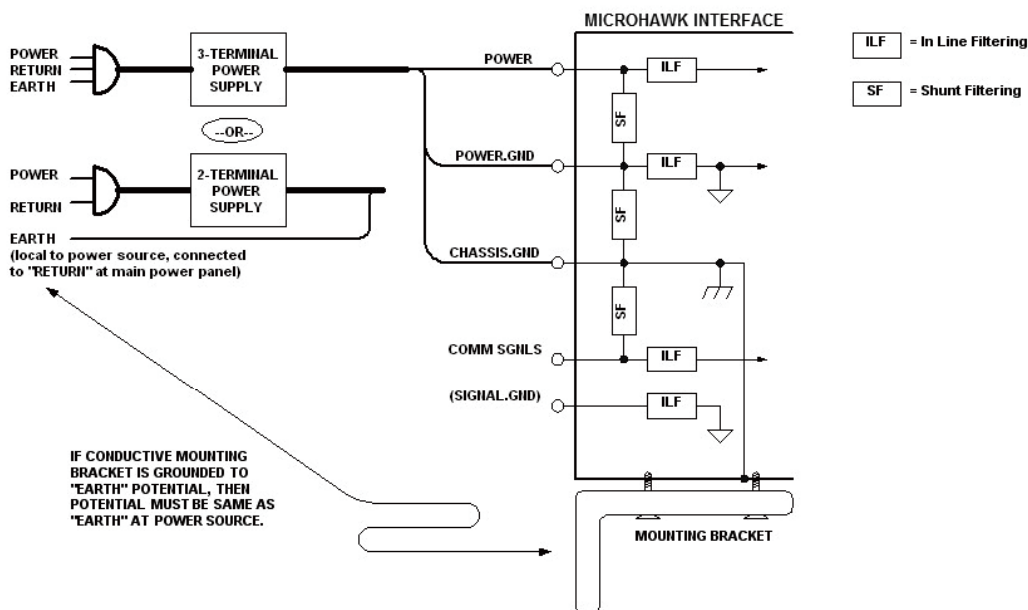


## Ground Loops

Ground loops (signal degradation due to different ground potentials in communicating devices) can be eliminated or minimized by ensuring that both the host, reader, and their power supplies are connected to a common earth ground.

**Note:** If a malfunction occurred to your reader by noise, mount a noise filter (RSAL2001W manufactured by TDK-Lambda Corp.) close to the reader's power-supply terminals and ground the chassis of the filter.

## Expected Power and Ground Connections for Proper Operation



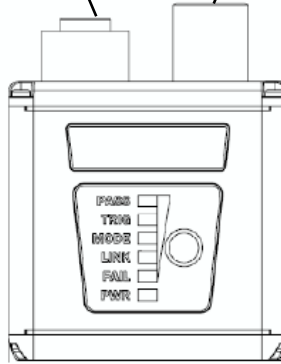
### Grounding Notes

- Ensure that mounting bracket "Earth" is at the same potential as power source "Earth".
- Supply "Return" and "Earth" ground must be stable, low-impedance reference points.
- "2-Terminal Power Supply" must still provide an "Earth" connection to the reader.
- "Signal Ground" can be used for communications and/or discrete signal ground reference. It must **not** be used as Power Ground or Earth Ground.

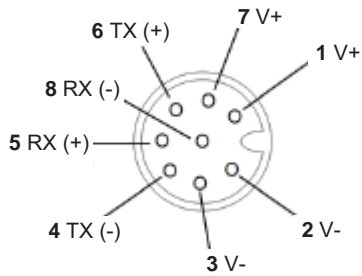
## Connectors

M12 8-pin Socket(Ethernet)

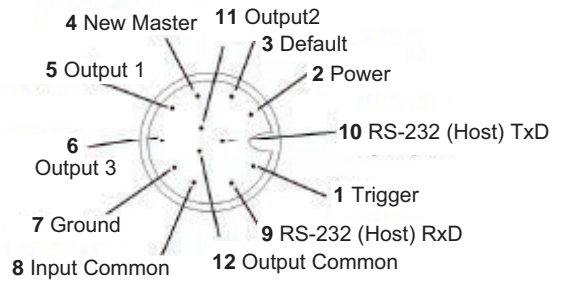
M12 12-pin Plug



## V430-F-series M12 Connectors



**M12 8-pin Socket (Ethernet)**



**M12 12-pin Plug**

General Specifications

**Ethernet Cables (sold separately)**

Part Numbers	Description
V430-WE-3M	Cordset, M12 8-Pin Plug to RJ45 Ethernet, 3M
V430-WELD-3M	Cordset, M12 8-Pin Plug to RJ45 Ethernet, Right Angle Down, 3M
V430-WELU-3M	Cordset, M12 8-Pin Plug to RJ45 Ethernet, Right Angle Up, 3M
V430-WE-5M	Cordset, M12 8-Pin Plug to RJ45 Ethernet, 5M

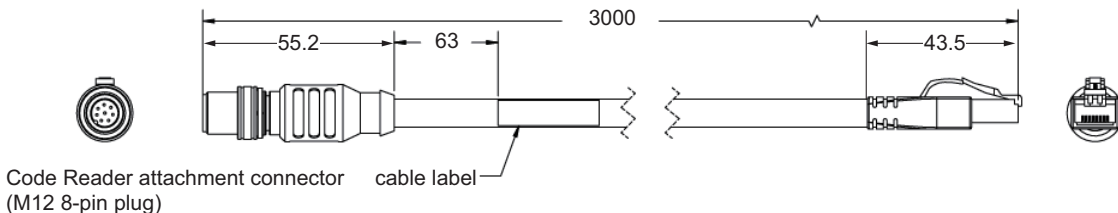
Item	Model	V430-WE-3M	V430-WELD-3M	V430-WELU-3M	V430-WE-5M
Cable length		3m	3m	3m	5m
Minimum bending radius		73.7mm			
Weight		225g	225g	225g	360g

**Important:** Do not bend any Cable beyond the specified minimum bending radius. Doing so may damage the Cable.

**Cordset, M12 8-Pin Plug to RJ45 Ethernet, 3M**

V430-WE-3M

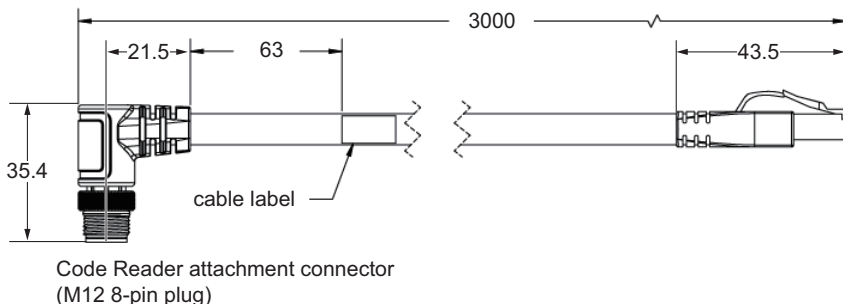
(Unit: [mm])



**Cordset, M12 8-Pin Plug to RJ45 Ethernet, Right Angle Down, 3M**

V430-WELD-3M

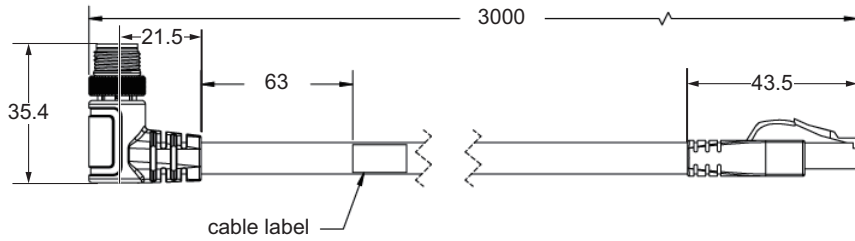
(Unit: [mm])



**Cordset, M12 8-Pin Plug to RJ45 Ethernet, Right Angle Up, 3M**

(Unit: [mm])

V430-WELU-3M

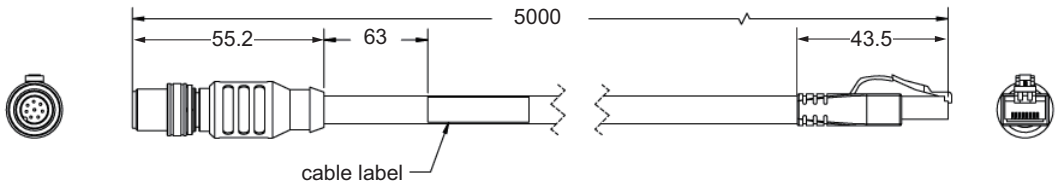


Code Reader attachment connector  
(M12 8-pin plug)

### Cordset, M12 8-Pin Plug to RJ45 Ethernet, 5M

V430-WE-5M

(Unit: [mm])

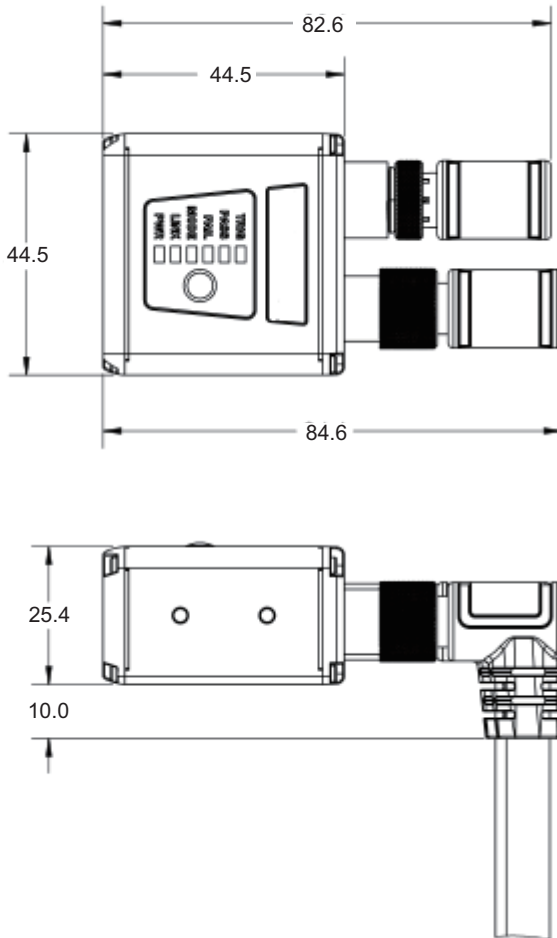


Code Reader attachment connector  
(M12 8-pin plug)

## General Specifications

The dimension when a right angle cable is used is as follows.

(Unit: [mm])



## I/O Cables (sold separately)

Part Numbers	Description
V430-W8-3M	Cordset, M12 12-Pin Socket to Flying Leads, 3M
V430-W8LD-3M	Cordset, M12 12-Pin Socket to Flying Leads, Right Angle Down, 3M
V430-W8LU-3M	Cordset, M12 12-Pin Socket to Flying Leads, Right Angle Up, 3M
V430-W8-5M	Cordset, M12 12-Pin Socket to Flying Leads, 5M
V430-W2-3M	Cordset, M12 12-Pin Socket to DB9 Socket with M12 12-Pin Plug

Item	Model	V430-W8-3M	V430-W8LD-3M	V430-W8-LU-3M	V430-W8-5M	V430-W2-3M
Cable length		3m	3m	3m	5m	3m
Wire gauge	Power line	AWG24				
	Other lines	AWG24				
Cable diameter		φ7.11				
Minimum bending radius		53.3mm				
Weight		270g	260g	260g	430g	285g

**Important:** Do not bend any Cable beyond the specified minimum bending radius. Doing so may damage the Cable.

## General Specifications

### Wiring table of V430-W8□

Wire color	Pin No.	Signal name	Function
Brown	2	24V	Power
Blue	7	0V	Ground
Red	8	COM_IN	Input Common
Red/Black	12	COM_OUT	Output Common
White	1	TRIG	Trigger
Black	9	HOST_RxD	RS-232(Host) RxD
Purple	10	HOST_TxD	RS-232(Host) TxD
Gray	5	OUTPUT1	Output 1
Gray/Red	11	OUTPUT2	Output 2
Pink	6	OUTPUT3	Output 3
Green	3	DEFAULT	Default
Yellow	4	NEW MASTER	New Master
None	-	-	Shield

Note: Connect the COM\_IN and COM\_OUT to the power supply of an input/output signal wiring destination device.

- When connecting an NPN device.

COM\_IN: Connect to the positive terminal of the other side power supply.

TRIG/DEFAULT/NEW MASTER: Recognize ON when those potentials are the same as the other side GND level.

COM\_OUT: Connect to the GND terminal of the other side.

OUTPUT1/OUTPUT2 /OUTPUT3: Become the same potential as COM\_OUT at ON.

- When connecting a PNP device.

COM\_IN: Connect to the GND terminal of the other side power supply.

TRIG/DEFAULT/NEW MASTER: Recognize ON when those potentials are the same as the other side positive level.

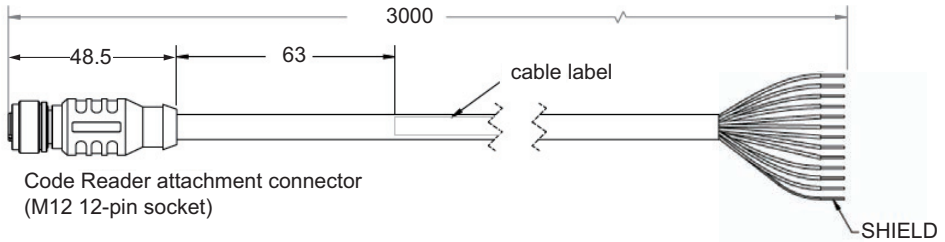
COM\_OUT: Connect to the positive terminal of the other side power supply.

OUTPUT1/OUTPUT2/ OUTPUT3: Become the same potential as COM\_OUT at ON.

### Cordset, M12 12-Pin Socket to Flying Leads, 3M

V430-W8-3M

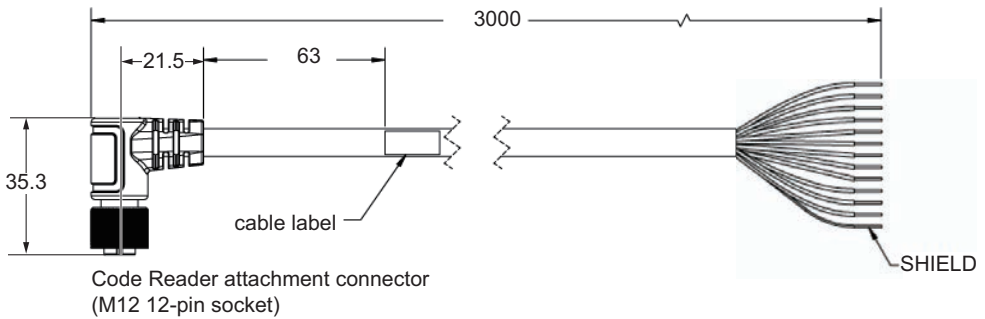
(Unit: [mm])



### Cordset, M12 12-Pin Socket to Flying Leads, Right Angle Down, 3M

V430-W8LD-3M

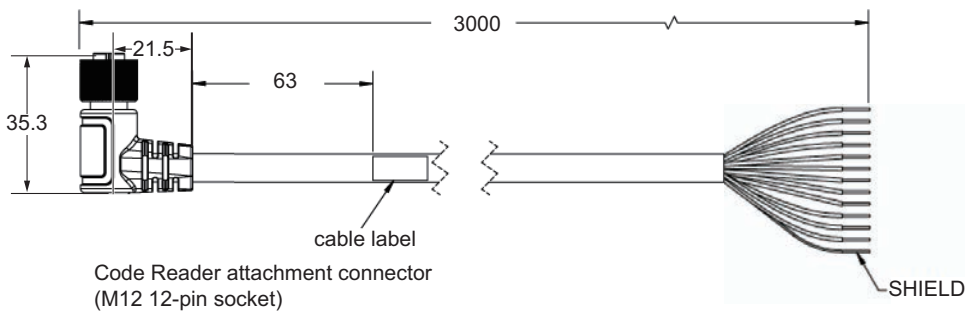
(Unit: [mm])



### Cordset, M12 12-Pin Socket to Flying Leads, Right Angle Up, 3M

V430-W8LU-3M

(Unit: [mm])

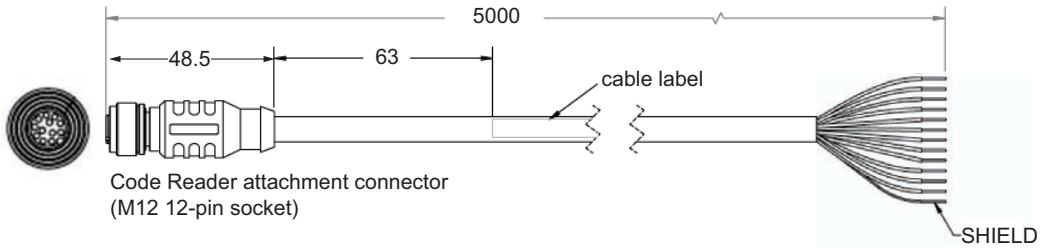


General Specifications

### Cordset, M12 12-Pin Socket to Flying Leads, 5M

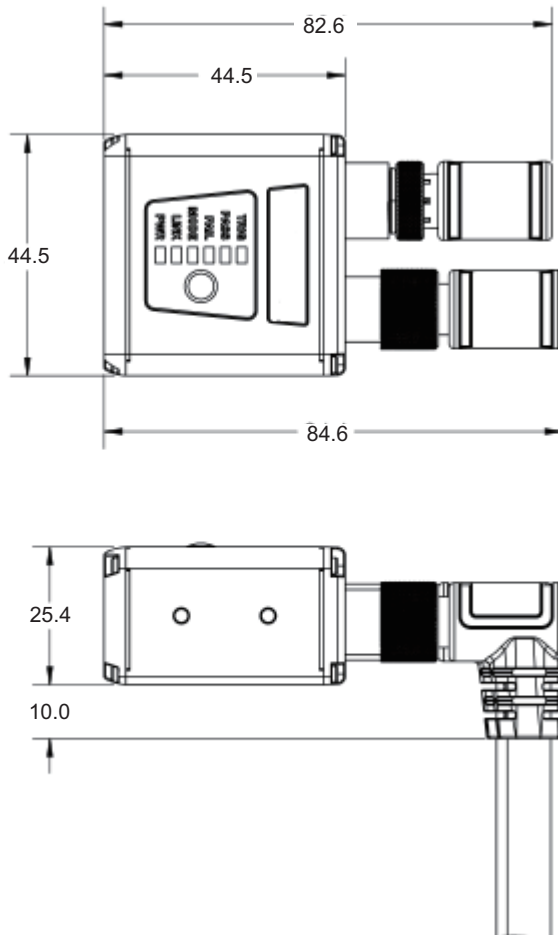
V430-W8-5M

(Unit: [mm])



The dimension when a right angle cable is used is as follows.

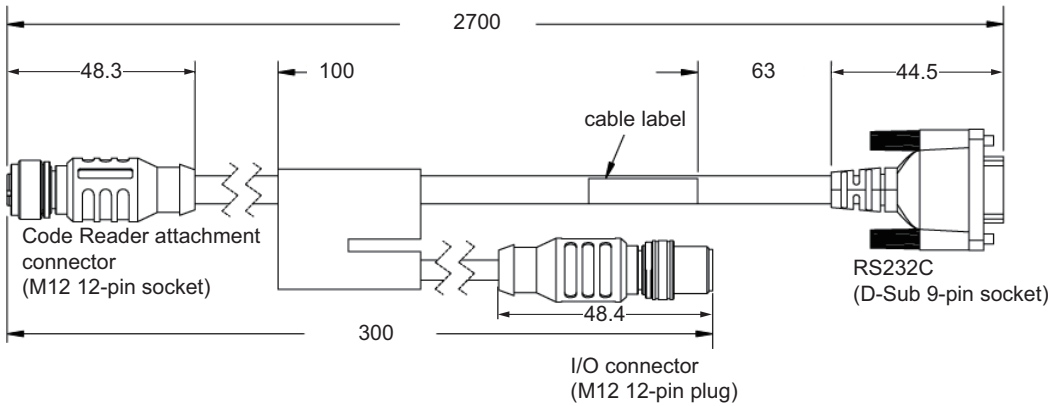
(Unit: [mm])



## Cordset, M12 12-Pin Socket to DB9 Socket with M12 12-Pin Plug

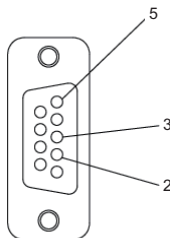
V430-W2-3M

(Unit: [mm])



Please connect V430-W8 to I/O connector (M12 12-pin plug) and connect to a power supply.  
RS-232C (D-sub 9-pin socket)

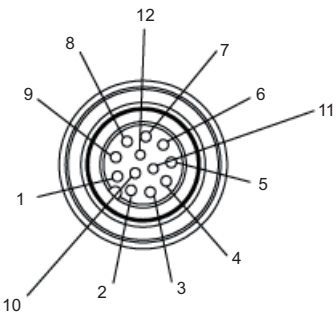
Pin No.	Signal name
1	-
2	HOST_RxD
3	HOST_TxD
4	-
5	0V
6	-
7	-
8	-
9	-



## General Specifications

I/O connector (M12 12-pin plug)

Pin No.	Signal name
1	TRIG
2	24V
3	DEFAULT
4	NEW MASTER
5	OUTPUT1
6	OUTPUT3
7	0V
8	COM_IN
9	-
10	-
11	OUTPUT2
12	COM_OUT

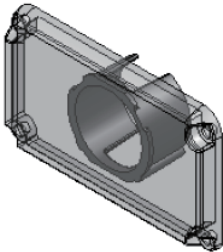


Note:

- Pin numbers vary depending on the external device type or cable to be connected. Check the instruction manual of the external device.
- Turn OFF the power supply before connecting or disconnecting a Cable. Peripheral devices may be damaged if the cable is connected or disconnected with the power ON.
- Use a slotted screwdriver when fixing screws of the D-Sub connector are hard to loosen.

## Optics Options (sold separately) Front Window (for replacement)

V430-AF0



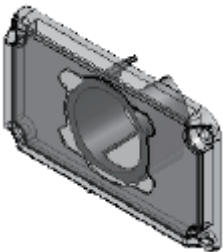
Accessories:  
Gasket(1)  
Phillips-Head Screws(4)

## Diffuser

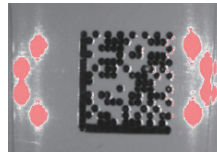
V430-AF1

Diffuser spreads out light.

Diffuser reduces direct reflection of LEDs.



Accessories:  
Gasket(1)  
Phillips-Head Screws(4)



Without Diffuser



With Diffuser

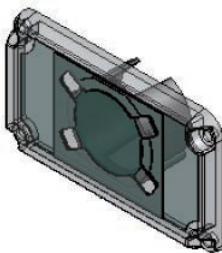
## Polarizer

V430-AF2

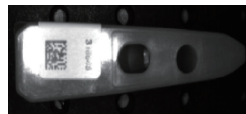
Polarizer reduces glare from specular objects.

Polarizer passes light from diffuse objects.

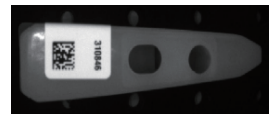
Specular (Vertical) Reflections are filtered out. Only Horizontal component of Diffuse Reflections make it to the camera.



Accessories:  
Gasket(1)  
Phillips-Head Screws(4)



Without Polarizer



With Polarizer

### How to install the V430-AF0/AF1/AF2

- 1 Disconnect power from the reader.
- 2 Remove the four screws from the front window of the reader.
- 3 Remove the front window and gasket.
- 4 Install the gasket onto the reader.  
Ensure that the gasket is properly seated in place and is covering all sealing surfaces.
- 5 Install the window: V430-AF0 (or window accessory: V430-AF1/AF2) onto the reader.
- 6 Secure the window in place using the screws provided. Do not over-tighten the screws.  
(1.0 in./lbs. (0.11 nm max.)



### Right Angle Mirror

V430-AF3

(Unit: [mm])

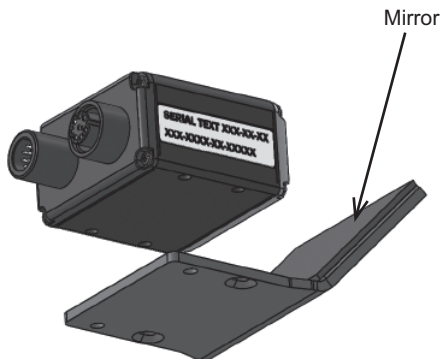
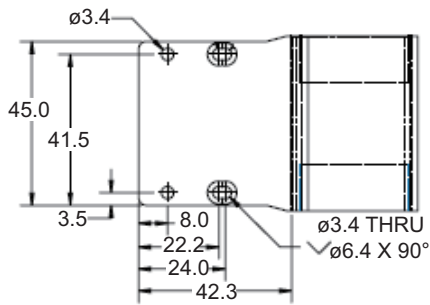
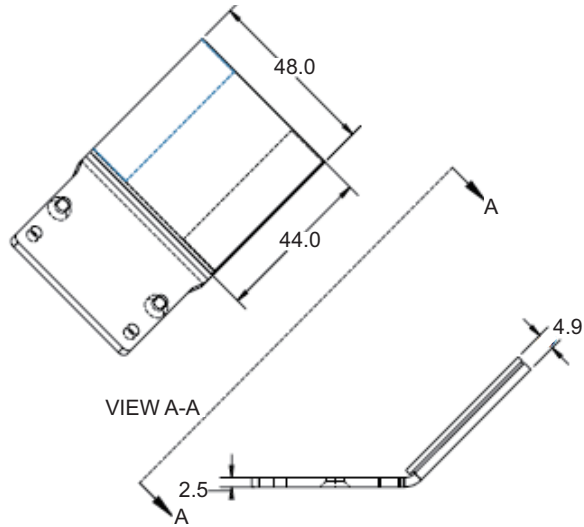
Right Angle Mirror allows the reader to fit compact spaces.

Reverses the image.



Bracket(1) (Material: Aluminum)

Mirror(1) (Material: Glass)



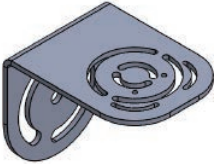
General Specifications

# Mounting Bracket (sold separately)

## L Bracket (It's possible to adjust the angle.)

V430-AM0

(Unit: [mm])



Material: SUS304

Thickness: 2.5mm

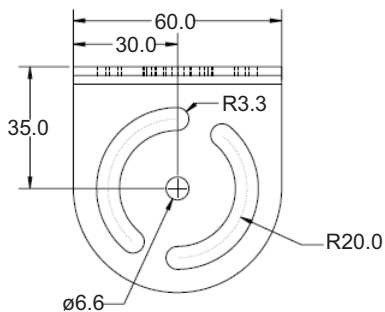
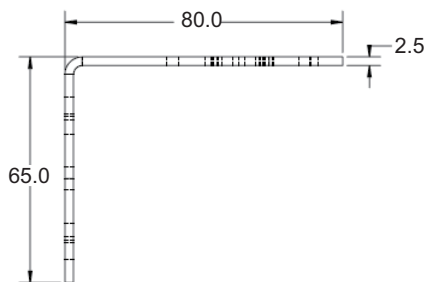
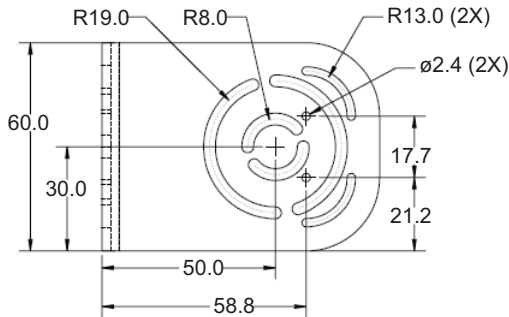
Accessories: Phillips-HeadScrews (M3×6) (2)

Washer (M3) (2)

The following accessories are not used with the V430-F-series:

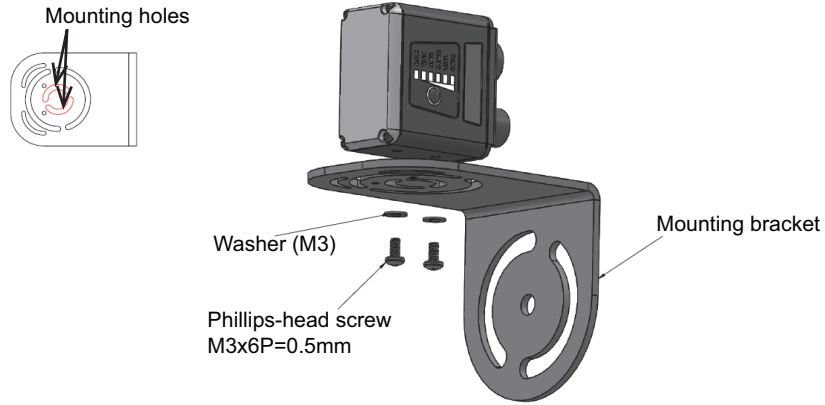
Phillips-Head Screws (M2×6) (2)

Washers for M2 Screws (2)

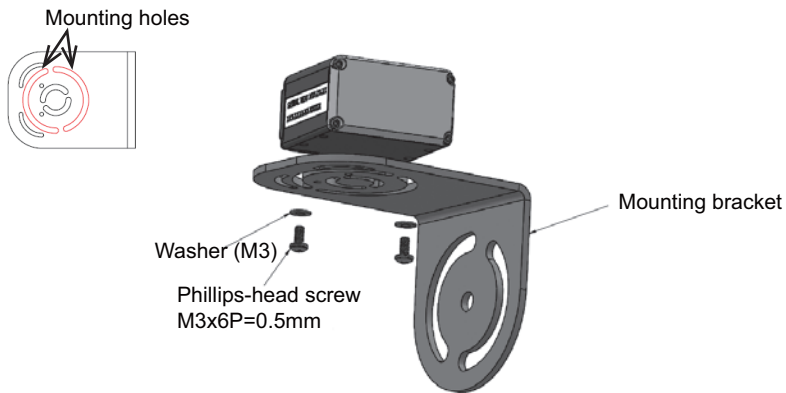


## Installation method

In case of side installation



In case of base installation



## General Specifications

### Mounting Block

V430-AM1

(Unit: [mm])



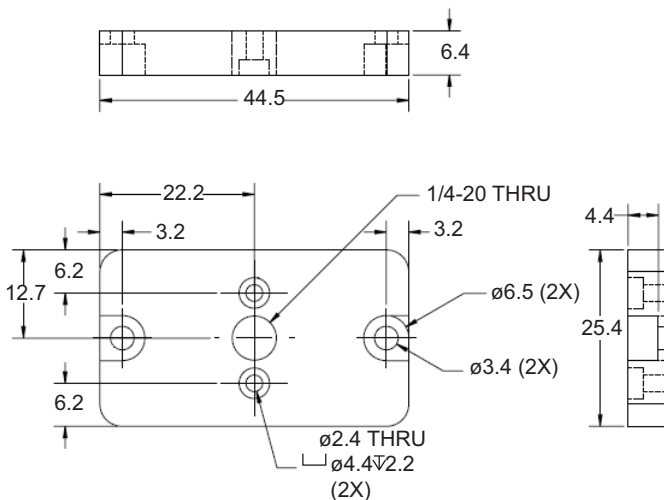
Material: Aluminum alloy

Thickness: 6.4mm

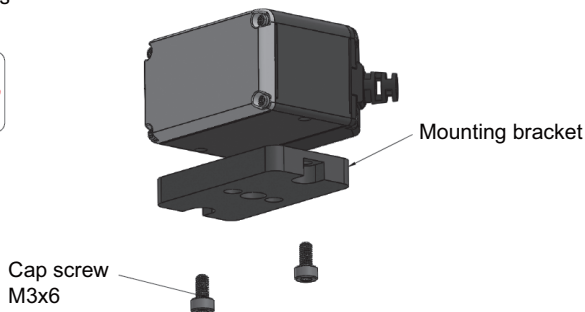
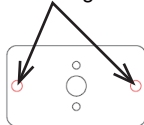
Accessories: Cap Screws (M3×6)(2)

The following accessories are not used with the V430-F-series:

Cap Screws (M2×8)(2)



Mounting holes



Note:

- Mounting the V430-F requires the use of the front set of mounting holes, closest to the window.
- As the material is aluminum alloy, there is no isolation effect. Although the body case of V430 is connected to FG (Frame ground), the FG is isolated from the internal electric circuit GND (0 VDC). If noise affects it, take measures by referencing **Grounding and Power** section.

## Appendix B — Serial Commands

### Serial Command Format

Omron Microscan readers are controlled by two types of serial commands: configuration commands and utility commands.

#### **Rules that apply to both configuration and utility commands**

- Less than '<' and greater than '>' angle bracket characters enclose the commands.
- Commands and data are case sensitive. Characters must be entered as upper or lower case, as specified.

### Serial Utility Commands

Serial Utility Commands are sent during operations and are not followed by <A> or <Z>.

### Serial Configuration Commands (K Commands)

Omron Microscan's serial configuration commands begin with a single "K" character followed by a 3-digit numeric character, comma-separated command fields, and an initializing command, as follows:

*<Knumeric character,data,data,...etc.><initializing command>*

An initializing command <Z> or <A> may follow the command.

- <Z> initializes the memory and saves for power-on.
- <A> initializes the memory but does not save for power-on.

For example, to enable **UPC** and save the change for power-on, send **<K473,1><Z>**.

To change **Baud Rate** and reset without saving changes for power-on, send **<K100,3><A>**.

#### **Serial Configuration Command Conventions**

- All command fields (except the last) must be followed by a comma (without a space).
- NULL cannot be used. The characters <, >, and , can be used, but only if entered as hex values.
- All fields preceding a modified field must be included.
- If there is no change in preceding fields, then commas alone can be entered in these fields. For example, if only the last field in the following command is changing, **<K100,4,1,0,0>** can be entered as **<K100,,,,0>**.
- All fields *following* a modified field can be omitted. For example, to change Baud Rate only, send **<K100,3>**.

### Concatenating Configuration Commands

Commands can be concatenated (added together) in a single string. For example, **<K145,1><K220,1><A>** enables **LRC**, sets **End of Read Cycle** mode to **New Trigger**, and resets the data buffers without saving the changes for power-on.

## **Serial Command Status Request**

To ensure that any command was received and accepted, send the **Show Reader Status** command: **<?>**.

The status of a specific serial command can be requested by entering the command followed by a question mark. For example, send **<K142?>** to request the status of **Postamble**.

## **Entering Control Characters in Serial Commands**

To enter control characters within a serial command, hold down the **Ctrl** key while typing the desired character.

*Example:* To enter a carriage return and line feed (**^M^J**), enter **<K141,1,CNTL-m CNTL-j>**

## Appendix C — Communications Protocol

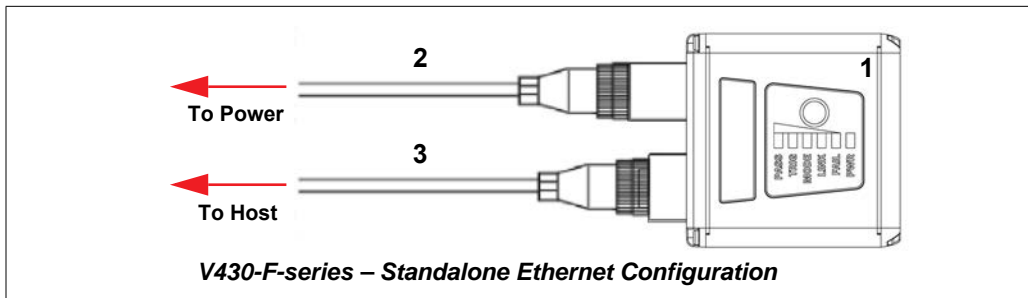
### Communications Protocol Command Table

Protocol Command (Mnemonic displayed on menu)	Control Characters (Entered in menu or serial command)	Hex Value	Effect of Command
RES	^D	04	Reset
REQ	^E	05	Request
EOT	^D	04	Reset
STX	^B	02	Start of Text
ETX	^C	03	End of Text
ACK	^F	06	Acknowledge
NAK	^U	15	Negative Acknowledge
XON	^Q	11	Begin Transmission
XOFF	^S	13	Stop Transmission

# Appendix D — V430-F-series and ESP Software Quick Start

## Step1 — Check Hardware and Connect the System

Item	Description	Model Number
1	V430-F	V430-F□
2	Power Supply, 100-240VAC, +24VDC, M12 12-Pin Socket	V430-W8-3M
3	Cordset, Host, Ethernet, M12 8-Pin Plug (Screw-On) to RJ45, 3 m.	V430-WE-3M

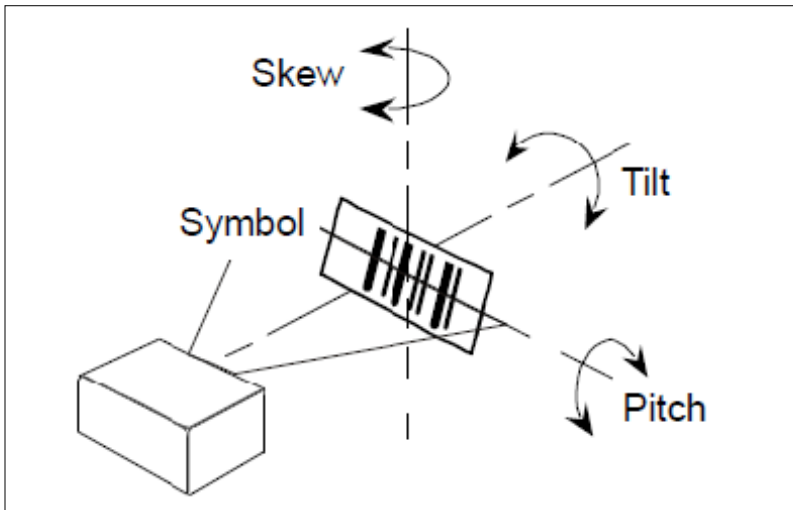


**Note:** The V430-F-series can be configured as an RS-232 reader with the V430-W2-3M cable.

## Step2 — Mount and Position the Reader

- Position the reader several inches from the symbol. You may need to reposition the reader a few times to find the ideal distance.
- Tip the reader relative to the symbol to avoid the glare of direct (specular) reflection.
- Symbols can be rotated (tilted) at any angle; however, for best results symbols should be aligned with the field of view. In the case of linear symbols, aligning the bars in the direction of their movement (ladder orientation) will minimize the chances of blurring and will result in more consistent decodes.

**Important:** Avoid excessive skew or pitch. Maximum skew is  $\pm 30^\circ$ ; maximum pitch is  $\pm 30^\circ$ . The illustration below shows approximate skew axis, pitch axis, and tilt axis.



*Reader and Symbol Orientation*

## Step3 — Install ESP

**ESP Software** can be installed from the Omron website or the Omron Microscan website (**Download Center**, located at: [www.microscan.com](http://www.microscan.com)).

- Follow the prompts to install ESP from the download site.
- Click the ESP icon on your desktop to run the program.



### Minimum System Requirements

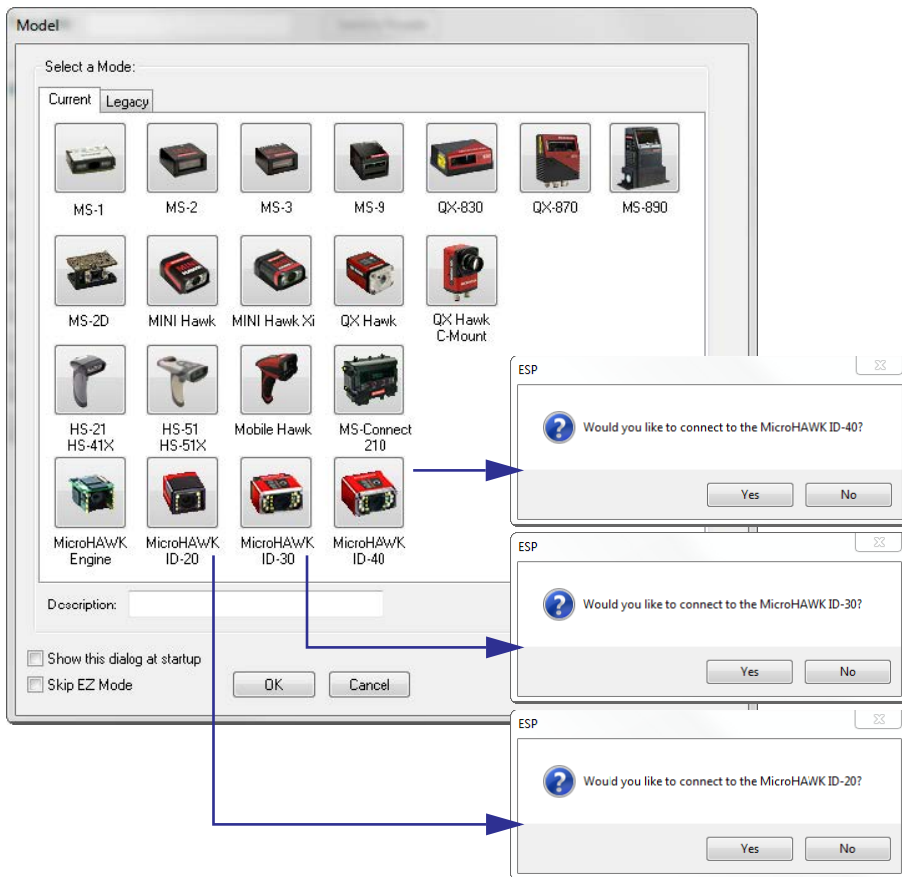
- 233 MHz Pentium® PC

## V430-F-series and ESP Software Quick Start

- Windows® 8, 7 operating system (32-bit or 64-bit)
- Internet Explorer® 6.0 or higher
- 128 MB RAM or greater
- 160 MB free disk space
- 800 x 600 256 color display (1024 x 768 32-bit color recommended)

### Step4 — Select Model

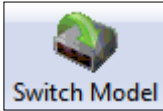
When you start **ESP**, the following menu will appear:



1. Click the button showing your model of the reader.
2. Click **OK** or double-click one of the buttons to select your reader.
3. Depending on the model you have selected, you will see the appropriate **Would you like to connect to the [XX]** dialog after selecting your reader and clicking **OK**.

4. Click **Yes** when asked if you would like to connect.

**Note:** If you need to select another model later, click the **Switch Model** button near the top of the screen or use **Model > New Model** in the menu toolbar.

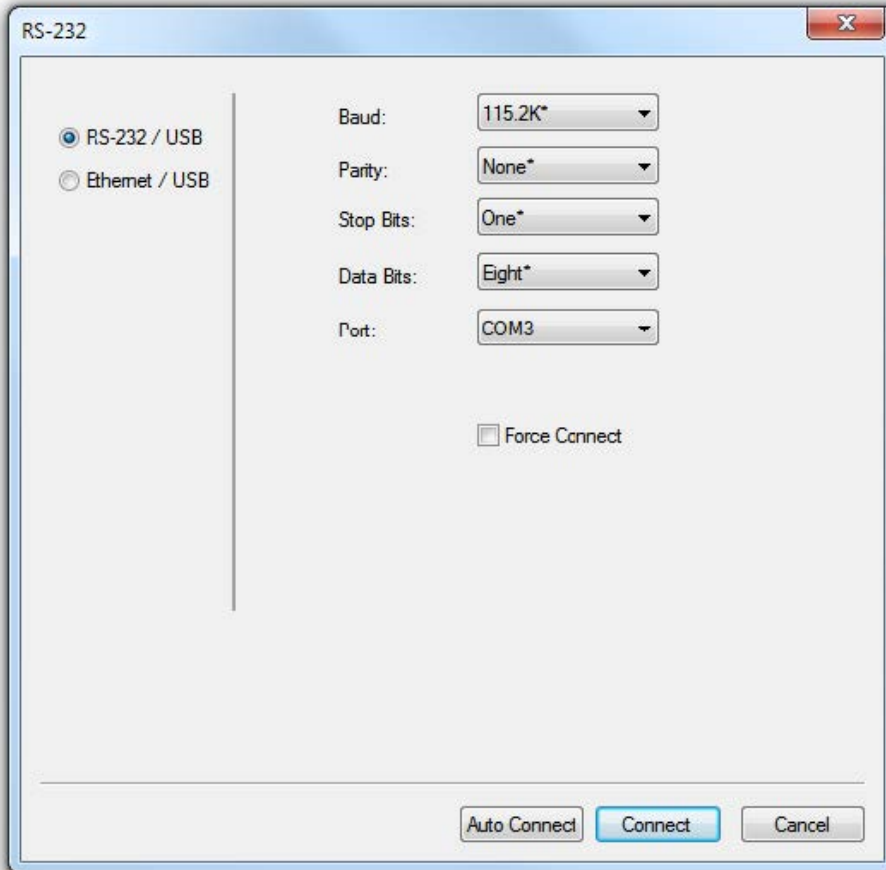


**Note:** If you connect to the V430-F, you need to select the "MicroHAWK ID-40" once. Click **No** when asked if you would like to connect the MicroHAWK ID-40.

Click **Connect** on the menu toolbar, and then select **Connection Wizard**, Click **Connect** when you see the dialog.

## Step5 — Connect

- Click **Connect** on the menu toolbar, and then select **Connection Wizard**.
- Select the communication interface required by your application.
- Configure settings as required by the application, and click **Connect**.



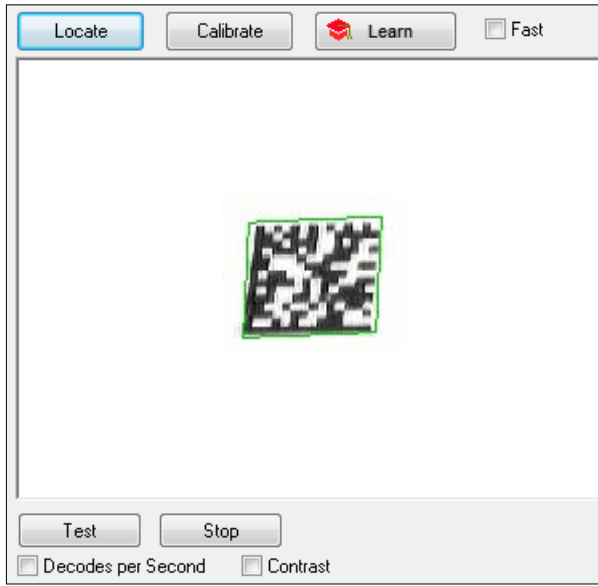
- When a connection is established, the green indicator in the status bar at the bottom right of the screen will be visible:

MicroHAWK ID-40-1   V430-F SD   **CONNECTED**   192.168.188.2   2001

**Important:** For best connection results, be sure that no decodable symbols are within the reader's field of view while attempting to connect.

## Step6 — Locate the Symbol in the Field of View

- In ESP's **EZ Mode**, click the **Locate** button to enable the blue target pattern.



The symbol in the field of view will appear in the video view beneath the **Locate** and **Calibrate** buttons, and you will see the blue target pattern projected from the front of the reader.

- Center the target pattern on the symbol.

**Important:** The entire symbol should fall within the field of view (FOV) of the reader. The field of view is what appears in **ESP's Locate/Calibrate** window in **EZ Mode**.

- Click the **Stop** button to end the **Locate** function.

## Step7 — Calibrate

V430-F-series settings can be adjusted automatically in **ESP** for optimum symbol decoding performance.

During the calibration routine, the reader will flash its amber Read Rate percent LEDs and red illumination LEDs while searching camera settings and determining the best configuration for decoding symbol data. Upon successful completion of this routine, a green LED pattern will flash brightly and illuminate the symbol.

### Calibrate by ESP

- Click the **Calibrate** button.



- The reader will search camera settings to determine the best configuration for decoding symbol data.

A successful calibration will display a green frame around the symbol, and the following message will appear: **Uploading all reader parameters**. After a moment the symbol data will be presented in the field below the image display window.

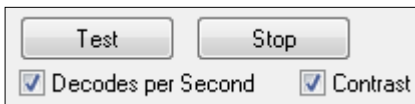
**Note:** If you choose to calibrate the reader by sending a **<@CAL>** command, a decode is also required for the calibration process to be completed successfully.

## Step8 — Test Read Rate

**Read Rate** indicates the number of successful decodes per second achieved by the reader.

### Test Read Rate by ESP

1. Click the **Test** button to start the Read Rate test and **Stop** to end it.



If a symbol has been successfully decoded, the symbol's data and related features will be presented in the field below the image display window. Also, while the symbol is being inspected, the Read Rate LEDs will indicate the corresponding Read Rate percentage on the back of the unit.

2. To end the test, click the **Stop** button.

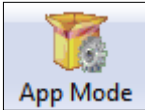
**Note:** Read Rate can also be tested using the **Read Rate** interface in **Utilities**.

### Test Read Rate by Serial Command

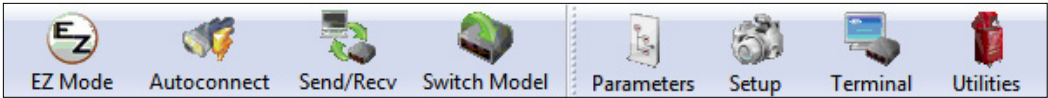
You can also start a test with the **<C>** or **<Cp>** command and end it with the **<J>** command.

## Step9 — Configure the Reader in ESP

Click the **App Mode** button to make configuration changes to the V430-F-series reader.



The following modes are accessible by clicking the buttons in the first row of **App Mode** icons:

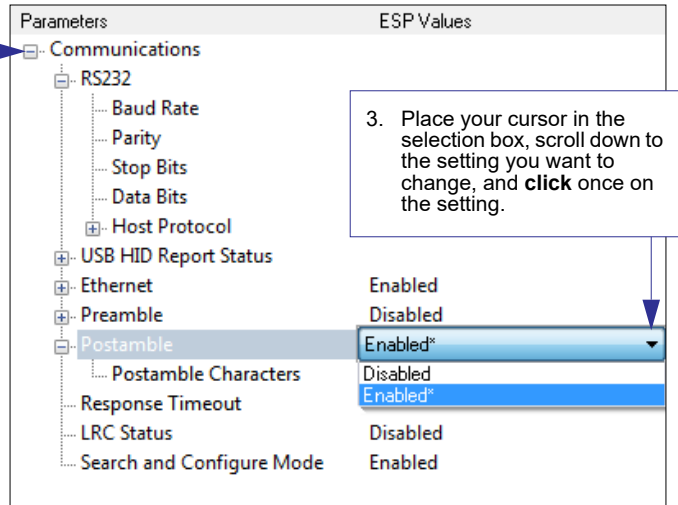


- Click **EZ Mode** to return to EZ Mode from App Mode.
- Click **Autoconnect** to establish communication (appears as **Connect** for the V430).
- Click **Send/Recv** to send or receive commands.
- Click **Switch Model** to open the model menu, to return to a previous reader model, or to remove a previous reader model.
- Click **Parameters** to show the tabbed tree controls for **Communication**, **Read Cycle**, **Symbologies**, **I/O Parameters**, **Symbol Quality**, **Matchcode**, and **Diagnostics**.
- Click **Setup** to access a **Camera Setup** tree control and the tabbed user interfaces for **Video**, **Evaluation**, **Calibration**, **WOI (Window of Interest)**, **Configuration Database**, **Ordered Output**, **Output Format**, and **Dynamic Setup**.
- Click **Terminal** to display decoded symbol data and to send serial commands to the reader using text or macros.
- Click **Utilities** to access the tabbed user interfaces for **Read Rate**, **Counters**, **Device Control**, **Differences from Default**, **Master Database**, and **Firmware**.

## Step10 — Save Configuration in ESP

To make changes to a configuration setting:

1. **Left-click** on the **+** to expand the desired tree.
2. **Double-click** on the desired parameter and click once in the selection box to view options.



4. **Left-click** again on the open screen to complete your selection.
5. **Right-click** on the open screen and select **Save to Reader** to implement the command in the reader.

### Saving Options

- **Send, No Save.** Changes will be lost when power is re-applied to the reader.
- **Send and Save.** This activates all changes in current memory *and* saves to the reader for power-on.

## Appendix E — Using ESP

This section is designed to help you understand the basic structure and elements of **ESP** (**E**asy **S**etup **P**rogram).

When you open **ESP**, unless otherwise specified in the **ESP Preferences** dialog accessible from the **Options** heading on the menu toolbar, you will enter **EZ Mode** for initial setup. From there, you can enter **App Mode**, where you can access several configuration menus: **Communications**, **Read Cycle**, **Symbologies**, **I/O Parameters**, **Symbol Quality**, **Matchcode**, and **Diagnostics**, as well as a **Camera Setup** interface, a **Terminal** interface, and a **Utilities** interface.

**ESP** can be used to configure the reader in three different ways:

- **Tree Controls:** Each configuration menu contains a list of all commands and command parameters that pertain to that specific element of reader operation. For example, the **I/O Parameters** menu shows a **Calibration Options** command (which corresponds to the <K529> serial command), and then a list of the parameters **Gain**, **Exposure**, **Symbol Type**, **Window of Interest Framing**, **Window of Interest Margin**, **Linescan Height**, and **Processing**. Each of these parameters is configurable dropdown menus and spin boxes.
- **Graphic User Interfaces:** Reader settings can be configured using radio buttons, sliders, spin boxes, check boxes, and various drag-and-drop functions.
- **Terminal:** **ESP**'s **Terminal** allows you to send serial commands directly to the reader by typing them in the **Send** text field.

For **ESP** system requirements, see **Minimum System Requirements** in the **Install ESP** step of the **Quick Start** section.

### **EZ Mode**

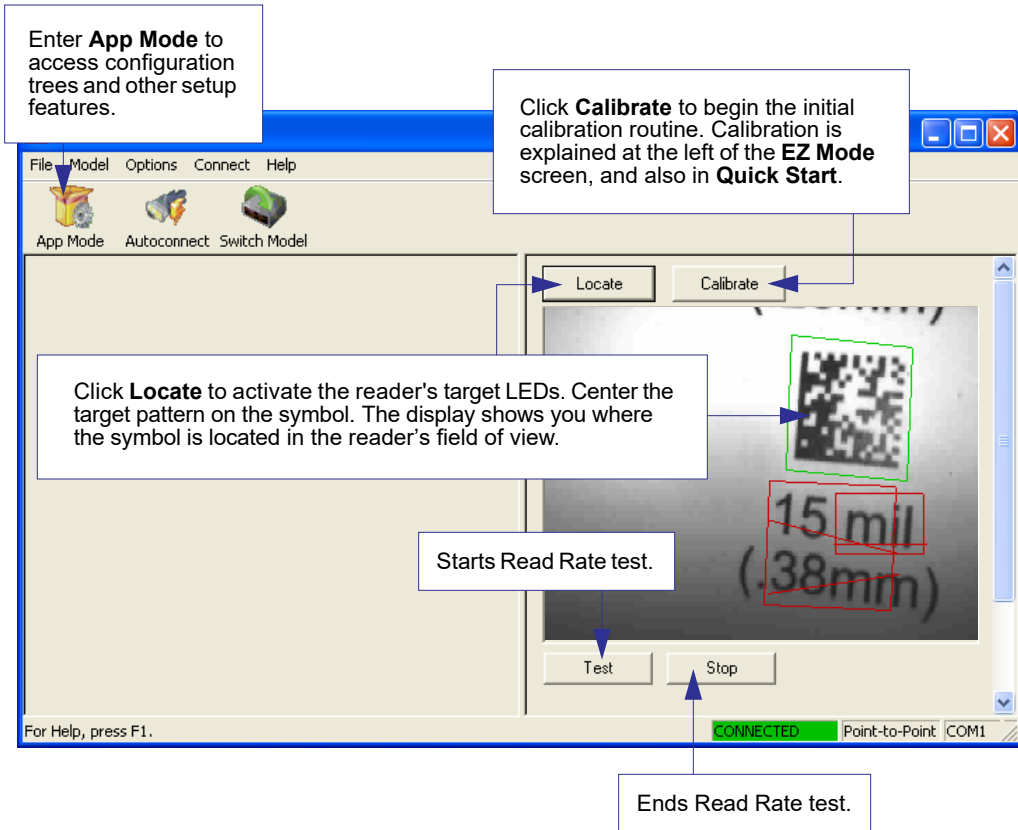
In **EZ Mode** you are presented with the **Locate**, **Calibrate**, and **Test** options. After connecting to your reader, **EZ Mode** is the screen you will see. You will be provided with on-screen instructions that will help you with positioning, testing, and calibration.

### **Test**

Click the **Test** button to start the Read Rate test for a quick indication of the reader's read capabilities and the limits of your application. When **Decodes per Second** is unchecked, the test will count the percentage of decodes relative to the number of actual scans. Click **Stop** to end the test.

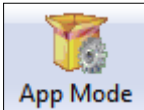
## Calibrate

The calibration routine that will optimize the reader by comparing Read Rates at various camera and image processing settings.

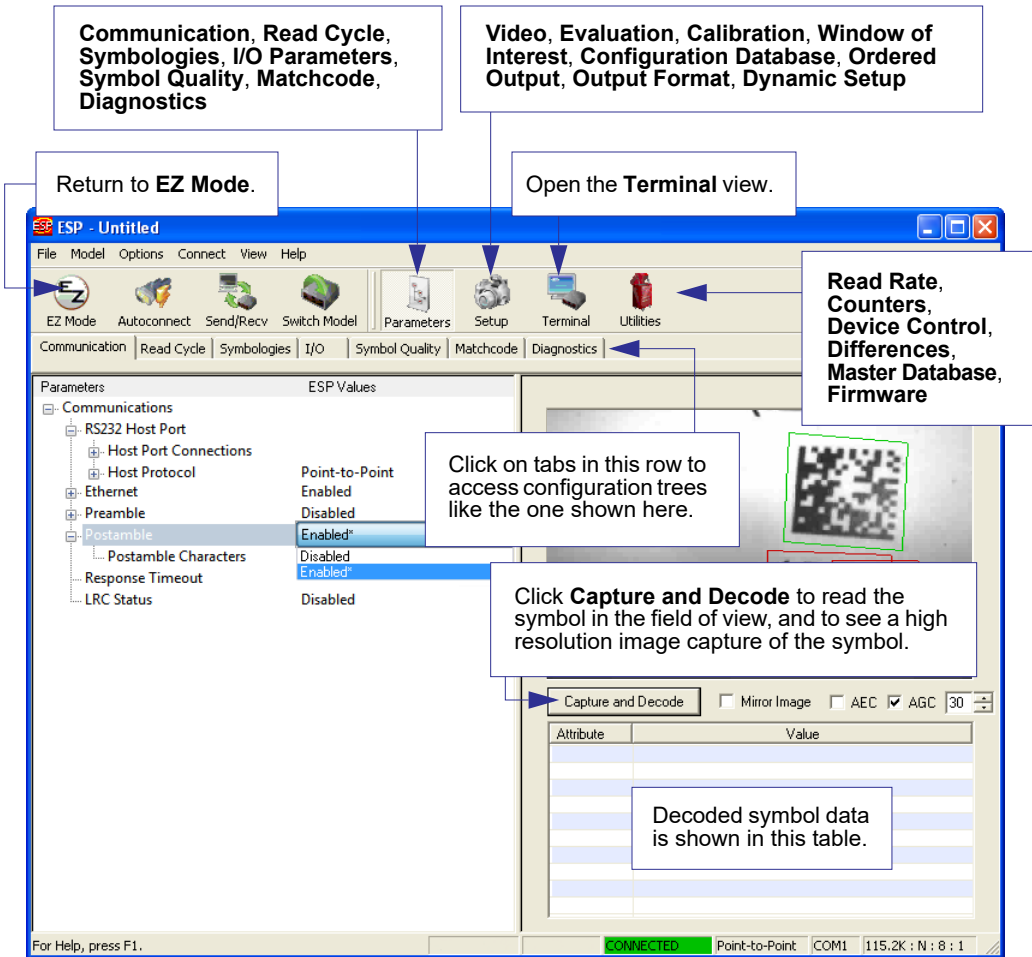


## App Mode

From **EZ Mode**, you can click on the **App Mode** button to access specific configuration menus, **Utilities** tools, **Camera** setup, **Output Format** options, and a **Terminal** window where serial commands can be entered.



**Note:** The **App Mode** and **EZ Mode** buttons appear in the same position to allow easy switching between these primary modes.



**Note:** For specific information on any of the icons shown above in the operations bar or configuration bar, see the corresponding sections of this manual.

## Menu Toolbar

### File > New

Whenever **New** is selected, the default configuration of **ESP** is loaded.

### Open/Save

When **Save** or **Save As** is selected, the **ESP** configuration is saved to the host computer's hard drive and available whenever the same file is selected under **Open**.

**Important:** When you save menu changes to your hard drive, these changes are not saved to your reader.

File	
New	Ctrl+N
Open...	Ctrl+O
Save	Ctrl+S
Save As...	
Print...	Ctrl+P
Import...	
Export...	
Recent File	
Exit	

### Import/Export

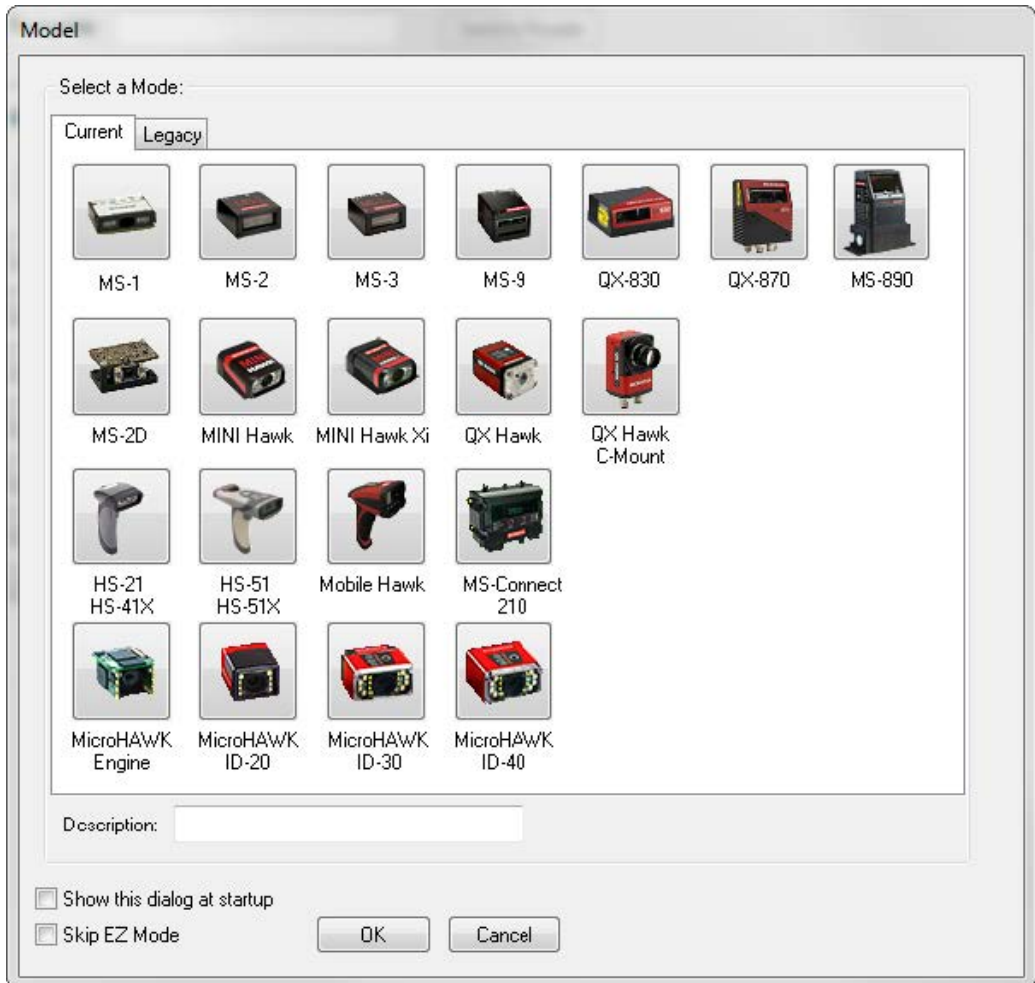
**Import** converts the ASCII settings from a text file to **ESP** configuration settings.

**Export** converts the active **ESP** configuration settings to an ASCII text file.

## Model

In the **Model** menu you can select any of the models supported by **ESP**. When you choose a different model, the connection to your present model will be terminated.

To connect to another model, select **New Model**, choose a new model from the **pop-up menu** that appears, and click **OK**.

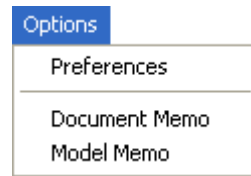


**Note:** When you save a **.esp** file, you are saving the settings of all models defined in that file.

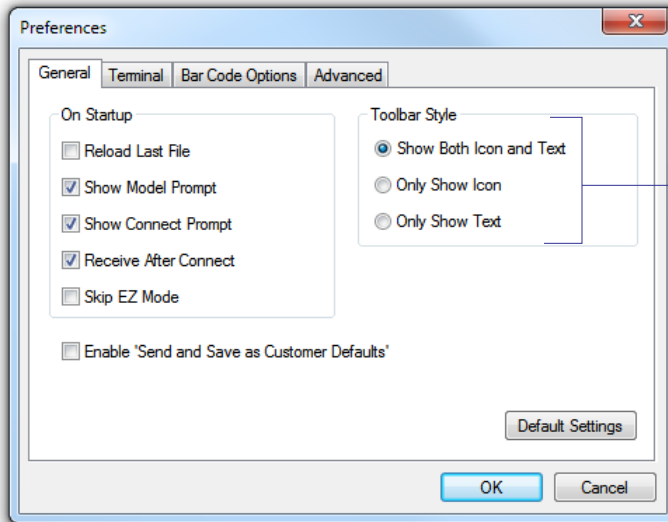
## Options

The **Options** menu allows you to save memos and set up **ESP Preferences**.

**Note:** Preferences will be saved and loaded into **ESP** whenever **ESP** is opened next, whether or not you save the **ESP** file.



### Preferences > General Tab



The **Toolbar Style** options allow you to determine how **ESP** will display the mode options in the two rows at the top of the screen.

### Reload Last File

At startup, reloads the last file saved to the host computer's hard drive.

### Show Model Prompt

At startup, shows the model menu displaying all supported readers.

### Show Connect Prompt

At startup, displays the **Would you like to connect to the MicroHAWK ID?** prompt.

### Receive After Connect

At startup, loads the reader's settings into **ESP**. (This is not recommended if you want to preserve your **ESP** settings for future use.)

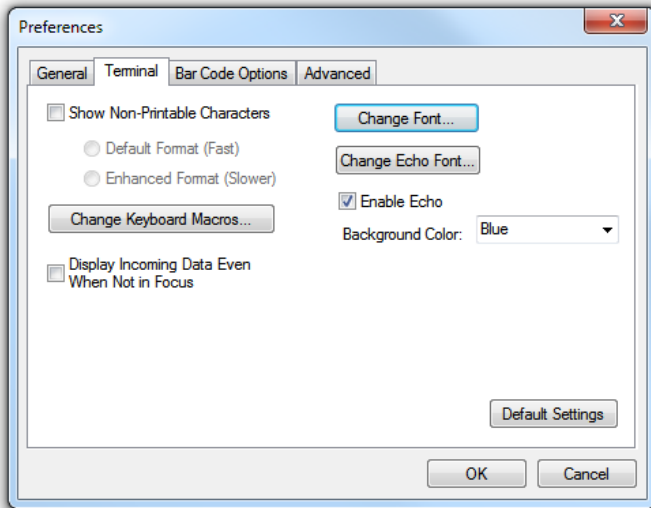
### Skip EZ Mode

At startup, skips **EZ Mode** and opens directly in **App Mode**.

## Enable 'Send and Save as Customer Defaults'

At startup, enables the **Send and Save as Customer Defaults** option in the **Send/Recv** command.

## Preferences > Terminal Tab



### Show Non-Printable Characters

When **Show Non-Printable Characters** is enabled, characters such as “CRLF” will be displayed in the **Terminal** window. When **Enhanced Format** is checked, the characters are displayed with more detailed formatting.

### Change Keyboard Macros

Clicking the **Change Keyboard Macros** button brings up the **Function Keys** dialog. In this dialog you can select the desired function key and then enter your macro keystrokes in the associated key map. For example, to make **Ctrl-F2** the keystroke to send a trigger character, select **F2**, then in the **Ctrl** row, enter **<trigger character>** and click **OK**. Then whenever the **Ctrl-F2** keystroke is pressed, the trigger character will start the read cycle.

**Note:** The **F1** key is reserved for opening **ESP Help** and the **F3** key is reserved for the **Find Next** function.

### Change Font

Allows you to modify the font used for decode data received from the reader on the **Terminal** screen.

## Using ESP

### Change Echo Font

Allows you to modify the font used for command characters typed into the **Terminal** view.

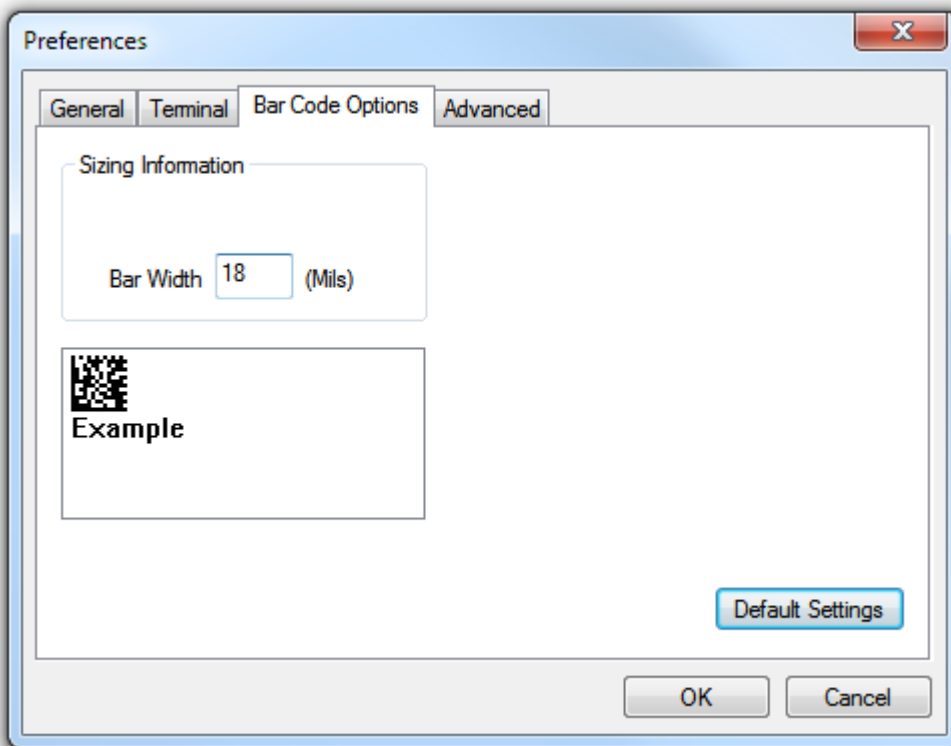
### Enable Echo

Allows you to enter command characters in **Terminal**.

### Display Incoming Data Even When Not in Focus

When **Display Incoming Data Even When Not in Focus** is enabled, data from the reader will continue to appear in the terminal even when **ESP** is not the top window.

## Preferences > Bar Code Options Tab



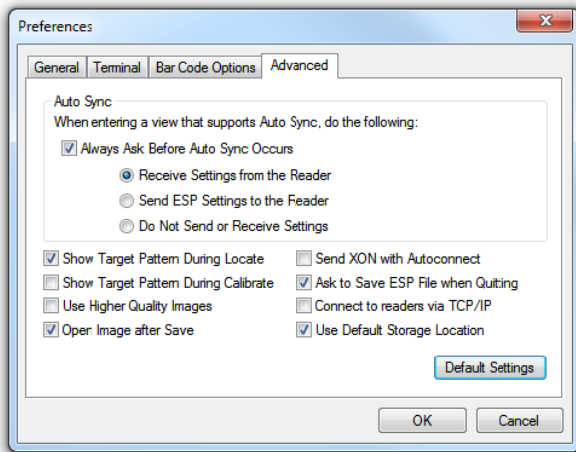
The **Bar Code Options** dialog allows you to set the size of user-created symbols.

### Sizing Information

Sets the bar width or module width (in **mils**, or thousandths of an inch) of user-created symbols.

*Example:* A bar width of 18 is 0.018 inches.

## Preferences > Advanced Tab



The **Auto Sync** options at the top of the **Advanced** tab allow you to determine whether Auto Sync will be enabled automatically in sections of **ESP** where it is used, or if it will ask you before it enables Auto Sync functions.

### Always Ask Before Auto Sync Occurs

If you check this option box, you are then able to determine what specific Auto Sync functions will be enabled. **Receive Settings from the Reader** will automatically send the reader's settings to **ESP** when Auto Sync is enabled. **Send ESP Settings to the Reader** will automatically send all reader configuration settings chosen in **ESP** to the reader. **Do Not Send or Receive Settings** creates a condition in which Auto Sync will not automatically send reader settings to **ESP**, or send **ESP** settings to the reader.

### Show Target Pattern During Locate

Allows you to determine whether the blue LED target pattern will be on or off during the **Locate** routine.

### Show Target Pattern During Calibrate

Allows you to determine whether the blue LED target pattern will be on or off during the **Calibrate** routine.

### Use Higher Quality Images

Sets **ESP** to output images at a higher resolution than standard JPEG format.

### Open Image after Save

When **Open Image after Save** is enabled, **ESP** automatically opens saved image captures. Images can be saved from the **Evaluation** tab in the **Camera** view, or by right-clicking an image in any other image capture view and then saving.

---

## Using ESP

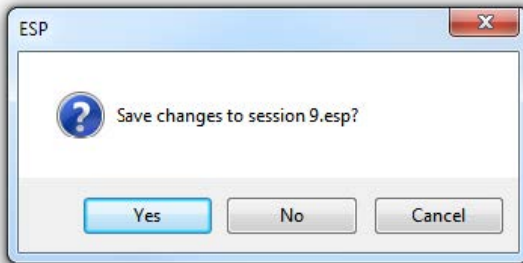
### Send XON with Autoconnect

Sends an **XON (Begin Transmission)** command to the reader before starting **Autoconnect**.

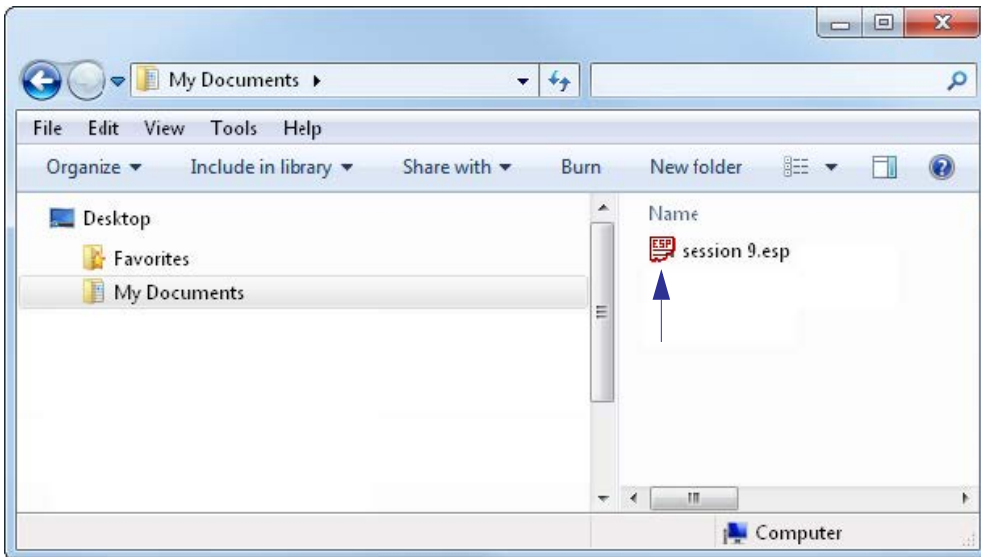
### Preferences > Advanced Tab (cont.)

#### Ask to Save ESP File when Quitting

When enabled, prompts the user to save a **.esp** file when ending a session.



The **.esp** file will be saved in the location of your choice.



### Connect to Readers via TCP/IP

When enabled, shows a **TCP/IP** option on the **Connection Wizard**.

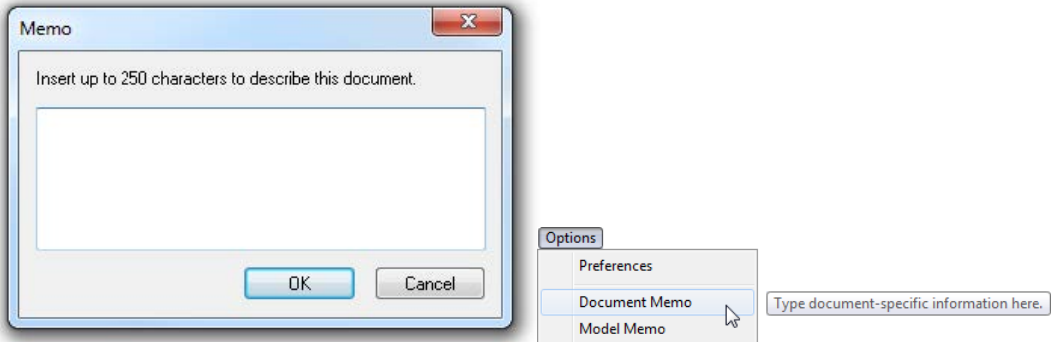
**Note:** There is no change while being showed in case of V430-F.

## Use Default Storage Location

When enabled, automatically stores data in **ESP's** Application Data folder.

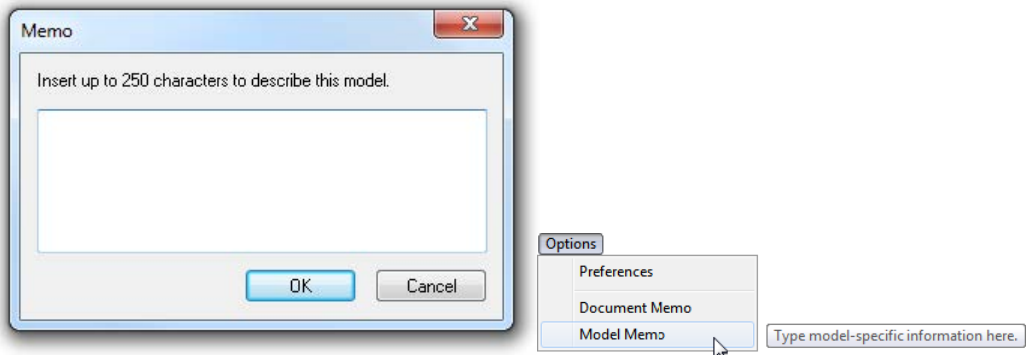
## Document Memo

The information you type in the **Document Memo** field will appear in a context-sensitive text box whenever your cursor hovers over the **Document Memo** item on the **Options** menu.



## Model Memo

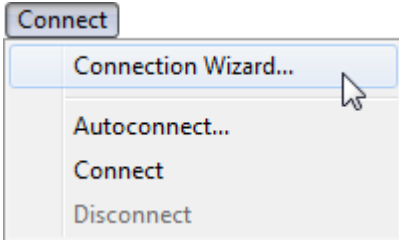
Similar to **Document Memo**, the information you type in the **Model Memo** field will appear in a context-sensitive text box whenever your cursor hovers over the **Model Memo** item on the **Options** menu. Memos created in **Model Memo** are specific to the model enabled when the message was created.



**Note:** Memos must be saved in a **.esp** file if you want them to be available in your next session. If you do not save your current session, any memos that you have entered during the session will be discarded, and will be unavailable in your next session.

## Connect

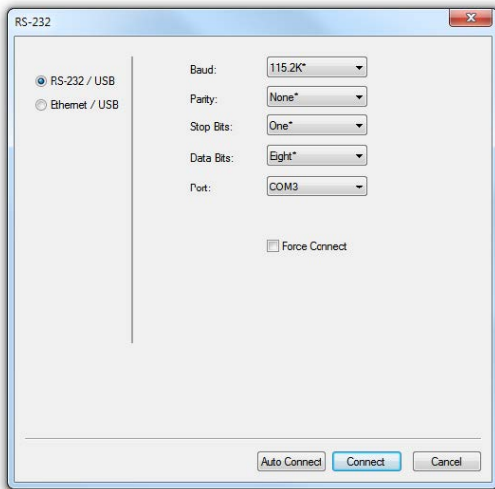
The **Connect** dropdown menu allows the user to access the **Connection Wizard**, as well as the **Autoconnect** dialog. **Connect** and **Disconnect** can also be performed directly from the dropdown menu without opening a dialog.



## Connection Wizard

To connect using the **Connection Wizard**:

- Click **Connect** on **ESP**'s menu toolbar, and then select **Connection Wizard**.
- Select the communication interface required by your application.
- Configure settings as required by the application, and click **Connect**.



- When a connection is established, the green indicator in the status bar at the bottom right of the screen will be visible.



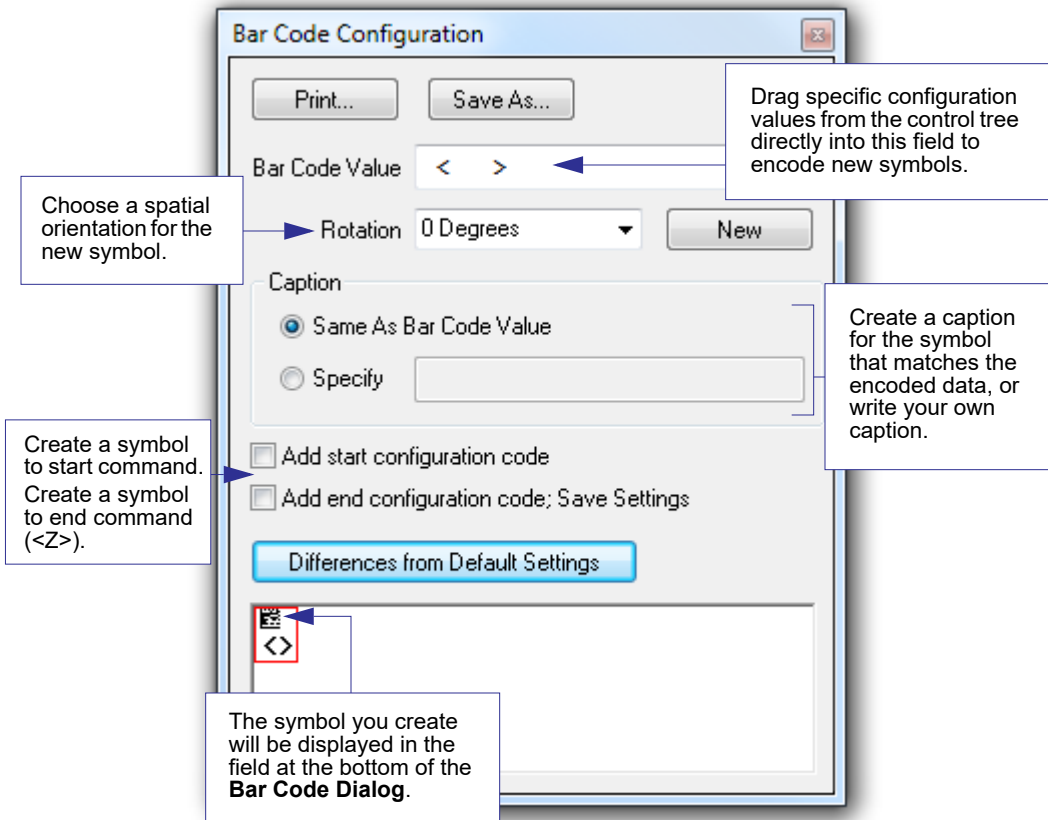
- If your RS-232 connection attempt fails, click the **Auto Connect** button to establish a connection between the reader and the host.

## View

The **View** menu allows you to move quickly between **Parameters**, **Setup**, **Terminal**, and **Utilities** without using the icon buttons on the **App Mode** toolbar. It also allows you to access the **Bar Code Dialog**.

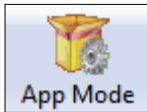
### Bar Code Dialog

In the **Bar Code Dialog** you can create symbols by typing the text you wish to encode. This is a useful tool for creating configuration symbols, allowing you to configure your reader by reading the symbols you create.

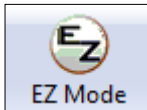


## ***Navigating in ESP***

Click the **App Mode** button to change reader settings, or to access the **Utilities**, **Camera**, **Terminal**, or **Output Format** views.

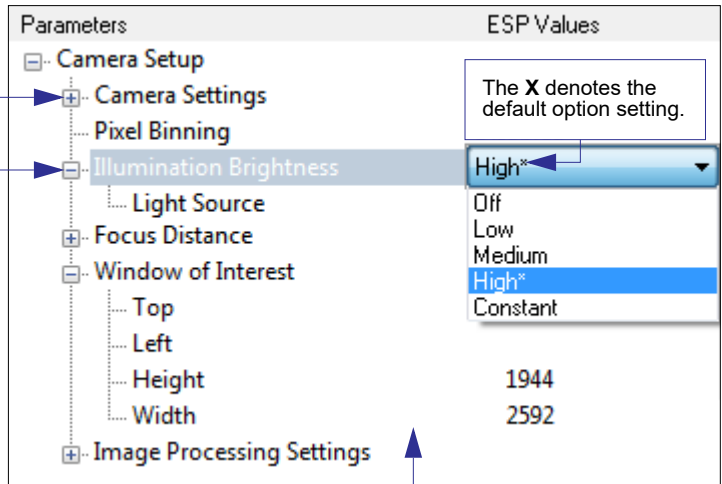


To return to **EZ Mode**, click the **EZ Mode** button.

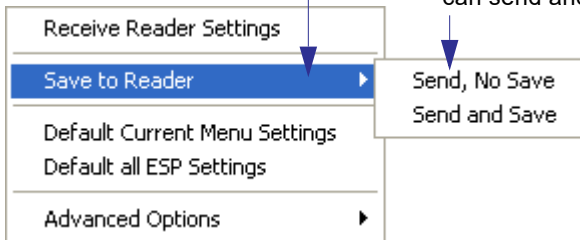


**To make changes to configuration settings in the tree controls:**

1. **Left-click** on the + to expand menu items.
2. **Double-click** the desired parameter and **single-click** in the selection box to view options.
3. Place your cursor in the selection box, scroll down to the setting you want to change, and **single-click** the setting.



4. **Left-click** again on the open screen to complete the selection.
5. **Right-click** on the open screen and select **Save to Reader** to implement the command in the reader. You can send the command without saving it, or you can send and save the command simultaneously.



## Send/Receive Options

To access **Receive**, **Save**, and **Default** options, click the **Send/Recv** button. You can also access these options by right-clicking in any of the configuration views.



### Receiving

From the **Send/Recv** menu, select **Receive Reader Settings**.

**Caution:** Do not select this option if you do not want to upload the reader's settings. For example, if your **ESP** file has a number of custom settings that you want to maintain and download into the reader, these settings would be lost by choosing **Yes**.

This is useful if you want to receive (upload) the reader's settings and save them as a file for future use. For example, if your reader has settings that you do not want to change, choosing **Yes** would allow you to load those settings to **ESP** and save them in an **ESP** file for later retrieval.

Receiving the reader's settings will also assure that you will not be subsequently saving any unwanted changes that you or someone else has made previously in **ESP**.

### Saving

#### **Send, No Save (<A>)**

Saves **ESP** settings to current memory.

#### **Send and Save (<Z>)**

Activates all changes in current memory *and* saves to the reader for power-on.

#### **Send and Save as Customer Defaults (<Zc>)**

Saves your default settings for quick retrieval.

This option will be visible only if you have checked **Enable 'Send and Save as Customer Defaults'** in **ESP Preferences**.

### Defaulting

When you select **Default Current Menu Settings** or **Default all ESP Settings**, you are only defaulting the **ESP** settings.

## Advanced Options

### Send Current View

This is the same as **Save to Reader** > **Send No Save** except that only the commands in the current configuration tree are sent.

### Send Current Command

This is the same as **Send Current View**, except that it saves only the command that is currently selected.

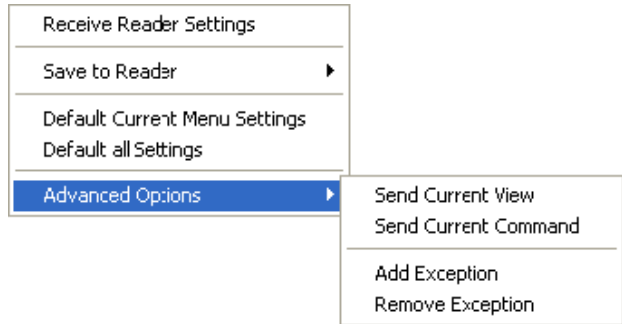
### Add/Remove Exception

After you perform a **Receive Reader Settings** command<sup>1</sup> and you click on the **Add Exception** option, you may see a list of serial commands. These are commands that may be in your reader's firmware, but not included in, or different from, your current version of **ESP**.

You can edit these commands by double-clicking on them and changing them as needed.

It is important to note that these commands will be saved to your reader whenever you send a **Save to Reader** command, or an **<A>** or a **<Z>** command.

Also, if there is a corresponding **ESP** menu item, the **ESP Value** column for that item will be blank following a **Receive Reader Settings** command.



1. From the **Send/Recv** button or by right-clicking in any blank section of a tree control view.

## Appendix F — Communications

This section explains how to set up communications with a host.

With WebLink or Omron Microscan's ESP (Easy Setup Program), configuration changes can be made in the menus and then sent and saved to the reader. The user can also send serial commands to the reader via Terminal window.

The following describes the basic flow of the serial (RS-232C) communications.

- Match RS-232C communication parameters (baud rate, parity, data bits, and stop bits) between V430 and the higher.
- Send the read command "< >" from the upper to V430.
- Send the "read result" from V430 to the upper.

The serial (RS-232C) communications use serial commands stated in this manual.

For example, "Read" commands are described in Appendix H — **Read Cycle**.

The following describes the basic flow of the serial (TCP) communications.

- V430 opens a port (default: 2001) as TCP server at startup.
- The higher connects to V430 as a TCP client.
- The higher sends the "read command" "< >" to V430.
- V430 sends the "read results" to the higher.

The serial (TCP) communications use serial commands stated in this manual.

For example, "Read" commands are described in Appendix H — **Read Cycle**.

The following describes the output format of serial (RS-232C, TCP) communications.

<Header> Read strings <Footer>

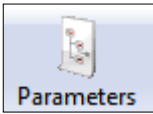
In default, the header is "None" and the footer is "CR+LF". The header and footer can be changed with WebLink. (Gear icon - **Advanced - Communications - Preamble/Postamble**)

For example, When reading a code of 12345, the default output data is below.

Output format of serial communications	Output data						
ASCII character notation:	1	2	3	4	5	CR	LF
Hex notation:	31	32	33	34	35	0D	0A

Addition to read strings, coordinate information of a read code and the print quality evaluation information can be added.

## Communications by ESP



Click the **Parameters** button and then the **Communication** tab.

Parameters	ESP Values
[-] Communications	
[-] RS232	
Baud Rate	115.2K
Parity	None
Stop Bits	One
Data Bits	Eight
+ Host Protocol	Point-to-Point
+ USB HID Report Status	
+ Ethernet	Enabled
+ Preamble	Disabled
+ Postamble	Enabled*
Postamble Characters	Disabled
Response Timeout	Enabled*
LRC Status	Disabled
Search and Configure Mode	Enabled

To open nested options, **single-click** the +.

To change a setting, **double-click** the setting and use your cursor to scroll through the options.

## **Communications Serial Commands**

Host Port Connections	<K100,baud rate,parity,stop bits,data bits>
Ethernet	<K126,status,IP address,subnet,gateway,IP address mode>
Ethernet TCP Ports	<K127,TCP Port 1,TCP Port 2>
Search and Configure Mode	<K128,status,timed window>
EtherNet/IP	<K129,status>
Host Protocol	<K140,protocol,address>
Preamble	<K141,status,preamble characters>
Postamble	<K142,status,postamble characters>
Response Timeout	<K143,response timeout>
LRC Status	<K145,status>
ACK/NAK Options	<K147,RES,REQ,STX,ETX,ACK,NAK>
Polling Mode Options	<K148,RES,REQ,STX,ETX,ACK,NAK>
EtherNet/IP Byte Swapping Enabled	<K163,status>
PROFINET	<K164,status>

## Host Port Connections

The host port can be configured with RS-232 connections.

The following settings define the basic transmission speeds and digital standards that ensure common formatting.

### Baud Rate, Host Port

*Usage:* Can be used to transfer data faster or to match host port settings.

*Definition:* The rate at which the reader and host transfer data back and forth.

*Serial Cmd:* <**K100**,*baud rate*,*parity*,*stop bits*,*data bits*>

*Default:* **115.2K**

*Options:*

0 = 600	1 = 1200	2 = 2400
3 = 4800	4 = 9600	5 = 19.2K
6 = 38.4K	7 = 57.6K	<b>8 = 115.2K</b>
9 = 230.4K		

### Parity, Host Port

*Usage:* Only changed if necessary to match host setting.

*Definition:* An error detection routine in which one data bit per character is set to 1 or 0 so that the total number of bits in the data field is either even or odd.

*Serial Cmd:* <**K100**,*baud rate*,**parity**,*stop bits*,*data bits*>

*Default:* **None**

*Options:* **0 = None**                      1 = Even                      2 = Odd

### Stop Bits, Host Port

*Usage:* Only changed if necessary to match host setting.

*Definition:* One or two bits added to the end of each character to indicate the end of the character.

*Serial Cmd:* <**K100**,*baud rate*,*parity*,**stop bits**,*data bits*>

*Default:* **One**

*Options:* **0 = One**                      1 = Two

### Data Bits, Host Port

*Usage:* Only changed if necessary to match host setting.

*Serial Cmd:* <**K100**,*baud rate*,*parity*,*stop bits*,**data bits**>

*Default:* **Eight**

*Options:* 0 = Seven                      **1 = Eight**

## Host Port Protocol

*Usage:* In general, the point-to-point protocols will work well in most applications. They require no address and must use RS-232 communications standards.

*Definition:* Protocols define the sequence and format in which information is transferred between the reader and the host.

*Serial Cmd:* <K140,protocol,address>

*Default:* **Point-to-Point**

*Options:* **0 = Point-to-Point**

4 = ACK/NAK

5 = Polling Mode

**Note:** In all protocol modes, the preamble <K141> and postamble <K142> character strings can be used to frame the decode data, and both are included in calculating the LRC (Longitudinal Redundancy Check).

### Point-to-Point (Standard)

*Usage:* Used only with RS-232.

*Definition:* Standard **Point-to-Point** requires no address and sends the data to the host whenever it is available, without a request or handshake from the host.

*Serial Cmd:* <K140,0>

### ACK/NAK

*Definition:* See the **ACK/NAK Options** command <K147>.

*Serial Cmd:* <K140,4>

### Polling Mode

*Definition:* See the **Polling Mode Options** command <K148>.

*Serial Cmd:* <K140,5>

### Poll Address

*Serial Cmd:* <K140,protocol,address>

*Default:* **1**

*Options:* 1 to 50

1 = Poll address 0x1C, Select address 0x1D

2 = Poll address 0x1E, Select address 0x1F

...

50 = Poll address 0x7E, Select address 0x7F

## ACK/NAK Options

**Definition:** These parameters take effect for **ACK/NAK <K140,4>** on the main RS-232 port and are completely independent of the **Polling Mode Options <K148>**. The reader always follows the protocol in both directions (to and from the host). There is no option to disable it from either direction.

**Serial Cmd:** <K147,RES,REQ,STX,ETX,ACK,NAK>

### RES-NAK Defaults

<i>RES: (Reset)</i>	00 (disabled)
<i>REQ: (Request)</i>	00 (disabled)
<i>STX: (Start of Text)</i>	00 (disabled)
<i>ETX: (End of Text)</i>	00 (disabled)
<i>ACK: (Acknowledge)</i>	06
<i>NAK: (Negative Acknowledge)</i>	15

The following are general outlines of the **ACK/NAK** protocol. Items that are framed by brackets ( [ ] ) can either be disabled or enabled. LRC does not include STX, but it does include preamble, postamble, and ETX.

### Symbol Data Output

**TX to host:** [STX] [preamble] SYMBOL DATA [postamble] [ETX] [LRC]

**Response from host:** ACK/NAK. Sent when LRC, ETX, postamble, or timeout (waiting for more data) are detected (if REQ is disabled) depending on what is enabled.

### Commands from Host to Reader

**TX to Reader:** [STX] <command> [ETX] [LRC]

**Response from Reader:** ACK/NAK. Sent when LRC, ETX, or command-ending angle bracket '>' are received, depending on what is enabled.

### Command Response from Reader to Host

**TX to host:** [STX] [preamble] COMMAND RESPONSE DATA [postamble] [ETX] [LRC]

**Response from host:** ACK/NAK. Sent when LRC, ETX, postamble, command-ending angle bracket '>', or timeout (waiting for more data) are detected, depending on what is enabled.

As with **Polling Mode <K140,5>**, the reader can optionally perform the REQ and RES event sequences in ACK/NAK mode. If the sender does not receive an ACK or NAK, it will send REQ to request such a response (if enabled). When the sender receives an ACK, too many NAKs, or times out (if already enabled), it will send a RES (if enabled) to terminate the transaction.

**Note:** See **ACK/NAK Data Flow Examples** for sample ACK/NAK communication scenarios.

## Polling Mode Options

**Definition:** These parameters only take effect for **Polling Mode <K140,5>** on the main RS-232 port and are completely independent of the **ACK/NAK Options <K147>**.

The values of protocol characters can be changed, but the protocol events cannot be disabled. The polling mode address is configured in the **<K140>** command (see **Poll Address**).

If RS-232 is enabled, **<K102,0>**, **Polling Mode** will operate as a **Point-to-Point** polling protocol. This is because the RS-232 transmitter is always left on when enabled.

**Serial Cmd:** **<K148,RES,REQ,STX,ETX,ACK,NAK>**

### RES-NAK Defaults

<i>RES: (Reset)</i>	04
<i>REQ: (Request)</i>	05
<i>STX: (Start of Text)</i>	02
<i>ETX: (End of Text)</i>	03
<i>ACK: (Acknowledge)</i>	06
<i>NAK: (Negative Acknowledge)</i>	15

**Note:** See **Polling Mode Data Flow Examples** for sample **Polling Mode** communication scenarios.

## Ethernet

Enables or disables Ethernet connectivity in the reader. This corresponds to the **<K126>** command. It requires a **<Zrdall>** to return to default settings.

[-] Ethernet	Enabled
IP Address	192.168.188.2
Subnet	255.255.0.0
Gateway	0.0.0.0
IP Address Mode	Static
TCP Port 1	2001
TCP Port 2	2003
EtherNet/IP	Enabled
Ethernet/IP Byte Swapping	Disabled
PROFINET	Disabled
[-] Preamble	Disabled
Preamble Characters	CR
[-] Postamble	Enabled
Postamble Characters	CR LF
Response Timeout	12 ms
LRC Status	Disabled
Search and Configure Mode	Enabled

## IP Address

This is the IP address of the reader when it is in Static IP Address Mode.

[-] Ethernet	Enabled
IP Address	192.168.188.2
Subnet	255.255.0.0
Gateway	0.0.0.0
IP Address Mode	Static
TCP Port 1	2001
TCP Port 2	2003
EtherNet/IP	Enabled
Ethernet/IP Byte Swapping	Disabled
PROFINET	Disabled
[-] Preamble	Disabled
Preamble Characters	CR
[-] Postamble	Enabled
Postamble Characters	CR LF
Response Timeout	12 ms
LRC Status	Disabled
Search and Configure Mode	Enabled

## Subnet

This is the subnet of the reader when it is in Static IP Address Mode.

[-] Ethernet	Enabled
... IP Address	192.168.188.2
... Subnet	255.255.0.0
... Gateway	0.0.0.0
... IP Address Mode	Static
... TCP Port 1	2001
... TCP Port 2	2003
... EtherNet/IP	Enabled
... Ethernet/IP Byte Swapping	Disabled
... PROFINET	Disabled
[-] Preamble	Disabled
... Preamble Characters	CR
[-] Postamble	Enabled
... Postamble Characters	CR LF
... Response Timeout	12 ms
... LRC Status	Disabled
... Search and Configure Mode	Enabled

## Gateway

This is the gateway IP address of the reader when it is in Static IP Address Mode.

[-] Ethernet	Enabled
... IP Address	192.168.188.2
... Subnet	255.255.0.0
... Gateway	0.0.0.0
... IP Address Mode	Static
... TCP Port 1	2001
... TCP Port 2	2003
... EtherNet/IP	Enabled
... Ethernet/IP Byte Swapping	Disabled
... PROFINET	Disabled
[-] Preamble	Disabled
... Preamble Characters	CR
[-] Postamble	Enabled
... Postamble Characters	CR LF
... Response Timeout	12 ms
... LRC Status	Disabled
... Search and Configure Mode	Enabled

## IP Address Mode

Determines how the reader's IP address will be defined.

Ethernet	Enabled
IP Address	192.168.188.2
Subnet	255.255.0.0
Gateway	0.0.0.0
IP Address Mode	Static
TCP Port 1	Static
TCP Port 2	DHCP*
EtherNet/IP	2005
Ethernet/IP Byte Swapping	Enabled
PROFINET	Disabled
Preamble	Disabled
Preamble Characters	CR
Postamble	Enabled
Postamble Characters	CR LF
Response Timeout	12 ms
LRC Status	Disabled
Search and Configure Mode	Enabled

### Static

In **Static Mode**, the reader uses the user-defined IP address. This is the default state for V430-F-series.

### DHCP

In **DHCP Mode**, the reader automatically acquires the IP address, Subnet, and Gateway addresses from a DHCP or BOOTP server.

## TCP Port 1

One of two TCP ports for Ethernet communication with the reader. The default setting is **2001**.

[-] Ethernet	Enabled
... IP Address	192.168.188.2
... Subnet	255.255.0.0
... Gateway	0.0.0.0
... IP Address Mode	Static
TCP Port 1	2001   1024 - 65535
... TCP Port 2	2003
... EtherNet/IP	Enabled
... Ethernet/IP Byte Swapping	Disabled
... PROFINET	Disabled
[-] Preamble	Disabled
... Preamble Characters	CR
[-] Postamble	Enabled
... Postamble Characters	CR LF
... Response Timeout	12 ms
... LRC Status	Disabled
... Search and Configure Mode	Enabled

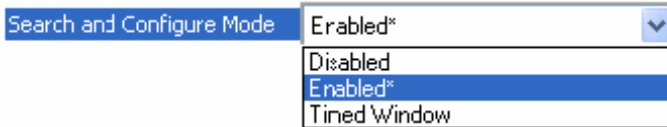
## TCP Port 2

One of two TCP ports for Ethernet communication with the reader. The default setting is **2003**.

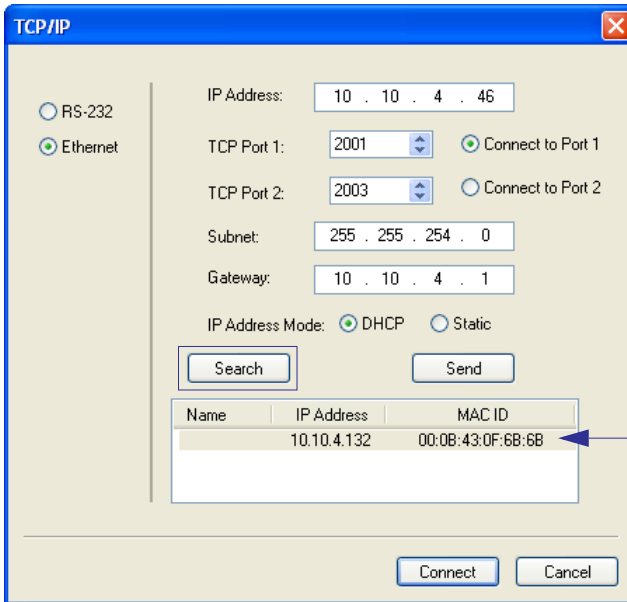
[-] Ethernet	Enabled
... IP Address	192.168.188.2
... Subnet	255.255.0.0
... Gateway	0.0.0.0
... IP Address Mode	Static
... TCP Port 1	2001
TCP Port 2	2003   1024 - 65535
... EtherNet/IP	Enabled
... Ethernet/IP Byte Swapping	Disabled
... PROFINET	Disabled
[-] Preamble	Disabled
... Preamble Characters	CR
[-] Postamble	Enabled
... Postamble Characters	CR LF
... Response Timeout	12 ms
... LRC Status	Disabled
... Search and Configure Mode	Enabled

## Search and Configure Mode

**Note:** Search is the non-applicable function in V430-F. Please use DDU (Device Discovery Utility) software, when using V430-F.



**Search and Configure Mode** is intended primarily for initial setup of an reader in a network. This parameter controls whether or not the reader will respond to ESP's **Search** function in the Ethernet TCP/IP connect dialog section of the **Connection Wizard**:



After the reader is in full use in an application, you may want the reader to continue to appear in the **Search** response list for future searches. This can help prevent disruption of the system that may occur is ESP were to show only unconfigured units.

Changes to this parameter are saved to NOVRAM and are set to default on power on.

A Reset **<A>** is required for settings to take effect.

**Important:** Once this setting is Disabled, ESP will only be able to connect to the reader if you know the IP address and enter it in the IP Address field of the Ethernet TCP/IP connect dialog. Search and Configure Mode can be re-enabled by defaulting the reader.

### Enabled

When enabled, **Search and Configure Mode** will find the reader and settings can be changed.

### Timed Window

When **Timed Window** is selected, Search and Configure Mode will find the reader and settings can be changed, but only 60 seconds from the last reset. After 60 seconds, Search and Configure Mode will be disabled.

## Response Timeout

*Usage:* Only used when a response is required from the host. The reader can be set to wait indefinitely by setting **Response Timeout** to zero.

*Definition:* The time that the reader will wait before timing out if **ACK**, **NAK**, and **ETX** are enabled, and a host response is expected.

*Serial Cmd:* <**K143,response timeout**>

*Default:* **12** (in 1 ms increments)

*Options:* 0 to 255 (A zero (0) setting causes an indefinite wait.)

## LRC (Longitudinal Redundancy Check) Status

*Usage:* Used when extra data integrity is required.

*Definition:* An error-checking routine that verifies the accuracy of transmissions. It is the exclusive OR of all characters following the **STX** (start of text) up to and including the **ETX** (end of text). What this means is that the binary representation of all the characters in a transmission are cumulatively added in a column and each resulting odd integer is assigned a 1 and each even integer a 0 (two 1s = 0, two 0s = 0, a 1 and a 0 = 1). The extra LRC character is then appended to the transmission, and the receiver (usually the host) performs the same addition and compares the results.

*Serial Cmd:* <**K145,status**>

*Default:* **Disabled**

*Options:* **0 = Disabled**                      1 = Enabled

## Protocol Configuration Examples

### Point-to-Point (Main Port)

<K100,8,0,1,1> Baud Rate: **115.2K**; Parity: **None**; Stop Bits: **2**; Data Bits: **8**  
 <K140,0> Point-to-Point  
 <K102,0> RS-232 enabled

### Polling Mode (Main Port)

<K100,4,0,1,1> Baud Rate: **9600**; Parity: **None**; Stop Bits: **2**; Data Bits: **8**  
 <K140,5,23> Polling Mode; Address: **23**  
 <K102,0> RS-232 Point-to-Point polling  
 <K143,30> 30 ms Response Timeout

### “User-Defined” Polling Mode (Main Port)

<K100,4,0,1,1> Baud Rate: **9600**; Parity: **None**; Stop Bits: **2**; Data Bits: **8**  
 <K140,5,12> Polling Mode; Address: **12**  
 <K148,,08,09,18,0B,0C,0D> Default RES (0x04), REQ=0x08; EOT=0x09; STX=0x18;  
 ETX=0x0B; ACK=0x0C; NAK=0x0D  
 <K102,0> RS-232 Point-to-Point polling  
 <K143,40> 40 ms Response Timeout

### ACK/NAK (Main Port)

<K100,9,0,1,1> Baud Rate: **230K**; Parity: **None**; Stop Bits: **2**; Data Bits: **8**  
 <K140,4> ACK/NAK  
 <K147,,,01,1B,2E,1F> Default RES and REQ (00, disabled); STX=0x01; ETX=0x1B;  
 ACK=0x2E; NAK=0x1F  
 <K102,0> RS-232 enabled  
 <K143,50> 50 ms Response Timeout

## **Preamble**

### **Preamble Status**

*Usage:* Useful for identifying and controlling incoming data. For example, defining the preamble as a carriage return and a line feed causes each decoded message to be displayed on its own line.

*Definition:* Defines a one to four character data string that can be added to the front of the decoded data.

*Serial Cmd:* <**K141**,*status*,*preamble character(s)*>

*Default:* **Disabled**

*Options:* **0 = Disabled**                      1 = Enabled (within any protocol)

### **Preamble Characters**

*Serial Cmd:* <**K141**,*status*,*preamble character(s)*>

*Default:* **^M** corresponds to: **carriage return**.

*Options:* To enter control characters within a serial command, hold down the **Ctrl** key while typing the desired character.

*Example:* <**K141**,**1**,**CNTL-m**> to enter the control character **^M**.

## Postamble

### Postamble Status

**Usage:** Useful for identifying and controlling incoming data. For example, defining the postamble as a carriage return and a line feed causes each decoded message to be displayed on its own line.

**Definition:** Allows the user to enable or disable up to four postamble characters that can be added to the end of the decoded data.

**Serial Cmd:** <**K142,status,postamble character(s)**>

**Default:** **Enabled**

**Options:** 0 = Disabled                      **1 = Enabled (within any protocol)**

### Postamble Characters

**Serial Cmd:** <**K142,status,postamble character(s)**>

**Default:** **^M^J** corresponds to: **carriage return/line feed.**

**Options:** To enter control characters within a serial command, hold down the control key while typing the desired character.

*Example:* <**K142,1,CNTL-m CNTL-j**> to enter **^M^J**.

## EtherNet/IP Byte Swapping Enabled

**Definition:** Enables or disables EtherNet/IP byte swapping for decode data.

**Serial Cmd:** <**K163,status**>

**Default:** **Disabled**

**Options:** **0 = Disabled**  
1 = Enabled

## PROFINET

**Definition:** Enables or disables the PROFINET communications protocol.

**Serial Cmd:** <**K164,status**>

**Default:** **Disabled**

**Options:** **0 = Disabled**  
1 = Enabled

## **Entering ASCII Characters as Hex Values**

Commands that require ASCII text fields, such as **Preamble** and **Postamble** commands, can be sent to the reader as hex values.

*Serial Cmd Format:* <Knnnh,00-FF>

To enter ASCII fields as hex values (00 to FF), add a lower-case **h** directly after the command's **K** number, and then enter the hex value that corresponds with the desired ASCII character.

*Example:*

Consider the **Postamble** command:

*Serial Cmd:* <K142,status,**postamble character(s)**>

Imagine that your application requires the ASCII character **>** to be the postamble in your symbol decode output.

The ASCII characters **<**, **>**, and **,** can only be entered as hex values. So, to make **>** the postamble in your symbol decode output, enter the **Postamble** command as follows:

**<K142h,,3E>**

Note that the "status" field contains only a **,**. This is because the only field that is being changed is the "postamble character(s)" field. (See **Serial Configuration Command Conventions** for a more detailed explanation of this command shortcut.)

## Appendix G — Calibration

This section shows the calibration options, and explains the different ways that those options can be configured.

### Calibration Serial Commands

Calibration Options	< <b>K529</b> ,gain,exposure,focus position,symbol type,WOI framing,WOI margin,line scan height,processing>
---------------------	---

### Calibration Overview

**Calibration** is one of the most powerful features of the V430-F-series. The calibration process can be initiated by serial command or in the **ESP** user interface.

When the reader enters calibration, it runs through an optimization cycle that sets the ideal parameters for reading symbols at the highest possible level of performance. Calibration can be specially configured to optimize specific parameters, such as gain, exposure, and symbol type.

## Calibration Options

This command specifies the operation of the calibration feature. The default configuration performs calibration on gain and symbol type. The calibration process optimizes the gain setting for the configured exposure.

### Gain

- Definition:* When enabled, gain is calibrated to provide the best available image quality and performance.  
When disabled, gain is fixed and is not part of the calibration process.
- Serial Cmd:* <**K529,gain,exposure,focus position,symbol type,WOI framing,WOI margin,line scan height,processing**>
- Default:* **Quick Calibrate**
- Options:* 0 = Disabled  
1 = Enabled (Decode Required)  
**2 = Quick Calibrate**

**Note:** If you choose to calibrate the reader by sending a <**@CAL**> command, a decode is also required for the calibration process to be completed successfully.

### Disabled

When disabled, gain is fixed and is not part of the calibration process.

### Enabled

When enabled, gain is calibrated to provide the best image quality and performance for the symbol present in the field of view. Calibration requires that a decodable symbol be placed in the field of view, as feedback from the symbol decoding process is used to select the best gain setting. If a symbol is not decoded the process will result in a fail condition. Gain is enabled by default.

### Quick Calibrate

**Quick Calibrate** uses the automatic gain control (AGC) feature of the image sensor to adjust the gain value such that the current image falls into a desirable region of the image sensor's sensitivity range, ensuring optimal image luminance. The image sensor converges on the optimal gain value within a few image frames.

## Exposure

**Definition:** Unless the application is static, exposure should be configured based on the application's line speed. The table below is a general guideline for exposure configurations at various line speeds.

**Serial Cmd:** <K529,gain,**exposure**,focus position,symbol type,WOI framing,WOI margin, line scan height,processing>

**Default:** **Quick Calibrate**

**Options:** 0 = Disabled  
1 = Enabled (Decode Required)  
**2 = Quick Calibrate**

**Note:** If you choose to calibrate the reader by sending a <@CAL> command, a decode is also required for the calibration process to be completed successfully.

**Note:** This table shows guidelines for exposure settings based on various line speeds. The settings shown depend on the reader's optical configuration and on symbol element size.

Exposure	Line Speed
100,000 – 4,000	Static
4,000 – 1,250	5" / sec
1,250 – 700	10" / sec
700 – 500	15" / sec
500 – 400	20" / sec

### Disabled

When disabled, exposure is fixed and is not part of the calibration process.

### Enabled

When enabled, exposure is calibrated to provide the best image quality and performance for the symbol present in the field of view. Calibration requires that a decodable symbol be placed in the field of view, as feedback from the symbol decoding process is used to select the best exposure setting. If a symbol is not decoded the process will result in a fail condition. Exposure is enabled by default.

### Quick Calibrate

**Quick Calibrate** uses the automatic exposure control feature of the image sensor to adjust the exposure value such that the current image falls into a desirable region of the image sensor's sensitivity range, ensuring optimal image luminance. The image sensor converges on the optimal exposure value within a few image frames.

## Focus Position

**Definition:** The reader's focus position can be configured by entering the target distance value, so focus position can usually be configured without calibration. However, if it is necessary to calibrate the focus distance there are two methods: the standard **Search Method** and a **Quick Focus** method, both of which are defined below.

**Serial Cmd:** <**K529**,gain,exposure,**focus position**,symbol type,WOI framing,WOI margin, line scan height,processing>

**Default:** **Quick Focus**

**Options:** 0 = Disabled

1 = Enabled (Decode Required)

**2 = Quick Focus**

### **Disabled**

The focus position is fixed and is not part of the calibration process.

### **Enabled (Search Method)**

Focus position is calibrated to provide the best image quality and performance. This method is a simple search algorithm that cycles through focus settings and configures camera settings to try and locate the desired focus as quickly as possible. This is accomplished when a symbol is decoded. Once a focus distance that produces a successful decode has been located, the algorithm fine tunes the search to locate the inside and outside focal distances. The final focus distance is between the inside and outside values. This method may be time-consuming if the focus is not found on the first pass.

### **Quick Focus**

**Quick Focus** quickly locates the focus setting for an object at the center of the field of view. This is accomplished with minimal image processing, by analyzing a histogram of the image frame. Before performing focus calibration, a value for exposure and gain is determined. The process then steps through the focus range of the system capturing the required number of image frames for each focal position. Then a histogram is performed on each image frame, and the histogram results for each focal position are averaged. When the process is finished, the data is analyzed and the optimal focus position is determined.

**Note:** This method may not work for all applications. This method is not ideal for very small symbols.

## Symbol Type

*Serial Cmd:* <**K529**,gain,exposure,focus position,**symbol type**,WOI framing,WOI margin,line scan height,processing>

*Default:* **Enabled**

*Options:* 0 = Disabled **1 = Enabled**

### ***Disabled***

When this feature is disabled, only the current enabled symbologies will be considered during the calibration process.

### ***Enabled***

When this feature is enabled, autodiscrimination is in effect during the calibration process. All supported symbologies except PDF417 and Pharmacode will be attempted during calibration. Any new symbologies successfully decoded during calibration will remain enabled at the end of the process. All enabled symbologies will remain enabled. For example, assume that only Code 39 is enabled at the beginning of calibration. If a Code 128 symbol is decoded during calibration, then Code 128 as well as Code 39 will be enabled.

## Window of Interest (WOI) Framing

**Definition:** If WOI Framing is enabled, the camera's Window of Interest will be set to a full size image when calibration begins. Once a symbol is decoded, the camera WOI will be zoomed in both vertically and horizontally (regardless of which WOI mode is enabled) to include the symbol plus an additional margin. This is done to speed up the calibration process. When a successful calibration is complete, the camera WOI will be adjusted according to the mode enabled. Otherwise, the original WOI configuration will be retained.

**Serial Cmd:** <K529,gain,exposure,focus position,symbol type,**WOI framing**,WOI margin, line scan height,processing>

**Default:** **Disabled**

**Options:** **0 = Disabled**

1 = Row and Column

2 = Row

3 = Column

4 = Straight Line

5 = Straight Line Framed

If WOI framing is not enabled, the current WOI configuration will be used until a symbol has been decoded. After a symbol is decoded, the WOI is framed exactly as it would be if a WOI framing mode was enabled. When calibration completes, the original WOI configuration is restored.

### **Disabled**

When this feature is disabled, the Window of Interest is not modified after the calibration process is complete.

### **Row and Column**

If the calibration process is successful, the Window of Interest will be modified to frame the symbol as well as an additional margin area around the symbol, determined by the **WOI Margin** parameter.

### **Row**

If the calibration process is successful, the Window of Interest rows will be modified to horizontally frame the symbol, plus an additional margin area around the symbol, determined by the WOI Margin parameter.

### **Column**

If the calibration process is successful, the Window of Interest columns will be modified to vertically frame the symbol, plus an additional margin area around the symbol, determined by the WOI Margin parameter.

### ***Straight Line***

This feature is intended for use with linear symbologies. If the calibration process is successful, the orientation of the symbol is determined and the Window of Interest is modified according to the symbol orientation. The scan line orientation is determined to be vertical if the symbol tilt is between 225° and 315°, or between 45° and 135°. Otherwise, the scan line will be horizontal.

If the symbol is vertical, the image column size will be set by the scan height parameter, and will be configured for full row resolution. If the symbol is horizontal, the image row size will be set by the scan height parameter, and will be configured for full column resolution. The scan line will be centered in the middle of the symbol. If the symbol is tilted such that the scan line will not pass completely through the symbol, the scan width will be adjusted to include the entire symbol. Refer to the diagram below:



### ***Straight Line Framed***

This parameter is the same as “Straight Line”, except that the Window of Interest will also frame the scan line on the symbol length as well. The scan line includes the symbol plus an additional margin area determined by the WOI Margin parameter.

## Window of Interest (WOI) Margin

*Definition:* Sets the margin size that is applied to the calibrated symbol. This parameter is expressed in number of pixels. If the margin causes the image to exceed the maximum image size, it will be reduced accordingly.

*Serial Cmd:* <**K529**,gain,exposure,focus position,symbol type,WOI framing,**WOI margin**, line scan height,processing>

*Default:* **75 (pixels)**

*Options:* 20 to 1280

## Line Scan Height

*Definition:* This parameter is only used with the Straight Line modes. It sets the scan height of the straight-line image, and it is expressed in number of pixels.

*Serial Cmd:* <**K529**,gain,exposure,focus position,symbol type,WOI framing,WOI margin, **line scan height**,processing>

*Default:* **64 (pixels)**

*Options:* 3 to 1280

## Processing

*Definition:* This setting defines the amount of time and effort the reader will spend attempting to decode a symbol for each parameter configuration.

*Serial Cmd:* <**K529**,gain,exposure,focus position,symbol type,WOI framing,WOI margin, line scan height,**processing**>

*Default:* **Medium**

*Options:* 0 = Low **1 = Medium**  
2 = High 3 = Definable

### **Low**

The reader will spend a low amount of effort attempting to decode the given symbol for each parameter configuration.

### **Medium**

The reader will spend a medium amount of effort attempting to decode the given symbol for each parameter configuration.

### **High**

The reader will spend a high amount of effort attempting to decode the given symbol for each parameter configuration.

### **Definable**

The processing time for each image frame is defined by **Image Processing Timeout**.

## Calibration by ESP

ESP's **Calibration** view incorporates all the functionality of the <K529> (**Calibration Options**) command in a single easy-to-use, intuitive interface. This calibration process allows the user much finer control of individual parameters than the calibration routine in **EZ Mode** or on the **Video** tab.

### Before/During Calibration

**Before** and **After** tabs give the user an authentic representation of the difference in what the reader "sees" before and after the calibration routine.

**Exposure, Gain, and Image Quality** values are all tracked in real-time during the calibration process.

**Gain and Shutter Speed** are configurable in the **Calibration** interface.

Determines the amount of time and effort the reader will spend attempting to decode a symbol for each parameter configuration. (**Low, Medium, High, Definable**).

Dropdown menu of **1D** and **2D** symbologies, and a check box for enabling or disabling **Composite** symbologies.

Initiates the calibration routine.

Cancels the calibration process, if necessary.

The **Window of Interest** section of the **Calibration** interface allows the user to make precise adjustments to **WOI Framing**, **WOI Margin** (in pixels), and the scan height of the straight-line image (in pixels).

Beginning calibration...  
Processing  
Medium\*

250 32 8792  
Shutter Gain Quality

Gain 32  
Shutter Speed 250

Symbology Type  
(ECC 200, Code 39)

Composite Enabled

Window of Interest  
WOI Framing Disabled\*  
WOI Margin 75  
Linescan Height 64

Calibrate  
Cancel  
Save

### After Calibration

Before After

250 38 8792

Shutter Gain Quality

Capture Settings  
Gain: 38  
Shutter Speed: 250

Processing  
Medium\*

Symbology Type  
(ECC 200, Code 39)

Composite Enabled

Window of Interest  
WOI Framing: Disabled\*  
WOI Margin: 75  
Linescan Height: 64

Calibrate  
Cancel  
Save

The **Shutter, Gain, and Quality** indicator bars remain stationary at the end of calibration to provide a visual reference for the final values of these parameters.

Notice the improved image resolution after the calibration process is complete.

The calibration progress bar indicates that the process has been completed.

Saves the optimal configuration parameters determined by calibration results.

## Initiating Calibration

Calibration can be initiated by serial command or from the **Calibration** interface in **ESP**. A symbol must be in the reader's field of view during the calibration process.

In **ESP**, the **Calibrate** button starts the calibration routine.



**Note:** If you choose to calibrate the reader by sending a **<@CAL>** command, a decode is also required for the calibration process to be completed successfully.

## Additional Notes about Calibration

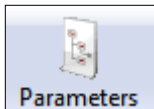
The following conditions apply to the reader's calibration process. Some of these items are noted at various points throughout this section, or in other sections of the reader's documentation.

1. If **Window of Interest Framing** is enabled, the WOI will be set to full frame when calibration begins. If **WOI Framing** is disabled, the current WOI configuration will be used for the **Search Pass**.
2. **Image Processing Mode** will not be altered during calibration.
3. If **Symbol Type** is enabled for calibration (**Autodiscriminate**), then Interleaved 2 of 5 **Range Mode Status (Interleaved 2 of 5) <K472>** will be enabled. This allows variable-length Interleaved 2 of 5 symbols to be decoded. If an Interleaved 2 of 5 symbol is decoded during calibration, then code length # 1 will be set to the decoded symbol length at the end of calibration. Otherwise, the symbol lengths will be restored to their original configurations.
4. **Pharmacode** is not calibrated.
5. All symbol types that were enabled before calibration will still be enabled after calibration. For example, if Data Matrix ECC 200 was enabled before calibration, and the calibration routine was performed on a Code 128 symbol, then after calibration is completed both Data Matrix ECC 200 and Code 128 will be enabled.
6. Calibration does not modify the global **Composite** status **<K453>**. The global Composite status must be configured properly before calibration.
7. If the user requires calibration of a **stacked** symbology **<K482>**, **<K483>**, or **<K484>**, that symbology must be enabled and configured appropriately before calibration.
8. The **Search** process will use the configurable Window of Interest for image captures. However, when the search process is completed, the WOI will be reduced to include only the symbol of interest and some additional boundary area.

## Appendix H — Read Cycle

After you've established communications and completed basic read rate testing, you will need to address the spatial and timing parameters associated with your application. This section explains those parameters.

### Read Cycle by ESP



Click the **Parameters** button and then the **Read Cycle** tab.

Parameters	ESP Values
[-] Read Cycle	
[+] Multisymbol	
[-] Trigger	
... Mode	Continuous Read Auto
[+] Trigger Filter Duration	
... External Trigger State	Active Closed
[+] Serial Trigger	
... Decodes Before Output	1
[-] End of Read Cycle	
... Mode	Timeout*
... Read Cycle Timeout	
[+] Capture Mode	
[+] Capture Time	
[+] Store No Read Image	
[+] Image Processing Settings	

The 'Mode' dropdown menu is open, showing the following options: Timeout\*, Timeout\*, New Trigger, Timeout or New Trigger, Last Frame, Last Frame or New Trigger.

To open nested options, **single-click** the +.

To change a setting, **double-click** the setting and use your cursor to scroll through the options.

## Read Cycle Serial Commands

Trigger Mode/Filter Duration	<K200, trigger mode, leading edge trigger filter, trailing edge trigger filter>
Serial Trigger Character	<K201, serial trigger character>
External Trigger State	<K202, external trigger state>
End of Read Cycle	<K220, end of read cycle mode, read cycle timeout>
Decodes Before Output	<K221, good decode(s) needed>
Multisymbol	<K222, number of symbols, multisymbol separator>
Start Trigger Character	<K229, start character>
Stop Trigger Character	<K230, stop character>
Capture Mode	<K241, capture mode, number of rapid captures, rapid capture mode, number of continuous captures, images per read cycle limit, read cycle history limit>
Capture Time	<K242, time before first capture, time between captures 1 and 2, time between captures 2 and 3, time between captures 3 and 4, time between captures 4 and 5, time between captures 5 and 6, time between captures 6 and 7, time between captures 7 and 8>
Image Storage	<K244, image storage type, image store mode>
Image Processing Timeout	<K245, image processing timeout>

## Read Cycle Setup

Setting up read cycle and triggering parameters will involve a series of decisions based on your particular application, as follows:

1. Select the number of symbols to be read in a single cycle. The reader can read multiple symbols in a single image frame.
2. Decide on the trigger type to be used: if serial, choose a serial character; if external, choose either **Level** or **Edge**.
3. Designate how the read cycle should end (**Timeout**, **New Trigger**, **Last Frame**).
4. Select **Capture Mode**, **Continuous Mode**, or **Rapid Mode**.
5. Select **Number of Captures** (if in **Rapid Capture Mode**).
6. Set the **Time Before First Capture** and **Time Between Captures**, if any.

**Note:** The capture rate increases as the frame size decreases.

## Multisymbol

**Usage:** Multisymbol is commonly used in shipping applications where a shipping symbol contains individual symbols for part number, quantity, etc. This feature allows on trigger to pick up all the symbols.

**Definition:** **Multisymbol** allows the user to define up to 100 symbols that can be read in a single read cycle.

**Conditions:** The following conditions apply:

- Each symbol must be different to be read, unless in **Rapid Capture Mode**, configured for “triggered capture”.
- The maximum number of characters in a read cycle is 3,000 for all symbols.
- All No-Read messages are posted at the end of the data string, unless output filtering is enabled.
- If more than one symbol is within the field of view at the same time, symbol data may not be displayed in the order of appearance.
- If **Matchcode Type** is set to **Sequential** or if **Trigger** is set to **Continuous Read 1 Output**, the reader will behave as if **Number of Symbols** were set to **1**, regardless of the user-defined configuration.

## Number of Symbols

**Definition:** **Number of Symbols** is the number of different symbols that can be read in a single read cycle.

**Serial Cmd:** <K222,number of symbols, multisymbol separator>

**Default:** 1

**Options:** 1 to 100

## Multisymbol Separator

**Usage:** Used to delimit or separate data fields with a user defined character.

**Definition:** Any valid ASCII character, inserted between each symbol read when Multisymbol is set to any number greater than 1.

**Serial Cmd:** <K222,number of symbols,multisymbol separator>

**Default:** , (comma)

**Options:** Any available ASCII character.

**Note:** If No-Read messages are disabled and there are No-Reads occurring, separators will only be inserted between symbol data outputs.

## Trigger Mode and Filter Duration

### Trigger Mode

**Definition:** The **Trigger** is the event that initiates a read cycle.

**Note:** When calibrating the reader or testing read rate, the current trigger setting will be disregarded.

**Serial Cmd:** <**K200**, **trigger mode**, *leading edge trigger filter*, *trailing edge trigger filter*>

**Default:** **Continuous Read Auto**

**Options:**

- 0 = Continuous Read
- 1 = Continuous Read 1 Output
- 2 = External Level
- 3 = External Edge
- 4 = Serial Data
- 5 = Serial Data and Edge
- 6 = Continuous Read Auto**

### Continuous Read

**Usage:** **Continuous Read** is useful in testing symbol readability or reader functions. It is not recommended for normal operations.

**Definition:** In **Continuous Read**, trigger input options are disabled, the reader is always in the read cycle, and it will attempt to decode and transmit every capture. If a single symbol stays within read range for multiple read cycles, its data will be transmitted repeatedly until it leaves the read range.

The reader sends replies to serial commands that require responses when symbol data is transmitted, or read cycle timeout is enabled and a timeout occurs *and* at least one captured image has been processed. Depending on the combination of enabled symbologies, the reader may take longer than the timeout to process a captured image.

**Note:** **When to Output** and **No-Read** options have no affect on **Continuous Read**.

**Serial Cmd:** <**K200**, **0**>

### **Continuous Read 1 Output**

**Usage:** **Continuous Read 1 Output** can be useful in applications where it is not feasible to use a trigger and all succeeding symbols contain different information. It is also effective in applications where the objects are presented by hand.

**Definition:** In **Continuous Read 1 Output** the reader self-triggers whenever it decodes a new symbol or a timeout occurs.

If **End of Read Cycle** is set to **Timeout** and the symbol doesn't change, the output is repeated at the end of each timeout period. For example, if **Timeout** is set to one second, the reader sends the symbol data immediately and repeats the output at intervals of one second for as long as it continues to capture the symbol.

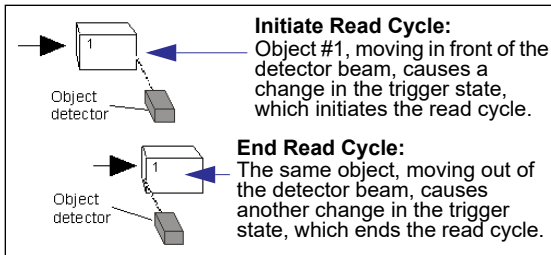
If **End of Read Cycle** is set to **New Trigger**, the reader will send the current symbol data immediately, *but only once*. A new symbol appearing in the reader's range will be read and sent immediately, provided it is not identical to the previous symbol.

**Serial Cmd:** <K200,1>

**Caution:** In automated environments, **Continuous Read 1 Output** is not recommended because there is typically no reliable way to verify that a symbol was missed.

**Note:** If **Trigger Mode** is set to **Continuous Read 1 Output**, the reader will behave as if **Number of Symbols** were set to **1**, regardless of the user-defined configuration.

## External Level



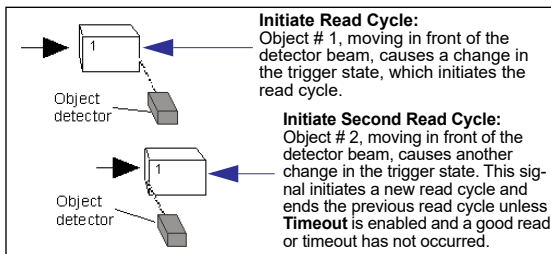
**Usage:** This mode is effective in an application where the speeds of the conveying apparatus are variable and the time the reader spends reading each object is not predictable. It also allows the user to determine if a No-Read has occurred.

**Definition:** **External Level** allows the read cycle (active state) to begin when a trigger (change of state) from an external sensing device is received. The read cycle persists until the object moves out of the sensor range and the active trigger state changes again.

**Serial Cmd:** <K200,2>

**Important:** **Level** and **Edge** apply to the active logic state (**Active Open** or **Active Closed**) that exists while the object is in a read cycle, between the rising edge and the falling edge. *Rising edge* is the trigger signal associated with the appearance of an object. *Falling edge* is the trigger signal associated with the subsequent disappearance of the object. This applies both to **External Level** and **External Edge**.

## External Edge



**Usage:** This mode is highly recommended in any application where conveying speed is constant, or if spacing, object size, or read cycle timeouts are consistent.

**Definition:** **External Edge**, as with **Level**, allows the read cycle (active state) to begin when a trigger (change of state) from an external sensing device is received. However, the passing of an object out of sensor range does not end the read cycle. The read cycle ends with a good read output, or, depending on the **End of Read Cycle** setting, a timeout or new trigger occurs.

**Serial Cmd:** <K200,3>

## **Serial Data**

**Usage:** **Serial Data** is effective in a highly controlled environment where the host knows precisely when the object is in the field of view. It is also useful in determining if a No-Read has occurred.

**Definition:** In **Serial Data**, the reader accepts an ASCII character from the host or controlling device as a trigger to start a read cycle. A **Serial Data** trigger behaves the same as an **External Edge** trigger.

Serial commands are entered inside angle brackets, as shown here: <t>.

**Serial Cmd:** <K200,4>

**Note:** In **Serial Data**, sending a non-delimited start serial character will start a read cycle; however, a non-delimited stop serial character has no effect.

## **Serial Data and Edge**

**Usage:** **Serial Data or External Edge** is seldom used but can be useful in an application that primarily uses an external sensing device but occasionally needs to be triggered manually.

**Definition:** In this mode the reader accepts either a serial ASCII character or an external trigger pulse to start the read cycle.

**Serial Cmd:** <K200,5>

**Note:** In **Serial Data**, sending a non-delimited start serial character will start a read cycle; however, a non-delimited stop serial character has no effect.

## **Continuous Read Auto**

**Definition:** Behaves identically to Continuous Read but maintains optimal self-adjusting photometry and focus parameters. As a result, the photometry parameters (Exposure and Gain) in the <K541> command as well as the focus parameter in the <K525> command are continuously updated with the optimal configuration parameters. In this mode, the illumination does not strobe, but instead is always active, as images are continuously captured. If the <K525,,,Auto Focus Mode> field is set to 1, and if there is a series of no-reads, this mode will self-start a focus pass. <K525,,, # noreads> defines how many no-reads must occur before the focus pass will start.

**Serial Cmd:** <K200,6>

## Leading Edge Trigger Filter

- Usage:** Used to ignore spurious triggers when **Trigger Mode** is set to External Edge or External Level.
- Definition:** To consider a change in state on the trigger input, the level must be stable for the trigger filter duration. In an edge mode, the reader will trigger a read cycle if the active state has been uninterrupted for the entire trigger filter duration. In a level mode, the leading edge is filtered such that on an active edge, the state must be held interrupted for the trigger filter duration before a trigger will occur.
- Serial Cmd:** <**K200**,trigger mode,leading edge trigger filter,trailing edge trigger filter>
- Default:** 1
- Options:** 1 to 65535 (Trigger filter range: 32.0  $\mu$ s to 2.10 seconds)

## Trailing Edge Trigger Filter

- Usage:** Used to ignore spurious triggers when **Trigger Mode** is set to External Edge or External Level.
- Definition:** To consider a change in state on the trigger input, the level must be stable for the trigger filter duration. In an edge mode, the reader will trigger a read cycle if the active state has been uninterrupted for the entire trigger filter duration. In a level mode, the trailing edge is filtered such that on the falling edge, the state must be held for the trigger filter duration before the trigger will be deemed inactive.
- Serial Cmd:** <**K200**,trigger mode,leading edge trigger filter,trailing edge trigger filter>
- Default:** 1
- Options:** 1 to 65535 (Trigger filter range: 32.0  $\mu$ s to 2.10 seconds)

## **External Trigger Polarity**

*Usage:* Allows users to select the trigger polarity that will be used in their application.

*Definition:* Determines the active state of the trigger signal applied to the cable input of the reader.

*Serial Cmd:* <K202,active state>

*Default:* **Negative**

*Options:* 0 = Positive                      **1 = Negative**

## **Serial Trigger**

*Usage:* Allows the user to define the trigger character and delimiters that start and stop the read cycle.

*Definition:* A serial trigger is considered an online host command and requires the same command format as all host commands. It must be entered within angle bracket delimiters < > or, in the case of non-delimited triggers, it must define individual start and stop characters.

## **Serial Trigger Character (Delimited)**

*Usage:* Allows the user to define the trigger character that initiates the read cycle.

*Definition:* A single ASCII host serial trigger character that initiates the read cycle. A delimited trigger character is one that either starts or ends the read cycle and is enclosed by delimiters such as < >.

*Serial Cmd:* <K201,serial trigger character>

*Default:* **Space bar**

*Options:* Any single ASCII character, including control characters, except NUL (0x00 in hex), an existing host command character, or an on-line protocol character. Control characters entered on the command line are displayed in the menu as mnemonic characters.

**Note:** **Serial Data** or **Serial Data or External Edge** triggering mode must be enabled for **Serial Trigger Character** to take effect.

## Start Trigger Character (Non-Delimited)

- Usage:** Useful in applications where different characters are required to start a read cycle.
- Definition:** A single ASCII host serial trigger character that starts the read cycle and is not enclosed by delimiters such as < and >. Non-delimited **Start** characters can be defined and will function according to the trigger event. When defining **Start** trigger characters, the following rules apply:
- In **External Edge** the reader looks only for the **Start** trigger character and ignores any **Stop** trigger character that may be defined.
  - In **External Level** the **Start** trigger character begins the read cycle and the **Stop** trigger character ends it. Note that even after a symbol has been decoded and the symbol data transmitted, the reader remains in **External Level** trigger read cycle until a **Stop** character is received.
  - In **Serial Data or External Edge** trigger mode, either a **Start** trigger character or a hardware trigger can start an edge trigger read cycle.
- Serial Cmd:** <**K229, start character**>
- Default:** **NUL** (00 in hex) (disabled)
- Options:** Two hex digits representing any ASCII character except **XON** and **XOFF**.

## Stop Trigger Character (Non-Delimited)

- Usage:** Useful in applications where different characters are required to end a read cycle.
- Definition:** A single ASCII host serial trigger character that ends the read cycle and is not enclosed by delimiters such as < and >. Non-delimited **Stop** characters can be defined and will function according to the trigger event. When defining **Stop** trigger characters, the following rules apply:
- In **External Edge** the reader looks only for the **Start** trigger character and ignores any **Stop** trigger character that may be defined.
  - In **External Level** the **Start** trigger character begins the read cycle and the **Stop** trigger character ends it. Note that even after a symbol has been decoded and the symbol data transmitted, the reader remains in **External Level** trigger read cycle until a **Stop** character is received.
  - In **Serial Data or External Edge** trigger mode, either a **Start** trigger character or a hardware trigger can start an edge trigger read cycle.
- Serial Cmd:** <**K230, stop character**>
- Default:** **NUL** (00 in hex) (disabled)
- Options:** Two hex digits representing an ASCII character.

## **End of Read Cycle**

**Definition:** The read cycle is the time during which the reader will attempt to capture and decode a symbol. A read cycle can be ended by a timeout, a new trigger, or by the last frame in a capture sequence or a combination of the above.

### **End of Read Cycle Mode**

**Note:** When operating in Continuous Read or Continuous Read 1 Output, the reader is always in the read cycle.

**Serial Cmd:** <**K220,end of read cycle,read cycle timeout**>

**Default:** **Timeout**

**Options:** **0 = Timeout**  
1 = New Trigger  
2 = Timeout or new Trigger  
3 = Last Frame  
4 = Last Frame or New Trigger

### **Timeout**

**Usage:** Typically used with **Serial Data or External Edge** and **Continuous Read 1 Output**.

It is effective in highly controlled applications when the maximum length of time between objects can be predicted. It assures that a read cycle ends before the next symbol appears, giving the system extra time to decode and transmit the data to the host.

**Definition:** **Timeout** ends the read cycle, causing the reader to stop reading symbols and send the symbol data or No-Read message when the time set in **Timeout** elapses (times out), *if* **When to Output** is set to **End of Read Cycle**.

If in **Continuous Read 1 Output**, a timeout initiates a new read cycle and allows the same symbol to be read again.

With **External Edge, Serial Data**, or **Serial Data or External Edge** enabled, a timeout ends the read cycle and symbol data or a No-Read message is sent to the host.

With **External Level** enabled, the read cycle does not end until the falling edge trigger occurs or a timeout occurs. The next read cycle does not begin until the next rising edge trigger.

## ***New Trigger***

**Usage:** **New Trigger** is an effective way to end a read cycle when objects move past the reader at irregular intervals (not timing-dependent).

**Definition:** **New Trigger** ends the current read cycle and initiates a new one when a new trigger occurs. **New Trigger** refers only to a rising edge trigger. With **External Edge**, **Serial Data**, or **Serial Data or External Edge** enabled, an edge or serial trigger ends a read cycle and initiates the next read cycle. In the case of **External Level**, a falling edge trigger ends the read cycle but the next read cycle does not begin until the occurrence of the next rising edge trigger.

## ***Timeout or New Trigger***

**Usage:** Useful in applications that require an alternative way to end the read cycle. For example, if an assembly line should stop completely or the intervals between objects are highly irregular.

**Definition:** **Timeout or New Trigger** is identical to **Timeout** except that a timeout or a new trigger (whichever occurs first) ends the read cycle.

## ***Last Frame***

**Usage:** Useful in applications in which the number of captures needed can be defined but the timeout duration varies.

**Definition:** **Last Frame** only applies to **Rapid Capture Mode**.

## ***Last Frame or New Trigger***

**Usage:** Useful in applications in which line speeds are irregular and a new labeled object could appear before the last frame in a **Rapid Capture** sequence.

**Definition:** **Last Frame or New Trigger** is identical to **New Trigger** except that a new trigger or last frame (whichever occurs first) ends the read cycle.

## ***Read Cycle Timeout***

**Definition:** **Read Cycle Timeout** is the duration of the read cycle.

**Serial Cmd:** <**K220,end of read cycle,read cycle timeout**>

**Default:** **50** (x10 ms)

**Options:** 1 to 65535

## Capture Mode

**Definition:** **Capture Mode** relates to the way that images are captured and processed.

**Serial Cmd:** <K241,capture mode,number of captures,rapid capture mode,number of continuous captures,images per read cycle limit,read cycle history>

**Default:** **Continuous Capture**

**Options:** 0 = Rapid Capture      1 = **Continuous Capture**

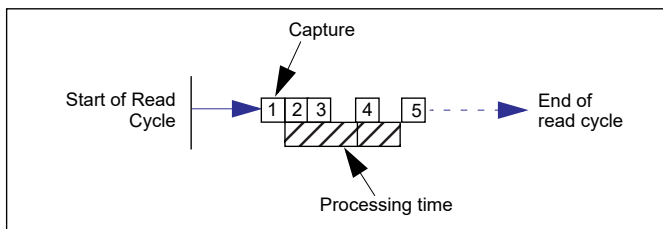
## Rapid Capture

**Definition:** In a rapid capture mode, one or multiple captures (as many as 32) can be taken at an interval specified by the time-between-captures parameter. In this mode, the only limiting time factor is integration and transfer timing.

## Continuous Capture

**Usage:** **Continuous Capture** is useful in applications with slower line speeds or where symbol spacing may be random or not time-dependent.

**Definition:** In **Continuous Capture Mode**, image captures are taken throughout the read cycle in a multi-buffered format (see diagram below). The reader begins processing the first captured image at the same time that it captures the second image. Captures will continue occurring throughout the read cycle until an end condition occurs, such as a timeout, a new trigger, the last frame in a capture sequence, or a combination of the above.



## Number of Captures

**Usage:** **Number of Captures** is used to specify the number of captures to be processed in **Rapid Capture Mode**.

**Definition:** Sets the total number of captures that are processed during a read cycle in **Rapid Capture Mode**. This feature is used in conjunction with **Capture Timing** parameters to specify the capture sequence of a rapid capture read cycle.

**Serial Cmd:** <K241,capture mode,number of captures,rapid capture mode,number of continuous captures,images per read cycle limit,read cycle history>

**Default:** 1

**Options:** 1 to 255

**Note:** The range of maximum number of captures is dynamic. This range is dependent on the maximum image size in the system. A full-size image (1280 x 1024) reduces the maximum number of images to **6**. The smaller the image size, the greater the maximum number of captures. Once the image size is reduced to small enough dimensions, the maximum number of captures will be capped at **64**.

If a user enters a maximum capture value greater than that allowed, the value will be limited to the number of system images. This command also affects the number of stored images allowed in the system. If the maximum number of captures is selected, the number of stored images allowed will be **0**.

## Rapid Capture Mode

**Definition:** In **Rapid Capture Mode**, one or multiple captures (as many as 32) can be taken at an interval specified by the time-between-captures parameter. In this mode, the only limiting time factor is integration and transfer timing.

**Serial Cmd:** <**K241,capture mode,number of captures,rapid capture mode,number of continuous captures,images per read cycle limit,read cycle history**>

**Default:** **Timed Capture**

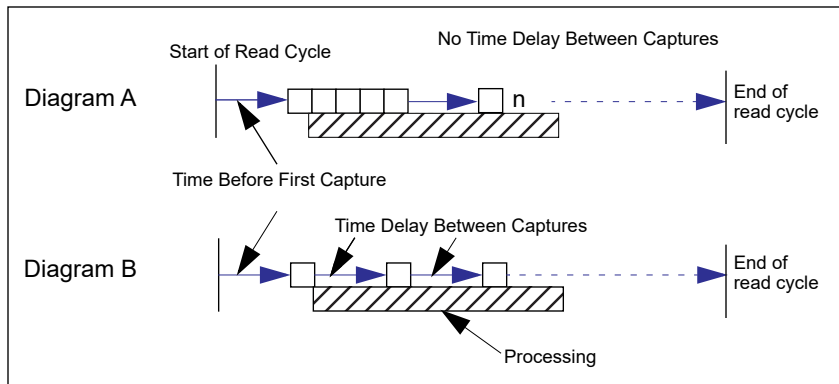
**Options:** **0 = Timed Capture**      1 = Triggered Capture

### Timed Capture

**Usage:** **Timed Rapid Capture** is useful in fast-moving applications in which symbols are only in the field of view for a short time and precise timing is required.

**Definition:** In **Timed Rapid Capture**, decoding occurs independent of and simultaneous with capturing, thus allowing precise timing or no delay at all between captures.

Also, consecutive captures are regarded as the same symbol if the output data is the same.



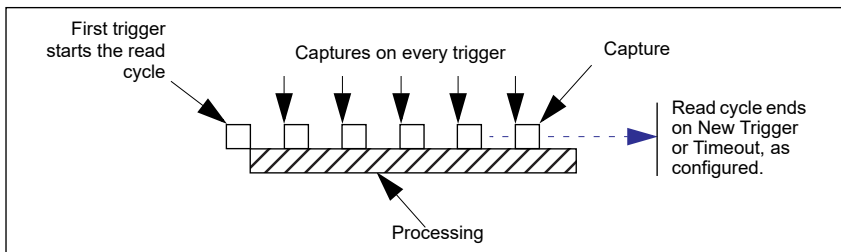
## Read Cycle

### Triggered Capture

**Usage:** Useful in applications where each decode must be treated as a discrete event, regardless of symbol data.

**Definition:** The first trigger event starts the read cycle, and subsequent triggers will continue until the predetermined **Number of Captures** is met, or until the predetermined **End of Read Cycle** condition is met-- whichever occurs first.

**Note:** If **End of Read Cycle** is set for **New Trigger** and the read cycle qualifications have not been met, the read cycle will only end *once it receives the first trigger after reaching the predetermined **Number of Captures** setting.*



### Number of Continuous Captures

**Definition:** Specifies the number of captures to process in Continuous Capture mode.

**Serial Cmd:** <K241,capture mode,number of captures,rapid capture mode,number of continuous captures,images per read cycle limit,read cycle history>

**Default:** 2

**Options:** 1 and 255

### Images per Read Cycle Limit

**Definition:** Specifies the number of captures to process in a read cycle.

**Serial Cmd:** <K241,capture mode,number of captures,rapid capture mode,number of continuous captures,images per read cycle limit,read cycle history>

**Default:** 10

**Options:** 3 and 255

## Read Cycle History

*Definition:* Specifies the number of images that can be stored in read cycle history.

*Serial Cmd:* <**K241**,capture mode,number of captures,rapid capture mode,number of continuous captures,**images per read cycle limit**,read cycle history>

*Default:* **10**

*Options:* 0 and 255

## Capture Timing

**Note:** Capture Timing applies only to **Rapid Capture Mode**.

### Time Before First Capture

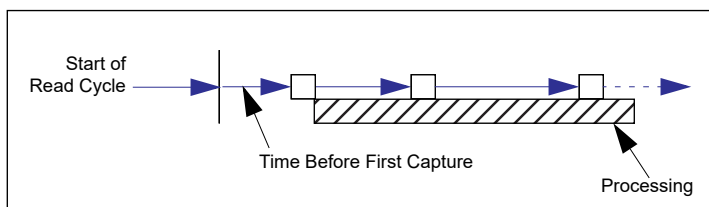
**Usage:** In almost any moving line application, a time delay is needed to ensure that a symbol will be in the reader's field of view at the beginning of the capture sequence.

**Definition:** **Time Before First Capture** in a moving line application is the time between an external trigger event and the occurrence of the first capture.

**Serial Cmd:** <K242,time before 1st capture,time between capture 1 and capture 2,,,,,,time between capture 7 and capture 8>

**Default:** 0

**Options:** 0 to 65535 (2.097 seconds, in 32  $\mu$ S increments)



### Time Between Captures

**Usage:** This is useful in applications where more than one symbol can appear during a single read cycle (multisymbol), or where line speeds are slow enough that captured frames might overlap or miss a symbol.

**Definition:** A time delay can be inserted between individual frame captures in **Rapid Capture Mode**.

**Serial Cmd:** <K242,time before 1st capture,time between captures [time 1,time 2,...time7]>

Entering 0s will result in no time between captures.

Entering a different value in each field will vary the time delays accordingly.

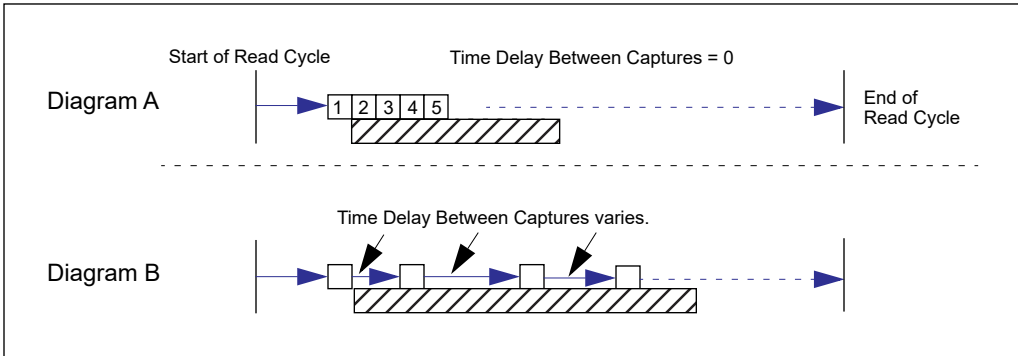
**Note:** You must enter time values along with comma separators for each field you want to change. If you omit fields, or enter only commas, the fields will remain as previously set.

**Important:** If the reader is configured to capture more than 8 images, the last (or 8th) delay value will be repeated for the remaining captures.

**Default:** 0

**Options:** 0 to 65535 (2.097 seconds, in 32  $\mu$ S increments)

**Note: Number of Captures** and number of frame delays (**Time Between Captures**) must be the same.



## Image Processing Timeout

*Usage:* Useful in higher speed applications where image processing time is long enough that not all captures have an opportunity to be processed.

*Definition:* Specifies the maximum amount of time to process a captured image. When the timeout expires, the image processing is aborted. This timeout works in both **Rapid Capture** and **Continuous Capture** modes, as well as with the Configuration Database.

*Serial Cmd:* <**K245,image processing timeout**>

*Default:* **5000 ms** (5 sec.)

*Options:* 1 to 65535 (in 1 ms increments)

### Notes:

- The timeout period does not include capture time.
- If a timeout occurs during processing and no symbols in the field of view have been decoded, the image will be recorded as a No-Read. For this reason, a longer timeout should be tried to ensure that the symbol is decoded successfully.

## Image Storage

### Image Storage Type

*Definition:* Allows the user to store images from separate read cycles and to retrieve them later. The number of available slots for storage depends on the mode of operation. If the reader is in **Rapid Capture Mode**, the number of images that can be stored is equivalent to the maximum number of the rapid count (the current rapid count setting). If the reader is in **Continuous Capture Mode**, a number of images equivalent to the maximum number of the rapid count minus 3.

*Serial Cmd:* <**K244,image storage type,image storage mode**>

*Default:* **Disabled/Clear**

*Options:* **0 = Disabled/Clear**                      1 = Store on No-Read

### Disabled/Clear

Upon selection of this option, all saved images will be cleared and the reader will not store images for later viewing.

## **Store on No-Read**

This option will cause the reader to store an image upon exiting the read cycle for retrieval at a later time. If multiple captures are present during the duration of a read cycle, the stored image will be the last image processed for that read cycle. This image is stored in RAM and can be retrieved as long as power is cycled to the reader, and as long as the reader has not been reset via a reset/save sequence. Other commands that can initialize storage in RAM are ones that change capture modes or put the reader in a test capture mode.

## **Image Storage Mode**

*Serial Cmd:*     **<K244,image storage type,image storage mode>**

*Default:*       **First Mode**

*Options:*       **0 = First Mode**                             **1 = Last Mode**

### **First Mode**

This mode allows the reader to store images until the available image memory has been filled. At that point the reader will stop saving additional images. In this mode, you will always have the first image captured, because the saving process stops once memory has been filled.

### **Last Mode**

In this mode, image storage continues after available memory limits are reached. The oldest image in memory is overwritten, so you will always have the most recent stored image.

## Image Storage Example

The following example assumes that the reader is in a rapid capture mode of 3 captures.

**Number of Symbols:** 1  
**Frame # 1:** No-Read  
**Frame # 2:** No-Read  
**Frame # 3:** Good Read, Symbol # 1  
**Read Cycle Result:** Good Read  
**Stored Frame:** None

**Number of Symbols:** 1  
**Frame # 1:** No-Read  
**Frame # 2:** No-Read  
**Frame # 3:** No-Read  
**Read Cycle Result:** No-Read  
**Stored Frame:** Frame # 3

**Number of Symbols:** 2  
**Frame # 1:** No-Read  
**Frame # 2:** No-Read  
**Frame # 3:** Good Read, Symbol # 1  
**Read Cycle Result:** No-Read  
**Stored Frame:** Frame # 2

## Decodes Before Output

### Good Decode(s) Needed

**Definition:** This value specifies the number of times a symbol needs to be read to qualify as a good read.

**Serial Cmd:** <K221,**good decode(s) needed**>

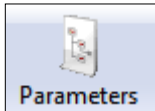
**Default:** 1

**Options:** 1 to 255

# Appendix I — Symbologies

This section describes the various symbol types that can be decoded by the V430-F-series.

## Symbologies by ESP



Click the **Parameters** button and then the **Symbologies** tab.

To change a setting, **double-click** the setting and use your cursor to scroll through the options.

Parameters	ESP Values
[-] Symbologies	
[-] 2D Symbologies	
+ Data Matrix	
... QR Code	Enabled
... Micro QR Code	Enabled
... Aztec Code	Disabled
[-] DotCode	Disabled
▶ Rotation Mode	No Rotation* ▼
+ 1D Symbologies	No Rotation*
+ Stacked Symbologies	Low Rotation
+ Composite	Omni Directional
+ Symbology ID	Disabled
... Damaged Symbol Status	Disabled
... Linear Security Level	Aggressive

To open nested options, **single-click** the **+**.

## Symbologies Serial Commands

Composite	<K453,symbology status,separator status,separator character>
Aztec	<K458,status>
Micro QR Code	<K459,status>
Postal Symbologies	<K460,postal symbology type,POSTNET status,PLANET status,USPS4CB status>
Code 39	<K470,status,check character status,check character output status, large intercharacter gap,fixed symbol length status, fixed symbol length,full ASCII set>
Codabar	<K471,status,start/stop match,start/stop output,large intercharacter gap,fixed symbol length status,symbol length,check character type,check character output>
Interleaved 2 of 5	<K472,status,check character status,check character output status, symbol length #1, symbol length #2, guard bar status, range mode status>
UPC/EAN	<K473,UPC status,EAN status,supplemental status,separator status, separator character,supplemental type,format UPC-E as UPC-A>
Code 128/EAN 128	<K474,status,fixed symbol length status,fixed symbol length,EAN 128 status,output format,application record separator status,application record separator character,application record brackets,application record padding>
Code 93	<K475,status,fixed symbol length status,symbol length>
PDF417	<K476,status,unused,fixed symbol length status,symbol length>
Pharmacode	<K477,status,fixed bar count status,fixed bar count,minimum bar count,bar width mode,direction,fixed threshold value,background color>
Data Matrix	<K479,ECC 200 status, ECC 000 status,ECC 050 status, ECC 080 status,ECC 100 status,ECC 140 status,ECC 120 status,ECC 130 status>
QR Code	<K480,status>
BC412	<K481,status,check character output,fixed symbol length status, fixed symbol length>
DataBar-14	<K482,status>
DataBar Limited	<K483,status>
DataBar Expanded	<K484,status,fixed symbol length status,fixed symbol length>
MicroPDF417	<K485,status,[unused],fixed symbol length status,fixed symbol length>
DotCode	<K497,status,rotation mode>

## Data Matrix

**Usage:** Very useful where information needs to be packed into a small area, and/or where symbols need to be applied directly to the substrate with laser etching, chemical etching, dot peen, or other methods.

**Definition:** Data Matrix is a type of Matrix symbology and has subsets ECC 000 - ECC 200. ECC 200 symbols have an even number of rows and an even number of columns. Most of the symbols are square with sizes from 10x10 to 144x144. Some symbols, however, are rectangular, with sizes from 8x18 to 16x48. All ECC 200 symbols can be recognized by the upper right corner module being light (binary 0) instead of dark.

### ECC 200

**Definition:** When enabled, will decode ECC 200 Data Matrix symbols.

**Serial Cmd:** <**K479**,**ECC 200 status**,*ECC 000 status*,*ECC 050 status*,*ECC 080 status*,*ECC 100 status*,*ECC 140 status*,*ECC 120 status*,*ECC 130 status*>

**Default:** **Enabled**

**Note:** This is the only symbol type enabled by default.

**Options:** 0 = Disabled                      **1 = Enabled**

### ECC 000

**Definition:** When enabled, will decode ECC 000 symbols.

**Serial Cmd:** <**K479**,*ECC 200 status*,**ECC 000 status**,*ECC 050 status*,*ECC 080 status*,*ECC 100 status*,*ECC 140 status*,*ECC 120 status*,*ECC 130 status*>

**Default:** **Disabled**

**Options:** **0 = Disabled**                      1 = Enabled

### ECC 050

**Definition:** When enabled, will decode ECC 050 symbols.

**Serial Cmd:** <**K479**,*ECC 200 status*,*ECC 000 status*,**ECC 050 status**,*ECC 080 status*,*ECC 100 status*,*ECC 140 status*,*ECC 120 status*,*ECC 130 status*>

**Default:** **Disabled**

**Options:** **0 = Disabled**                      1 = Enabled

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## Symbologies

### ECC 080

*Definition:* When enabled, will decode ECC 080 symbols.

*Serial Cmd:* <**K479**,ECC 200 status,ECC 000 status,ECC 050 status,**ECC 080 status**,  
ECC 100 status,ECC 140 status,ECC 120 status,ECC 130 status>

*Default:* **Disabled**

*Options:* **0 = Disabled**                      1 = Enabled

### ECC 100

*Definition:* When enabled, will decode ECC 100 symbols.

*Serial Cmd:* <**K479**,ECC 200 status,ECC 000 status,ECC 050 status,ECC 080 status,  
**ECC 100 status**,ECC 140 status,ECC 120 status,ECC 130 status>

*Default:* **Disabled**

*Options:* **0 = Disabled**                      1 = Enabled

### ECC 140

*Definition:* When enabled, will decode ECC 140 symbols.

*Serial Cmd:* <**K479**,ECC 200 status,ECC 000 status,ECC 050 status,ECC 080 status,  
ECC 100 status,**ECC 140 status**,ECC 120 status,ECC 130 status>

*Default:* **Disabled**

*Options:* **0 = Disabled**                      1 = Enabled

### ECC 120

*Definition:* When enabled, will decode ECC 120 symbols.

*Serial Cmd:* <**K479**,ECC 200 status,ECC 000 status,ECC 050 status,ECC 080 status,  
ECC 100 status,ECC 140 status,**ECC 120 status**,ECC 130 status>

*Default:* **Disabled**

*Options:* **0 = Disabled**                      1 = Enabled

### ECC 130

*Definition:* When enabled, will decode ECC 130 symbols.

*Serial Cmd:* <**K479**,ECC 200 status,ECC 000 status,ECC 050 status,ECC 080 status,  
ECC 100 status,ECC 140 status,ECC 120 status,**ECC 130 status**>

*Default:* **Disabled**

*Options:* **0 = Disabled**                      1 = Enabled

## Aztec

**Usage:** Used in document imaging, railway ticket validation, and some postal applications.

**Definition:** A 2D matrix symbology built on a square grid with a square “bull’s-eye” pattern at the center. **Aztec** can encode up to 3,832 numeric or 3,067 alphabetical characters, or 1,914 bytes of data.  
The level of Reed-Solomon error correction used with Aztec is configurable, from 5% to 95% of the total data region. The recommended error correction level is 23% of symbol capacity plus codewords.

**Serial Cmd:** <**K458,status**>

**Default:** **Disabled**

**Options:** **0 = Disabled**                      1 = Enabled

## QR Code

**Usage:** Widely implemented in the automotive industry in Japan and throughout their worldwide supply chain.

**Definition:** QR Code is capable of handling numeric, alphanumeric, and byte data as well as kanji and kana characters. Up to 7,366 characters (numeric data) can be encoded using this symbol. Therefore, less space is required to encode the same amount of data in a QR Code symbol than in a conventional symbol, lowering the cost of labeling.

Three Position Detection Patterns in the symbol make omnidirectional, ultra-fast reading possible.

QR Code has error protection capability. Data can often be restored even if a part of the symbol has become dirty or damaged.

**Serial Cmd:** <**K480,status**>

**Default:** **Enabled**

**Options:** **0 = Disabled**                      1 = Enabled

## Micro QR Code

**Usage:** Used in various applications that require higher data density than that provided by standard QR Code. Some application examples are automotive inventory, vehicle ID, and mobile phone URL encoding.

**Definition:** **Micro QR Code** is a 2D matrix symbology that comes in 4 different symbol sizes, the largest capable of encoding 35 numeric characters.

**Serial Cmd:** <**K459,status**>

**Default:** **Enabled**

**Options:** **0 = Disabled**                      1 = Enabled

## Code 39

- Usage:** **Code 39** is considered the standard for non-retail 1D symbology.
- Definition:** An alphanumeric symbology with unique start/stop code patterns, composed of 9 black and white elements per character, of which 3 are wide.
- Serial Cmd:** *<K470,status,check character status,check character output status,large intercharacter gap,fixed symbol length status,fixed symbol length,full ASCII set>*
- Default:** **Enabled**
- Options:** 0 = Disabled                      1 = **Enabled**

### Check Character Status (Code 39)

- Serial Cmd:** *<K470,status,check character status,check character output status,large intercharacter gap,fixed symbol length status,fixed symbol length,full ASCII set>*
- Default:** **Disabled**
- Options:** **0 = Disabled**                      1 = Enabled

### Check Character Output Status (Code 39)

- Usage:** **Check Character Output Status**, added to the symbol, provides additional data security.
- Definition:** When enabled, the check character is read and compared along with the symbol data. When disabled, symbol data is sent without the check character.
- Note:** With **Check Character Output Status** and an **External** or **Serial** trigger option enabled, an invalid check character calculation will cause a No-Read message to be transmitted at the end of the read cycle.
- Serial Cmd:** *<K470,status,check character status,check character output status,large intercharacter gap,fixed symbol length status,fixed symbol length,full ASCII set>*
- Default:** **Disabled**
- Options:** **0 = Disabled**                      1 = Enabled

## Large Intercharacter Gap (Code 39)

**Usage:** **Large Intercharacter Gap** is helpful for reading symbols that are printed out of specification.

**Definition:** When enabled, the reader can read symbols with gaps between symbol characters that exceed three times (3x) the narrow element width.

**Serial Cmd:** <**K470**,status,check character status,check character output status,**large intercharacter gap**,fixed symbol length status,fixed symbol length,full ASCII set>

**Default:** **Disabled**

**Options:** **0 = Disabled**                      1 = Enabled

## Fixed Symbol Length Status (Code 39)

**Definition:** When enabled, the reader will check the symbol length against the symbol length field. If disabled, any length will be considered valid.

**Serial Cmd:** <**K470**,status,check character status,check character output status,**large intercharacter gap**,**fixed symbol length status**,fixed symbol length,full ASCII set>

**Default:** **Disabled**

**Options:** **0 = Disabled**                      1 = Enabled

## Fixed Symbol Length (Code 39)

**Usage:** **Fixed Symbol Length** helps prevent truncations and increases data integrity by ensuring that only one symbol length will be accepted.

**Definition:** Specifies the exact number of characters that the reader will recognize (this does not include start and stop and check characters). The reader ignores any symbology that does not match the specified length.

**Serial Cmd:** <**K470**,status,check character status,check character output status,**large intercharacter gap**,fixed symbol length status,**fixed symbol length**,full ASCII set>

**Default:** **10**

**Options:** 1 to 64

## Full ASCII Set (Code 39)

*Usage:* Must be enabled when reading characters outside the standard character set (0-9, A-Z, etc.)

The user must know in advance whether or not to use the **Full ASCII Set** option. Since **Full ASCII Set** requires two code words to encode one character, it is less efficient.

*Definition:* Standard Code 39 encodes 43 characters; zero through nine, capital “A” through capital “Z”, minus symbol, plus symbol, forward slash, space, decimal point, dollar sign, and percent symbol. When **Full ASCII Set** is enabled, the reader can read the full ASCII character set, from 0 to 255.

*Serial Cmd:* <**K470**,*status,check character status,check character output status,large intercharacter gap,fixed symbol length status,fixed symbol length,full ASCII set*>

*Default:* **Disabled**

*Options:* **0 = Disabled**                      1 = Enabled

## Code 128/EAN 128

- Usage:** **Code 128** is a smaller symbology useful in applications with tight spots and high security needs.
- Definition:** A very dense alphanumeric symbology. It encodes all 128 ASCII characters, it is continuous, has variable length, and uses multiple element widths measured edge to edge.
- Serial Cmd:** *<K474,status,fixed symbol length status,fixed symbol length,EAN 128 status,output format,application record separator status,application record separator character,application record brackets,application record padding>*
- Default:** **Enabled**
- Options:** 0 = Disabled                      **1 = Enabled**

### Fixed Symbol Length Status (Code 128/EAN 128)

- Definition:** When enabled, the reader will check the symbol length against the symbol length field. If disabled, any length will be considered a valid symbol.
- Serial Cmd:** *<K474,status,fixed symbol length status,fixed symbol length,EAN 128 status,output format,application record separator status,application record separator character,application record brackets,application record padding>*
- Default:** **Disabled**
- Options:** **0 = Disabled**                      1 = Enabled

### Fixed Symbol Length (Code 128/EAN 128)

- Usage:** **Fixed Symbol Length** helps prevent truncations and increases data integrity by ensuring that only one symbol length will be accepted.
- Definition:** This specifies the exact number of characters that the reader will recognize (this does not include start, stop, and check characters). The reader ignores any symbol not having the specified length.
- Serial Cmd:** *<K474,status,fixed symbol length status,fixed symbol length,EAN 128 status,output format,application record separator status,application record separator character,application record brackets,application record padding>*
- Default:** **10**
- Options:** 1 to 64

## EAN 128 Status (Code 128/EAN 128)

**Definition:** When this field is disabled, the reader will not check any Code 128 labels for conformance to EAN requirements, or perform any special formatting. When enabled, the reader can read symbols with or without a function 1 character in the first position. If a symbol has a function 1 character in the first position, it must conform to EAN format. Symbols that conform to EAN format will also be subject to the special output formatting options available in this command.

If EAN status is required, the reader will only decode symbols that have a function 1 character in the first position and that conform to EAN format. All symbols read will be subject to the special output formatting options available in this command.

**Note:** Code 128 status must be enabled for EAN status to be active.

**Serial Cmd:** <**K474**,status,fixed symbol length status,fixed symbol length,**EAN 128 status**,output format,application record separator status,application record separator character,application record brackets,application record padding>

**Default:** **Disabled**

**Options:** **0 = Disabled**                      1 = Enabled                      2 = Required

## Output Format (Code 128/EAN 128)

**Definition:** In **Standard**, the reader will not apply special EAN output formatting options.

In **Application**, the reader will apply the special EAN output formatting options to decoded EAN-conforming symbols.

**Serial Cmd:** <**K474**,status,fixed symbol length status,fixed symbol length,EAN 128 status,**output format**,application record separator status,application record separator character,application record brackets,application record padding>

**Default:** **Standard**

**Options:** **0 = Standard**                      1 = Application

## Application Record Separator Status (Code 128/EAN 128)

**Definition:** When enabled, an EAN separator will be inserted into the output between fields whenever an EAN-conforming symbol is decoded and EAN output formatting applies.

**Serial Cmd:** <**K474**,status,fixed symbol length status,fixed symbol length,EAN 128 status,output format,**application record separator status**,application record separator character,application record brackets,application record padding>

**Default:** **Disabled**

**Options:** **0 = Disabled**                      1 = Enabled

## Application Record Separator Character (Code 128/EAN 128)

- Definition:* This is an ASCII character that serves as an EAN separator in formatted EAN output.
- Serial Cmd:* <**K474**,status,fixed symbol length status,fixed symbol length,EAN 128 status,output format,application record separator status,**application record separator character**,application record brackets,application record padding>
- Default:* ,
- Options:* Any ASCII character (7 bit)

## Application Record Brackets (Code 128/EAN 128)

- Definition:* If an EAN-conforming symbol is decoded and EAN formatting applies, this feature places bracket characters around the application identifiers in the formatted output.
- Serial Cmd:* <**K474**,status,fixed symbol length status,fixed symbol length,EAN 128 status,output format,application record separator status,application record separator character,**application record brackets**,application record padding>
- Default:* **Disabled**
- Options:* **0 = Disabled**                      1 = Enabled

## Application Record Padding (Code 128/EAN 128)

- Definition:* This feature causes the reader to pad variable-length application fields with leading zeroes. This is not done for the last field of a symbol.
- Serial Cmd:* <**K474**,status,fixed symbol length status,fixed symbol length,EAN 128 status,output format,application record separator status,application record separator character,application record brackets,**application record padding**>
- Default:* **Disabled**
- Options:* 0 = Disabled                      **1 = Enabled**

## BC412

**Usage:** Widely used in semiconductor manufacturing. Particularly useful where speed, accuracy, and ease of printing are required.

**Definition:** BC412 (Binary Code 412), a proprietary IBM symbology since 1988, is an alphanumeric symbol with a set of 35 characters, each encoded by a set of 4 bars in 12 module positions. All bars have a single width; it is the presence (1) or absence (0) of bars in each of the twelve module positions that make BC412 binary.

This symbology is also bi-directional and self-clocking, with a start character and a stop character.

**Serial Cmd:** <**K481,status,check character output,fixed symbol length status,fixed symbol length**>

**Default:** **Disabled**

**Options:** **0 = Disabled**                      1 = Enabled

### Check Character Output (BC412)

**Usage:** **Check Character Output**, added to the symbol, provides additional security.

**Definition:** When enabled, the check character is read and compared along with the symbol data. When disabled, symbol data is sent without the check character.

**Serial Cmd:** <**K481,status,check character output,fixed symbol length status,fixed symbol length**>

**Default:** **Disabled**

**Options:** **0 = Disabled**                      1 = Enabled

### Fixed Symbol Length Status (BC412)

**Definition:** When enabled, the reader will check the symbol length against the symbol length field. If disabled, any length will be considered valid.

**Serial Cmd:** <**K481,status,check character output,fixed symbol length status,fixed symbol length**>

**Default:** **Disabled**

**Options:** **0 = Disabled**                      1 = Enabled

## Fixed Symbol Length (BC412)

*Definition:* When enabled, the check character is read and compared along with the symbol data. When disabled, symbol data is sent without the check character.

*Serial Cmd:* <**K481**,*status*,*check character output*,*fixed symbol length status*,**fixed symbol length**>

*Default:* **10**

*Options:* 1 to 64

## Interleaved 2 of 5

**Usage:** I-2/5 has been popular because it is the most dense symbology for printing numeric characters less than 10 characters in length; however, Omron Microscan does not recommend this symbology for any new applications because of inherent problems such as truncation.

**Definition:** A dense, continuous, self-checking, numeric symbology. Characters are paired together so that each character has five elements, two wide and three narrow, representing numbers 0 through 9, with the bars representing the first character and the interleaved spaces representing the second character. (A check character is highly recommended).

**Important:** You must set Symbol Length in order to decode I-2/5 symbols, unless **Range Mode** is enabled.

**Serial Cmd:** <**K472,status,check character status,check character output status,symbol length #1,symbol length #2,guard bar status,range mode status**>

**Default:** **Enabled**

**Options:** 0 = Disabled                      1 = **Enabled**

## Check Character Status (Interleaved 2 of 5)

**Usage:** This option is not typically used, but it can be enabled for additional security in applications where the host requires redundant check character verification.

**Definition:** An error correcting routine in which the check character is added.

**Serial Cmd:** <**K472,status,check character status,check character output status,symbol length #1,symbol length #2,guard bar status,range mode status**>

**Default:** **Disabled**

**Options:** **0 = Disabled**                      1 = Enabled

## Check Character Output Status (Interleaved 2 of 5)

**Definition:** When enabled, a check character is sent along with the symbol data for added data security.

**Serial Cmd:** <**K472,status,check character status,check character output status,symbol length #1,symbol length #2,guard bar status,range mode status**>

**Default:** **Disabled**

**Options:** **0 = Disabled**                      1 = Enabled

## Symbol Length #1 (Interleaved 2 of 5)

**Usage:** Useful in applications where 1 2/5 symbols of a specific length are required.

**Definition:** The **Symbol Length # 1** field is one of two fields against which the decoded symbol is compared before accepting it as valid or rejecting it.

**Serial Cmd:** <**K472**,status,check character status,check character output,**symbol length #1**,symbol length #2,guard bar status,range mode status>

**Default:** **16**

**Options:** 0 to 64, even only

**Important:** If **Range Mode** is disabled, the length of the symbol must match either **Symbol Length # 1** or **Symbol Length # 2** to be considered a valid symbol.

If **Range Mode** is enabled, **Symbol Length # 1** and **Symbol Length # 2** form a range into which the length of the symbol must fall to be considered valid.

## Symbol Length #2 (Interleaved 2 of 5)

**Usage:** Useful in applications where 1 2/5 symbols of a specific length are required.

**Definition:** The **Symbol Length # 2** field is one of two fields against which the decoded symbol is compared before accepting it as valid or rejecting it.

**Serial Cmd:** <**K472**,status,check character status,check character output,symbol length #1,**symbol length #2**,guard bar status,range mode status>

**Default:** **6**

**Options:** 0 to 64, even only

**Important:** If **Range Mode** is disabled, the length of the symbol must match either **Symbol Length # 2** or **Symbol Length # 1** to be considered a valid symbol.

If **Range Mode** is enabled, **Symbol Length # 2** and **Symbol Length # 1** form a range into which the length of the symbol must fall to be considered valid.

## Guard Bar Status (Interleaved 2 of 5)

**Note:** Whenever **Guard Bar** is enabled, the presence of guard bars (also called “bearer bars”) is required for decoding to take place.

*Usage:* Useful when I-2/5 multisymbols are enabled to prevent false data output. This typically occurs with highly tilted or skewed symbols.

*Definition:* A guard bar is a heavy bar, at least twice the width of the wide bar, surrounding the printed I-2/5 symbol and helping to prevent false reads.

*Serial Cmd:* <**K472**,status,check character status,check character output,symbol length #1,symbol length #2,**guard bar status**,range mode status>

*Default:* **Disabled**

*Options:* **0 = Disabled**                      1 = Enabled

## Range Mode Status (Interleaved 2 of 5)

*Usage:* Useful in applications where I 2/5 symbols of a specific length are required.

*Definition:* When **Range Mode** is disabled, the reader checks the value of the symbol length against the values set in **Symbol Length # 1** and **Symbol Length # 2**. If the symbol length does not match either of the preset values, then it is rejected as invalid.

When **Range Mode** is enabled, **Symbol Length # 1** and **Symbol Length # 2** are combined to form a range of valid symbol lengths. Any symbol length that does not fall into this range is rejected as an invalid symbol. Either of the preset symbol length values in the **Symbol Length # 1** and **Symbol Length # 2** fields can form the start or end of the range.

*Serial Cmd:* <**K472**,status,check character status,check character output,symbol length #1,symbol length #2,guard bar status,**range mode status**>

*Default:* **Enabled**

*Options:* 0 = Disabled                      1 = Enabled

## Code 93

*Usage:* Sometimes used in clinical applications.

*Definition:* Code 93 is a variable-length, continuous symbology employing four element widths. Each Code 93 character has nine modules that may be either black or white. Each character contains three bars and three spaces.

*Serial Cmd:* **<K475,status,fixed symbol length status,symbol length>**

*Default:* **Enabled**

*Options:* **0 = Disabled**                      1 = Enabled

### Fixed Symbol Length Status (Code 93)

*Definition:* When disabled, the reader will accept any Code 93 symbol provided is doesn't exceed the system's maximum capabilities.

When enabled, the reader will reject any Code 93 symbol that doesn't match the fixed symbol length.

*Serial Cmd:* **<K475,status,fixed symbol length status,symbol length>**

*Default:* **Disabled**

*Options:* **0 = Disabled**                      1 = Enabled

### Symbol Length (Code 93)

*Definition:* This is the symbol length value against which all Code 93 symbols will be compared.

*Serial Cmd:* **<K475,status,fixed symbol length status,symbol length>**

*Default:* **10**

*Options:* 1 to 64

## Codabar

**Usage:** Used in photo-finishing and library applications. Previously used in medical applications, but not typically used in newer medical applications.

**Definition:** Codabar is a 16-bit character set (0 through 9, and the characters \$, :, /, ., +, and -) with start/stop codes and at least two distinctly different bar widths.

**Serial Cmd:** <**K471**,*status*,*start/stop match*,*start/stop output*,*large intercharacter gap*,*fixed symbol length status*,*symbol length*,*check character type*,*check character output*>

**Default:** **Disabled**

**Options:** **0 = Disabled**                      1 = Enabled

### Start/Stop Match (Codabar)

**Definition:** When disabled, the reader will decode Codabar symbols whether or not the start and stop characters are the same.  
When enabled, the reader will not decode Codabar symbols unless the start and stop characters are the same.

**Serial Cmd:** <**K471**,*status*,**start/stop match**,*start/stop output*,*large intercharacter gap*,*fixed symbol length status*,*symbol length*,*check character type*,*check character output*>

**Default:** **Enabled**

**Options:** 0 = Disabled                      **1 = Enabled**

### Start/Stop Output (Codabar)

**Definition:** When disabled, the start and stop characters will *not* be present in the data output of the decoded symbol.

When enabled, the start and stop characters *will* be present in the data output of the decoded symbol.

**Note:** Because the start and stop characters are included as part of the data, the characters must be included as part of the length in a fixed length mode of operation.

**Serial Cmd:** <**K471**,*status*,*start/stop match*,**start/stop output**,*large intercharacter gap*,*fixed symbol length status*,*symbol length*,*check character type*,*check character output*>

**Default:** **Enabled**

**Options:** 0 = Disabled                      **1 = Enabled**

## Large Intercharacter Gap (Codabar)

**Definition:** When disabled, the spaces between characters, or the “intercharacter gap”, are ignored during the decode process.

**Note:** If the intercharacter space is large enough to be considered a margin, the symbol will not decode, regardless of this parameter’s setting.

**Serial Cmd:** <**K471**,status,start/stop match,start/stop output,**large intercharacter gap**,fixed symbol length status,symbol length,check character type,check character output>

**Default:** **Disabled**

**Options:** **0 = Disabled**                      1 = Enabled

## Fixed Symbol Length Status (Codabar)

**Definition:** When disabled, the reader will accept any Codabar symbol provided it doesn’t exceed the system’s maximum capabilities.

When enabled, the reader will reject any Codabar symbol that doesn’t match the fixed length.

**Serial Cmd:** <**K471**,status,start/stop match,start/stop output,large intercharacter gap,**fixed symbol length status**,symbol length,check character type,check character output>

**Default:** **Enabled**

**Options:** **0 = Disabled**                      1 = Enabled

## Symbol Length (Codabar)

**Definition:** This is the value against which all Codabar symbol lengths will be compared.

**Serial Cmd:** <**K471**,status,start/stop match,start/stop output,large intercharacter gap,fixed symbol length status,**symbol length**,check character type,check character output>

**Default:** **10**

**Options:** 1 to 64

## Check Character Type (Codabar)

*Definition:* When disabled, the reader will not perform any character checking calculations on decoded Codabar symbols.

When set to **Mod 16**, the reader will perform a modulus 16 check character calculation on the symbol. If the symbol does not pass this calculation, it will not be decoded.

When set to **NW7**, The reader will perform an NW7 modulus 11 check character calculation on the symbol. If the symbol does not pass this calculation, it will not be decoded.

When set to **Both**, the reader will perform both the Mod 16 and NW7 modulus 11 check character calculations on the symbol. If the symbol does not pass either calculation, it will not be decoded.

*Serial Cmd:* <**K471**,status,start/stop match,start/stop output,large intercharacter gap,fixed symbol length status,symbol length,**check character type**,check character output>

*Default:* **Disabled**

*Options:* **0 = Disabled**                      1 = Mod 16                      2 = NW7 (Mod 11)

3 = Mod 16 and NW7

## Check Character Output (Codabar)

*Definition:* When this field is disabled and a check character calculation is enabled, the reader will strip the verified check character from the symbol data output. This condition must be accounted for if a fixed length is also being used.

When enabled, the reader will output the check character as part of the symbol data. This condition must be accounted for if a fixed length is also being used.

*Serial Cmd:* <**K471**,status,start/stop match,start/stop output,large intercharacter gap,fixed symbol length status,symbol length,check character type,**check character output**>

*Default:* **Disabled**

*Options:* **0 = Disabled**                      1 = Enabled

## UPC/EAN

**Usage:** Used primarily in point-of-sale applications in the retail industry. It is commonly used with the readers in applications in combination with **Matchcode** when there is a need to verify that the right product is being placed in the right packaging.

**Definition:** **UPC** (Universal Product Code) is a fixed length, numeric, continuous symbology. UPC can have two- or five-digit supplemental bar code data following the normal code. The UPC Version A (UPC, A) symbol is used to encode a 12 digit number. The first digit is the number system character, the next five are the manufacturer number, the next five are the product number, and the last digit is the checksum character.  
When enabled, the reader will read UPC Version A and UPC Version E only.

**Serial Cmd:** <**K473,UPC status,EAN status,supplementals status,separator status,separator character,supplemental type,format UPC-E as UPC-A**>

**Default:** **Enabled**

**Options:** 0 = Disabled                      **1 = Enabled**

## EAN Status

**Usage:** **EAN** is the European version of the UPC symbology and is used in European market applications.

**Note:** **UPC** must be enabled for **EAN** to take effect.

**Definition:** EAN is a subset of UPC. When enabled, the reader will read UPC Version A, UPC Version E, EAN 13, and EAN 8. It also appends a leading zero to UPC Version A symbol information and transmits 13 digits. If transmitting 13 digits when reading UPC Version A symbols is not desired, disable EAN.  
**Note:** The extra character identifies the country of origin.

**Serial Cmd:** <**K473,UPC status,EAN status,supplementals status,separator status,separator character,supplemental type,format UPC-E as UPC-A**>

**Default:** **Enabled**

**Options:** 0 = Disabled                      **1 = Enabled**

## Supplementals Status (UPC/EAN)

**Usage:** Reads **Supplementals** typically used in publications and documentation.

**Definition:** A supplemental is a 2 to 5 digit symbol appended to the main symbol. When set to **Enabled** or **Required**, the reader reads supplemental code data that has been appended to the standard UPC or EAN codes.

**Serial Cmd:** <**K473,UPC status,EAN status,supplementals status,separator status,separator character,supplemental type,format UPC-E as UPC-A**>

**Default:** **Disabled**

**Options:** **0 = Disabled**                      1 = Enabled                      2 = Required

### **Disabled**

UPC **Supplementals** will not be decoded.

### **Enabled**

When enabled, the reader will try to decode a main and a supplemental.

### **Required**

When set to **Required**, both the main and the supplemental symbols must be read.

For example, if **Supplementals** is set to **Required**, **Separator** is enabled, and an asterisk is defined as the UPC separator character. Then the data is displayed as:

MAIN \* SUPPLEMENTAL.

**Note:** Under no circumstances will the supplemental symbol data be sent without a main symbol.

**Note:** If additional symbols—other than the main or supplemental—will be read in the same read cycle, **Number of Symbols** should be set accordingly.

## **Separator Status (UPC/EAN)**

*Usage:* Allows users to distinguish between the main and **Supplemental** symbols.

*Definition:* A character can be inserted between the standard UPC or EAN symbology and the supplemental symbology when **Supplementals** is set to **Enabled** or **Required**.

*Serial Cmd:* <**K473**,UPC status,EAN status,supplementals status,**separator status**, separator character,supplemental type,format UPC-E as UPC-A>

*Default:* **Disabled**

*Options:* **0 = Disabled**                      1 = Enabled

## **Separator Character (UPC/EAN)**

**Note:** If **Separator Character** has been changed to any other character and you wish to redefine the separator as a comma you will need to use ESP.

*Usage:* As required by the application.

*Definition:* Allows the user to change the separator character from a comma to a new character.

*Serial Cmd:* <**K473**,UPC status,EAN status,supplementals status,**separator status**, **separator character**,supplemental type,format UPC-E as UPC-A>

*Default:* , (**comma**)

*Options:* Any ASCII character.

**Note:** Whenever **Separator Character** is defined as a comma ( , ) sending a <**K473,s?**> command will return the current settings, including the separator character comma which appears after the separator status comma.

## Supplemental Type (UPC/EAN)

*Usage:* As required by symbology used in application.

*Definition:* Allows the user to select 2 character or 5 character supplements, or both.

*Serial Cmd:* <**K473**,UPC status,EAN status,supplementals status,separator status,separator character,**supplemental type**,format UPC-E as UPC-A>

*Default:* **Both**

*Options:* **0 = Both**                      1 = 2 characters only                      2 = 5 characters only

### **Both**

Either 2 character or 5 character supplementals will be considered valid.

### **2 Characters Only**

Only two character supplementals will be considered valid.

### **5 Characters Only**

Only five character supplementals will be considered valid.

## Format UPC-E as UPC-A (UPC/EAN)

*Definition:* When disabled, the reader will output the version E symbols in their encoded 6-character format.

When enabled, the reader will format the symbol as either a 12-character UPC-A symbol or an EAN-13 symbol, depending on the state of the EAN status parameter. This formatting reverses the zero suppression that is used to generate the symbol in the UPC specification.

*Serial Cmd:* <**K473**,UPC status,EAN status,supplementals status,separator status,separator character,supplemental type,**format UPC-E as UPC-A**>

*Default:* **Enabled**

*Options:* **0 = Disabled**                      1 = Enabled

## Pharmacode

**Usage:** Used mostly with packaging for the pharmaceuticals industry.

**Definition:** Encodes up to five different numbers, each with its own color, which may be entered in decimal or “binary” format with a 1 represented by a thick bar and a 0 represented by a thin bar. Bar width is independent of height. In decimal format, each part can be up to 999,999. In binary format, each input can have up to 19 ones and zeros.

**Important:** When Pharmacode is enabled, other linear symbologies will not decode properly. Disable Pharmacode before reading other linear symbologies.

**Serial Cmd:** <**K477**,**status**,*fixed symbol length status*,*fixed symbol length*,*minimum number of bars*,*bar width status*,*direction*,*fixed threshold value*,*background color*>

**Default:** **Disabled**

**Options:** **0 = Disabled**                      1 = Enabled

### Fixed Symbol Length Status (Pharmacode)

**Definition:** When enabled, the reader will check the symbol length against the symbol length field. If disabled, any length will be considered valid.

**Serial Cmd:** <**K477**,*status*,**fixed symbol length status**,*fixed symbol length*,*minimum number of bars*,*bar width status*,*direction*,*fixed threshold value*,*background color*>

**Default:** **Disabled**

**Options:** **0 = Disabled**                      1 = Enabled

### Fixed Symbol Length (Pharmacode)

**Definition:** Specifies the exact number of bars that must be present for the reader to recognize and decode the Pharmacode symbol.

**Serial Cmd:** <**K477**,*status*,*fixed symbol length status*,**fixed symbol length**,*minimum number of bars*,*bar width status*,*direction*,*fixed threshold value*,*background color*>

**Default:** **5**

**Options:** 1 to 16

## Minimum Number of Bars (Pharmacode)

**Definition:** Sets the minimum number of bars that a Pharmacode symbol must have to be considered valid.

**Serial Cmd:** <**K477**,*status, fixed symbol length status, fixed symbol length, minimum number of bars, bar width status, direction, fixed threshold value, background color*>

**Default:** 4

**Options:** 1 to 16

## Bar Width Status (Pharmacode)

**Definition:** If set to **Mixed**, the reader will autodiscriminate between narrow bars and wide bars. If set to **All Narrow**, all bars will be considered as narrow bars. If set to **All Wide**, all bars will be considered as wide bars. If set to **Fixed Threshold**, it will use the fixed threshold value to determine whether the bars are narrow or wide. The **Bar Width Status** setting will be ignored when the reader is able to tell the difference between the narrow and the wide bars.

**Serial Cmd:** <**K477**,*status, fixed symbol length status, fixed symbol length, minimum number of bars, bar width status, direction, fixed threshold value, background color*>

**Default:** **Mixed**

**Options:** **0 = Mixed**  
 1 = All Narrow  
 2 = All Wide  
 3 = Fixed Threshold

## Direction (Pharmacode)

**Definition:** Specifies the direction in which a symbol can be read.

**Serial Cmd:** <**K477**,*status, fixed symbol length status, fixed symbol length, minimum number of bars, bar width status, direction, fixed threshold value, background color*>

**Default:** **Forward**

**Options:** **0 = Forward**                      1 = Reverse

## Fixed Threshold Value (Pharmacode)

*Definition:* Used when **Bar Width Status** is set to **Fixed Threshold**. Defines the minimum difference in pixels that will distinguish a narrow bar from a wide bar.

*Serial Cmd:* <K477,status,fixed symbol length status,fixed symbol length,minimum number of bars,bar width status,direction,**fixed threshold value**,background color>

*Default:* **10**

*Options:* 1 to 65535

## Background Color (Pharmacode)

*Definition:* Used when the color of bars is reversed. Sets the background color that a Pharmacode symbol must have to be considered valid.

*Serial Cmd:* <K477,status,fixed symbol length status,fixed symbol length,minimum number of bars,bar width status,direction,fixed threshold value,background color>

*Default:* **White**

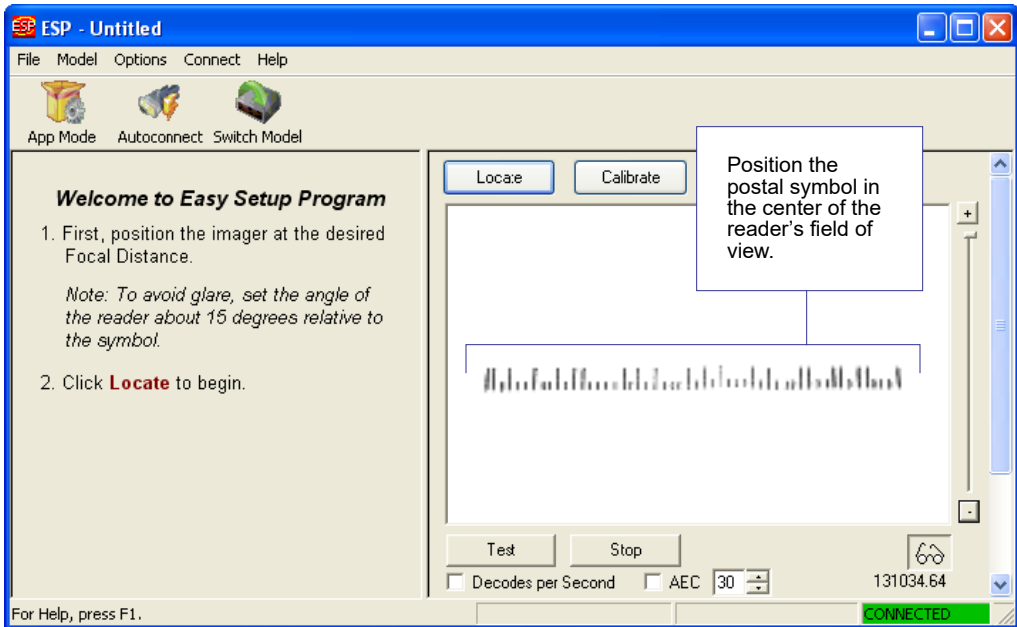
*Options:* 0 = Black          1 = White

## Postal Symbologies

**Important: Postal Symbologies** must have a minimum pixels-per-element value of **4** to be decoded reliably by the reader.

The reader must be configured to specific read range, field of view, and camera parameters before decoding Postal Symbologies.

For optimal decode results, position the symbol as close to the center of the reader's field of view as possible.



## Postal Symbology Type

**Usage:** The following 1D **Postal Symbologies** are used in mail sortation, auditing, certified mail, registered mail, metered mail, and point-of-sale (POS) applications.

**Definition:** Determines the postal symbology that will be decoded by the reader.

**Serial Cmd:** <**K460,postal symbology type,POSTNET status,PLANET status,USPS4CB status**>

**Default:** **Disabled**

**Options:** **0 = Disabled**

1 = U.S. Post (POSTNET, PLANET, USPS4CB)

2 = Australia Post

3 = Japan Post

4 = Royal Mail

5 = KIX

6 = UPU

### **U.S. Post (POSTNET, PLANET, USPS4CB)**

When **U.S. Post** is enabled (<**K460,1**>), the reader will only decode **POSTNET**, **PLANET**, and **USPS4CB** symbols.

**Important: POSTNET Status, PLANET Status, and USPS4CB Status** are enabled by default. However, if any of the three U.S. Post symbologies is set to **disabled** individually, symbols of that type will not be decoded by the reader even when U.S. Post is enabled.

For example, if **U.S. Post** is enabled but **POSTNET Status** is disabled (<**K460,1,0**>), **POSTNET** symbols will not be decoded by the reader.

See **POSTNET Status, PLANET Status, and GS1 DataBar** for more detail about U.S. Post symbologies.

### **Australia Post**

When **Australia Post** is enabled (<**K460,2**>), the reader will only decode Australia Post symbols.

### **Japan Post**

When **Japan Post** is enabled (<**K460,3**>), the reader will only decode Japan Post symbols.

### **Royal Mail**

When **Royal Mail** is enabled (<**K460,4**>), the reader will only decode Royal Mail symbols.

### **KIX**

When **KIX** is enabled (<**K460,5**>), the reader will only decode KIX symbols.

## UPU

When **UPU** is enabled, the reader will decode UPU symbols.

For example, if **Postal Symbology Type** is set to **UPU** and **POSTNET Status** is enabled and (<**K460,6,1**>), the reader will attempt to decode both UPU and POSTNET symbols.

## POSTNET Status

**Usage:** **POSTNET** is used by the United States Postal Service to direct mail. The ZIP Code or ZIP+4 Code is encoded in the symbol. Data is encoded in half-height and full-height bars, making POSTNET a “2-state” symbology. The delivery point (usually the last two digits of the address or post office box number) is also typically encoded in POSTNET symbols.

**Definition:** If **U.S. Post** and **POSTNET Status** are both enabled, the reader will decode POSTNET symbols.

**Serial Cmd:** <**K460**,postal symbology type,**POSTNET status**,**PLANET status**,**USPS4CB status**>

**Default:** **Enabled**

**Options:** 0 = Disabled  
1 = **Enabled**

## PLANET Status

**Usage:** **PLANET (Postal Alphanumeric Encoding Technique)** is a symbology used by the United States Postal Service to track and identify items during delivery. Each PLANET symbol is either 12 or 14 digits long, and encodes data in half-height and full-height bars, making PLANET a “2-state” symbology. The symbol always starts and ends with a full-height bar, or “guard rail”, and each individual digit is represented by a set of five bars in which two of the bars are always short.

**Definition:** If **U.S. Post** and **PLANET Status** are both enabled, the reader will decode PLANET symbols.

**Serial Cmd:** <**K460**,postal symbology type,**POSTNET status**,**PLANET status**,**USPS4CB status**>

**Default:** **Enabled**

**Options:** 0 = Disabled  
1 = **Enabled**

## USPS4CB Status

*Usage:* **USPS4CB**, also called **Intelligent Mail**, is used by the United States Postal Service to sort and track individual items as well as flats of mail. USPS4CB combines the capabilities of POSTNET and PLANET, and can encode 31 digits (65 bars). USPS4CB symbols are slightly longer than POSTNET symbols, and offer additional flexibility in choosing symbol height and width. Data is encoded in four types of bars (“states”), each of which is identified by a name and a value. This type of postal symbol is known as “4-state”. Each bar has a “tracker”, or middle section, to which an “ascender” (top section) or “descender” (bottom section) may be added. The 4-state format allows the symbol to contain more information, and makes it easier to decode. 4-state symbols can also be printed easily in a variety of media, including dot matrix, inkjet, and laser.

*Definition:* If **U.S. Post** and **USPS4CB Status** are both enabled, the reader will decode USPS4CB symbols.

*Serial Cmd:* <**K460**,postal symbology type,POSTNET status,PLANET status,**USPS4CB status**>

*Default:* **Enabled**

*Options:* 0 = Disabled

**1 = Enabled**

## GS1 DataBar

### DataBar Expanded

**Usage:** Used to encode primary and supplementary data in retail point-of-sale and other applications.

**Definition:** DataBar Expanded is a variable length symbology that can encode supplementary information in addition to the 14-digit EAN item identification number and is capable of encoding up to 74 numeric or 41 alphabetic characters.

**Serial Cmd:** <**K484,status,fixed symbol length status,fixed symbol length**>

**Default:** **Enabled**

**Options:** **0 = Disabled**      1 = Enabled

### Fixed Symbol Length Status (DataBar Expanded)

**Definition:** When enabled, the reader will check the symbol length against the symbol length field, minus the embedded check character. If disabled, any length would be considered valid.

**Serial Cmd:** <**K484,status,fixed symbol length status,fixed symbol length**>

**Default:** **Disabled**

**Options:** **0 = Disabled**      1 = Enabled

### Fixed Symbol Length (DataBar Expanded)

**Usage:** **Fixed Symbol Length** helps prevent truncations and increases data integrity by ensuring that only one symbol length will be accepted.

**Definition:** Specifies the exact number of characters that the reader will recognize (this does not include start, stop, and check character characters). The reader ignores any symbol not having the specified length.

**Serial Cmd:** <**K484,status,fixed symbol length status,fixed symbol length**>

**Default:** **14**

**Options:** 1 to 74

### DataBar Limited

**Usage:** DataBar Limited is designed to be read by laser and CCD readers. It is not recommended for omnidirectional slot scanners.

**Definition:** Encodes a smaller 14-digit symbol (74 modules wide) that is not omnidirectional.

**Serial Cmd:** <**K483,status**>

**Default:** **Enabled**

**Options:** **0 = Disabled**      1 = Enabled

## **DataBar-14**

*Usage:* Used in the grocery, retail, and prescription drug industries where 14-digit EAN item identification may be needed.

*Definition:* DataBar-14 is a fixed symbol length symbology that encodes 14 digits, including a 1-digit indicator. DataBar-14 is 96 modules wide. It can be stacked in two rows, it can read omnidirectionally if printed in full height, or horizontally if height-truncated for small marking.

*Serial Cmd:* **<K482,status>**

*Default:* **Enabled**

*Options:* **0 = Disabled**      1 = Enabled

## PDF417

**Usage:** Used in applications where a large amount of information (over 32 characters) needs to be encoded within a symbol, typically where the symbol is transported from one facility to another. For example, an automobile assembly line might use a single symbol with multiple fields of information that will be read at several stations along the way, without reference to a database.

**Definition:** A two-dimensional, multi-row (3 to 90), continuous, variable length symbology that has high data capacity for storing up to 2,700 numeric characters, 1,800 printable ASCII characters, or 1,100 binary characters per symbol. Each symbol character consists of 4 bars and 4 spaces in a 17-module structure.

**Serial Cmd:** <K476,status,[unused],fixed symbol length status,fixed symbol length>

**Default:** Enabled

**Options:** 0 = Disabled                      1 = Enabled

**Note:** Sending <a1> will cause PDF417 data to be prefaced with information consisting of error correction level (ECC Level *n*), number of rows (*n* Rows), number of columns (*n* Columns), number of informative code words (*n* Info Code Words) and the number of data characters (*n* Data Characters). This feature can be disabled by re-sending <a1>.

### Fixed Symbol Length Status (PDF417)

**Serial Cmd:** <K476,status,[unused],fixed symbol length status,fixed symbol length>

**Default:** Disabled

**Options:** 0 = Disabled                      1 = Enabled

### Fixed Symbol Length (PDF417)

**Usage:** Used to increase data integrity by ensuring that only one symbol length will be accepted.

**Definition:** When enabled, the PDF symbol must contain the same number of characters as the symbol length setting before it can be considered a good read. The reader will ignore any symbol not having the specified length.

**Serial Cmd:** <K476,status,[unused],fixed symbol length status,fixed symbol length>

**Default:** 10

**Options:** 1 to 2710

**Note:** Fixed Symbol Length Status must be enabled for Fixed Symbol Length to take effect.

## MicroPDF417

*Usage:* Used for labeling small items that need large data capacity.

*Definition:* A variant of PDF417, a very efficient and compact stacked symbology that can encode up to 250 alphanumeric characters or 366 numeric characters per symbol.

*Serial Cmd:* <**K485,status,[unused],fixed symbol length status,fixed symbol length**>

*Default:* **Enabled**

*Options:* **0 = Disabled**      1 = Enabled

### Fixed Symbol Length Status (MicroPDF417)

*Serial Cmd:* <**K485,status,[unused],fixed symbol length status,fixed symbol length**>

*Default:* **Disabled**

*Options:* **0 = Disabled**      1 = Enabled

### Fixed Symbol Length (MicroPDF417)

*Usage:* Used to increase data integrity by ensuring that only one symbol length will be accepted.

*Definition:* When enabled, the MicroPDF417 symbol must contain the same number of characters as the symbol length setting before it can be considered a good read. The reader will ignore any symbol not having the specified length.

*Serial Cmd:* <**K485,status,[unused],fixed symbol length status,fixed symbol length**>

*Default:* **10**

*Options:* 1 to 366

**Note:** **Fixed Symbol Length Status** must be enabled for **Fixed Symbol Length** to take effect.

## Composite

When set to **Enabled** or **Required**, will decode the 2D composite component of a linear symbol. The linear symbol can be DataBar-14, DataBar Expanded, DataBar Limited, EAN-128, UPC-A, EAN-13, EAN-8, and UPC-E.

*Usage:* Allows reading by both linear and 2D readers.

*Definition:* Combines 2D and linear width-modulated symbology on the same symbol where different messages can be read by each reader type.

*Serial Cmd:* <**K453**,*mode*,*separator status*,*separator*>

*Default:* **Disabled**

*Options:* **0 = Disabled**                      1 = Enabled                      2 = Required

### Enabled

If **Composite** is set to **Enabled**, the reader will decode both the 2D composite and linear components. However, if the 2D composite component is not decoded, the linear data will be sent by itself at the end of the read cycle.

### Required

If set to **Required**, the reader must decode both components, or a No-Read will occur.

## Separator Status (Composite)

*Usage:* Allows the user to distinguish between the main and **Supplemental** symbols.

*Definition:* Separates the linear and the composite component.

*Serial Cmd:* <**K453**,*mode*,**separator status**,*separator*>

*Default:* **Disabled**

*Options:* **0 = Disabled**                      1 = Enabled

## Separator Character (Composite)

**Note:** The Separator Character will be the same as the character defined in the **Multisymbol Separator** field of the <**K222**> command.

*Usage:* As required by the application.

*Definition:* Allows the user to change the separator character from a comma to a new character.

*Serial Cmd:* <**K453**,*mode*,*separator status*,**separator**>

*Default:* , (comma)

*Options:* Any ASCII character.

## **DotCode**

**Important:** When **DotCode** is enabled, no other symbologies will be decodable. You must disable DotCode to decode symbols of any other type.

### **DotCode Status**

*Serial Cmd:* <K497,**status**,*rotation mode*>

*Default:*     **0 = Disabled**

*Options:*     **0 = Disabled**

                  1 = Enabled

### **Disabled**

The reader will not attempt to decode DotCode symbols.

### **Enabled**

The reader will attempt to decode DotCode symbols.

### **Rotation Mode**

*Serial Cmd:* <K497,*status*,**rotation mode**>

*Default:*     **0 = No Rotation**

*Options:*     **0 = No Rotation**

                  1 = Low Rotation

                  2 = Omnidirectional

### **No Rotation**

The reader will decode horizontal and vertical symbols (+/- approximately **3 degrees**).

### **Low Rotation**

The reader will decode +/- approximately **10 degrees** from the horizontal or vertical symbols. It is slightly slower than the No Rotation option.

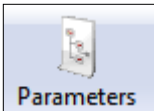
### **Omnidirectional**

The reader will support **360 degree** reading. Omnidirectional is significantly slower than the other two options.

# Appendix J — I/O Parameters

This section includes instructions on setting up conditions for changing input/output electrical transitions for control of the reader's internal and external devices. A discrete I/O (in/out) signal is an electrical transition from one voltage level to another so that digital switching can occur.

## I/O Parameters by ESP



Click the **Parameters** button and then the **I/O** tab.

Parameters	ESP Values
[-] I/O Parameters	
[+] Symbol Data Output	Good Read
[+] No Read Message	Enabled
[+] Read Duration Output	Disabled
[+] Output Object Info	Disabled
[+] Output Indicators	
[+] Serial Verification	
[+] Image Storage	Disabled
[+] Image Storage Location	RAM
[+] EZ Trax Output	Disabled
[+] Setup Button	Enabled
[+] Calibration Options	
[+] Database Identifier Output	Disabled*
[+] Output 1 Parameters	Disabled*
[+] Output 2 Parameters	Enabled
[+] Output 3 Parameters	
[-] Quality Output	
Quality Output Separator	,
Decodes/Trigger Status	Disabled

To change a setting, **double-click** the setting and use your cursor to scroll through the options.

To open nested options, **single-click** the + and it will become a - as shown above.

## I/O Parameters Serial Commands

Power On/Reset Counts	<K406,power-on,resets,power-on saves,customer default saves>
Time Since Reset (Read-Only)	<K407,hours,minutes>
Service Message	<K409,status,service message,threshold,resolution>
User-Defined Name	<K412,user-defined name>
Serial Verification	<K701,serial command echo status,control/hex output>
Quality Output	<K704,quality output separator,decodes per trigger status>
Symbol Data Output	<K705,status,when to output,symbology identifier status>
Read Duration Output	<K706,status,separator>
No-Read Message	<K714,status,message>
Output Object Info	<K734,output frame number status,output coordinates status>
LED Configuration	<K737,ISO/IEC 16022 grade>
Output Indicators	<K750,green flash LED status,target pattern LED status,green flash duration>
Database Identifier Output	<K759,status,separator character>
Image Push to Host	<K764,Image Storage Status,Stored Image Type,Image Storage,Image File Format,Image Quality,Image Scale,File Save Options>
Image Push to Host Detail Setup	<K763,Image Storage Location,FTP Host Info,Transfer Optimization,RAM Drive Size in MB,Save Image Until,Action at Image Storage Limit>
Setup Button	<K770,global status,default on power-on,load configuration database,save for power-on>
Setup Button Modes	<K771,button option 1,button option 2,button option 3,button option 4>
Trend Analysis Output 1	<K780,trend analysis mode,number of triggers,number to output on,decodes per trigger>
Trend Analysis Output 2	<K781,trend analysis mode,number of triggers,number to output on,decodes per trigger>
Trend Analysis Output 3	<K782,trend analysis mode,number of triggers,number to output on,decodes per trigger>
Diagnostic Output 1	<K790,service unit message status>
Diagnostic Output 2	<K791,service unit message status>
Diagnostic Output 3	<K792,service unit message status>
ISO/IEC 16022 Symbol Quality Output 1	<K800,output on symbol contrast,symbol contrast threshold,output on print growth,print growth threshold,output on axial non-uniformity,axial non-uniformity threshold,output on Unused ECC,Unused ECC threshold>
ISO/IEC 16022 Symbol Quality Output 2	<K801,output on symbol contrast,symbol contrast threshold,output on print growth,print growth threshold,output on axial non-uniformity,axial non-uniformity threshold,output on Unused ECC,Unused ECC threshold>
ISO/IEC 16022 Symbol Quality Output 3	<K802,output on symbol contrast,symbol contrast threshold,output on print growth,print growth threshold,output on axial non-uniformity,axial non-uniformity threshold,output on Unused ECC,Unused ECC threshold>
Output 1 Parameters	<K810,output on,output state,pulse width,output mode>
Output 2 Parameters	<K811,output on,output state,pulse width,output mode>
Output 3 Parameters	<K812,output on,output state,pulse width,output mode>

ISO/IEC 15415 Symbol Quality Output 1	< <b>K870</b> , Output on Overall Grade, Overall Grade Threshold, Symbol Contrast, Symbol Contrast Threshold, Modulation, Modulation Threshold, Reflectance Margin, Reflectance Margin Threshold, Fixed Pattern Damage, Fixed Pattern Damage Threshold, Axial Nonuniformity, Axial Nonuniformity Threshold, Grid Nonuniformity, Grid Nonuniformity Threshold, Unused ECC, Unused ECC Threshold>
ISO/IEC 15415 Symbol Quality Output 2	< <b>K871</b> , Output on Overall Grade, Overall Grade Threshold, Symbol Contrast, Symbol Contrast Threshold, Modulation, Modulation Threshold, Reflectance Margin, Reflectance Margin Threshold, Fixed Pattern Damage, Fixed Pattern Damage Threshold, Axial Nonuniformity, Axial Nonuniformity Threshold, Grid Nonuniformity, Grid Nonuniformity Threshold, Unused ECC, Unused ECC Threshold>
ISO/IEC 15415 Symbol Quality Output 3	< <b>K872</b> , Output on Overall Grade, Overall Grade Threshold, Symbol Contrast, Symbol Contrast Threshold, Modulation, Modulation Threshold, Reflectance Margin, Reflectance Margin Threshold, Fixed Pattern Damage, Fixed Pattern Damage Threshold, Axial Nonuniformity, Axial Nonuniformity Threshold, Grid Nonuniformity, Grid Nonuniformity Threshold, Unused ECC, Unused ECC Threshold>
ISO/IEC 15416 Symbol Quality Output 1	< <b>K880</b> , Output on Overall Grade, Overall Grade Threshold, Edge Determination, Edge Determination Threshold, Decode, Decode Threshold, Contrast, Contrast Threshold, Min Reflectance, Min Reflectance Threshold, Min Edge Contrast, Min Edge Contrast Threshold, Modulation, Modulation Threshold, Defects, Defects Threshold, Decodability, Decodability Threshold, Quiet Zone, Quiet Zone Threshold >
ISO/IEC 15416 Symbol Quality Output 2	< <b>K881</b> , Output on Overall Grade, Overall Grade Threshold, Edge Determination, Edge Determination Threshold, Decode, Decode Threshold, Contrast, Contrast Threshold, Min Reflectance, Min Reflectance Threshold, Min Edge Contrast, Min Edge Contrast Threshold, Modulation, Modulation Threshold, Defects, Defects Threshold, Decodability, Decodability Threshold, Quiet Zone, Quiet Zone Threshold >
ISO/IEC 15416 Symbol Quality Output 3	< <b>K882</b> , Output on Overall Grade, Overall Grade Threshold, Edge Determination, Edge Determination Threshold, Decode, Decode Threshold, Contrast, Contrast Threshold, Min Reflectance, Min Reflectance Threshold, Min Edge Contrast, Min Edge Contrast Threshold, Modulation, Modulation Threshold, Defects, Defects Threshold, Decodability, Decodability Threshold, Quiet Zone, Quiet Zone Threshold >
ISO/IEC 29158 Symbol Quality Output 1	< <b>K890</b> , Output on Overall Grade, Overall Grade Threshold, Cell Contrast, Cell Contrast Threshold, Cell Modulation, Cell Modulation Threshold, Fixed Pattern Damage, Fixed Pattern Damage Threshold, Axial Nonuniformity, Axial Nonuniformity Threshold, Grid Nonuniformity, Grid Nonuniformity Threshold, Unused ECC, Unused ECC Threshold>
ISO/IEC 29158 Symbol Quality Output 2	< <b>K891</b> , Output on Overall Grade, Overall Grade Threshold, Cell Contrast, Cell Contrast Threshold, Cell Modulation, Cell Modulation Threshold, Fixed Pattern Damage, Fixed Pattern Damage Threshold, Axial Nonuniformity, Axial Nonuniformity Threshold, Grid Nonuniformity, Grid Nonuniformity Threshold, Unused ECC, Unused ECC Threshold>
ISO/IEC 29158 Symbol Quality Output 3	< <b>K892</b> , Output on Overall Grade, Overall Grade Threshold, Cell Contrast, Cell Contrast Threshold, Cell Modulation, Cell Modulation Threshold, Fixed Pattern Damage, Fixed Pattern Damage Threshold, Axial Nonuniformity, Axial Nonuniformity Threshold, Grid Nonuniformity, Grid Nonuniformity Threshold, Unused ECC, Unused ECC Threshold>

## Symbol Data Output

### Symbol Data Output Status

**Note:** **Symbol Data Output** relates to data and should not be confused with **Outputs 1, 2, and 3** listed in the **Output Parameters** which describe output states and functions.

*Usage:* Useful when the host needs symbol data only under certain conditions.

*Definition:* Defines the conditions under which decoded symbol data is transmitted to the host.

*Serial Cmd:* <**K705,symbol data output status,when to output,symbology identifier status**>

*Default:* **Good Read**

*Options:* 0 = Disabled  
1 = Match  
2 = Mismatch  
**3 = Any Good Read**  
4 = Only If All Good Reads

**Note:** **Symbol Data Output Status**, if set to **Match** or **Mismatch**, will not take effect unless **Matchcode Type** is enabled and a master symbol is loaded into memory.

### Disabled

*Usage:* It is useful when an application only needs to use the discrete outputs and can allow the reader to do the decision-making. When **Disabled**, the host does not need the symbol data and the communication lines are used only for setup and status checks.

*Definition:* When set to **Disabled**, the reader will not transmit any data that is generated during a read cycle (symbols, No-Reads, etc.)

### Match

*Usage:* **Match** is used in an application that requires specific symbol information and needs to sort, route, or verify based on matching the specific symbol data.

*Definition:* When set to **Match**, the reader transmits symbol data whenever a symbol matches a master symbol. However, if **Matchcode Type** is **Disabled**, it transmits on any good read.

**Note:** A No-Read can still be transmitted if **Enabled**.

### **Mismatch**

*Usage:* Mismatch is typically used as a flag within the host system to prevent an item from being routed in the wrong container.

*Definition:* With Mismatch enabled, the reader transmits symbol data whenever the symbol data information does NOT match the master symbol.

**Note:** A No-Read can still be transmitted if **Enabled**.

### **Any Good Read**

*Usage:* **Any Good Read** is used when an application requires all symbol data to be transmitted. It's typically used in tracking applications in which each object is uniquely identified.

*Definition:* With **Any Good Read** enabled, the reader outputs symbol data for any qualified symbol in the read cycle regardless of **Matchcode Type** setting. **No Read** is output if no symbols are qualified.

### **Only If All Good Reads**

*Definition:* With **Only If All Good Reads** enabled, the reader outputs symbol data only when all symbols in the read cycle are qualified. **No Read** is output if no symbols are qualified.

## When to Output Symbol Data

*Definition:* This command allows the user to choose when symbol data can be sent to the host.

*Serial Cmd:* <K705,symbol data output status,**when to output**,symbology identifier status>

*Default:* **As Soon As Possible**

*Options:* **0 = ASAP**                      1 = End of Read Cycle

### As Soon As Possible

*Usage:* **As Soon As Possible** is useful in applications in which symbol data needs to be moved quickly to the host, typically when the host is making decisions based on symbol data.

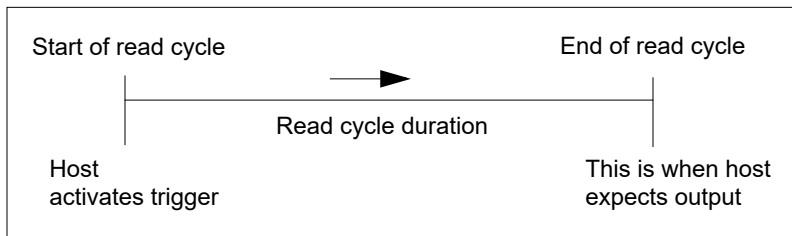
*Definition:* Enabling **As Soon As Possible** causes symbol data to be sent to the host immediately after a symbol has been successfully decoded.

**Note:** More than one decode might in fact be required to qualify as a good read, depending on how **Decodes Before Output** is set.

### End of Read Cycle

*Usage:* **End of Read Cycle** is useful in timing-based systems in which the host is not ready to accept data at the time that it is decoded.

*Definition:* Enabling **End of Read Cycle** means that symbol data does not get sent to the host until the read cycle ends with a timeout or new trigger.



## Symbology Identifier Status

Serial Cmd: <**K705**,symbol data output status,when to output,**symbology identifier status**>

Default:       **Disabled**

Options:       **0 = Disabled**            1 = Enabled

### ***Disabled***

When set to **Disabled**, the symbol data output does not contain symbology information.

### ***Enabled***

When set to **Enabled**, the symbol data output contains a three-character symbology identifier sequence.

## **No-Read Message**

*Usage:* Used in applications where the host needs serial verification that a symbol has not been read and especially useful in new print verification.

*Definition:* When enabled, and if no symbol has been decoded before timeout or the end of the read cycle, the No-Read message will be transmitted to the host.

### **No-Read Message Mode**

*Serial Cmd:* <**K714**,*No-Read message status*,*No-Read message*>

*Default:* **Enabled**

*Options:* 0 = Disabled                      1 = **Enabled**

#### **Disabled**

Only symbol data is output after a read cycle.

#### **Enabled**

When the reader is in a triggered mode, a No-Read message will be appended for each failed read attempt.

### **No-Read Message**

*Definition:* Any combination of ASCII characters can be defined as the No-Read message.

*Serial Cmd:* <**K714**,*No-Read message status*,**No-Read message**>

*Default:* **NOREAD**

*Options:* A string of up to 64 characters.

**Note:** **No-Read Message** will only be transmitted if **Symbol Data Output** is set to **Match**, **Mismatch**, or **Good Read**.

**No-Read Message** can be set to any ASCII character.

## Read Duration Output

**Usage:** Useful in evaluating actual read cycle timing results, especially when initially setting up an application to determine maximum line speed (obtainable based on spacing between symbols.)

**Definition:** When enabled the duration of the read cycle (in milliseconds) is appended to the symbol data.  
The read duration is the time from the beginning of the read cycle until data is output.

## Read Duration Output Mode

**Serial Cmd:** <K706,status,separator>

**Default:** Disabled

**Options:** 0 = Disabled      1 = Enabled

**Important:** To measure the entire read cycle when in **External Level** trigger mode, set **When to Output Symbol Data** to **End of Read Cycle**.

This output can measure over 49 days' worth of duration; if exceeded, the "OVERFLOW" message will be output in place of the duration.

## Read Duration Output Separator

**Definition:** User defined character that separates the symbol information from the **Read Duration Output**.

**Serial Cmd:** <K706,status,separator>

**Default:** [space character]

**Options:** Any ASCII character.

## **Output Indicators**

The V430-F-series has three LED arrays, as follows:

1. A target pattern of blue LEDs for centering the field of view, which is projected from the front of the reader.
2. An array of green LEDs projected from the front of the reader that can be programmed to flash in response to user-defined conditions.
3. A row of five status LEDs on the side of the reader.

### **Green Flash Mode**

*Usage:* Used as a visual verification that a good read has occurred.

*Definition:* An array of green LEDs in the front of the reader can be programmed to flash in response to user-defined conditions.

*Serial Cmd:* <K750,green flash mode,target pattern status,green flash duration>

*Default:* **Static Presentation**

*Options:*

- 0 = Disabled
- 1 = Good Read**
- 2 = Static Presentation
- 3 = Match
- 4 = Mismatch
- 5 = Strobe

### **Disabled**

Green flash LEDs are disabled.

### **Good Read**

Green flash LEDs will flash when a good read condition is met or when **Matchcode** is enabled and a match occurs.

## **Static Presentation Mode**

**Static Presentation Mode** is used in conjunction with **Continuous Read Mode: <K200,0>**.

When operating in **Static Presentation Mode**, the red LEDs will illuminate while the reader is searching for a symbol in **Continuous Read Mode**. When a symbol is placed in the field of view and a good read occurs, the green LEDs will illuminate and stay on for the duration of time set in **Green Flash Duration**. Only one read will occur during that time unless more than one symbol is enabled in **Number of Symbols**.

**Note:** If **Static Presentation Mode** is selected but the reader is not in **Continuous Read**, the **Green Flash** will not occur.

### **To use Static Presentation:**

1. Enable **Continuous Read**.
2. Select the number of symbols.
3. Enable **Static Presentation** in **Green Flash Mode**.
4. Select the read time in **Green Flash Duration**.

## **Match**

The green LEDs will flash when a match condition is met. If multisymbol is enabled, then green flash LEDs will illuminate only if all symbols qualify as a match. If matchcode is disabled, then this mode will activate the LEDs on a good read.

## **Mismatch**

Same as **Match**, except that LEDs will illuminate on a mismatch.

## **Strobe**

Green flash LEDs will act as an illumination strobe for image capture. If it is required that the green flash LEDs be the *only* illumination for image capture, then the internal illumination LEDs can be disabled.

## Target Pattern

- Usage:* Assists users in positioning and locating symbols in the center of the reader's field of view.
- Definition:* The user can control when the targeting system is ON or OFF, and can save this condition for power-on.
- Serial Cmd:* <**K750**,green flash mode,**target pattern status**,green flash duration>
- Default:* **Always ON**
- Options:* 0 = Always OFF  
1 = ON only when not in the read cycle  
2 = ON only when in the read cycle  
**3 = Always ON**

### **Always OFF**

The target pattern will remain OFF at all times unless overridden by an operational command.

### **ON Only When Not in the Read Cycle**

The target pattern is always ON except during the read cycle. If the operational command overrides this setting, the target pattern will remain on at all times.

### **ON Only When in the Read Cycle**

The target pattern will remain OFF except during the read cycle. If the operational command overrides this setting, the target pattern will remain on at all times.

### **Always ON**

The target pattern is always ON.

## Green Flash Duration

- Usage:* Provides visual verification that a good read has occurred.
- Definition:* When a good read occurs, the green LEDs will illuminate and stay on for the time set in the **Green Flash Duration** value.
- Serial Cmd:* <**K750**,green flash mode,**target pattern status**,**green flash duration**>
- Default:* **25** (250ms)
- Options:* 0 to 65535 (in 10 ms increments)

## LED Configuration

**Usage:** Useful as a visible indicator of read rates and symbol quality.

**Definition:** Determines the mode in which the status LEDs operate.

**Serial Cmd:** <**K737,LED mode,ISO/IEC 16022 grade**>

**Default:** **Standard**

**Options:** **0 = Standard**      1 = ISO/IEC 16022 grade

In ISO/IEC 16022 grade mode the LEDs represent the grade of the first Data Matrix symbol decoded in the read cycle.

The parameter to be graded is set in the **ISO/IEC 16022 Grade** options.

For example, to program the LEDs to indicate the ISO/IEC 16022 print growth grade, set **LED Mode** to **ISO/IEC 16022 Grade** and set **ISO/IEC 16022 Grade** to **Print Growth**. If all the LEDs from 20% to 100% are illuminated, the read result is a grade A; if only the 20% LED is illuminated, the result is a grade F.

### Standard

In **Standard Mode**, the STATUS LED indicates read cycle status and the GOOD READ LED illuminates upon a good read at the end of a read cycle. In a read rate test, these LEDs represent the percentage of good reads per images captured.

### ISO/IEC 16022 Grade

**Usage:** Provides visual grading of specific ISO/IEC 16022 parameters.

**Definition:** Determines which ISO/IEC 16022 parameter the reader will grade via the LEDs.

**Serial Cmd:** <**K737,LED mode,ISO/IEC 16022 grade**>

**Default:** **Final Grade**

**Options:** **0 = Final Grade**  
 1 = Symbol Contrast  
 2 = Print Growth  
 3 = Axial Non-Uniformity  
 4 = Unused ECC

## Serial Verification

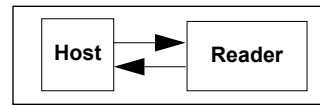
Allows the user to verify configuration command status.

### Serial Command Echo Status

**Usage:** This command is useful in removing any doubt about the reader's interpretation of any configuration command.

For example, if the current preamble is "SOM" and **<K701,1, ,START>** is entered, the reader will echo back **<K701,SOM>** since the attempted entry "START" exceeds the four character limit for that command. Therefore, it is rejected and the existing "SOM" message is echoed back and remains the preamble message.

**Definition:** When enabled, a configuration command received from the host is echoed back to the host with the resultant settings.



**Function:** If a command with multiple fields is processed, some of the fields may have been processed properly while others were not. The changes will appear in the string echoed back so that the user will know which fields did or did not change.

**Serial Cmd:** **<K701,serial command echo status, unused, control/hex output>**

**Default:** **Disabled**

**Options:** **0 = Disabled**      1 = Enabled

### Control/Hex Output

**Usage:** Useful for viewing settings with binary characters when using serial commands on a terminal.

**Definition:** Determines the response to a **Serial Command Echo** or status request command.

When set to **Control**, two characters are transmitted to represent a non-displayable character. For example, a carriage return will be shown as: **^M**.

**Serial Cmd:** **<K701,serial command echo status, unused, control/hex output>**

**Default:** **Control**

**Options:** **0 = Control**      1 = Hex

## Setup Button

The Setup button has four positions, selectable by the length of time the button is held down. Each position can be programmed for any of eight options.

- Definition:* Serves as a master switch to enable/disable the Setup button status.
- Serial Cmd:* <**K770,global status**,default on power-on,load Configuration Database,save for power-on>
- Default:* **Enabled**
- Options:* 0 = Disabled  
**1 = Enabled**  
 2 = Trigger  
 4 = Parameter Switch

## Global Status

### *Disabled*

When set to **Disabled**, the Setup button does not function.

### *Enabled*

When selected, the Setup button is enabled and the function of each button position is selected by the **Setup Button Mode** command.

### *Trigger*

When selected, the Setup button acts as a trigger for the reader to start and end read cycles. All other button operations are inactive.

*In External Level:* The read cycle endures for as long as the Setup button is pressed, unless a timeout occurs and **Timeout** is enabled for **End of Read Cycle**.

*In External Edge:* As with **Level**, **Edge** allows a read cycle to be initiated by pressing the Setup button, but unlike **Level**, the read cycle ends with a good read output, a timeout, or a new trigger.

### *Parameter Switch*

The parameter switch toggles between custom defaults and power-on settings. The condition is the same as that achieved by sending the <**Arc**> and <**Arp**> commands consecutively.

## Default on Power-On

*Definition:* When enabled, if the Setup button is held down on power-on the reader will default to customer defaults and save for power-on. This is the same as sending a <Zrc> command.

*Serial Cmd:* <K770,global status,**default on power-on**,load Configuration Database,save for power-on>

*Default:* **Enabled**

*Options:* 0 = Disabled                    **1 = Enabled**

## Load Configuration Database

*Definition:* Allows the user to load the Configuration Database with calibration results. When the user performs a calibration using the Setup button, all the database entries are moved down one index and the results of the calibration are saved to index 1. The results will be saved as current settings as well.

*Serial Cmd:* <K770,global status,default on power-on,**load Configuration Database**,save for power-on>

*Default:* **Enabled**

*Options:* 0 = Disabled                    **1 = Enabled**

## Save for Power-On

*Definition:* If enabled, after calibration is complete, all parameters will be saved for power-on.

*Serial Cmd:* <K770,global status,default on power-on,load Configuration Database,**save for power-on**>

*Default:* **Disabled**

*Options:* **0 = Disabled**                    1 = Enabled

## Setup Button Modes

**Usage:** Useful for performing multiple, repetitive tasks at the work site.

**Definition:** The global status field for the Setup button must be enabled for button processing to start. Once you press the button the reader will sequence through each button position. If you release the button after the button position but before the next button option starts, the reader will execute the action programmed for that button position. The status LEDs and the green flash will also illuminate to signal the current position. All button positions have the same configurable options. Also note that a quick press and release of the button before any button position is the same as if a position selected was configured as disabled.

**Serial Cmd:** <K771,button option 1,button option 2,button option 3,button option 4>

**Options:**

Button Option 1	Button Option 2	Button Option 3	Button Option 4
0 = Disabled	0 = Disabled	0 = Disabled	0 = Disabled
1 = Read Rate	1 = Read Rate	<b>1 = Read Rate</b>	1 = Read Rate
2 = Calibrate	<b>2 = Calibrate</b>	2 = Calibrate	2 = Calibrate
3 = Save for Power-On	3 = Save for Power-On	3 = Save for Power-On	<b>3 = Save for Power-On</b>
4 = Unused	4 = Unused	4 = Unused	4 = Unused
5 = Load New Master	5 = Load New Master	5 = Load New Master	5 = Load New Master
6 = Unused	6 = Unused	6 = Unused	6 = Unused
<b>7 = Target System</b>	7 = Target System	7 = Target System	7 = Target System
8 = Unused	8 = Unused	8 = Unused	8 = Unused
9 = Bar Code Config.	9 = Bar Code Config.	9 = Bar Code Config.	9 = Bar Code Config.

### Disabled

When set to disabled, the associated button position will have no function associated with it, and the position will be skipped over.

### Read Rate

Read Rate will be initiated when the associated button position is selected. Read Rate will perform decodes/second and is the same as sending a <C> from the terminal. To exit Read Rate Mode quickly press and release the Setup button.

### Calibrate

Calibration will be initiated when the associated button position is selected. To abort calibration, quickly press and release the Setup button.

## Save for Power-On

All reader settings will be saved to non-volatile memory to be recalled on power-on whenever the associated button position is selected. This is the same as sending a <Z> from the terminal.

## Load New Master

Functions in the same way as new master pin input whenever the associated button position is selected. The new master pin's **Consecutive Decode** requirement holds true for this function.

## Target System

Turns on the target pattern whenever the associated button position is selected. To disable, quickly press and release the Setup button.

**Note:** This mode is the only one that does not require that the button be released before taking effect. If it is necessary to have the target system on before another operation such as calibration or read rate is performed, ensure that the target system mode is assigned a lower position so that it will be activated first.

## Bar Code Configuration

Enables bar code configuration mode whenever the associated button position is selected. When enabled, the reader can accept configuration commands from symbols. To disable, quickly press and release the Setup button.

## Setup Button Operation

To execute Setup button commands:

### Position 1

Hold down button until the 20% LED illuminates.

### Position 2

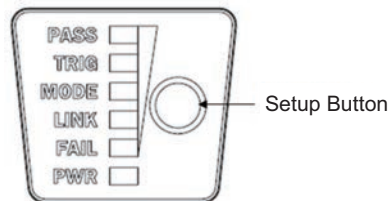
Hold down button until the 20% and 40% LEDs illuminate.

### Position 3

Hold down button until the 20%, 40%, and 60% LEDs illuminate.

### Position 4

Hold down button until the 20%, 40%, 60%, and 80% LEDs illuminate.



## Configurable Output 1

**Usage:** This option provides discrete signalling to host software to control external devices such as PLCs and relays. It is useful for routing, sorting, and to prevent mis-packaging and mis-routing.

**Definition:** Sets the discrete output functions for specific user-selected conditions. Allows the user to set the conditions under which an output (or outputs) will be activated.

**Serial Cmd:** <**K810,output on,output state,pulse width,output mode**>

**Default:** **Mismatch or No-Read**

**Options:**

- 0 = Mismatch or No-Read**
- 1 = Match (or Good Read)
- 2 = Mismatch
- 3 = No-Read
- 4 = Trend Analysis
- 5 = Symbol Quality
- 6 = Diagnostic Warning
- 7 = In Read Cycle

**Note:** If **Output On** is set to **Match** or **Mismatch**, a transition (switching) will not occur unless **Matchcode Type** is enabled and a master symbol is loaded into memory.

### ***Mismatch or No-Read***

Activates discrete output when the data does not match that of the master symbol or the symbol has not been decoded before the end of the read cycle.

### ***Match (or Good Read)***

Activates a discrete output when the symbol data matches the master symbol.

**Note:** If you want to output for a good read and **Matchcode** is not enabled, you can enable any output for **Match**.

### ***Mismatch***

Activates a discrete output whenever the symbol data does not match that of the master symbol.

### ***No-Read***

Activates a discrete output whenever the symbol data is not decoded before the end of the read cycle.

### ***Trend Analysis***

**Usage:** Typically used when successful decodes are occurring but a discrete output is needed to flag a trend in quality issues.

**Definition:** Activates discrete output when a trend analysis condition is met, depending on the trend analysis option enabled.

### **Symbol Quality**

*Usage:* Typically used when a discrete indication is needed to flag a symbol quality condition.

*Definition:* Activates discrete output when a symbol quality condition is met, depending on the symbol quality option enabled.

### **Diagnostic Warning**

*Usage:* Typically used when a discrete indication of a diagnostic condition is needed.

*Definition:* Activates discrete output when a diagnostic warning condition is met, depending on the diagnostic option enabled.

### **In Read Cycle**

*Definition:* Activates a discrete output when the reader is in a read cycle.

## Output State

- Definition:* Sets the active electrical state of the discrete output.
- Serial Cmd:* <**K810**,output on,output state,pulse width,output mode>
- Default:* **Normally Open**
- Options:* **0 = Normally Open**            1 = Normally Closed

## Pulse Width

- Definition:* Sets the time in 1 ms increments that the discrete output remains active.
- Serial Cmd:* <**K810**,output on,output state,pulse width,output mode>
- Default:* 500ms
- Options:* 0 to 65535(in 1 ms increments)

## Output Mode

- Definition:* Sets the condition in which the discrete output is de-activated.
- Serial Cmd:* <**K810**,output on,output state,pulse width,output mode>
- Default:* **Pulse**
- Options:* **0 = Pulse**  
2 = Latch Mode 2  
3 = Latch Mode 3

### **Pulse**

This is the default mode of operation in which the programmable output is activated when the **Output On** condition has been met and held active for the duration of the selected pulse width.

### **Latch Mode 2 (Unlatch Opposite Condition)**

The programmable output is activated when the **Output On** condition has been met and held active until the opposite condition selected under **Output On** has been met.

For example, if **No-Read** is enabled under **Output On**, the programmable output will go active on a No-Read and remain active until the opposite condition, a good read, occurs.

### **Latch Mode 3 (Unlatch Re-enter Read Cycle)**

The programmable output is active when the Output On condition has been met and is held active until a new read cycle begins.

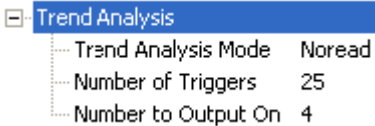
**Note:** All of the **Output On** modes are inhibited when any **Output on Warning** is active for **Output 1**.

## Trend Analysis Output 1

**Note:** **Output On** under **Output 1 Parameters** must be set to **Trend Analysis** for this output to function.



Under **Output 1 Parameters**, expand the **Trend Analysis** tree:



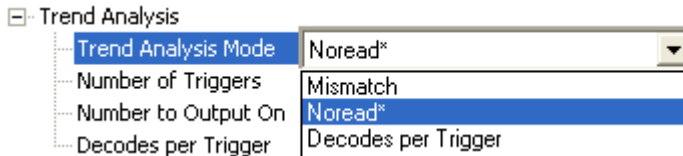
**Usage:** Useful in cases where the user doesn't want to shut down for one condition but wants to monitor quality and read conditions.

**Definition:** Applies **Trend Analysis** settings to **Output 1**.  
With **Trend Analysis**, the user can track the occurrences and frequency of mismatches, No-Reads, and the number of reads per trigger, and output the results to any of three outputs.

**Example:** *Trend Analysis Mode = No-Read*  
*Trigger Evaluation Period= 25 triggers (read cycles)*  
*Number to Output On = 4*  
In this example, the reader will activate an output when 4 No-Reads occur within a period of 25 triggers (read cycles).

## Trend Analysis Mode

**Definition:** Sets the trend condition (**Mismatch**, **No-Read**, or **Decodes per Trigger**) that will activate the output.



**Serial Cmd:** `<K780,trend analysis mode,trigger evaluation period,number to output on,decodes per trigger threshold>`

**Default:** **No-Read**

Options:      0 = Mismatch  
                  **1 = No-Read**  
                  2 = Decodes per Trigger

***Mismatch***

Output will be activated when the number of mismatches equals the value entered for **Number to Output On** within the trigger window selected in **Number of Triggers**.

***No-Read***

Output will be activated when the number of No-Reads equals the value entered for **Number to Output On** within the trigger window selected in **Number of Triggers**.

***Decodes per Trigger***

Output will be activated when the number of decodes equals the value entered for **Number to Output On** within the trigger window selected in **Number of Triggers**.

## Trigger Evaluation Period

*Definition:* The number of triggers to examine for the trend analysis condition.

*Serial Cmd:* <K780,trend analysis mode,**trigger evaluation period**,number to output on,decodes per trigger threshold>

*Default:* 0

*Options:* 0 to 255

## Number to Output On

*Usage:* *Example:* If **Number to Output On** is set to 3 and **Trend Analysis Mode** is set to **No-Read**, then the output will not be activated until 3 No-Reads have occurred.

*Definition:* Sets the number of **Trend Analysis Mode** events (mismatches, No-Reads, or reads/trigger as configured by Trend Analysis Mode) to occur within the trigger evaluation period before activating the associated output.

*Serial Cmd:* <K780,trend analysis mode,trigger evaluation period,**number to output on**,decodes per trigger threshold>

*Default:* 0

*Options:* 0 to 255

## Decodes per Trigger Threshold

*Definition:* The appropriate output will be activated if, at the end of the read cycle, the symbol decode count is below this setting.

**Note:** To activate this feature the reader must be in Decodes per Trigger mode. To put the reader in this mode during the read cycle and the Trend Analysis operation, the Decodes per Trigger status in the quality settings must be enabled. Enabling this setting will also append the decode count to the symbol data.

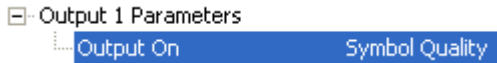
*Serial Cmd:* <K780,trend analysis mode,trigger evaluation period,number to output on,**decodes per trigger threshold**>

*Default:* 0

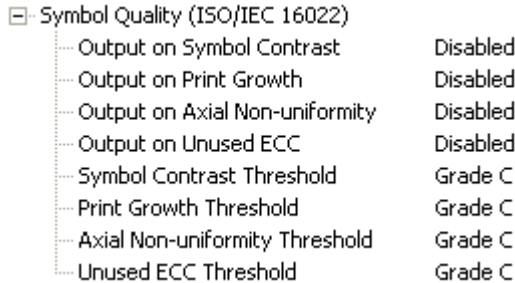
*Options:* 0 to 65535

## ISO/IEC 16022 Symbol Quality Output 1

**Note:** **Output On** under **Output 1 Parameters** must be set to **Symbol Quality** for this output to function.



Under **Output 1 Parameters**, expand the **Symbol Quality (ISO/IEC 16022)** tree.



### Output on Symbol Contrast

**Usage:** Lets the user know if symbol quality is less than acceptable.

**Definition:** If enabled, toggles Output 1 to an active state when **Symbol Contrast Threshold** is met.

**Serial Cmd:** <**K800,output on symbol contrast,symbol contrast threshold,output on print growth,print growth threshold,output on axial non-uniformity,axial non-uniformity threshold,output on UEC,UEC threshold**>

**Default:** **Disabled**

**Options:** **0 = Disabled**                      1 = Enabled

### Output on Print Growth

**Usage:** Lets the user know if symbol quality is less than acceptable.

**Definition:** If enabled, toggles **Output 1** to an active state when **Print Growth Threshold** is met.

**Serial Cmd:** <**K800,output on symbol contrast,symbol contrast threshold,output on print growth,print growth threshold,output on axial non-uniformity,axial non-uniformity threshold,output on UEC,UEC threshold**>

**Default:** **Disabled**

**Options:** **0 = Disabled**                      1 = Enabled

## Output on Axial Non-Uniformity

*Usage:* Lets the user know if symbol quality is less than acceptable.

*Definition:* If enabled, toggles **Output 1** to an active state when **Axial Non-Uniformity Threshold** is met.

*Serial Cmd:* <**K800**,output on symbol contrast,symbol contrast threshold,output on print growth,print growth threshold,**output on axial non-uniformity**,axial non-uniformity threshold,output on UEC,UEC threshold>

*Default:* **Disabled**

*Options:* **0 = Disabled**                      1 = Enabled

## Output on Unused Error Correction

*Usage:* Lets the user know if symbol quality is less than acceptable.

*Definition:* If enabled, toggles **Output 1** to an active state when **UEC Threshold** is met.

*Serial Cmd:* <**K800**,output on symbol contrast,symbol contrast threshold,output on print growth,print growth threshold,output on axial non-uniformity,axial non-uniformity threshold,**output on UEC**,UEC threshold>

*Default:* **Disabled**

*Options:* **0 = Disabled**                      1 = Enabled

## Symbol Contrast Threshold

*Usage:* Lets the user set the acceptable level of symbol quality.

*Definition:* Conforms to ISO/IEC 16022 symbol quality grading (A,B,C,D).

*Serial Cmd:* <**K800**,output on symbol contrast,**symbol contrast threshold**,output on print growth,print growth threshold,output on axial non-uniformity,axial non-uniformity threshold,output on UEC,UEC threshold>

*Default:* **Grade C**

*Options:* 0 = Grade A  
1 = Grade B  
**2 = Grade C**  
3 = Grade D

## Print Growth Threshold

- Usage:* Lets the user set the acceptable level of symbol quality.
- Definition:* Conforms to ISO/IEC 16022 symbol quality grading (A,B,C,D).
- Serial Cmd:* <**K800**,output on symbol contrast,symbol contrast threshold,output on print growth,**print growth threshold**,output on axial non-uniformity,axial non-uniformity threshold,output on UEC,UEC threshold>
- Default:* **Grade C**
- Options:* 0 = Grade A  
1 = Grade B  
**2 = Grade C**  
3 = Grade D

## Axial Non-Uniformity Threshold

- Usage:* Lets the user set the acceptable level of symbol quality.
- Definition:* Conforms to ISO/IEC 16022 symbol quality grading (A,B,C,D).
- Serial Cmd:* <**K800**,output on symbol contrast,symbol contrast threshold,output on print growth,print growth threshold,output on axial non-uniformity,**axial non-uniformity threshold**,output on UEC,UEC threshold>
- Default:* **Grade C**
- Options:* 0 = Grade A  
1 = Grade B  
**2 = Grade C**  
3 = Grade D

## Unused Error Correction Threshold

- Usage:* Lets the user set the acceptable level of symbol quality.
- Definition:* Conforms to ISO/IEC 16022 symbol quality grading (A,B,C,D).
- Serial Cmd:* <**K800**,output on symbol contrast,symbol contrast threshold,output on print growth,print growth threshold,output on axial non-uniformity,axial non-uniformity threshold,output on UEC,**UEC threshold**>
- Default:* **Grade C**
- Options:* 0 = Grade A  
1 = Grade B  
**2 = Grade C**  
3 = Grade D

## ISO/IEC 15415 Symbol Quality Output 1

**Note:** Output On under Output 1 Parameters must be set to Symbol Quality for this output to function.

☐ Output 1 Parameters

☐ Output On      Symbol Quality

Bar code symbol print quality test specification - 2D Symbols

Supported symbologies:

- DataMatrix ECC200
- QR Code
- Micro QR Code

Minimum Resolution: 6.0 Pixels Per Element

### Output on Overall Grade

*Usage:* Lets the user know if symbol quality is less than acceptable.

*Definition:* If enabled, drives **Output** if grade is under **Overall Grade Threshold**.

*Serial Cmd:* <**K870, output on overall grade, overall grade threshold, symbol contrast, symbol contrast threshold, modulation, modulation threshold, reflectance margin, reflectance margin threshold, fixed pattern damage, fixed pattern damage threshold, axial non-uniformity, axial non-uniformity threshold, grid non-uniformity, grid non-uniformity threshold, unused ECC, unused ECC threshold**>

*Default:* **Disabled**

*Options:* **0 = Disabled**                      1 = Enabled

## Overall Grade Threshold

*Usage:* Sets the threshold for driving the output.

*Definition:* Conforms to ISO/IEC 15415 symbol quality grading (A,B,C,D).

*Serial Cmd:* <**K870**, output on overall grade, **overall grade threshold**, symbol contrast, symbol contrast threshold, modulation, modulation threshold, reflectance margin, reflectance margin threshold, fixed pattern damage, fixed pattern damage threshold, axial non-uniformity, axial non-uniformity threshold, grid non-uniformity, grid non-uniformity threshold, unused ECC, unused ECC threshold>

*Default:* **Grade B**

*Options:* 0 = Grade D  
1 = Grade C  
**2 = Grade B**  
3 = Grade A

## Symbol Contrast

*Usage:* Lets the user know if symbol quality is less than acceptable.

*Definition:* If enabled, drives **Output** if grade is under **Symbol Contrast Threshold**.

*Serial Cmd:* <**K870**, output on overall grade, overall grade threshold, **symbol contrast**, symbol contrast threshold, modulation, modulation threshold, reflectance margin, reflectance margin threshold, fixed pattern damage, fixed pattern damage threshold, axial non-uniformity, axial non-uniformity threshold, grid non-uniformity, grid non-uniformity threshold, unused ECC, unused ECC threshold>

*Default:* **Disabled**

*Options:* **0 = Disabled**                      1 = Enabled

## Symbol Contrast Threshold

*Usage:* Sets the threshold for driving the output.

*Definition:* Conforms to ISO/IEC 15415 symbol quality grading (A,B,C,D).

*Serial Cmd:* <**K870**, output on overall grade, overall grade threshold, symbol contrast, **symbol contrast threshold**, modulation, modulation threshold, reflectance margin, reflectance margin threshold, fixed pattern damage, fixed pattern damage threshold, axial non-uniformity, axial non-uniformity threshold, grid non-uniformity, grid non-uniformity threshold, unused ECC, unused ECC threshold>

*Default:* **Grade B**

*Options:* 0 = Grade D  
1 = Grade C  
**2 = Grade B**  
3 = Grade A

## Modulation

*Usage:* Lets the user know if symbol quality is less than acceptable.

*Definition:* If enabled, drives **Output** if grade is under **Modulation Threshold**.

*Serial Cmd:* <**K870**, output on overall grade, overall grade threshold, symbol contrast, symbol contrast threshold, **modulation**, modulation threshold, reflectance margin, reflectance margin threshold, fixed pattern damage, fixed pattern damage threshold, axial non-uniformity, axial non-uniformity threshold, grid non-uniformity, grid non-uniformity threshold, unused ECC, unused ECC threshold>

*Default:* **Disabled**

*Options:* **0 = Disabled**                      1 = Enabled

## Modulation Threshold

*Usage:* Sets the threshold for driving the output.

*Definition:* Conforms to ISO/IEC 15415 symbol quality grading (A,B,C,D).

*Serial Cmd:* <**K870**, output on overall grade, overall grade threshold, symbol contrast, symbol contrast threshold, modulation, **modulation threshold**, reflectance margin, reflectance margin threshold, fixed pattern damage, fixed pattern damage threshold, axial non-uniformity, axial non-uniformity threshold, grid non-uniformity, grid non-uniformity threshold, unused ECC, unused ECC threshold>

*Default:* **Grade B**

*Options:* 0 = Grade D  
1 = Grade C  
**2 = Grade B**  
3 = Grade A

## Reflectance Margin

*Usage:* Lets the user know if symbol quality is less than acceptable.

*Definition:* If enabled, drives **Output** if grade is under **Reflectance Margin Threshold**.

*Serial Cmd:* <**K870**, output on overall grade, overall grade threshold, symbol contrast, symbol contrast threshold, modulation, modulation threshold, **reflectance margin**, reflectance margin threshold, fixed pattern damage, fixed pattern damage threshold, axial non-uniformity, axial non-uniformity threshold, grid non-uniformity, grid non-uniformity threshold, unused ECC, unused ECC threshold>

*Default:* **Disabled**

*Options:* **0 = Disabled**                      1 = Enabled

## Reflectance Margin Threshold

*Usage:* Sets the threshold for driving the output.

*Definition:* Conforms to ISO/IEC 15415 symbol quality grading (A,B,C,D).

*Serial Cmd:* <**K870**, output on overall grade, overall grade threshold, symbol contrast, symbol contrast threshold, modulation, modulation threshold, reflectance margin, **reflectance margin threshold**, fixed pattern damage, fixed pattern damage threshold, axial non-uniformity, axial non-uniformity threshold, grid non-uniformity, grid non-uniformity threshold, unused ECC, unused ECC threshold>

*Default:* **Grade B**

*Options:* 0 = Grade D  
1 = Grade C  
**2 = Grade B**  
3 = Grade A

## Fixed Pattern Damage

*Usage:* Lets the user know if symbol quality is less than acceptable.

*Definition:* If enabled, drives **Output** if grade is under **Fixed Pattern Damage Threshold**.

*Serial Cmd:* <**K870**, output on overall grade, overall grade threshold, symbol contrast, symbol contrast threshold, modulation, modulation threshold, reflectance margin, reflectance margin threshold, **fixed pattern damage**, fixed pattern damage threshold, axial non-uniformity, axial non-uniformity threshold, grid non-uniformity, grid non-uniformity threshold, unused ECC, unused ECC threshold>

*Default:* **Disabled**

*Options:* **0 = Disabled**                      1 = Enabled

## Fixed Pattern Damage Threshold

*Usage:* Sets the threshold for driving the output.

*Definition:* Conforms to ISO/IEC 15415 symbol quality grading (A,B,C,D).

*Serial Cmd:* <**K870**, output on overall grade, overall grade threshold, symbol contrast, symbol contrast threshold, modulation, modulation threshold, reflectance margin, reflectance margin threshold, fixed pattern damage, **fixed pattern damage threshold**, axial non-uniformity, axial non-uniformity threshold, grid non-uniformity, grid non-uniformity threshold, unused ECC, unused ECC threshold>

*Default:* **Grade B**

*Options:* 0 = Grade D  
1 = Grade C  
**2 = Grade B**  
3 = Grade A

## Axial Non-uniformity

*Usage:* Lets the user know if symbol quality is less than acceptable.

*Definition:* If enabled, drives **Output** if grade is under **Axial Non-uniformity Threshold**.

*Serial Cmd:* <**K870**, output on overall grade, overall grade threshold, symbol contrast, symbol contrast threshold, modulation, modulation threshold, reflectance margin, reflectance margin threshold, fixed pattern damage, fixed pattern damage threshold, **axial non-uniformity**, axial non-uniformity threshold, grid non-uniformity, grid non-uniformity threshold, unused ECC, unused ECC threshold>

*Default:* **Disabled**

*Options:* **0 = Disabled**                      1 = Enabled

## Axial Non-uniformity Threshold

*Usage:* Sets the threshold for driving the output.

*Definition:* Conforms to ISO/IEC 15415 symbol quality grading (A,B,C,D).

*Serial Cmd:* <**K870**, output on overall grade, overall grade threshold, symbol contrast, symbol contrast threshold, modulation, modulation threshold, reflectance margin, reflectance margin threshold, fixed pattern damage, fixed pattern damage threshold, axial non-uniformity, **axial non-uniformity threshold**, grid non-uniformity, grid non-uniformity threshold, unused ECC, unused ECC threshold>

*Default:* **Grade B**

*Options:* 0 = Grade D  
1 = Grade C  
**2 = Grade B**  
3 = Grade A

## Grid Non-uniformity

*Usage:* Lets the user know if symbol quality is less than acceptable.

*Definition:* If enabled, drives **Output** if grade is under **Grid Non-uniformity Threshold**.

*Serial Cmd:* <**K870**, output on overall grade, overall grade threshold, symbol contrast, symbol contrast threshold, modulation, modulation threshold, reflectance margin, reflectance margin threshold, fixed pattern damage, fixed pattern damage threshold, axial non-uniformity, axial non-uniformity threshold, **grid non-uniformity**, grid non-uniformity threshold, unused ECC, unused ECC threshold>

*Default:* **Disabled**

*Options:* **0 = Disabled**                      1 = Enabled

## Grid Non-uniformity Threshold

*Usage:* Sets the threshold for driving the output.

*Definition:* Conforms to ISO/IEC 15415 symbol quality grading (A,B,C,D).

*Serial Cmd:* <**K870**, output on overall grade, overall grade threshold, symbol contrast, symbol contrast threshold, modulation, modulation threshold, reflectance margin, reflectance margin threshold, fixed pattern damage, fixed pattern damage threshold, axial non-uniformity, axial non-uniformity threshold, grid non-uniformity, **grid non-uniformity threshold**, unused ECC, unused ECC threshold>

*Default:* **Grade B**

*Options:* 0 = Grade D  
1 = Grade C  
**2 = Grade B**  
3 = Grade A

## Unused ECC

*Usage:* Lets the user know if symbol quality is less than acceptable.

*Definition:* If enabled, drives **Output** if grade is under **Unused ECC Threshold**.

*Serial Cmd:* <**K870**, output on overall grade, overall grade threshold, symbol contrast, symbol contrast threshold, modulation, modulation threshold, reflectance margin, reflectance margin threshold, fixed pattern damage, fixed pattern damage threshold, axial non-uniformity, axial non-uniformity threshold, grid non-uniformity, grid non-uniformity threshold, **unused ECC**, unused ECC threshold>

*Default:* **Disabled**

*Options:* **0 = Disabled**                      1 = Enabled

## Unused ECC Threshold

*Usage:* Sets the threshold for driving the output.

*Definition:* Conforms to ISO/IEC 15415 symbol quality grading (A,B,C,D).

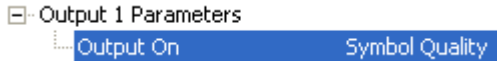
*Serial Cmd:* <**K870**, output on overall grade, overall grade threshold, symbol contrast, symbol contrast threshold, modulation, modulation threshold, reflectance margin, reflectance margin threshold, fixed pattern damage, fixed pattern damage threshold, axial non-uniformity, axial non-uniformity threshold, grid non-uniformity, grid non-uniformity threshold, unused ECC, **unused ECC threshold**>

*Default:* **Grade B**

*Options:* 0 = Grade D  
1 = Grade C  
**2 = Grade B**  
3 = Grade A

## ISO/IEC 15416 Symbol Quality Output 1

**Note:** Output On under Output 1 Parameters must be set to Symbol Quality for this output to function.



### Bar Code Print Quality Guideline

Supported Symbologies:

- Code 128 / GS1-128
- UPC-A / UPC-E / EAN-13 / EAN-8
- Interleaved 2 of 5 / ITF-14
- Code 39
- Code 93
- Codabar

Minimum Resolution: 4.0 Pixels Per Element

### Output on Overall Grade

**Usage:** Lets the user know if symbol quality is less than acceptable.

**Definition:** If enabled, drives **Output** if grade is under **Overall Grade Threshold**.

**Serial Cmd:** *<K880, output on overall grade, overall grade threshold, edge determination, edge determination threshold, decode, decode threshold, contrast, contrast threshold, min reflectance, min reflectance threshold, min edge contrast, min edge contrast threshold, modulation, modulation threshold, defects, defects threshold, decodability, decodability threshold, quiet Zone, quiet zone threshold >*

**Default:** **Disabled**

**Options:** **0 = Disabled**                      1 = Enabled

## Overall Grade Threshold

*Usage:* Sets the threshold for driving the output.

*Definition:* Conforms to ISO/IEC 15416 symbol quality grading (A,B,C,D).

*Serial Cmd:* <**K880**, output on overall grade, **overall grade threshold**, edge determination, edge determination threshold, decode, decode threshold, contrast, contrast threshold, min reflectance, min reflectance threshold, min edge contrast, min edge contrast threshold, modulation, modulation threshold, defects, defects threshold, decodability, decodability threshold, quiet Zone, quiet zone threshold >

*Default:* **Grade B**

*Options:* 0 = Grade D  
1 = Grade C  
**2 = Grade B**  
3 = Grade A

## Edge Determination

*Usage:* Lets the user know if symbol quality is less than acceptable.

*Definition:* If enabled, drives **Output** if grade is under **Edge Determination Threshold**.

*Serial Cmd:* <**K880**, output on overall grade, overall grade threshold, **edge determination**, edge determination threshold, decode, decode threshold, contrast, contrast threshold, min reflectance, min reflectance threshold, min edge contrast, min edge contrast threshold, modulation, modulation threshold, defects, defects threshold, decodability, decodability threshold, quiet Zone, quiet zone threshold >

*Default:* **Disabled**

*Options:* **0 = Disabled**                      1 = Enabled

## Edge Determination Threshold

**Usage:** Sets the threshold for driving the output.

**Definition:** Conforms to ISO/IEC 15416 symbol quality grading (A,B,C,D).

**Serial Cmd:** <**K880**, output on overall grade, overall grade threshold, edge determination, **edge determination threshold**, decode, decode threshold, contrast, contrast threshold, min reflectance, min reflectance threshold, min edge contrast, min edge contrast threshold, modulation, modulation threshold, defects, defects threshold, decodability, decodability threshold, quiet Zone, quiet zone threshold >

**Default:** **Grade B**

**Options:**  
 0 = Grade D  
 1 = Grade C  
**2 = Grade B**  
 3 = Grade A

## Decode

**Usage:** Lets the user know if symbol quality is less than acceptable.

**Definition:** If enabled, drives **Output** if grade is under **Decode Threshold**.

**Serial Cmd:** <**K880**, output on overall grade, overall grade threshold, edge determination, edge determination threshold, **decode**, decode threshold, contrast, contrast threshold, min reflectance, min reflectance threshold, min edge contrast, min edge contrast threshold, modulation, modulation threshold, defects, defects threshold, decodability, decodability threshold, quiet Zone, quiet zone threshold >

**Default:** **Disabled**

**Options:** **0 = Disabled**                      1 = Enabled

## Decode Threshold

*Usage:* Sets the threshold for driving the output.

*Definition:* Conforms to ISO/IEC 15416 symbol quality grading (A,B,C,D).

*Serial Cmd:* <**K880**, output on overall grade, overall grade threshold, edge determination, edge determination threshold, decode, **decode threshold**, contrast, contrast threshold, min reflectance, min reflectance threshold, min edge contrast, min edge contrast threshold, modulation, modulation threshold, defects, defects threshold, decodability, decodability threshold, quiet Zone, quiet zone threshold >

*Default:* **Grade B**

*Options:* 0 = Grade D  
1 = Grade C  
**2 = Grade B**  
3 = Grade A

## Contrast

*Usage:* Lets the user know if symbol quality is less than acceptable.

*Definition:* If enabled, drives **Output** if grade is under **Contrast Threshold**.

*Serial Cmd:* <**K880**, output on overall grade, overall grade threshold, edge determination, edge determination threshold, decode, decode threshold, **contrast**, contrast threshold, min reflectance, min reflectance threshold, min edge contrast, min edge contrast threshold, modulation, modulation threshold, defects, defects threshold, decodability, decodability threshold, quiet Zone, quiet zone threshold >

*Default:* **Disabled**

*Options:* **0 = Disabled**                      1 = Enabled

## Contrast Threshold

**Usage:** Sets the threshold for driving the output.

**Definition:** Conforms to ISO/IEC 15416 symbol quality grading (A,B,C,D).

**Serial Cmd:** <**K880**, output on overall grade, overall grade threshold, edge determination, edge determination threshold, decode, decode threshold, contrast, **contrast threshold**, min reflectance, min reflectance threshold, min edge contrast, min edge contrast threshold, modulation, modulation threshold, defects, defects threshold, decodability, decodability threshold, quiet Zone, quiet zone threshold >

**Default:** **Grade B**

**Options:**  
 0 = Grade D  
 1 = Grade C  
**2 = Grade B**  
 3 = Grade A

## Min Reflectance

**Usage:** Lets the user know if symbol quality is less than acceptable.

**Definition:** If enabled, drives **Output** if grade is under **Min Reflectance Threshold**.

**Serial Cmd:** <**K880**, output on overall grade, overall grade threshold, edge determination, edge determination threshold, decode, decode threshold, contrast, contrast threshold, **min reflectance**, min reflectance threshold, min edge contrast, min edge contrast threshold, modulation, modulation threshold, defects, defects threshold, decodability, decodability threshold, quiet Zone, quiet zone threshold >

**Default:** **Disabled**

**Options:** **0 = Disabled**                      1 = Enabled

## Min Reflectance Threshold

*Usage:* Sets the threshold for driving the output.

*Definition:* Conforms to ISO/IEC 15416 symbol quality grading (A,B,C,D).

*Serial Cmd:* <**K880**, output on overall grade, overall grade threshold, edge determination, edge determination threshold, decode, decode threshold, contrast, contrast threshold, min reflectance, **min reflectance threshold**, min edge contrast, min edge contrast threshold, modulation, modulation threshold, defects, defects threshold, decodability, decodability threshold, quiet Zone, quiet zone threshold >

*Default:* **Grade B**

*Options:* 0 = Grade D  
1 = Grade C  
**2 = Grade B**  
3 = Grade A

## Min Edge Contrast

*Usage:* Lets the user know if symbol quality is less than acceptable.

*Definition:* If enabled, drives **Output** if grade is under **Min Edge Contrast Threshold**.

*Serial Cmd:* <**K880**, output on overall grade, overall grade threshold, edge determination, edge determination threshold, decode, decode threshold, contrast, contrast threshold, min reflectance, min reflectance threshold, **min edge contrast**, min edge contrast threshold, modulation, modulation threshold, defects, defects threshold, decodability, decodability threshold, quiet Zone, quiet zone threshold >

*Default:* **Disabled**

*Options:* **0 = Disabled**                      1 = Enabled

## Min Edge Contrast Threshold

**Usage:** Sets the threshold for driving the output.

**Definition:** Conforms to ISO/IEC 15416 symbol quality grading (A,B,C,D).

**Serial Cmd:** <**K880**, output on overall grade, overall grade threshold, edge determination, edge determination threshold, decode, decode threshold, contrast, contrast threshold, min reflectance, min reflectance threshold, min edge contrast, **min edge contrast threshold**, modulation, modulation threshold, defects, defects threshold, decodability, decodability threshold, quiet Zone, quiet zone threshold >

**Default:** **Grade B**

**Options:** 0 = Grade D  
1 = Grade C  
**2 = Grade B**  
3 = Grade A

## Modulation

**Usage:** Lets the user know if symbol quality is less than acceptable.

**Definition:** If enabled, drives **Output** if grade is under **Modulation Threshold**.

**Serial Cmd:** <**K880**, output on overall grade, overall grade threshold, edge determination, edge determination threshold, decode, decode threshold, contrast, contrast threshold, min reflectance, min reflectance threshold, min edge contrast, min edge contrast threshold, **modulation**, modulation threshold, defects, defects threshold, decodability, decodability threshold, quiet Zone, quiet zone threshold >

**Default:** **Disabled**

**Options:** **0 = Disabled**                      1 = Enabled

## Modulation Threshold

*Usage:* Sets the threshold for driving the output.

*Definition:* Conforms to ISO/IEC 15416 symbol quality grading (A,B,C,D).

*Serial Cmd:* <**K880**, *output on overall grade, overall grade threshold, edge determination, edge determination threshold, decode, decode threshold, contrast, contrast threshold, min reflectance, min reflectance threshold, min edge contrast, min edge contrast threshold, modulation, **modulation threshold**, defects, defects threshold, decodability, decodability threshold, quiet Zone, quiet zone threshold* >

*Default:* **Grade B**

*Options:* 0 = Grade D  
1 = Grade C  
**2 = Grade B**  
3 = Grade A

## Defects

*Usage:* Lets the user know if symbol quality is less than acceptable.

*Definition:* If enabled, drives **Output** if grade is under **Defects Threshold**.

*Serial Cmd:* <**K880**, *output on overall grade, overall grade threshold, edge determination, edge determination threshold, decode, decode threshold, contrast, contrast threshold, min reflectance, min reflectance threshold, min edge contrast, min edge contrast threshold, modulation, modulation threshold, **defects**, defects threshold, decodability, decodability threshold, quiet Zone, quiet zone threshold* >

*Default:* **Disabled**

*Options:* **0 = Disabled**                      1 = Enabled

## Defects Threshold

- Usage:** Sets the threshold for driving the output.
- Definition:** Conforms to ISO/IEC 15416 symbol quality grading (A,B,C,D).
- Serial Cmd:** <**K880**, *output on overall grade, overall grade threshold, edge determination, edge determination threshold, decode, decode threshold, contrast, contrast threshold, min reflectance, min reflectance threshold, min edge contrast, min edge contrast threshold, modulation, modulation threshold, defects, **defects threshold**, decodability, decodability threshold, quiet Zone, quiet zone threshold* >
- Default:** **Grade B**
- Options:** 0 = Grade D  
1 = Grade C  
**2 = Grade B**  
3 = Grade A

## Decodability

- Usage:** Lets the user know if symbol quality is less than acceptable.
- Definition:** If enabled, drives **Output** if grade is under **Decodability Threshold**.
- Serial Cmd:** <**K880**, *output on overall grade, overall grade threshold, edge determination, edge determination threshold, decode, decode threshold, contrast, contrast threshold, min reflectance, min reflectance threshold, min edge contrast, min edge contrast threshold, modulation, modulation threshold, defects, defects threshold, **decodability**, decodability threshold, quiet Zone, quiet zone threshold* >
- Default:** **Disabled**
- Options:** **0 = Disabled**                      1 = Enabled

## Decodability Threshold

*Usage:* Sets the threshold for driving the output.

*Definition:* Conforms to ISO/IEC 15416 symbol quality grading (A,B,C,D).

*Serial Cmd:* <**K880**, output on overall grade, overall grade threshold, edge determination, edge determination threshold, decode, decode threshold, contrast, contrast threshold, min reflectance, min reflectance threshold, min edge contrast, min edge contrast threshold, modulation, modulation threshold, defects, defects threshold, decodability, **decodability threshold**, quiet Zone, quiet zone threshold >

*Default:* **Grade B**

*Options:* 0 = Grade D  
1 = Grade C  
**2 = Grade B**  
3 = Grade A

## Quiet Zone

*Usage:* Lets the user know if symbol quality is less than acceptable.

*Definition:* If enabled, drives **Output** if grade is under **Quiet Zone Threshold**.

*Serial Cmd:* <**K880**, output on overall grade, overall grade threshold, edge determination, edge determination threshold, decode, decode threshold, contrast, contrast threshold, min reflectance, min reflectance threshold, min edge contrast, min edge contrast threshold, modulation, modulation threshold, defects, defects threshold, decodability, decodability threshold, **quiet Zone**, quiet zone threshold >

*Default:* **Disabled**

*Options:* **0 = Disabled**                      1 = Enabled

## Quiet Zone Threshold

*Usage:* Sets the threshold for driving the output.

*Definition:* Conforms to ISO/IEC 15416 symbol quality grading (A,B,C,D).

*Serial Cmd:* **<K880**, *output on overall grade, overall grade threshold, edge determination, edge determination threshold, decode, decode threshold, contrast, contrast threshold, min reflectance, min reflectance threshold, min edge contrast, min edge contrast threshold, modulation, modulation threshold, defects, defects threshold, decodability, decodability threshold, quiet Zone, quiet zone threshold >*

*Default:* **Grade B**

*Options:*  
0 = Grade D  
1 = Grade C  
**2 = Grade B**  
3 = Grade A

## ISO/IEC 29158 Symbol Quality Output 1

**Note:** Output On under Output 1 Parameters must be set to Symbol Quality for this output to function.

☐ Output 1 Parameters

☐ Output On      Symbol Quality

Automatic identification and data capture – Direct Part Mark (DMP) Quality

Supported symbologies:

- DataMatrix ECC200

Minimum Resolution: 6.0 Pixels Per Element

### Output on Overall Grade

**Usage:** Lets the user know if symbol quality is less than acceptable.

**Definition:** If enabled, drives **Output** if grade is under **Overall Grade Threshold**.

**Serial Cmd:** <**K890, output on overall grade, overall grade threshold, cell contrast, cell contrast threshold, cell modulation, cell modulation threshold, fixed pattern damage, fixed pattern damage threshold, axial non-uniformity, axial non-uniformity threshold, grid non-uniformity, grid non-uniformity threshold, unused ECC, unused ECC threshold**>

**Default:** **Disabled**

**Options:** **0 = Disabled**                      1 = Enabled

### Overall Grade Threshold

**Usage:** Sets the threshold for driving the output.

**Definition:** Conforms to ISO/IEC 29158 symbol quality grading (A,B,C,D).

**Serial Cmd:** <**K890, output on overall grade, overall grade threshold, cell contrast, cell contrast threshold, cell modulation, cell modulation threshold, fixed pattern damage, fixed pattern damage threshold, axial non-uniformity, axial non-uniformity threshold, grid non-uniformity, grid non-uniformity threshold, unused ECC, unused ECC threshold**>

**Default:** **Grade B**

**Options:** 0 = Grade D  
1 = Grade C  
**2 = Grade B**  
3 = Grade A

## Cell Contrast

- Usage:** Lets the user know if symbol quality is less than acceptable.
- Definition:** If enabled, drives **Output** if grade is under **Symbol Contrast Threshold**.
- Serial Cmd:** <**K890**, output on overall grade, overall grade threshold, **cell contrast**, cell contrast threshold, cell modulation, cell modulation threshold, fixed pattern damage, fixed pattern damage threshold, axial non-uniformity, axial non-uniformity threshold, grid non-uniformity, grid non-uniformity threshold, unused ECC, unused ECC threshold>
- Default:** **Disabled**
- Options:** **0 = Disabled**                      1 = Enabled

## Cell Contrast Threshold

- Usage:** Sets the threshold for driving the output.
- Definition:** Conforms to ISO/IEC 29158 symbol quality grading (A,B,C,D).
- Serial Cmd:** <**K890**, output on overall grade, overall grade threshold, cell contrast, **cell contrast threshold**, cell modulation, cell modulation threshold, fixed pattern damage, fixed pattern damage threshold, axial non-uniformity, axial non-uniformity threshold, grid non-uniformity, grid non-uniformity threshold, unused ECC, unused ECC threshold>
- Default:** **Grade B**
- Options:** 0 = Grade D  
1 = Grade C  
**2 = Grade B**  
3 = Grade A

## Cell Moduration

- Usage:** Lets the user know if symbol quality is less than acceptable.
- Definition:** If enabled, drives **Output** if grade is under **Cell Moduration Threshold**.
- Serial Cmd:** <**K890**, output on overall grade, overall grade threshold, cell contrast, cell contrast threshold, **cell modulation**, cell modulation threshold, fixed pattern damage, fixed pattern damage threshold, axial non-uniformity, axial non-uniformity threshold, grid non-uniformity, grid non-uniformity threshold, unused ECC, unused ECC threshold>
- Default:** **Disabled**
- Options:** **0 = Disabled**                      1 = Enabled

## Cell Moduration Threshold

*Usage:* Sets the threshold for driving the output.

*Definition:* Conforms to ISO/IEC 29158 symbol quality grading (A,B,C,D).

*Serial Cmd:* <**K890**, output on overall grade, overall grade threshold, cell contrast, cell contrast threshold, cell modulation, **cell modulation threshold**, fixed pattern damage, fixed pattern damage threshold, axial non-uniformity, axial non-uniformity threshold, grid non-uniformity, grid non-uniformity threshold, unused ECC, unused ECC threshold>

*Default:* **Grade B**

*Options:* 0 = Grade D  
1 = Grade C  
**2 = Grade B**  
3 = Grade A

## Fixed Pattern Damage

*Usage:* Lets the user know if symbol quality is less than acceptable.

*Definition:* If enabled, drives **Output** if grade is under **Fixed Pattern Damage Threshold**.

*Serial Cmd:* <**K890**, output on overall grade, overall grade threshold, cell contrast, cell contrast threshold, cell modulation, **cell modulation threshold**, fixed pattern damage, fixed pattern damage threshold, axial non-uniformity, axial non-uniformity threshold, grid non-uniformity, grid non-uniformity threshold, unused ECC, unused ECC threshold>

*Default:* **Disabled**

*Options:* **0 = Disabled**                      1 = Enabled

## Fixed Pattern Damage Threshold

*Usage:* Sets the threshold for driving the output.

*Definition:* Conforms to ISO/IEC 29158 symbol quality grading (A,B,C,D).

*Serial Cmd:* <**K890**, output on overall grade, overall grade threshold, cell contrast, cell contrast threshold, cell modulation, cell modulation threshold, fixed pattern damage, **fixed pattern damage threshold**, axial non-uniformity, axial non-uniformity threshold, grid non-uniformity, grid non-uniformity threshold, unused ECC, unused ECC threshold>

*Default:* **Grade B**

*Options:* 0 = Grade D  
1 = Grade C  
**2 = Grade B**  
3 = Grade A

## Axial Non-uniformity

- Usage:** Lets the user know if symbol quality is less than acceptable.
- Definition:** If enabled, drives **Output** if grade is under **Axial Non-uniformity Threshold**.
- Serial Cmd:** <**K890**, output on overall grade, overall grade threshold, cell contrast, cell contrast threshold, cell modulation, cell modulation threshold, fixed pattern damage, fixed pattern damage threshold, **axial non-uniformity**, axial non-uniformity threshold, grid non-uniformity, grid non-uniformity threshold, unused ECC, unused ECC threshold>
- Default:** **Disabled**
- Options:** **0 = Disabled**                      1 = Enabled

## Axial Non-uniformity Threshold

- Usage:** Sets the threshold for driving the output.
- Serial Cmd:** <**K890**, output on overall grade, overall grade threshold, cell contrast, cell contrast threshold, cell modulation, cell modulation threshold, fixed pattern damage, fixed pattern damage threshold, axial non-uniformity, **axial non-uniformity threshold**, grid non-uniformity, grid non-uniformity threshold, unused ECC, unused ECC threshold>
- Definition:** Conforms to ISO/IEC 29158 symbol quality grading (A,B,C,D).
- Default:** **Grade B**
- Options:** 0 = Grade D  
1 = Grade C  
**2 = Grade B**  
3 = Grade A

## Grid Non-uniformity

- Usage:** Lets the user know if symbol quality is less than acceptable.
- Definition:** If enabled, drives **Output** if grade is under **Grid Non-uniformity Threshold**.
- Serial Cmd:** <**K890**, output on overall grade, overall grade threshold, cell contrast, cell contrast threshold, cell modulation, cell modulation threshold, fixed pattern damage, fixed pattern damage threshold, axial non-uniformity, axial non-uniformity threshold, **grid non-uniformity**, grid non-uniformity threshold, unused ECC, unused ECC threshold>
- Default:** **Disabled**
- Options:** **0 = Disabled**                      1 = Enabled

## Grid Non-uniformity Threshold

*Usage:* Sets the threshold for driving the output.

*Definition:* Conforms to ISO/IEC 29158 symbol quality grading (A,B,C,D).

*Serial Cmd:* <**K890**, output on overall grade, overall grade threshold, cell contrast, cell contrast threshold, cell modulation, cell modulation threshold, fixed pattern damage, fixed pattern damage threshold, axial non-uniformity, axial non-uniformity threshold, grid non-uniformity, **grid non-uniformity threshold**, unused ECC, unused ECC threshold>

*Default:* **Grade B**

*Options:* 0 = Grade D  
1 = Grade C  
**2 = Grade B**  
3 = Grade A

## Unused ECC

*Usage:* Lets the user know if symbol quality is less than acceptable.

*Definition:* If enabled, drives **Output** if grade is under **Unused ECC Threshold**.

*Serial Cmd:* <**K890**, output on overall grade, overall grade threshold, cell contrast, cell contrast threshold, cell modulation, cell modulation threshold, fixed pattern damage, fixed pattern damage threshold, axial non-uniformity, axial non-uniformity threshold, grid non-uniformity, grid non-uniformity threshold, **unused ECC**, unused ECC threshold>

*Default:* **Disabled**

*Options:* **0 = Disabled**                      1 = Enabled

## Unused ECC Threshold

*Usage:* Sets the threshold for driving the output.

*Definition:* Conforms to ISO/IEC 29158 symbol quality grading (A,B,C,D).

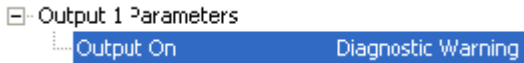
*Serial Cmd:* <**K890**, output on overall grade, overall grade threshold, cell contrast, cell contrast threshold, cell modulation, cell modulation threshold, fixed pattern damage, fixed pattern damage threshold, axial non-uniformity, axial non-uniformity threshold, grid non-uniformity, grid non-uniformity threshold, unused ECC, **unused ECC threshold**>

*Default:* **Grade B**

*Options:* 0 = Grade D  
1 = Grade C  
**2 = Grade B**  
3 = Grade A

## Diagnostics Output 1

**Note:** **Output On** under **Output 1 Parameters** must be set to **Diagnostic Warning** for this output to function.



Under **Output 1 Parameters**, expand the **Diagnostics** tree.



*Serial Cmd:* <**K790,unused 1,service unit**>

*Default:* **0**

*Options:* **0 = Disabled**

## Service Unit

When **Diagnostic Warning** is enabled, the **Output On** configuration has no effect. The output will remain active as long as one of the diagnostic warning conditions is met. The output will become inactive once it detects that there are no diagnostic warning conditions.

*Definition:* Allows the user to set up the output to toggle to active when the service timer has expired. This condition will only be held for one service timer click.

**Note:** This feature cannot be used if the reader is in a **Continuous Read** mode.

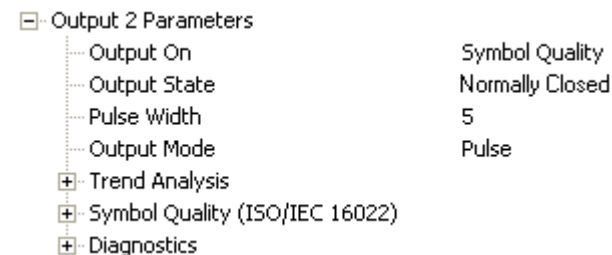
*Serial Cmd:* <**K790,unused 1,service unit**>

*Default:* **0**

*Options:* **0 = Disabled**                      1 = Enabled

## Configurable Output 2

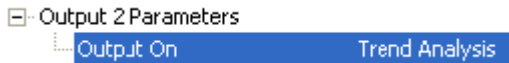
**Note:** **Output 2** has the same parameters and default settings as **Output 1**.



*Serial Cmd:* <**K811,output on,output state,pulse width,output mode**>

## Trend Analysis Output 2

**Note:** **Output On** under **Output 2 Parameters** must be set to **Trend Analysis** for this output to function.



*Serial Cmd: <K781,trend analysis mode,trigger evaluation period,number to output on>*

## ISO/IEC 16022 Symbol Quality Output 2

**Note:** **Output On** under **Output 2 Parameters** must be set to **Symbol Quality** for this output to function.



*Serial Cmd: <K801,output on symbol contrast,symbol contrast threshold,output on print growth,print growth threshold,output on axial non-uniformity,axial non-uniformity threshold,output on UEC,UEC threshold>*

## ISO/IEC 15415 Symbol Quality Output 2

**Note:** **Output On** under **Output 2 Parameters** must be set to **Symbol Quality** for this output to function.



*Serial Cmd: <K871, output on overall grade, overall grade threshold, symbol contrast, symbol contrast threshold, modulation, modulation threshold, reflectance margin, reflectance margin threshold, fixed pattern damage, fixed pattern damage threshold, axial non-uniformity, axial non-uniformity threshold, grid non-uniformity, grid non-uniformity threshold, unused ECC, unused ECC threshold>*

## ISO/IEC 15416 Symbol Quality Output 2

**Note:** **Output On** under **Output 2 Parameters** must be set to **Symbol Quality** for this output to function.



*Serial Cmd: <K881, output on overall grade, overall grade threshold, edge determination, edge determination threshold, decode, decode threshold, contrast, contrast threshold, min reflectance, min reflectance threshold, min edge contrast, min edge contrast threshold, modulation, modulation threshold, defects, defects threshold, decodability, decodability threshold, quiet Zone, quiet zone threshold >*

## ISO/IEC 29158 Symbol Quality Output 2

**Note:** **Output On** under **Output 2 Parameters** must be set to **Symbol Quality** for this output to function.



*Serial Cmd: <K891, output on overall grade, overall grade threshold, cell contrast, cell contrast threshold, cell modulation, cell modulation threshold, fixed pattern damage, fixed pattern damage threshold, axial non-uniformity, axial non-uniformity threshold, grid non-uniformity, grid non-uniformity threshold, unused ECC, unused ECC threshold>*

## Diagnostics Output 2

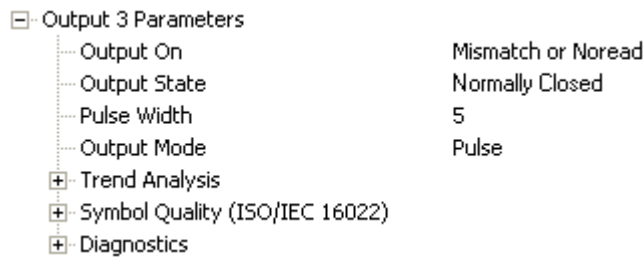
**Note:** **Output On** under **Output 2 Parameters** must be set to **Diagnostic Warning** for this output to function.



*Serial Cmd: <K791,unused 1,service unit>*

## Configurable Output 3

**Note:** **Output 3** has the same parameters and default settings as **Output 1** and **Output 2**, with the **exception of Output On**, option 8: **Use as External Illumination Strobe**.



*Serial Cmd: <K812,output on,output state,pulse width,output mode>*

## Output On Output 3

**Usage:** This option provides discrete signaling to host software to control external devices such as PLCs and relays. It is useful for routing, sorting, and preventing mis-packaging and mis-routing.

**Definition:** Sets the discrete output functions for specific user-selected conditions. Allows the user to determine when an output (or outputs) will be activated.

**Serial Cmd:** <K812,output on,output state,pulse width,output mode>

**Default:** **Mismatch or No-Read**

**Options:** **0 = Mismatch or No-Read**  
1 = Match (or Good Read)  
2 = Mismatch  
3 = No-Read  
4 = Trend Analysis  
5 = Symbol Quality  
6 = Diagnostic Warning  
7 = In Read Cycle  
8 = Use as External Illumination Strobe

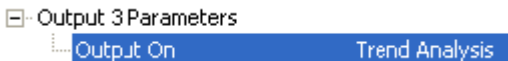
### **Use as External Illumination Strobe**

**Definition:** Asserts the external illumination strobe output during image capture.

**Important:** Illumination Brightness (K536), Light

## **Trend Analysis Output 3**

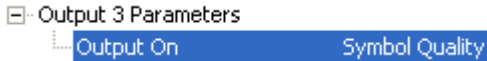
**Note:** Output On under Output 3 Parameters must be set to Trend Analysis for this output to function.



**Serial Cmd:** <K782,trend analysis mode,trigger evaluation period,number to output on>

## ISO/IEC 16022 Symbol Quality Output 3

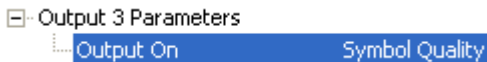
**Note:** **Output On** under **Output 3 Parameters** must be set to **Symbol Quality** for this output to function.



**Serial Cmd:** *<K802,output on symbol contrast,symbol contrast threshold,output on print growth,print growth threshold,output on axial non-uniformity,axial non-uniformity threshold,output on UEC,UEC threshold>*

## ISO/IEC 15415 Symbol Quality Output 3

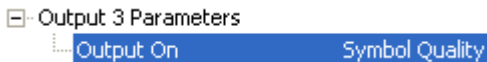
**Note:** **Output On** under **Output 3 Parameters** must be set to **Symbol Quality** for this output to function.



**Serial Cmd:** *<K872, output on overall grade, overall grade threshold, symbol contrast, symbol contrast threshold, modulation, modulation threshold, reflectance margin, reflectance margin threshold, fixed pattern damage, fixed pattern damage threshold, axial non-uniformity, axial non-uniformity threshold, grid non-uniformity, grid non-uniformity threshold, unused ECC, unused ECC threshold>*

## ISO/IEC 15416 Symbol Quality Output 3

**Note:** **Output On** under **Output 3 Parameters** must be set to **Symbol Quality** for this output to function.



**Serial Cmd:** *<K882, output on overall grade, overall grade threshold, edge determination, edge determination threshold, decode, decode threshold, contrast, contrast threshold, min reflectance, min reflectance threshold, min edge contrast, min edge contrast threshold, modulation, modulation threshold, defects, defects threshold, decodability, decodability threshold, quiet Zone, quiet zone threshold >*

## ISO/IEC 29158 Symbol Quality Output 3

**Note:** **Output On** under **Output 3 Parameters** must be set to **Symbol Quality** for this output to function.

☐ Output 3 Parameters

☐ Output On      Symbol Quality

*Serial Cmd: <K892, output on overall grade, overall grade threshold, cell contrast, cell contrast threshold, cell modulation, cell modulation threshold, fixed pattern damage, fixed pattern damage threshold, axial non-uniformity, axial non-uniformity threshold, grid non-uniformity, grid non-uniformity threshold, unused ECC, unused ECC threshold>*

## Diagnostics Output 3

**Note:** **Output On** under **Output 3 Parameters** must be set to **Diagnostic Warning** for this output to function.

☐ Output 3 Parameters

☐ Output On      Diagnostic Warning

*Serial Cmd: <K792,unused 1,service unit>*

## Power On/Reset Counts

**Note: Power On/Reset Counts** is a read-only command.

### Power-On

*Serial Cmd: <K406,power-on,resets,power-on saves,power-on flash saves>*

**Power-On** uses a 16-bit counter that increments each time the reader is powered-on.

### Resets

*Serial Cmd: <K406,power-on,resets,power-on saves,power-on flash saves>*

**Resets** uses a 16-bit counter that increments each time the reader is reset. This value is reset at power-on.

### Power-On Saves

*Serial Cmd: <K406,power-on,resets,power-on saves,power-on flash saves>*

**Power-On Saves** uses a 16-bit counter that increments each time an reader setting is saved for power-on with a **<Z>** command.

### Power-On Flash Saves

*Serial Cmd: <K406,power-on,resets,power-on saves,power-on flash saves>*

**Power-On Flash Saves** uses a 16-bit counter that increments each time an reader setting is saved to the customer parameter section of flash memory with a **<Zc>** command.

## ***Time Since Reset***

**Note:** **Time Since Reset** is a read-only command.

### **Hours**

*Serial Cmd:* <**K407,hours,minutes**>

*Default:* **16-bit counter** (0 to 65535)

**Hours** uses a 16-bit counter that increments every 60 minutes.

### **Minutes**

*Serial Cmd:* <**K407,hours,minutes**>

*Default:* **16-bit counter** (0 to 60)

**Minutes** uses a 16-bit counter that increments every 60 seconds.

**Note:** Time counts are reset at power-on, but not with an <**A**> or <**Z**> command.

## Service Message

When **Service Message** is enabled, a message of up to 10 ASCII characters is sent whenever the system detects that the service timer's limit has been reached. The service timer is reset at power-on, meaning that the service timer's limit is the amount of time since last reset. Service timer increments can be set in seconds or minutes.

*Serial Cmd:* <**K409**,*status*,*service message*,*threshold*,*resolution*>

*Default:* **0**

*Options:* **0 = Disabled**                      1 = Enabled

## Service Message

*Serial Cmd:* <**K409**,*status*,**service message**,*threshold*,*resolution*>

*Default:* **SERVICE**

*Options:* An ASCII string between 1 and 10 characters.

## Threshold

*Serial Cmd:* <**K409**,*status*,*service message*,**threshold**,*resolution*>

*Default:* **300** (5 minutes)

*Options:* 1 to 65535

## Resolution

*Serial Cmd:* <**K409**,*status*,*service message*,*threshold*,**resolution**>

*Default:* **Seconds**

*Options:* **0 = Seconds**                      1 = Minutes

## User-Assigned Name

*Definition:* **User-Assigned Name** allows you to enter any string of ASCII characters to help you identify your reader. The user-assigned name is saved at power-on and custom defaults, and is stored as a "sticky" parameter so it cannot be defaulted without a <**Zrdall**> or <**K412d**> command.

*Serial Cmd:* <**K412**,*user-assigned name*>

*Options:* ASCII string, up to 19 characters

## Output Object Info

### Output Frame Number

Serial Cmd: <K734,output frame number,output coordinates>

Default: **Disabled**

Options: **0 = Disabled**                      1 = Enabled

#### **Disabled**

When **Output Frame Number** is set to **Disabled**, the frame number is not output as part of the symbol data.

#### **Enabled**

When **Output Frame Number** is set to **Enabled**, the number of the frame in which the symbol was first decoded is attached to the symbol output information. The output format is “Fnnn”, where “nnn” is a 3-digit decimal value from 0 to 255. The frame number rolls over to 0 once it passes 255.

If this feature is enabled, the frame information will follow the symbol data, and it will precede any symbol quality data (if symbol quality settings are enabled—see **Symbol Quality Separator**). The symbol quality separator is located between the end of the already-formatted data and the “F” that precedes the frame number.

### Output Coordinates

Serial Cmd: <K734,output frame number,output coordinates>

Default: **Disabled**

Options: **0 = Disabled**                      1 = Enabled

#### **Disabled**

When **Output Coordinates** is set to **Disabled**, the coordinates are not output as part of the symbol data.

#### **Enabled**

When **Output Coordinates** is set to **Enabled**, the four sets of object coordinates for the first successfully decoded symbol are attached to the symbol data output in the following format:

“(nnn,mmm)”, where “nnn” is a 3-digit X-coordinate and “mmm” is a 3-digit Y-coordinate. The validation separator is located between the end of the already formatted data and the first coordinate point. The point with the lowest X + Y sum will be output first, followed by the next three points in a clockwise direction.

Example:

(032,040)(287,056)(287,279)(048,271)

## Database Identifier Output

*Usage:* Useful in keeping track of which database entries read which symbols.

*Serial Cmd:* <**K759**,*status*,*separator*>

*Default:* **0**

*Options:* **0 = Disabled**                      1 = Enabled

### Output Status

#### **Disabled**

When this command is disabled, no database identifier information will be output.

#### **Enabled**

When this command is enabled, the reader will append a two-digit number and the characters "DB" to the data output following the separator for each symbol decoded using **Configuration Database**. For example, if the separator is an underscore character and the second database entry reads a symbol encoded with "data capture" during the read cycle, the symbol data output will be "data capture\_DB02". If the database is not active, no identifiers will be attached to output.

### Separator

*Usage:* The separator character separates the symbol data from the database identifier.

*Serial Cmd:* <**K759**,*status*,**separator**>

*Default:* <**space**>

*Options:* Any ASCII character.

## Quality Output

### Separator

*Definition:* The separator character separates quality output data from symbol data.

*Serial Cmd:* <K704,**separator**,*decodes per trigger status*>

*Default:* ,

*Options:* Any ASCII character.

### Decodes per Trigger Status

*Definition:* When this feature is enabled, the reader enters a state where it processes frames as configured until the end of a read cycle, with or without a successful symbol decode. When the read cycle ends, the reader outputs any decoded symbol data along with the decodes per trigger count.

*Serial Cmd:* <K704,*separator*,**decodes per trigger status**>

*Default:* **0**

*Options:* **0 = Disabled**                      1 = Enabled

## Image Push to Host

**Definition:** **Image Storage Status** determines whether or not **Image Logging** is active.

**Note:** Only images that have been processed by the decoder will be saved. If Image Storage Status and **RAM Drive Size in MB** in <K764> are switched from **Disable** to **Enable**, a cold boot of the reader will be required in order to create the required RAM Drive, and it will take additional time for the reader to re-initialize. Switching from Enable to Disable does not require a cold boot.

**Serial Cmd:** <K763,**image storage status**,stored image type,image storage,image file format,image quality,image scale,file save options>

**Default:** **Disabled**

**Options:** **0 = Disabled**  
1 = Enabled

## Stored Image Type

**Definition:** **Stored Image Type** defines what kind of image you want to log in a read cycle.

**Serial Cmd:** <K763,image storage status,**stored image type**,image storage,image file format,image quality,image scale,file save options>

**Default:** **No Read**

**Options:** 1 = Good Read  
**2 = No Read**  
3 = Good Read + No Read  
4 = Match  
8 = Mismatch  
12 = Match + Mismatch  
15 = Good Read + No Read + Match + Mismatch

## Image Storage

**Definition:** **Image Storage** defines which image will be stored within a read cycle.

- **Good Read/Match/Mismatch:** First qualified image or all qualified images.
- **No Read:** First image or all images that have an IP report.

**Serial Cmd:** <K763,image storage status,stored image type,**image storage**,image file format,image quality,image scale,file save options>

**Default:** **First Image in a Read Cycle**

**Options:** **0 = First Image in a Read Cycle**  
1 = All Images in a Read Cycle

## Image File Format

*Definition:* **Image File Format** defines the image format you want to use.

*Serial Cmd:* <**K763**,*image storage status*,*stored image type*,*image storage*,**image file format**,*image quality*,*image scale*,*file save options*>

*Default:* **PNG**

*Options:* **0 = PNG**  
1 = JPG

## Image Quality

*Definition:* **Image Quality** defines the amount of image compression you want the image to have.

*Serial Cmd:* <**K763**,*image storage status*,*stored image type*,*image storage*,*image file format*,**image quality**,*image scale*,*file save options*>

*Default:* **90**

*Options:* 1 to 100

## Image Scale

*Definition:* **Image Scale** defines the size you want the image to be.

*Serial Cmd:* <**K763**,*image storage status*,*stored image type*,*image storage*,*image file format*,*image quality*,**image scale**,*file save options*>

*Default:* **Full**

*Options:* **0 = Full**  
1 = 1/4th  
2 = 1/8th

## File Save Options

*Definition:* **File Save Options** determines which files you want to save.

*Serial Cmd:* <**K763**,*image storage status*,*stored image type*,*image storage*,*image file format*,*image quality*,*image scale*,**file save options**>

*Default:* **Image**

*Options:* **1 = Image**  
2 = Read Cycle Report  
3 = Image + Read Cycle Report

## Image Push to Host Detailed Setup

### Image Storage Location

**Definition:** Defines where the saved image is going to be stored.

**Note:** When saving images to **RAM**, the system is limited to the actual RAM space available in the system. The number of images that can be saved depends on the **Max RAM Drive Size**. The actual system path is **/imagesd0/Images/**. When saving images to **FTP**, the path is **<last 6 digits of device's MAC Address>\_Images/** on the host FTP director. Note that the FTP server needs to grant the user with create directory rights as the system will need to create a directory on the FTP server to store all uploaded images.

**File save scheme:** The image file will be posted with its system reset count, followed by its read cycle i.d., followed by its image i.d., followed by its stored image type defined in **<K763>**, as follows:

**<last 6 digits of device's MAC Address>\_<system total reset count>\_<read cycle id>\_<image id>\_<save image type>.{png, jpg}**

**<last 6 digits of device's MAC Address>\_<system total reset count>\_<read cycle id>\_<image id>\_readreport.xml**

**Serial Cmd:** **<K764,image storage location,FTP host info,transfer optimization,RAM drive size in MB,save image until,action at image storage limit>**

**Default:** **RAM**

**Options:** **0 = RAM**  
**1 = FTP**

### FTP Host Info

**Definition:** **mscan|pass@192.168.188.1:21** signifies a the user with **mscan** at **192.168.188.1** FTP server on port **21** with **pass** as the FTP login password.

**Note:** If port is not defined with the FTP server address, it will default to port 21.

**Serial Cmd:** **<K764,image storage location,FTP host info,transfer optimization,RAM drive size in MB,save image until,action at image storage limit>**

**Default:** **"user|pass@xxx.xxx.xxx.xxx:21"**

**Options:** Maximum 255 characters including the characters **"|"**, **"@"**, and **":"**.

## Transfer Optimization

**Definition:** **Transfer Optimization** defines how the image is going to be stored in triggered captured modes.

**Serial Cmd:** `<K764,image storage location,FTP host info,transfer optimization,RAM drive size in MB,save image until,action at image storage limit>`

**Default:** **Speed**

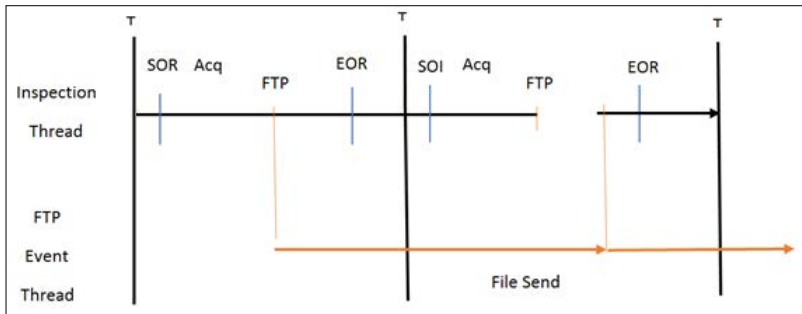
**Options:** **0 = Speed (Lossy)**  
1 = Accuracy (Lossless)

### Speed (Lossy)

Images will be saved when possible. Some images may be dropped.

**SOR** = Start of Read Cycle

**EOR** = End of Read Cycle

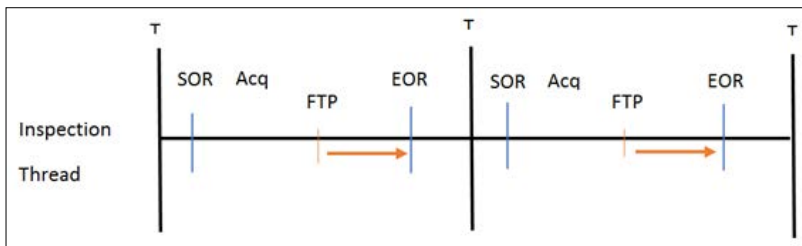


### Accuracy (Lossless)

Every image in read cycle is transferred. The read cycle may be delayed due to image saving since each transfer will need to be finished before the end of the read cycle.

**SOR** = Start of Read Cycle

**EOR** = End of Read Cycle



## RAM Drive Size in MB

**Definition:** This defines the maximum RAM Drive size on the system. It is also limited to the memory available on the system and affects the max. rapid image count in **<K241>** since the onboard memory may be taken up by the RAM Drive. Images may not be saved if the RAM Drive is not large enough to store all the images in the current read cycle and if **Image Storage Location** is set to **FTP** with **Image Save Mode** set to **Speed**. If Image Storage Location is set to FTP with Image Save Mode set to **Accuracy**, all images in the read cycle will be transferred to the FTP host but the read cycle may be delayed.

**Serial Cmd:** **<K764,image storage location,FTP host info,transfer optimization,RAM drive size in MB,save image until,action at image storage limit>**

**Default:** **20**

**Options:** 1 to 50

Note: The number of images that can be save in the RAM drive vary depending on model, RAM drive size setting, image file format.

The following is a list of the number of images to be saved when the **Image File Format** is **PNG** and, the **Image Scale** is **Full**.

Resolution	No. of images to be saved	
	default: 20MB	Max.: 50MB
0.3 Mpix	57	143
1.2 Mpix	16	42
5 Mpix	4	10

## Save Image Until

**Definition:** This defines how long the image will be stored in the system when the **Image Storage Location** is **RAM**.

If set to **New Read Cycle**, the saved image will be erased upon entering the next read cycle.

If set to **System Reset**, the saved image will be erased upon the next system reset.

**Serial Cmd:** **<K764,image storage location,FTP host info,transfer optimization,RAM drive size in MB,save image until,action at image storage limit>**

**Default:** **New Read Cycle**

**Options:** **1 = New Read Cycle**  
**2 = System Reset**

## **Action at Image Storage Limit**

*Definition:* This defines what to do when **Action at Storage Full** is reached and when images are saved on **RAM**. When this setting is set to **Erase Oldest First**, the oldest images in the current read cycle will be erased.

*Serial Cmd:* <**K764**,*image storage location,FTP host info,transfer optimization,RAM drive size in MB,save image until,***action at image storage limit**>

*Default:* **Stop**

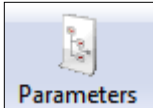
*Options:* **0 = Stop**

1 = Erase Oldest First

# Appendix K — Symbol Quality

This section describes parameters that, when enabled, will output detailed symbol quality evaluations.

## Symbol Quality by ESP



Click the **Parameters** button and then the **Symbol Quality** tab.

Parameters	ESP Values
[-] Symbol Quality	
[-] Global	
Symbol Quality Separator	SP
Output Mode	Grade
[-] Data Matrix	
[-] ISO/IEC 16022 Parameters	
Symbol Contrast	Disabled*
Print Growth	Disabled*
Axial Non-uniformity	Enabled
Unused ECC	Disabled
[+] Grading	

To open nested options, **single-click** the +.

To change a setting, **double-click** the setting and use your cursor to scroll through the options.

## Symbol Quality Serial Commands

Symbol Quality Separator / Output Mode	<K708, symbol quality separator, output mode>
ISO/IEC 16022 Symbol Quality Output	<K709, symbol contrast, print growth, axial non-uniformity, unused ECC>
Microscan Symbol Quality Output	<K710, percent cell damage, total read time, capture time, locate time, decode time, pixels per element, ECC level, matrix size, quiet zone, symbol angle>
ISO/IEC 15415 Symbol Quality Output	<K725, aperture, overall, contrast, modulation, reflectance margin, fixed pattern damage, axial nonuniformity, grid nonuniformity, unused ECC>
ISO/IEC 15416 Symbol Quality Output	<K726, aperture, overall, edge determination, decode, contrast, minimum reflectance, minimum edge contrast, modulation, defects, decodability, quiet zone>
ISO/IEC 29158 Symbol Quality Output	<K727, overall, cell contrast, cell modulation, fixed pattern damage, axial nonuniformity, grid nonuniformity, unused ECC>

## Overview of Symbol Quality

V430-F supports the following standards.

ISO code pint quality grading	Supported code
ISO/IEC 15415	DataMatrix (ECC200, GS1)
	QR Code <sup>*1</sup>
	Micro QR
ISO/IEC TR 29158	DataMatrix (ECC200, GS1)
ISO/IEC 15416	Code 128/GS1-12
	UPC/EAN(JAN)
	ITF
	Code 39
	Code 93
	Codabar
ISO/IEC 16022 <sup>*2</sup>	DataMatrix (ECC200, GS1)

\*1. QR Code unique grading, VID/FID, are not supported.

\*2. The evaluation standard of ISO/IEC 16022 is presently integrated to ISO/IEC 15415.

Information about symbol quality and timing can be appended to symbol data by enabling specific evaluation parameters. The order in which these values are appended corresponds to the order in ISO/IEC 16022 Parameters, Microscan Grading Parameters, ISO/IEC 15415 Parameters, ISO/IEC 15416 Parameters, and ISO/IEC 29158 Parameters.

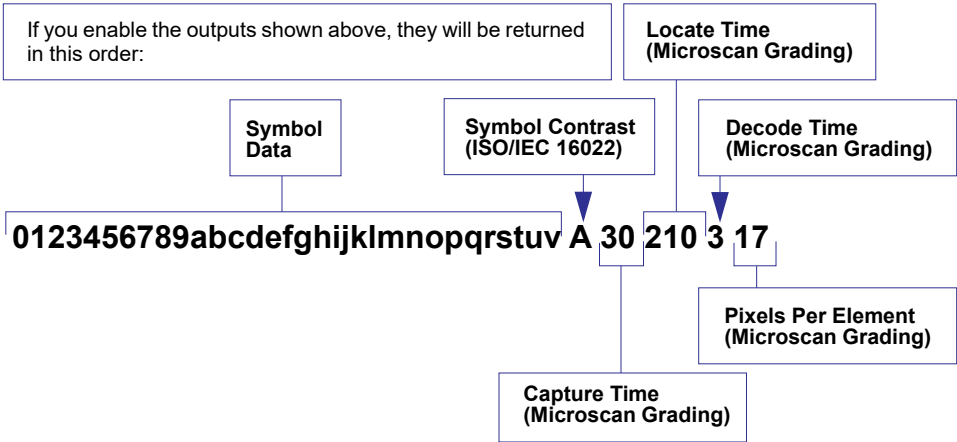
Symbol Quality parameters are separated into ISO/IEC 16022 Symbol Quality Output, Microscan Symbol Quality Output, ISO/IEC 15415 Symbol Quality Output, ISO/IEC 15416 Symbol Quality Output, and ISO/IEC 29158 Symbol Quality Output.

## Symbol Quality

**Total Read Time, Symbol Quality Separator, and Output Mode** are common parameters.

Symbol Quality		
Global		
Symbol Quality Separator		SP
Output Mode		Grade
Data Matrix		
ISO/IEC 16022 Parameters		
Symbol Contrast	Enabled	
Print Growth	Disabled	
Axial Non-uniformity	Disabled	
Unused ECC	Disabled	
Grading		
Percent Cell Damage	Disabled	
Total Read Time	Disabled	
Capture Time	Enabled	
Locate Time	Enabled	
Decode Time	Enabled	
Pixels Per Element	Enabled	
ECC Level	Disabled	
Matrix Size	Disabled	
Quiet Zone	Disabled	
Symbol Angle	Disabled	

The enabled **Symbol Quality** parameters are appended to symbol data output.



## Symbol Quality Separator/Output Mode

**Symbol Quality Separator** applies to both Symbol Quality groups: ISO/IEC 16022 Symbol Quality Output, ISO/IEC 15415 Symbol Quality Output, ISO/IEC 15416 Symbol Quality Output, ISO/IEC 29158 Symbol Quality Output, and Microscan Symbol Quality Output.

### Symbol Quality Separator

**Definition:** Inserts a separator between each enabled field of the symbol quality output.

**Serial Cmd:** <K708, *symbol quality separator*, output mode>

**Default:** <SP> (space character)

**Options:** Any ASCII character.

### Symbol Quality Separator by ESP

The image shows a software interface for configuring the Symbol Quality Separator. On the left, a tree view under 'Parameters' shows 'Symbol Quality' expanded to 'Global', where 'Symbol Quality Separator' is selected and set to 'SP'. Below it, 'Data Matrix' is expanded to 'ISO/IEC 16022 Parameters', which includes 'Symbol Contrast', 'Print Growth', 'Axial Non-uniformity', and 'Unused ECC'. On the right, a keypad is displayed with a grid of ASCII characters. The 'SP' character is highlighted in a blue box at the top of the keypad. A text box with an arrow pointing to the 'SP' in the keypad contains the following text:

When you double-click on the default separator **SP**, the **Symbol Quality Separator Calculator** appears. Use the calculator keypad for one-click separator configuration.

Below the keypad, the text reads: 'Click 'Delete' to remove characters.'

## Output Mode

**Note: Output Mode** applies to ISO/IEC 16022 symbol quality parameters, ISO/IEC 15415 symbol quality parameters, ISO/IEC 15416 symbol quality parameters, and ISO/IEC 29158 symbol quality parameters.

*Definition:* Output Mode specifies how the output parameters, if enabled, are formatted.

*Serial Cmd:* <**K708**,symbol quality separator,**output mode**>

*Default:* **Grade**

*Options:* **0 = Grade**                      1 = Value                                      2 = Score

### Grade

If in **Grade Mode**, a grade (A,B,C,D,F) is appended to the symbol data.

### Value

If in **Value Mode**, the calculated value for the given parameter is appended to the symbol data.

### Score

If in **Score Mode**, a percentage of passing lines for that parameter is appended to the symbol data.

## ISO/IEC 16022 Symbol Quality Output

Symbol Quality Parameters for Data Matrix symbols specified by ISO/IEC 16022.

### Symbol Contrast

**Usage:** Lets the user know if contrast settings are less than acceptable.

**Definition:** All the pixels that fall within the area of the test symbol, including its required zone, will be sorted by their reflectance values to select the darkest 10% and the lightest 10% of the pixels. The arithmetic mean of the darkest and the lightest pixels is calculated and the difference of the two means is the Symbol Contrast.

(ANSI) Symbol Contrast grading is defined this way:

A (4.0) if SC > 70%

B (3.0) if SC > 55%

C (2.0) if SC > 40%

D (1.0) if SC > 20%

F (0.0) if SC < 20%

If enabled, the symbol contrast is appended to the symbol data according to the **ISO/IEC 16022 Symbol Quality Output Mode** setting.

**Serial Cmd:** <K709,**symbol contrast**,*print growth*,*axial non-uniformity*,*UEC*>

**Default:** Disabled

**Options:** 0 = Disabled 1 = Enabled

### Print Growth

**Definition:** The extent to which dark or light markings appropriately fill or exceed their module boundaries. These values are determined by counting pixels in the clock pattern of the binary digitized image, then comparing it to a nominal value and minimum and maximum values. The print growth grade is defined in this way:

A (4.0) if  $-0.50 < PG < 0.50$

B (3.0) if  $-0.70 < PG < 0.70$

C (2.0) if  $-0.85 < PG < 0.85$

D (1.0) if  $-1.00 < PG < 1.00$

F (0.0) if  $PG < -1.00$  or  $PG > 1.00$

If enabled, the print growth is appended to the symbol data according to the **ISO/IEC 16022 Symbol Quality Output Mode** setting.

**Serial Cmd:** <K709,*symbol contrast*,**print growth**,*axial non-uniformity*,*UEC*>

**Default:** Disabled

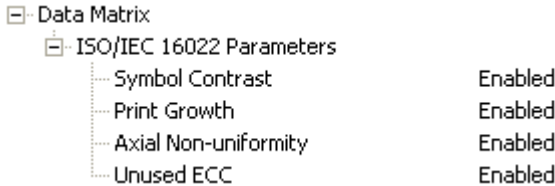
**Options:** 0 = Disabled 1 = Enabled



## ISO/IEC 16022 Symbol Quality Output by ESP

ESP's **Symbol Quality** interface allows you to evaluate Data Matrix symbols for compliance with ISO/IEC 16022 requirements.

First, determine which ISO/IEC 16022 Parameters you need to evaluate, using the **Symbol Quality** tree control.



Once you have set these Data Matrix evaluation parameters, go to the **Preferences Tab** and set your Data Matrix Grading Report output preferences.



After your output preferences are set, click the **Data Matrix Grading** button.

There will be a wait of a few seconds, and then the evaluation results will appear in the **Symbol Quality** view, in a format similar to the one shown below.

Data Matrix Grading Report						GRADE	
ISO/IEC 16022:	Symbol Contrast	= 80 %	Dx	- 51 %	Dnom	- 50 %	A
	Print Growth	= 0.26	Dy	- 54 %	Dmax	- 65 %	A
	Axial Nonuniformity	= 0.00	Xavg	- 13.2	Dmin	- 35 %	A
	Unused ECC	- 100 %	Yavg	- 13.1			A
GRADING:	% Cell Damage	= 0 %	Earl	- 0	Enax	- 10	A
	Total Read Time	= 99 ms					
	Capture Time	= 65 ms					
	Locate Time	= 27 ms					
	Decode Time	= 7 ms					
	Pixels/Element	= 13.1					
	ECC Level	= 200					
	Matrix Size	= 14x14					
	Quiet Zone	= PASS					

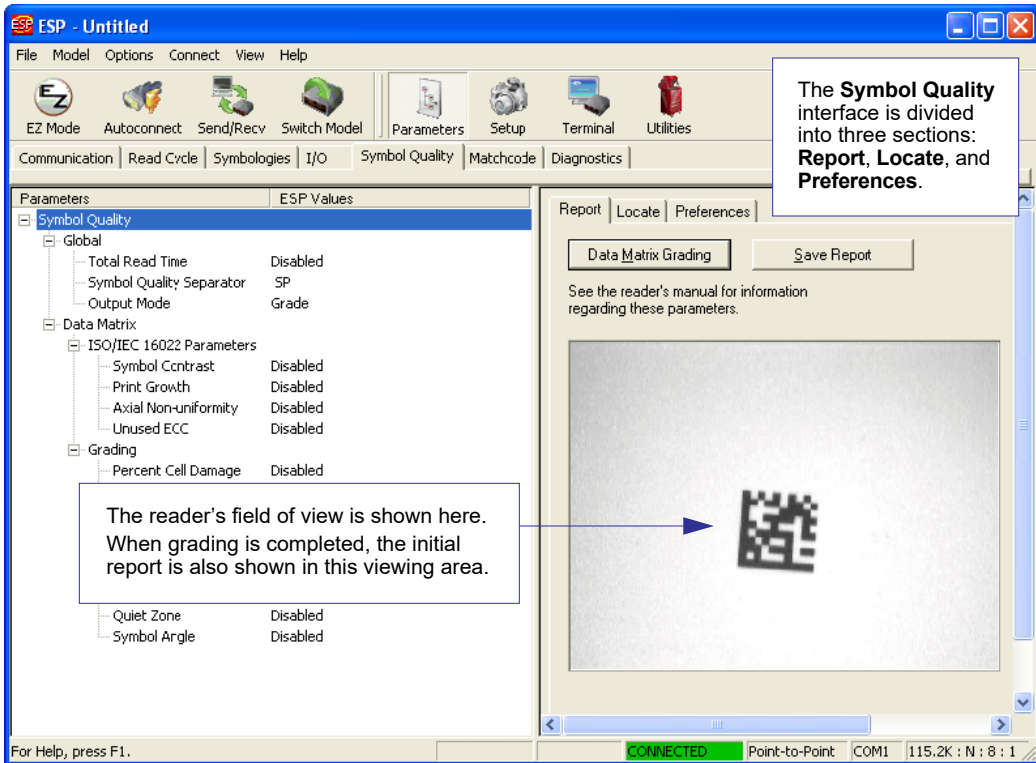
If you want to view the results in a report format, click the **Save Report** button. The report will be output in the format you chose in the **Preferences** dialog.

## Report Tab

The **Report** tab allows the user to initiate **Data Matrix Grading** and to generate and save grading reports.

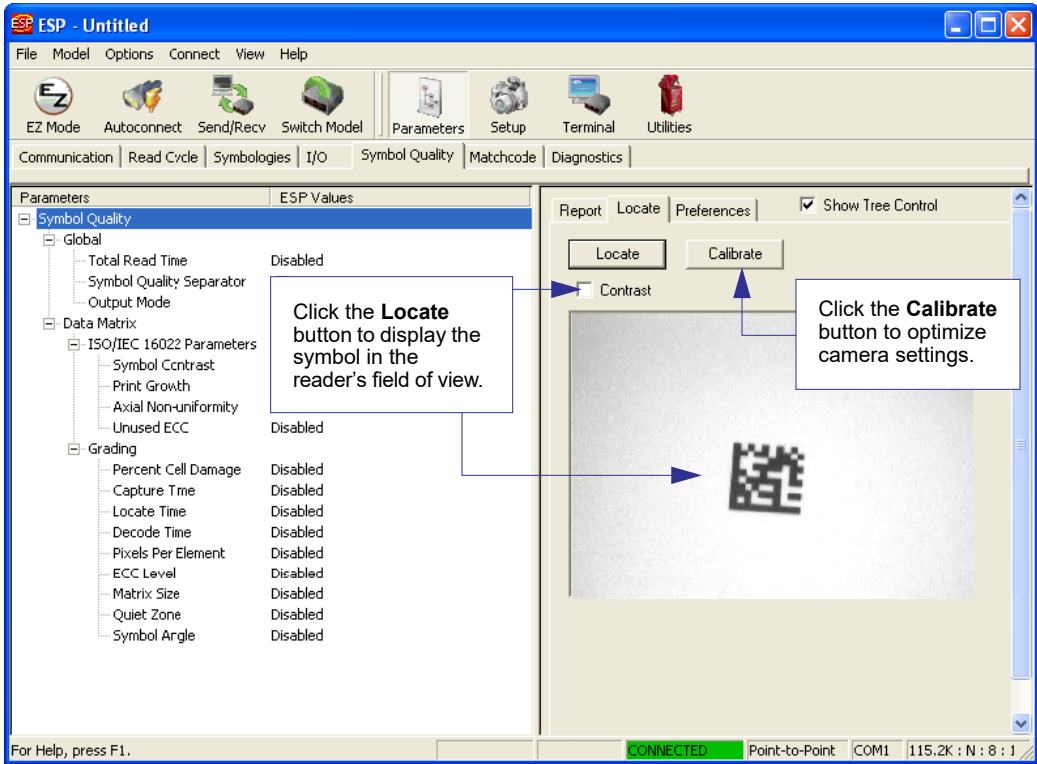
To save the report as a PDF file, an HTML file, a CSV file, or an RTF file, click the **Save Report** button.

Reports appear in the viewing area underneath the **Data Matrix Grading** and **Save Report** buttons.



## Locate Tab

The **Locate** tab allows the user to determine the position of the symbol within the reader's field of view, and to optimize the reader's camera settings for symbol quality evaluation.



## Preferences Tab

The **Preferences** tab allows the user to set defaults that are automatically activated when grading is completed. For this reason, the user is advised to set preferences before performing grading.

The screenshot shows the 'Preferences' tab of a software application. The interface includes several sections: 'Fields for report' with input fields for 'Operator Name' (J.Doe) and 'Company Name' (XYZ Corp.); 'Saved Options' with checkboxes for 'Show Report Options dialog during 'Save Report'', 'Autofit Content', 'Store Report without file path prompt', 'Automatically open generated report', 'Include Image', and 'Enable UII Parsing (Based on MIL-STD-130N)'; a 'Default Report Type' dropdown menu currently set to 'PDF Files (\*.pdf)'; a 'Default Path' field containing 'C:\Documents and Settings\%symbol grades'; radio buttons for 'Bitmap' and 'JPEG' image formats; a 'JPEG Image Quality' slider set to 100; and a list of 'Overall Grade Based On' criteria including 'Symbol Contrast', 'Print Growth', 'Axial Nonuniformity', and 'Unused ECC'. At the bottom are 'Default Settings' and 'Revert Settings' buttons. Several callout boxes provide additional information: one explains that operator and company information is appended to the report; another instructs to choose the default report type and check 'Autofit Content'; a third explains that the 'Store Report without file path prompt' option is used to avoid file path prompts; a fourth explains that the 'Include Image' option outputs symbol images as Bitmap or JPEG files; a fifth explains that 'Enable UII Parsing' is based on MIL-STD-130N; and a sixth explains that the 'Default Settings' button returns settings to default while 'Revert Settings' returns them to the most recent state.

Report | Locate | Preferences  Show Tree Control

Fields for report

Operator Name: J.Doe

Company Name: XYZ Corp.

User: [ ]

This information is appended at the bottom of the report.

Choose the default report type to be generated when you click **Save Report** on the **Report** tab. Check **Autofit Content** to ensure that saved PDF report content will fit on a single page.

Saved Options

Show Report Options dialog during 'Save Report'.

Default Report Type: PDF Files (\*.pdf)

Autofit Content  Low Graphic HTML  Append to file (.csv)

Store Report without file path prompt  Auto-save report

Use symbol data for file name

C:\Documents and Settings\%symbol grades

Default Path

Automatically open generated report  Print after saving

Include Image  Bitmap  JPEG

JPEG Image Quality: 100 1 - 100

PDF Files (\*.pdf)

PDF Files (\*.pdf)

HTML Files (\*.htm)

CSV Files (\*.csv)

Rich Text Edit Files (\*.rtf)

Typically you will be asked where you wish to store your report. If you do not want to be prompted to choose a file path, click **Store Report without file path prompt**.

Click the **Include Image** check box to output the captured symbol image with your saved report as a Bitmap or JPEG image file.

Enables ESP to parse UII symbol data into the correct fields and output order defined by the U.S. Department of Defense UIID initiative.

Overall Grade Based On

Symbol Contrast  Use Number

Print Growth

Axial Nonuniformity

Unused ECC

Enable UII Parsing (Based on MIL-STD-130N)

Default Settings

Revert Settings

Returns all settings to default.

Returns all settings to most recent.

## Microscan Symbol Quality Output

### Percent Cell Damage

**Definition:** When this feature is enabled, the cell damage percentage is appended to data output. (Data Matrix Only)

**Serial Cmd:** <K710,**percent cell damage**,total read time,capture time,locate time,decode time,pixels per element,ECC level,matrix size,quiet zone,symbol angle>

**Default:** Disabled

**Options:** 0 = Disabled 1 = Enabled

### Total Read Time

**Definition:** The time that transpires between the image capture and the output of the decoded data, including locate time.

When enabled, the total read time is appended to the symbol data.

**Serial Cmd:** <K710,percent cell damage,**total read time**,capture time,locate time,decode time,pixels per element,ECC level,matrix size,quiet zone,symbol angle>

**Default:** Disabled

**Options:** 0 = Disabled 1 = Enabled

### Capture Time

**Definition:** Capture time (in milliseconds) is a fixed “overhead” that includes the time of capture and transfer of the image.

When enabled, the capture time is appended to the symbol data.

**Serial Cmd:** <K710,percent cell damage,total read time,**capture time**,locate time,decode time,pixels per element,ECC level,matrix size,quiet zone,symbol angle>

**Default:** Disabled

**Options:** 0 = Disabled 1 = Enabled

## Locate Time

*Definition:* The time in milliseconds from the start of image processing until the symbol has been located and is ready to be decoded.

When enabled, the locate time is appended to the symbol data.

*Serial Cmd:* <**K710**,percent cell damage,total read time,capture time,**locate time**,decode time,pixels per element,ECC level,matrix size,quiet zone,symbol angle>

*Default:* **Disabled**

*Options:* **0 = Disabled** 1 = Enabled

## Decode Time

*Definition:* The time in milliseconds required to decode a symbol.

When enabled, the decode time is appended to the symbol data.

*Serial Cmd:* <**K710**,percent cell damage,total read time,capture time,locate time,**decode time**,pixels per element,ECC level,matrix size,quiet zone,symbol angle>

*Default:* **Disabled**

*Options:* **0 = Disabled** 1 = Enabled

## Pixels Per Element

*Definition:* The number of pixels for each element, either dark or light for both **x** and **y** directions.

When enabled, the pixels per element value is appended to the symbol data.

DotCode is not supported.

*Serial Cmd:* <**K710**,percent cell damage,total read time,capture time,locate time,decode time,**pixels per element**,ECC level,matrix size,quiet zone,symbol angle>

*Default:* **Disabled**

*Options:* **0 = Disabled** 1 = Enabled

## Error Correction Level

*Definition:* Outputs the Data Matrix ECC level.

When enabled, the ECC level is appended to the symbol data.  
(Data Matrix Only)

*Serial Cmd:* <**K710**,percent cell damage,total read time,capture time,locate time,decode time,pixels per element,**ECC level**,matrix size,quiet zone,symbol angle>

*Default:* **Disabled**

*Options:* **0 = Disabled** 1 = Enabled

## Matrix Size

**Definition:** Defines the symbol matrix size, in number of pixels in both the **x** and **y** axis.

When enabled, the matrix size value is appended to the symbol data. DotCode, Micro PDF417, Pharmacode, and GS1 Databar (Composite) are not supported.

**Serial Cmd:** <**K710**,percent cell damage,total read time,capture time,locate time,decode time,pixels per element,ECC level,**matrix size**,quiet zone,symbol angle>

**Default:** **Disabled**

**Options:** **0 = Disabled**                      1 = Enabled

## Quiet Zone

**Definition:** When this feature is enabled, the size of the quiet zone is evaluated and a PASS or FAIL message is appended to the symbol data. (Data Matrix Only)

**Serial Cmd:** <**K710**,percent cell damage,total read time,capture time,locate time,decode time,pixels per element,ECC level,matrix size,**quiet zone**,symbol angle>

**Default:** **Disabled**

**Options:** **0 = Disabled**                      1 = Enabled

## Symbol Angle

**Definition:** When this feature is enabled, the symbol orientation is appended to data output as a degree value representing the angle of the Data Matrix symbol's L-shaped finder pattern relative to the reader. DotCode is not supported.

**Serial Cmd:** <**K710**,percent cell damage,total read time,capture time,locate time,decode time,pixels per element,ECC level,matrix size,quiet zone,**symbol angle**>

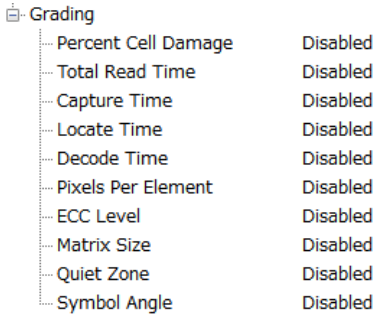
**Default:** **Disabled**

**Options:** **0 = Disabled**                      1 = Enabled

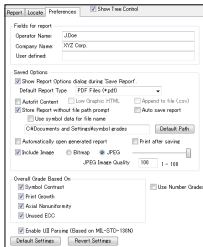
## Microscan Symbol Quality Output by ESP

ESP's **Symbol Quality** interface allows you to evaluate Data Matrix symbols for compliance with a rigorous set of standards, such as Locate Time, Capture Time, and Decode Time.

First, determine which parameters you want to evaluate, using the **Symbol Quality** tree control.



Once you have set these Data Matrix evaluation parameters, go to the **Preferences Tab** and set your Data Matrix Grading Report output preferences.



After your output preferences are set, click the **Data Matrix Grading** button.

There will be a wait of a few seconds, and then the evaluation results will appear in the **Symbol Quality** view, in a format similar to the one shown below.

Data Matrix Grading Report						GRADE
ISO/IEC	Symbol Contrast	= 80 %	Dx - 51 %	Dnom - 50 %		A
16022:	Print Growth	= 0.26	Dy - 54 %	Dmax - 65 %		A
	Axial Nonuniformity	= 0.00	Xavg - 13.2	Dmin - 35 %		A
	Unused ECC	= 100 %	Yavg - 13.1			A
			EstL - 0			
GRADING:	% Cell Damage	= 0 %	Emax - 10			
	Total Read Time	= 99 ms				
	Capture Time	= 65 ms				
	Locate Time	= 27 ms				
	Decode Time	= 7 ms				
	Pixels/Element	= 13.1				
	ECC Level	= 200				
	Matrix Size	= 14x14				
	Quiet Zone	= PASS				

If you want to view the results in a report format, click the **Save Report** button. The report will be output in the format you chose in the **Preferences** dialog.



## Contrast

*Definition:* Contrast measurements assume 8-bit 0 to 255 grey correlate to 0 to 100% reflectance. Contrast is calculated in accordance with the ISO 15415 specification. The Contrast grading is defined as follows.

A (4.0) if  $C \geq 70\%$

B (3.0) if  $C \geq 55\%$

C (2.0) if  $C \geq 40\%$

D (1.0) if  $C \geq 20\%$

F (0.0) if  $C < 20\%$

When enabled, the Contrast is attached to the symbol output data as a value.

*Serial Cmd:* <**K725**, aperture, overall, **contrast**, modulation, reflectance margin, fixed pattern damage, axial non-uniformity, grid non-uniformity, unused ECC>

*Default:* **Disabled**

*Options:* **0 = Disabled** 1 = Enabled

## Modulation

*Definition:* Modulation is calculated in accordance with the ISO 15415 specification.

The Modulation grading is defined as follows.

A (4.0) if  $MOD \geq 0.50$

B (3.0) if  $MOD \geq 0.40$

C (2.0) if  $MOD \geq 0.30$

D (1.0) if  $MOD \geq 0.20$

F (0.0) if  $MOD < 0.20$

When enabled, the Modulation is attached to the symbol output data as a value.

*Serial Cmd:* <**K725**, aperture, overall, contrast, **modulation**, reflectance margin, fixed pattern damage, axial non-uniformity, grid non-uniformity, unused ECC>

*Default:* **Disabled**

*Options:* **0 = Disabled** 1 = Enabled



## Grid Non-Uniformity

*Definition:* Grid Non-Uniformity is calculated in accordance with the ISO 15415 specification. The Grid Non-Uniformity grading is defined as follows.

A (4.0) if  $GN \leq 0.38$

B (3.0) if  $GN \leq 0.50$

C (2.0) if  $GN \leq 0.63$

D (1.0) if  $GN \leq 0.75$

F (0.0) if  $GN > 0.75$

When enabled, the Grid Non-Uniformity is attached to the symbol output data as a value.

*Serial Cmd:* <K725, aperture, overall, contrast, modulation, reflectance margin, fixed pattern damage, axial non-uniformity, **grid non-uniformity**, unused ECC>

*Default:* **Disabled**

*Options:* **0 = Disabled** 1 = Enabled

## Unused ECC

*Definition:* Unused ECC is calculated in accordance with the ISO 15415 specification. The Unused ECC grading is defined as follows.

A (4.0) if  $UEC \geq 0.62$

B (3.0) if  $UEC \geq 0.50$

C (2.0) if  $UEC \geq 0.37$

D (1.0) if  $UEC \geq 0.25$

F (0.0) if  $UEC < 0.25$

When enabled, the Unused ECC is attached to the symbol output data as a value.

*Serial Cmd:* <K725, aperture, overall, contrast, modulation, reflectance margin, fixed pattern damage, axial non-uniformity, grid non-uniformity, **unused ECC**>

*Default:* **Disabled**

*Options:* **0 = Disabled** 1 = Enabled

## Grading Report

<VAL3>: Responds with a text report that summarized the grading of ISO/IEC15415. This command will return the evaluation results, in a format similar to the one shown below.

15415 Validation Report			GRADE
ISO/IEC	Overall	= 0	F
15415:	Symbol Contrast	= 30	D
	Modulation	= 0	F
	Reflectance Margin	= 0	F
	Fixed Pattern Damage	= 50	C
	Axial Nonuniformity	= 100	A
	Grid Nonuniformity	= 100	A
	Unused ECC	= 45	C
	Aperture	= 80 %	
SYMBOL			
DATA:	6000000006		
TYPE:	Datamatrix		

## ISO/IEC 15416 Symbol Quality Output

Symbol Quality Parameters for bar code symbols specified by ISO/IEC 15416

Supported Symbologies:

- Code 128/GS1-128
- UPC-A/UPC-E/EAN-13/EAN-8
- Interleaved 2 of 5/ITF-14
- Code 39
- Code 93
- Codabar

Minimum Resolution: 4.0 Pixels Per Element

### Aperture

*Definition:* The size of aperture to use for grading configured as a percentage of the nominal narrow element width for the symbol under evaluation. For example, if you have a 13 mil UPC symbol and you wish to grade using a 6 mil aperture you would configure the aperture to 46% ( $6/13 = 0.46$ ).

*Serial Cmd:* <**K726, aperture**, overall, edge determination, decode, contrast, minimum reflectance, minimum edge contrast, modulation, defects, decodability, quiet zone>

*Default:* 40%

*Options:* Any number between 0 to 100%

### Overall

*Definition:* Overall is calculated in accordance with the ISO 15416 specification. The overall grade is the average of the individual scan grades applied to the symbol. The individual scan grades are the lowest individual parameter grade seen during the individual scan. These individual scan grades are not available for output. When enabled, the Overall is attached to the symbol output data as a value.

*Serial Cmd:* <**K726, aperture, overall**, edge determination, decode, contrast, minimum reflectance, minimum edge contrast, modulation, defects, decodability, quiet zone>

*Default:* **Disabled**

*Options:* **0 = Disabled**                      1 = Enabled

## Edge Determination

*Definition:* Edge Determination is calculated and graded for each scan and provided for the overall grade calculation in accordance with the ISO 15416 specification. The parameter grade and value provided for output is an average value for each measured scan over the entire symbol. When enabled, the Edge Determination is attached to the symbol output data as a value.

*Serial Cmd:* <**K726**, aperture, overall, **edge determination**, decode, contrast, minimum reflectance, minimum edge contrast, modulation, defects, decodability, quiet zone>

*Default:* **Disabled**

*Options:* **0 = Disabled**                      1 = Enabled

## Decode

*Definition:* Decode is calculated and graded for each scan and provided for the overall grade calculation in accordance with the ISO 15416 specification. The parameter grade and value provided for output is an average value for each measured scan over the entire symbol. When enabled, the Decode is attached to the symbol output data as a value.

*Serial Cmd:* <**K726**, aperture, overall, edge determination, **decode**, contrast, minimum reflectance, minimum edge contrast, modulation, defects, decodability, quiet zone>

*Default:* **Disabled**

*Options:* **0 = Disabled**                      1 = Enabled

## Contrast

*Definition:* Contrast measurements assume 8-bit, 0 to 255 grey correlate to 0 to 100% reflectance. Contrast is calculated and graded for each scan and provided for the overall grade calculation in accordance with the ISO 15416 specification. The parameter grade and value provided for output is an average value for each measured scan over the entire symbol. When enabled, the Contrast is attached to the symbol output data as a value.

*Serial Cmd:* <**K726**, aperture, overall, edge determination, decode, **contrast**, minimum reflectance, minimum edge contrast, modulation, defects, decodability, quiet zone>

*Default:* **Disabled**

*Options:* **0 = Disabled**                      1 = Enabled

## Minimum Reflectance

*Definition:* Minimum reflectance is calculated and graded for each scan and provided for the overall grade calculation in accordance with the ISO 15416 specification. The parameter grade and value provided for output is an average value for each measured scan over the entire symbol. When enabled, the Minimum Reflectance is attached to the symbol output data as a value.

*Serial Cmd:* <**K726**, aperture, overall, edge determination, decode, contrast, **minimum reflectance**, minimum edge contrast, modulation, defects, decodability, quiet zone>

*Default:* **Disabled**

*Options:* **0 = Disabled** 1 = Enabled

## Minimum Edge Contrast

*Definition:* Contrast measurement assume 8-bit 0 to 255 grey correlate 0 to 100% reflectance The Minimum Edge Contrast is calculated and graded for each scan and provided for the overall grade calculation in accordance with the ISO 15416 specification. The parameter grade and value provided for output is an average value for each measured scan over the entire symbol.

When enabled, the Minimum Edge Contrast is attached to the symbol output data as a value.

*Serial Cmd:* <**K726**, aperture, overall, edge determination, decode, contrast, minimum reflectance, **minimum edge contrast**, modulation, defects, decodability, quiet zone>

*Default:* **Disabled**

*Options:* **0 = Disabled** 1 = Enabled

## Modulation

*Definition:* Modulation is calculated and graded for each scan and provided for the overall grade calculation in accordance with the ISO 15416 specification. The parameter grade and value provided for output is an average value for each measured scan over the entire symbol.

When enabled, the Modulation is attached to the symbol output data as a value.

*Serial Cmd:* <**K726**, aperture, overall, edge determination, decode, contrast, minimum reflectance, minimum edge contrast, **modulation**, defects, decodability, quiet zone>

*Default:* **Disabled**

*Options:* **0 = Disabled** 1 = Enabled



## Grading Report

<VAL4>: Responds with a text report that summarized the grading of ISO/IEC15416. This command will return the evaluation results, in a format similar to the one shown below.

15416 Validation Report			GRADE
ISO/IEC	Overall	= 0	F
15416:	Edge Determination	= 0	F
	Decode	= 100	D
	Contrast	= 35	A
	Min Reflectance	= 100	A
	Min Edge Contrast	= 0	F
	Modulation	= 0	F
	Defects	= 100	A
	Decodability	= 1	F
	Quiz Zone	= 100	A
	Aperture	= 40 %	A
SYMBOL			
DATA:	code128		
TYPE:	Code128		

## ISO/IEC 29158 Symbol Quality Output

Symbol Quality Parameters for direct part marking specified by ISO/IEC 29158

Supported Symbologies:

- DataMatrix ECC200

Minimum Resolution: 6.0 Pixels Per Element

### Overall

*Definition:* The overall grade is the minimum grade of all evaluated parameters, noting minimum reflectance is not evaluated.  
When enabled, the overall grade is attached to the symbol output data as a value.

*Serial Cmd:* <**K727, overall**, cell contrast, cell modulation, fixed pattern damage, axial non-uniformity, grid non-uniformity, unused ECC>

*Default:* **Disabled**

*Options:* **0 = Disabled** 1 = Enabled

### Cell contrast

*Definition:* Cell Contrast is calculated in accordance with the ISO 29158 specification.  
When enabled, the Cell Contrast is attached to the symbol output data as a value.

*Serial Cmd:* <**K727, overall, cell contrast**, cell modulation, fixed pattern damage, axial non-uniformity, grid non-uniformity, unused ECC>

*Default:* **Disabled**

*Options:* **0 = Disabled** 1 = Enabled

### Cell Modulation

*Definition:* Cell Modulation is calculated in accordance with the ISO 29158 specification. Note the difference in the calculation for Cell Modulation versus Modulation in ISO 15415 eliminated the need for the parameter Reflectance Margin which was added to ISO 15415.  
When enabled, the Cell Modulation is attached to the symbol output data as a value.

*Serial Cmd:* <**K727, overall, cell contrast, cell modulation**, fixed pattern damage, axial non-uniformity, grid non-uniformity, unused ECC>

*Default:* **Disabled**

*Options:* **0 = Disabled** 1 = Enabled

## Fixed Pattern Damage

*Definition:* Fixed Pattern Damage is calculated in accordance with the ISO 29158 specification.

When enabled, the Fixed Pattern Damage is attached to the symbol output data as a value.

*Serial Cmd:* <**K727**, overall, cell contrast, cell modulation, **fixed pattern damage**, axial non-uniformity, grid non-uniformity, unused ECC>

*Default:* **Disabled**

*Options:* **0 = Disabled** 1 = Enabled

## Axial Non-Uniformity

*Definition:* Axial Non-Uniformity is calculated in accordance with the ISO 29158 specification.

When enabled, the Axial Non-Uniformity is attached to the symbol output data as a value.

*Serial Cmd:* <**K727**, overall, cell contrast, cell modulation, fixed pattern damage, **axial non-uniformity**, grid non-uniformity, unused ECC>

*Default:* **Disabled**

*Options:* **0 = Disabled** 1 = Enabled

## Grid Non-Uniformity

*Definition:* Grid Non-Uniformity is calculated in accordance with the ISO 29158 specification.

When enabled, the Grid Non-Uniformity is attached to the symbol output data as a value.

*Serial Cmd:* <**K727**, overall, cell contrast, cell modulation, fixed pattern damage, axial non-uniformity, **grid non-uniformity**, unused ECC>

*Default:* **Disabled**

*Options:* **0 = Disabled** 1 = Enabled

## Unused ECC

*Definition:* Unused ECC is calculated in accordance with the ISO 29158 specification.

When enabled, the Unused ECC is attached to the symbol output data as a value.

*Serial Cmd:* <**K727**, overall, cell contrast, cell modulation, fixed pattern damage, axial non-uniformity, grid non-uniformity, **unused ECC**>

*Default:* **Disabled**

*Options:* **0 = Disabled** 1 = Enabled

## Grading Report

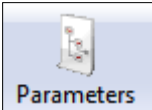
<VAL5>: Responds with a text report that summarized the grading of ISO/IEC29158. This command will return the evaluation results, in a format similar to the one shown below.

29158 Validation Report			GRADE
ISO/IEC	Overall	= 75	B
29158:	Cell Contrast	= 100	A
	Cell Modulation	= 75	B
	Fixed Pattern Damage	= 100	A
	Axial Nonuniformity	= 100	A
	Grid Nonuniformity	= 100	A
	Unused ECC	= 100	A
SYMBOL			
DATA:	6000000006		
TYPE:	Datamatrix		

# Appendix L — Matchcode

This section explains the matchcode output functions and the master symbol database setup.

## Matchcode by ESP



Click the **Parameters** button and then the **Matchcode** tab.

Parameters	ESP Values
<input type="checkbox"/> Matchcode	
... Matchcode Type	Disabled
... Sequential Matching	Increment
... Match Start Position	0
... Match Length	1
... Wild Card	*
... Sequence on No Read	Enabled
... Sequence on Mismatch	Disabled
... Sequence Step Interval	1
... New Master Pin	Disabled*
<input type="checkbox"/> Match Replace	Disabled*
... Replacement String	Enabled
<input type="checkbox"/> Mismatch Replace	Disabled
... Replacement String	MISMATCH

To open nested options, **single-click** the +.

To change a setting, **double-click** the setting and use your cursor to scroll through the options.

## Matchcode Serial Commands

Matchcode	<K223,matchcode type,sequential matching,match start position,match length,wildcard character, sequence on No-Read,sequence on mismatch>
Number of Master Symbols	<K224,number of master symbols>
New Master Pin	<K225,status>
Sequence Step Interval	<K228,sequence step interval>
Master Symbol Data	<K231,index,master symbol data>
Match Replace	<K735,status,match replacement string>
Mismatch Replace	<K736,status,mismatch replacement string>

### Overview of Matchcode

**Definition:** **Matchcode** allows the user to store master symbol data in the reader's memory, compare that data against other symbol data, and define how symbol data and/or discrete signal output will be directed.

A master symbol database can be set up for up to 10 master symbols.

**Note:** **Matchcode** will function with multiple symbols; however, if **Matchcode Type** is set to **Sequential** or if **Triggering Mode** is set to **Continuous Read 1 Output**, the reader will behave as if **Number of Symbols** were set to 1, regardless of the user-defined configuration.

**Usage:** Matchcode is used in applications to sort, route, or verify data based on matching the specific symbol in a variety of ways as defined in this section. For example, a manufacturer might sort a product based on dates that are embedded in the symbol.

### Steps for Entering and Using Master Symbols

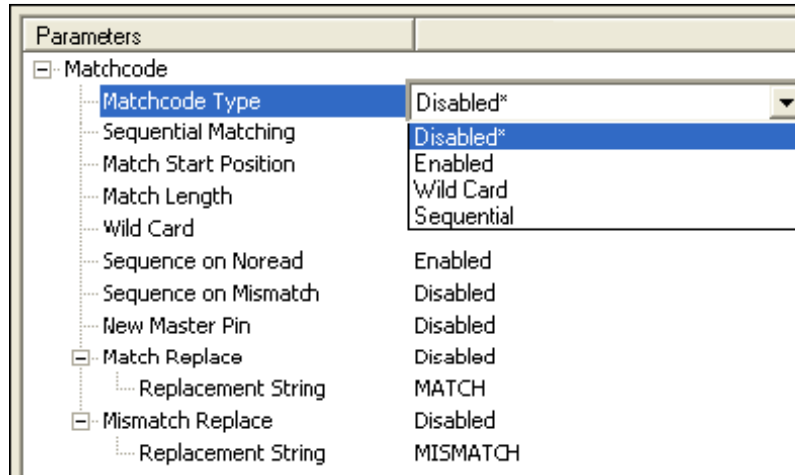
1. Set **Triggering Mode** to **External** or **Serial**.
2. Choose the method of symbol comparison that fits your application.
3. Define the output you want to achieve with your matchcode setup:
  - a. Symbol data output
  - b. Discrete output
4. Select the number of master symbols you want to create.
5. Decide which of 4 ways you want to enter your master symbol(s):
  - a. Use **ESP** to type master symbol data directly.
  - b. Send a serial command with symbol data in the form of **<M231,master symbol#, data>**.
  - c. Send a **<G>** (**Read Next Symbol as Master Symbol**) command.
  - d. Enable the **New Master Pin** command and activate the discrete input to store the next symbol read as the master symbol.

## Matchcode Type

**Definition:** Allows the user to choose the way that master symbols will be compared with subsequently read symbols.

**Note:** First set **Triggering Mode** to **External** or **Serial**.

**ESP:**



**Serial Cmd:** <**K223,matchcode type,sequential matching,match start position,match length,wild card character,sequence on No-Read,sequence on mismatch**>

**Default:** **Disabled**

**Options:**  
**0 = Disabled**  
1 = Enabled  
2 = Wild Card  
3 = Sequential

**Disabled:** Has no effect on operations.

**Enabled:** Instructs the reader to compare symbols or portions of symbols with the master symbol.

**Wild Card:** Allows the user to enter user-defined wild card characters in the master symbol.

**Sequential:** Instructs the reader to sequence after each match (numeric only) and compare symbols or portions of symbols for sequential numbers.

**Note:** If **Matchcode Type** is set to **Sequential**, the reader will behave as if **Number of Symbols** were set to **1**, regardless of the user-defined configuration.

## Sequential Matching

- Usage:** Useful in tracking product serial numbers that increment or decrement sequentially.
- Definition:** With Sequential enabled, Sequential Matching determines if a count is in ascending (incremental) or descending (decremental) order.
- Serial Cmd:** <**K223**,*matchcode type*,**sequential matching**,*match start position,match length,wild card character,sequence on No-Read,sequence on mismatch*>
- Default:** **Increment**
- Options:** **0 = Increment**                      1 = Decrement

## Match Start Position

- Usage:** **Match Start Position** is useful in defining specific portions of a symbol for comparison. For example, if a symbol contains a part number, manufacturing date, and lot code info, but you are only interested in the part number information, you can set the reader to sort only the part number and ignore the other characters.
- Definition:** **Match Start Position** determines the portions of symbols that will be matched by defining the first character in the symbol (from left to right) that will be compared with those of the master symbol, when **Matchcode Type** is set to **Enabled** or **Sequential**.
- Function:** For example, if **Match Start Position** is set to **3**, the first 2 characters read in the symbol will be ignored and only the 3rd and subsequent characters to the right will be compared, up to the number of characters specified by **Match Length**.
- Serial Cmd:** <**K223**,*matchcode type,sequential matching,match start position,match length,wild card character,sequence on No-Read,sequence on mismatch*>
- Default:** **0**
- Options:** 0 to 3000

**Note:** **Match Start Position** must be set to **1** or greater to enable this feature. A **0** setting will disable this feature.

## Match Length

- Usage:* *Example:* If **Match Length** is set to **6** in a 10-character symbol, and **Match Start Position** is set to **2**, only the 2nd through 7th characters (from left to right) will be compared.
- Definition:* Defines the length of the character string that will be compared with that of the master symbol when **Match Start Position** is set to **1** or greater. When **Match Start Position** is set to **0**, no comparison will occur.
- Serial Cmd:* <**K223**,*matchcode type,sequential matching,match start position,match length,wild card character,sequence on No-Read,sequence on mismatch*>
- Default:* 1
- Options:* 1 to 3000

## Wild Card Character

- Usage:* *Example:* With **Wild Card Character** defined as the default asterisk, defining **CR\*34** as the master symbol will result in matches for CR134 and CR234, but not CR2345. Entering URGENT\*\* as your master symbol will result in matches for URGENT, URGENT1, and URGENT12 but not for URGENT123. This means any wild cards appended to the master symbol data will result in matches of symbols in variable lengths up to the master symbol lengths but not over. However, wild cards in the beginning or center of a symbol (e.g., UR\*\*NT) do not allow for variable symbol lengths.
- Definition:* Wild Card Character allows a user to define a wild card character as part of the master symbol.
- Serial Cmd:* <**K223**,*matchcode type,sequential matching,match start position,match length,wild card character,sequence on No-Read,sequence on mismatch*>
- Default:* \* (asterisk)
- Options:* Any ASCII character.



## Sequence on Mismatch

**Note:** Matchcode must be set to **Sequential** for this command to function.

**Usage:** Enable this parameter if every trigger event should have a decode *and* more than one consecutive mismatch may occur.  
 Disable this parameter if every trigger event should have a decode but no more than one consecutive mismatch may occur.

**Definition:** When set to Enabled, the master symbol sequences on every decode, match, or mismatch.  
 When set to Disabled, the master symbol will not sequence whenever consecutive mismatches occur.

**Serial Cmd:** <**K223**,matchcode type,sequential matching,match start position,match length,wild card character,sequence on No-Read,**sequence on mismatch**>

**Default:** Disabled

**Options:** 0 = Disabled 1 = Enabled

The reader will sequence the master to one more or one less than the decoded symbol.

As an example of **Sequence on Mismatch Enabled**, consider the following decodes:

<b>Master Symbol</b>	<b>Decoded Symbol</b>	<b>Master Symbol after Decode</b>
001	001	002
002	002	003
003	abc	004 (sequenced on mismatch)
004	004	005
005	def	006 (sequenced on mismatch)
006	ghi	007 (sequenced on mismatch)
007	007	008

As an example of **Sequence on Mismatch Disabled**, consider the following decodes:

<b>Master Symbol</b>	<b>Decoded Symbol</b>	<b>Master Symbol after Decode</b>
001	001	002
002	002	003
003	abc	004 (sequenced because of previous match)
004	004	005
005	def	006 (sequenced because of previous match)
006	ghi	006 (not sequenced)
006	006	007





## Appendix M — Camera and IP Setup

This section provides adjustment parameters for the physical controls of the camera, image acquisition, database settings, and image diagnostics.

### Camera and IP Setup by ESP



Click the **Setup** button to bring up the **Camera Setup** menu.

Parameters	ESP Values
[-] Camera Setup	
[+] Camera Settings	
[-] Pixel Binning	Disabled
[-] Illumination Brightness	High*
[-] Light Source	Off
[-] Focus Distance	Low
[-] Window of Interest	Medium
[-] Top	High*
[-] Left	Constant
[-] Height	1944
[-] Width	2592
[+] Image Processing Settings	

To change a setting, **double-click** the setting and use your cursor to scroll through the options.

To open nested options, **single-click** the **+**.

## Camera and IP Setup Serial Commands

Window of Interest	<K516,row pointer,column pointer,row depth,column width>
Damaged Symbol	<K519,damaged symbol status>
Focus Setup	<K525,focal distance,distance units,focus mode,no-read limit>
Illumination Brightness	<K536,brightness,light source,fixed light on time,fixed light on delay time>
Camera Settings	<K541,exposure,gain>
Pixel Binning	<K542,pixel binning status>
Color Filter	<K543,color filter>
White Balance	<K544,red gain,green gain,blue gain>
Morphological Pre-Processing	<K550,status>
Morphological Operation	<K551,morphological operation,operator size>
Set License	<K556,license file name,license key>
Linear Security Level	<K560,linear security level>
Fast Linear Mode	<K561,fast linear mode>

## Video

The **Video** view is similar to the **EZ Mode** interface, in that the user has the ability to perform the same **Locate**, **Calibrate**, and **Test** routines. There is also a focal distance adjustment tool to the right of the video view.

**Video** also features **Capture and Decode** functionality, which is similar to the **Configuration** interfaces (**Communication**, **Read Cycle**, **Symbologies**, **I/O**, **Matchcode**, and **Diagnostics**).

The screenshot shows the Video interface with a central video feed of a QR code. The interface includes several control buttons and a data table. Callouts provide detailed explanations for these elements:

- Locate:** Activates the reader's target pattern and initiates live video display of the symbol in the field of view.
- Calibrate:** Initiates Calibration routine.
- Capture and Decode:** Allows the user to take an image capture of the symbol in the field of view at any time, and to decode the symbol data. Similar to the **Capture and Decode** function in the **Configuration** views.
- Test:** Initiates the **Test** routine. Allows the user to test the reader's read rate and decodes per second, and also displays decoded symbol data in the field at the bottom of the screen. Click **Stop** to end the **Test** routine.
- Stop:** Click **Stop** to end the **Test** routine.
- Contrast Control:** When enabled, shows the symbol in higher contrast than the default contrast value.
- Focal Distance Control:** Clicking this icon enables the focal distance slide control to the right of the video view. The focal distance value is displayed just below the icon.
- Data Table:** Symbol data and **Test** results are shown in this field.

Attribute	Value
Number of Symbols	1
Symbol E1	
Symbol Data	Microscan

## Evaluation

In **Evaluation**, you can view images currently in the reader, capture and decode a symbol, save it as a digital file, and perform histogram and line scan evaluations.

When you click on the **Evaluation** tab, you will see the images that are currently stored in the reader.

Click **Receive** to refresh this view.

Click **Capture/Decode** to display the current stored image. Only one capture and decode event will occur, regardless of read cycle settings.

Click **Read** to trigger a read cycle. If there is enough time in the read cycle, up to 32 good reads (or 6 full-scale images) can be captured and displayed, depending on the size of the images, and depending on the number enabled in **Number of Captures** under **Capture Mode** in the **Camera Setup** menu tree to the left of the tabs.

If you click **Save**, the current image will be saved to the location of your choice.

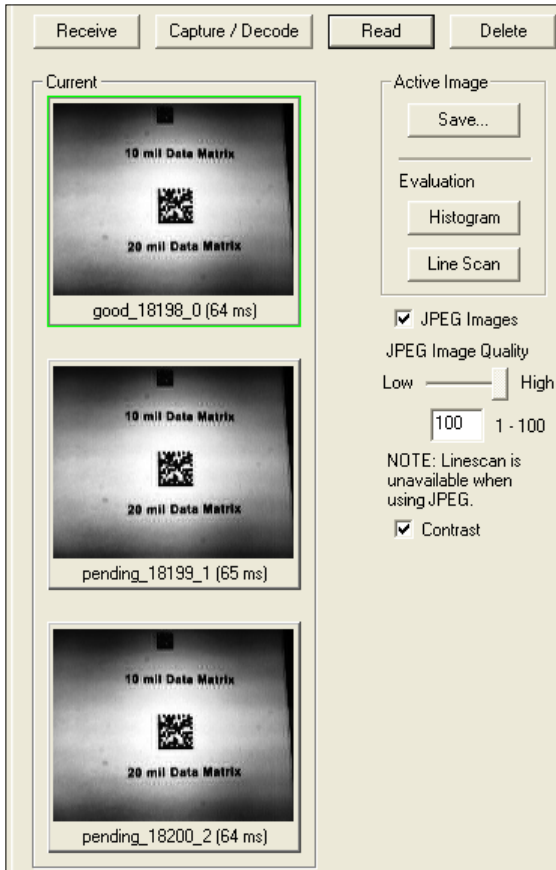
**Note:** An image can only be saved in the format in which it was uploaded to **ESP**. JPEG images will be saved as **.jpg**, and bitmaps will be saved as **.bmp**.

When you click the **JPEG Image** box, notice that the **Line Scan** button is grayed out.

The JPEG option allows faster captures and transfers, but since the JPEG standard compresses image data, it is not suitable for the more rigorous demands of line scan evaluation.

JPEG also allows you to adjust the image quality (resolution) by adjusting the sliding tab between 1 and 100, 1 being the lowest quality and 100 being the highest.

When possible, use the highest quality; when image transfer speed must be increased, use a lower image quality setting. Adjustments for this setting will depend on your specific hardware and software limitations.



## Histogram

**Usage:** Useful in determining quality and contrast of symbols.

**Definition:** A histogram is a graphic representation of the numeric count of the occurrence of each intensity (gray level) in an image. The horizontal axis represents the values of gray levels, and the vertical axis represents the number of pixels for each gray level.

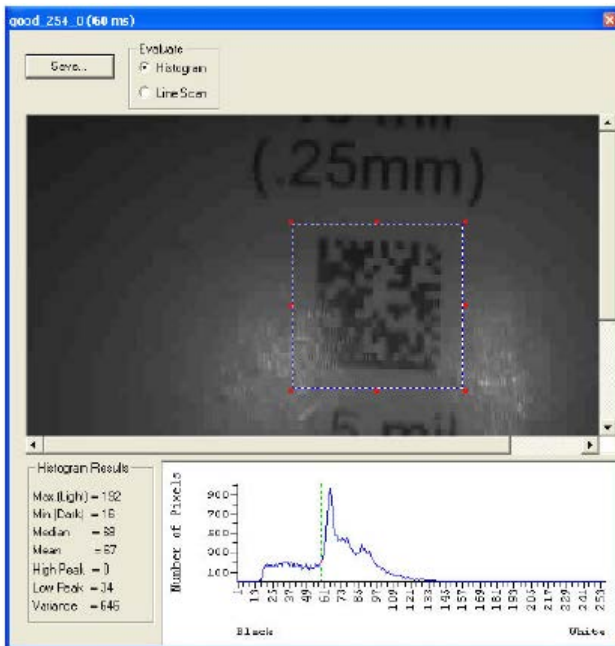
**Note:** Since histograms are performed in the reader, the results will be saved regardless of whether the image was uploaded as a JPEG (.jpg) or a bitmap (.bmp).

1. From the **Evaluation** window, click the **Histogram** button.

The current image is transferred into the histogram operation. This may take a moment, since all the relevant pixels are being evaluated intensively.

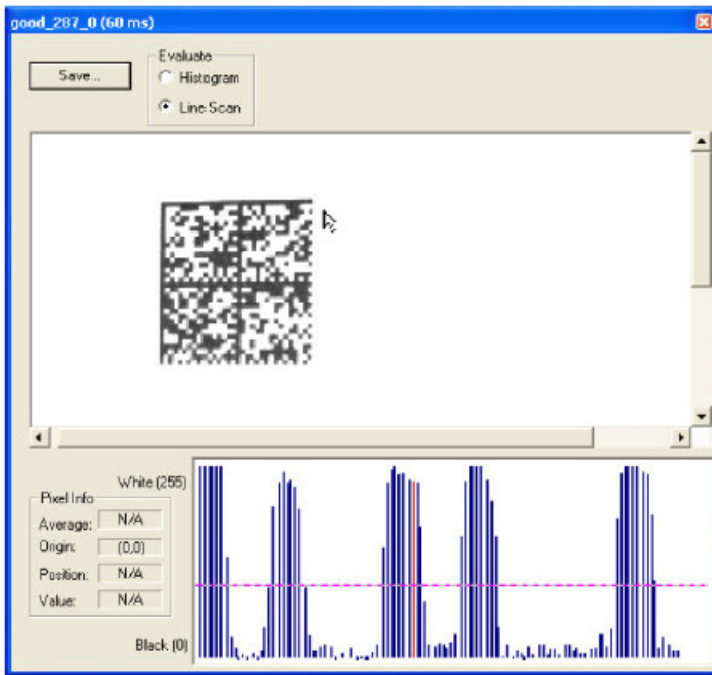
2. When the **Histogram** window opens, you may need to expand the window and/or adjust the scroll bars in order to bring the image into view.
3. To generate a histogram, click and drag your cursor diagonally across the symbol or a portion of the symbol.

The image will be surrounded by an “area of interest box”, a dashed blue line with red anchor points that can be selected and moved by placing a cursor inside the box, and can be resized by clicking and dragging the anchor points.



## Line Scan

1. From the **Evaluation** tab, click the **Line Scan** button. A window like that shown below will appear.
2. Drag your cursor *horizontally* across the image.  
This will create a dashed horizontal line. Pixel information and a visual representation of the dark and light pixels will be displayed below the image.



When you center your cursor over the dashed line, it becomes a double arrow cross. This allows you to move the line anywhere in the window. You can also use your keyboard arrows to move the line incrementally in any direction.

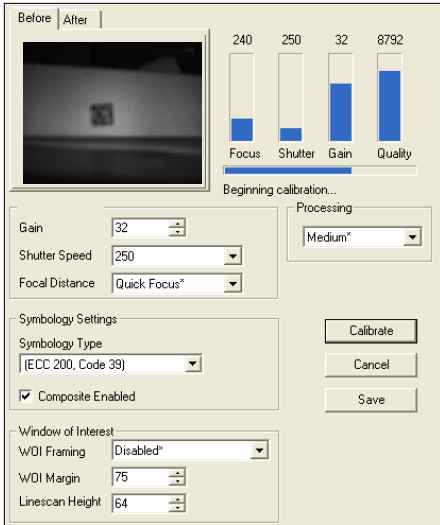
As with the histogram, the line scan compares light and dark pixels, but in a spatial distribution. On the **Y** axis of the graph below, **0** is black and **255** is white; the **X** axis represents the horizontal axis of the symbol as described by the line scan.

When you click anywhere on the graph, a vertical red line appears at that point and its position and value (in terms of black-to-white) are updated in the **Pixel Info** table to the left of the graph (237 in this example). In addition, a horizontal dashed red line is displayed that indicates the average value.

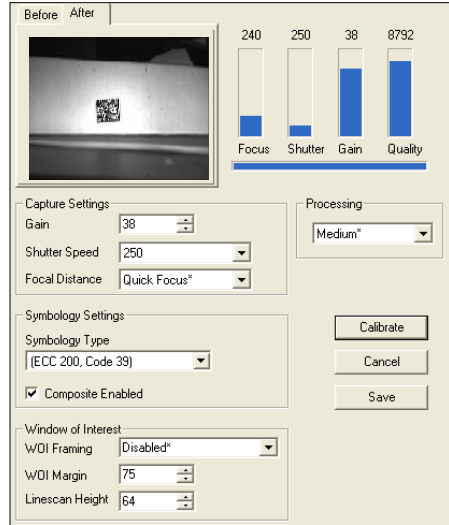
## Calibration

The Calibration interface in **ESP** is a powerful and intuitive way to optimize the reader's performance. It allows the user to control several complex, simultaneous calibration operations, and to follow the progress of those operations using cues such as progress bars, real-time representations of calibration values, and other dynamic user feedback.

See the **Calibration** section for full documentation of this feature.



*ESP's Calibration interface shown during a calibration routine*



*ESP's Calibration interface shown after a calibration routine*

## Window of Interest

The active pixel area of the image sensor is called the **Window of Interest (WOI)**. The WOI allows the user to select an area of the field of view in which the desired symbol is located.

The programmable window of interest increases decode speed, improves threshold, and makes it easy to select specific symbols from among several in the field of view. The user provides the upper-left pixel location and the size of the window in rows and columns to define the Window of Interest.

**Important: Window of Interest** will shrink the field of view and therefore could cause some symbols to be missed in dynamic applications.

## Window of Interest by ESP

1. From the **Camera** menu, click the **WOI** tab to bring up **Window of Interest**.

If you haven't already captured an image, click the **Capture and Decode** button to decode the present image. If successful, the **Good Read** indicator on the **WOI** tab will be green and the symbol will appear in the pane below.

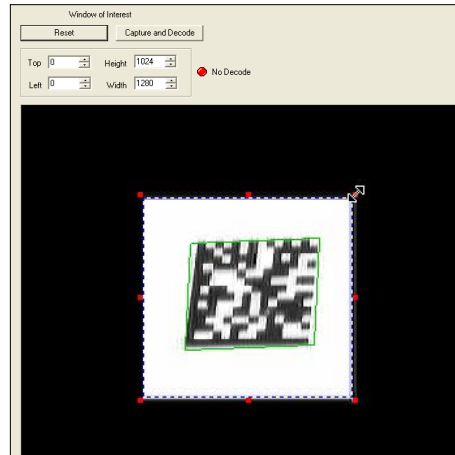
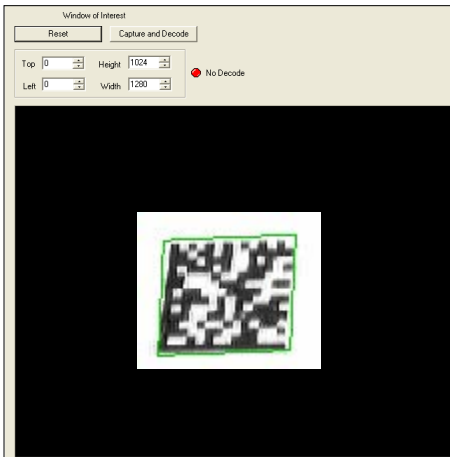
**Note:** You can resize the image by clicking and dragging the **ESP** window from the lower right corner. This is useful where very small symbols are being read.

2. Click and drag your cursor over the symbol that you want to isolate for reading.

Notice that the surrounding area goes black.

You can use the handles on the image area that you have just drawn to resize the region of interest. You can also click on the center of the window of interest and move it.

3. Test the new settings in **Read Rate Mode**.



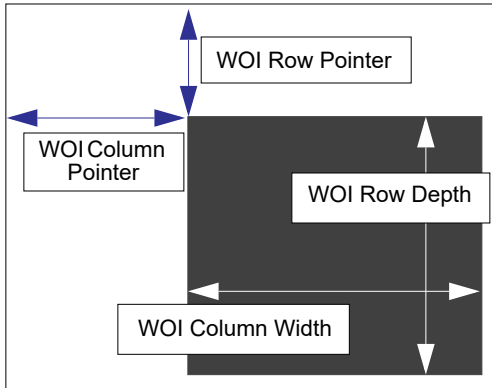
**Note:** To remove the window of interest, click the **Reset** button or click anywhere in the WOI pane.

Note that all pixels not in the WOI are defined as black.

Because the reader has far less processing to do in a smaller window, read rates typically increase dramatically. One possible downside is that the chance of missing a symbol increases with the smaller window. Always verify that your WOI will be large enough to allow for any random movement of symbols in your field of view.

## Window of Interest by Serial Command

The figure shows where to locate the start position of the row and column pointers and how to measure the column depth and row width dimensions.



### Row Pointer

**Definition:** Defines the row position of the upper-left starting point of the image window.

**Serial Cmd:** <K516,**row pointer**,column pointer,row depth,column width>

**Default:** All models: 0

**Options:** V430-F000  50C QSXGA : 0 to (1944 – row depth)  
 V430-F000  12M SXGA : 0 to (960 – row depth)  
 V430-F  M03M WVGA : 0 to (480 – row depth)

### Column Pointer

**Definition:** Defines the column position of the upper-left starting point of the image window.

**Serial Cmd:** <K516,row pointer,**column pointer**,row depth,column width>

**Default:** All models: 0

**Options:** V430-F000  50C QSXGA: 0 to (2592 – column width)  
 V430-F000  12M SXGA: 0 to (1280 – column width)  
 V430-F  M03M WVGA: 0 to (752 – column width)

## Row Depth

*Definition:* Defines the size, in rows, of the image window. Maximum value is defined as the maximum row size of the image sensor minus the Row Pointer value.

*Serial Cmd:* <K516,row pointer,column pointer,row depth,column width>

*Default:* **V430-F000**  **50C QSXGA: 1944**

**V430-F000**  **12M SXGA: 960**

**V430-F**    **M03M WVGA: 480**

*Options:* **V430-F000**  **50C QSXGA:** 3 to (1944 – row pointer)

**V430-F000**  **12M SXGA:** 3 to (960 – row pointer)

**V430-F**    **M03M WVGA:** 3 to (480 – row pointer)

## Column Width

*Definition:* Defines the size, in columns, of the image window. Maximum value is defined as the maximum column size of the image sensor minus the Column Pointer value.

*Serial Cmd:* <K516,row pointer,column pointer,row depth,column width>

*Default:* **V430-F000**  **50C QSXGA: 2592**

**V430-F000**  **12M SXGA: 1280**

**V430-F**    **M03M WVGA: 752**

*Options:* **V430-F000**  **50C QSXGA:** 8 to (2592 – column pointer)

**V430-F000**  **12M SXGA:** 8 to (1280 – column pointer)

**V430-F**    **M03M WVGA:** 8 to (752 – column pointer)

## Important Notes

- The column width value must be a modulus 8 value. Regardless of the column width setting that is configured, the actual column width will be decreased if necessary to a modulus 8 value. For example, a column width value of **639** would actually be **632**. A user query for the value of this setting would still return **639**.
- The column pointer must be an even value. Regardless of the column pointer setting that is configured, the actual column pointer will be decreased if necessary to an even value. For example, a column pointer value of **101** would actually be **100**. A user query for the value of this setting would still return **101**.

## Configuration Database

The Configuration Database allows the user to manage multiple configuration profiles. It is a useful tool in applications that require several different reader configurations to be applied sequentially, and it allows the user to perform far more complex operations than would be possible with only one set of configuration parameters.

See **Configuration Database** for full documentation of this feature.

The screenshot displays the Configuration Database interface. At the top, 'Active Indexes' is set to 5, and 'Auto Sync Database settings with Reader' is checked. An 'Advanced Options...' button is visible. The interface is divided into 'Capture Settings' and 'Processing Settings' sections. The 'Capture Settings' section includes parameters: Capture Index, Exposure, Gain, Pixel Binning, Top, Left, Height, and Width. The 'Processing Settings' section includes Morphology Operation, Morphology Size, and Symbol Type. Below these sections, a table lists 10 configuration profiles. Profile 1 is selected, and its 'Capture Settings' are highlighted in yellow. The 'Processing Settings' for all profiles are currently set to 'Erode', 'Small', and 'ECC 200'. At the bottom, there are checkboxes for 'Capture for Every Index', 'Show Database Index in Output', and 'Sort Index Positions on Good Reads', along with buttons for 'Calibrate...', 'Receive Settings', 'Send Settings', 'Load Current To Index', and 'Load Index To Current'.

Index	Capture Index	Exposure	Gain	Pixel Binning	Top	Left	Height	Width	Morphology Operation	Morphology Size	Symbol Type
1	10000	20	Disable	0	0	1944	2592	...	Disable	Small	Disabled Test
2	10000	20	Disable	0	0	1944	2592	...	Disable	Small	Disabled Test
3	10000	20	Disable	0	0	1944	2592	...	Disable	Small	Disabled Test
4	10000	20	Disable	0	0	1944	2592	...	Disable	Small	Disabled Test
5	10000	20	Disable	0	0	1944	2592	...	Disable	Small	Disabled Test
6	10000	20	Disable	0	0	1944	2592	...	Disable	Small	Disabled Test
7	10000	20	Disable	0	0	1944	2592	...	Disable	Small	Disabled Test
8	10000	20	Disable	0	0	1944	2592	...	Disable	Small	Disabled Test
9	10000	20	Disable	0	0	1944	2592	...	Disable	Small	Disabled Test
10	10000	20	Disable	0	0	1944	2592	...	Disable	Small	Disabled Test

**Configuration Database view, 5 Active Indexes, Capture Settings highlighted**

## Dynamic Setup

**Dynamic Setup** is used to calculate image capture timing during a read cycle. Without proper timing, the reader will not be able to decode all symbols in a read cycle. An external trigger is used to activate image captures so the user can make timing adjustments as capture events occur.

The user can control Capture #, Number of Captures, and Number of Symbols using these spin boxes.

Read Rate is represented graphically in real-time as the user makes adjustments to the time delay between image captures.

Capture #: 1  
Number of Captures: 1  
Number of Symbols: 1

Delay (Sec): 0.078432

Delay Adjustment:  
 Coarse  
 Medium  
 Fine

Decrease: <      Increase: >

The Delay Adjustment slider allows the user extremely precise control of the time delays between image captures in a read cycle. Delay values are shown in seconds in the field above the slider. The Coarse and Fine Delay Adjustment options determine whether larger or smaller adjustment increments will be used.

## Pixel Binning

**Definition:** In addition to windowing the image sensor, smaller resolutions can be obtained by down sampling the entire captured image by using pixel binning. Pixel binning can increase the signal to noise ratio and produce a more pleasing output image with reduced artifacts. It will also improve low-light performance. It is important to note that enabling pixel binning does not affect the sensor frame rate as the pixels still need to be processed in order to be averaged and binned.

**Usage:** <K542,pixel binning>

**Default:** Disabled

**Options:** 0 = Disabled                      1 = Enabled

### **Disabled**

Pixel-binning is disabled.

### **Enabled**

Two column pixels and two row pixels are averaged to create a single pixel value providing a 2:1 reduction in the vertical pixels and a 2:1 reduction in the horizontal pixels for a combined 4:1 reduction. An image with a dimension of 640 x 480 will be scaled to 320 x 240.

## Camera Settings

**Camera Settings** are typically obtained during the calibration process, and do not necessarily need to be modified directly by the user.

### QSXGA, SXGA, and WVGA

#### Exposure

*Usage:* Faster exposures reduce blurring in faster applications.  
Slower exposures are useful in slower applications and lower contrast applications.

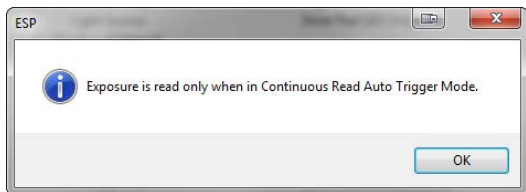
*Definition:* This value sets the exposure or integration time (in micro-seconds) for the image sensor pixels. The exposure setting in relation to the speed of the object is critical. If an object is moving rapidly and too long an exposure value is selected, blurring or smearing of the object will occur. As exposure time is decreased the movement of the object becomes less of a factor but, with the duration of light collection by the pixels reduced, the image sensor gain will need to be increased to compensate.

*Serial Cmd:* <K541,exposure,gain>

*Default:* **All versions: 2,500  $\mu$ s**

*Options:* Any number between 50 – 100,000

**Note:** The Exposure parameter is read-only when the reader is in **Continuous Read Auto Trigger Mode**.



## Gain

*Usage:* Can be used to adjust the brightness of the image.

*Definition:* Sets the gain value for the image sensor and is a percentage value from 0 (lowest gain) to 100% (highest gain). This setting can be configured through auto-calibration. A higher gain value will increase the brightness of the image, but the noise performance of the system will be reduced. Before configuring the gain, the required exposure should be set, and the gain should be configured to optimize the exposure setting.

*Serial Cmd:* <K541,exposure,gain>

*Default:* **QSXGA: 33%**

**SXGA: 0%**

**WVGA: 33%**

*Options:* Any number between 0 – 100, representing 0% to 100%

**Important:** There are 4 levels of Gain in SXGA readers. Each level corresponds to 25 percentage points.

- Level 1 = 0 to 24%
- Level 2 = 25 to 49%
- Level 3 = 50 to 74%
- Level 4 = 75 to 100%

## **White Balance Settings (QSXGA Color Only)**

*Definition:* <K544,red gain,green gain,blue gain>

*Default:* **Factory-Calibrated**

*Options:* Any number between 0 – 100

### **Red Gain**

Sets the gain value for the red color channel of the image sensor and is a percentage value from 0% (lowest gain) to 100% (highest gain). The color channel parameters are used to avoid unrealistic colors so that objects that appear white to the human eye are rendered white in the final image. The default value for this parameter is factory-calibrated.

### **Green Gain**

Sets the gain value for the green color channel of the image sensor and is a percentage value from 0% (lowest gain) to 100% (highest gain). The color channel parameters are used to avoid unrealistic colors so that objects that appear white to the human eye are rendered white in the final image. The default value for this parameter is factory-calibrated.

### **Blue Gain**

Sets the gain value for the blue color channel of the image sensor and is a percentage value from 0% (lowest gain) to 100% (highest gain). The color channel parameters are used to avoid unrealistic colors so that objects that appear white to the human eye are rendered white in the final image. The default value for this parameter is factory-calibrated.

## Color Filter

**Definition:** If you are using a 5 megapixel color V430-F-series, this filter captures an image in color. To process the image for symbol decoding, the image must be filtered or the R, G, and B cells need to be equalized. This can be done by applying one of the filters available or by performing a white balance with the current camera configuration before trying to decode a symbol. This option specifies the filter method that is applied to the RGB color image to produce a monochrome image.

**Usage:** <K543,color filter>

**Default:** **Green Interpolate**

**Options:** 0 = Disabled (Raw, No Filter)

1 = Enabled

2 = Horizontal 1D Symbols

**3 = Green Interpolate**

### Disable

No filter is applied to image. If you are attempting to read symbols with no filter applied, a white balance should be performed first to balance the red, blue, and green cells of the image sensor.

### Enabled(General Purpose)

This is a general purpose filter that is applied to the RGB image to provide a grayscale image that can be used for most applications.

This filter should be used when reading 2D symbols, 1D symbols that are not positioned horizontally in the field of view, or a combination of 1D and 2D symbols.

### Horizontal 1D Symbols

This filter is applied to the RGB image to provide a grayscale image that is specifically designed to provide the best suitable image for a horizontally-positioned 1D symbol.

This filter should be used when reading 1D symbols that are positioned horizontally across the field of view.

## Green Interpolate

This filter is applied to the RGB image to provide a grayscale image for decoding similar to a luminance calculation. Unlike a luminance calculation, Green Interpolate provides an image **1:1** resolution to the input image. This filter provides better omni-directional symbol decode performance. Like Horizontal 1D Symbols, and unlike General Purpose, a white balance is not necessary.

This filter is recommended for most decoding applications that can afford extra processing time.

**Note:** For high-resolution 1D symbols that are positioned horizontally, the Horizontal 1D Symbols filter is preferable.

## Focus Setup

### Focal Distance

- Definition:** Provides the focal distance adjustment for the camera.  
Any value outside this range will be rejected.  
If you attempt to set the Focal distance as the out of range value of your model, the parameter will be left as-is.
- Serial Cmd:** <K525,focal distance,distance units,focus mode,no-read limit>
- Default:** **102**
- Options:** 25 to 4,000 (mm)  
100 to 4,000 (1/100 inch)

### Distance Units

- Definition:** Defines the measurement unit value of the **Focal Distance** parameter.
- Serial Cmd:** <K525,focal distance,distance units,focus mode,no-read limit>
- Default:** **Millimeters**
- Options:** **0 = Millimeters**  
1 = 1/100 inch

For example, the following are valid configurations to set the Focal Distance to three distances:

Required Focal Distance	Distance Units = mm (0)	Distance Units = 1/100 in. (1)
2 inch, or 50 mm	<K525,50,0>	<K525,200,1>
3 inch, or 76 mm	<K525,76,0>	<K525,300,1>
6 inch, or 152 mm	<K525,152,0>	<K525,600,1>

### Focus Mode

- Definition:** This field set to **1** enables the autofocus mode to be enabled. The read cycle must also be a **Continuous Read** mode or **Continuous Read Auto** (Auto Photometry) mode. Autofocus mode does not apply to triggered read cycles. If the value is set to **0**, only the distance value is used.
- Serial Cmd:** <K525,focal distance,distance units,focus mode,no-read limit>
- Default:** **No-Read Autofocus**
- Options:** 0 = User Value Only  
**1 = No-Read Autofocus**

## No-Read Limit

*Definition:* This is the number of no-reads that are encountered consecutively in a **Continuous Read** mode to trigger an **Autofocus** pass.

*Serial Cmd:* <**K525**,focal distance,distance units,focus mode,**no-read limit**>

*Default:* **5**

*Options:* 1 to 255

## ***Illumination Brightness***

**Definition:** This feature allows you to adjust the brightness of the illumination LEDs. Since the reader has control over the brightness of the illumination, it can provide consistent brightness output between readers through a factory calibration operation. Each of the brightness settings is calibrated to provide the same level of intensity for each reader.

**Serial Cmd:** `<K536,brightness,light source,fixed light on time,fixed light on delay time>`

**Default:** **High**

**Options:**

- 0 = Off
- 1 = Low
- 2 = Medium
- 3 = High**
- 4 = Constant
- 5 = Extreme

### ***Constant***

When set to **Constant**, the illumination brightness is the same power level as the **High** setting. However, the LEDs will always be on during a read cycle and will only be off between read cycles. This cuts down on perceptible LED flashing.

### ***Extreme***

When set to **Extreme**, **illumination brightness** enters Power Strobe mode. In this mode, illumination is extremely intense, and can only be activated for a maximum of 1 ms.

## ***Light Source***

**Definition:** The setting allows the user to change the illumination light source.

**Serial Cmd:** `<K536,brightness,light source,fixed light on time,fixed light on delay time>`

**Default:** **Outer LED Only**

**Options:**

- 0 = External Strobe
- 1 = Inner White LED Only
- 2 = Inner Red LED Only
- 3 = Outer LED Only**

### ***External Strobe***

For **Configurable Output 3 (K812)**, **Output On**, Use as **External Illumination Strobe** to function, **Light Source** must be set to **External Strobe**.

## Fixed Light ON Time

**Note:** Fixed Light ON Time only functions when **Power Strobe** mode and **External Strobe** are enabled.

**Note:** Entering **0** will disable Fixed Light ON Time, and will override it to **1 ms** if **Illumination Brightness** is set to **Extreme**.

*Definition:* **Fixed Light ON Time** allows you to control **how long** illumination will be **ON** when the camera captures an image. This command functions along with **Fixed Light ON Delay Time** to allow you to vary the amount of time an object appears in an image capture, assuming the capture environment is dark.

*Serial Cmd:* <**K536**,*brightness*,*light source*,**fixed light on time**,*fixed light on delay time*>

*Options:* 0 - 100,000  $\mu$ s

*Default:* **0 (Disabled)**

## Fixed Light ON Delay Time

**Note:** Fixed Light ON Delay Time only functions when **Power Strobe** mode and **External Strobe** are enabled.

*Definition:* **Fixed Light ON Delay Time** allows you to control **when** illumination will be **ON** during an image capture. This command functions along with **Fixed Light ON Time** to allow you to vary **the time at which** an object appears in an image capture, assuming the capture environment is dark.

### **Example of Fixed Light ON Time and Fixed Light ON Delay Time in Power Strobe Mode:**

**Preconditions:** The moving target object will show up 20  $\mu$ s after capture starts. A 100  $\mu$ s exposure will be able to freeze a moving object in the captured image.

**Setup:** Power Strobe with Fixed Light ON Time set to 100  $\mu$ s and Fixed Light ON Delay Time set to 20  $\mu$ s with exposure set to 120  $\mu$ s.

### **Example of Fixed Light ON Time and Fixed Light ON Delay Time in External Strobe Mode:**

**Preconditions:** The time delay between the strobe signal on the reader's Output 3 and the moment the external illuminator turns ON is 50  $\mu$ s. A 100  $\mu$ s exposure will be able to freeze a moving object in the captured image.

**Setup:** External Strobe with Fixed Light ON Time set to 50  $\mu$ s and Fixed Light ON Delay Time set to 100  $\mu$ s with exposure set to 150  $\mu$ s.

*Serial Cmd:* <**K536**,*brightness*,*light source*,**fixed light on time**,**fixed light on delay time**>

*Options:* 0 - 100,000  $\mu$ s

*Default:* **0**



## ***Morphological Operation and Operator Size***

### **Morphological Operation**

*Definition:* **Morphological Operation** allows the user to select the method for processing captured images.

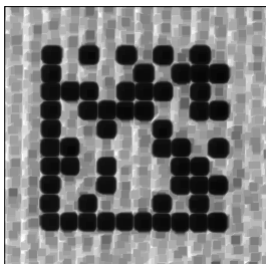
*Serial Cmd:* <K551,0,morphological operation,operator size>

*Default:* **Grow Dark**

*Options:* **0 = Grow Dark**  
1 = Shrink Dark  
2 = Connect Dark  
3 = Separate Dark

### ***Erode (Grow Dark)***

**Erode** increases the dark cell size of a symbol. Useful for increasing the dark cell size of a dark-on-light Data Matrix symbol.



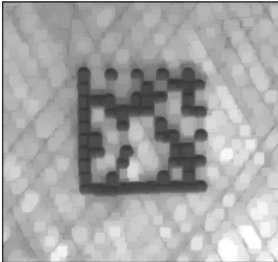
### ***Dilate (Shrink Dark)***

**Dilate** increases the light cell size of a symbol. Useful for increasing the light cell size of a light-on-dark Data Matrix symbol.



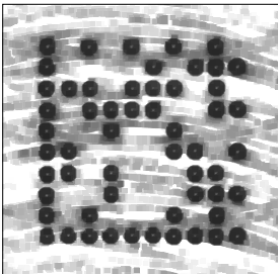
### **Open (Connect Dark)**

**Open** removes minor light defects of dark cells by performing a **Dilate** function followed by an **Erode** function.



### **Close (Separate Dark)**

**Close** removed minor dark defects of light cells by performing an **Erode** function followed by a **Dilate** function.



## **Operator Size**

**Definition:** **Operator Size** determines the size of the area or “pixel neighborhood” (measured in pixels) in which the morphological operation is being performed.

**Serial Cmd:** `<K551,0,morphological operation,operator size>`

**Default:** **Small**

**Options:**

- 3 = Small (3 pixels by 3 pixels)**
- 5 = Medium (5 pixels by 5 pixels)**
- 7 = Large (7 pixels by 7 pixels)**

## **Damaged Symbol**

**Definition:** When **Damaged Symbol** is enabled, the reader will make additional attempts to decode damaged Code 128 and Code 39 symbols. It is effective on symbols with high noise and partial bar missing. Enabling Damaged Symbol may significantly increase decode time.

**Serial Cmd:** <**K519**,*damaged symbol status*>

**Default:** **Disabled**

**Options:** **0 = Disabled**  
1 = Enabled

## **Linear Security Level**

**Definition:** **Linear Security Level** is intended to prevent misreads. When it is set to a higher level, it requires more scan lines to decode the same result, making it more secure.

**Serial Cmd:** <**K560**,*linear security level*>

**Default:** **Aggressive**

**Options:** **0 = Aggressive**  
1 = Normal  
2 = Secure

## Fast Linear Mode

**Definition:** **Fast Linear Mode** optimizes 1D symbol decoding. If you know the direction the application's symbols will be oriented, set Fast Linear Mode to match that direction.

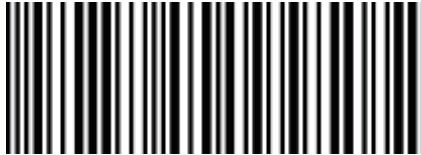
**Serial Cmd:** <K561,fast linear mode>

**Options:** **XMODE\_FLM=DIS** (or any other string) = No Fast Linear Mode  
**XMODE\_FLM=HORIZ=STD** = Standard horizontal Fast Linear Mode  
**XMODE\_FLM=VERT=STD** = Standard vertical Fast Linear Mode

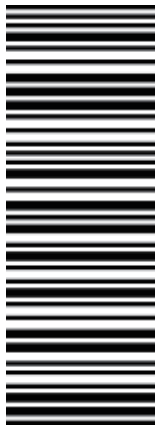
**Note:** **XMODE\_FLM\_HORIZ=STD** cannot decode vertical symbols, and **XMODE\_FLM\_VERT=STD** cannot decode horizontal symbols.

If you know the direction the application's symbols will be oriented relative to the reader, set Fast Linear Mode to match that direction.

**Horizontal** requires that the entire symbol be oriented horizontally in the reader's field of view.



**Vertical** requires that the entire symbol be oriented vertically in the reader's field of view.



## Set License

Serial Cmd: <**K556**,license file name,license key>

### License File Name

The **License File Name** is the name of the file that holds the license key. The file name should be no longer than 32 characters including the mandatory **.lic** extension. By convention, the file name should begin with the first three octets of the target device's MAC address followed by a short key descriptor. An example filename is **17B2C3-X-Mode.lic**.

### License Key

The **License Key** field is a 29 character string representing the license key. The key is generated by a proprietary licensing tool and the format is a sequence of five five-character dash-separated fields. An example key is **12345-67890-ABCDE-FGHIJ-KLMNO**.

**Note:** For V430, it is not necessary to set license.

## Appendix N — Configuration Database

This section concerns the various capture settings and processing settings that can be used to fine-tune the reader's performance in your application.

For the Configuration Database, the following functions as the bank switching function are possible to achieve.

- Up to ten settings can be held.
- Settable parameters: Exposure, Gain, Focal Distance, Pixel Binning, Window of Interest/Region of Interest, Symbology, Morphology Operator, and Morphology Size.
- Switch command of the database: <K255-,index>
- Automatic switching function of the database: <K252,number of active indexes>

Use ESP or a serial command to set the Configuration Database.

### Configuration Database Serial Commands

Number of Active Indexes	<K252,number of active indexes,sort database>
Configuration Database Status	<K255,index,exposure,gain,focal distance,pixel binning,row pointer,column pointer,row depth,column width,symbology,morphology operator,morphology size>
Save Current Settings to Database	<K255+,index>
Load Current Settings from Database	<K255-,index>
Request Selected Index Settings	<K255?,index>
Request All Database Settings	<K255?>
Database Mode	<K256,switch mode,frame count/time,image process looping,image dimensions>

## Number of Active Indexes

**Usage:** Useful for applications that require several different complex reader configurations to be applied sequentially. Multiple database indexes allow you to concatenate configuration profiles, and to perform more complex operations than would be possible with only one set of configuration parameters.

**Definition:** This feature allows you to set the number of database records (groups of settings) that will be used automatically during the read cycle. If **Number of Active Indexes** is set to 0, only the current reader settings will be used, not database entry settings.

**Serial Cmd:** <K252,number of active indexes,sort database>

**Default:** 0 (Disabled)

**Options:** 0 to 10

## Sort Database

**Definition:** **Sort Database** moves the database entry that produced a successful decode to the first position in the list of database entries.

**Serial Cmd:** <K252,number of active indexes,sort database>

**Default:** Disabled

**Options:** 0 = Disabled                      1 = Enabled

## Number of Active Indexes by ESP

Click the arrow on the **Active Indexes** dropdown menu and select how many database indexes will be used during the read cycle. (0 to 10).

Active Indexes: 5     Auto Sync Database settings with Reader    Advanced Options...

Capture Settings: Capture Index, Exposure, Gain, Pixel Binning, Top, Left, Height, Width, ROI, ROI

Processing Settings: Morphology Operation, Morphology Size, Symbol Type

Index	Current	Erode	Small	ECC 200	Sort Index Positions on Good Reads	
1	10000 25	Disable	0	0	1944 2592	<input checked="" type="checkbox"/>
2	10000 20	Disable	0	0	1944 2592	<input type="checkbox"/>
3	10000 20	Disable	0	0	1944 2592	<input type="checkbox"/>
4	10000 20	Disable	0	0	1944 2592	<input type="checkbox"/>
5	10000 20	Disable	0	0	1944 2592	<input type="checkbox"/>
6	10000 20	Disable	0	0	1944 2592	<input type="checkbox"/>
7	10000 20	Disable	0	0	1944 2592	<input type="checkbox"/>
8	10000 20	Disable	0	0	1944 2592	<input type="checkbox"/>
9	10000 20	Disable	0	0	1944 2592	<input type="checkbox"/>
10	10000 20	Disable	0	0	1944 2592	<input type="checkbox"/>

Capture for Every Index     Show Database Index in Output     Sort Index Positions on Good Reads

Buttons: Calibrate..., Receive Settings, Send Settings, Load Current To Index, Load Index To Current

**Sort Index Positions on Good Reads** moves the database entry that produces the first successful decode to the top of the list.

## Configuration Database Status

### Index

**Usage:** Useful for applications that require several different complex reader configurations to be applied sequentially. Multiple database indexes allow you to concatenate configuration profiles, and to perform more complex operations than would be possible with only one set of configuration parameters.

**Definition:** Determines the specific database index that will be used.

**Serial Cmd:** <**K255,index,exposure,gain,focal distance,pixel binning,row pointer,column pointer,row depth,column width,symbology,morphology operator,morphology size**>

**Options:** 1 to 10

### Exposure

**Serial Cmd:** <**K255,index,exposure,gain,focal distance,pixel binning,row pointer,column pointer,row depth,column width,symbology,morphology operator,morphology size**>

**Default:** **2500**

**Options:** 50 to 100,000

**Note:** The Exposure parameter is read-only when the reader is in **Continuous Read** mode.

### Gain

**Serial Cmd:** <**K255,index,exposure,gain,focal distance,pixel binning,row pointer,column pointer,row depth,column width,symbology,morphology operator,morphology size**>

**Default:** **0**

**Options:** 0 to 100

### Focal Distance

**Definition:** Provides the focal distance adjustment for the camera.

Any value outside this range will be rejected.

If you attempt to set the Focal distance as the out of range value of your model, the parameter will be left as-is.

**Serial Cmd:** <**K255,index,exposure,gain,focal distance,pixel binning,row pointer,column pointer,row depth,column width,symbology,morphology operator,morphology size**>

**Default:** **102**

**Options:** 25 to 4,000 (mm)

100 to 4,000 (1/100 inch)

## Pixel Binning

*Serial Cmd:* <**K255**,index,exposure,gain,focal distance,**pixel binning**,row pointer,column pointer,row depth,column width,symbology,morphology operator,morphology size>

*Default:* **Disabled**

*Options:* **0 = Disabled**                      1 = Enabled

**Important:** Pixel Binning has no effect when the **Image Dimension** mode is configured as **Region of Interest** in the **Database Mode** command. This is because the **Window of Interest** camera settings are determined by the software based on the **Region of Interest** setup. There is no benefit to Pixel Binning to increase processing speed when ROI is configured, because the frame size would need to be increased to make Pixel Binning possible.

## Row Pointer

*Definition:* The image dimension settings can be applied as a Window of Interest or a Region of Interest, depending on the image dimension mode selected in the **Database Mode** command.

*Serial Cmd:* <**K255**,index,exposure,gain,focal distance,**pixel binning**,**row pointer**,column pointer,row depth,column width,symbology,morphology operator,morphology size>

*Default:* **All models: 0**

*Options:* **V430-F000**  **50C QSXGA:** 0 to (1944 – row depth)  
**V430-F000**  **12M SXGA:** 0 to (960 – row depth)  
**V430-F**  **M03M WVGA:** 0 to (480 – row depth)

## Column Pointer

*Definition:* The image dimension settings can be applied as a Window of Interest or a Region of Interest, depending on the image dimension mode selected in the **Database Mode** command.

*Serial Cmd:* <**K255**,index,exposure,gain,focal distance,**pixel binning**,row pointer,**column pointer**,row depth,column width,symbology,morphology operator,morphology size>

*Default:* **All models: 0**

*Options:* **V430-F000**  **50C QSXGA:** 0 to (2592 – column width)  
**V430-F000**  **12M SXGA:** 0 to (1280 – column width)  
**V430-F**  **M03M WVGA:** 0 to (752 – column width)

## Row Depth

*Definition:* The image dimension settings can be applied as a Window of Interest or a Region of Interest, depending on the image dimension mode selected in the **Database Mode** command.

*Serial Cmd:* <**K255**,*index,exposure,gain,focal distance,pixel binning,row pointer,column pointer,row depth,column width,symbology,morphology operator,morphology size*>

*Default:* **V430-F000**  **50C QSXGA: 1944**  
**V430-F000**  **12M SXGA: 960**  
**V430-F**    **M03M WVGA: 480**

*Options:* **V430-F000**  **50C QSXGA:** 3 to (1944 – row pointer)  
**V430-F000**  **12M SXGA:** 3 to (960 – row pointer)  
**V430-F**    **M03M WVGA:** 3 to (480 – row pointer)

## Column Width

*Definition:* The image dimension settings can be applied as a Window of Interest or a Region of Interest, depending on the image dimension mode selected in the **Database Mode** command.

*Serial Cmd:* <**K255**,*index,exposure,gain,focal distance,pixel binning,row pointer,column pointer,row depth,column width,symbology,morphology operator,morphology size*>

*Default:* **V430-F000**  **50C QSXGA: 2592**  
**V430-F000**  **12M SXGA: 1280**  
**V430-F**    **M03M WVGA: 752**

*Options:* **V430-F000**  **50C QSXGA:** 8 to (2592 – column pointer)  
**V430-F000**  **12M SXGA:** 8 to (1280 – column pointer)  
**V430-F**    **M03M WVGA:** 8 to (752 – column pointer)

## Symbology

**Definition:** This field allows the user to configure the database to enable specific symbologies for selected database indexes. Symbology-specific parameters must be configured with the appropriate symbology command.

For example, if fixed length Code 128 is required, it must first be set up with the Code 128 command: **<K474>**.

To select a particular symbology, add the number value associated with that symbology.

**Examples:**

If Data Matrix and Code 39 are required, the parameter would be:  $2 + 16 = 18$ .

If I 2/5, BC412, and DataBar Limited are required, the parameter would be:  $128 + 2048 + 16384 = 18560$ .

**Serial Cmd:** **<K255,index,exposure,gain,focal distance,pixel binning,row pointer,column pointer,row depth,column width,symbology,morphology operator,morphology size>**

**Default:** **Disabled**

### **Disabled**

When **Symbology** is disabled, the database uses the current **Symbology** setup to determine active symbologies.

### **Any Symbology (Add 1)**

All symbologies *except Pharmacode* are enabled while this database index is being used.

### **Data Matrix (Add 2)**

If enabled, Data Matrix will be active for this database index.

**Important:** The ECC level must be configured using the Data Matrix command **<K479>**. If no ECC level has been configured, the reader will not decode Data Matrix symbols.

### **QR Code (Add 4)**

If enabled, QR Code will be active for this database index.

### **Code 128 (Add 8)**

If enabled, Code 128 will be active for this database index.

### **Code 39 (Add 16)**

If enabled, Code 39 will be active for this database index.

### **Codabar (Add 32)**

If enabled, Codabar will be active for this database index.

**Code 93 (Add 64)**

If enabled, Code 93 will be active for this database index.

**Interleaved 2 of 5 (Add 128)**

If enabled, Interleaved 2 of 5 will be active for this database index.

**UPC/EAN (Add 256)**

If enabled, UPC/EAN will be active for this database index.

**PDF417 (Add 512)**

If enabled, PDF417 will be active for this database index.

**MicroPDF417 (Add 1024)**

If enabled, MicroPDF417 will be active for this database index.

**BC412 (Add 2048)**

If enabled, BC412 will be active for this database index.

**Pharmacode (Add 4096)**

If enabled, Pharmacode will be active for this database index.

**DataBar-14 (Add 8192)**

If enabled, DataBar-14 will be active for this database index.

**Important:** If the stacked and non-stacked operation is required, the DataBar-14 command must be configured as follows: **<K482,2>**. If the DataBar-14 status parameter in the **<K482>** command is set to either Disabled or Enabled, the reader will only read non-stacked DataBar-14 symbols.

**DataBar Limited (Add 16384)**

If enabled, DataBar Limited will be active for this database index.

**DataBar Expanded (Add 32768)**

If enabled, DataBar Expanded will be active for this database index.

**Important:** If the stacked and non-stacked operation is required, the DataBar Expanded command must be configured as follows: **<K484,2>**. If the DataBar Expanded status parameter in the **<K484>** command is set to either Disabled or Enabled, the reader will only read non-stacked DataBar Expanded symbols.

**Micro QR Code (Add 65536)**

If enabled, Micro QR Code will be active for this database index.

### **Aztec (Add 131072)**

If enabled, Aztec will be active for this database index.

### **Postal Symbologies (Add 262144)**

If enabled, Postal Symbologies will be active for this database index.

## **Morphology Operator**

*Definition:* Specifies the morphology operation (**erode, dilate, open, close**) used to pre-process the WOI.

*Serial Cmd:* <**K255**,index,exposure,gain,focal distance,pixel binning,row pointer,column pointer,row depth,column width,symbology,**morphology operator**,morphology size>

*Default:* **Disabled**

## **Morphology Size**

*Definition:* Specifies the morphology operator size to apply: **Small (3 x 3)**, **Medium (5 x 5)**, and **Large (7 x 7)**.

*Serial Cmd:* <**K255**,index,exposure,gain,focal distance,pixel binning,row pointer,column pointer,row depth,column width,symbology,morphology operator,**morphology size**>

*Default:* **Small(3 x 3)**



## Image Process Looping

*Usage:* Useful in applications where it is necessary to process a single captured image multiple times using different IP and decode parameters.

*Serial Cmd:* <**K256**,switch mode,frame count/time,**image process looping**,image dimensions>

*Default:* **Disabled**

*Options:* **0 = Disabled**                      1 = Enabled

### **Disabled**

When **Image Process Looping** is set to **Disabled**, an image is captured for every database configuration, whether or not any camera settings have been modified.

### **Enabled**

When **Image Process Looping** is set to **Enabled**, the last captured image frame is re-processed with the new IP and decode parameters. If camera settings have not been changed from the last capture event, and when a database configuration is loaded to current, active settings, no new image is captured.

**Note:** An exception to this is the first database index: a new image is always captured when the first database index is used. When a camera setting has been modified from one database setting to the next, a new image is captured. For example, if all database entries contained the same camera setting values but had different IP and decode parameters, an image frame would only be captured when the first database configuration was used.

## Image Dimensions

**Definition:** Determines how the image dimension parameters will be implemented.

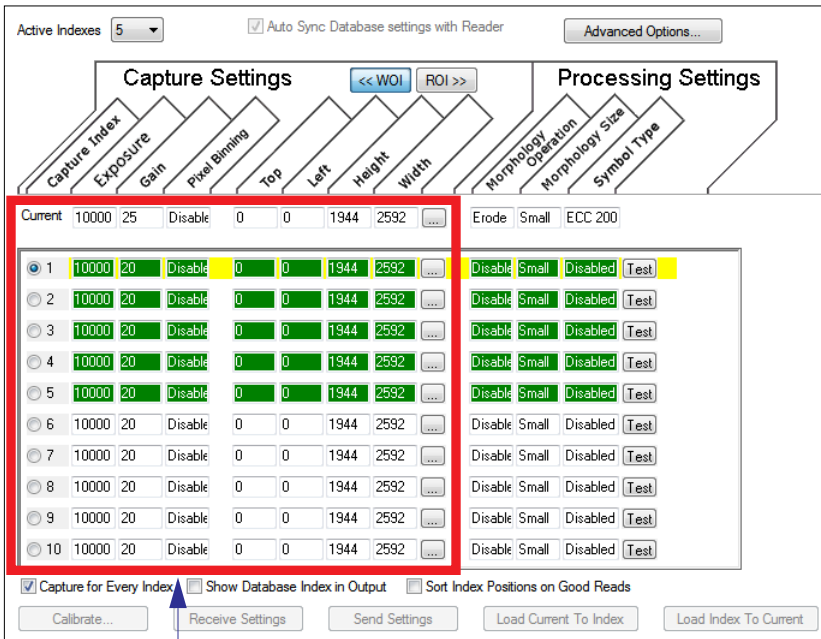
**Serial Cmd:** <K256,switch mode,frame count/time,image process looping,**image dimensions**>

**Default:** 0

**Options:** 0 = Window of Interest      1 = Region of Interest

### Window of Interest (WOI) by ESP

When **Image Dimensions** is set to **Window of Interest**, the database image dimension parameters are *camera settings*, and they determine the size of the image to be captured.



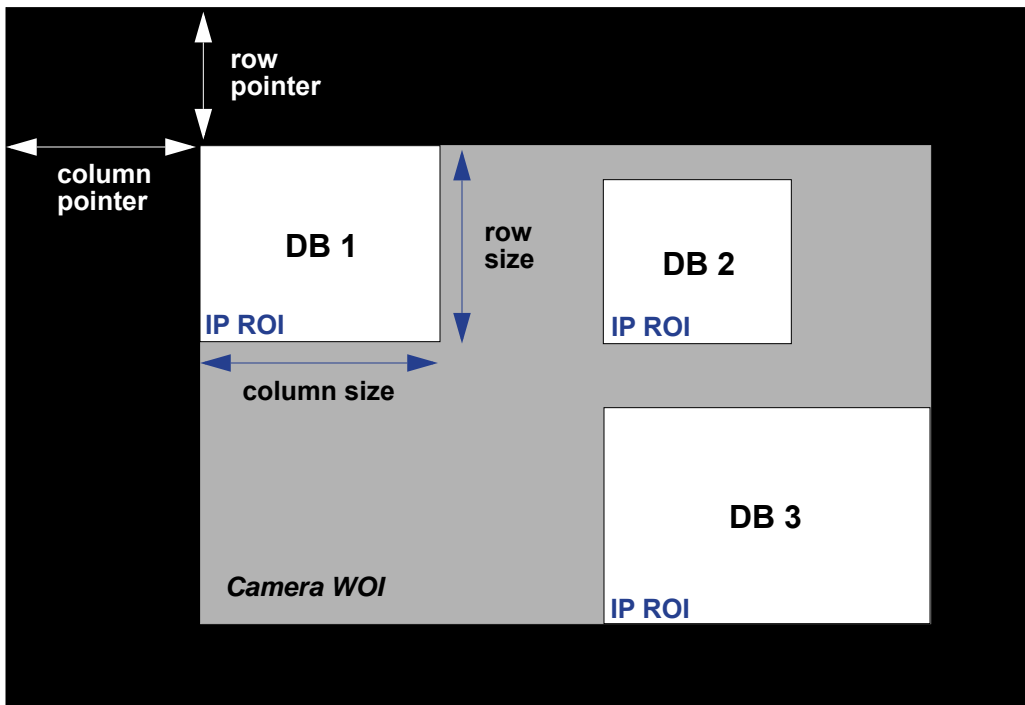
Camera settings (**Capture Index, Exposure, Gain, Pixel Binning**) located in the left half of the highlighted area.

Image capture dimensions located in the right half of the highlighted area.

### Region of Interest (ROI)

When **Image Dimensions** is set to Region of Interest, the database image dimension parameters are *IP and decode settings*, and they determine the region or area of the captured image to be processed.

**ROI** coordinate data is based on the full image size. The **WOI** of the captured image will be configured to cover all the ROI settings in the current, active database entry. In the following example, there are three active database settings, each with a different ROI configuration. Their coordinates are based at point 0,0 of the full scale image. In this example, **DB1** and **DB3** determine the size of the captured image WOI, while DB2 has no impact. The image WOI is not configurable. It is automatically set up by the database according to the ROI settings.



**Full Image Size (SXGA Reader: 1280 x 960; WVGA Reader: 752 x 480)**

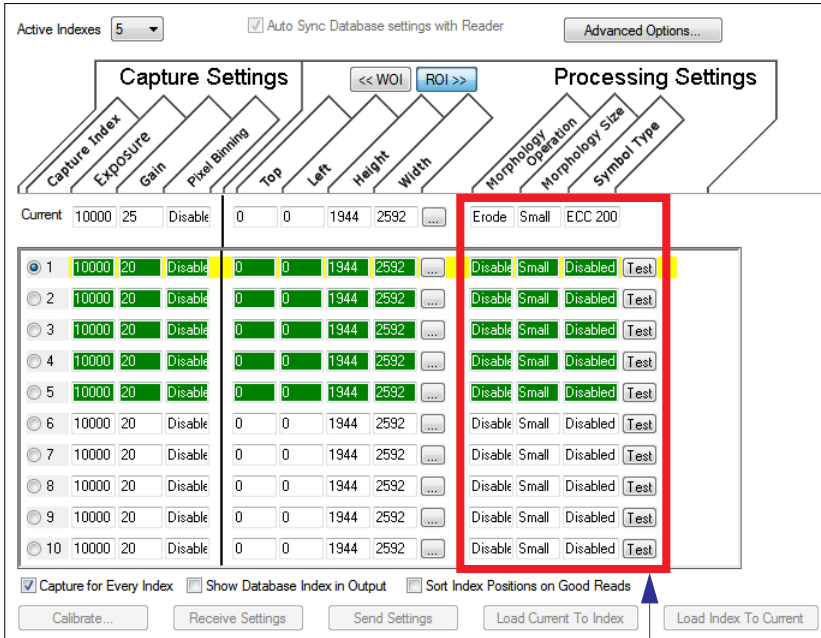
**Note:** Since the **ROI** parameters are not a camera setting, a change in **ROI** parameters from one index to another does *not* indicate an image capture event.

This feature is intended to be used in conjunction with **Image Process Looping**, to allow different regions of a captured image to be processed using different IP and decode settings.

Also, if this feature is used in conjunction with **Output Filtering**, multiple decoded symbols in a captured image frame can be output according to their location in the field of view.

## Region of Interest (ROI) by ESP

When **Image Dimensions** is set to Region of Interest, the database image dimension parameters are *IP and decode settings*, and they determine the region or area of the captured image to be processed.



**Morphology Operation, Morphology Size, and Symbol Type are Processing Settings values.**

## Save Current Settings to Configuration Database

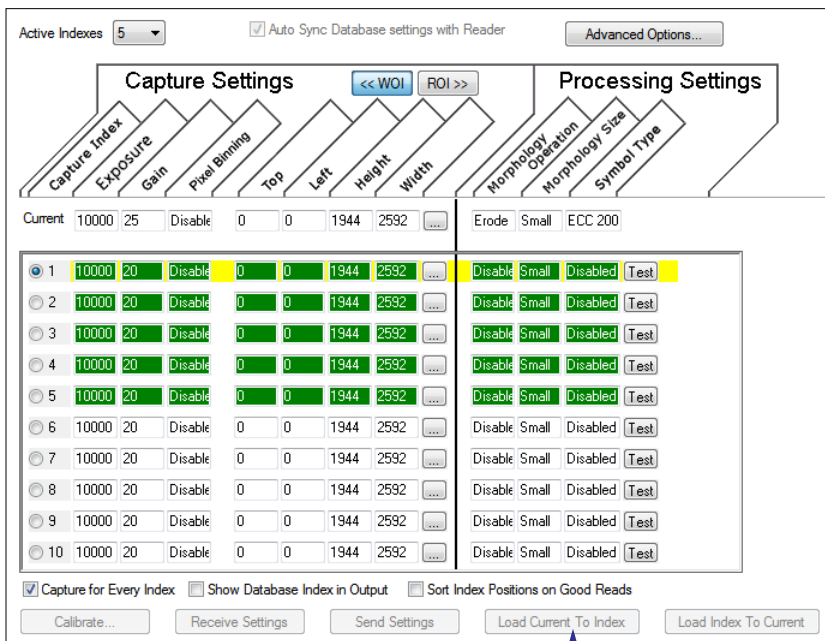
**Definition:** Allows current, active configuration settings to be saved to a selected database index.

**Serial Cmd:** <K255+,index>

**Example:**  
<K255+,5>

This command phrase saves the reader's current, active configuration settings to database index 5.

### Save Current Settings to Configuration Database by ESP



Click the **Load Current to Index** button to save the reader's current configuration parameters to the selected database index.

## Load Current Settings from Configuration Database

**Definition:** Allows the configuration settings contained in a selected database index to be loaded to current, active configuration settings.

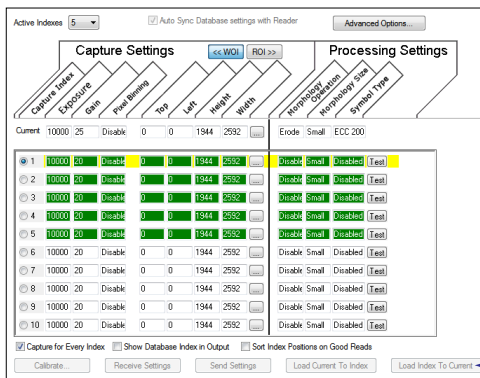
**Serial Cmd:** <K255-,index>

**Example:**

<K255-,5>

This command phrase loads the configuration settings contained in database index 5 to current, active configuration settings.

### Load Current Settings from Configuration Database by ESP



Click the **Load Index to Current** button to load configuration settings from the selected index to current, active settings.

### Notes on Symbol Type

- The **current** DataBar Expanded status does not change if it is configured as Enabled (Stacked) and the **database** DataBar Expanded status is Enabled.
- The **current** DataBar-14 status does not change if it is configured as Enabled (Stacked) and the **database** DataBar Expanded status is Enabled.
- Data Matrix ECC level is determined by the **current** settings and not by **database** settings. Therefore, the database does not know which ECC level to enable, and has no effect on current Data Matrix ECC settings.

## **Request Selected Index Settings**

*Definition:* Returns configuration settings for the selected database index.

*Serial Cmd:* <K255?,index>

*Example:*

<K255?,5>

This command phrase returns the configuration settings for database index 5.

## **Request All Configuration Database Settings**

*Definition:* Returns configuration settings for all indexes in the Configuration Database.

*Serial Cmd:* <K255?>

*Example:*

<K255?>

This command phrase returns the configuration settings for all 10 database indexes.

# Appendix O — Terminal

This section describes the **Terminal** window and macro functions in **ESP**.

## Terminal



Click this button to display the **Terminal** view.

This view will appear:

The screenshot shows the ESP software interface with the Terminal window open. The window title is "ESP - Untitled". The menu bar includes File, Model, Options, Connect, View, Terminal, and Help. The toolbar contains icons for EZ Mode, Autoconnect, Switch Model, Parameters, Setup, Terminal, and Utilities. The Terminal window itself has a blue background and a status bar at the bottom. Callouts point to various elements:

- Copy, paste, save**: Points to the top-left corner of the Terminal window.
- Clear screen**: Points to the top-left corner of the Terminal window.
- Type text here to find matching text in the Terminal window.**: Points to the search bar in the Terminal window.
- Terminal screen**: Points to the main blue area of the Terminal window.
- Type serial commands here.**: Points to the input field at the bottom of the Terminal window.
- Macros listed on this bar**: Points to the macro list bar at the bottom of the Terminal window.
- Click on desired Macro to run.**: Points to a macro in the list.
- Click on macros arrow to Add Macro, Remove Macro, or Edit Macro.**: Points to the arrow icon in the macro list bar.

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## Terminal

The **Terminal** screen allows you to send serial commands to the reader by using macros, by copying and pasting, or by typing commands in the **Send** text field.

The **Terminal** screen also displays symbol data or information from the reader.

You can also right-click on the **Terminal** screen to bring up a menu of further options.

## Find

The **Find** function allows you to enter text strings to be searched for in the **Terminal** window. For example, a series of symbols have been scanned into the **Terminal** view and you want to determine if a particular symbol whose data begins with “ABC” has been read.

1. Type “ABC” into the **Find** box.



2. Press **Enter**.

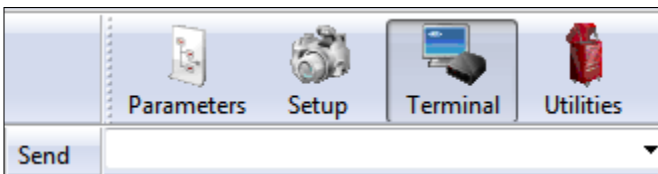
The first instance of “ABC” will be highlighted in the **Terminal** window.

3. Click the **Find** button to the left of the text field to locate additional instances of “ABC”.

## Send

The **Send** function allows you to enter serial commands and then send them to the reader.

1. Type the command into the **Send** box.

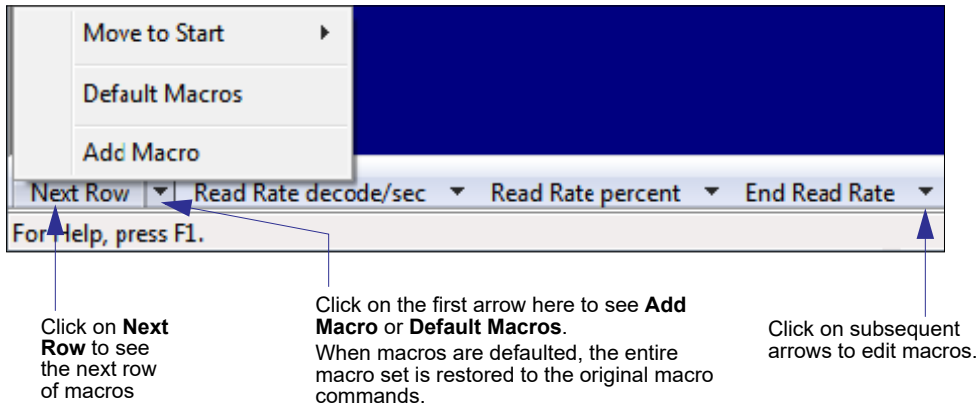


2. Press **Enter**.

3. Click the **Send** button to the left of the text field to send.

## Macros

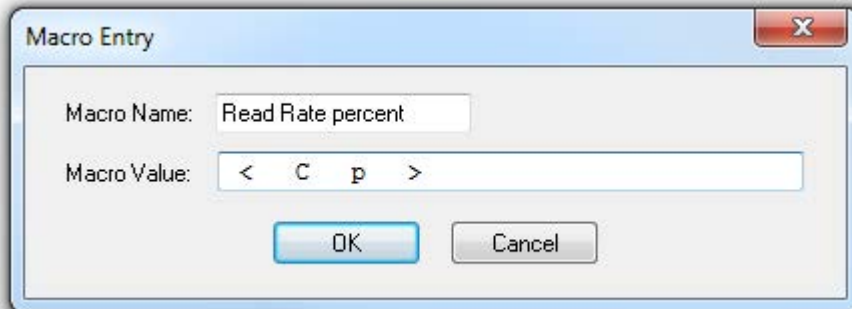
Macros can be stored in a macro selection bar, edited in a separate window, and executed by clicking on the macro name.



When you click on the macro name, the macro is executed in the **Terminal** window. If this is a command, it is sent to the reader at the same time that it is displayed.

## Editing a Macro

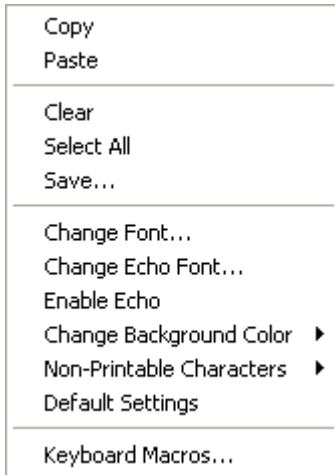
When you click the arrow next to any macro and select **Edit**, the following appears:



You can edit an existing macro or type in the **Macro Name** text field and define it in the **Macro Value** text field. Click **OK**.

## Terminal Menus

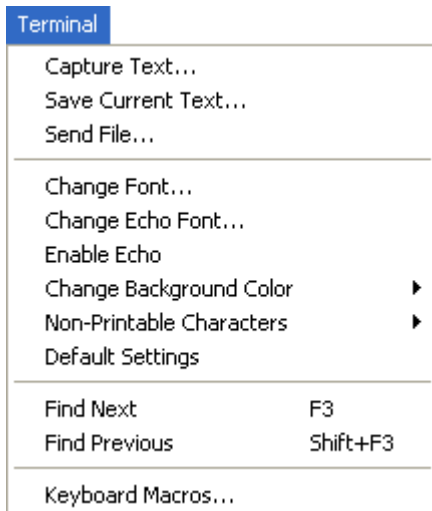
Right-click on the **Terminal** window to display the following menu:



- **Copy** selected text to clipboard.
- **Paste** from Terminal or other text.
- **Clear** all text in Terminal window.
- **Select All** text in the Terminal window.
- **Save...** brings up a **Save As** dialog.
- **Change Font...** of text in Terminal; brings up a **Font** dialog.
- **Change Echo Font...** to change typed text; brings up a **Font** dialog.
- **Enable Echo** enables Echo text (typed by user).
- **Change Background Color** of Terminal window.
- **Non-Printable Characters** allows you to hide non-printable characters, or to show them in **Standard** or **Enhanced** format.
- **Default Settings** returns all the above settings to default.
- **Keyboard Macros** allows you to create new keyboard macro commands that can be sent from function keys (F2, F4, F5, etc.).

## Terminal Dropdown Menu

The dropdown **Terminal** menu has **Capture Text**, **Save Current Text**, **Send File**, **Find Next**, and **Find Previous** functions, as well as the same functions defined above.



- **Capture Text...** lets you append data in real time to a text file of your choice. While in operation, the text file cannot be opened. You can select Pause to interrupt the capture flow or Stop to end the flow and open the file.
- **Save Current Text...** saves all text in the Terminal window to a text file.
- **Send File** allows you to browse for specific files and send them to the reader.
- **Find Next** searches for a user-defined section of text in the Terminal.
- **Find Previous** operates in the same way as Find Next, but searches backward through Terminal text.

# Appendix P — Utilities

Utility commands are generally commands that are performed during reader operations to check or determine read rates, or to perform miscellaneous operations on reader hardware. Serial utility commands are not prefaced with a “K” and a numeric code, nor do they require an initialization command (<A> and <Z>). They can be entered from within any terminal program or from **ESP’s Terminal** or **Utilities** windows.

## Operational Commands

**Note:** For a list of all K commands, see **Serial Configuration Commands**.

Type	Command	Name
Counter Request/Clear	<q>	No-Reads Per Read Cycle Counter
	<q0>	No-Reads Per Read Cycle Counter Reset
	<\$>	Mismatch Per Read Cycle Counter
	<\$0>	Mismatch Per Read Cycle Counter Reset
	<N>	No-Read Counter
	<O>	No-Read Counter Reset
	<T>	Trigger Counter
	<U>	Trigger Counter Reset
	<V>	Match Code Counter
	<W>	Match Code Counter Reset
	<X>	Mismatch Counter
Firmware Verification	<Y>	Mismatch Counter Reset
	<#>	Request All Part Numbers
	<#a>	Request Application Firmware Part Number
	<#b>	Request Boot Code Firmware Part Number
	<!>	Request All Firmware Checksums
	<!a>	Request Application Firmware Checksum
Read Rate	<!b>	Request Boot Code Firmware Checksum
	<!s>	Request Current Parameter Settings Checksum
	<C>	Decodes Per Second Test
	<Cp>	Decode Percent Test
Device Control	<J>	Exit Read Rate Tests
	<a1>	Preface PDF417 Output with Data Attributes
	<L1>	Pulse Programmable Output 1
Read Cycle Enable/Disable	<L2>	Pulse Programmable Output 2
	<L3>	Pulse Programmable Output 3
	<I>	End Current Read Cycle until <H>
	<H>	Enable Read Cycle after <I>
	<I1> <sup>1</sup>	Activate Targeting System
	<I0> <sup>2</sup>	Deactivate Targeting System

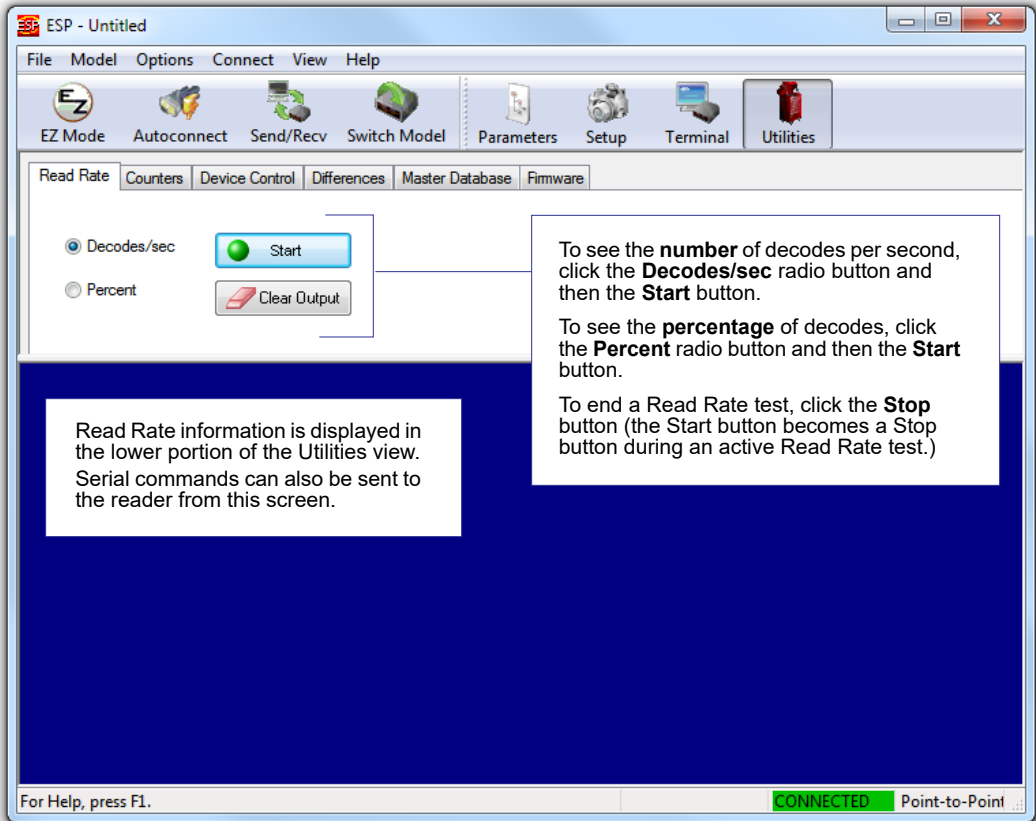
## Utilities

<b>Parameter Reset/Save</b>	<b>&lt;A?/1&gt;</b>	Complete Reset when Resets or Save for Power-On Command Has Been Issued
	<b>&lt;A?/0&gt;</b>	Warm Reset if Power-On Command Has Been Issued
<b>Resets</b>	<b>&lt;A&gt;</b>	Software Reset, Current Parameters Retained
	<b>&lt;Ard&gt;</b>	Software Reset, Recall Default Parameters except Communication and Custom Unit Name Parameters
	<b>&lt;Arp&gt;</b>	Software Reset, Recall Power-On Default Parameters
	<b>&lt;Arc&gt;</b>	Software Reset, Recall Customer Default Parameters
	<sup>1</sup> <b>&lt;l1&gt;</b>	= lowercase 'L', one
	<sup>2</sup> <b>&lt;l0&gt;</b>	= lowercase 'L', zero
<b>Save for Power-On</b>	<b>&lt;Z&gt;</b>	Software Reset, Save Current Settings for Power-On
	<b>&lt;Zc&gt;</b>	Software Reset, Save Current Settings as Customer Default Parameters
	<b>&lt;Zrc&gt;</b>	Software Reset, Recall Customer Default Parameters and Save for Power-On
	<b>&lt;Zrd&gt;</b>	Software Reset, Recall Microscan Default Parameters Except Communication and Custom Unit Name Parameters and Save for Power-On
	<b>&lt;Zrdall&gt;</b>	Software Reset, Recall Microscan Default Parameters Including Communication and Custom Unit Name Parameters and Save for Power-On
<b>Master Database</b>	<b>&lt;G&gt;</b>	Store Next Symbol Read to Database Index 1
	<b>&lt;Gn&gt;</b>	Store Next Symbol Read to Database Index <i>n</i>
	<b>&lt;NEWM&gt;</b>	New Master Load Status
<b>Reader Status</b>	<b>&lt;?&gt;</b>	Reader Status Request
<b>Train/Optimize</b>	<b>&lt;TRAIN&gt;</b>	Initiate Train Operation
	<b>&lt;UNTRAIN&gt;</b>	Initiate Untrain Operation
	<b>&lt;TRAIN?&gt;</b>	Train Status Request
	<b>&lt;OPT&gt;</b>	Initiate Optimize Operation
	<b>&lt;UNOPT&gt;</b>	Initiate Un-Optimize Operation
	<b>&lt;OPT?&gt;</b>	Display Optimize Status
<b>Barcode Configuration</b>	<b>&lt;BCCFG&gt;</b>	Enter Barcode Configuration
<b>Symbol Quality</b>	<b>&lt;VAL3&gt;</b>	ISO/IEC 15415 Grading Report
	<b>&lt;VAL4&gt;</b>	ISO/IEC 15416 Grading Report
	<b>&lt;VAL5&gt;</b>	ISO/IEC 29158 Grading Report

## Read Rate



Click the **Utilities** button and then the **Read Rate** tab to display the Read Rate view.



## **Read Rate Serial Utility Commands**

### ***Enter Decodes/Second Test***

Sending **<C>** instructs the reader to transmit the decodes per second and symbol data (if any). The decode rate can vary dramatically due to the angle and location of the symbol in relation to the field of view. This test is very useful in aligning and positioning the reader during setup.

### ***Enter Percent Test***

Sending **<Cp>** instructs the reader to transmit the percentage of decodes and any decoded symbol data.

### ***End Read Rate Test***

Sending **<J>** ends both the Percent test and the Decodes/Second test.

## Counters



Click the **Utilities** button and then the **Counters** tab to display the Counters view.

**Note:** All counter values will be lost if power is cycled, or if the reader receives a **Reset** or **Save** command.

Click the **Request** button to display the appropriate co

### Counters by Serial Command

#### **No-Read Counter**

Sending <N> displays the total number of No-Reads that have occurred since the last reset.

#### **No-Read Counter Reset**

Sending <O> sets the No-Read Counter to 0.

#### **Trigger Counter**

Sending <T> displays the total number of triggers since the last reset.

#### **Trigger Counter Reset**

Sending <U> sets the trigger counter to 0.

#### **Good Read/Match Counter (or Good Read Counter)**

Sending <V> displays the total number of good reads matching the master symbol, or, if **Master Symbol** is not enabled, the number of good reads since the last reset. This counter is always enabled, but will only work as a match count when **Master Symbol** is enabled. If **Master Symbol** is not enabled, this counter records the number of good reads. This count can be requested at any time.

#### **Good Read/Match Counter Reset**

Sending <W> sets the Match Counter to 0.

#### **Mismatch Counter**

Sending <X> displays the number of decoded symbols since the last reset that do not match the master symbol.

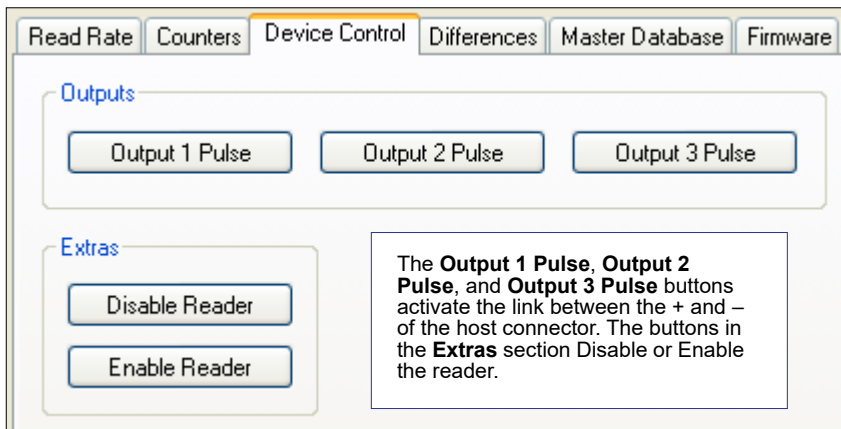
#### **Mismatch Counter Reset**

Sending <Y> sets the Mismatch Counter to 0.

## Device Control



Click the **Utilities** button and then the **Device Control** tab to display the Device Control view.



### Device Control by Serial Command

#### **Output 1 Pulse**

Sending **<L1>** activates the link between Output 1 (+) and Output 1 (-) of the host connector (regardless of Master Symbol or Output 1 status).

#### **Output 2 Pulse**

Sending **<L2>** activates the link between Output 2 (+) and Output 2 (-) of the host connector (regardless of Master Symbol or Output 2 status).

#### **Output 3 Pulse**

Sending **<L3>** activates the link between Output 3 (+) and Output 3 (-) of the host connector (regardless of Master Symbol or Output 3 status).

#### **Disable Reader**

Sending **<I>** will turn the reader OFF, end the current read cycle, and will not allow the reader to enter another read cycle until turned ON. This feature is useful during extended periods of time when no symbols are being decoded, or the reader is being configured. Disabling the reader will not affect any commands that have already been downloaded.

#### **Enable Reader**

Sending **<H>** will turn the reader ON and allow it to enter read cycles.

## Differences from Default



Click the **Utilities** button and then the **Differences** tab to display the Differences from Default view.

Clicking the **Differences from Default** button will cause **ESP** to check all stored configuration settings and compare them to default settings. All settings that are different than default will appear in the left column (shown below), and descriptions of those settings will appear in the right column.

Click this button for a list of **ESP** configuration settings that are different than default settings.

Click **Generate Bar Code** to display the **Bar Code Configuration**. Then create configuration symbols containing the required configuration commands.

Command	Description
<K200,3>	Mode (External Edge)
<K220,,50>	Read Cycle Timeout (50)
<K474h,2>	Code 128 (Edge to Edge)
<K810,3>	Output On (No Read)
<K811,1>	Output On (Good Read/Match)
<K812,2>	Output On (Mismatch)

Send configuration settings to the reader without saving by clicking **Send to Reader**.

Click **Save As** to save the report as plain text or a tab-delimited text file.

Send configuration settings to the reader and save in ESP by clicking **Send and Save**.

- To create a symbol containing any of the command settings in the table, click **Generate Bar Code**.
- To save the **Differences from Default** report, either as plain text or as a tab-delimited text file, click **Save As**.
- Click **Send and Save** to send the settings to the reader and save them, or **Send to Reader** to send the settings without saving them.

**Important:** To use **Differences from Default**, connect to the reader and **Receive Reader Settings** via the **Send/Recv** button on the toolbar.

# Master Database



Click the **Utilities** button and then the **Master Database** tab to display the Master Database view.

**Important:** The **Master Database** is used for all **Matchcode** modes except **Sequential** and **Wild Card**, both of which use **Master Database Index # 1**.

## Master Database Overview

Used where more than one master symbol is required, as in a **Multisymbol** setup, for matching and other **Matchcode** operations.

Allows the user to define up to 10 master symbols as the master symbol database, which can be entered by keyboard, scanned in, displayed, or deleted by serial or **ESP** commands.

1. Click the **Master Database** tab.
2. Enable **Matchcode Type**.
3. Set the **Master Symbol Database Size**.
4. Select the database index in which the master symbol will be entered.
5. Do one of the following to enter master symbol data:
  - a. Double-click the index row to type data directly into the index.
  - b. Click the **Read Symbol into Selected Index** to enter the next decoded symbol.

The screenshot shows the 'Master Database' tab in a software application. It includes a 'Master Symbol Database Size' spinner set to 5, a checked 'Matchcode Type' checkbox, and buttons for 'Read Symbol into Selected Index', 'Receive Reader's Database', and 'Send Database to Reader'. Below these is a table with 5 rows of master symbols. Callout boxes provide instructions: 'Set Master Symbol Database Size here.' points to the spinner; 'Loads the next symbol decoded into the selected index.' points to the 'Read Symbol into Selected Index' button; 'Loads the reader's saved master symbols into ESP.' points to the 'Receive Reader's Database' button; 'Saves the database to the reader.' points to the 'Send Database to Reader' button; and 'Double-click a row to enter data into popup text box.' points to the first row of the table.

Index	Master Symbol Data
1	Master Symbol 1
2	Master Symbol 2
3	Master Symbol 3
4	Master Symbol 4
5	Master Symbol 5

Caution: Since the total number of characters available for the master symbol database is limited, changes to the Master Symbol Database Size will re-allocate the number of characters available for each master symbol and could cause existing master symbols to be deleted. See manual for details.

## Master Symbol Database Size

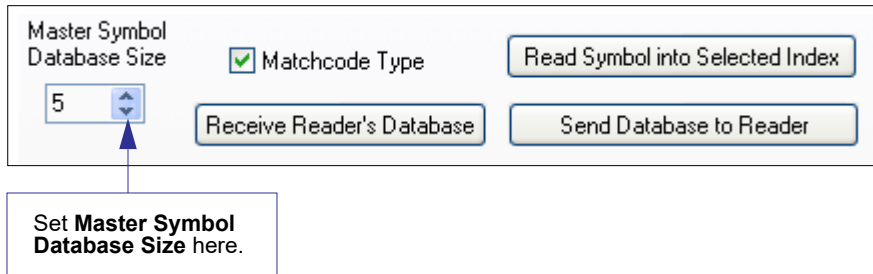
**Definition:** **Number of Master Symbols** allows you to select **1** to **10** master symbols for the master symbol database.

**Serial Cmd:** **<K231, master symbol number, master symbol data>**

**Note:** You must follow this command with a save command **<A>** or **<Z>**.

**Default:** **1**

**Options:** 1 to 10



**Caution:** Since the total number of characters available for the master symbol database is **3000**, changes to the **Master Symbol Database Size** will re-allocate the number of characters available for each master symbol and could cause existing master symbols to be deleted (except master symbol #1, unless it also exceeds the size limitation).

The table below specifies the maximum number of characters available to each symbol according the number of master symbols defined, from 1 to 10.

<b>Master Symbol Number</b>	<b>Maximum Characters</b>	<b>Master Symbol Number</b>	<b>Maximum Characters</b>
# 1	3000	# 6	500
# 2	1500	# 7	428
# 3	1000	# 8	375
# 4	750	# 9	333
# 5	600	# 10	300

## Enter Master Symbol Data

**Usage:** Allows you to enter master symbol data for any enabled master symbol index number (1 to 10), provided the total number of characters does not exceed the maximum allowed.

**Serial Cmd:** <**K231**,*master symbol number*,*master symbol data*>

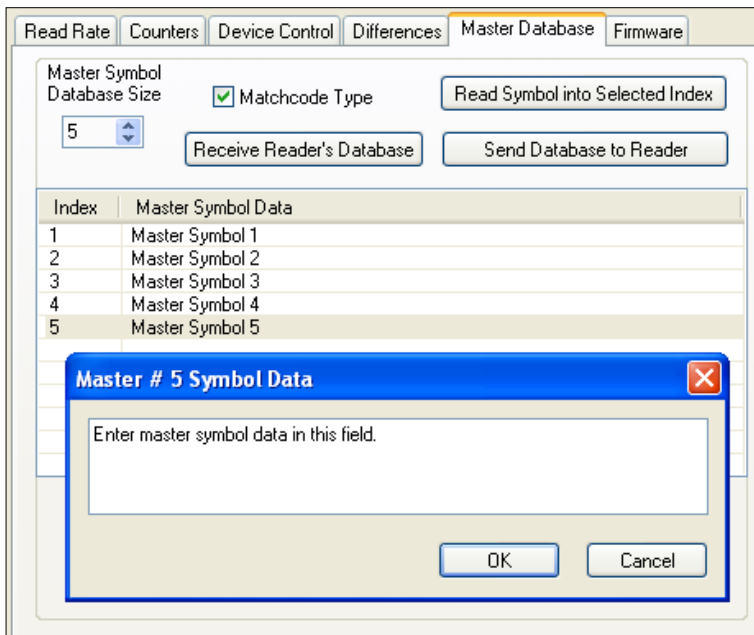
**Options:** Enter data for 1 to 10 symbols (any combination of ASCII text up to the maximum allowed).

For example, to enter data for master symbol 9, after making certain that master symbol database size is enabled for 9 or more symbols, send <**K231**,**9**,*data*>.

**Important:** The ASCII characters <, >, and, can only be entered as hex values.

**Caution:** If no data is entered, the existing data will be deleted.

- ESP:**
1. Open the **Utilities** menu.
  2. Set the number of master symbols you want to create in **Master Symbol Database Size**.
  3. Double-click on each symbol number you want to set up and copy, or type your data in the popup dialog and click **OK**.



4. When all your data has been entered, click the **Send Database to Reader** button.

## Request Master Symbol Data

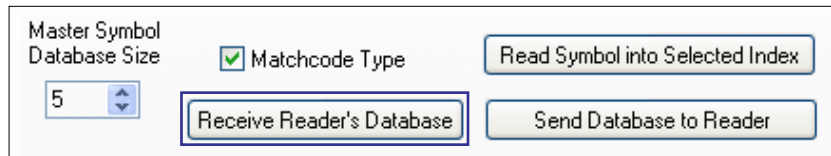
**Definition:** Returns master symbol data for any enabled master symbols from 1 to 10. For example, to request master symbol # 5, enter **<K231 ?,5>**. The reader transmits master symbol # 5 data in brackets in the following format: **<5/>**. If no master symbol data is available, the output will be: **<5/>**.

**Serial Cmd:** **<K231 ?,master symbol number>**

**Caution:** Be sure to add the ? or you will delete the master symbol.

**Note:** This command returns the number of master symbols if no number is included.

- ESP:**
1. Click the **Utilities** button and the **Master Database** tab.
  2. Click the **Receive Reader's Database** button.



## Request All Master Symbol Data

**Definition:** This command will return master symbol data for all symbols enabled (up to 10).

**Serial Cmd:** **<K231 ?>**

## Read Next Symbol as Master Symbol

**Definition:** After you've set the size in the database, you can order the reader to read the next symbol as the master symbol for any given master symbol number.

**Serial Cmd:** **<Gmaster symbol number>**

To store the next symbol decoded as master symbol # 1, send:

**<G>** or **<G1>**.

To store the next symbol decoded as the master symbol for any other master symbol database number, send:

**<Gmaster symbol number [1-10]>**.

For example, **<G5>** will cause the next symbol read to be entered as master symbol # 5.

- ESP:**
1. In the **Master Database** tab under the **Output Format** menu, select the master symbol index number in which you want to store the symbol data.
  2. Click the **Read Symbol into Selected Index** button.

**Caution:** If you've selected an index which already has existing data, that data will be copied over by new decoded data when you use this command.

## Request New Master Status

*Usage:* Informs the user when a new master symbol is pending and which position it is in.

*Definition:* Returns the position in the master symbol database that will be loaded on the next read.

*Serial Cmd:* <NEWM>

The reader returns: <NEWM/*next master to load*>

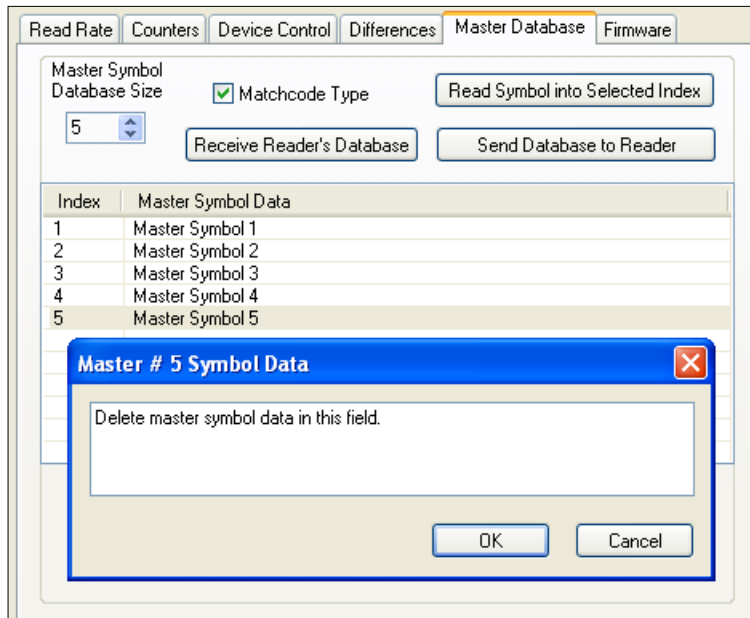
Once a symbol has been read and loaded, the status will be cleared and the response will be <NEWM/0>.

(See also **New Master Pin** in **Matchcode**.)

## Delete Master Symbol Data

**Definition:** You can directly delete the master symbol data by serial command or by **ESP**.

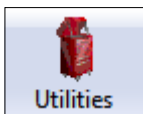
- ESP:**
1. Click the **Utilities** button to access the master symbol.
  2. Click the **Master Database** tab and double-click the symbol number you want to delete.
  3. Delete text and click **OK**.



**Serial Cmd:** **<K231, master symbol number,>**

To delete a master symbol, enter the database number and a comma, but leave the data field empty. For example, to delete master symbol # 5, send the following: **<K231,5,>**. The command is entered with a blank master symbol data field, which tells the reader to delete the selected master symbol from the database.

## Firmware



Click the **Utilities** button and then the **Firmware** tab to display the Firmware view.

Read Rate Counters Device Control Differences Master Database **Firmware**

**Firmware Update**

App Code [v] Start...

**Firmware Verification**

App Code [v] Request Part No. [ ]

App Code [v] Request Checksum [ ]

### Firmware Update

Application code versions are specific to your reader. Consult with your sales representative before downloading application code. If needed, an application code file will be sent to you.

#### To download application code:

1. First, be sure that your reader is connected to the host.
2. Apply power to the reader.
3. Before updating, you should verify the current firmware.
4. Click in the Firmware Update text box and select the file type you want to download. This will open a file locator box.
5. Navigate to the appropriate file, open the file and click **Start**.

**Caution:** Do not interrupt power or disconnect the host cable while download is in progress. Be sure that each download is complete before moving on to the next.

**Important:** When updating firmware, be sure that the application code and boot code versions are mutually compatible.

## Firmware Verification

### Request Part Number by ESP

You can send a request to the reader for part numbers, checksums, boot code, and application code.

1. Click the **Firmware** tab.
2. From the dropdown selection box to the left of the **Request Part No.** button, make your selection.
3. Select the code type to see its part number displayed in the text field to the right of the **Request Part No.** button.

The screenshot shows a software interface titled "Firmware Verification". It contains two rows of controls. The top row features a dropdown menu labeled "App Code" with a downward arrow, a button labeled "Request Part No.", and an empty text input field. The bottom row features a similar dropdown menu labeled "App Code", a button labeled "Request Checksum", and another empty text input field. The "Request Part No." button in the top row is highlighted with a blue border.

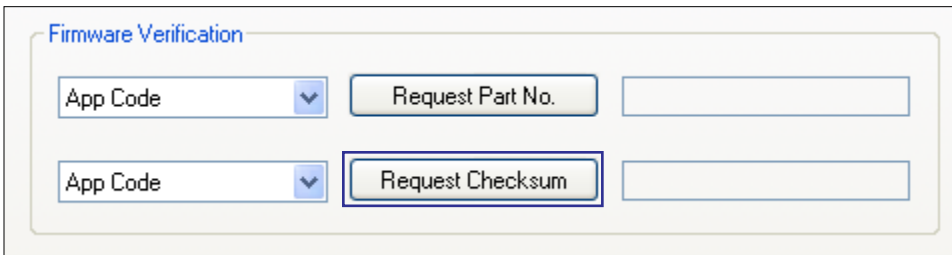
### Request Part Number by Serial Command

- When you send **<#>** (a request for all product part numbers), the reader returns: **<#b/BOOT\_P/N><#a/APP\_P/N><#p/PROFILE\_P/N>**.
- When you send **<#a>** (a request for the application code part number), the reader returns: **<#a/APP\_P/N>**.
- When you send **<#b>** (a request for the boot code part number), the reader returns: **<#b/BOOT\_P/N>**.
- When you send **<#p>** (a request for profile module part numbers), the reader returns: **<#p/PROFILE\_P/N>**.

### Request Checksum by ESP

You can send a request to the reader for part numbers, checksums, boot code, and application code.

1. Click the **Firmware** tab.
2. From the dropdown selection box to the left of the **Request Checksum** button, make your selection.
3. Select the code type to see its checksum displayed in the text field to the right of the **Request Checksum** button.



### Request Checksum by Serial Command

- When you send `<!>` (a request for all available firmware checksums), the reader returns: `<!b/BOOT_CHECKSUM><!a/APP_CHECKSUM><!p/PROFILE_CHECKSUM>`
- When you send `<!a>` (a request for the application code checksum), the reader returns: `<!a/APP_CHECKSUM>`
- When you send `<!b>` (a request for the boot code checksum), the reader returns: `<!b/BOOT_CHECKSUM>`
- When you send `<!p>` (a request for profile module checksum), the reader returns: `<!p/PROFILE_CHECKSUM>`

## Default/Reset/Save

Understanding and controlling your reader's active, saved, and default settings is critical to its successful operation.

	<i>Function</i>	<i>Serial Cmd</i>	<i>ESP (first, right-click in any menu tree)<sup>a</sup></i>
<b>Resets (not saved for power-on)</b>	Reset	<A>	Save to Reader, Send No Save
	Reset and Recall Microscan Defaults	<Ard>	No
	Reset and Recall Power-On Parameters	<Arp>	No
	Reset and Recall Customer Default Parameters	<Arc>	No
<b>Saved for Power-on</b>	Save Current Settings for Power-On	<Z>	Save to Reader, Send and Save
	Save Current Settings as Customer Default Parameters for Power-On	<Zc>	Save to Reader, Send and Save Customer Defaults for Power-On <sup>b</sup>
	Recall Microscan Default Parameters and Save for Power-On	<Zrd>	No
	Recall Customer Default Parameters and Save for Power-On	<Zrc>	No

a. When you right-click in a menu tree and select **Default Current Menu Settings** or **Default All ESP Settings**, it is important to note that only **ESP** settings are defaulted. To save these defaults to the reader itself, you need to follow up with a **Save to Reader, Send and Save** command.

b. Only available in ESP if enabled under the Options dropdown menu.

### Resets

Resets (“A” commands) affect only the current settings (active memory) and are not saved for power-on.

### Saved for Power-on

Power-on parameters (“Z” commands) are saved to NOVRAM and recalled and loaded into current parameters when power is cycled to the reader or the <Arp> command is issued.

### Defaults

Defaults are Microscan firmware settings or saved customer settings that can be recalled, either by software or hardware reset.

## Customer Default Parameters

Customer default parameters (saved by **<Zc>**) are the same set of parameters as power-on parameters but are saved in a different, isolated section of NOVRAM. This allows a user essentially to create a backup set of parameters that can be recalled in the event that the current parameters or power-on parameters have been accidentally changed or are no longer desired.

It is important to note that a hardware default does not affect customer default parameters. For example, a user that has inadvertently changed communication settings and saved them with a **<Z>** command, may not know the correct settings or have the capability to communicate within those settings. By first doing a hardware default to restore the known Microscan defaults, the user can then recall the previous customer saved settings with an **<Arc>** or **<Zrc>** command.

## Microscan Default Parameters

Microscan default parameters are contained in the firmware and cannot be changed.

### **Software Defaults**

Microscan default parameters can be recalled (loaded into current settings) with **<Ard>** command or recalled and saved for power-on with the **<Zrd>** command.

### **Hardware Default**

If a software default and reset is not possible, it may be necessary to reset the reader by shorting (connecting) specific pins. This procedure has the same effect as the **<Zrdall>** software command.

**Important:** For this reset to occur, this command must be executed within 60 seconds of a power-on or a reset.

1. Apply power to the reader.
2. Locate Pin 3 (Default) and Pin 7 (Ground) on the connector. (Access depends on wiring configuration. May require an accessory cable).

**Caution:** Be certain that the correct pins are located. Connecting the wrong pins could cause serious damage to the unit.

3. Momentarily connect the wires (or pins).
4. Within 3 seconds, disconnect and then reconnect the two wires again.

## Reader Status Requests

### <?> Status Byte

The reader responds to a status request <?> with a two character hex value, such as <?/22>. To determine status:

1. Look up the binary conversion in the table below.

For example, the first hex **2** would be **0 0 1 0** in binary, as read from binary digits **3** through **0**; the second hex **2** is also **0 0 1 0** as read from binary digits **7** through **4**.

2. Next, enter your binary values from the table below in the “Binary” column next to the appropriate bit.

Bit	Binary	Reader Status
0	0	Command error detected
1	1	Command received
2	0	Communication error detected
3	0	Flash sector unprotect failure
4	0	Host port buffer overflow
5	1	Reader is in a read cycle

Hex Value	Binary Bit Digits			
	7	6	5	4
	3	2	1	0
0	0	0	0	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0
9	1	0	0	1
A	1	0	1	0
B	1	0	1	1
C	1	1	0	0
D	1	1	0	1
E	1	1	1	0
F	1	1	1	1

3. Under “Binary,” interpret **1s** as true and **0s** as not true. For example, bit 1 has a **1** in the “Binary” column, indicating “Command Received”. Bit 5 is also a **1**, indicating that the “Reader is in a read cycle”.

### <K?> All Status Request

This is the fastest way to learn the reader’s current configuration. Sending this request will return the current settings of all commands, starting with the lowest K command value and ending with the highest K command value.

### <K??> All Descriptor Status Request

This request will return all current descriptors for every K command, starting with the lowest K command value and ending with the highest K command value.

### <K?#> All Range Status Request

This request will return the current settings of all commands within the user-defined range, starting with the lowest user-defined K command value and ending with the highest user-defined K command value.

### **<Knnn?> Single Status Request**

This request will return the value of the variables associated with the requested K command. The request of a single entry of a database command cannot exceed the number of database slots for the specific command.

### **<Knnn??> Single Descriptor Status Request**

This request returns the basic functional description of all fields in the requested K command.

### **<Knnn?#> Single Range Status Request**

This request will return the value range and storage type description of all fields in the requested K command.

### **<Knnn?\*> Display Command Wildcard**

This request will return the individual K command status, description, and range for each parameter.

## Other Operational Serial Commands

The following serial utility commands can be entered from **Terminal** or a PLC:

### Train and Optimize

#### **Train Symbol**

Format: **<TRAIN>**: Initiates a Train operation.

This command will put the product into a mode of operation that will cause it to “train” the next symbol decoded. This mode of operation will remain active until either a symbol is decoded or the call is made to disable the mode and revert back to normal operation. Upon decoding a symbol, the image processing will save pertinent information regarding the target symbol to allow higher readability for the similar symbols.

The data collected by the Train operation can be saved for a power-on condition, using the **<Z>** command.

#### **Un-Train Symbol**

Format: **<UNTRAIN>**: Initiates an Un-Train operation.

This command will cause the product to discard any information acquired during a Train operation. The Untrained state can be saved for a power-on condition, using the **<Z>** command.

#### **Train Status**

Format: **<TRAIN?>**: Responds with Train Status

This command will return the current status of the TRAIN operation.

Response: **< TRAIN,0>**: Default, not trained

**<TRAIN,1>**: Train operation in process

**<TRAIN,2>**: Symbol trained

#### **Train Persistence**

The train state and parameters persist the same as ordinary parameters. Examples:

- A unit in the trained state has not been saved. A power cycle will remove any trained state information and the unit will come up in its configured state.
- A unit is saved in a training state. The unit will come from power up in the training state and train the first symbol read.
- A unit is saved in a trained state. The unit will come from power up in the trained state and only read the trained symbol type.
- A trained unit is issued a reset default command **<Ard>**. The unit will return to an untrained state but if power is cycled will return to its saved state.

### **Optimize Symbol**

Format: **<OPT>** Initiates an Optimize operation.

This command will put the product into a mode of operation that will cause it to “optimize” the next symbol decoded. This mode of operation will remain active until either a symbol is decoded or the call is made to disable the mode and revert back to normal operation.

Upon decoding a symbol, the image processing will save pertinent information regarding the target symbol to allow it to be processed quicker and more consistently.

The data collected by the Optimize operation can be saved for a power-on condition, using the **<Z>** command.

### **Un-Optimize Symbol**

Format: **<UNOPT>**: Initiates an Un-Optimize operation.

This command will cause the product to discard any information acquired during a Optimize operation. The Un-Optimized state can be saved for a power-on condition, using the **<Z>** command.

### **Optimize Status**

Format: **<OPT?>**: Responds with Optimize Status

This command will return the current status of the OPT operation.

Response: **<OPT,0>**: Default, not optimized

**<OPT,1>**: Optimize operation in-process

**<OPT,2>**: Symbol optimized

### **Optimize Persistence**

The Optimize state and parameters persist the same as ordinary parameters. Examples:

- A unit in the optimized state has not been saved. A power cycle will remove any optimized state information and the unit will come up in its configured state.
- A unit is saved in a optimizing state. The unit will come from power up in the optimizing state and optimize the first symbol read.
- A unit is saved in a optimized state. The unit will come from power up in the optimized state and only read the optimized symbol type.
- A optimized unit is issued a reset default command **<Ard>**. The unit will return to an un-optimized state but if power is cycled will return to its saved state.

## **Y-Modem Upload Transfer Options**

**<uy,path,filename>**

## **Y-Modem Download Transfer Options**

**<dy,path,filename>**

## Image Library Request

<op,9> Manages files in a selected directory.

<i>File Source</i>	<i>Explanation</i>
<b>(Nothing)</b>	All files in “root” directory
<b>/</b>	All files in “root” directory
<b>/saved</b>	All files in “saved” directory
<b>*.*</b>	All files in all directories
<b>/del</b>	Deletes all files in the root directory
<b>/saved/del</b>	Deletes all files in the saved directory
<b>del*.*</b>	Deletes files in all directories

## Bar Code Configuration Mode

*Definition:* **Bar Code Configuration Mode** is a way of programming the reader by using ECC 200 Data Matrix symbols.

*Serial Cmd:* **<BCCFG>**

**Bar Code Configuration Mode** can be entered in two different ways:

1. By forcing the reader into **Bar Code Configuration Mode** by serial command **<BCCFG>**.
2. By reading a Data Matrix symbol with a special code word used by ISO/IEC 16022 to signify reader programming. This can be either in a regular read cycle or during a read rate test. Reading this symbol in the calibration routine will have no effect.<sup>1</sup>

Once **Bar Code Configuration Mode** has been entered, the Data Matrix symbols can be thought of as serial data. You can configure the reader by printing labels in Omron Microscan’s serial command format. Commands are processed as if the data were streamed in through the serial port. The reader will acknowledge the symbol with a green flash, and echo the serial data to the host. If the command causes the reader to produce more serial output, such as serial verification or counter requests, the data will be routed to the host port.

**Bar Code Configuration Mode** can be exited by any reset **<A>**, **<Z>** or **<J>** command.

The command to exit **Bar Code Configuration Mode** can be included as part of the Data Matrix symbol. For example, try encoding **<K200,4><K220,1><J>** into a Data Matrix symbol. This configures the reader to enable **Serial Trigger Mode**, to program a new trigger to end the read cycle, and to exit **Bar Code Configuration Mode** with **<J>**.

**Note:** When the system is in barcode configuration mode, 2D symbols are allowed to pass through even if the reader only has a 1D license. The system outputs a **Config Code Received** message when the configuration symbol is decoded instead of showing the configuration symbol’s actual symbol data. A **>** character is output to the Terminal to indicate that the system is ready for bar code configuration mode.

1. In normal reading modes, it is required to read a special Data Matrix symbol with a special codeword used by ISO/IEC 16022 to signify reader programming.

## Appendix Q — Output Format

This section explains how to control the formatting and filtering of decoded symbol data for output.

### Output Format Serial Commands

Format Extract	<K740,output index,start location,length>
Format Insert	<K741,output index,length,hex string>
Format Assign	<K742,symbol number,status>
Format Status	<K743,output format status>
Output Filter Configuration	<K744,filter number,symbology,length,wildcard,placeholder,data,unused,database index>
Output Format Count	<K745,number of filters>

## Output Format Status

**Definition:** This is a global enable/disable parameter. In order to use formatting you must set up the format using the insert and extract commands, and you must also assign a symbol to format using the **Format Assign** command.

**Serial Cmd:** <K743,output format status>

**Default:** Disabled

**Options:** 0 = Disabled                      1 = Enabled

### Output Format Status Disabled

When **Output Format Status** is set to **Disabled**, output formatting is globally disabled.

### Output Format Status Enabled

When **Output Format Status** is set to **Enabled**, output formatting is enabled. However, **Format Assign**, **Format Insert**, and **Format Extract** must be properly set up as well.

### Output Format Status by ESP

On the **Output Format** tab, check the **Enable Output Format** box.

The screenshot shows the 'Output Format' configuration window. The 'Output Format' tab is active. The 'Enable Output Format' checkbox is checked. The 'Auto Sync with Reader' checkbox is also checked. The 'Set Number of Symbols' is set to 1. The 'Output Phrase' section shows a 'Preamble' of 'CR', a 'Symbol #1' represented by a QR code, and a 'Postamble' of 'CR LF'. All three checkboxes ('Enable', 'Parse', 'Enable') are checked. At the bottom, there are buttons for 'Parse Symbols...', 'Send and Save', 'Receive', and 'Quality Parameters...'. A 'Show Parse Table' link is also visible.

## Format Assign

### Symbol Number

**Definition:** **Symbol Number** refers to the number of the symbol to which output formatting will apply. For example, if you wish to enable user-defined formatting to symbol # 2 in a multisymbol read cycle, you would send the command **<K742,2,1>**.

Note that the number of symbols may exceed the format capabilities.

**Serial Cmd:** **<K742, symbol number, status>**

**Options:** 1 to 10  
1 = Formatted output status for symbol # 1.  
2 = Formatted output status for symbol # 2.  
...  
10 = Formatted output status for symbol # 10.

### Status

**Definition:** **Status** refers to the user-defined formatting of a selected symbol position in the read cycle result. Note that there is also a global formatting “enable” command that must be set for the formatting to be applied.

**Serial Cmd:** **<K742, symbol number, status>**

**Default:** **Disabled**

**Options:** **0 = Disabled**            1 = Enabled (Assign parameters to specified symbol.)

### Format Assign by ESP

Enable Output Format

Set Number of Symbols: 5

Use the **Set Number of Symbols** spin box to determine the number of symbols to be included in the output phrase.

Output Phrase

Preamble:  Symbol #1  Parse Symbol Separator:  Symbol #2  Parse Symbol #3  Parse Symbol #4  Parse Symbol #5  Parse Postamble:   Enable

Then check the **Parse** boxes beneath the symbols that you wish to format for user-defined output.

---

## Format Extract

### Output Index

*Definition:* **Output Index** refers to the database entry you wish to modify with this command. A formatted output is built by *extracting data from a symbol's original data output* and/or inserting user-defined characters.

It may be helpful to think of individual indexes as positions in the final formatted output you wish to build. Starting with index # 1, enter either an extract or insert command to begin building your desired output string. Then, with the next index number, enter either an extract or insert command to continue building the output string. Continue this process until you are finished building the string.

*Serial Cmd:* <**K740,output index,start location,length**>

*Options:* 1 to 100

### Start Location

*Definition:* Defines the location within the symbol data where the character extraction will begin. The first character extracted will also be the first character in the sequence displayed in user-defined output.

*Serial Cmd:* <**K740,output index,start location,length**>

*Default:* **0 (disabled)**

*Options:* 0 to *n* (maximum number of characters in the symbol data).

### Length

*Definition:* Defines the length (in consecutive characters) that will be extracted and placed in user-defined output.

*Serial Cmd:* <**K740,output index,start location,length**>

*Default:* **0 (disabled; end of format cell array)**

*Options:* 0 to *n* (maximum number of characters in the symbol data).

## Format Extract by ESP

Parse Symbols... Send and Save Receive Quality Parameters...

▼ Hide Parse Table

Build Sequence: Test

Step	Insert Data	Extract Range
Extract		2 - 4

Sample Symbol:  
Original: ABCDEFGHIJKLMNOPQRSTUVWXYZ0123456789  
Output: BCD

**Symbol Parse**

Step	Insert Data	Extract Range
Extract		2 - 4

Add Insert Step Add Extract Step  
Remove Step Clear All Parsing

Sample Symbol:  
Original: ABCDEFGHIJKLMNOPQRSTUVWXYZ0123456789  
Output: BCD

OK Cancel

The **Extract Range** function corresponds to the **Start Location** and **Length** parameters in the **Format Extract** serial command.

Multiple character sequences can be extracted and inserted using **Symbol Parse**. In this example, the selected extraction range is characters 2-4. The “Sample Symbol” example on the **Symbol Parse** dialog shows the selected character positions extracted and output as desired. Simultaneously, the data string from the selected symbol is displayed at the bottom left of the **Parse Table**, followed by the user-defined extracted output.

## Format Insert

### Output Index

**Definition:** **Output Index** refers to the database entry you wish to modify with this command. A formatted output is built by extracting data from a symbol's original data output and/or *inserting user-defined characters*.

It may be helpful to think of individual indexes as positions in the final formatted output you wish to build. Starting with index # 1, enter either an extract or insert command to begin building your desired output string. Then, with the next index number, enter either an extract or insert command to continue building the output string. Continue this process until you are finished building the string.

**Serial Cmd:** <**K741**,**output index**,length,hex string>

**Options:** 1 to 100

### Length

**Definition:** Specifies the length of the user-defined character string that will be inserted. This function is limited to 4 characters per output index, so multiple indexes must be entered in order to insert longer character sequences.

For example, if you wish to insert a 10 character sequence in user-defined output, you would need three commands with consecutive index numbers, where the first two character sequence lengths were 4 and the third was 2.

**Serial Cmd:** <**K741**,**output index**,length,hex string>

**Default:** 0 (disabled; end of format cell array)

**Options:** 0 to 4

### Hex String

**Definition:** Specifies a character string that represents ASCII characters to be inserted in the database entry. Two hex characters are required for every ASCII character to be inserted in the user-defined output string. These two characters comprise the hex (base 16) value of the ASCII character.

For example, if you wanted to enter the three-character sequence "Hi!" you would enter **3** for the length of the string, and a hex sequence of **486921** for the ASCII sequence to be inserted. (48 = H; 69 = i; 21 = !)

**Important:** Each pair of hex characters represents one ASCII character. Hex character pairs range from 00 to FF. Since you are limited to 4 ASCII characters per insertion per database entry, you are likewise limited to 8 hex characters per insertion per database entry.

**Serial Cmd:** <**K741**,**output index**,length,hex string>

**Default:** NUL (00 in hex)

**Options:** 00 to FF (As many as 4 bytes, or hex values.)

## Format Insert by ESP

**Symbol Parse**

Step	Insert Data	Extract Range
Insert		

Sample Symbol:  
 Original: ABCDEFGHIJKLMNOPQRSTUVWXYZ0123456789  
 Output:

SP SP

SOH	STX	ETX	EOT	ENQ
ACK	BEL	BS	HT	LF
VT	FF	CR	SO	SI
SI	DC1	DC2	DC3	DC4
NAK	SYN	ETB	CAN	EM
SUB	ESC	FS	GS	RS
US	SP			

Click 'Delete' to remove characters.

The **Insert** process is very similar to the **Extract** process, except that **Insert** allows the user to enter characters using the **Insert** calculator (shown above).

Hide Parse Table

Build Sequence:

Step	Insert Data	Extract Range
Insert	SP SP	
Extract		3 - 5

Sample Symbol:  
 Original: ABCDEFGHIJKLMNOPQRSTUVWXYZ0123456789  
 Output: CDE

Notice that **Extract** and **Insert** share the same **Parse Table**.

**Symbol Parse**

Step	Insert Data	Extract Range
Insert	SP SP	
Extract		3 - 5

Sample Symbol:  
 Original: ABCDEFGHIJKLMNOPQRSTUVWXYZ0123456789  
 Output: CDE

## Output Filter Configuration

*Definition:* Output filtering is a method of providing a set of good read qualifiers and also providing ordered output. There is a filter for up to the first 10 positions in a multisymbol output. The first filter corresponds to the first symbol output at the end of the read cycle. Each filter has settings for the following four parameters: **Symbology**, **Symbol Length**, **Data**, and **Configuration Database Number**.

*Serial Cmd:* <**K744**, *filter number, symbology, length, wildcard, placeholder, data, unused, database index*>

### Rules for Output Filter Configuration

#### Output Filter Configuration Rule # 1

Each symbol that is decoded must match one of the filters before it can be saved to a read cycle record. There is an exception to this rule, however, when the number of symbols required for a read cycle exceeds the number of active filters. In such a case, unfiltered symbols can be placed into unfiltered output positions.

For example, if the number of symbols required is 6 but there are only 4 active filters, the last 2 positions can be filled by any (unfiltered) qualified symbol.

#### Output Filter Configuration Rule # 2

The same filter setup can be used multiple times.

For example, filters 1, 2, and 3 can be set up to filter Data Matrix symbols, and the output will occur in the order the symbols are decoded.

#### Output Filter Configuration Rule # 3

All qualified symbols will be sorted and output in the matching filter position. If a symbol matches filter 3, it will be output as the third symbol. If a filter does not have a matching qualified symbol, a No-Read message will be output in place of the symbol (assuming the No-Read message is enabled).

For example, if there is not a symbol that meets filter 3's requirements, then a No-Read message will be output in the third output position.

### Filter Number

*Definition:* This is the filter index number that represents the position of the symbol in the data output at the end of the read cycle. This index number should be entered along with the following filter settings for the predetermined symbol position.

*Serial Cmd:* <**K744**, *filter number, symbology, length, wildcard, placeholder, data, unused, database index*>

*Options:* 1 to 10

## Symbology

*Definition:* Specifies the symbology allowed to occupy this location in multisymbol output.  
**Note:** To filter or order a symbol, the symbol must meet all the requirements of the selected filter index.

*Serial Cmd:* <**K744**, filter number, **symbology**, length, wildcard, placeholder, data, unused, database index>

*Default:* **0** (any symbology)

*Options:*

- 0 = Any type
- 1 = Interleaved 2 of 5
- 2 = Code 39
- 3 = Code 128
- 4 = Codabar
- 5 = UPC
- 6 = PDF417
- 7 = EAN 128
- 8 = Code 93
- 9 = Pharmacode
- 10 = GS1 DataBar
- 11 = MicroPDF417
- 12 = Composite
- 13 = BC412
- 14 = Data Matrix
- 15 = QR Code
- 16 = Micro QR Code
- 17 = Aztec
- 18 = Postal Symbologies

## Length

*Definition:* Specifies the length of the decoded symbol allowed to occupy this location in multisymbol output.  
**Note:** To filter or order a symbol, the symbol must meet all requirements of the selected filter index.

*Serial Cmd:* <**K744**, filter number, symbology, **length**, wildcard, placeholder, data, unused, database index>

*Default:* **0**

*Options:* 0 to 64

## Wildcard

*Definition:* This is the character to be used in the data output field when performing a data filter comparison. The wildcard character represents the end of matching, and allows for variable lengths of symbol output.

*Serial Cmd:* <**K744**, filter number, symbology, length, **wildcard**, placeholder, data, unused, database index>

*Default:* “ \* “ = **2A** (hex)

*Options:* Any ASCII input in the form of a pair of hex characters.

Example:

2A = \*

00 = disabled

## Placeholder

*Definition:* The placeholder character requires a character to be present, but does not compare the data value.

*Serial Cmd:* <**K744**, filter number, symbology, length, wildcard, **placeholder**, data, unused, database index>

*Default:* “ ? ” = **3F** (hex)

*Options:* Any ASCII input in the form of a pair of hex characters.

Example:

3F = ?

00 = disabled

## Data

*Definition:* This is the data string to be used when comparing symbol data for output filtering and ordering. This data string may also contain wildcard and placeholder characters to facilitate matching. Remember that in order to filter or order symbol data, it must meet all the requirements of the selected filter index.

*Examples:*

- Filter data = "123\*". This will match data strings of "123", "123456", and "123ABC", but not "12".
- Filter data = "123\*AB?C". This will be interpreted as "123\*".
- Filter data = "123?". This will match "1234" and "123A", but not "123", "12345", or "1234C".
- Filter data = "123?A". This will match "1234A" and "123BA", but not "123", "1234C", or "1234ABCD".
- Filter data = "123?A?". This will match "1234AB" and "123BAT", but not "1234A" or "123BATS".
- Filter data = "12??\*". This will match "1234", "123456", and "123ABC", but not "12" or "123".
- Filter data = "123?A\*". This will match "1234A", "123BA", and "123BATS", but not "1234" or "1234C".

*Serial Cmd:* <**K744**, filter number, symbology, length, wildcard, placeholder, **data**, unused, database index>

*Default:* **00** (NUL)

*Options:* Any ASCII input in the form of a pair of hex characters.  
Maximum length: 63 bytes defined.

*Examples:*

41422A = AB\*

Data [0] = NUL represents string matching disabled.

## Database Index

*Definition:* The index of the database entry that decodes a given symbol must equal this setting for filtering to occur. A setting of **0** allows any database index for this filter entry.

*Serial Cmd:* <**K744**, filter number, symbology, length, wildcard, placeholder, **data**, unused, **database index**>

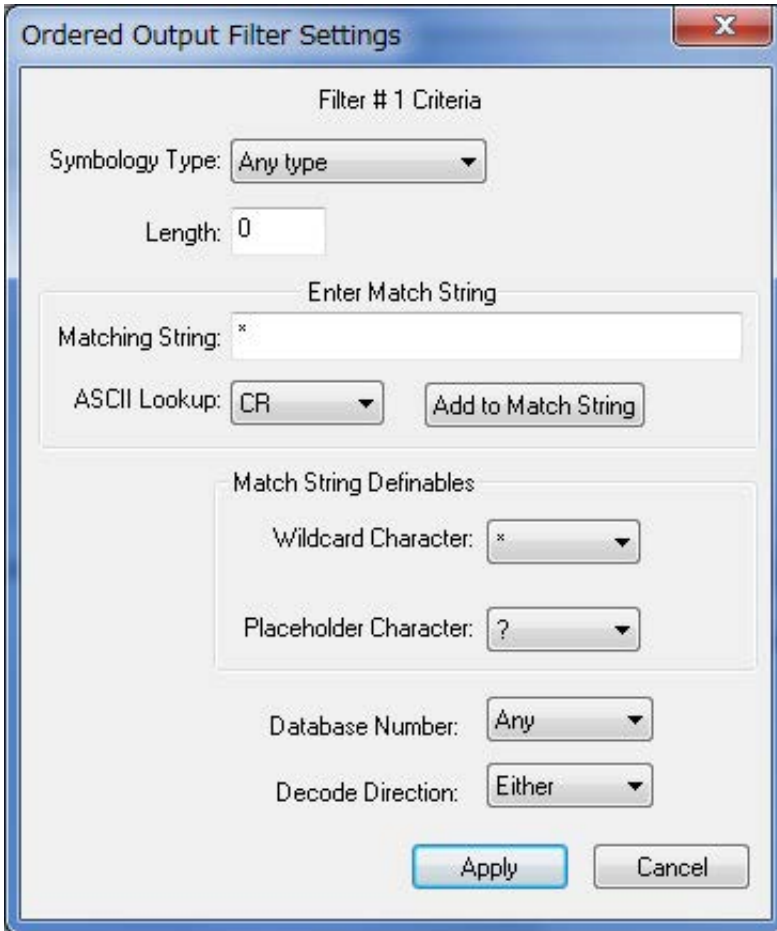
*Default:* **0** (any index)

*Options:* 0 to 10

## Ordered Output Filter Configuration by ESP

Double-clicking on a row in the Ordered Output table brings up the **Ordered Output Filter Settings** dialog.

Use these settings to determine **Symbology Type**, **Length** of the symbol, a user-defined **Matching String**, **ASCII Lookup**, **Wildcard Character**, **Placeholder Character**, and **Database Number**. Click **Apply** to save the settings to the corresponding filter.



The screenshot shows the "Ordered Output Filter Settings" dialog box. The title bar includes a close button (X). The dialog is divided into several sections:

- Filter # 1 Criteria**:
  - Symbology Type: Any type (dropdown)
  - Length: 0 (text input)
- Enter Match String**:
  - Matching String: \* (text input)
  - ASCII Lookup: CR (dropdown)
  - Add to Match String (button)
- Match String Definables**:
  - Wildcard Character: \* (dropdown)
  - Placeholder Character: ? (dropdown)
- Database Number: Any (dropdown)
- Decode Direction: Either (dropdown)

At the bottom, there are "Apply" and "Cancel" buttons.

## **Number of Filters**

*Definition:* **Number of Filters** refers to the number of active output filters. **0** disables all output filters. Any non-zero numeral will enable filtering to be performed using the filter indexes covered by this value.

For example, if the number of filters is **1**, then only filter index # 1 will be applied. If the number of filters is **2**, then only filter index # 1 and filter index # 2 will be applied, etc.

*Serial Cmd:* **<K745,number of filters>**

*Default:* **0**

*Options:* 0 to 10

# Appendix R — ASCII Table

Dec	Hex	Mne	Ctrl
00	00	NUL	^@
01	01	SOH	^A
02	02	STX	^B
03	03	ETX	^C
04	04	EOT	^D
05	05	ENQ	^E
06	06	ACK	^F
07	07	BEL	^G
08	08	BS	^H
09	09	HT	^I
10	0A	LF	^J
11	0B	VT	^K
12	0C	FF	^L
13	0D	CR	^M
14	0E	SO	^N
15	0F	SI	^O
16	10	DLE	^P
17	11	DC1	^Q
18	12	DC2	^R
19	13	DC3	^S
20	14	DC4	^T
21	15	NAK	^U
22	16	SYN	^V
23	17	ETB	^W
24	18	CAN	^X
25	19	EM	^Y
26	1A	SUB	^Z
27	1B	ESC	^[
28	1C	FS	^\
29	1D	GS	^]
30	1E	RS	^^
31	1F	US	^_

Dec	Hex	Ch
32	20	SP
33	21	!
34	22	"
35	23	#
36	24	\$
37	25	%
38	26	&
39	27	'
40	28	(
41	29	)
42	2A	*
43	2B	+
44	2C	,
45	2D	-
46	2E	.
47	2F	/
48	30	0
49	31	1
50	32	2
51	33	3
52	34	4
53	35	5
54	36	6
55	37	7
56	38	8
57	39	9
58	3A	:
59	3B	;
60	3C	<
61	3D	=
62	3E	>
63	3F	?

Dec	Hex	Ch
64	40	@
65	41	A
66	42	B
67	43	C
68	44	D
69	45	E
70	46	F
71	47	G
72	48	H
73	49	I
74	4A	J
75	4B	K
76	4C	L
77	4D	M
78	4E	N
79	4F	O
80	50	P
81	51	Q
82	52	R
83	53	S
84	54	T
85	55	U
86	56	V
87	57	W
88	58	X
89	59	Y
90	5A	Z
91	5B	[
92	5C	\
93	5D	]
94	5E	^
95	5F	_

Dec	Hex	Ch
96	60	`
97	61	a
98	62	b
99	63	c
100	64	d
101	65	e
102	66	f
103	67	g
104	68	h
105	69	i
106	6A	j
107	6B	k
108	6C	l
109	6D	m
110	6E	n
111	6F	o
112	70	p
113	71	q
114	72	r
115	73	s
116	74	t
117	75	u
118	76	v
119	77	w
120	78	x
121	79	y
122	7A	z
123	7B	{
124	7C	
125	7D	}
126	7E	~
127	7F	D

## Appendix S — Q & A

Question	Answer
Is the settings possible without any PC tool and PLC?	<p>It is possible to do by reading a DataMatrix for the setting. The DataMatrix can be generated by ESP.</p> <p>The following describes how to generate DataMatrix for the setting.</p> <ol style="list-style-type: none"> <li>1. Connect V430 preconfigured and ESP.</li> <li>2. Receive the setting data of V430 by ESP.</li> <li>3. Select the <b>Utilities - Differences</b> Tab.</li> <li>4. Click the <b>Differences from Default</b> Button.</li> <li>5. Click the <b>Generate Bar Code</b> Button.</li> <li>6. As The <b>Bar code configuration</b> dialog appears, place a check to the <b>Add Start configuration code and Add end configuration code; Save Settings</b>.</li> <li>7. Click the <b>Print</b> Button to print the DataMatrix for the settings.</li> </ol> <p>The following describes how to read the DataMatrix for the settings.</p> <ol style="list-style-type: none"> <li>1. To reflect the settings, turn on V430 in the factory shipment state. → (In the factory shipment) the state is set to <b>Continuous Read</b>.</li> <li>2. Read the <b>Add start configuration code</b> first. → The LEDs on the device flash in order. (<b>Bar Code Configuration Mode</b>)</li> <li>3. Read the DataMatrix generated for setting commands in order.</li> <li>4. Read <b>Add end configuration code</b> in the last. → The <b>Bar code configuration mode</b> ends and the settings are saved.</li> </ol>
What is PPE?	<p>PPE stands for <b>Pixel Per Element</b>. For 2D code, it is one cell size on a captured image. For 1D code (barcode), it is the minimum bar width on a captured image. e.g. When [PPE=4.0] is displayed on WebLink at DataMatrix read, the DataMatrix cell size is four pixels on the captured image.</p>
When magnifying an image on WebLink, it blurs.	<p>On WebLink, compressed images are displayed. Since such images have lower resolution than measured images, therefore they might be blur when magnifying them. When magnifying a measured image with an actual resolution, use saved images. For the image saving method, refer to Q&amp;A: <i>How to save read images</i>.</p>
How to react when being unable to WebLink.	<ul style="list-style-type: none"> <li>• <b>For Internet Explorer, check the following settings.</b> Uncheck the upper right <b>Tool icon - Compatibility View settings - Display Intranet sites in Compatibility View</b>. Or use Google Chrome.</li> <li>• <b>Turn off the VPN function.</b> Turn off the VPN function. When the VPN function is turned on, local LAN connections other than the VPN are disabled all.</li> <li>• <b>Check the IP address using DDU.</b> DDU (Discovery Device Utility) is a tool to search a V430 whose IP address is lost. When the search was succeeded, its IP address also can be changed. Download the DDU from Omron Web site or Omron Microscan Web site. If you cannot download it, please contact your Omron representative.</li> <li>• <b>Initialize V430 if the above measures does not help.</b> Related Q&amp;A: <i>How to initialize the settings?</i></li> </ul>

<p>Differences between WebLink and ESP</p>	<p>The merits of WebLink are that does not require the installation and is easily operated to set with a Web browser. Use WebLink basically. Most of the functions are settable except for some functions. The following shows a list of comparison.</p> <p>WebLink Merits:  <ul style="list-style-type: none"> <li>• No installation software (Web browser)</li> <li>• Japanese supported</li> <li>• visually easy to understand UI</li> </ul> Demerits:  <ul style="list-style-type: none"> <li>• Some advanced functions are not available (refer to ESP's merits)</li> </ul> </p> <p>ESP Merits  <ul style="list-style-type: none"> <li>• The following functions supported which cannot be used with WebLink Firmware update function for V430 itself Setting for <b>Configuration Database</b> (equivalent to bank switching function of V400-F) Setting for <b>Order Output Filter</b> File save of output data by <b>Terminal - Capture</b> function.</li> </ul> Demerits  <ul style="list-style-type: none"> <li>• Japanese not supported</li> <li>• Not compatible for automatic connection function to V430 via EtherNet and RS-232C</li> <li>• Not compatible for ISO 15415/15416/29158</li> </ul> </p>
<p>Can the position information of a code be output?</p>	<p>Enable <b>Advanced - I/O - Output Object Info - Output Coordinates</b>. Following the captured string, every four vertexes of the code are output.  <ul style="list-style-type: none"> <li>• Output example: When a code of 123456 was captured 123456,(0032,0040)(0287,0056)(0287,0279)(0048,0271)</li> </ul> </p>
<p>Can serial commands calibrate brightness or focus?</p>	<p>It is possible to adjust with a serial command &lt;@CAL&gt; executing the calibration. Which parameter should be adjusted at Calibration, it is selectable with the following parameter on WebLink. <b>Advanced - I/O tab - Calibration Options</b></p> <p>When executing the &lt;@CAL&gt; command, V430 outputs numeric values indicating trial results in some rows and then <b>Calibration PASSED</b>. When failed, <b>Calibration FAILED</b> is output. Example of a response when &lt;@CAL&gt; was succeeded.:  Prog  Exposure Gain Brightness  2   5764 33 24  100   6011 33 37  Calibration PASSED.</p>
<p>How is a trigger inputted in serial communications?</p>	<p>The following describes a serial command to input a trigger in default.  <ul style="list-style-type: none"> <li>• Serial Trigger command  ASCII character notation &lt; &gt;  Hex notation                   3C 20 3E</li> </ul> Although space is a default in the center (Hex notation: 20), it can be changed to any ASCII character from the menu below.  WebLink - Gear icon - <b>Advanced - Read Cycle - Serial Trigger - Serial Trigger Character (Delimited)</b>  Additionally, from the menu below, any ASCII character can be set up to two characters for Start Trigger Character/Stop Trigger Character that do not need &lt; &gt;.  WebLink - Gear icon - <b>Advanced - Read Cycle - Serial Trigger - Start Trigger Character (Non-Delimited)/Stop Trigger Character (Non-Delimited)</b></p>
<p>What kind of effect is in Teaching?</p>	<p>When Teaching (Hat icon on WebLink) was executed, judgment of code type and the detection algorithm optimization are performed. When reading codes with the same conditions, the reading will be more stable just to execute Teaching. However, Teaching is not a function that always needs be executed.</p>

## Q & A

How to access a RAM drive from a PC?	A PC can access a RAM drive using the FTP client tool. The initial values of V430 are as follows.	
	Settings	Value
	IP address	192.168.188.2
	Path	imagesd0/images/
	Account	target
	Password	password
Example: When using Internet Explorer to access. 1. If the IP address is the default, enter <i>ftp://192.168.188.2/imagesd 0/images/</i> in the address bar to connect. 2. Enter your account and password. 3. Download the file saved in the RAM drive to your PC.		

Parallel communications timing chart

The parallel output signals, OUTPUT1/OUTPUT2/OUTPUT3, can change those roles by the output condition settings.

The default is that those are turned on when all are No-Read.

WebLink - Gear icon - **Advanced - I/O - OUTPUT1 parameters - Output On**

Additionally, a timing to turn off can also be adjusted using the following setting.

WebLink - Gear icon - **Advanced - I/O - OUTPUT1 parameters - Output Mode**

When you want to detect a timing that the output is changed, set the output condition for one of OUTPUT1/OUTPUT2/OUTPUT3 to **In Read Cycle**.

According to the setting, it turns on in a period from detecting a trigger, reading, and end of output.

For example, the following describes a timing chart in a case of a setting below.

• Output On

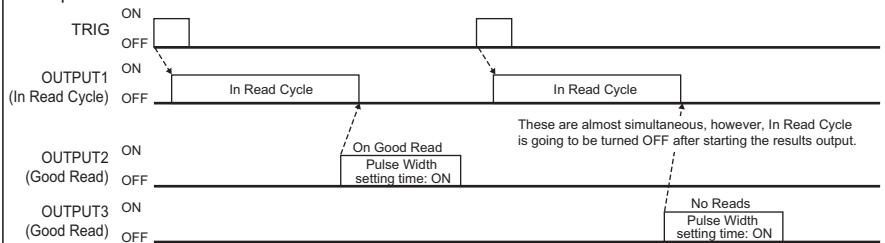
OUTPUT1 In Read Cycle

OUTPUT2 Match or Good Read

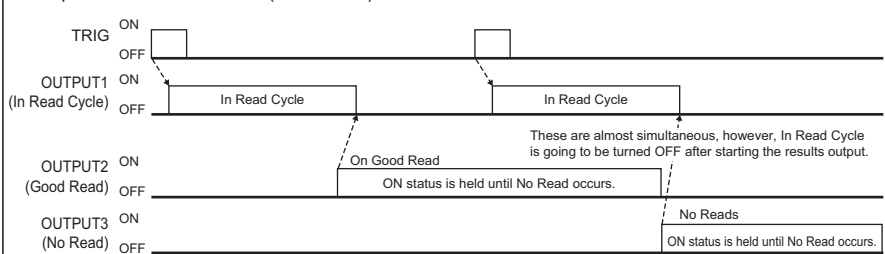
OUTPUT3 Mismatch or No-Read

• Timing chart

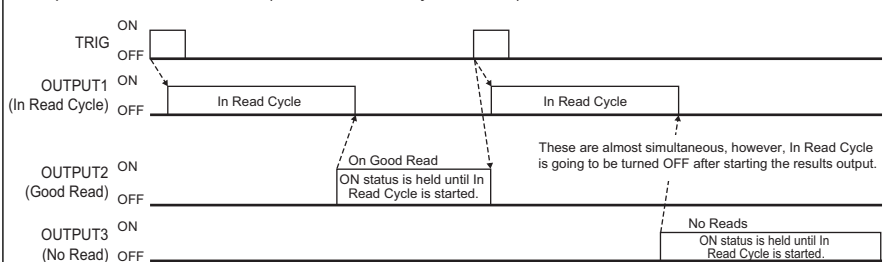
<Output Mode: Pulse case>



<Output Mode: Latch Mode 2 (Status held) case>



<Output Mode: Latch Mode 3 (OFF at In Read Cycle started) case>



## Q & A

<p>How to estimate an exposure time when reading a moving symbol?</p>	<p>A moving amount of a symbol during exposure should be 1/10 or less of the cell size (for barcode, narrow bar width).          When a cell size is C [mm] and a line speed is L [mm/s], use the following formula to get the exposure time S.  <math>S \leq 0.1 \times C/L</math>          For example, When a cell size is 0.3 [mm] and a line speed is 300 [mm/s], the exposure time should be 100 [μs] or less.  <math>0.1 \times 0.3 \text{ [mm]} / 300 \text{ [mm/s]} = 100 \text{ [μs]}</math></p>																												
<p><b>Read Rate of Counts</b> on the right panel is not available.</p>	<p><b>Read Rate of Counts</b> on the right panel is sometimes not available depending on the setting of Read Cycle.</p> <table border="1"> <thead> <tr> <th>Read Cycle</th> <th>Read Rate</th> </tr> </thead> <tbody> <tr> <td>Presentation</td> <td>Unavailable</td> </tr> <tr> <td>Continuous Read</td> <td>Unavailable</td> </tr> <tr> <td>Triggered</td> <td>Available</td> </tr> <tr> <td>Start/Stop</td> <td>Available</td> </tr> <tr> <td>Custom</td> <td>Refer to below</td> </tr> </tbody> </table> <p>When Read Cycle is <b>Custom</b>, it sometimes is unavailable depending on the setting of Trigger Mode.</p> <table border="1"> <thead> <tr> <th>Trigger Mode</th> <th>Read Rate</th> </tr> </thead> <tbody> <tr> <td>Continuous Read</td> <td>Unavailable</td> </tr> <tr> <td>Continuous Read 1 Output</td> <td>Unavailable</td> </tr> <tr> <td>External Level</td> <td>Available</td> </tr> <tr> <td>External Edge</td> <td>Available</td> </tr> <tr> <td>Serial Data</td> <td>Available</td> </tr> <tr> <td>Serial Data and Edge</td> <td>Available</td> </tr> <tr> <td>Continuous Read Auto</td> <td>Unavailable</td> </tr> </tbody> </table>	Read Cycle	Read Rate	Presentation	Unavailable	Continuous Read	Unavailable	Triggered	Available	Start/Stop	Available	Custom	Refer to below	Trigger Mode	Read Rate	Continuous Read	Unavailable	Continuous Read 1 Output	Unavailable	External Level	Available	External Edge	Available	Serial Data	Available	Serial Data and Edge	Available	Continuous Read Auto	Unavailable
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<p>Only one image can save.</p>	<p>When <b>Save Image</b> Until is set to <b>New Read Cycle</b>, only last one image is saved.          When saving multiple images, set WebLink - Gear icon - <b>Advanced - Image Storage - Save Image Until to System Reset</b>.          Additionally, when <b>Image Storage Location</b> was set to <b>FTP</b>, images might not be saved due to the shorter read interval if <b>Transfer Optimization</b> is <b>set to Speed (Lossy)</b>.          When you want to prioritize the image storage over the read, set WebLink - Gear icon - <b>Advanced - Image Storage - Transfer Optimization to Accuracy (Lossless)</b>.</p>																												
<p>How to acquire or change the settings from external?</p>	<p>With the serial communications, it is possible to do so using a serial command so called K command.          For each K command, refer to Chapter 3 or later.          Example: Set the exposure time to 1,000 [μs].          Command: &lt;K541,1000&gt;          Response: None</p> <p>As adding “?” to a K command, the setting value will be returned.          Example: Acquire the current exposure time and gain.          Command: &lt;K541?&gt;          Response: &lt;K541,1000,30&gt;</p> <p>Presently, the exposure time is set to 1,000 [μs] and the gain is set to 30 [%].</p>																												

<p>How can I read multiple codes in the field of view?</p>	<p>When the string of codes are different from each other, multiple codes in the field of view can be read.</p> <ul style="list-style-type: none"> <li>• <b>Settings</b> To enable multiple reads, change the value of default <i>Look for 1 Symbols</i> in <b>Read Cycle</b> at the left on the setup screen. Or, change the settings below. WebLink - Gear icon - <b>Advanced - Read Cycle - Multisymbol - Number of Symbols</b></li> <li>• <b>Output order</b> The output order is practically random because of the order of completed read. Using the <b>Configuration Database</b> or <b>Order Output Filter</b> functions with ESP or serial commands, up to 10 output order can be controlled (when symbols satisfy the output conditions).</li> <li>• <b>Cautions</b> Multiple reads are not available in codes with the same string.</li> </ul>																		
<p>Is it possible to specify the output range for output string?</p>	<p>Turn on <b>Output Format</b> at the left on the WebLink setup screen. With clicking format strings, <b>Output Formatting Editor</b> screen opens. With enabling <b>Parse Symbol</b>, the output range can be specified.</p>																		
<p>What kinds of lighting patterns are adopted?</p>	<table border="1"> <thead> <tr> <th>LED</th> <th>Purpose</th> <th>WebLink Setting menu</th> <th>Simultaneous lighting</th> </tr> </thead> <tbody> <tr> <td>Outside LED</td> <td>Imaging LED Mainly use when illuminating a wide range. 5M type is white. 0.3M and 1.2M types are red.</td> <td rowspan="3"><b>Advanced - Camera Setup - Camera Settings</b></td> <td rowspan="3">These three cannot be turned on simultaneously. Only one of the lighting patterns can be set.</td> </tr> <tr> <td>Inside red LED</td> <td>Imaging LED Use this when red color lighting is needed.</td> </tr> <tr> <td>Inside white LED</td> <td>Imaging LED Use this when illuminating a narrow range. The purpose is changeable with the setting.</td> </tr> <tr> <td>Green LED</td> <td>Illuminate at a good read (default). Additional green lighting at imaging. Target pattern lighting.</td> <td rowspan="2"><b>Advanced - I/O - Output Indicator</b></td> <td rowspan="2">Possible to turn it on with other lighting LED simultaneously.</td> </tr> <tr> <td>Blue LED</td> <td>This turns on when leading the image center position to the cross part of the blue lighting.</td> </tr> </tbody> </table>	LED	Purpose	WebLink Setting menu	Simultaneous lighting	Outside LED	Imaging LED Mainly use when illuminating a wide range. 5M type is white. 0.3M and 1.2M types are red.	<b>Advanced - Camera Setup - Camera Settings</b>	These three cannot be turned on simultaneously. Only one of the lighting patterns can be set.	Inside red LED	Imaging LED Use this when red color lighting is needed.	Inside white LED	Imaging LED Use this when illuminating a narrow range. The purpose is changeable with the setting.	Green LED	Illuminate at a good read (default). Additional green lighting at imaging. Target pattern lighting.	<b>Advanced - I/O - Output Indicator</b>	Possible to turn it on with other lighting LED simultaneously.	Blue LED	This turns on when leading the image center position to the cross part of the blue lighting.
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<p>Is the lighting brightness adjustable?</p>	<p>The lighting brightness is adjustable using the menu on WebLink. Gear icon - <b>Advanced - Camera Settings - Illumination Brightness</b></p>																		
<p>How to output the same code only once in Constant Read state?</p>	<p>To output the same code only once in Constant Read state with V430, set the following.</p> <ul style="list-style-type: none"> <li>• Gear icon - <b>Advanced - Read Cycle - Trigger - Mode: Continuous Read 1 Output</b></li> <li>• Gear icon - <b>Advanced - Read Cycle - End of Read Cycle - Mode: New Trigger</b></li> </ul> <p>With the above setting, V430 in Constant Read state reads the same code only once and only output it when a code different from the previous code is read. When you want to set V430 so that it can read the same code again after some time passed, set <b>End of Read Cycle Mode</b> to <b>Timeout and adjust Read Cycle Timeout</b>.</p>																		

How to initialize the settings?	<p>There are three initialization methods.</p> <ul style="list-style-type: none"> <li>• <b>Initialization by operating the menu on WebLink</b> <ol style="list-style-type: none"> <li>1. Click the Gear icon at the right of WebLink.</li> <li>2. Click the Restore Default Settings Button.</li> </ol> <p>* This performs an initialization processing as same as a serial command &lt;Zrd&gt;.</p> </li> <li>• <b>Boot while pressing the Setup Button.</b>  <i>Customer Default Parameters</i> are loaded.           <ol style="list-style-type: none"> <li>1. Hold down the Setup Button on the main body and turn on the power.</li> <li>2. Keep the state for approx. 30 seconds.</li> </ol> <p>* This performs an initialization processing as same as a serial command &lt;Zrd&gt;.</p> </li> <li>• <b>Initialization by DEFAULT signal of parallel.</b>            It resets the hardware. The following I/O signals are used.           <table border="1"> <thead> <tr> <th>Line color</th> <th>PIN No.</th> <th>Signal name</th> </tr> </thead> <tbody> <tr> <td>Brown</td> <td>2</td> <td>24 VDC (Power)</td> </tr> <tr> <td>Green</td> <td>3</td> <td>Default</td> </tr> <tr> <td>Blue</td> <td>7</td> <td>0 VDC (Ground)</td> </tr> <tr> <td>Red</td> <td>8</td> <td>COM_IN</td> </tr> </tbody> </table> </li> </ul> <p>Before turning on, connect PIN 2 and 8.          Perform the following procedures within 60 seconds after turning on.         <ol style="list-style-type: none"> <li>1. Connect PIN 3 to PIN 7.</li> <li>2. Disconnect the connection between PIN 3 and PIN 7.</li> <li>3. Connect PIN 3 to PIN 7 again within 3 seconds after the disconnection.</li> <li>4. Disconnect the connection after starting the reboot.</li> </ol> <p>* This performs an initialization processing as same as a serial command &lt;Zrdall&gt;.          Note: Be sure to check that all pins are correctly located. If connecting pins mistakenly, it may cause severe damage to the device.          With the serial commands &lt;Zrd&gt; and &lt;Zrc&gt;, some settings like the communication settings may not be restored to the factory default. To restore the settings to the factory default, using the &lt;Zrdall&gt; command or the DEFAULT signal of parallel are sometimes required.</p> </p>	Line color	PIN No.	Signal name	Brown	2	24 VDC (Power)	Green	3	Default	Blue	7	0 VDC (Ground)	Red	8	COM_IN
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How to save read images?	<p>The read images are possible to save with the following procedures.</p> <ul style="list-style-type: none"> <li>• Save images on WebLink.            Click <b>Save Current Image</b> button at the right end on the <b>Image Control Toolbar</b> at the upper right on the image area to save the read image to your PC. The file is download to a destination you set with a browser.</li> <li>• Save images to the RAM drive.            Images read according to Read Cycle can be saved in the RAM drive on V430. Click Gear icon at the upper right - <b>Image Storage</b> to open <b>Image Save Options</b>, and set the conditions to save images. Click the <b>Advanced</b> button to set other parameters such as <b>Save Image Until</b>. Such saved images can be saved in a PC via FTP. Regarding the method to save images via FTP, refer to "How to access a RAM drive from a PC?". Regarding No. of images savable to the RAM drive, refer to "How many sheets of images can be saved in the RAM drive?". It is initialized when turning off the power because of RAM drive.</li> <li>• Save images to a FTP server.            Images read according to Read Cycle can be saved to an FTP server on the network. Click Gear icon at the upper right - <b>Image Storage</b> to open <b>Image Save Options</b>, and set the conditions to save images. Select FTP for the <b>Image Storage Location</b>. By setting the FTP address of the FTP server after that, images can be saved in it.</li> </ul> <p>* Re-reading is not available by using the saved images.</p>															
How to check read characters?	<p>When checking character strings, turn on <b>Matchcode</b> at the left panel on WebLink.          Click <b>Mode</b> of <b>Matchcode</b> and register character strings you want to check to <b>Match String Database</b>.          Up to 10 strings are registrable to <b>Match String Database</b>.</p>															
What is the smallest size of the readable 2D code?	<p>A 2D code with 2x2 pixels or more in the cell size on an image is readable.          This figure is a theoretical value. In practice, test it for the judgment.</p>															

<p>What is the smallest size of the readable barcode?</p>	<p>In ideal, a barcode with the size below is readable.</p> <p>Barcode width: 1 pixel or more Barcode height: 16 pixels or more</p> <p>These figures are theoretical values. In practice, test it for the judgment.</p>														
<p>What is the method to evaluate the reading stability?</p>	<p>There are two methods.</p> <ul style="list-style-type: none"> <li>• ISO print quality evaluation The ISO print quality evaluation is a function to evaluate the read stability compatible for the ISO standards. For example, use ISO 29158 to evaluate DataMatrix of DPM. Enable Gear icon - <b>Advanced - Symbol Quality - ISO/IEC 29158 Parameters</b>, which add an evaluation results to the end of a read character strings.</li> <li>• Read Rate Mode Operating the Setup Button or performing the Read Rate command makes the device to Rear Rate mode. The operation display LED on the body becomes to indicate the Read Rate and the body is set to a state to output the rate via the serial (RS-232C) communications or TCP communications.</li> </ul>														
<p>What is the number of the maximum readable characters?</p>	<p>V430-F can read up to the maximum numbers defined each code standard.</p> <p>For example, although up to 7,089 characters can be input to QR code based on the standard, V430-F can read the code.</p>														
<p>What is the readable installation distance?</p>	<p>That of V430-F depends on the cell size (bar width) of a target code too.</p> <p>The reference values are described on page A-5 to A-6, refer to them. The read range is described, which was possible to read with typical cell size examples for the design readable focal distance per format. * For barcode, a half size of the bar width for readable values of 2D code cell size is a guide.</p>														
<p>How to shorten the read time?</p>	<p>Please consider below.</p> <ul style="list-style-type: none"> <li>• Construct appropriate optical conditions like an image is in focus or having sufficient contrast. Mount distance, Mount angle, Exposure time)</li> <li>• Limit symbol types for the read target.</li> <li>• Enable the optimization. (Graph icon on the setup screen)</li> <li>• Perform the Window of Interest.</li> </ul>														
<p>Can read character strings be saved in a file?</p>	<p>In ESP, it can be saved as a text file by selecting <b>Terminal menu - Capture Text...</b> in the connected state. By changing the extension of a saved text file to .csv, the file can be referenced as CSV file.</p>														
<p>What parameters need to be adjusted when a symbol is unable to read?</p>	<p>Adjust the following parameters.</p> <table border="1"> <thead> <tr> <th>Symbol state</th> <th>Adjustment</th> </tr> </thead> <tbody> <tr> <td>An image is dark.</td> <td>Adjust <b>Exposure</b> or <b>Gain</b> to bright the image.</td> </tr> <tr> <td>Out of focus.</td> <td>Adjust <b>Focus</b> to make the symbol in focus.</td> </tr> <tr> <td>A cell size is small.</td> <td>Change the mount distance or use a high pixel density and narrow field of view type.</td> </tr> <tr> <td>Noisy background</td> <td>Remove noise with the Morphological Preprocessing. When 5 M type is used, adjust the color filter.</td> </tr> <tr> <td>The read time takes much time.</td> <td>Set <b>Timeout</b> longer.</td> </tr> <tr> <td>The lighting is reflected.</td> <td>Tilt the lighting by approx. 15 degrees to reduce the reflection. Or, try to use the optional Polarizer (V430-AF2) and the Diffuser (V430-AF1).</td> </tr> </tbody> </table>	Symbol state	Adjustment	An image is dark.	Adjust <b>Exposure</b> or <b>Gain</b> to bright the image.	Out of focus.	Adjust <b>Focus</b> to make the symbol in focus.	A cell size is small.	Change the mount distance or use a high pixel density and narrow field of view type.	Noisy background	Remove noise with the Morphological Preprocessing. When 5 M type is used, adjust the color filter.	The read time takes much time.	Set <b>Timeout</b> longer.	The lighting is reflected.	Tilt the lighting by approx. 15 degrees to reduce the reflection. Or, try to use the optional Polarizer (V430-AF2) and the Diffuser (V430-AF1).
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The read time takes much time.	Set <b>Timeout</b> longer.														
The lighting is reflected.	Tilt the lighting by approx. 15 degrees to reduce the reflection. Or, try to use the optional Polarizer (V430-AF2) and the Diffuser (V430-AF1).														

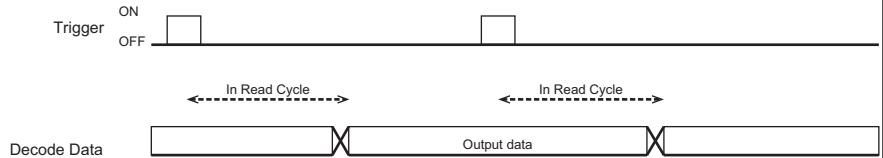
## Q & A

<p>Is it possible to function the autofocus while reading?</p>	<p>The autofocus while reading can be enabled when the Read Cycle is set to <b>Continuous Read</b> or <b>Continuous Read Auto</b>.          Since the autofocus adjustment needs several seconds, use the Configuration Database function when switching the mount distances that are predetermined.          Related Q&amp;A: <i>Can serial commands calibrate brightness or focus?</i></p>
<p>What is the number of the maximum characters for Match String Database?</p>	<p>It is 3,000 characters.          It is divided by the number of registrations, so it varies depending on the number of registrations.          When the number of registrations is one, it can register up to 3,000 characters.          When the number of registrations is ten, each registration can register up to 300 characters.          Related Q&amp;A: <i>What is the number of the maximum readable characters?</i></p>
<p>How to change Match String externally?</p>	<p>Use &lt;K231&gt; command.          Command format: &lt;K231, index, master symbol data&gt;          Example:          When setting ABC to the first Match String Database:          &lt;K231, 1, ABC&gt;</p>
<p>How to enable the External Trigger rather than Continuous Read?</p>	<p>Set the Trigger Mode except for <b>Continuous Read</b>. Refer to the following instruction.          Select Gear icon - <b>Advanced - Read Cycle - Trigger - Mode - External Edge or Serial Data and Edge</b>.</p>
<p>How can I confirm the OK/NG Read result over Ether-Net/IP?</p>	<p>The method differs according to the selected input assembly.</p> <ul style="list-style-type: none"> <li>• When using a Small (100) assembly;              First determine whether the Output String (DECODE DATA STRING) is <b>NOREAD</b> (default).</li> <li>• When using a Big (101) assembly;              There is a way to verify the <b>External Output Status</b> OUTPUT bit.              Please note that the <b>External Output Status</b> is dependent on the Output condition setting for the Parallel I/O OUTPUT signal. The default setting is ON when there is a Read Fail.</li> <li>• When an assembly after MXL/SLC (102) is selected;              You can verify the <b>Read Cycle Pass, Read Cycle Fail</b> bit status in <b>Device Status</b>. The <b>Read Cycle Pass, Read Cycle Fail</b> bit is OFF during a READ cycle and is updated when <b>Data Is Ready</b> is ON.</li> </ul>

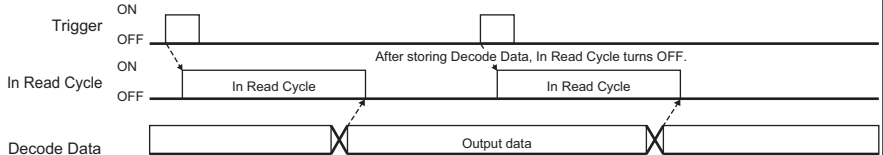
EtherNet/IP data output timing

The timing signal indicating when the output data is stored in the data memory of the PLC varies depending on the selected assembly.

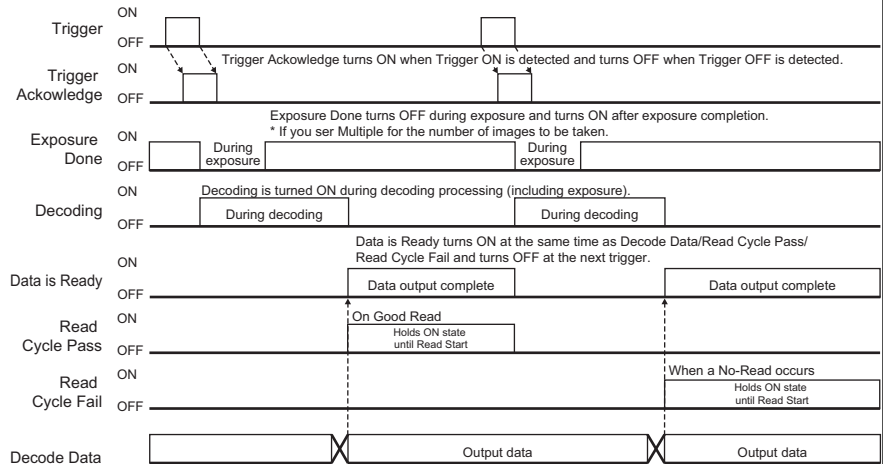
- When using the Small (100) assembly, there is no applicable data output timing signal
  - When using the Big (101) assembly, the timing of data output is when **Device Status - In Read Cycle** bit changes from ON to OFF.
  - When MXL/SLC (102) or later assembly is selected, Output is at the timing when the **Date Status Ready** bit of **Device Status** turns ON.
- When using the Small (100) assembly, there is no applicable data output timing signal.



· When using the Big (101) assembly, the timing of data output is when **Device Status - In Read Cycle** bit changes from ON to OFF.



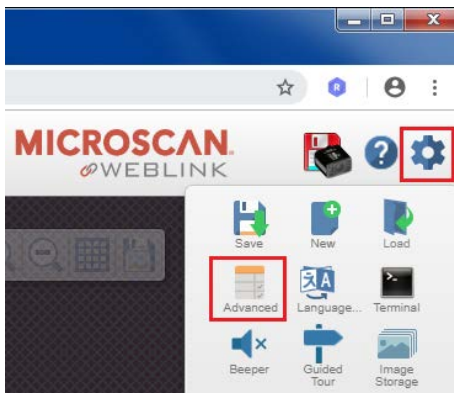
· When MXL/SLC (102) or later assembly is selected, Output is at the timing when the **Data Status Ready** bit of **Device Status** turns ON.



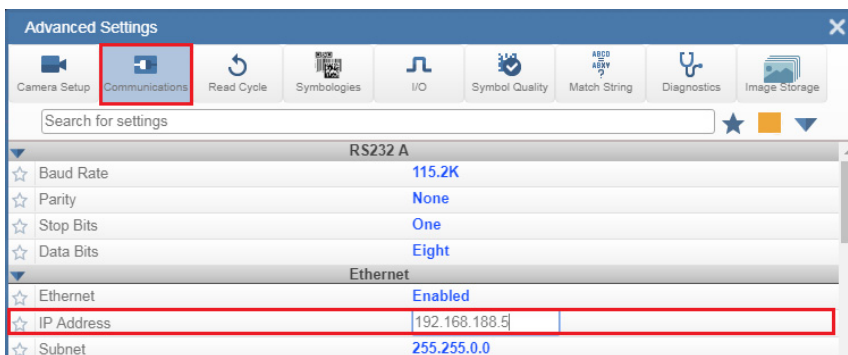
To change the IP address, configure it from the following item in the **Advanced** in the WebLink.-  
**Communications - Ethernet - IP Address.**

Follow the procedures below.

- 1.Launch WebLink.
- 2.Click the gear icon on the upper right of the screen to select **Advanced**.



- 3.Select **Communications - IP address** and input the new IP address to change.  
For instance: Set **192.168.188.5**.



- 4.Click Flash memory icon to save the settings to it.



- 5.The following dialog box appears and then click **OK**.

192.168.188.2 の内容

Saving the current settings on your camera will require a reboot. Continue?

OK

キャンセル

To change the IP address

6. Close the browser opening WebLink. Enter the new IP address (<http://192.168.188.5>) set at the procedure 3 to re-open WebLink..



7. When WebLink is launched successfully, the IP address change is completed.

For a V430 whose IP address has been unknown, use the DDU software. For the usage, please refer to **Step3 — Connect to WebLink** in **Chapter 2 V430-F-series and WebLink Quick Start**. For the DDU software, download from Omron Web site or Omron MicroScan Web site. If you cannot download it, please contact your Omron representative.

# Appendix T — ESP Software Operation Guide

## ESP Software Overview

### *What is ESP Software?*

ESP (Easy Setup Program) is Omron Microscan software intended to be used for making setting changes, automatically adjusting settings, and updating firmware on the V430 reader. It should be installed on a PC.

### *Operating Environment Requirements*

Supported OS: Windows® 10, 8, 7 (32-bit, 64-bit)

### *ESP Software Special Functions and Precautions for Use*

WebLink is the recommended tool for most V430 reader operations and setting adjustments. However, for the operations described below under **ESP Special Functions**, the WebLink functions are more limited, so ESP should be used.

### **ESP Special Functions**

1. You can use ESP to save data that has been output to the terminal. For detailed information, refer to **Terminal Screen**.
2. The Configuration Database can be used to set up and toggle between multiple image capture setting combinations for reading with only 1 trigger input. The following are other useful features.
  - Read result data can be output for multiple captured images.
  - With only 1 trigger input, it is possible to use different imaging settings when you wish to read 2 or more symbols.
  - Using one image that has multiple symbols you wish to read, it is possible to individually select the regions for each symbol and read and output data for each in any order, according to conditions you specify. For further information, refer to **Configuration Database Function**.
3. **Ordered Output** You can specify the data output order for a symbol type you wish to output. Example: Output symbol data for QR Code first and then Code 39. For further information, please refer to **Ordered Output Function**.
4. ESP can be used to update the V430 firmware. For further information, refer to **How to Update Reader Firmware using ESP**.

## Precautions

1. ESP Software is available in English only. There is no Japanese version of the software.
2. The following settings, which are supported in WebLink cannot be set or changed from ESP software. Use WebLink to configure the following:
  - Camera Setup > Lighting > Illumination Brightness: Extreme
  - Camera Setup > Lighting > Fixed Light On Time
  - Camera Setup > Lighting > Fixed Light Delay Time
  - Multiple Settings in Symbologies > Advanced
  - I/O > Symbol Quality (ISO/IEC 15415) > Output1
  - I/O > Symbol Quality (ISO/IEC 15416) > Output1
  - I/O > Symbol Quality (ISO/IEC 29158) > Output1
  - I/O > Symbol Quality (ISO/IEC 15415) > Output2
  - I/O > Symbol Quality (ISO/IEC 15416) > Output2
  - I/O > Symbol Quality (ISO/IEC 29158) > Output2
  - I/O > Symbol Quality (ISO/IEC 15415) > Output3
  - I/O > Symbol Quality (ISO/IEC 15416) > Output3
  - I/O > Symbol Quality (ISO/IEC 29158) > Output3
  - Multiple Settings in Symbol Quality > ISO/IEC 15415 Parameters
  - Multiple Settings in Symbol Quality > ISO/IEC 15416 Parameters
  - Multiple Settings in Symbol Quality > ISO/IEC 29158 Parameters

# ESP Software General Operation

## Downloading ESP Software

ESP software can be downloaded from the following location:

Omron Microscan Download Center: <http://www.microscan.com/en-us/support/download-center>

Click **Omron Microscan Software Downloads - ESP X.X.X** (X represents the latest revision number).

**Important:** Member registration is required for downloading.

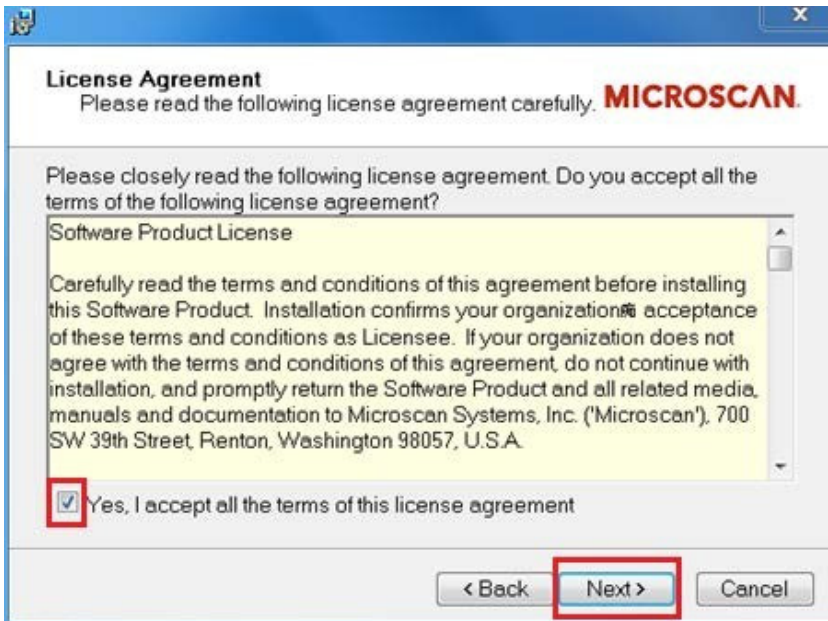
If you are unable to download the software from this location (<http://www.fa.omron.co.jp/>), please contact your OMRON sales representative.

## Steps for Installing and Configuring ESP Software

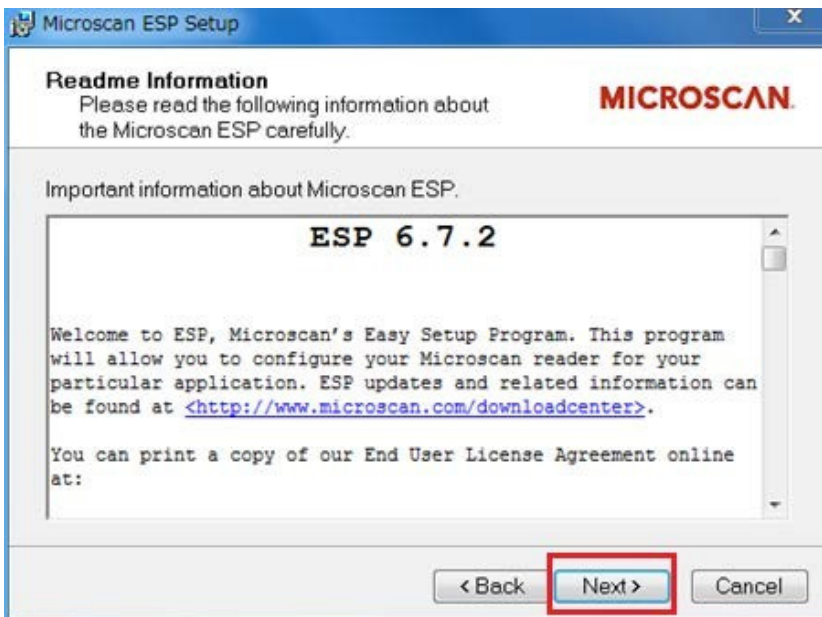
1. Extract the downloaded file and double-click **Setup.exe**.
2. The ESP software setup screen will launch. Click **Next**.



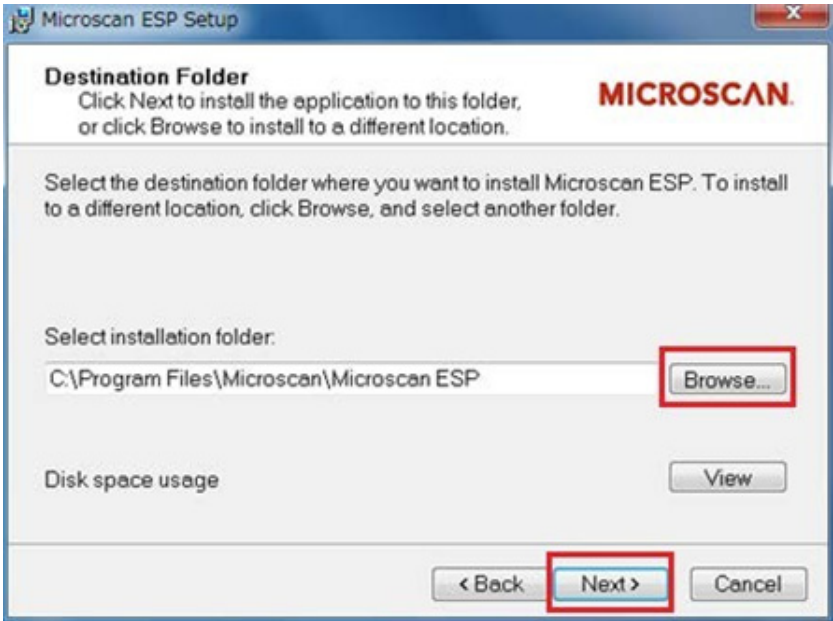
3. Read the ESP software product license, check the box for **Yes**, and then click **Next**.



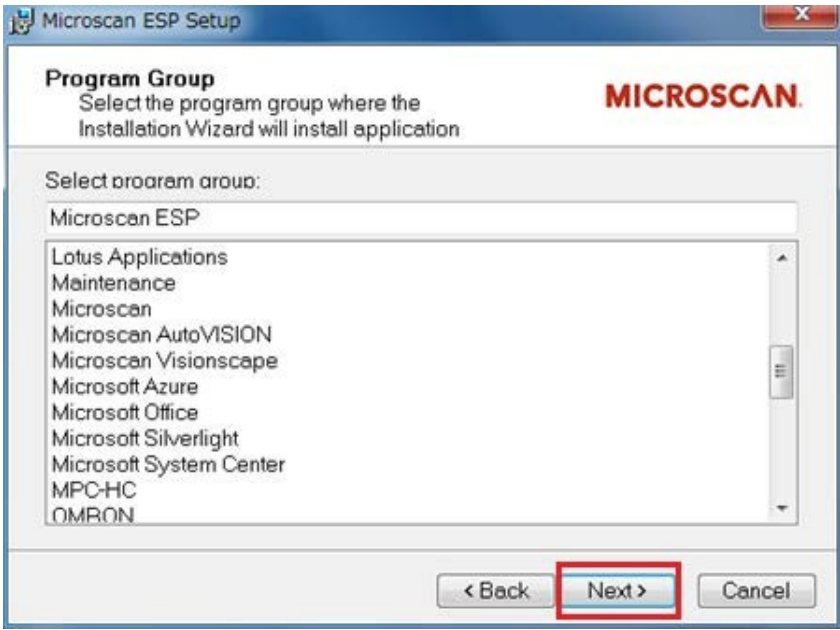
4. **Readme Information** is displayed. Click **Next**.



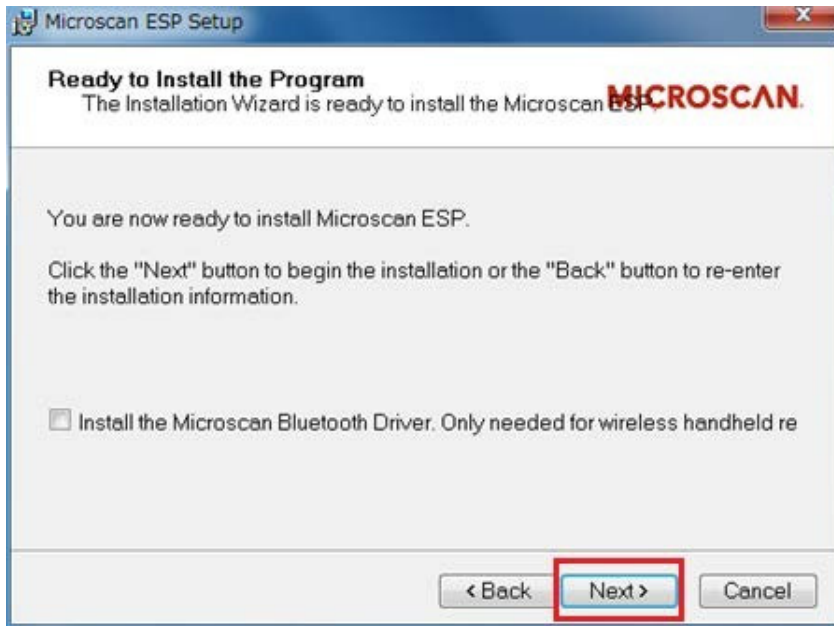
5. Select the location you wish to install ESP software to and click **Next**. (By default it is installed to **Program Files**.)



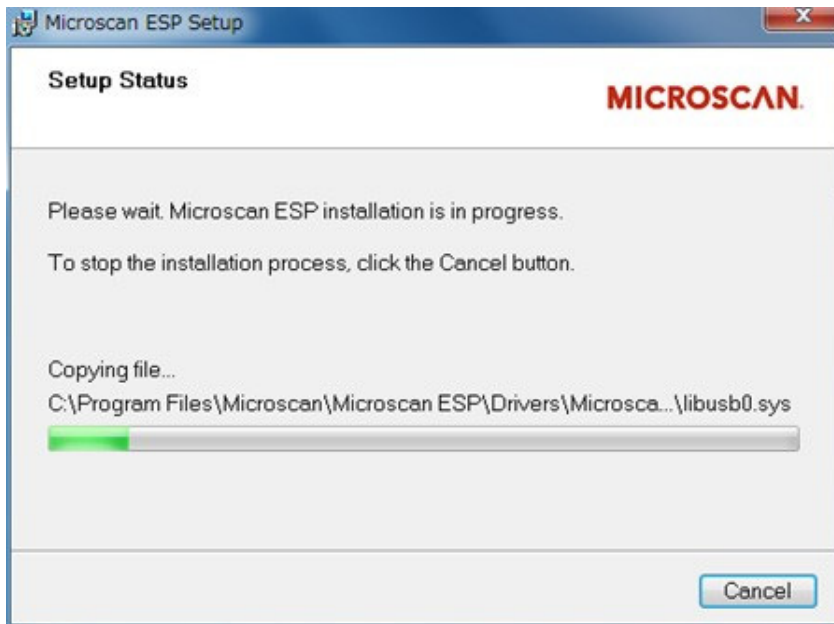
6. Click **Next**.



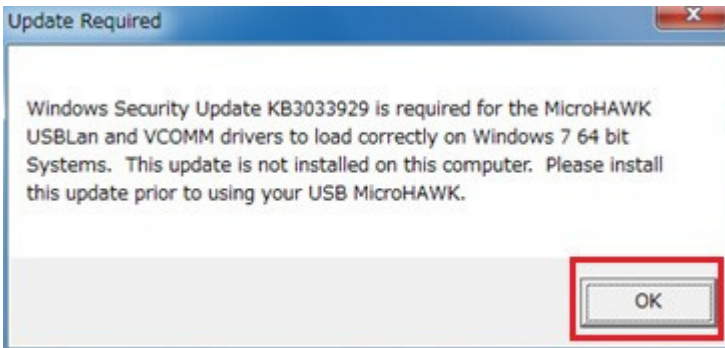
7. Uncheck the box for Install the Microscan Bluetooth and click **Next**.



8. The installation starts.



9. If the screen about device software appears, click **Install**.
10. If the screen below appears, click **OK**.



11. When installation is complete, the following screen is displayed. Click **Finish**.

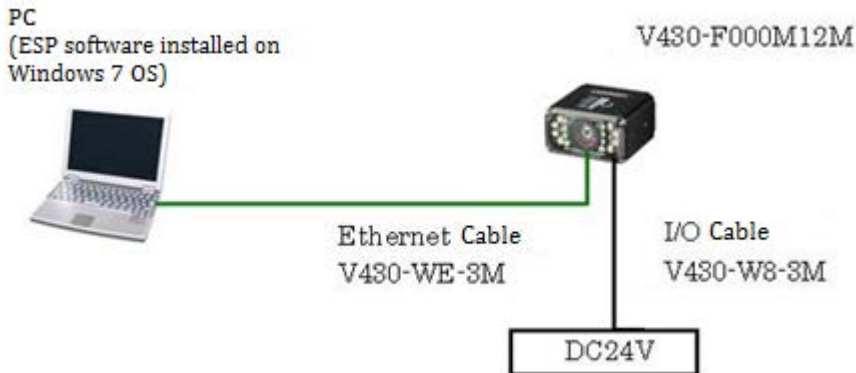


## How to Connect to a Device with ESP Software

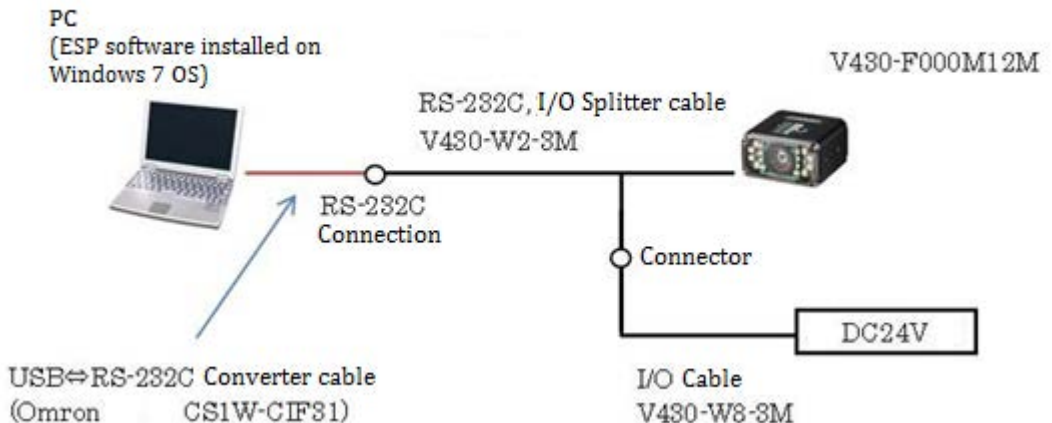
### Connection Method

To use ESP with a reader, connect to the reader by Ethernet or RS-232C. The OS and models shown below are an example configuration.

### Ethernet Connection Example



### RS-232C Connection Example

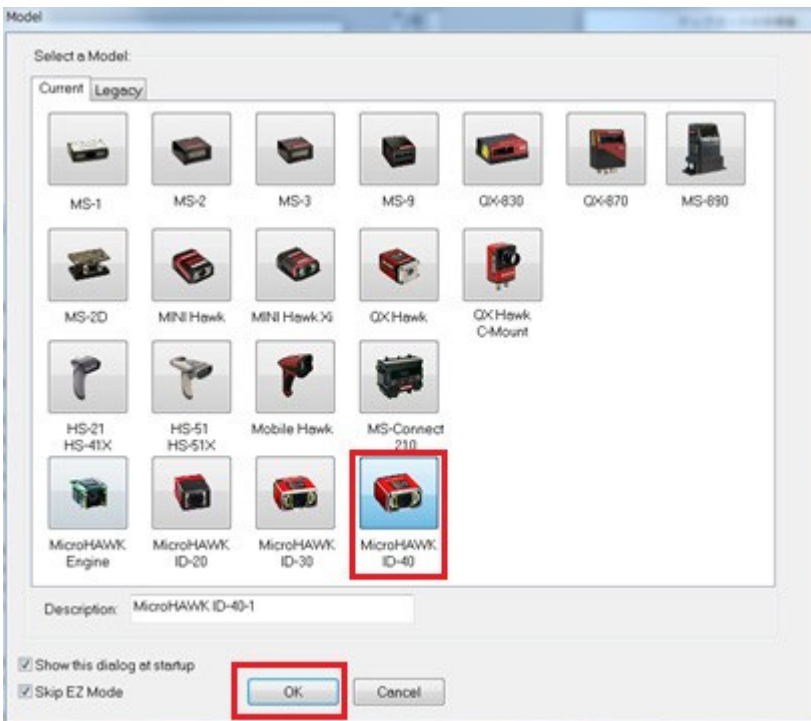


## Connect to a V430 Reader from ESP Software

1. Connect the PC and the V430 reader according to the instructions in **How to Connect to a Device with ESP Software**.
2. Launch ESP software.



3. Select the **MicroHAWK ID-40** and click **OK**.

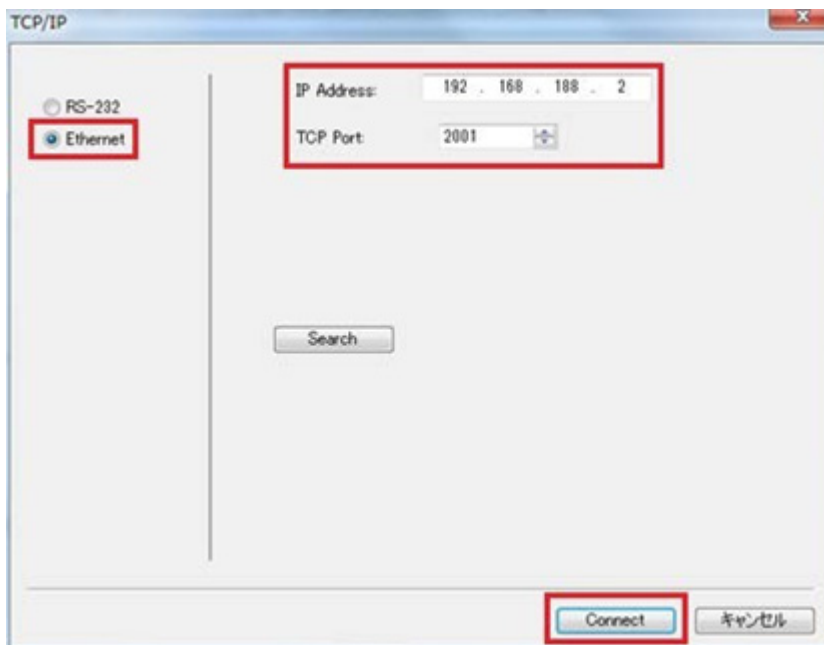


**Note:** The V430-F is not listed, but the MicroHAWK ID-40 is a comparable product.

4. The dialog **Would you like to connect to the MicroHAWK ID-40?** is displayed. Click **Yes**.

5. (a.) If using an Ethernet connection, select **Ethernet** and set the IP address and TCP Port settings. Then click **Connect**.

The **Search** button cannot be used to connect to the V430.



If the IP address of the V430 reader is unknown, use the DDU (Device Discovery Utility) software. The DDU software can be downloaded from the following location:

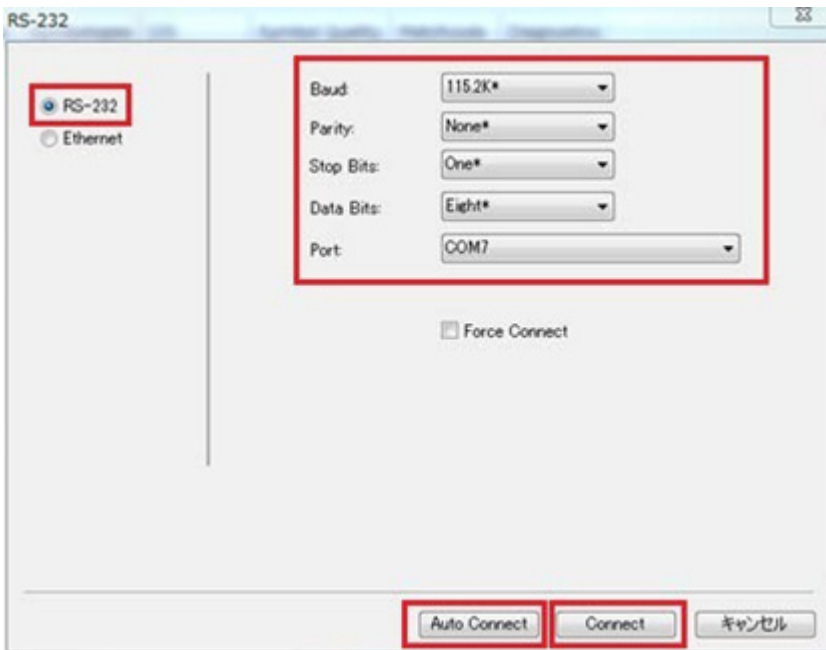
- Omron Microscan Download Center <https://www.microscan.com/en-us/support/download-center>. Navigate to [Omron Microscan Software Downloads] and click on [Device Discovery Utility X.X] (X indicates the latest version number) to begin the download.

**Important:** Member registration is required for downloading.

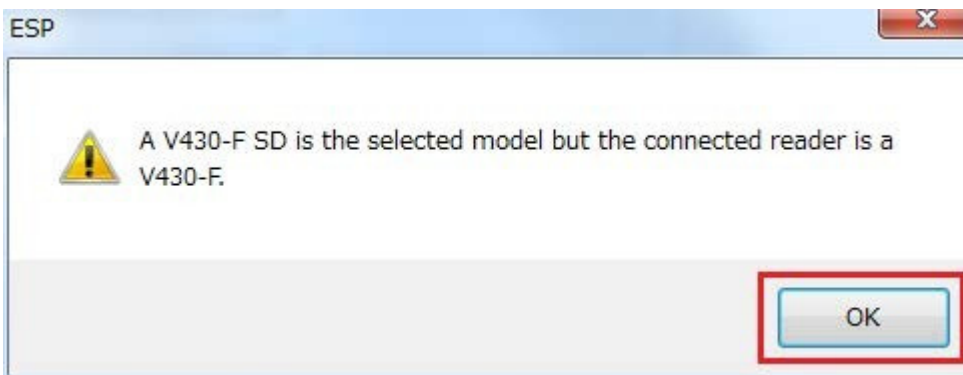
If you are unable to download the software from this location (<https://www.fa.omron.co.jp/>), please contact your OMRON sales representative.

- (b.) For an RS-232C connection, select [RS-232] and enter the required settings for this communication method.

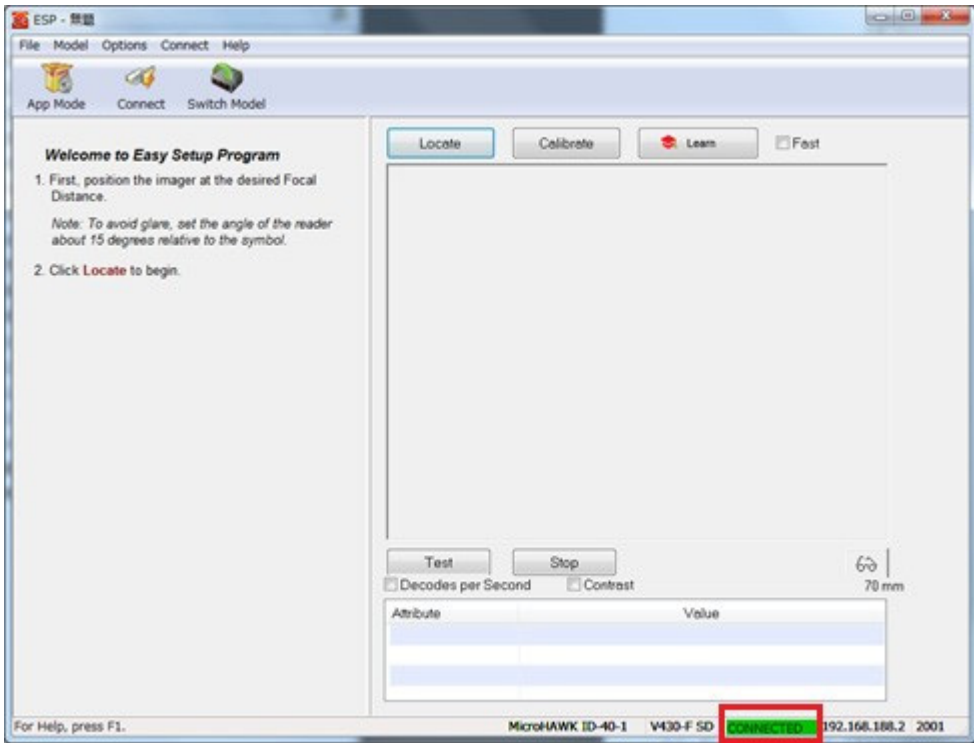
After entering, click **Connect**. If settings other than the COM Port, are unknown, you can click on **AutoConnect** to automatically search and connect.



- The following message is displayed. Click **OK**.
- You are now connected to the V430 reader.



Confirm the status is CONNECTED (green background).



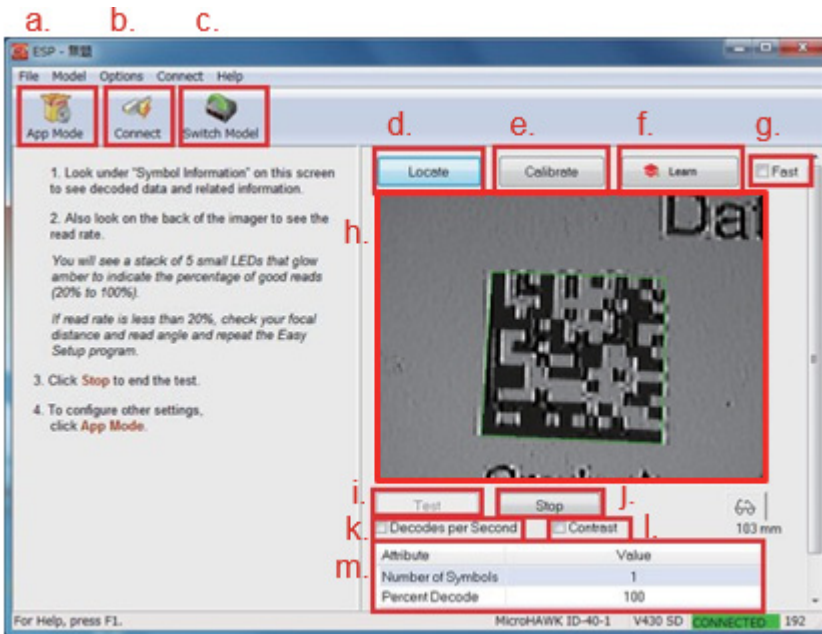
# Explanation of ESP Menu Items

## The Menu Bar

File Model Options Connect View Help

- **File:** Load or Save ESP (.esp) setting files.
  - **Model:** Connect to a V430 reader.
  - **Options:** Change the general system settings for ESP software.
  - **Connect:** Establish communication with a V430 through a physical connection.
  - **View:** Navigate to the **Parameters**, **Setup**, **Terminal**, **Utilities**, or **Barcode Dialog** views.
  - **Help:** Display the ESP Help files and software version information.
- For more detailed information on all the menu items above, please see **Using ESP**.

## EZ Mode

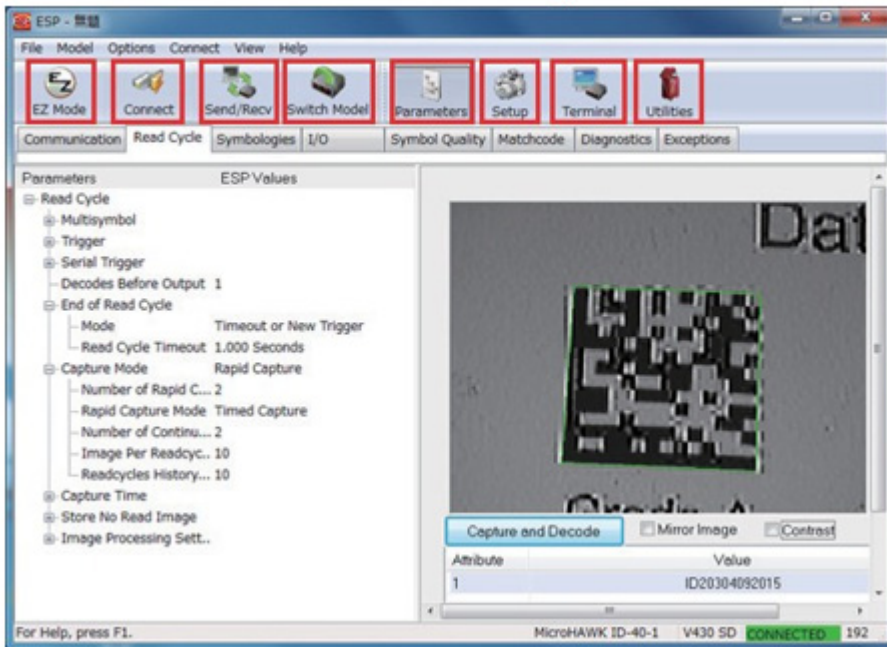


- a) **App Mode:** Clicking on this will take you to the **App Mode** screen.
- b) **Connect:** Establish communication with a V430 through a physical connection.
- c) **Switch Model:** Connect to a V430 reader.
- d) **Locate:** When you click Locate, the current field of view from the V430 is displayed on the **Field of View Screen**.

- e) **Calibrate:** Perform calibration to optimize the reading of the symbol currently displayed in the field of view.
- f) **Learn:** Perform teaching for the symbol.
- g) **Fast:** Decimates the image to decrease image update times.
- h) **Field of View Screen:** Displays the current field of view from the V430 reader.
- i) **Test:** Starts a Read rate test.
- j) **Stop:** Stops the Read rate test in progress.
- k) **Decodes per Second:** Outputs the number of Decodes per second.
- l) **Contrast:** Adjusts the display based on the contrast of the Field of view image.
- m) **Symbol information:** Outputs the decoded content of the symbol.

## App Mode

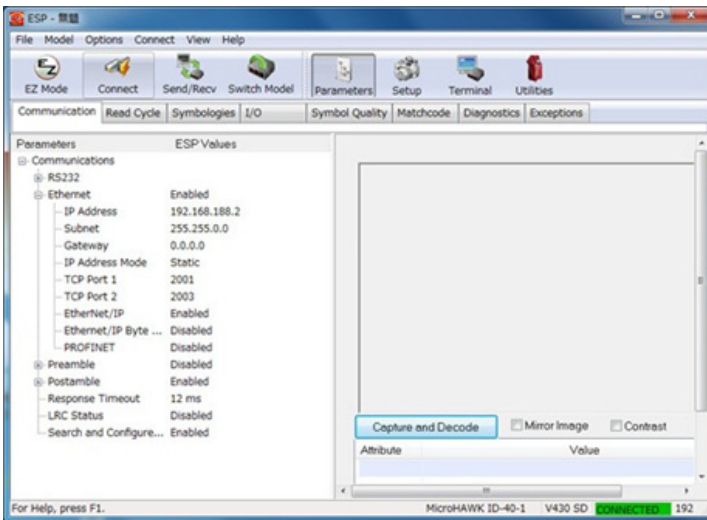
a. b. c. d. e. f. g. h.



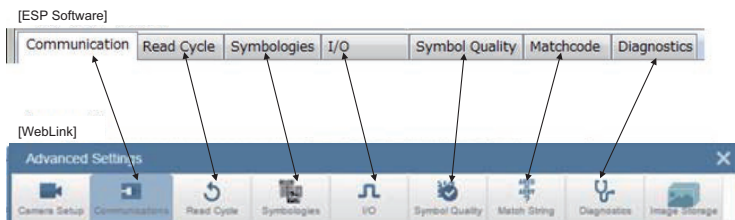
- a) **EZ Mode:** Clicking on this will take you to the **EZ Mode** screen.
- b) **Connect:** Establish communication with a V430 through a physical connection.
- c) **Send/Recv:** Load current settings from and apply settings to the V430 reader.
  - **Receive Reader Settings:** Load the current settings from the V430 reader.
  - **Save to Reader:** Apply settings made in ESP to the V430 reader and save them to file.
  - **Send, No Save:** Apply settings to the V430 reader without saving them to file.
  - **Send and Save:** Apply settings to the V430 reader and save them to file.

- **Send and Save as Customer Defaults:** The written setting value is saved as the default value of customer use parameter.
  - **Default all ESP Settings:** Returns all settings in ESP to Microscan's default parameters. This selection will not apply or save any changes on the V430 reader.  
For more information on Customer default parameters and Microscan default parameters, refer to **Utilities**.
- d) **Switch Model:** Connect to a V430 reader.
- e) **Parameters:** Set the Read Cycle and I/O parameters.
- f) **Setup:** Set the brightness for imaging, setup the configuration database, and the output order of decoded character strings.
- g) **Terminal:** Opens the command terminal from which K Commands can be sent to the reader and decoded character strings can be displayed.
- h) **Utilities:** Update the V430 Reader firmware.

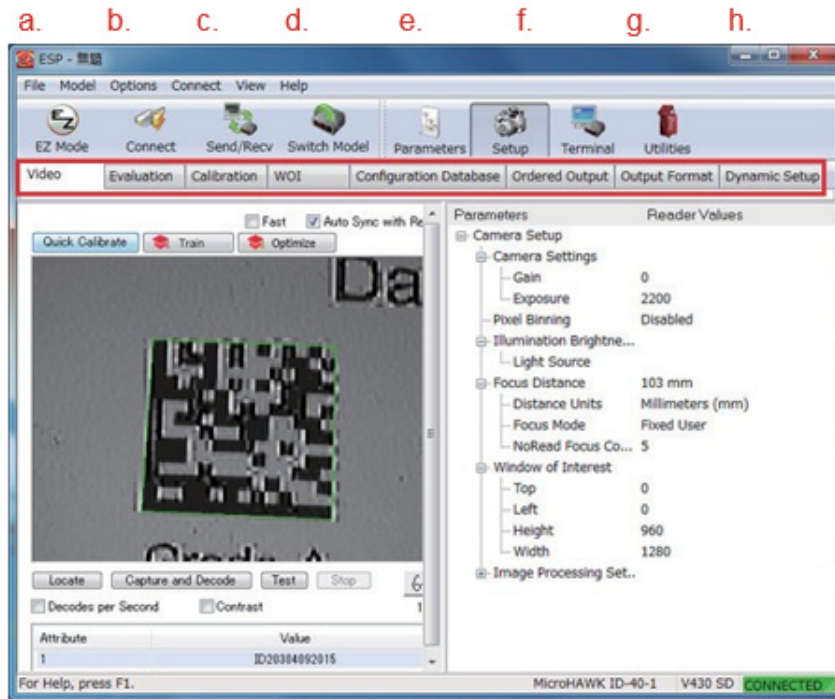
## Parameters Screen



The setting items displayed on the **Parameters** screen can also all be made from the WebLink **Advanced Settings** tab. However, please note that there are differences between WebLink and ESP regarding what is displayed and how it is displayed. The advanced setting tabs correspond as shown below.



## Setup Screen

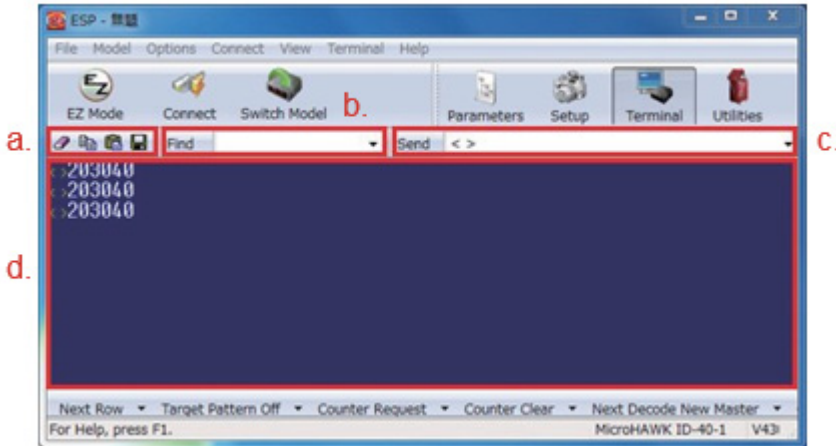


- a) **Video:** The settings that can be made from this menu are the same as those that can be made from **Advanced Settings > Camera Setup** in WebLink.
- b) **Evaluation:** The V430 Reader can display and capture images, and perform image analysis using histograms and line scans.
- c) **Calibration:** You can perform calibration on the symbol being imaged.
- d) **WOI:** The imaging range of the V430 Reader can be specified by entering coordinates or dragging the frame with the cursor.
- e) **Configuration Database:** Multiple setting combinations can be stored and applied using only one trigger input.
- f) **Ordered Output:** By specifying the conditions for outputting codes that are read, you can control the order in which they are output.
- g) **Output Format:** You can insert a header or footer, extract a decoded string, or add an arbitrary string to the output of the read symbol.  
This setting corresponds with **Advanced Settings > Output Format** in WebLink.
- h) **Dynamic Setup:** You can adjust the image capture timing when capturing multiple images during the scanning cycle.  
This setting corresponds with **Advanced Settings > Read Cycle** in WebLink.  
For more detailed information on all the items above, refer to **Camera Setup and IP**

**Setup.**

## **Terminal**

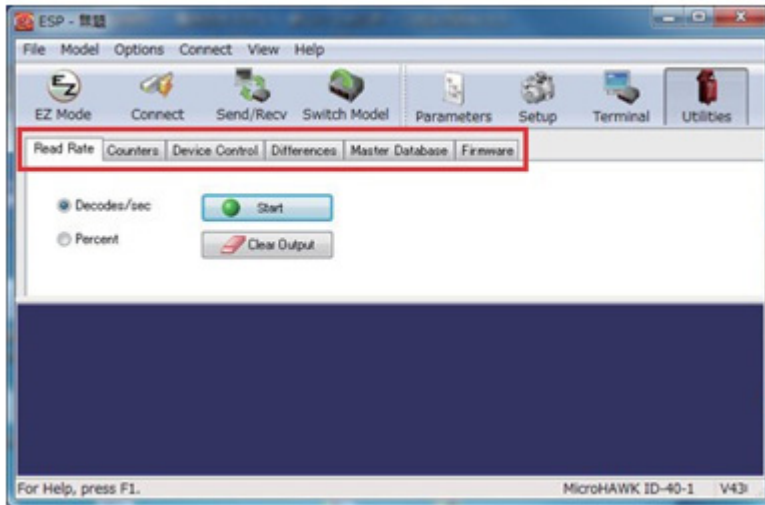
Using **Terminal**, you can view the serial command sent and confirm its response.



- a) **Operation Icons:** From left: **Erase Text**, **Copy Text**, **Paste Text**, and **Save Text**. With **Save Text** you can save the command and response history of serial command output to the terminal as a .txt file in any location.
- b) **Searching for Text:** Enter the text you want to search in the space on the right, and click **Find** to search.
- c) **Sending a Serial Command:** You can send the serial command by entering the serial command you want to send in the space on the right and clicking **Send**.
- d) The history of command and response of serial command is displayed here.

## Utilities

a. b. c. d. e. f.



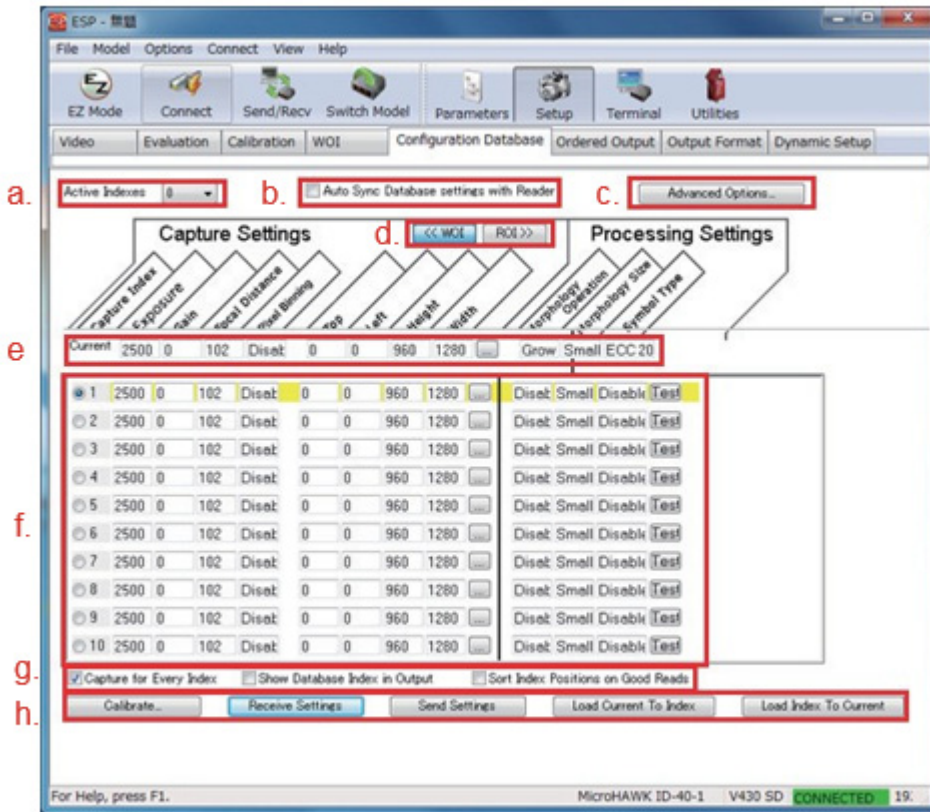
- a) **Read Rate:** Displays Read Rate statistics.
- b) **Counters:** You can check and reset the count values for **Cycle, Reads, No Read,** and **Mismatch**.
- c) **Device Control:** You can test the Output ON conditions for OUTPUT 1, 2 and 3 signals of the I/O cable, and enable/disable Read Cycle on the V430 reader.
- d) **Differences:** You can use this to view settings on the V430 reader for differences from the Microscan default parameters and output a DataMatrix symbol for the settings that differ. This Data Matrix symbol can be used when you want to set the same parameter for multiple V430 readers.
- e) **Master Database:** Up to 10 master symbols can be registered for use in matchcodes.
- f) **Firmware:** Used to update the V430 reader firmware. For further information, refer to **How to Update Reader Firmware using ESP**. For other functions, refer to **Utilities**.

## The Configuration Database Function

The **Configuration Database** function in ESP can be used to set up and toggle between multiple image capture setting combinations for reading with only one trigger input.

It is intended primarily for the following use cases:

- Output of decoded data from multiple captured images.
- With only one trigger input, it is possible to use different imaging settings when you wish to read two or more symbols.
- Using one image that has multiple symbols you wish to read, it is possible to individually select the regions for each symbol and read and output data for each in any order, according to conditions you specify.



- Active Indexes:** Specify the database number for the settings combination you wish to use (0 to 10). Setting the value to "1" or more enables the use of Configuration Database settings.
- Auto Sync Database Settings with Reader:** Check the box to automatically apply settings changed in Configuration Database to the V430 reader.
- Advanced Options:** Set the timing for switching between databases.

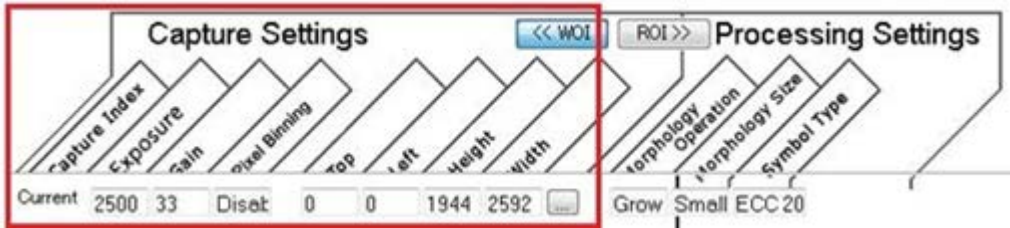
- **Timeout:** Set the time limit before switching to the next database when there is a No Read with the current database being used.
  - **Frames:** Set the number of image captures and successful reads to get before switching to the next database. All switch back to database 1 if you switch from database 10.
- d) **WOI, ROI:** Specify how to handle the set range. For further information on this function, refer to Window of Interest and Region of Interest screens and WOI/ROI settings.
- e) **Current:** Current V430 reader settings being used.
- f) **Database List:** Displays the maximum of 10 databases that can be used. Different setting values can be saved to each database. For further information on this function, refer to **Settings That Can Be Saved in the Databases**.
- g) Functions for bottom row of buttons:
- **Capture for Every Index (Checked):** Capture an image every time you switch the database. (Unchecked): Images are not captured for every switching of the database. Use this setting if you want to perform different processing such as changing the field of view, changing output order of multiple symbols contained in a single image, or specifying the code type and outputting in order. In this case, it is necessary to set the same exposure time, gain and focal length for all databases.
  - **Show Database Index in Output (Checked):** When outputting data, add information to determine which database was used to read the code.  
**Example Output:** The string "ABC123" successfully decoded using the settings saved in database 3 (**ABC123 DB3**).  
**Unchecked:** Setting not used.
- **Sort Index Positions on Good Reads**  
**Checked:** Swaps the setting value stored in the database number that read with the setting value stored in database 1. Use this when you want to shorten the time to decode the same symbol again.  
**Unchecked:** Setting not used.
- h) Functions for bottom row of buttons:
- Calibrate:** Perform calibration on the settings displayed for Current.
  - Receive Settings:** Load settings from the V430 reader in to ESP.
  - Send Settings:** Save setting changes made in ESP to the V430 reader.
  - Load Current To Index:** Save the Current setting to the selected database.
  - Load Index To Current:** Load the settings saved in the selected database into Current.

## Window of Interest, Region of Interest (WOI/ROI) Settings

### The Difference between WOI and ROI

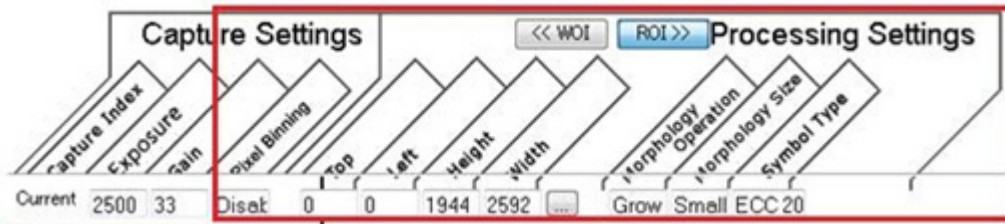
#### WOI Settings (Window of Interest)

The ranges set for all the items, **Top** to **Width** are used to set size and location of the image to capture.



#### ROI Settings (Region of Interest)

The ranges set for all the items, **Top** to **Width** are used to set size and location of the region in which to search for a symbol.

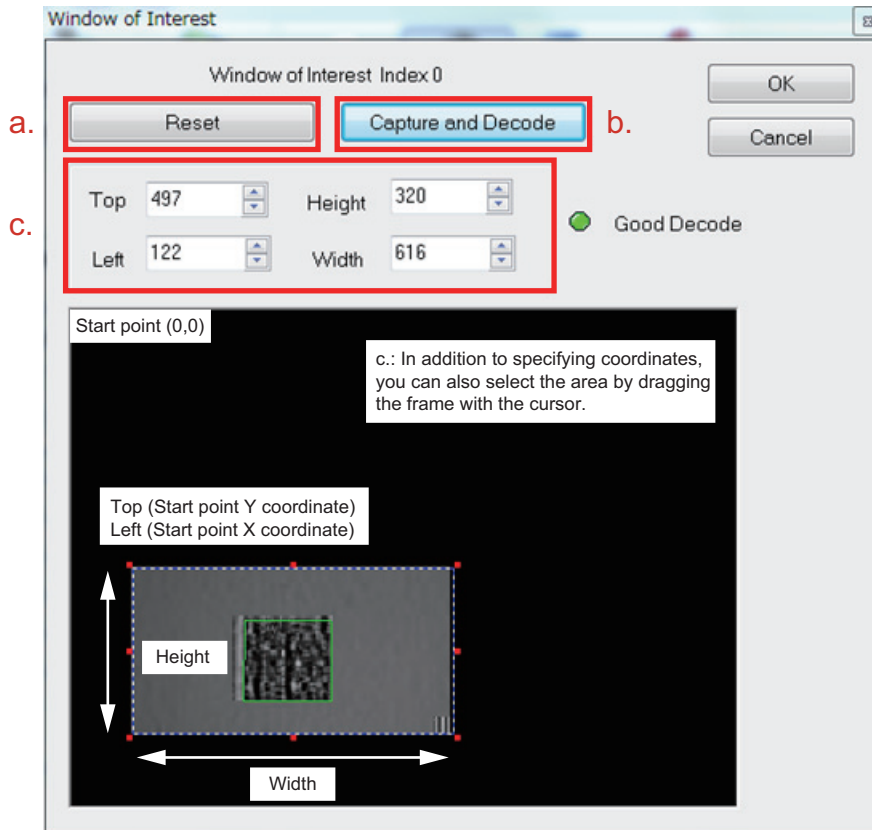


#### Designated Area of Range



Clicking this button takes you to the following screens.

### Window of Interest and Region of Interest Screens (Setting Items are Identical)



- a) **Reset:** Resets the Field of View settings.
- b) **Capture and Decode:** Confirm Read results. If the symbol is successfully read, it will be displayed within a green frame and **Good Decode** will be displayed.

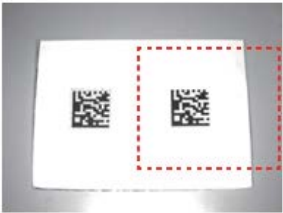
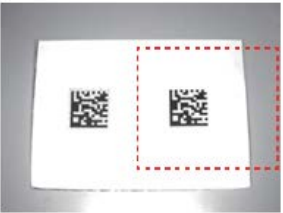






**The Difference between WOI and ROI**

**WOI (Window of Interest)** applies the selected range as the image to capture.

**ROI (Region of Interest)** applies the selected range as the region in which to search for a symbol.

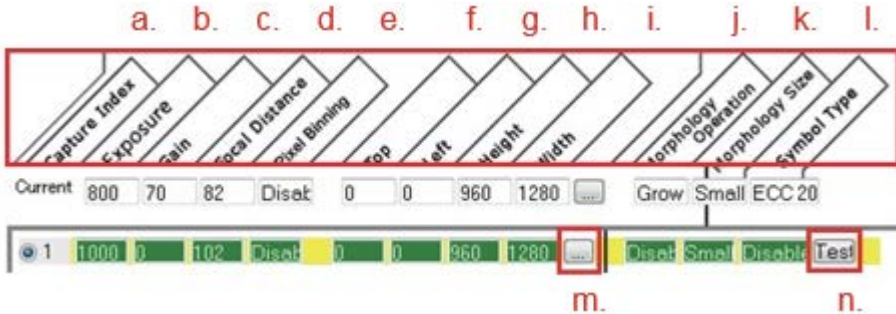
The differences between WOI and ROI settings are as follows:

The red frame shows the ranges set on the **Window of Interest** and **Region of Interest** screens.

	WOI (Window of Interest)	ROI (Region of Interest)
Captured image and specified range		
Range of captured image		
Range within to read a code symbol		
Output image		

## Settings That Can Be Saved in the Databases

### Explanation of Each Setting Item



- a) **Capture Index:** Numbers from 1 to 10 have been assigned. Check the radio button next to the numbers and apply them by clicking on either **Load Current To Index** or **Load Index To Current**.
- b) **Exposure:** The exposure time.
- c) **Gain:** The amount of gain (brightness).
- d) **Focal Distance:** Sets the focal distance to use.
- e) **Pixel Binning:** Set Pixel binning.
- f) **Top:** Start coordinate on the Y-axis of the Field of View to read in.
- g) **Left:** Start coordinate on the X-axis of the Field of View to read in.
- h) **Height:** Width on the Y-axis of Field of View in which to read.
- i) **Width:** Width on the X-axis of Field of View in which to read.
- j) **Morphology Operation:** Pre-processing to perform.
- k) **Morphology Size:** Specify size of pre-processing.
- l) **Symbol Type:** Specify the type of symbol to read.
- m) Clicking on the ... button allows you to change the read field of view by dragging the frame. For further information on this function, refer to **Window of Interest**, **Region of Interest** screens, and **WOI/ROI** settings.
- n) **Test Button:** Perform a test read. If a symbol is read, the database number used to achieve the successful read and the decoded character string for the symbol is displayed at the lower right of the Configuration Database screen.



## Configuration Database Use Case Examples

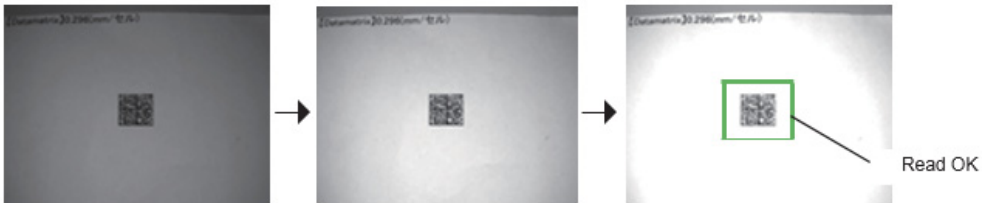
Here, we will describe several specific examples for using the Configuration Database function.

### Settings Example 1: Performing a Read by Switching the Database to Use

After trigger input, it tries to read one code by switching through three setting values.

#### Read Image

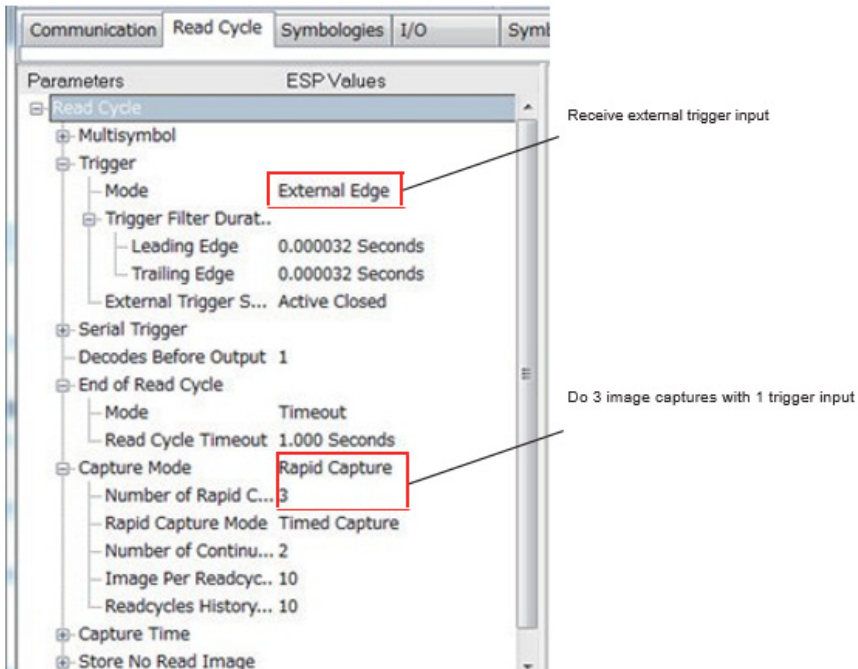
1. Trigger input from an external device.
2. Image capture is done three times using different brightness settings.



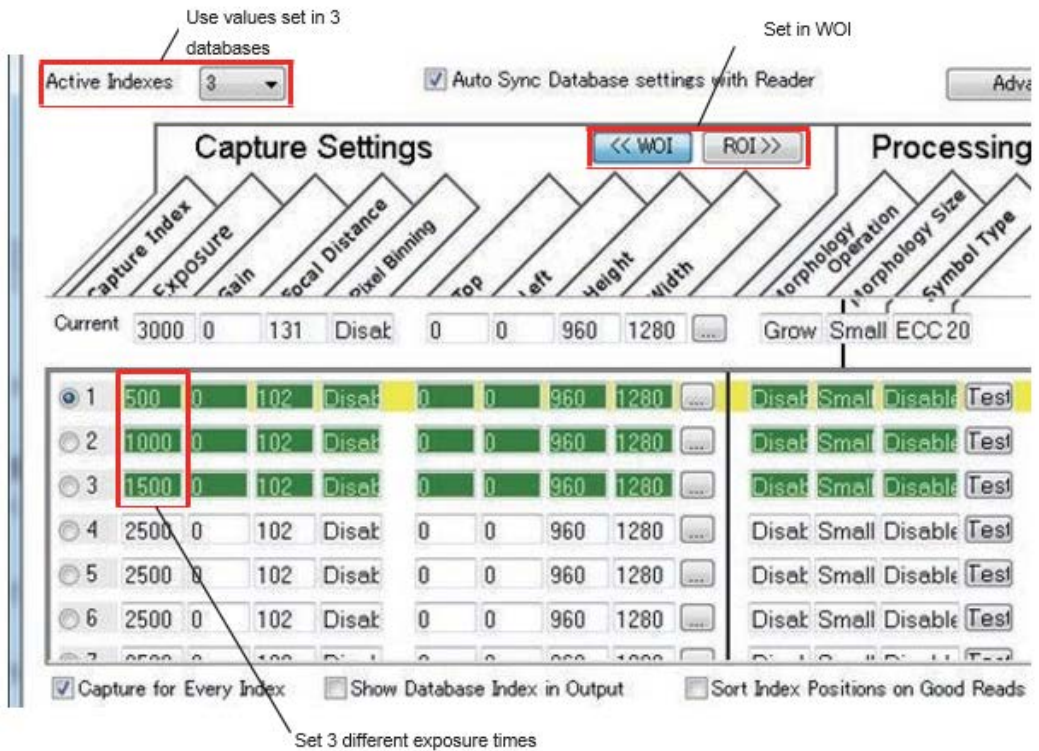
3. The decoded string output at the point where there is an OK Read.

## ESP Software Settings

### Read Cycle



## Configuration Database Setting

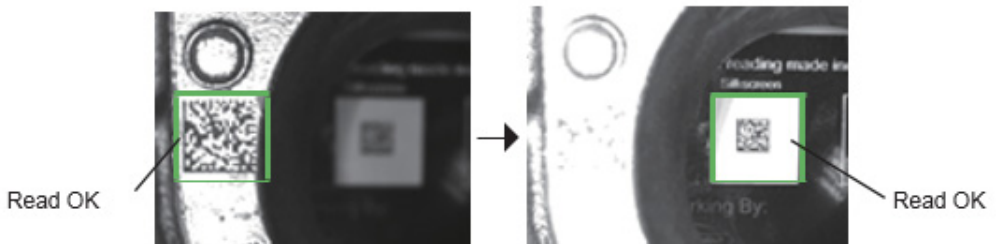


### Settings Example 2: Read Multiple Symbols One-by-One with Different Settings

After trigger input, it tries to read two codes, one by one by switching through two setting values.

#### Read Image

1. Trigger input from an external device.
2. Image capture is done two times while using different brightness and Focal distance settings.



3. The decoded string output for each at the point where each has an OK Read.

## ESP Software Settings

### Read Cycle

The screenshot shows the 'Read Cycle' configuration window in the ESP software. The window has tabs for 'Communication', 'Read Cycle', 'Symbologies', 'I/O', and 'Symb'. The 'Read Cycle' tab is active, showing a tree view of parameters and their values. Three specific settings are highlighted with red boxes and annotated with arrows and text:

- Number of Symbols:** Set to 2. Annotation: "Perform read on 2 code symbols".
- Mode:** Set to External Edge. Annotation: "Receive external trigger input".
- Capture Mode:** Set to Rapid Capture. Annotation: "Do 2 image captures with 1 trigger input".

Other visible settings include:

- Multisymbol: Multisymbol Separ... ,
- Trigger: Trigger Filter Durat.., Leading Edge 0.000032 Seconds, Trailing Edge 0.000032 Seconds, External Trigger S... Active Closed
- Serial Trigger: Decodes Before Output 1
- End of Read Cycle: Mode Timeout or New Trigger, Read Cycle Timeout 1.500 Seconds
- Capture Mode: Number of Rapid C... 2, Rapid Capture Mode Timed Capture, Number of Continu... 2, Image Per Readcyc.. 10, Readcycles History... 10
- Capture Time

### Configuration Database Setting

Use values set in 2 databases

Active Indexes:

Auto Sync Database settings with Reader

#### Capture Settings

Capture Index, Exposure, Gain, Focal Distance, Pixel Binning, Top, Left, Height, Width

<< WOI   ROI >>

#### Processing

Morphology Operation, Morphology Size, Symbol Type

Current: 7500 0 100 Disat 0 0 960 1280 ... Grow Small ECC 20

<input checked="" type="radio"/> 1	7500	0	100	Disat	0	0	960	1280	...	Disat	Small	Data M	Test
<input type="radio"/> 2	20000	0	150	Disat	0	0	960	1280	...	Disat	Small	Data M	Test
<input type="radio"/> 3	2500	0	50	Disat	0	0	960	1280	...	Disat	Small	Disable	Test
<input type="radio"/> 4	2500	0	50	Disat	0	0	960	1280	...	Disat	Small	Disable	Test
<input type="radio"/> 5	2500	0	50	Disat	0	0	960	1280	...	Disat	Small	Disable	Test
<input type="radio"/> 6	2500	0	50	Disat	0	0	960	1280	...	Disat	Small	Disable	Test
<input type="radio"/> 7	2500	0	50	Disat	0	0	960	1280	...	Disat	Small	Disable	Test
<input type="radio"/> 8	2500	0	50	Disat	0	0	960	1280	...	Disat	Small	Disable	Test
<input type="radio"/> 9	2500	0	50	Disat	0	0	960	1280	...	Disat	Small	Disable	Test
<input type="radio"/> 10	2500	0	50	Disat	0	0	960	1280	...	Disat	Small	Disable	Test

Capture for Every Index    Show Database Index in Output    Sort Index Positions on Good Reads

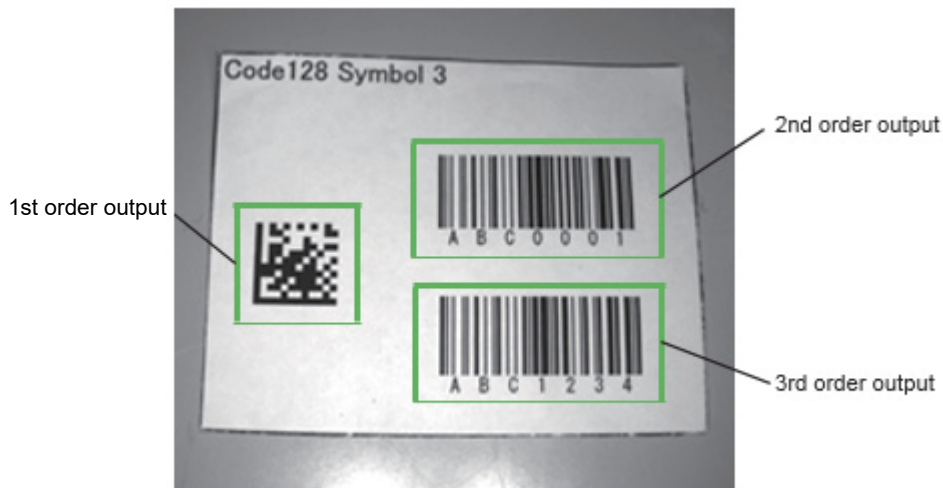
2 types of settings are saved

**Settings Example 3: Separate the Fields of View and Output the Symbols Included in the Specified Field of View in Order**

After trigger input, 3 symbols are imaged from 1 captured image and output in order.

**Read Image**

1. Trigger input from an external device.
2. From 1 image capture, 3 symbols decoded and output in a specified order.



## ESP Software Settings

### Read Cycle

The screenshot shows the 'Read Cycle' tab of the ESP Software Settings dialog. The 'Parameters' section is expanded to show the following settings:

- Read Cycle** (Selected)
- Multisymbol**
  - Number of Symbols: **3** (Annotated: Perform read on 3 code symbols)
  - Multisymbol Separ...: ,
- Trigger**
  - Mode: **External Edge** (Annotated: Receive external trigger input)
  - Trigger Filter Durat..
    - Leading Edge: 0.000032 Seconds
    - Trailing Edge: 0.000032 Seconds
  - External Trigger S...: Active Closed
- Serial Trigger**
  - Decodes Before Output: 1
- End of Read Cycle**
  - Mode: Timeout or New Trigger
  - Read Cycle Timeout: 1.000 Seconds
- Capture Mode**
  - Number of Rapid C...: **1** (Annotated: Do 1 image captures with 1 trigger input (Since the code symbols are output sequentially, only one image is taken))
  - Rapid Capture Mode: Timed Capture
  - Number of Continu...: 2
  - Image Per Readcyc..: 10
  - Readcycles History...: 10

### Configuration Database Setting

Use values set in 3 databases

Active Indexes   Auto Sync Database settings with Reader

Set in ROI

Capture Settings: Capture Index, Exposure, Gain, Focal Distance, Pixel Binning, Top, Left, Height, Width

Processing: Morphology Operation, Morphology Size, Symbol Type

Current: 825, 0, 122, Disak, 0, 0, 960, 1280, ..., Grow, Small, ECC 20

1	1000	0	122	Disak	0	0	928	616	...	Disak	Small	Disable	Test
2	1000	0	122	Disak	2	583	464	696	...	Disak	Small	Disable	Test
3	1000	0	122	Disak	509	622	432	656	...	Disak	Small	Disable	Test
4	2500	0	102	Disak	0	0	960	1280	...	Disak	Small	Disable	Test
5	2500	0	102	Disak	0	0	960	1280	...	Disak	Small	Disable	Test
6	2500	0	102	Disak	0	0	960	1280	...	Disak	Small	Disable	Test
7	2500	0	102	Disak	0	0	960	1280	...	Disak	Small	Disable	Test
8	2500	0	102	Disak	0	0	960	1280	...	Disak	Small	Disable	Test

Capture for Every Index  Show Database Index in Output  Sort Index Positions on Good Reads

Set the Exposure, Gain, and Focus Distance to be the same for all (because only one image is taken, all must be the same).

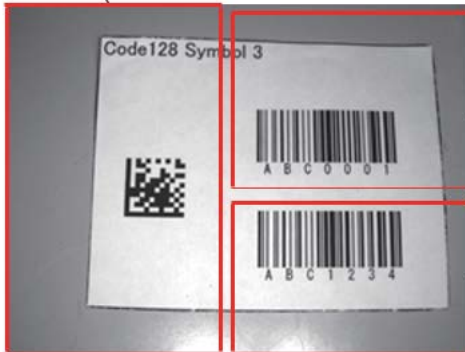
Store each field of view. Refer to [Setting field of view] below for how to set the field of view here

Uncheck this

### Field of View Range Set

The symbols included in the range specified in databases 1 to 3 are output in order.

Database 1 Field of view range



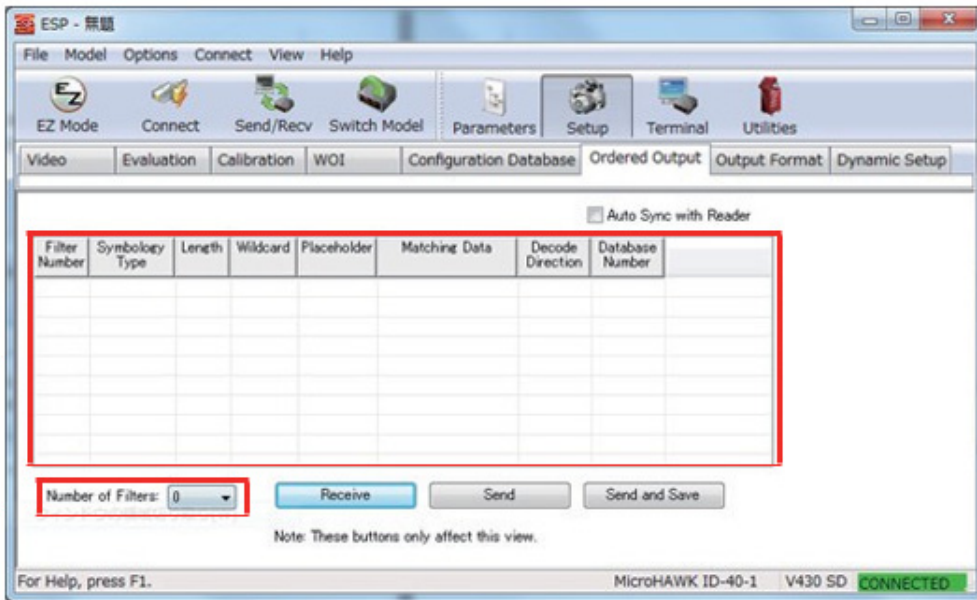
Database 2 Field of view range

Database 3 Field of view range

## Ordered Output Function

The Ordered Output function can control the output order of the symbols by performing filter setting according to the condition by which you want to output.

For example, if you set Filter Number 1 to **QR Code** and Filter Number 2 to **Code 128**, when multiple codes are read, strings are output in the order of 1) QR Code and then 2) Code 128. Codes that do not match the conditions set will not be output.



- a) Set the Output condition for the symbol. Output Read data in the order of the Filter Number it matches. You can go to the [Ordered Output Filter Settings] screen by double-clicking each line in the frame.
- b) **Number of Filters:** This should be set to the number of symbols you wish to output.

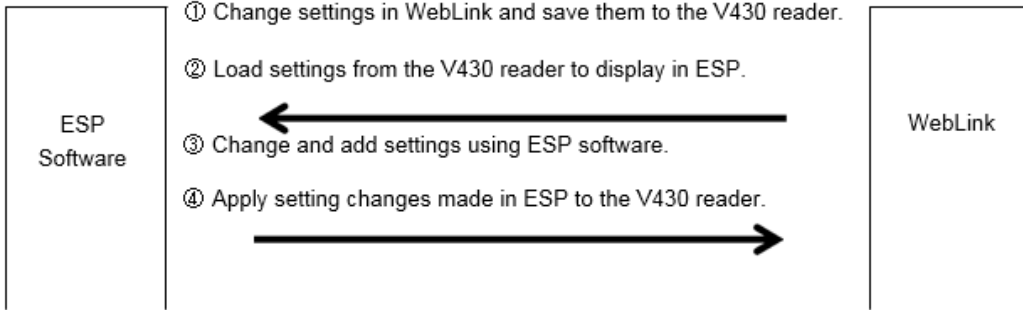
## Ordered Output Filter Settings Screen

- a) **Symbology Type:** You can set it to output a string only when it is a specific symbol type.
- b) **Length:** You can set it to output a string only when it is a specified length.
- c) **Matching String:** You can set it to output only a specified string. Strings can include ASCII characters, wildcards, and placeholders.
- d) **ASCII Lookup:** Enter an ASCII text in to Matching String.
- e) **Wildcard Character:** You can set the character to use as a wildcard. Wildcards can be included at the end of a string, and the output condition after the wildcard is any string (including 0 characters).  
**Example:** Wildcard = \*, Matching String: 123\*  
**Decoded String:** 123 → Output  
**Decoded String:** 123456 → Output  
**Decoded String:** 123ABC → Output  
**Decoded String:** 12 → No output
- f) **Placeholder Character:** You can set a character to use as a placeholder. Placeholders can be included anywhere in the string, and the output condition is any single character.  
**Example:** Placeholder = ?, Matching String: 123?A  
**Decoded String:** 1234A → Output  
**Decoded String:** 123BA → Output  
**Decoded String:** 123 → No Output  
**Decoded String:** 1234C → No Output
- g) **Database Number:** Specify the order in which you want to output the symbol that meets the set conditions.
- h) **Decode Direction:** This function is not supported in the V430.

# ESP Software Settings

## Using WebLink in Conjunction with ESP

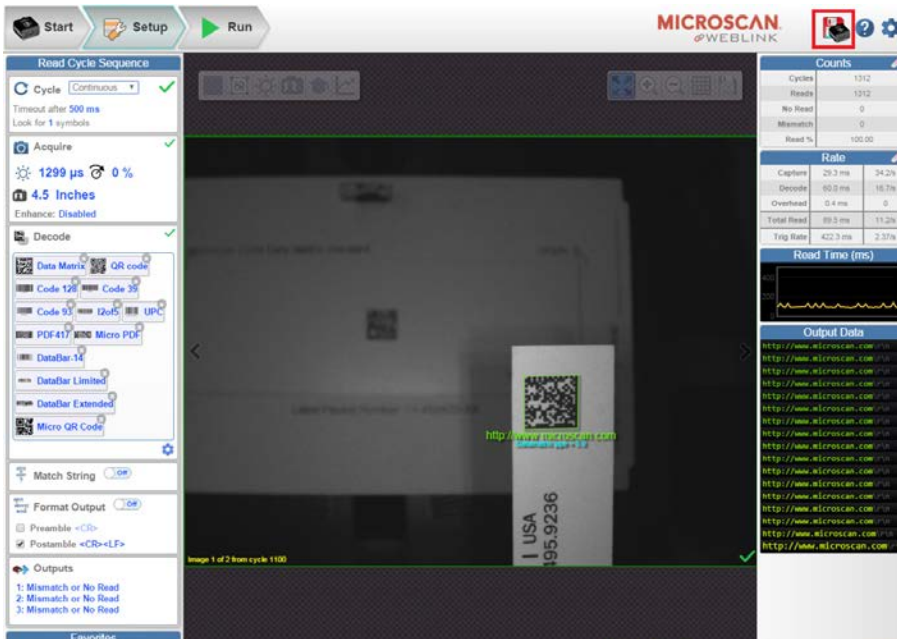
When using WebLink in conjunction with ESP, the general workflow for using them together is as follows.



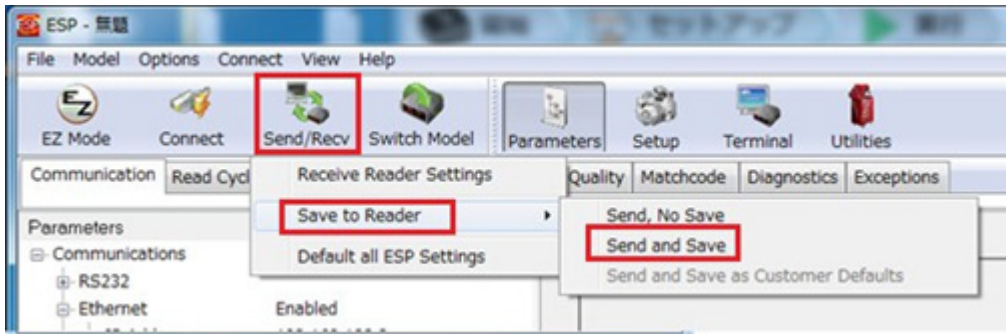
These settings can also be changed using WebLink. If you want to change the settings again with ESP Software, select **Receive Reader Settings** from the **Send / Recv** button and load the V430 reader settings before changing settings again.

## How Settings are Applied

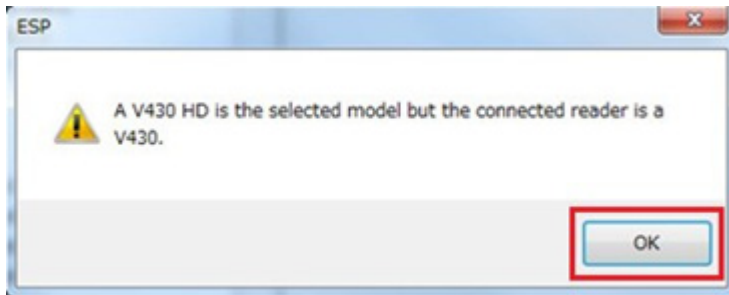
1. Set in WebLink. Click on the **Save** icon in the red box below to save the setting.



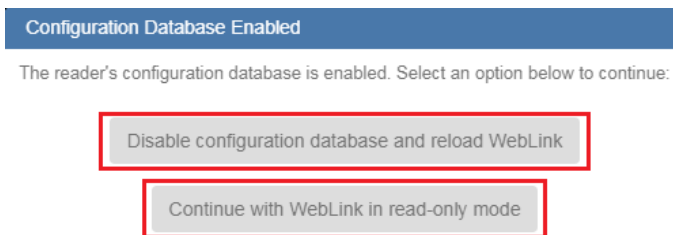
2. Launch ESP Software. When you connect, the message **Would you like to receive the reader settings?** will be displayed. Click **Yes**. Load settings from the V430 reader to display in ESP.
3. Add or apply new settings from ESP Software (such as Configuration database settings).
4. From the **Menu** bar select **Send / Recv > Save to Reader > Send and Save** to apply ESP settings to the V430 reader.



5. After sending the settings to the reader, the screen below will be displayed indicating that the settings were applied.



**Caution:** When **Active Indexes** of the Configuration Database is enabled, the following screen will display when WebLink is started:



### Disable configuration database and reload WebLink

The Active Indexes will be disabled (set to 0) and settings will be reloaded into WebLink.

### Continue with WebLink in read-only mode

WebLink will operate in read-only mode whereby no setting changes made in WebLink, or trigger input set from WebLink, can be sent to the reader.

If the browser is closed and re-opened, the same dialog will be displayed.

## How to Use ESP Software with a V430 Reader

By using ESP Software with the V430 reader, you can reduce the time required to adjust settings. The following example use case shows how that can be done.

When you want to read multiple symbols using different settings for each. (Sample A is read with setting 1, Sample B is read with setting 2, and Sample C is read with setting 3.)

- To store multiple setting values, they must be stored using the **Configuration Database** function.
- Adjust the V430 reader settings for each sample and store the settings for each in databases 1 to 10.

For this case, follow the steps below.

1. Start both ESP Software and WebLink.
2. Display the current V430 reader settings in ESP Software.
3. In ESP Software, go to the **Configuration Database** screen, and in WebLink, go to the **Startup** screen.
4. In WebLink, set the desired Read parameters for Sample A.
5. In ESP, select a database number in which to store the parameters with which you wish to read Sample A. (See **a** below.)
6. Click **Load Current to Index**. This will store the Read settings for Sample A in to the selected database. (See **b** below.)
7. Repeat steps 4 to 6 above until the desired parameters for all the samples have been set.
8. When settings are complete, click **Send Settings**. (See **c** below.)



# How to Update Reader Firmware using ESP

This section describes the use of ESP Utilities to update the firmware of the V430 reader.



## ***Precautions for Updating Reader Firmware***

- The update file required for updating the firmware from ESP can be downloaded from the web page <https://www.fa.omron.co.jp/>.
- Updating the V430 reader firmware will revert any saved setting changes on the reader to the factory defaults. Make sure to create a backup file for the current reader settings before updating the firmware.
- Do not turn off power to the V430 reader while it is being updated.
- Be careful not to accidentally disconnect any cables between the PC and the V430 reader while it is being updated.
- Once you update the reader's firmware, you cannot change it back to the older firmware version. Also, if you accidentally apply the old firmware, you may not be able to connect to the V430. Please be careful not to apply an older version than the current firmware version.

## ***Preparation***

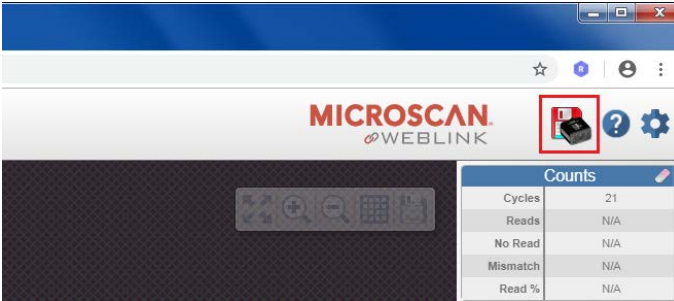
1. ESP Software
2. PC with compatible browser such as Google Chrome or Internet Explorer 11
3. A V430 reader with Ethernet cable, I/O cable, and 24V power
4. Firmware file

### **Example of update file structure:**

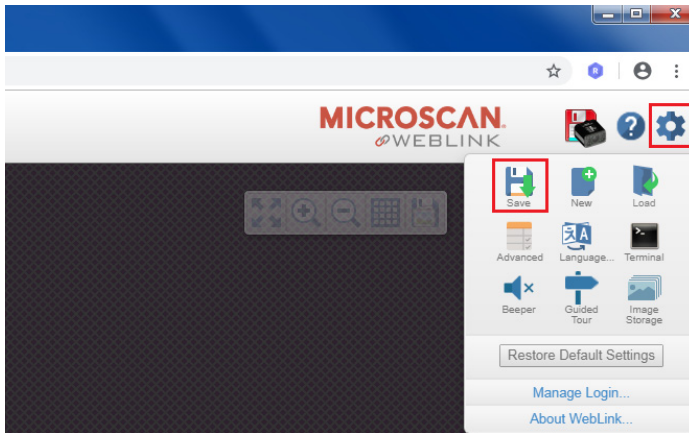
 30-9000079-1.3.1\_3006-http.zip  
 35-9000097-1.3.1.3009.vsf

## Create a V430 Reader Settings Backup File using WebLink

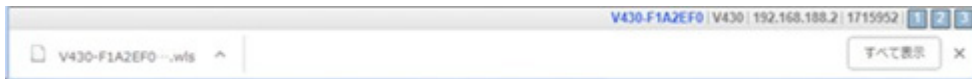
1. Save the current V430 settings. Click the **Save** icon in the red box below.



2. Click on the Gear icon on the right side of the screen and select **Save**.



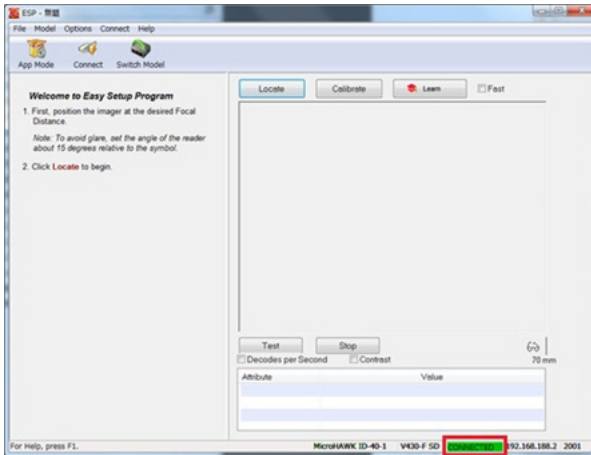
- When using Google Chrome, the V430 settings file will be saved to **C:\Users\username)\Downloads**.



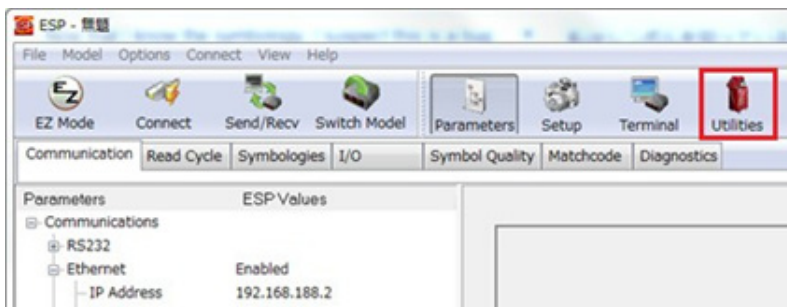
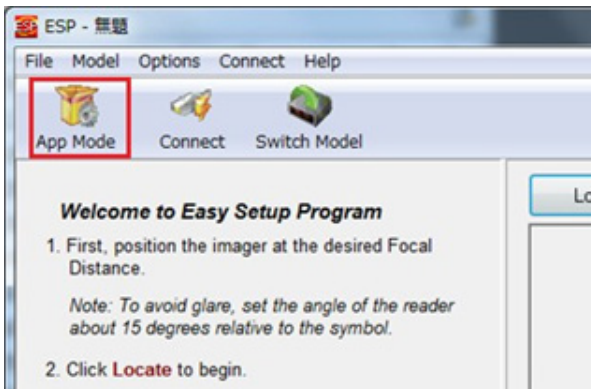
- When using Internet Explorer, you will be prompted to confirm the folder in which you wish to save the V430 settings file.

## Firmware Update Steps

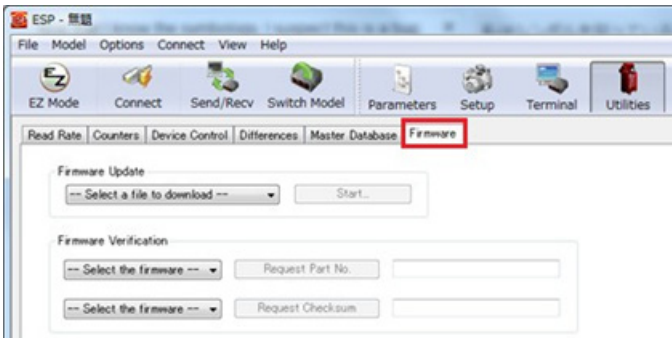
1. After connecting by Ethernet to the V430 you wish to update, confirm that **CONNECTED** is displayed as shown in the red box below.



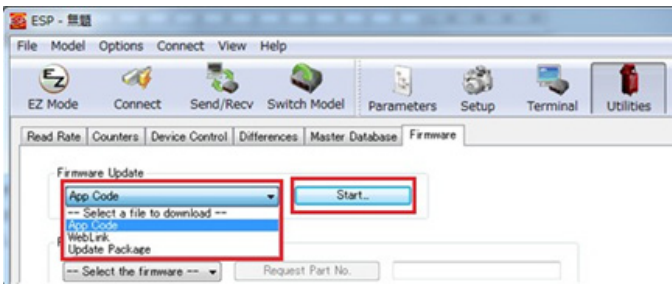
2. Update V430 reader firmware.
3. Click **App Mode** and then select **Utilities**.



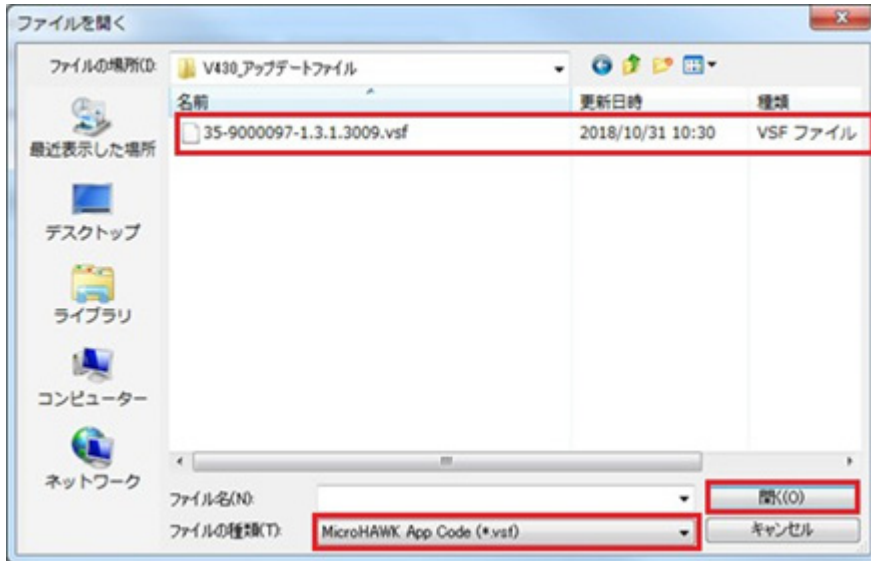
4. Click the **Firmware** tab.



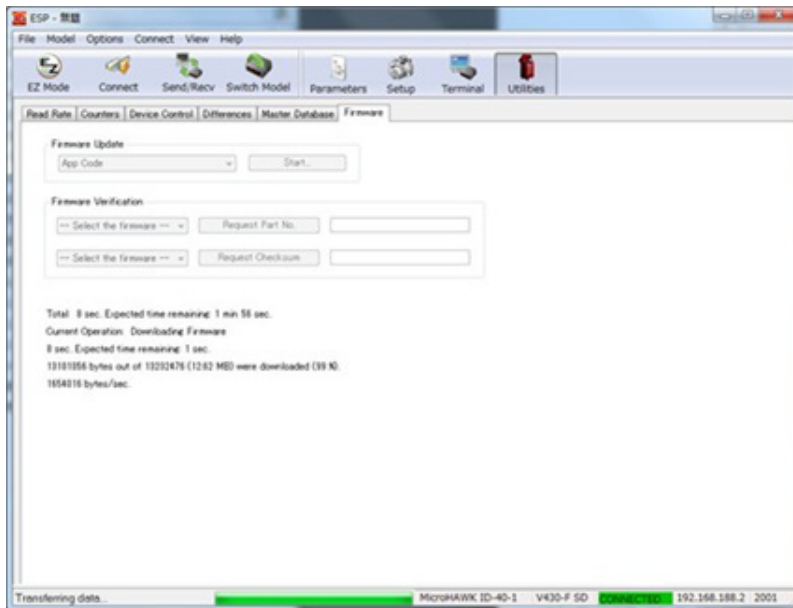
5. From **Firmware Update** > -- Select a file to download --, choose **App Code** and then click **Start...**



6. The file selection screen is displayed. Select the file type (T): **MicroHAWK App Code (\*.vsf)** and click **Open**.

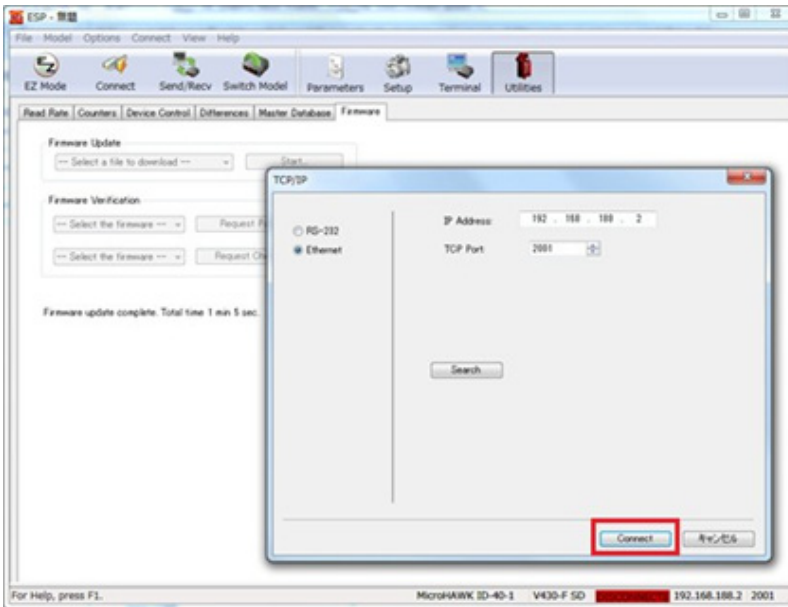


7. The update starts. The updating process typically takes a few minutes.

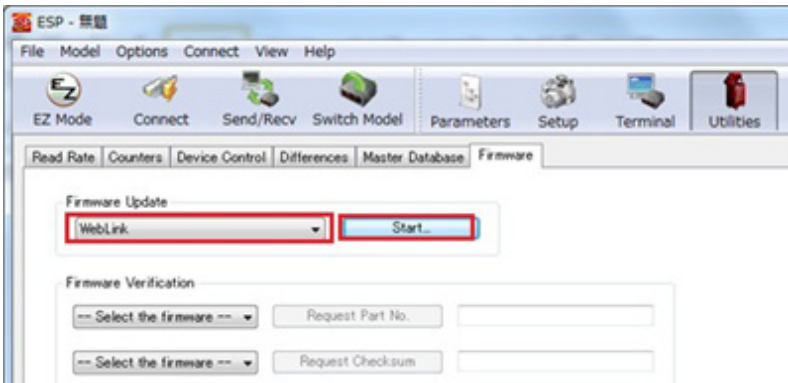


8. When the update is complete, **Firmware update complete Total time XXmin XXsec** will be displayed.

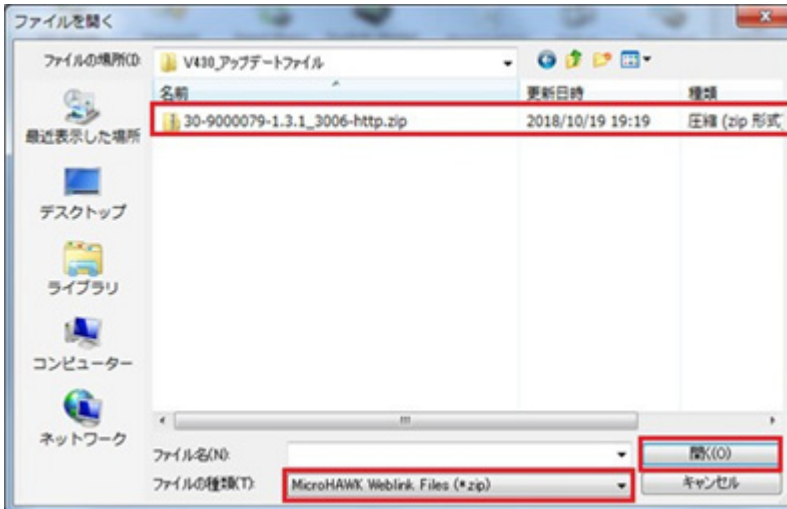
9. The **TCP/IP** dialog will display again. Click **Connect**.



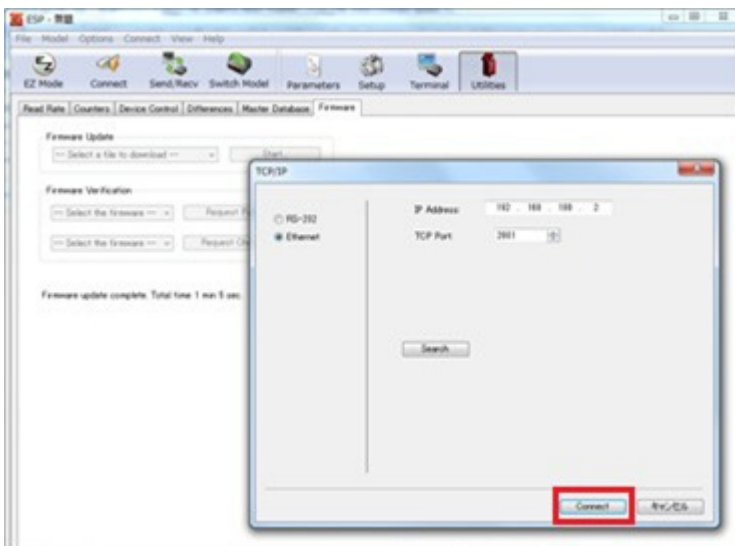
10. Update WebLink on the reader. From **Firmware Update** > -- Select a file to download --, choose **WebLink** and then click **Start...**



11. The file selection screen is displayed. Select the file type (T): **MicroHAWK WebLink Files (\*.zip)** and click **Open**.

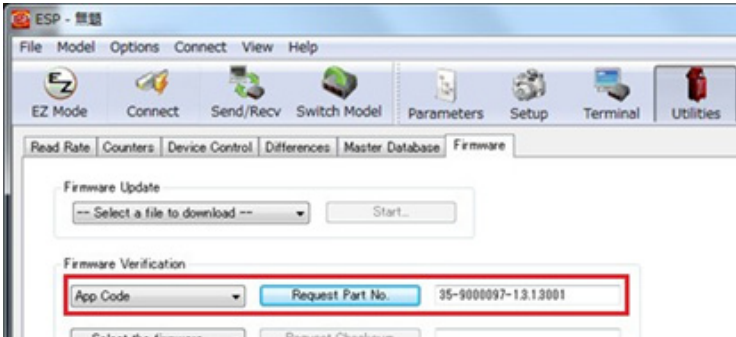


12. The update starts. The update process typically takes a few minutes. When the update is complete, **Firmware update complete Total time XXmin XXsec** will be displayed. The **TCP/IP** dialog will display again. Click **Connect**.

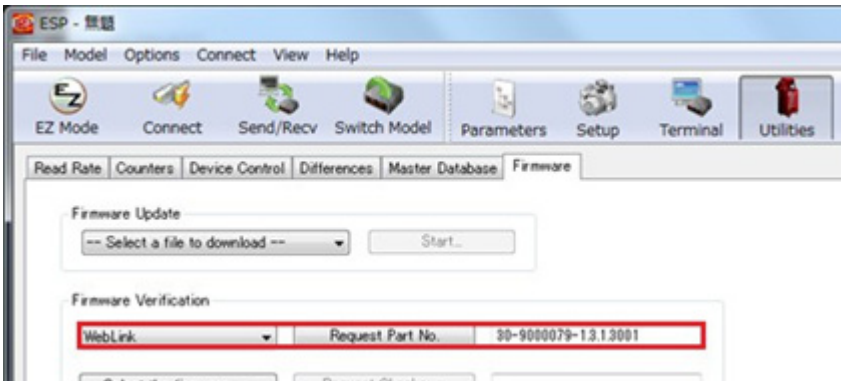


13. After the update is complete, verify the updated versions. In **Firmware Verification > --Select the firmware--**, choose **App Code**.

14. Click **Request Part No.** to display the updated version of the App Code. Confirm that the version of App Code is correct.



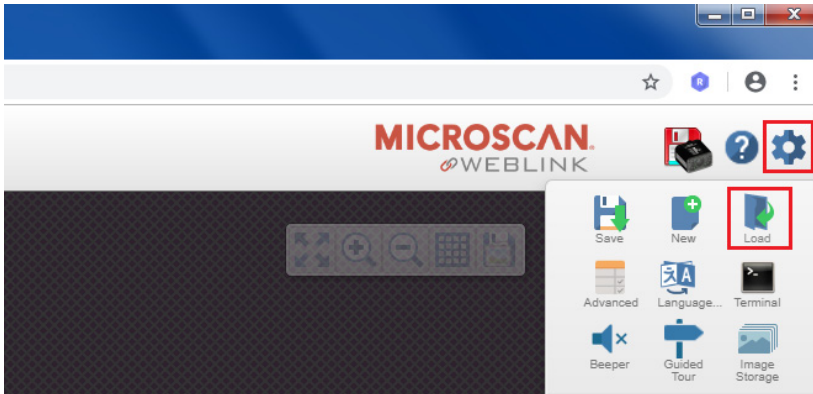
15. Change **App Code** to **WebLink**.
16. Click **Request Part No.** to display the updated version of WebLink. Confirm that the version of WebLink is correct.



17. Firmware update using ESP is now completed.

## Load the Saved Settings File to the V430 Reader

1. After a firmware update, you can re-apply saved settings to the V430 reader. Open WebLink, click the **Gear icon** on the right side of the screen, and select **Load**.



2. Select the saved settings (**.wls**) file and click **Open**.
3. The settings saved in the file will be applied.



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