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About MicroHAWK ID Readers

About MicroHAWK ID Readers

The key features of MicroHAWK ID-20, ID-30, ID-40, and ID-45 Readers are:
• World’s smallest industrial barcode readers
• Able to read any symbol on any surface
• Intuitive WebLink user interface
• Customizable hardware options
• Customizable software options

MicroHAWK ID Communications

The preferred method for configuring and testing MicroHAWK ID readers is WebLink – Omron Microscan’s proprietary browser-based user interface that enables you to access, configure, and test your reader without having to install software or retrieve files from a host system.

Important: Although it is technically possible to configure MicroHAWK ID readers with legacy K command syntax or legacy ESP Software, WebLink is the intended configuration tool for MicroHAWK ID readers.

About This Manual

The purpose of this manual is to document MicroHAWK ID readers and WebLink, the user interface specifically designed to configure and operate MicroHAWK ID readers.

Note: This manual contains documentation of K commands and ESP Software in Appendices C – Q for users who prefer legacy configuration methods.
Introduction

Statements of Compliance

FCC
The MicroHAWK ID-20, ID-30, ID-40, and ID-45 have been tested for compliance with FCC (Federal Communications Commission) requirements and has been found to conform to applicable FCC standards.
To comply with FCC RF exposure compliance requirements, this device must not be co-located with or operate in conjunction with any other antenna or transmitter.
Changes or modifications not expressly approved by the party responsible for compliance could void the user’s authority to operate the equipment.

CE
The MicroHAWK ID-20, ID-30, ID-40, and ID-45 have been tested for compliance with EU Directive 2014/30/EU for Electromagnetic Compatibility, and has been found to conform to applicable CE standards, specifically the following requirements:
General Immunity for ITE Equipment: EN 55024:2010
The CE Declaration of Conformity for this product is available from Omron Microscan upon request.
The MicroHAWK ID-20, ID-30, ID-40, and ID-45 have been tested by an independent electromagnetic compatibility laboratory in accordance with the applicable specifications and instructions.

UL
The MicroHAWK ID-20, ID-30, ID-40, and ID-45 have been tested for compliance with UL (Underwriters Laboratories) standards and guidelines, and has been found to conform to applicable UL standards.
Information Technology Equipment – Safety IEC/EN 60950-1
Photobiological Safety of Lamps and Lamp Systems – IEC/EN 62471

Korean Radio Regulations (KC Mark)
The MicroHAWK ID-20, ID-30, ID-40, and ID-45 have been registered under Clause 3, Article 58-2 of the Radio Waves Act.

Manufacturer: Omron Microscan Systems, Inc., 700 SW 39th St., Renton, WA 98057, USA
Производитель: «Омрон Майкроскан Системс Инк», США, Рентон, штат Вашингтон 98057, 700 SW 39th Street
ОГРН 10677746976582
Представитель: Общество с ограниченной ответственностью “Омрон Электроникс”, 125040, Российская Федерация, город Москва, улица Правды, дом 26, ОГРН 10677746976582
Date of Manufacture: The first two digits of the serial number are the two-digit year of manufacture, or the year of manufacture +20 for serial numbers starting with 3.
Дата изготовления: первые две цифры серийного номера являются двумя последними цифрами года изготовления +20 для серийных номеров, начинающихся с 3.

Restricted Substances
See the following link for Omron Microscan compliance statements related to all applicable restricted substances:
Warning and Caution Summary

The MicroHAWK ID-20 USB connector may be susceptible to an ESD event that could cause loss of functionality. Under normal operating conditions, the user is not likely to touch the USB connector except during installation. Therefore, it is advised that the user connect the USB connector to the MicroHAWK ID-20 before plugging into the host computer. Use proper grounding techniques before handling the device during operation. If an ESD event occurs and operation is interrupted, reset the device by cycling power.

NOTICE: The Light Emitting Diodes used in the MicroHAWK ID product are classified as exempt. This classification is considered safe and represents no photobiological hazard. As with any light source they should be used consistent with their intended use. Do not stare directly at the LED output.

Location of the MicroHAWK ID’s LED aperture window:

This reader is intended for connection to a UL-listed direct plug-in power unit marked Class II and rated 10 to 28 VDC at 5 watts or greater.

U.S. models must use a similarly-rated Class I or Class II power supply that is certified to comply with standards for safety IEC 60950-1 Ed. 2 (2005) and IEC 60825-1 Ed. 2 (2007).

European models must use a similarly-rated Class I or Class II power supply that is certified to comply with standard for safety EN 60950-1 (2006) with Am. 11 (2009).

There are no user-serviceable parts in the reader. Opening the imager voids the Omron Microscan Systems, Inc. warranty.
1 Overview

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The browser-based WebLink interface enables quick and easy configuration and testing of MicroHAWK ID-20, ID-30, ID-40, and ID-45 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 MicroHAWK ID reader, and provides the power and flexibility expected by advanced users.
License Agreement

The WebLink License Agreement is shown the first time WebLink is loaded. Once you click I have read and accept all terms of this license agreement, you will not see the agreement at the beginning of subsequent WebLink sessions.
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**

![Save to Flash Memory Icon]

**Saved to Flash Memory**

![Saved to Flash Memory 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.

Application Settings Menu

![Application Settings Menu Diagram]

Note: The Enable USB Drive Mode option only appears when you are using an ID-20 or ID-30, which support USB connectivity.
Left Panel

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, License Options, Reader Model, Serial Number, MAC ID, Firmware version, WebLink version, Sensor, Optics, Decoder, and Speed.

Note: The information in this area is selectable so that you can copy it to a clipboard.

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.
**Image Area**

**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.
Overview

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.

When the Read Cycle is looking for 2 or more symbols, the Train button appears.

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

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**
Overview

Assisted Setup

New Setup
Guided Tour

**Load Setup**

*Image Area*
Overview

Control Toolbar

Image Toolbar
Guided Tour

Save Settings to Reader

Help
Overview

**Settings**

**Counts**
Guided Tour

Rate

Read Time
Overview

Output Data

Setup View
Guided Tour

Read Cycle Step

Acquire Step
Overview

**Decode Step**

![Decode Step Image]

**Match Step**

![Match Step Image]
Guided Tour

Format Output Step

Favorites
Run View

Filmstrip
This section is designed to get your MicroHAWK ID reader up and running quickly using WebLink. Following these steps will allow you to get a sense of the reader’s capabilities and to test sample symbols.
Check Hardware and Connect the System

Check Hardware and Connect the System

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>MicroHAWK ID-20, MicroHAWK ID-30, MicroHAWK ID-40, or MicroHAWK ID-45</td>
<td>7AXY-YZZZ-LPPP</td>
</tr>
<tr>
<td>2</td>
<td>Cable, USB A to Micro B, 6 ft., ID-20</td>
<td>61-9000034-01</td>
</tr>
<tr>
<td>3</td>
<td>Cable, USB A to Micro B, 3 ft., ID-20</td>
<td>61-9000045-01</td>
</tr>
<tr>
<td>4</td>
<td>Power Supply, 5V</td>
<td>97-9000006-01</td>
</tr>
<tr>
<td>5</td>
<td>Cable, DB15 to Ext. Power/USB, ID-30</td>
<td>61-9000038-01</td>
</tr>
<tr>
<td>6</td>
<td>Power Supply, 100-240VAC, +24VDC, M12 12-Pin Socket</td>
<td>97-000012-01</td>
</tr>
<tr>
<td>7</td>
<td>Cordset, Host, Ethernet, M12 8-Pin Plug (Screw-On) to RJ45, 1 m.</td>
<td>61-000160-03</td>
</tr>
</tbody>
</table>

Note: See the MicroHAWK ID-20 / ID-30 / ID-40 / ID-45 Configuration Guide for all configurations.

ID-20 – Standalone USB Configuration

ID-30 – Standalone USB Configuration

Note: An accessory USB cable is required between the 15-pin corner-exit cable and the host’s USB port.

Note: There are two USB connection options – one is BUS-powered and the other is externally powered. BUS-powered cable delivers reduced illumination – approximately 30% less brightness.

ID-40 – Standalone Ethernet Configuration

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 ±30°; maximum pitch is ±30°. The illustration below shows approximate skew axis, pitch axis, and tilt axis.
Install WebLink Drivers (ID-20 and ID-30)

1. Plug the reader into a USB port and wait for the AutoPlay dialog to appear.
2. Click Open folder to view files and double-click the Double-Click Here.bat batch file.
3. At the command prompt, select option 1 and then type Enter. VCOM and USBLAN drivers are installed.
4. At the command prompt, select option 2 to install the WebLink and FTP drive shortcuts. WebLink and MicroHAWK FTP drive shortcut icons will appear on the desktop.
5. When installation of the drivers and shortcuts is complete, unplug the reader from the USB port.
6. Re-plug the reader into the USB port and wait for the reader to reboot and to enter read mode (LEDs ON).
7. Double-click the WebLink desktop shortcut. WebLink will load and start. (See Step 4 – Connect to WebLink.)
8. Double-click the FTP drive shortcut and log in with username: target and password: password.
9. The FTP drive is opened so you can access additional resources and installers in the Tools and Documentation folder.

You are now ready to use the MicroHAWK ID-20 or ID-30 with WebLink.

Minimum System Requirements

Important: Use of an embedded operating system (Windows CE) and/or an underpowered machine (limited RAM, limited disk space) is not recommended.

- Intel® Core™2 Duo Processor
- Microsoft Windows 7 (32-bit)
- Internet Explorer 11 or higher, Microsoft Edge, Mozilla Firefox, Opera, Safari
- 1GB/128MB Video RAM
- 750MB hard drive space
- 16-bit color display
- 3.0 Windows Experience Index
- Web sockets
- HTML5 Canvas and HTML5 Audio

Recommended System Requirements

- Intel® Core™i3 Duo Processor
- Microsoft Windows 10 (64-bit) or Microsoft Windows 7 (64-bit)
- Google Chrome, current version
- 2GB RAM/128MB Video RAM
- 1GB hard drive space
- 32-bit color display
- 4.0 Windows Experience Index
- Web sockets
- HTML5 Canvas and HTML5 Audio
Connect to WebLink

**MicroHAWK ID-20 and MicroHAWK ID-30**

When you double-click the WebLink desktop shortcut or enter the reader’s IP address directly in the address bar of your web browser, WebLink will load and start.

**Note:** WebLink is the preferred user interface for MicroHAWK ID Readers, but Omron Microscan’s ESP Software can also be used for configuration and testing. ESP is useful in the following circumstances:

- Device discovery to find the reader IP address;
- If you only have an RS-232 (serial) connection;
- Updating MicroHAWK ID firmware;
- Using the Configuration Database;
- Creating barcodes for reader configuration;
- Generating Symbol Quality reports.

**MicroHAWK ID-40 or ID-45 (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.

**MicroHAWK ID-40 or ID-45 (DHCP Network Connection)**

1. Plug your reader into the your network adapter.
2. Connect via **Ethernet TCP/IP**.
3. Click **Search** to find the reader. When the reader appears in the field below the **Search** and **Send** buttons, select it.
4. Change the reader from **Static** to **DHCP** and click **Send and Save**. The camera will reboot and the software will search for the reader again.
5. When the reader is found, note the new IP address that is generated.
6. Open a browser and type the new IP address.
   WebLink will load.
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, WebLink Branding Utility, and About WebLink.

Note: The Enable USB Drive Mode option only appears when you are using an ID-20 or ID-30, which support USB connectivity.
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 .json WebLink setup file.
Explore the Setup View

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.

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

<table>
<thead>
<tr>
<th>Cycle</th>
<th>Presentation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green Flash for 1000 ms</td>
<td></td>
</tr>
<tr>
<td>Timeout after 1000 ms</td>
<td></td>
</tr>
<tr>
<td>Look for 1 symbols</td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Cycle</th>
<th>Continuous</th>
</tr>
</thead>
<tbody>
<tr>
<td>Timeout after 1000 ms</td>
<td></td>
</tr>
<tr>
<td>Look for 1 symbols</td>
<td></td>
</tr>
</tbody>
</table>

**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.

<table>
<thead>
<tr>
<th>Cycle</th>
<th>Triggered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serial Trigger Character <code>&lt;SP&gt;</code></td>
<td></td>
</tr>
<tr>
<td>Trigger Delay 32µs</td>
<td></td>
</tr>
<tr>
<td>Timeout after 1000 ms</td>
<td></td>
</tr>
<tr>
<td>Look for 1 symbols</td>
<td></td>
</tr>
</tbody>
</table>
Configure Read Cycle Settings

**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**.
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.

![Acquire](image1)

**Important:** There are 4 levels of Gain in SXGA MicroHAWK ID 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.

![Acquire](image2)

**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.

![Focus](image3)

![Focus](image4)
Configure Acquire 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:

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.
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.

<table>
<thead>
<tr>
<th>Symbology Settings</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Data Matrix</strong></td>
</tr>
<tr>
<td>Code 128</td>
</tr>
<tr>
<td>Code 39</td>
</tr>
<tr>
<td>Codabar</td>
</tr>
<tr>
<td>Code 93</td>
</tr>
<tr>
<td>Interleaved 2 of 5</td>
</tr>
<tr>
<td>UPC/EAN</td>
</tr>
<tr>
<td>PDF417</td>
</tr>
<tr>
<td>Micro PDF417</td>
</tr>
<tr>
<td>BC412</td>
</tr>
<tr>
<td>Pharmacode</td>
</tr>
<tr>
<td>DataBar Expanded</td>
</tr>
<tr>
<td>Postal Symbologies</td>
</tr>
</tbody>
</table>

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.
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.
Configure Output 1, 2, and 3 Settings

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.

Note: The 1, 2, and 3 output indicators at the lower right of the screen display the results of the last read cycle.
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.
MicroHAWK ID Part Number Structure

MicroHAWK ID part numbers follow the format 7ABX-YZZZ-LPPP.

7 = MicroHAWK

Example Part Number: 7432-2000-1005

Description: MicroHAWK ID-45, IP65/67 Case, 24V, Ethernet, SXGA 1.2 Megapixel, Mono, High-Density, Autofocus, Red Outer LEDs, High-Speed, X-Mode Decoder.

(A) Model
1: Engine, No Case, USB
2: ID-20, IP40 Case, USB
3: ID-30, IP54 Case, 5V, USB
4: ID-40, IP65/67 Case, 24V, Ethernet

(B) Software
1: Auto ID
2: (Reserved)
3: ID-45; same IP rating, power, and comm. as ID-40

(X) Sensor
1: WVGA, 0.3 Megapixel, Mono
2: SXGA, 1.2 Megapixel, Mono
3: QSXGA, 5 Megapixel, Color

(Y) Optics
0: Custom
1: Standard-Density
2: High-Density
3: Ultra-High-Density
4: Long-Range (Autofocus Long Range available for SXGA sensor only.)
5: Ultra-High-Density with Polarizer

(ZZZ) Focus Distance
000: Autofocus
050: 50 mm = 1.96 in.
064: 64 mm = 2.51 in. – UHD FF
081: 81 mm = 3.18 in.
102: 102 mm = 4.02 in.
133: 133 mm = 5.23 in.
190: 190 mm = 7.48 in.
300: 300 mm = 11.81 in.
400: 400 mm = 15.75 in. – UHD FF

(L) Outer LED Color
0: N/A (Engine and ID-20)
1: Red (Not available with QSXGA sensor.)
2: White
3: Blue
4: IR

(PPP) Speed and Decoder
000: Standard-Speed, 1D Decoder
001: High-Speed, 1D Decoder
002: Standard-Speed, 1D/2D Decoder
003: Standard-Speed, X-Mode Decoder
004: High-Speed, 1D/2D Decoder
005: High-Speed, X-Mode Decoder

Notes:
• (A) Model: The MicroHAWK Engine is available for OEM-certified partners only.
• (L) Outer LED Color: Outer LEDs provide extra illumination. Base level illumination included with all readers.
• (PPP) Speed and Decoder: 1D omnidirectional decoding functionality is included with all readers. The 1D/2D Decoder option is useful for printed labels. X-Mode is the full decoder package for 1D, 2D, DPM, and damaged symbols.
• Field Upgrades: Not available for optics or illumination due to factory settings for optical alignment, LED balancing, and sealing for IP enclosure rating. However, the reader's speed and decoder version are field-upgradeable via licenses.
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Assisted Setup ...................................................................................................................................3-4
Reader Information ............................................................................................................................3-5
Setup Buttons.....................................................................................................................................3-7

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, License Options, 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, WebLink Branding Utility, and About WebLink.
Note: The Enable USB Drive Mode option only appears when you are using an ID-20 or ID-30, 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, Decoder, Speed, 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 Microscan 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.
- The next question is whether or not you need the decoded data to match an existing string of data. This enables or disables Match String.
- If the answer to the previous question is Yes, a follow-up question appears asking for the exact output string that the decoded data must match. If the answer to the previous question is No, the follow-up question does not appear.
- 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, License Options, Reader Model, Serial Number, MAC ID, Firmware version, WebLink version, Sensor, Optics, Decoder, and Speed.

Note: The information in this area is selectable so that you can copy it to a clipboard.
Note: The user-defined name must be 19 characters or fewer.

License Options

Clicking License Options allows you to select the desired camera license and then create an email message to send to Omron Microscan requesting that license.

As you select your license options on the left side of the Decoder and Speed section of the License Options dialog, the images to the right of the options change to reflect your choices.
Reader Information

If you click Email Request, a message resembling the example below will open in your preferred email client.

Once you have received the requested licenses from your vendor, you can return to the License Options dialog and click the Download License button. An Open dialog will appear, allowing you to select the requested license files. When you click OK, WebLink sends the licenses to the camera.

If the camera already has **X-Mode** and **High Speed** licenses, this dialog will appear:
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 .json WebLink setup file.
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4 Setup

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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.

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.
Setup

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.

![Acquire Settings](image)

**Important:** There are 4 levels of Gain in SXGA MicroHAWK ID 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](image)

**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.

![Autofocus](image)
**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:

![Spot Focus Icons](image)

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

![Select Location Message](image)

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.

![Crosshairs Example](image)

**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.
Acquire

Enhance

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

<table>
<thead>
<tr>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disabled</td>
</tr>
<tr>
<td>Grow Dark</td>
</tr>
<tr>
<td>Shrink Dark</td>
</tr>
<tr>
<td>Connect Dark</td>
</tr>
<tr>
<td>Separate Dark</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small</td>
</tr>
<tr>
<td>Medium</td>
</tr>
<tr>
<td>Large</td>
</tr>
</tbody>
</table>

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.
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.
Decode

You can also enable one of several postal code options using the Postal Option dropdown 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.

Data Matrix 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.
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

`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

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 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. This option allows you to set the conditions under which an output (or outputs) will be activated.
**Setup**

---

**Mode**

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

- **Output Mode**
  - **Mismatch or No Read**
  - **Pulse**
  - **Latch Mode 1 (Unlatch Input #1 Pin)**
  - **Latch Mode 2 (Unlatch Opposite Condition)**
  - **Latch Mode 3 (Unlatch Re-Enter Read Cycle)**

**Pulse Width**

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

- **Output 1**
  - **Output On**
  - **Mismatch or No Read**
  - **Mode**
  - **Pulse**
  - **Pulse Width**
    - **500 ms**
  - **State**
    - **Normally Open**

**State**

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

- **Output 1**
  - **Output On**
  - **Mismatch or No Read**
  - **Mode**
  - **Pulse**
  - **Pulse Width**
    - **500 ms**
  - **State**
    - **Normally Open**
    - **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.

- **Output Indicators**
  - **Output 1**
  - **Output 2**
  - **Output 3**

**Note:** These three output indicators display the results of the last read cycle.
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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Rate ....................................................................................................................................................5-3
Read Time ..........................................................................................................................................5-4
Output Data ........................................................................................................................................5-5
Image History .....................................................................................................................................5-6

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.

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.

<table>
<thead>
<tr>
<th>Rate</th>
<th>Value</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capture</td>
<td>244.6 ms</td>
<td>4.1/s</td>
</tr>
<tr>
<td>Decode</td>
<td>405.1 ms</td>
<td>2.5/s</td>
</tr>
<tr>
<td>Overhead</td>
<td>1.0 ms</td>
<td></td>
</tr>
<tr>
<td>Total Read</td>
<td>650.6 ms</td>
<td>1.5/s</td>
</tr>
<tr>
<td>Trig Rate</td>
<td>1688.0 ms</td>
<td>0.59/s</td>
</tr>
</tbody>
</table>

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

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.
Output Data

The Output Data area of the right panel shows the data from each symbol decoded in a read cycle. The preamble and postamble are also shown here if enabled and configured.
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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Save ................................................................................................................................................... 6-3
New .................................................................................................................................................... 6-4
Load ................................................................................................................................................... 6-5
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Guided Tour ..................................................................................................................................... 6-10
Image Storage .................................................................................................................................. 6-11
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Manage Login .................................................................................................................................. 6-20
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This section describes the Application Settings menu, which enables you to control a wide array of WebLink and MicroHAWK ID 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, WebLink Branding Utility, and About WebLink.

Note: The Enable USB Drive Mode option only appears when you are using an ID-20 or ID-30, which support USB connectivity.
Save

Save saves the current configuration.
**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.
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.
Application Settings

Beeper

Enabling **Beeper** causes your PC to beep when WebLink receives a decode from the reader. **Note:** There is no beeper in MicroHAWK reader hardware.
Guided Tour

Clicking **Guided Tour** launches a tutorial that explains the functions of the various areas of the WebLink user interface.
When you click the **Image Storage** icon in the **Application Settings** menu, you will see this dialog:

![Image Storage Options](image.png)

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.

![Image Storage Options dialog]

- **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**: RAM (Volatile Memory)
  - **RAM Drive Size**: 20 MB  Up to 17 images
  - **Save Image Until**: New Read Cycle
  - **Action at Image Storage Limit**: Stop

[OK] [Default]
**Application Settings**

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)

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](image)

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

Image Storage by External FTP Server

An external FTP server can be used to store images captured by the MicroHAWK. 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.
Application Settings

- 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 MicroHAWK ID 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.
Image Storage

- If you are using a MicroHAWK ID-20, enter **192.168.188.1** as your FTP server address. Check the IP address of the PC’s Ethernet adapter using `ipconfig` in the command prompt. (For the PC in this example, the IP address for an ID-40 would be **192.168.1.5**.)

<table>
<thead>
<tr>
<th>Ethernet adapter Local Area Connection:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Link-local IPv6 Address ... : fc00::33c8:37f0:804d:311</td>
</tr>
<tr>
<td>IPv4 Address ... : 192.168.188.1</td>
</tr>
<tr>
<td>Subnet Mask ... : 255.255.255.0</td>
</tr>
<tr>
<td>Default Gateway ... : 192.168.1.1</td>
</tr>
</tbody>
</table>

The MicroHAWK ID-20 creates a new Ethernet adapter:

<table>
<thead>
<tr>
<th>Ethernet adapter Local Area Connection 12:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Link-local IPv6 Address ... : fc00::3d9:df62:7ba:1767:28</td>
</tr>
<tr>
<td>IPv4 Address ... : 192.168.188.1</td>
</tr>
<tr>
<td>Subnet Mask ... : 255.255.255.248</td>
</tr>
<tr>
<td>Default Gateway ... : 192.168.1.1</td>
</tr>
</tbody>
</table>

- For the connected MicroHAWK ID-20, the FTP server address would be **192.168.188.1**.
- Click **OK** in the **Image Storage Options** dialog. 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.

WebLink will prevent unauthorized access when login is enabled.
Note: This will restart WebLink automatically.

A password is needed to disable login.
Enable USB Drive Mode

Clicking **Enable USB Drive Mode** in the **Application Settings** menu brings up the Enable USB Drive Mode dialog shown below.

When you click the **Enable** button in the dialog, your reader will reboot, and then you can use it as you would a USB flash drive. If you click **Enable – Don’t Reboot**, the camera will reboot later.

**Important:** The USB drive functionality self-disables on the next reader reboot. To enable USB drive functionality again, follow the same procedure described above.

If you try to enable USB Drive Mode when it’s already enabled, this dialog will appear:

**Note:** The **Enable USB Drive Mode** option only appears in the **Application Settings** menu when you are using an ID-20 or ID-30, which support USB connectivity.
WebLink Branding Utility

The WebLink Branding Utility allows you to include your company's logo in the user interface.

This logo of your choice is shown in the splash screen, the banner area at the top of the WebLink user interface, and other locations.

To launch the Branding Utility, open a web browser and enter the following URL:

http://[IP address]/app/brandutility/

Important: The IP address must match the IP address of your reader. The IP address shown above is only an example.

You can also launch the Branding Utility by clicking WebLink Branding Utility in the Application Settings menu. This will open the Branding Utility dialog shown here:

Enable branding by checking the Enable Branding box.
Application Settings

You can verify that branding is enabled in WebLink by loading it in another browser tab. You will see the “generic logo company” image on the splash screen and banner.

To change the logo, click the **Load a new image** button. Browse and select your logo image file (.png preferred). Once selected, the **Image Preview** area will update as shown below.

![Image Preview](image.png)

Refresh WebLink and your logo will now appear in the splash screen.

![Splash Screen](splash.png)

Your logo will also appear on the banner to the left of the **WebLink** logo.

You can also specify a URL to launch in a new window whenever your logo in the banner area is clicked. This URL can either launch a web page (e.g. `http://www.microscan.com`) or open a new email message (e.g. `mailto:youremail@yourcompany.com`).

![Version 1.1.0.0](version.png)

Your branding information can be saved as a local .json file to be loaded to other readers. To save the configuration, click **Save to local branding file**.

This will open a **File Save** dialog. Save the file with a descriptive filename such as `branding.json`.

To load the branding file to another reader, open the Branding Utility on the new reader. **Important**: The IP address of the new reader will be different than the IP address of the first reader. Remember to match the IP address in the URL with the IP address of the new reader. `http://[other IP address]/app/brandutility/`

Open the Branding Utility on the new reader, enable branding, and load the saved file by clicking **Load an existing branding file**.

Repeat this procedure for any additional readers requiring branding.
**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, Decoder, Speed, 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 Microscan website.

![About WebLink Dialog](image)
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

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.
Filters

**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.

![Terminal](image)

**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.
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

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Illumination Brightness</td>
<td>Extreme</td>
</tr>
<tr>
<td>Light Source</td>
<td>External Strobe</td>
</tr>
<tr>
<td>Fixed Light On Time</td>
<td>0</td>
</tr>
<tr>
<td>Fixed Light Delay Time</td>
<td>0</td>
</tr>
</tbody>
</table>

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 MicroHAWK ID’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.
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 verifies have calibration processes. These processes are required to ensure proper references for grading metrics. The MicroHAWK 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.
I/O

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 MicroHAWK 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 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 (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.
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.
I/O

**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.
**I/O**

**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.
Advanced Settings

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.
I/O

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 MicroHAWK firmware.

Supported Symbologies
• Data Matrix ECC 200 / GS1 Data Matrix
• 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).
**Advanced Settings**

**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.
I/O

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.
Advanced Settings

**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.
I/O

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 MicroHAWK firmware.

Supported Symbologies
• Data Matrix ECC200 / GS1 Data Matrix

Minimum Resolution
• 6.0 Pixels Per Element (Element = Nominal Cell Dimension)
Advanced Settings

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.
I/O

**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.
I/O

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

![Symbol Quality Menu](image)

**Important:** For descriptions of symbol grading functionality, refer to the Symbol Grading section in I/O.
**Match String**

**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**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Match Code Type</td>
<td>Disabled</td>
</tr>
<tr>
<td>Sequential Matching</td>
<td>Increment</td>
</tr>
<tr>
<td>Match Start Position</td>
<td>0</td>
</tr>
<tr>
<td>Match Length</td>
<td>1</td>
</tr>
<tr>
<td>Wildcard</td>
<td>^</td>
</tr>
<tr>
<td>Sequence on No Read</td>
<td>Enabled</td>
</tr>
<tr>
<td>Sequence on Mismatch</td>
<td>Disabled</td>
</tr>
<tr>
<td>New Master Pin</td>
<td>Disabled</td>
</tr>
<tr>
<td>Match Replace</td>
<td>Disabled</td>
</tr>
<tr>
<td>Replacement String</td>
<td>MATCH</td>
</tr>
<tr>
<td>Mismatch Replace</td>
<td>Disabled</td>
</tr>
<tr>
<td>Replacement String</td>
<td>MISMATCH</td>
</tr>
</tbody>
</table>
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**

![Diagnostics Menu Image](image-url)
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.

<table>
<thead>
<tr>
<th>Command</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>FTP Address</td>
<td>user1</td>
</tr>
</tbody>
</table>

Image Storage Menu

Command parameters can be changed directly from this menu.
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.

---

**Advanced Settings**

---

**Camera Settings**
- Exposure: 1209 µs
- Gain: 0%

**Focus**
- Focus Distance: 4.5
- Distance Units: Inches
- Focus Mode: No Read Auto Focus
- No Read Limit: 5
- Operation: Separate Dark
- Size: Large

**Ethernet**
- Ethernet: Enabled
- IP Address: 10.10.5.13
- Subnet: 255.255.254.0
- Gateway: 10.10.6.1
- IP Address Mode: Static

**Trigger**
- Mode: External Level
- Leading Edge: 32 µs
- Trailing Edge: 32 µs

**Data Matrix**
- ECC 200 Status: Enabled
- ECC 000 Status: Enabled
- ECC 050 Status: Disabled
- ECC 080 Status: Disabled
- ECC 100 Status: Disabled
- ECC 140 Status: Disabled
- ECC 120 Status: Disabled
- ECC 130 Status: Disabled

**Calibration Options**
- Gain: Quick Calibrate
- Exposure: Quick Calibrate
- Focus Position: Quick Focus
- Symbol Type: Calibrate
- Window of Interest Framing: Don't Calibrate
- Window of Interest Margin: 75
- Linescan Height: 64
- Processing: Medium

**Output Indicators**
- Green Flash Mode: Good Read
- Targeting: Always On
- Green Flash Duration: 500 ms
- User-Defined Name: MicroHAWK174916
Differences from Default
Appendix A

General Specifications

Contents
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Safety Certifications ............................................................... A-8
MicroHAWK ID-20 General Specifications

Dimensions
- Height: 24 mm (0.94"), Width: 34 mm (1.34"), Length: 39 mm (1.54"
- Weight: 26 g (0.92 oz.)

Enclosure
- IP40, Plastic

Environmental
- Operating Temperature: 0° to 40° C (32° to 104° F)
- Storage Temperature: -50° to 75° C (-58° to 167° F)
- Humidity: 5% to 95% (non-condensing)

Emissions
- EN 55022:2010 Class B Limits

Electrical
- 5 VDC ± 5%, 350 mA @ 5 VDC (typ.)

Connector
- Micro-B USB

Communication
- USB 2.0 High-Speed (Ethernet over USB and HID)

Illumination
- High-Output LEDs: 4 Red (625 nm), 4 White

Indicators
- Power LED, 2 Target Pattern LEDs, 2 Good Read

Green Flash LEDs

Speed
- Standard: Up to 10 FPS
- High-Speed: Max. Sensor FPS

Memory
- 2 GB Non-Volatile Flash, 256 MB RAM

Decoder
- Standard: High-Contrast 1D; Plus: High-Contrast 1D/2D; X-Mode: Poor or Damaged 1D/2D + DPM

Optics
- Standard Density, High-Density, UHD

Sensor Options
- WVGA (Mono): CMOS 0.34 MP (752 x 480)
- SXGA (Mono): CMOS 1.2 MP (1280 x 960)
- QSXGA (Color): CMOS 5 MP (2592 x 1944)

Shutter
- Global (WVGA, SXGA); Rolling (QSXGA)

Exposure Time
- 50 - 100,000, Default: 2,500 μs

Focus
- Standard, HD: Fixed (50-300 mm)
- UHD: Fixed (64 mm, 400 mm)

Frames Per Second
- WVGA: Up to 60
- SXGA: Up to 42
- QSXGA: Up to 5

Symbologies
- 2D: Data Matrix (ECC 0-200), QR Code, Micro QR Code, Aztec, Stacked: PDF417, MicroPDF417, GS1 Databar (Composite and Stacked); Linear: Code 39, Code 128, BC412, Interleaved 2 of 5, UPC/EAN, Codabar, Code 93, Pharmacode, PLANET, POSTNET, Japanese Postal, Australia Post, Royal Mail, Intelligent Mail, KIX

Note: Inches [millimeters]. Nominal dimensions shown. Typical tolerances apply.
MicroHAWK ID-30 General Specifications

Dimensions
- Height: 25 mm (0.98")
- Width: 45 mm (1.77")
- Length: 38 mm (1.50")
- Weight without Cable: 46 g (1.62 oz.)

Enclosure
- IP54, Aluminum

Environmental
- Operating Temperature: 0° to 40° C (32° to 104° F)
- Storage Temperature: -50° to 75° C (-58° to 167° F)
- Humidity: 5% to 95% (non-condensing)

Emissions
- EN 55022:2010 Class A Limits

Electrical
- 5 VDC ± 5%, 600 mA @ 5 VDC (typ.)

Connector
- 0.91 m Cable with High-Density 15-Pin D-Sub Socket

Communication
- USB 2.0 High-Speed (Ethernet over USB and HID), RS-232

Discrete I/O
- 3 in / 3 out: Trigger Input: 5-28V rated (0.16mA @ 5VDC); New Master: 5 to 28V rated (0.16mA @ 5VDC); Outputs (1, 2, 3): 5V TTL-compatible, can sink 10mA and source 10mA

Illumination
- High-Output LEDs: Inner: 4 Red (625 nm), 4 White; Outer: 8 Red, White, Blue, or IR

Indicators
- TRIG, PASS, FAIL, MODE, LINK, PWR LEDs, 2 Target Pattern LEDs, 2 Good Read Green Flash LEDs

Speed
- Standard: Up to 10 FPS; High-Speed: Max. Sensor FPS

Memory
- 2 GB Non-Volatile Flash, 256 MB RAM

Decoder
- Standard: High-Contrast 1D; Plus: High-Contrast 1D/2D; X-Mode: Poor or Damaged 1D/2D + DPM

Optics
- Standard Density, High-Density, UHD, Long Range

Sensor Options
- WVGA (Mono): CMOS 0.34 MP (752 x 480)
- SXGA (Mono): CMOS 1.2 MP (1280 x 960)
- QSXGA (Color): CMOS 5 MP (2592 x 1944)

Shutter
- Global (WVGA, SXGA); Rolling (QSXGA)

Exposure Time
- 50 - 100,000, Default: 2,500 μs

Focus
- Standard, HD: Fixed (50-300 mm) or Autofocus
- UHD: Fixed (64 mm, 400 mm) or Autofocus
- Long Range: Autofocus, 16.5 mm Focal Length, 75-1,160 mm Autofocus Distance

Frames Per Second
- WVGA: Up to 60; SXGA: Up to 42; QSXGA: Up to 5

Symbologies
- 2D: Data Matrix (ECC 0-200), QR Code, Micro QR
- Code: Aztec; Stacked: PDF417, MicroPDF417, GS1 Databar (Composite and Stacked); Linear: Code 39, Code 128, BC412, Interleaved 2 of 5, UPCA/EAN, Codabar, Code 93, Pharmacode, PLANET, POSTNET, Japanese Postal, Australia Post, Royal Mail, Intelligent Mail, KIX
**MicroHAWK ID-40 General Specifications**

**Dimensions**
- Height: 25 mm (0.98")
- Width: 45 mm (1.77")
- Length: 45 mm (1.77")
- Weight: 68 g (2.40 oz.)

**Enclosure**
- IP-65/67, Aluminum

**Environmental**
- Operating Temperature: 0° to 45° C (32° to 113° F)
- Storage Temperature: -50° to 75° C (-58° to 167° F)
- Humidity: 5% to 95% (non-condensing)

**Emissions**
- EN 55022:2010 Class B

**Electrical**
- 4.75-30VDC, 200mV p-p max ripple, 150mA @ 24VDC (typ.)

**Connector**
- M12 12-Pin Power, M12 8-Pin Ethernet

**Passive PoE**
- 24V passive Power over Ethernet, Type B. Requires passive PoE power supply.

**Communication**
- RS-232, Ethernet TCP/IP, EtherNet/IP, PROFINET I/O

**Discrete I/O**
- 3 in / 3 out: Optoisolated Trigger and Input Common; New Master: Bi-directional, Optoisolated, 4.5-28V rated (10mA @ 28VDC); Outputs (1, 2, 3): Bi-directional, Optoisolated, 1-28V rated (Ice < 100mA at 24VDC, current limited by user)

**Illumination**
- High-Output LEDs: Inner: 4 Red (625 nm), 4 White; Outer: 8 Red, White, Blue, or IR

**Indicators**
- TRIG, PASS, FAIL, MODE, LINK, PWR LEDs, 2 Target Pattern LEDs; 2 Good Read Green Flash LEDs

**Speed**
- Standard: Up to 10 FPS; High-Speed: Max. Sensor FPS

**Memory**
- 2 GB Non-Volatile Flash, 256 MB RAM

**Decoder**
- Standard: High-Contrast 1D; Plus: High-Contrast 1D/2D; X-Mode: Poor or Damaged 1D/2D + DPM

**Optics**
- Standard Density, High-Density, UHD, Long Range

**Sensor Options**
- WVGA (Mono): CMOS 0.34 MP (752 x 480)
- SXGA (Mono): CMOS 1.2 MP (1280 x 960)
- QSXGA (Color): CMOS 5 MP (2592 x 1944)

**Shutter**
- Global (WVGA, SXGA); Rolling (QSXGA)

**Exposure Time**
- 50 - 100,000, Default: 2,500 μs

**Focus**
- Fixed Focus: SD, HD (50-300 mm); UHD (64 or 400 mm)
- Autofocus: SD, HD (50-300 mm); UHD (40-150 mm); Long Range (16.5 mm Focal Length, 75-1,160 mm Autofocus Distance)

**Frames Per Second**
- WVGA: Up to 60; SXGA: Up to 42; QSXGA: Up to 5

**Symbologies**
- 2D: Data Matrix (ECC 0-200), QR Code, Micro QR Code, Aztec; Stacked: PDF417, MicroPDF417, GS1 Dabarar (Composite and Stacked); Linear: Code 39, Code 128, BC412, Interleaved 2 of 5, UPC/EAN, Codabar, Code 93, Pharmacode, PLANET, POSTNET, Japanese Postal, Australia Post, Royal Mail, Intelligent Mail, KIX
**MicroHAWK ID-45 General Specifications**

**Dimensions**
- Height: 40.10 mm (1.58”);
- Width: 56.70 mm (2.23”);
- Length: 53.60 mm (2.11”);
- Weight: 98.47 g (3.47 oz.)

**Enclosure**
- IP-65/67, Aluminum

**Environmental**
- Operating Temperature: 0° to 45° C (32° to 113° F)
- Storage Temperature: -50° to 75° C (-58° to 167° F)
- Humidity: 5% to 95% (non-condensing)

**Emissions**
- EN 55022:2010 Class B

**Electrical**
- 10-30 VDC, 200 mV p-p max ripple, 150 mA @ 24 VDC (typ.); Passive Power over Ethernet (PoE), 24V

**Connector**
- M12 12-Pin Power/IO, M12 8-Pin Ethernet

**Communication**
- RS-232, Ethernet TCP/IP, PROFINET, EtherNet/IP

**Discrete I/O**
- 3 in / 3 out, Optoisolated Trigger Input; New Master: Bi-directional, Optoisolated, 4.5-28V rated (10mA @ 28VDC); Outputs (1, 2, 3): Bi-directional, Optoisolated, 1-28V rated (ICE < 100mA at 24VDC, current limited by user)

**Illumination**
- High-Output LEDs: Inner: 4 Red, 4 White; Outer: 24 Red (624 nm)

**Indicators**
- TRIG, PASS, FAIL, MODE, LINK, PWR LEDs; 2 Target Pattern LEDs; 2 Good Read Green Flash LEDs

**Speed**
- Standard: Up to 10 FPS
- High-Speed: Maximum Sensor FPS

**Memory**
- 2 GB Non-Volatile Flash, 256 MB RAM

**Decoder**
- X-Mode (Poor or Damaged 1D/2D + DPM)

**Optics**
- High-Density, UHD

**Sensor**
- WVGA (Mono): CMOS 0.34 MP (752 x 480)
- SXGA (Mono): CMOS 1.2 MP (1280 x 960)

**Shutter**
- Global (WVGA, SXGA)
- Exposure: 50 - 100,000, Default: 2,500 µs

**Focus**
- HD: Liquid Lens Autofocus (42 - 300 mm)
- UHD: Liquid Lens Autofocus (32 - 150 mm)

**Acquisition Speed**
- Up to 42 FPS (SXGA)

**Symbologies**
- 2D: Data Matrix (ECC 0-200), QR Code, Micro QR Code, Aztec, Stacked: PDF417, MicroPDF417, GS1 Databar (Composite and Stacked); Linear: Code 39, Code 128, BC412, Interleaved 2 of 5, UPC/EAN, Codabar, Code 93, Pharmacode, PLANET, POSTNET, Japanese Postal, Australia Post, Royal Mail, Intelligent Mail, KIX

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**Appendix A — General Specifications**

**MicroHAWK ID-45 Dimensions**

*Note: Inches [millimeters]. Nominal dimensions shown. Typical tolerances apply.*
### MicroHAWK ID-45 General Specifications

#### Read Ranges

<table>
<thead>
<tr>
<th>WVGA High Density</th>
<th>Field of View</th>
<th>Typical 2D Mil Size</th>
<th>Depth of Field (mm)</th>
<th>Minimum 2D Mil Size</th>
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<td>Outside</td>
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### Read Ranges (cont.)

#### 5MP High Density

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#### ID-20 SXGA Ultra-High Density - 64 mm

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#### ID-20 SXGA Ultra-High Density - 400 mm

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#### ID-30, ID-40, and ID-45 SXGA Autofocus, UHD

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<th>Min. 2D Element</th>
<th>Horizontal Field of View (mm)</th>
<th>Read Range (mm)</th>
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**Important:** Read range specifications are subject to change.
Safety Certifications

FCC, UL/cUL, CE, RoHS/WEEE

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Product specifications are given for typical performance at 25° C (77° F) using grade A symbols. Performance characteristics may vary at high temperatures or other environmental extremes.

Warranty – One year limited warranty on parts and labor. Extended warranty available.
Appendix B

Electrical Specifications

Contents

MicroHAWK ID-20 ................................................................. B-2
MicroHAWK ID-30 ................................................................. B-3
MicroHAWK ID-40 ................................................................. B-4
MicroHAWK ID-45 ................................................................. B-5
MicroHAWK ID-20 Electrical Specifications

5 VDC ± 5%, 350 mA at 5 VDC (typ.)

*MicroHAWK ID-20 Micro-USB Type B Socket*

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</tbody>
</table>
Appendix B — Electrical Specifications

MicroHAWK ID-30 Electrical Specifications
5 VDC ± 5%, 600 mA at 5 VDC (typ.)

MicroHAWK ID-30 High-Density 15-Pin Dsub Socket

Note: An accessory cable is required between the ID-30’s 15-pin corner-exit cable and the host’s USB port.

<table>
<thead>
<tr>
<th>Pin</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+5VDC</td>
</tr>
<tr>
<td>2</td>
<td>TX232</td>
</tr>
<tr>
<td>3</td>
<td>RX232</td>
</tr>
<tr>
<td>4</td>
<td>GND</td>
</tr>
<tr>
<td>5</td>
<td>D+</td>
</tr>
<tr>
<td>6</td>
<td>N/C</td>
</tr>
<tr>
<td>7</td>
<td>Output 1+</td>
</tr>
<tr>
<td>8</td>
<td>New Master+</td>
</tr>
<tr>
<td>9</td>
<td>Trigger+</td>
</tr>
<tr>
<td>10</td>
<td>D−</td>
</tr>
<tr>
<td>11</td>
<td>Output 3+</td>
</tr>
<tr>
<td>12</td>
<td>Default+</td>
</tr>
<tr>
<td>13</td>
<td>N/C</td>
</tr>
<tr>
<td>14</td>
<td>Output 2+</td>
</tr>
<tr>
<td>15</td>
<td>Vbus</td>
</tr>
</tbody>
</table>
**MicroHAWK ID-40 Electrical Specifications**

4.75 – 30 VDC; 200 mV p-p max ripple, 150 mA at 24 VDC (typ.)

**MicroHAWK ID-40 M12 Connectors**

![M12 12-pin Plug](image)

![M12 8-pin Socket (Ethernet)](image)

**Grounding and Isolation**

**Important:** Mounting an ID-30, ID-40, or ID-45 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, P/N 98-9000064-01, will ensure that no ground loop or other external electrical noise can occur through the reader.
**MicroHAWK ID-45 Electrical Specifications**

**MicroHAWK ID-45 Electrical Specifications**

10 – 30 VDC; 200 mV p-p max ripple, 150 mA at 24 VDC (typ.)

**MicroHAWK ID-45 M12 Connectors**

*Diagram showing M12 12-pin Plug and M12 8-pin Socket (Ethernet)*
MicroHAWK ID-45 Electrical Specifications
Appendix C
Serial Commands

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Serial Command Format

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 MicroHAWK Engine’s memory and saves for power-on.
• <A> initializes the MicroHAWK Engine’s 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.
Appendix C — Serial Commands

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>
Serial Command Format
Appendix D
MicroHAWK ID and ESP Software Quick Start

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This section is designed to get your MicroHAWK ID up and running quickly with ESP Software. Following these steps will allow you to get a sense of the reader’s capabilities and to test sample symbols.
Check Hardware and Connect the System

Check Hardware and Connect the System

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>MicroHAWK ID-20, MicroHAWK ID-30, MicroHAWK ID-40, or MicroHAWK ID-45</td>
<td>7AXY-YZZZ-LPPP</td>
</tr>
<tr>
<td>2</td>
<td>Cable, USB A to Micro B, 6 ft., ID-20</td>
<td>61-9000034-01</td>
</tr>
<tr>
<td>3</td>
<td>Cable, USB A to Micro B, 3 ft., ID-20</td>
<td>61-9000045-01</td>
</tr>
<tr>
<td>4</td>
<td>Power Supply, 5V</td>
<td>97-9000006-01</td>
</tr>
<tr>
<td>5</td>
<td>Cable, DB15 to Ext. Power/USB, ID-30</td>
<td>61-9000038-01</td>
</tr>
<tr>
<td>6</td>
<td>Power Supply, 100-240VAC, +24VDC, M12 12-Pin Socket</td>
<td>97-000012-01</td>
</tr>
<tr>
<td>7</td>
<td>Cordset, Host, Ethernet, M12 8-Pin Plug (Screw-On) to RJ45, 1 m.</td>
<td>61-000160-03</td>
</tr>
</tbody>
</table>

Note: See the MicroHAWK ID-20 / ID-30 / ID-40 / ID-45 Configuration Guide for all configurations.

ID-20 – Standalone USB Configuration

To Host

USB Type A Plug

2 or 3

Micro-USB Type B Plug

ID-30 – Standalone USB Configuration

To Host

Accessory USB Cable to Host

Integrated Corner-Exit Cable

Power Supply

Note: An accessory USB cable is required between the 15-pin corner-exit cable and the host's USB port.

Note: There are two USB connection options – one is BUS-powered and the other is externally powered. BUS-powered cable delivers reduced illumination – approximately 30% less brightness.

ID-40 – Standalone Ethernet Configuration

To Power

To Host

Appendix D — MicroHAWK ID and ESP Software Quick Start

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 ±30°; maximum pitch is ±30°. The illustration below shows approximate skew axis, pitch axis, and tilt axis.

![Reader and Symbol Orientation](image)

Reader and Symbol Orientation
Install ESP

ESP Software can be found on Omron Microscan’s Tools Drive (37-000010-01) that is packaged with the reader if the Drive was ordered at the time of purchase. ESP can also be installed from the Download Center, located at: www.microscan.com.

- Follow the prompts to install ESP from the Omron Microscan Tools Drive or Download Center.
- Click the ESP icon on your desktop to run the program.

Minimum System Requirements

- 233 MHz Pentium® PC
- Windows® 10 or 7 (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)
Select Model

When you start ESP, the following menu will appear:

1. Click the button showing your version of the MicroHAWK.
2. Click OK or double-click one of the MicroHAWK buttons to select your reader.
3. Depending on the MicroHAWK version you have selected, you will see the appropriate Would you like to connect to the MicroHAWK ID-[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.
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:

![Connection Wizard Interface]

**Important:** For best connection results, be sure that no decodable symbols are within the reader’s field of view while attempting to connect.
Appendix D — MicroHAWK ID and ESP Software Quick Start

Locate the Symbol in the Field of View

• In ESP’s EZ Mode, click the Locate button to enable the blue target pattern.

![Image of Locate/Calibrate window]

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.
Calibrate

MicroHAWK ID 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.

  ![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.
Appendix D — MicroHAWK ID and ESP Software Quick Start

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.

![Test Stop buttons](image)

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.
Configure the Reader in ESP

Configure the Reader in ESP

Click the App Mode button to make configuration changes to the MicroHAWK ID 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 Autonnect to establish communication (appears as Connect for the ID-40).
- 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.
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.
3. Place your cursor in the selection box, scroll down to the setting you want to change, and **click** once on the setting.
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.
**MicroHAWK ID Part Number Structure**

MicroHAWK ID part numbers follow the format **7ABX-YZZZ-LPPP**.

### 7 = MicroHAWK

**Example Part Number**: 7432-2000-1005

**Description**: MicroHAWK ID-45, IP65/67 Case, 24V, Ethernet, SXGA 1.2 Megapixel, Mono, High-Density, Autofocus, Red Outer LEDs, High-Speed, X-Mode Decoder.

(A) **Model**
1: Engine, No Case, USB
2: ID-20, IP40 Case, USB
3: ID-30, IP54 Case, 5V, USB
4: ID-40, IP65/67 Case, 24V, Ethernet

(B) **Software**
1: Auto ID
2: (Reserved)
3: ID-45; same IP rating, power, and comm. as ID-40

(X) **Sensor**
1: WVGA, 0.3 Megapixel, Mono
2: SXGA, 1.2 Megapixel, Mono
3: QSXGA, 5 Megapixel, Color

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Description</th>
<th>Resolution</th>
<th>Frame Rate Std</th>
<th>Frame Rate High</th>
</tr>
</thead>
<tbody>
<tr>
<td>WVGA</td>
<td>752 x 480, 0.3 MP, Mono</td>
<td>Global Shutter</td>
<td>10 FPS</td>
<td>60 FPS</td>
</tr>
<tr>
<td>SXGA</td>
<td>1280 x 960, 1.2 MP, Mono</td>
<td>Global Shutter</td>
<td>10 FPS</td>
<td>42 FPS</td>
</tr>
<tr>
<td>QSXGA</td>
<td>2592 x 1944, 5 MP, Color</td>
<td>Rolling Shutter</td>
<td>5 FPS</td>
<td></td>
</tr>
</tbody>
</table>

(Y) **Optics**
0: Custom
1: Standard-Density
2: High-Density
3: Ultra-High-Density
4: Long-Range (Autofocus Long Range available for SXGA sensor only.)
5: Ultra-High-Density with Polarizer

(ZZZ) **Focus Distance**
000: Autofocus
050: 50 mm = 1.96 in.
064: 64 mm = 2.51 in. – UHD FF
081: 81 mm = 3.18 in.
102: 102 mm = 4.02 in.
133: 133 mm = 5.23 in.
190: 190 mm = 7.48 in.
300: 300 mm = 11.81 in.
400: 400 mm = 15.75 in. – UHD FF

(L) **Outer LED Color**
0: N/A (Engine and ID-20)
1: Red (Not available with QSXGA sensor.)
2: White
3: Blue
4: IR

(PPP) **Speed and Decoder**
000: Standard-Speed, 1D Decoder
001: High-Speed, 1D Decoder
002: Standard-Speed, 1D/2D Decoder
003: Standard-Speed, X-Mode Decoder
004: High-Speed, 1D/2D Decoder
005: High-Speed, X-Mode Decoder

**Notes:**
- (A) **Model**: The MicroHAWK Engine is available for OEM-certified partners only.
- (L) **Outer LED Color**: Outer LEDs provide extra illumination. Base level illumination included with all readers.
- (PPP) **Speed and Decoder**: 1D omnidirectional decoding functionality is included with all readers. The 1D/2D Decoder option is useful for printed labels. X-Mode is the full decoder package for 1D, 2D, DPM, and damaged symbols.
- **Field Upgrades**: Not available for optics or illumination due to factory settings for optical alignment, LED balancing, and sealing for IP enclosure rating. However, the reader’s speed and decoder version are field-upgradeable via licenses.
This section is designed to help you understand the basic structure and elements of ESP (Easy Setup Program).

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 MicroHAWK ID 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**

**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.

---

Enter **App Mode** to access configuration trees and other setup features.

Click **Calibrate** to begin the initial calibration routine. Calbration is explained at the left of the **EZ Mode** screen, and also in Quick Start.

Click **Locate** to activate the MicroHAWK ID’s target LEDs. Center the target pattern on the symbol. The display shows you where the symbol is located in the reader’s field of view.

Starts Read Rate test.

Ends Read Rate test.
Appendix E — Using ESP

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.

**Communication, Read Cycle, Symbologies, I/O Parameters, Symbol Quality, Matchcode, Diagnostics**

**Video, Evaluation, Calibration, Window of Interest, Configuration Database, Ordered Output, Output Format, Dynamic Setup**

**Return to EZ Mode.**

**Open the Terminal view.**

Click on tabs in this row to access configuration trees like the one shown here.

**Read Rate, Counters, Device Control, Differences, Master Database, Firmware**

Click **Capture and Decode** to read the symbol in the field of view, and to see a high resolution image capture of the symbol.

**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. The illustration below shows how settings can be saved and received between ESP and the reader, and ESP and the host hard drive.

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.
**Appendix E — Using ESP**

**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.
Menu Toolbar

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

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.
Appendix E — Using ESP

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.

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.
Menu Toolbar

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.
Appendix E — Using ESP

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.

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

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.

Use Default Storage Location
When enabled, automatically stores data in ESP’s Application Data folder.
Appendix E — Using ESP

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 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.
Menu Toolbar

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 MicroHAWK ID 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.

The symbol you create will be displayed in the field at the bottom of the Bar Code Dialog.

Choose a spatial orientation for the new symbol.

Drag specific configuration values from the control tree directly into this field to encode new symbols.

Create a caption for the symbol that matches the encoded data, or write your own caption.
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.
Send/Receive Options

**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\(^1\) 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.
This section explains how to set up communications with a host.

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

**Communications by ESP**

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

### Parameters

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<thead>
<tr>
<th>Parameters</th>
<th>ESP Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communications</td>
<td></td>
</tr>
<tr>
<td>RS232</td>
<td></td>
</tr>
<tr>
<td>- Baud Rate</td>
<td>115.2K</td>
</tr>
<tr>
<td>- Parity</td>
<td>None</td>
</tr>
<tr>
<td>- Stop Bits</td>
<td>One</td>
</tr>
<tr>
<td>- Data Bits</td>
<td>Eight</td>
</tr>
<tr>
<td>- Host Protocol</td>
<td>Point-to-Point</td>
</tr>
<tr>
<td>USB HID Report Status</td>
<td></td>
</tr>
<tr>
<td>Ethernet</td>
<td>Enabled</td>
</tr>
<tr>
<td>Preamble</td>
<td>Disabled</td>
</tr>
<tr>
<td>Postamble</td>
<td>Enabled**</td>
</tr>
<tr>
<td>- Postamble Characters</td>
<td>Disabled</td>
</tr>
<tr>
<td>- Response Timeout</td>
<td>Enabled**</td>
</tr>
<tr>
<td>- LRC Status</td>
<td>Disabled</td>
</tr>
<tr>
<td>- Search and Configure Mode</td>
<td>Enabled</td>
</tr>
</tbody>
</table>

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

To change a setting, **double-click** the setting and use your cursor to scroll through the options.
## Appendix F — Communications

### Communications Serial Commands

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<td>EtherNet/IP</td>
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<td>Host Protocol</td>
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<td>&lt;K141, status, preamble characters&gt;</td>
</tr>
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<td>Postamble</td>
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</tr>
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<td>Response Timeout</td>
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<tr>
<td>LRC Status</td>
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<tr>
<td>ACK/NAK Options</td>
<td>&lt;K147, RES, REQ, STX, ETX, ACK, NAK&gt;</td>
</tr>
<tr>
<td>Polling Mode Options</td>
<td>&lt;K148, RES, REQ, STX, ETX, ACK, NAK&gt;</td>
</tr>
<tr>
<td>USB HID/Keyboard</td>
<td>&lt;K149, Omron Microscan Report Enabled, Keyboard Report Enabled, Keyboard Language, USB VCOM Status, UART Status&gt;</td>
</tr>
<tr>
<td>EtherNet/IP Byte Swapping Enabled</td>
<td>&lt;K163, status&gt;</td>
</tr>
<tr>
<td>PROFINET</td>
<td>&lt;K164, status&gt;</td>
</tr>
<tr>
<td>USB Mass Storage Driver</td>
<td>&lt;K900, status&gt;</td>
</tr>
</tbody>
</table>
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
8 = 115.2K
9 = 230K

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.
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: 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

RES: (Reset) 00 (disabled)
REQ: (Request) 00 (disabled)
STX: (Start of Text) 00 (disabled)
ETX: (End of Text) 00 (disabled)
ACK: (Acknowledge) 06
NAK: (Negative Acknowledge) 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.
Appendix F — Communications

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

RES: (Reset) 04
REQ: (Request) 05
STX: (Start of Text) 02
ETX: (End of Text) 03
ACK: (Acknowledgment) 06
NAK: (Negative Acknowledge) 15
**Ethernet**

Enables or disables Ethernet connectivity in the reader. This corresponds to the `<K126>` command. It requires a `<Zrdall>` to return to default settings.

<table>
<thead>
<tr>
<th>Ethernet</th>
<th>Enabled</th>
</tr>
</thead>
<tbody>
<tr>
<td>IP Address</td>
<td>192.168.0.100</td>
</tr>
<tr>
<td>Subnet</td>
<td>255.255.0.0</td>
</tr>
<tr>
<td>Gateway</td>
<td>0.0.0.0</td>
</tr>
<tr>
<td>IP Address Mode</td>
<td>Static</td>
</tr>
<tr>
<td>TCP Port 1</td>
<td>2001</td>
</tr>
<tr>
<td>Symbol Data Output</td>
<td>Enabled</td>
</tr>
<tr>
<td>Extra Symbol Information</td>
<td>Enabled</td>
</tr>
<tr>
<td>Diagnostics Output</td>
<td>Enabled</td>
</tr>
<tr>
<td>External Source Processing Mode</td>
<td>Command</td>
</tr>
<tr>
<td>TCP Port 2</td>
<td>2003</td>
</tr>
<tr>
<td>Symbol Data Output</td>
<td>Enabled</td>
</tr>
<tr>
<td>Extra Symbol Information</td>
<td>Enabled</td>
</tr>
<tr>
<td>Diagnostics Output</td>
<td>Enabled</td>
</tr>
<tr>
<td>External Source Processing Mode</td>
<td>Command</td>
</tr>
</tbody>
</table>

**IP Address**

This is the IP address of the reader when it is in Static IP Address Mode.

<table>
<thead>
<tr>
<th>Ethernet</th>
<th>Enabled</th>
</tr>
</thead>
<tbody>
<tr>
<td>IP Address</td>
<td>192.168.0.100</td>
</tr>
<tr>
<td>Subnet</td>
<td>255.255.0.0</td>
</tr>
<tr>
<td>Gateway</td>
<td>0.0.0.0</td>
</tr>
<tr>
<td>IP Address Mode</td>
<td>Static</td>
</tr>
<tr>
<td>TCP Port 1</td>
<td>2001</td>
</tr>
<tr>
<td>Symbol Data Output</td>
<td>Enabled</td>
</tr>
<tr>
<td>Extra Symbol Information</td>
<td>Enabled</td>
</tr>
<tr>
<td>Diagnostics Output</td>
<td>Enabled</td>
</tr>
<tr>
<td>External Source Processing Mode</td>
<td>Command</td>
</tr>
<tr>
<td>TCP Port 2</td>
<td>2003</td>
</tr>
<tr>
<td>Symbol Data Output</td>
<td>Enabled</td>
</tr>
<tr>
<td>Extra Symbol Information</td>
<td>Enabled</td>
</tr>
<tr>
<td>Diagnostics Output</td>
<td>Enabled</td>
</tr>
<tr>
<td>External Source Processing Mode</td>
<td>Command</td>
</tr>
</tbody>
</table>
Appendix F — Communications

**Subnet**
This is the subnet of the reader when it is in Static IP Address Mode.

<table>
<thead>
<tr>
<th>Ethernet</th>
<th>Enabled</th>
</tr>
</thead>
<tbody>
<tr>
<td>IP Address</td>
<td>192.168.0.100</td>
</tr>
<tr>
<td><strong>Subnet</strong></td>
<td>255.255.0.0</td>
</tr>
<tr>
<td>Gateway</td>
<td>0.0.0.0</td>
</tr>
<tr>
<td>IP Address Mode</td>
<td>Static</td>
</tr>
<tr>
<td>TCP Port 1</td>
<td>2001</td>
</tr>
<tr>
<td>Symbol Data Output</td>
<td>Enabled</td>
</tr>
<tr>
<td>Extra Symbol Information</td>
<td>Enabled</td>
</tr>
<tr>
<td>Diagnostics Output</td>
<td>Enabled</td>
</tr>
<tr>
<td>External Source Processing Mode</td>
<td>Command</td>
</tr>
</tbody>
</table>

| TCP Port 2 | 2003 |
| Symbol Data Output | Enabled |
| Extra Symbol Information | Enabled |
| Diagnostics Output | Enabled |
| External Source Processing Mode | Command |

**Gateway**
This is the gateway IP address of the reader when it is in Static IP Address Mode.

<table>
<thead>
<tr>
<th>Ethernet</th>
<th>Enabled</th>
</tr>
</thead>
<tbody>
<tr>
<td>IP Address</td>
<td>192.168.0.100</td>
</tr>
<tr>
<td><strong>Subnet</strong></td>
<td>255.255.0.0</td>
</tr>
<tr>
<td>Gateway</td>
<td>0.0.0.0</td>
</tr>
<tr>
<td>IP Address Mode</td>
<td>Static</td>
</tr>
<tr>
<td>TCP Port 1</td>
<td>2001</td>
</tr>
<tr>
<td>Symbol Data Output</td>
<td>Enabled</td>
</tr>
<tr>
<td>Extra Symbol Information</td>
<td>Enabled</td>
</tr>
<tr>
<td>Diagnostics Output</td>
<td>Enabled</td>
</tr>
<tr>
<td>External Source Processing Mode</td>
<td>Command</td>
</tr>
<tr>
<td>TCP Port 2</td>
<td>2003</td>
</tr>
<tr>
<td>Symbol Data Output</td>
<td>Enabled</td>
</tr>
<tr>
<td>Extra Symbol Information</td>
<td>Enabled</td>
</tr>
<tr>
<td>Diagnostics Output</td>
<td>Enabled</td>
</tr>
<tr>
<td>External Source Processing Mode</td>
<td>Command</td>
</tr>
</tbody>
</table>
### Ethernet

**IP Address Mode**

Determines how the reader's IP address will be defined.

<table>
<thead>
<tr>
<th></th>
<th>Ethernet</th>
<th>TCP Port 1</th>
<th>TCP Port 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>static</td>
<td>Enabled</td>
<td>Enabled</td>
<td>Enabled</td>
</tr>
<tr>
<td>dhcp</td>
<td></td>
<td>dhcp</td>
<td></td>
</tr>
<tr>
<td>ip addr</td>
<td>192.168.0.100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>subnet</td>
<td>255.255.0.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>gateway</td>
<td>0.0.0.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ip addr mode</td>
<td>Static*</td>
<td>dhcp</td>
<td></td>
</tr>
</tbody>
</table>

#### Static

In **Static Mode**, the reader uses the user-defined IP address entered in ESP. This is the default state for an Ethernet-enabled MicroHAWK.

#### DHCP

In **DHCP Mode**, the reader automatically acquires the IP address, Subnet, and Gateway addresses from a DHCP or BOOTP server. This is the default state for a USB MicroHAWK.
TCP Port 1

One of two TCP ports for Ethernet communication with the reader. The default setting is 2001.

- **Ethernet**: Enabled
  - **IP Address**: 192.168.0.100
  - **Subnet**: 255.255.0.0
  - **Gateway**: 0.0.0.0
  - **IP Address Mode**: Static

- **TCP Port 1**: 2001
  - **Symbol Data Output**: Enabled
  - **Extra Symbol Information**: Enabled
  - **Diagnostics Output**: Enabled
  - **External Source Processing Mode**: Command

- **TCP Port 2**: 2003
  - **Symbol Data Output**: Enabled
  - **Extra Symbol Information**: Enabled
  - **Diagnostics Output**: Enabled
  - **External Source Processing Mode**: Command

**Symbol Data Output**
Enables or disables decoded symbol data output from the reader.

**Extra Symbol Information**
Enables or disables extra symbol information output from the reader.

**Diagnostics Output**
Enables or disables diagnostics output from the reader.

**External Source Processing Mode**
Enables or disables processing of commands or data from sources external to the reader.

**Command**
**Command** enables command processing in the reader.

**Data**
**Data** enables Ethernet TCP Port 1 as a data source port.

**Note:** The data path between **in** the source port and **out** the source port is always two-way. Data is copied from source data ports and all those source ports' data is transmitted to the destination port, and from the destination port to the source port.
Ethernet

TCP Port 2
One of two TCP ports for Ethernet communication with the reader. The default setting is 2003.

- Ethernet: Enabled
  - IP Address: 192.168.0.100
  - Subnet: 255.255.0.0
  - Gateway: 0.0.0.0
  - IP Address Mode: Static

- TCP Port 1: 2001
  - Symbol Data Output: Enabled
  - Extra Symbol Information: Enabled
  - Diagnostics Output: Enabled
  - External Source Processing Mode: Command

- TCP Port 2: 2003
  - Symbol Data Output: Enabled
  - Extra Symbol Information: Enabled
  - Diagnostics Output: Enabled
  - External Source Processing Mode: Command

Symbol Data Output
Enables or disables decoded symbol data output from the reader.

Extra Symbol Information
Enables or disables extra symbol information output from the reader.

Diagnostics Output
Enables or disables diagnostics output from the reader.

External Source Processing Mode
Enables or disables processing of commands or data from sources external to the reader.

Command
Command enables command processing in the reader.

Data
Data enables Ethernet TCP Port 2 as a data source port.

Note: The data path between in the source port and out the source port is always two-way. Data is copied from source data ports and all those source ports’ data is transmitted to the destination port, and from the destination port to the source port.
Appendix F — Communications

Search and Configure Mode

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.

| Search and Configure Mode | Enabled* | Disabled | Enabled* | Timed Window |

Changes to this parameter are saved to NOVRAM and are set to default on power on. A Reset 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.

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 if ESP were to show only unconfigured units.
Response Timeout

**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
Appendix F — Communications

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**

**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.
USB HID/Keyboard

**Definition:** These parameters cause the reader to reboot after a `<Z>` or `<A>` command. The data packet is structured for input and output as follows:
- Byte 1 = Report Type (Always 1)
- Byte 2 = Data Length (Hex Format)
- Byte 3 – 64 = Data to Command Processor

**Serial Cmd:** `<K149,Omron Microscan Report Enabled,Keyboard Report Enabled,Keyboard Language,USB VCOM Status,UART Status>`

Omron Microscan Report Enabled

**Serial Cmd:** `<K149,Omron Microscan Report Enabled,Keyboard Report Enabled,Keyboard Language,USB VCOM Status,UART Status>`

**Default:** 0 = Disabled

**Options:**
- 0 = Disabled
- 1 = Enabled

Keyboard Report Enabled

**Serial Cmd:** `<K149,Omron Microscan Report Enabled,Keyboard Report Enabled,Keyboard Language,USB VCOM Status,UART Status>`

**Default:** 0 = Disabled

**Options:**
- 0 = Disabled
- 1 = Enabled

Keyboard Language

**Definition:** Used by the reader to help identify what keyboard layout to use when the keyboard drive is outputting data. If the unit does not have the keyboard layout assigned to this parameter, than it will default to the **en-US** keyboard layout. On the next page is the list of acceptable languages with predefined keyboard layouts. If they are pre-loaded into the reader’s firmware they are shown in bold. All other languages will need to be manually loaded as a keyboard.def file or added to the reader’s firmware.

**Serial Cmd:** `<K149,Omron Microscan Report Enabled,Keyboard Report Enabled,Keyboard Language,USB VCOM Status,UART Status>`

**Default:** **en-US**

**Options:** ASCII string, up to 25 characters
## Keyboard Languages

<table>
<thead>
<tr>
<th>Language</th>
<th>Display Name</th>
<th>Loaded into Firmware</th>
</tr>
</thead>
<tbody>
<tr>
<td>af-ZA</td>
<td>Afrikaans - South Africa</td>
<td>No</td>
</tr>
<tr>
<td>sq-AL</td>
<td>Albanian - Albania</td>
<td>No</td>
</tr>
<tr>
<td>ar-DZ</td>
<td>Arabic - Algeria</td>
<td>No</td>
</tr>
<tr>
<td>ar-BH</td>
<td>Arabic - Bahrain</td>
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</tr>
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<td>ar-EG</td>
<td>Arabic - Egypt</td>
<td>No</td>
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<td>ar-IQ</td>
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<tr>
<td>ar-JO</td>
<td>Arabic - Jordan</td>
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</tr>
<tr>
<td>ar-KW</td>
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</tr>
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<td>ar-LB</td>
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</tr>
<tr>
<td>ar-LY</td>
<td>Arabic - Libya</td>
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</tr>
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<td>ar-MA</td>
<td>Arabic - Morocco</td>
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</tr>
<tr>
<td>ar-OM</td>
<td>Arabic - Oman</td>
<td>No</td>
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<tr>
<td>ar-QA</td>
<td>Arabic - Qatar</td>
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</tr>
<tr>
<td>ar-SA</td>
<td>Arabic - Saudi Arabia</td>
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<td>ar-SY</td>
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<td>ar-TN</td>
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<td>ar-AE</td>
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<td>ar-YE</td>
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<tr>
<td>hy-AM</td>
<td>Armenian - Armenia</td>
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<tr>
<td>Cy-az-AZ</td>
<td>Azeri (Cyrillic) - Azerbaijan</td>
<td>No</td>
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<tr>
<td>Lt-az-AZ</td>
<td>Azeri (Latin) - Azerbaijan</td>
<td>No</td>
</tr>
<tr>
<td>eu-ES</td>
<td>Basque - Basque</td>
<td>No</td>
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<tr>
<td>be-BY</td>
<td>Belarusian - Belarus</td>
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<td>bg-BG</td>
<td>Bulgarian - Bulgaria</td>
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<td>ca-ES</td>
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<td>zh-CN</td>
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<td>zh-HK</td>
<td>Chinese - Hong Kong SAR</td>
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<td>zh-MO</td>
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<td>zh-TW</td>
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<td>zh-CHS</td>
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<td>zh-CHT</td>
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<td>en-BZ</td>
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<td>en-TT</td>
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<td>en-GB</td>
<td>English - United Kingdom</td>
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## Keyboard Languages (continued)

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<th>Language</th>
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<td>fo-FO</td>
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<td>Farsi - Iran</td>
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<td>Norwegian (Nynorsk) - Norway</td>
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<td>Lt-sr-SP</td>
<td>Serbian (Latin) - Serbia</td>
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</table>
### Keyboard Languages (continued)

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<tr>
<th>Code</th>
<th>Language</th>
<th>Description</th>
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<tbody>
<tr>
<td>sk-SK</td>
<td>Slovak - Slovakia</td>
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<td>si-SI</td>
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<td>es-BO</td>
<td>Spanish - Bolivia</td>
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<td>es-CL</td>
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<td>es-CR</td>
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<td>es-D0</td>
<td>Spanish - D.R.</td>
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</tr>
<tr>
<td>vi-VN</td>
<td>Vietnamese - Vietnam</td>
<td>No</td>
</tr>
</tbody>
</table>
Appendix F — Communications

**USB VCOM (Virtual COM) Status**

*Definition:* This command enables the USB Virtual COM Port Driver if your reader supports the driver. The reader will reset so the driver can be used.

*Serial Cmd:* `<K149, Omron Microscan Report Enabled, Keyboard Report Enabled, Keyboard Language, USB VCOM Status, UART Status>`

*Options:*  
0 = Disabled (Default for ID-40)  
1 = Enabled (Default for Engine, ID-20, and ID-30)

**UART Status**

*Definition:* This command allows the reader to communicate on the reader’s UART if the reader is UART-capable. The reader will reset so the UART can be used.

*Serial Cmd:* `<K149, Omron Microscan Report Enabled, Keyboard Report Enabled, Keyboard Language, USB VCOM Status, UART Status>`

*Options:*  
0 = Disabled (Default for ID-20)  
1 = Enabled (Default for Engine, ID-30, and ID-40)
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: \(<K164,\text{status}>\)
Default: Disabled
Options: 0 = Disabled
1 = Enabled
USB Mass Storage Driver

**USB Mass Storage Driver**

*Definition:* Enables USB MicroHAWK readers to display a Mass Storage device on the host PC.

*Serial Cmd:* `<K900,status>`

*Default:* Disabled

*Options:* 0 = Disabled
1 = Enabled
Appendix F — Communications

Enter 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.)
Entering ASCII Characters as Hex Values
This section shows the MicroHAWK ID’s calibration options, and explains the different ways that those options can be configured.
Calibration Serial Commands

Calibration Serial Commands

| Calibration Options | \(<K529, \text{gain, exposure, focus position, symbol type, WOI framing, WOI margin, line scan height, processing}>\) |

Calibration Overview

Calibration is one of the most powerful features of the MicroHAWK ID. 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.
Appendix G — Calibration

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. If 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:* Enabled (Decode Required)

*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.
Calibration Options

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: Enabled (Decode Required)
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.

<table>
<thead>
<tr>
<th>Exposure</th>
<th>Line Speed</th>
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<tr>
<td>100,000 – 4,000</td>
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<tr>
<td>4,000 – 1,250</td>
<td>5’/ sec</td>
</tr>
<tr>
<td>1,250 – 700</td>
<td>10’/ sec</td>
</tr>
<tr>
<td>700 – 500</td>
<td>15’/ sec</td>
</tr>
<tr>
<td>500 – 400</td>
<td>20’/ sec</td>
</tr>
</tbody>
</table>

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:** Enabled (Decode Required)

**Options:**
- 0 = Disabled
- 1 = Enabled (Decode Required)
- 2 = Quick Calibrate

**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 configurates 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** is 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.
**Calibration Options**

**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.
Appendix G — Calibration

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.
Calibration Options

**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.
Appendix G — Calibration

**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.

Gain and Shutter Speed are configurable in the Calibration interface.

Exposure, Gain, and Image Quality values are all tracked in real-time during the calibration process.

Determines the amount of time and effort the reader will spend attempting to decode a symbol for each parameter configuration. (Low, Medium, High, Definable).

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).
After Calibration

Notice the improved image resolution after the calibration process is complete.

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 four parameters.

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.
Appendix G — Calibration

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. **Thresholding Mode** will be set to **Adaptive** during calibration. At the completion of a successful calibration, the threshold mode will remain set to Adaptive regardless of its previous setting. Otherwise, the value will revert back to its original state. This is so the reader can continue to decode after calibration is finished.

4. 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.

5. **Pharmacode** is not calibrated.

6. The symbol size, dimension, and orientation parameters of the **No Symbol / Bad Symbol and Symbol Qualification** command <K718> will be updated if calibration is successfully completed.

7. 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.

8. Calibration does not modify the global **Composite status <K453>**. The global Composite status must be configured properly before calibration.

9. If the user requires calibration of a **stacked symbology <K482>, <K483>, or <K484>,** that symbology must be enabled and configured appropriately before calibration.

10. 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.
Additional Notes about Calibration
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

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

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

#### Parameters

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Click the **Parameters** button and then the **Read Cycle** tab.
## Appendix H — Read Cycle

### Read Cycle Serial Commands

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<td>Stop Trigger Character</td>
<td>&lt;K230, stop character&gt;</td>
</tr>
<tr>
<td>Capture Mode</td>
<td>&lt;K241, capture mode, number of rapid captures, rapid capture mode, number of continuous captures, images per read cycle limit, read cycle history limit&gt;</td>
</tr>
<tr>
<td>Capture Time</td>
<td>&lt;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&gt;</td>
</tr>
<tr>
<td>Image Storage</td>
<td>&lt;K244, image storage type, image store mode&gt;</td>
</tr>
<tr>
<td>Image Processing Timeout</td>
<td>&lt;K245, image processing timeout&gt;</td>
</tr>
</tbody>
</table>
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 MicroHAWK ID 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** Photometry/Focus (if supported by reader model)

**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>`
Appendix H — Read Cycle

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.
**Trigger Mode and Filter Duration**

**External Level**

*Initiate Read Cycle:* Object #1, moving in front of the detector beam, causes a change in the trigger state, which initiates the read cycle.

*End Read Cycle:* The same object, moving out of the detector beam, causes another change in the trigger state, which ends the read cycle.

**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**

*Initiate Read Cycle:* Object #1, moving in front of the detector beam, causes a change in the trigger state, which initiates the read cycle.

*Initiate Second Read Cycle:* Object #2, moving in front of the detector beam, causes another change in the trigger state. This signal initiates a new read cycle and ends the previous read cycle unless **Timeout** is enabled and a good read or timeout has not occurred.

**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>`
Appendix H — Read Cycle

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.

Note: Illumination Brightness will be changed to High if it was previously set to Extreme and the Light Source is not External.

Serial Cmd: <K200,6>
Trigger Mode and Filter Duration

**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 (32 μs)

*Options:* 1 to 65535 (Trigger filter range: 0 μs 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 (32 μs)

*Options:* 1 to 65535 (Trigger filter range: 0 μs 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: Positive
Options: 0 = Negative  1 = Positive
Serial Trigger

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.
Appendix H — Read Cycle

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)

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.
Appendix H — Read Cycle

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.
**End of Read Cycle**

**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 labelled 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:* 200 (x10 ms)

*Options:* 1 to 65535
Appendix H — Read Cycle

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.

![Diagram of Continuous Capture Mode](image-url)
Capture Mode

**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

**Important:** If a value of 255 is entered, the reader is in Infinite Rapid mode.

**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 SXGA image (1280 x 1024) reduces the maximum number of images to 49. 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
Appendix H — Read Cycle

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.

![Diagram A](image1)

Diagram A

- Start of Read Cycle
- No Time Delay Between Captures
- End of read cycle
- Time Before First Capture
- Time Delay Between Captures

![Diagram B](image2)

Diagram B

- Processing
- End of 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.

![Diagram C](image3)

Diagram C

- First trigger starts the read cycle
- Captures on every trigger
- Capture
- Read cycle ends on New Trigger or Timeout, as configured.
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 µS increments)
Capture Timing

**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 µS increments)

**Note:** Number of Captures and number of frame delays (Time Between Captures) must be the same.

---

**Diagram A**

Start of Read Cycle

1 2 3 4 5

Time Delay Between Captures = 0

End of Read Cycle

**Diagram B**

Time Delay Between Captures varies.
Appendix H — Read Cycle

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: \(<\text{K244}, \text{image storage type}, \text{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: \(<\text{K244}, \text{image storage type}, \text{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.

<table>
<thead>
<tr>
<th>Number of Symbols:</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frame # 1:</td>
<td>No-Read</td>
</tr>
<tr>
<td>Frame # 2:</td>
<td>No-Read</td>
</tr>
<tr>
<td>Frame # 3:</td>
<td>Good Read, Symbol # 1</td>
</tr>
<tr>
<td>Read Cycle Result:</td>
<td>Good Read</td>
</tr>
<tr>
<td>Stored Frame:</td>
<td>None</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Number of Symbols:</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frame # 1:</td>
<td>No-Read</td>
</tr>
<tr>
<td>Frame # 2:</td>
<td>No-Read</td>
</tr>
<tr>
<td>Frame # 3:</td>
<td>No-Read</td>
</tr>
<tr>
<td>Read Cycle Result:</td>
<td>No-Read</td>
</tr>
<tr>
<td>Stored Frame:</td>
<td>Frame # 3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Number of Symbols:</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frame # 1:</td>
<td>No-Read</td>
</tr>
<tr>
<td>Frame # 2:</td>
<td>No-Read</td>
</tr>
<tr>
<td>Frame # 3:</td>
<td>Good Read, Symbol # 1</td>
</tr>
<tr>
<td>Read Cycle Result:</td>
<td>No-Read</td>
</tr>
<tr>
<td>Stored Frame:</td>
<td>Frame # 2</td>
</tr>
</tbody>
</table>
Minimum Good Reads

**Minimum Good Reads**

*Definition:* This value specifies the number of times a symbol needs to be read to qualify as a good read.

*Serial Cmd:* `<K221,minum good reads>`

*Default:* 1

*Options:* 1 to 255
Appendix I
Symbologies

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This section describes the various symbol types that can be decoded by the MicroHAWK ID.
To change a setting, double-click the setting and use your cursor to scroll through the options.

To open nested options, single-click the +.
## Symbologies Serial Commands

<table>
<thead>
<tr>
<th>Symbology Type</th>
<th>Command Structure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Composite</td>
<td><code>&lt;K453,symbology status,separator status,separator character&gt;</code></td>
</tr>
<tr>
<td>Aztec</td>
<td><code>&lt;K458,status&gt;</code></td>
</tr>
<tr>
<td>Micro QR Code</td>
<td><code>&lt;K459,status&gt;</code></td>
</tr>
<tr>
<td>Postal Symbologies</td>
<td><code>&lt;K460,postal symbology type,POSTNET status,PLANET status,USPS4CB status&gt;</code></td>
</tr>
<tr>
<td>Code 39</td>
<td><code>&lt;K470,status,check character status,check character output status,large intercharacter gap,fixed symbol length status,fixed symbol length,full ASCII set&gt;</code></td>
</tr>
<tr>
<td>Codabar</td>
<td><code>&lt;K471,status,start/stop match,start/stop output,large intercharacter gap,fixed symbol length status,symbol length,check character type,check character output&gt;</code></td>
</tr>
<tr>
<td>Interleaved 2 of 5</td>
<td><code>&lt;K472,status,check character status,check character output status,symbol length #1,symbol length #2,guard bar status,range mode status&gt;</code></td>
</tr>
<tr>
<td>UPC/EAN</td>
<td><code>&lt;K473,UPC status,EAN status,supplemental status,separator status,separator character,supplemental type,format UPC-E as UPC-A&gt;</code></td>
</tr>
<tr>
<td>Code 128/EAN 128</td>
<td><code>&lt;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&gt;</code></td>
</tr>
<tr>
<td>Code 93</td>
<td><code>&lt;K475,status,fixed symbol length status,symbol length&gt;</code></td>
</tr>
<tr>
<td>PDF417</td>
<td><code>&lt;K476,status,unused,fixed symbol length status,symbol length&gt;</code></td>
</tr>
<tr>
<td>Pharmacode</td>
<td><code>&lt;K477,status,fixed bar count status,fixed bar count,minimum bar count,bar width mode,direction,fixed threshold value&gt;</code></td>
</tr>
<tr>
<td>Data Matrix</td>
<td><code>&lt;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&gt;</code></td>
</tr>
<tr>
<td>QR Code</td>
<td><code>&lt;K480,status&gt;</code></td>
</tr>
<tr>
<td>BC412</td>
<td><code>&lt;K481,status,check character output,fixed symbol length status,fixed symbol length&gt;</code></td>
</tr>
<tr>
<td>DataBar-14</td>
<td><code>&lt;K482,status&gt;</code></td>
</tr>
<tr>
<td>DataBar Limited</td>
<td><code>&lt;K483,status&gt;</code></td>
</tr>
<tr>
<td>DataBar Expanded</td>
<td><code>&lt;K484,status,fixed symbol length status,fixed symbol length&gt;</code></td>
</tr>
<tr>
<td>MicroPDF417</td>
<td><code>&lt;K485,status,[unused],fixed symbol length status,fixed symbol length&gt;</code></td>
</tr>
<tr>
<td>DotCode</td>
<td><code>&lt;K497,status,rotation mode&gt;</code></td>
</tr>
</tbody>
</table>
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
Appendix I — 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`
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
Appendix I — Symbologies

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 labelling.

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: Disabled

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 encodation.

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: Disabled

Options: 0 = Disabled 1 = Enabled
Appendix I — Symbologies

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,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,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 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,full ASCII set>`

Default: Disabled

Options: 0 = Disabled 1 = Enabled
**Code 39**

**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 character 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
Appendix I — Symbologies

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,full ASCII set,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 character 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
Appendix I — Symbologies

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.

Note: Code 128 status must be enabled for EAN status to be active. 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.

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
Code 128/EAN 128

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: Enabled
Options: 0 = Disabled 1 = Enabled
Appendix I — Symbologies

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 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 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 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 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
Appendix I — Symbologies

Symbol Length #1 (Interleaved 2 of 5)

**Usage:** Useful in applications where I 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 I 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
Appendix I — Symbologies

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:** Disabled

**Options:**
- 0 = Disabled
- 1 = Enabled

**Fixed Symbol Length Status (Code 93)**

**Definition:** When disabled, the reader will accept any Code 93 symbol provided it 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
**Appendix I — Symbologies**

**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:* Disabled  
*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
Codabar

**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
Appendix I — Symbologies

UPC/EAN

Usage: Used primarily in point-of-sale applications in the retail industry. It is commonly used with Omron Microscan 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. However, if a supplemental is not decoded, the main will be sent by itself at the end of the read cycle.

Required
When set to Required, both the main and the supplemental symbols must be read or a single No-Read condition results.
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
Appendix I — Symbologies

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.
**UPC/EAN**

### 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:** Disabled

**Options:**
- 0 = Disabled
- 1 = Enabled
Pharmacode

**Important:** WebLink’s *Train* command does not function with 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>`

**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>`

**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>`

**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>`

**Default:** 2

**Options:**

- 1 to 16
Pharmacode

**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>`

**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>`

**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>`

**Default:** 10

**Options:** 1 to 65535
Postal Symbologies

Important: Postal Symbologies must have a minimum pixels-per-element value of 4 to be decoded reliably by the MicroHAWK ID.

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 Symbologies

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
Appendix I — Symbologies

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.
Postal Symbologies

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
Appendix I — Symbologies

**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:** Disabled

**Options:**
- 0 = Disabled
- 1 = Enabled

Where appropriate, use 1 (non-stacked) for better performance over 2 (stacked and non-stacked).

**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
Appendix I — Symbologies

**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:* Disabled

*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:* Disabled

*Options:* 0 = Disabled 1 = Enabled
PDF417

**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.
Appendix I — Symbologies

MicroPDF417

Usage: Used for labelling 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: Disabled
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 = Enabled
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.
**Symbology Identifier**

**Symbology Identifier** is an AIM standard prefix set of characters that identifies the symbol type.

When enabled, the imager analyzes and identifies the symbology and adds a three-character identifying prefix to the data:

- ] (closed bracket character) indicating the presence of a symbology identifier.
- A, C, E, F, G, I, L, e, etc. See the AIM website for a full list of symbology identifiers.
- (A = Code 39; C = Code 128; E = UPC/EAN; F = Codabar; G = Code 93; I = Interleaved 2 of 5; L = PDF417 and MicroPDF417; e = GS1 DataBar (RSS)

- **Modifier**
  
  *Example:* ]C0 indicates a Code 128 symbol.

<table>
<thead>
<tr>
<th>Symbology Identifier</th>
<th>Disabled*</th>
<th>Enabled</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disabled**</td>
<td>Enabled</td>
<td></td>
</tr>
<tr>
<td>Enabled</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Disabled**

When set to **Disabled**, symbol data output does not contain Symbology Identifier information.

**Enabled**

When set to **Enabled**, symbol data output contains a Symbology Identifier sequence.

**Explanation of Modifiers for Code 39, Codabar, and Interleaved 2 of 5**

- For Code 39, Codabar, and Interleaved 2 of 5, the modifier indicates **Check Character** and **Check Character Output** status.
- For Code 39 only, Full ASCII must be enabled to see modifiers 4, 5, and 7.

<table>
<thead>
<tr>
<th>Modifier</th>
<th>Check Character</th>
<th>Check Character Output</th>
<th>Full ASCII Conversion (Code 39 Only)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Disabled</td>
<td>N/A</td>
<td>No</td>
</tr>
<tr>
<td>1</td>
<td>Enabled</td>
<td>Enabled</td>
<td>No</td>
</tr>
<tr>
<td>3</td>
<td>Enabled</td>
<td>Disabled</td>
<td>No</td>
</tr>
<tr>
<td>4</td>
<td>Disabled</td>
<td>N/A</td>
<td>Yes</td>
</tr>
<tr>
<td>5</td>
<td>Enabled</td>
<td>Enabled</td>
<td>Yes</td>
</tr>
<tr>
<td>7</td>
<td>Enabled</td>
<td>Disabled</td>
<td>Yes</td>
</tr>
</tbody>
</table>

*Example:* ]A5 indicates a Code 39 symbol with **Check Character** and **Check Character Output** enabled and Full ASCII conversion performed.

**Explanation of Modifiers for Other Symbologies**

- For Code 128, a 1 indicates EAN 128; otherwise the modifier is 0.
- For all other symbologies, the modifier is 0.
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.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>ESP Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>I/O Parameters</td>
<td></td>
</tr>
<tr>
<td>Symbol Data Output</td>
<td>Good Read</td>
</tr>
<tr>
<td>No Read Message</td>
<td>Enabled</td>
</tr>
<tr>
<td>Read Duration Output</td>
<td>Disabled</td>
</tr>
<tr>
<td>Output Object Info</td>
<td>Disabled</td>
</tr>
<tr>
<td>Output Indicators</td>
<td></td>
</tr>
<tr>
<td>Serial Verification</td>
<td>Disabled</td>
</tr>
<tr>
<td>Image Storage</td>
<td>Disabled</td>
</tr>
<tr>
<td>Image Storage Location</td>
<td>RAM</td>
</tr>
<tr>
<td>Setup Button</td>
<td>Enabled</td>
</tr>
<tr>
<td>Calibration Options</td>
<td></td>
</tr>
<tr>
<td>Database Identifier Output</td>
<td>Disabled</td>
</tr>
<tr>
<td>Output 1 Parameters</td>
<td>Disabled</td>
</tr>
<tr>
<td>Output 2 Parameters</td>
<td>Enabled</td>
</tr>
<tr>
<td>Output 3 Parameters</td>
<td></td>
</tr>
<tr>
<td>Quality Output</td>
<td></td>
</tr>
<tr>
<td>Quality Output Separator</td>
<td>,</td>
</tr>
<tr>
<td>Decodes/Trigger Status</td>
<td>Disabled</td>
</tr>
</tbody>
</table>

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.
## Appendix J — I/O Parameters

### I/O Parameters Serial Commands

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power On/Reset Counts</td>
<td><code>&lt;K406&gt;</code></td>
<td><code>&lt;K406&gt;,power-on,reset, power-on saves, customer default saves&gt;</code></td>
</tr>
<tr>
<td>Time Since Reset (Read-Only)</td>
<td><code>&lt;K407&gt;</code></td>
<td><code>&lt;K407&gt;,hours, minutes&gt;</code></td>
</tr>
<tr>
<td>Service Message</td>
<td><code>&lt;K409&gt;</code></td>
<td><code>&lt;K409&gt;,status, service message, threshold, resolution&gt;</code></td>
</tr>
<tr>
<td>User-Defined Name</td>
<td><code>&lt;K412&gt;</code></td>
<td><code>&lt;K412&gt;,user-defined name&gt;</code></td>
</tr>
<tr>
<td>Serial Verification</td>
<td><code>&lt;K701&gt;</code></td>
<td><code>&lt;K701&gt;,serial command echo status, control/echo output&gt;</code></td>
</tr>
<tr>
<td>Quality Output Separator</td>
<td><code>&lt;K704&gt;</code></td>
<td><code>&lt;K704&gt;,quality output separator, decodes per trigger status&gt;</code></td>
</tr>
<tr>
<td>Symbol Data Output</td>
<td><code>&lt;K705&gt;</code></td>
<td><code>&lt;K705&gt;,status, when to output, symbology identifier status&gt;</code></td>
</tr>
<tr>
<td>Read Duration Output</td>
<td><code>&lt;K706&gt;</code></td>
<td><code>&lt;K706&gt;,status, separator&gt;</code></td>
</tr>
<tr>
<td>No-Read Message</td>
<td><code>&lt;K714&gt;</code></td>
<td><code>&lt;K714&gt;,status, message</code></td>
</tr>
<tr>
<td>Object Output Information</td>
<td><code>&lt;K734&gt;</code></td>
<td><code>&lt;K734&gt;,output frame number status, output coordinates status&gt;</code></td>
</tr>
<tr>
<td>LED Configuration</td>
<td><code>&lt;K737&gt;</code></td>
<td><code>&lt;K737&gt;,ISO/IEC 16022 grade&gt;</code></td>
</tr>
<tr>
<td>Green Flash and Target LEDs</td>
<td><code>&lt;K750&gt;</code></td>
<td><code>&lt;K750&gt;,green flash LED status, target pattern LED status, green flash duration&gt;</code></td>
</tr>
<tr>
<td>Database Identifier Output</td>
<td><code>&lt;K759&gt;</code></td>
<td><code>&lt;K759&gt;,status, separator character&gt;</code></td>
</tr>
<tr>
<td>Image Push to Host</td>
<td><code>&lt;K763&gt;</code></td>
<td><code>&lt;K763&gt;,Image Storage Status, Stored Image Type, Image Storage, Image File Format, Image Quality, Image Scale, Save Options&gt;</code></td>
</tr>
<tr>
<td>Image Push to Host Detail Setup</td>
<td><code>&lt;K763&gt;</code></td>
<td><code>&lt;K763&gt;,Image Storage Location, FTP Host Info, Transfer Optimization, RAM Drive Size in MB, Save Image Until, Action at Image Storage Limit&gt;</code></td>
</tr>
<tr>
<td>Setup Button</td>
<td><code>&lt;K770&gt;</code></td>
<td><code>&lt;K770&gt;,global status, default on power-on, load configuration database, save for power-on&gt;</code></td>
</tr>
<tr>
<td>Setup Button Modes</td>
<td><code>&lt;K771&gt;</code></td>
<td><code>&lt;K771&gt;,button option 1, button option 2, button option 3, button option 4&gt;</code></td>
</tr>
<tr>
<td>Trend Analysis Output 1</td>
<td><code>&lt;K780&gt;</code></td>
<td><code>&lt;K780&gt;,trend analysis mode, number of triggers, number to output on, decodes per trigger&gt;</code></td>
</tr>
<tr>
<td>Trend Analysis Output 2</td>
<td><code>&lt;K781&gt;</code></td>
<td><code>&lt;K781&gt;,trend analysis mode, number of triggers, number to output on, decodes per trigger&gt;</code></td>
</tr>
<tr>
<td>Trend Analysis Output 3</td>
<td><code>&lt;K782&gt;</code></td>
<td><code>&lt;K782&gt;,trend analysis mode, number of triggers, number to output on, decodes per trigger&gt;</code></td>
</tr>
<tr>
<td>Diagnostic Output 1</td>
<td><code>&lt;K790&gt;</code></td>
<td><code>&lt;K790&gt;,service unit message status&gt;</code></td>
</tr>
<tr>
<td>Diagnostic Output 2</td>
<td><code>&lt;K791&gt;</code></td>
<td><code>&lt;K791&gt;,service unit message status&gt;</code></td>
</tr>
<tr>
<td>Diagnostic Output 3</td>
<td><code>&lt;K792&gt;</code></td>
<td><code>&lt;K792&gt;,service unit message status&gt;</code></td>
</tr>
<tr>
<td>ISO/IEC 16022 Symbol Quality Output 1</td>
<td><code>&lt;K800&gt;</code></td>
<td><code>&lt;K800&gt;,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&gt;</code></td>
</tr>
<tr>
<td>ISO/IEC 16022 Symbol Quality Output 2</td>
<td><code>&lt;K801&gt;</code></td>
<td><code>&lt;K801&gt;,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&gt;</code></td>
</tr>
<tr>
<td>ISO/IEC 16022 Symbol Quality Output 3</td>
<td><code>&lt;K802&gt;</code></td>
<td><code>&lt;K802&gt;,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 ECCthreshold&gt;</code></td>
</tr>
<tr>
<td>Output 1 Parameters</td>
<td><code>&lt;K810&gt;</code></td>
<td><code>&lt;K810&gt;,output on, output state, pulse width, output mode&gt;</code></td>
</tr>
<tr>
<td>Output 2 Parameters</td>
<td><code>&lt;K811&gt;</code></td>
<td><code>&lt;K811&gt;,output on, output state, pulse width, output mode&gt;</code></td>
</tr>
<tr>
<td>Output 3 Parameters</td>
<td><code>&lt;K812&gt;</code></td>
<td><code>&lt;K812&gt;,output on, output state, pulse width, output mode&gt;</code></td>
</tr>
</tbody>
</table>
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.
Appendix J — I/O Parameters

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.
Symbol Data Output

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.

![Diagram of read cycle](image)
**Symbology Identifier Status**

**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:** Disabled

**Options:**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Disabled</td>
</tr>
<tr>
<td>1</td>
<td>Enabled</td>
</tr>
</tbody>
</table>

**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

**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.
Appendix J — I/O Parameters

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

Output Indicators

The MicroHAWK ID 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: Good Read
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.
Appendix J — I/O Parameters

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.
Output Indicators

**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:** 250 ms

**Options:** 0 to 65535 (in 10 ms increments)
LED Configuration

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
Appendix J — I/O Parameters

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,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,control/hex output>
Default: Control
Options: 0 = Control  1 = Hex
Setup Button

**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  
3 = Unlatch Outputs  
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 imager 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.

**Unlatch Outputs**

In this configuration, the Setup button will unlatch any logic outputs that have been latched.

**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.
Appendix J — I/O Parameters

**Default on Power-On**

**Definition:** When enabled, if the Setup button is held down on power-on the imager 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 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:**

<table>
<thead>
<tr>
<th>Button Option 1</th>
<th>Button Option 2</th>
<th>Button Option 3</th>
<th>Button Option 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 = Disabled</td>
<td>0 = Disabled</td>
<td>0 = Disabled</td>
<td>0 = Disabled</td>
</tr>
<tr>
<td>1 = Read Rate</td>
<td>1 = Read Rate</td>
<td>1 = Read Rate</td>
<td>1 = Read Rate</td>
</tr>
<tr>
<td>2 = Calibrate</td>
<td>2 = Calibrate</td>
<td>2 = Calibrate</td>
<td>2 = Calibrate</td>
</tr>
<tr>
<td>3 = Save for Power-On</td>
<td>3 = Save for Power-On</td>
<td>3 = Save for Power-On</td>
<td>3 = Save for Power-On</td>
</tr>
<tr>
<td>4 = Unused</td>
<td>4 = Unused</td>
<td>4 = Unused</td>
<td>4 = Unused</td>
</tr>
<tr>
<td>5 = Load New Master</td>
<td>5 = Load New Master</td>
<td>5 = Load New Master</td>
<td>5 = Load New Master</td>
</tr>
<tr>
<td>6 = Unused</td>
<td>6 = Unused</td>
<td>6 = Unused</td>
<td>6 = Unused</td>
</tr>
<tr>
<td>7 = Target System</td>
<td>7 = Target System</td>
<td>7 = Target System</td>
<td>7 = Target System</td>
</tr>
<tr>
<td>8 = Unused</td>
<td>8 = Unused</td>
<td>8 = Unused</td>
<td>8 = Unused</td>
</tr>
<tr>
<td>9 = Bar Code Config.</td>
<td>9 = Bar Code Config.</td>
<td>9 = Bar Code Config.</td>
<td>9 = Bar Code Config.</td>
</tr>
</tbody>
</table>

**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 imager 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 imager 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

Configurable Output 1

- Output 1 Parameters
  - Output On: Trend Analysis
  - Output State: Normally Closed
  - Pulse Width: 5
  - Output Mode: Pulse
  - Trend Analysis
  - Symbol Quality (ISO/IEC 16022)
  - Diagnostics

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 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: \textlt{K810,output on,output state,pulse width,output mode}\textgt

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 any mode containing Match or Mismatch, the transition (switching) will only occur if Matchcode Type is enabled and Master Symbol(s) are 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.

Mismatch
Activates a discrete output when symbol data does not match that of the master symbol.

No-Read
Activates a discrete output when symbol data is not decoded before the end of the read cycle.
Appendix J — I/O Parameters

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.
Configurable Output 1

**Output State**

*Definition:* Sets the active electrical state of the discrete output.

*Serial Cmd:* `<K810,output on,output state,pulse width,output mode>`

*Default:* Negative

*Options:* 0 = Normally Open  1 = Normally Closed

**Pulse Width**

*Definition:* Sets the time in 10 ms increments that the discrete output remains active.

*Serial Cmd:* `<K810,output on,output state,pulse width,output mode>`

*Default:* 5 (Corresponds to 50 ms)

*Options:* 0 to 255 (0 to 2.55 seconds). Divide the number entered on the command line by 100 for time in seconds.

**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.
Appendix J — I/O Parameters

Trend Analysis Output 1

**Note:** Output On under Output 1 Parameters must be set to Trend Analysis for this output to function.

- **Output 1 Parameters**
  - **Output On:** Trend Analysis

Under **Output 1 Parameters**, expand the **Trend Analysis** tree:

- **Trend Analysis**
  - **Trend Analysis Mode:** NoRead
  - **Number of Triggers:** 25
  - **Number to Output On:** 4

**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).
Configurable Output 1

Trend Analysis Mode

Definition: Sets the trend condition (Mismatch, No-Read, or Decodes per Trigger) that will activate the output.

<table>
<thead>
<tr>
<th>Trend Analysis Mode</th>
<th>Number of Triggers</th>
<th>Number to Output On</th>
<th>Decodes per Trigger</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trend Analysis Mode</td>
<td>Mismatch</td>
<td>Mismatch</td>
<td>Decodes per Trigger</td>
</tr>
<tr>
<td></td>
<td>No-Read</td>
<td>No-Read</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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.
Appendix J — I/O Parameters

**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

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
Appendix J — I/O Parameters

**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
Diagnostics Output 1

**Note:** *Output On* under *Output 1 Parameters* must be set to *Diagnostic Warning* for this output to function.

- **Output 1 Parameters**
  - **Output On**

Under *Output 1 Parameters*, expand the *Diagnostics* tree.

- **Diagnostics**
  - **Service Unit**
    - **Disabled**

**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

**Configurable Output 2**

Note: **Output 2** has the same parameters and default settings as **Output 1**.

- **Output 2 Parameters**
  - **Output On**
  - **Output State**
  - **Pulse Width**
  - **Output Mode**
  - **Trend Analysis**
  - **Symbol Quality (ISO/IEC 16022)**
  - **Diagnostics**

**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.

- **Output 2 Parameters**
  - **Output On**
  - **Trend Analysis**

**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.

- **Output 2 Parameters**
  - **Output On**
  - **Symbol Quality**

**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>`

**Diagnostics Output 2**

Note: **Output On** under **Output 2 Parameters** must be set to **Diagnostic Warning** for this output to function.

- **Output 2 Parameters**
  - **Output On**
  - **Diagnostic Warning**

**Serial Cmd:** `<K791,unused 1,service unit>`
Appendix J — I/O Parameters

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.

| Output 3 Parameters |  |
|---------------------|--|---|---|---|
| Output On           | Mismatch or No-read |
| Output State        | Normally Closed      |
| Pulse Width         | 5                    |
| Output Mode         | Pulse                |
| Trend Analysis      |                      |
| Symbol Quality (ISO/IEC 16022) |        |
| Diagnostics         |                      |

**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 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 Source, External Strobe must be enabled for Use External Illumination Strobe to function.
Trend Analysis Output 3

Note: Output On under Output 3 Parameters must be set to Trend Analysis for this output to function.

- Output 3 Parameters
  - Output On: Trend Analysis

Serial Cmd: \texttt{<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.

- Output 3 Parameters
  - Output On: Symbol Quality

Serial Cmd: \texttt{<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>}

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: \texttt{<K792,unused 1,service unit>}

ISO/IEC 16022
Appendix J — I/O Parameters

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)

**Minutes**

Serial Cmd: `<K407,hours,minutes>`

Default: 16-bit counter (0 to 60)

Note: Time counts are reset at power-on, but not with an `<A>` or `<Z>` command.
Appendix J — I/O Parameters

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

**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:**  

**Default:**  MicroHAWK

**Options:**  ASCII string, up to 19 characters
Frame Information

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

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.
Appendix J — I/O Parameters

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 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
Appendix J — I/O Parameters

**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 “:”.

---

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Appendix J — I/O Parameters

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
**Image Push to Host Detailed Setup**

**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 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

**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:* 0 = New Read Cycle
1 = 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 J — I/O Parameters

List Saved Images in RAM

```xml
<ListSavedImagesRamList/>
```

List Saved Images in RAM lists all images and cycle reports that are currently stored in RamDrive (/imagesd0/Images).

Example replies:

- `<ListSavedImagesRamList/>Empty`
- `<ListSavedImagesRamList>/111111_00000042_00000002_readreport.xml/111111_00000042_00000002_00000032_noread.png/111111_00000042_00000002_00000033_noread.png>

List Saved Images in Flash

```xml
<ListSavedImagesFlashList/>
```

List Saved Images in Flash lists all images and cycle reports that are currently stored in flash memory (/sd0:0/User/Images/).

Example replies:

- `<ListSavedImagesFlashList/>Empty`
- `<ListSavedImagesFlashList>/111111_00000042_00000002_readreport.xml/111111_00000042_00000002_0000002f_noread.png/111111_00000042_00000002_00000030_noread.png>

Image Push to Flash

```xml
<ImagePushToFlash,option/>
```

Options: All Moves all images from RamDrive to flash memory.
         Image Name Moves an image from RamDrive to flash memory.

Image Push to Flash pushes the image that is currently stored in RamDrive (/imagesd0/Images) to flash memory (/sd0:0/User/Images/). A reply of `<ImagePushToFlash/1>` is output when the operation is completed successfully. If flash does not have enough space to store all images in /imagesd0/Images, images will not be saved and a reply of `<ImagePushToFlash/0>` will be output.

Image Erase from Flash

```xml
<ImageEraseFromFlash,option/>
```

Options: All Removes all images from flash.
         Image Name Removes an image from flash.

Image Erase from Flash clears all images saved in flash memory (/sd0:0/User/Images/). A reply of `<ImageEraseFromFlash/1>` is output when the operation is completed successfully. If the operation is not completed successfully, a reply of `<ImageEraseFromFlash/0>` is output.
Image Erase from Flash
Appendix K
Symbol Quality

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Omron Microscan Symbol Quality Output by ESP ....................... K-17

This section describes parameters that, when enabled, will output detailed symbol quality evaluations.
Symbol Quality by ESP

Symbol Quality by ESP

Click the Parameters button and then the Symbol Quality tab.

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

<table>
<thead>
<tr>
<th>Output Cycle ID and Report</th>
<th>&lt;K707, status, separator&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symbol Quality Separator / Output Mode</td>
<td>&lt;K708, symbol quality separator, Data Matrix output mode&gt;</td>
</tr>
<tr>
<td>ISO/IEC 16022 Symbol Quality Output</td>
<td>&lt;K709, symbol contrast, print growth, axial non-uniformity, unused ECC&gt;</td>
</tr>
<tr>
<td>Omron Microscan Symbol Quality Output</td>
<td>&lt;K710, percent cell damage, total read time, capture time, locate time, decode time, pixels per element, ECC level, matrix size, quiet zone, symbol angle&gt;</td>
</tr>
</tbody>
</table>
Overview of Symbol Quality

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 directly to the order in which they appear in ESP's Symbol Quality tree control.

Symbol Quality parameters are separated into ISO/IEC 16022 Symbol Quality Output and Omron Microscan Symbol Quality Output.

Total Read Time, Symbol Quality Separator, and Output Mode are common to both ISO/IEC 16022 and Omron Microscan Grading Parameters.

If you enable the outputs shown above, they will be returned in this order:

Symbol Data

0123456789abcdefgijklmnopqrstuvwxyz

256 A 30 210 3 17

Capture Time (Omron Microscan Grading)

Decode Time (Omron Microscan Grading)

Pixels Per Element (Omron Microscan Grading)
Appendix K — Symbol Quality

**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.
Overview of Symbol Quality

**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.

Click the **Locate** button to display the symbol in the reader’s field of view.

Click the **Calibrate** button to optimize camera settings.
Appendix K — Symbol Quality

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.

- **Fields for report**
  - Operator Name: J. Doe
  - Company Name: XYZ Corp.

- **Saved Options**
  - Show Report Options dialog during 'Save Report'.
  - Default Report Type: PDF Files (*.pdf)
  - Include Image: Bitmap
  - JPEG Image Quality: 100

- **Overall Grade Based On**
  - Symbol Contrast
  - Print Growth
  - Axial Nonuniformity
  - Unused ECC
  - Enable UII Parsing

- **Options**
  - Returns all settings to default.
  - Revert Settings

This information is appended at the bottom of the report.

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.

Check Autofit Content to ensure that saved PDF report content will fit on a single page.

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 IUID initiative.
Output Cycle ID and Report

Output Cycle ID and Report

Output Cycle ID and Report outputs a read cycle ID and report for each read cycle.

Output Cycle ID and Report Status

Serial Cmd:  <K707,status,separator>
Default:     Disabled
Options:     0 = Disabled
              1 = Enabled Cycle ID
              2 = Full Cycle Report

Disabled
Read cycle ID and report information will not be output.

Enabled Cycle ID
The read cycle ID number in hex will be displayed after the separator.

Full Cycle Report
The entire XML cycle report is displayed and the separator doesn’t apply.

Note: The Full Cycle Report is not displayed in the Output Data section of WebLink. The report can be displayed by clicking once on the displayed image to make it the focus of the WebLink user interface, and then typing Alt + X.

Output Cycle ID and Report Separator

Definition: Inserts a separator between each enabled field of the output.
Serial Cmd:  <K707,status,separator>
Default:     <SP> (space character)
Options:     Any ASCII character.
Appendix K — Symbol Quality

Symbol Quality Separator/Data Matrix Output Mode

Symbol Quality Separator applies to both Symbol Quality groups: ISO/IEC 16022 Symbol Quality Output and Omron 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

When you double-click on the default separator SP, the Symbol Quality Separator Calculator appears. Use the calculator keypad for one-click separator configuration.
Symbol Quality Separator/Data Matrix Output Mode

**Data Matrix Output Mode**

**Note:** Output Mode applies to ISO/IEC 16022 symbol quality parameters.

**Definition:** Output Mode specifies how the four output parameters, if enabled, are formatted.

**Serial Cmd:** `<K708,symbol quality separator,output mode>`

**Default:** Grade

**Options:**

<table>
<thead>
<tr>
<th>Grade</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 = Grade</td>
<td>1 = Value</td>
</tr>
</tbody>
</table>

**Grade**

If in Grade Mode, a grade (A,B,C,D) is appended to the symbol data.

**Value**

If in Value Mode, the calculated value for the given 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 -.050 < PG < 0.50
- B (3.0) if -.070 < PG < 0.70
- C (2.0) if -.085 < PG < 0.85
- D (1.0) if -.10 < 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**

**Axial Non-Uniformity (Data Matrix Only)**

**Definition:** Axial non-uniformity is a measure of how much the sampling point spacing differs from one axis to another, namely AN = abs (XAVG - YAVG) / ((XAVG + YAVG)/2) where abs () yields the absolute value. If a symbology has more than two major axes, then AN is computed for those two average spacings which differ the most. (ANSI) axial non-uniformity grading is defined this way:

- A (4.0) if AN < .06
- B (2.0) if AN < .08
- C (2.0) if AN < .10
- D (1.0) if AN < .12
- F (0.0) if AN > .12

If enabled, the axial non-uniformity is appended to the symbol data according 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

**Unused Error Correction (Data Matrix Only)**

**Definition:** The correction capacity of Reed-Solomon decoding is expressed in the equation: e + 2d < d - p, where e is the number of erasures, d is the number of error correction code words, and p is the number of code words reserved for error detection.

- A (4.0) if UEC > .62
- B (3.0) if UEC > .50
- C (2.0) if UEC > .37
- D (1.0) if UEC > .25
- F (0.0) if UEC < .25

If enabled, the UEC 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
Appendix K — Symbol Quality

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.

- Data Matrix
  - ISO/IEC 16022 Parameters
    - Symbol Contrast: Enabled
    - Print Growth: Enabled
    - Axial Non-uniformity: Enabled
    - Unused ECC: Enabled

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.

<table>
<thead>
<tr>
<th>ISO/IEC 16022</th>
<th>Symbol Quality Report</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symbol Contrast</td>
<td>80 %</td>
</tr>
<tr>
<td>Contrast</td>
<td>Enabled</td>
</tr>
<tr>
<td>Print Growth</td>
<td>0.26</td>
</tr>
<tr>
<td>Axial Non-uniformity</td>
<td>0.00</td>
</tr>
<tr>
<td>Unused ECC</td>
<td>100 %</td>
</tr>
<tr>
<td>Grade</td>
<td>A</td>
</tr>
</tbody>
</table>

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.
Omron Microscan Symbol Quality Output

Omron Microscan Symbol Quality Output

**Percent Cell Damage (Data Matrix Only)**

**Definition:** When this feature is enabled, the cell damage percentage is appended to data output.

**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

a. **Total Read Time** applies globally to all three Symbol Quality standards.

**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
Appendix K — Symbol Quality

**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 (Data Matrix Only)**

*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.

*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 (Data Matrix Only)**

*Definition:* Outputs the Data Matrix ECC level.  
When enabled, the ECC level 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

**Matrix Size (Data Matrix Only)**

*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.

*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
Omron Microscan Symbol Quality Output

**Quiet Zone (Data Matrix Only)**

*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.

*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 (Data Matrix Only)**

*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.

*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
Omron 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.

- Grading
  - Percent Cell Damage: Disabled
  - Capture Time: Disabled
  - Locate Time: Disabled
  - Decode Time: Disabled
  - Pixels Per Element: Disabled
  - ECC Level: Disabled
  - Matrix Size: Disabled
  - Quiet Zone: Disabled
  - Symbol Angle: Disabled

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.

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.
Omron Microscan Symbol Quality Output by ESP
Contents
Matchcode by ESP.................................................................L-2
Matchcode Serial Commands..............................................L-3
Overview of Matchcode......................................................L-4
Matchcode Type...................................................................L-5
Sequence Step Interval.........................................................L-10
Match Replace..............................................................L-11
Mismatch Replace..............................................................L-12
New Master Pin...............................................................L-13

This section explains the MicroHAWK ID’s matchcode output functions and the master symbol database setup.
**Matchcode by ESP**

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

<table>
<thead>
<tr>
<th>Parameters</th>
<th>ESP Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Matchcode</td>
<td></td>
</tr>
<tr>
<td>Matchcode Type</td>
<td>Disabled</td>
</tr>
<tr>
<td>Sequential Matching</td>
<td>Increment</td>
</tr>
<tr>
<td>Match Start Position</td>
<td>0</td>
</tr>
<tr>
<td>Match Length</td>
<td>1</td>
</tr>
<tr>
<td>Wild Card</td>
<td>*</td>
</tr>
<tr>
<td>Sequence on No Read</td>
<td>Enabled</td>
</tr>
<tr>
<td>Sequence on Mismatch</td>
<td>Disabled</td>
</tr>
<tr>
<td>Sequence Step Interval</td>
<td>1</td>
</tr>
<tr>
<td>New Master Pin</td>
<td>Disabled*</td>
</tr>
<tr>
<td>Match Replace</td>
<td></td>
</tr>
<tr>
<td>Replacement String</td>
<td>Enabled</td>
</tr>
<tr>
<td>Mismatch Replace</td>
<td></td>
</tr>
<tr>
<td>Replacement String</td>
<td>MIS MATCH</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Matchcode</th>
<th>Number of Master Symbols</th>
<th>New Master Pin</th>
<th>Sequence Step Interval</th>
<th>Master Symbol Data</th>
<th>Match Replace</th>
<th>Mismatch Replace</th>
</tr>
</thead>
<tbody>
<tr>
<td>Matchcode</td>
<td>&lt;K223, matchcode type, sequential matching, match start position, match length, wildcard character, sequence on No-Read, sequence on mismatch&gt;</td>
<td>&lt;K224, number of master symbols&gt;</td>
<td>&lt;K225, status&gt;</td>
<td>&lt;K228, sequence step interval&gt;</td>
<td>&lt;K231, index, master symbol data&gt;</td>
<td>&lt;K735, status, match replacement string&gt;</td>
</tr>
</tbody>
</table>
Overview of Matchcode

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**.

<table>
<thead>
<tr>
<th>Parameters</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Matchcode Type</strong></td>
<td>Disabled*</td>
</tr>
<tr>
<td>Sequential Matching</td>
<td>Disabled*</td>
</tr>
<tr>
<td>Match Start Position</td>
<td>Enabled</td>
</tr>
<tr>
<td>Match Length</td>
<td>Wild Card</td>
</tr>
<tr>
<td>Wild Card</td>
<td>Sequential</td>
</tr>
<tr>
<td>Sequence on Noread</td>
<td>Enabled</td>
</tr>
<tr>
<td>Sequence on Mismatch</td>
<td>Disabled</td>
</tr>
<tr>
<td>New Master Pin</td>
<td>Disabled</td>
</tr>
<tr>
<td><strong>Match Replace</strong></td>
<td>Disabled</td>
</tr>
<tr>
<td>- Replacement String</td>
<td>MATCH</td>
</tr>
<tr>
<td><strong>Mismatch Replace</strong></td>
<td>Disabled</td>
</tr>
<tr>
<td>- Replacement String</td>
<td>MISMATCH</td>
</tr>
</tbody>
</table>

**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.
Matchcode Type

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.
**Matchcode Type**

### Sequence on No-Read

**Usage:** Sequence on No-Read is useful when the reader needs to stay in sequence even if no decode occurs.

**Definition:** When Sequence on No-Read is Enabled and Matchcode is set to Sequential, the reader sequences the master symbol on every match or No-Read. When disabled, it does not sequence on a No-Read.

**Serial Cmd:** `<K223,matchcode type,sequential matching,match start position,match length,wild card character,sequence on No-Read,sequence on mismatch>`

**Default:** Enabled

**Options:**
- 0 = Disabled
- 1 = Enabled

As an example of Sequence on No-Read Enabled, consider the following decodes:

<table>
<thead>
<tr>
<th>Master Symbol</th>
<th>Decoded Symbol</th>
<th>Master Symbol after Decode</th>
</tr>
</thead>
<tbody>
<tr>
<td>001</td>
<td>001</td>
<td>002</td>
</tr>
<tr>
<td>002</td>
<td>002</td>
<td>003</td>
</tr>
<tr>
<td>003</td>
<td>No-Read</td>
<td>004 (sequenced on No-Read)</td>
</tr>
<tr>
<td>004</td>
<td>004</td>
<td>005</td>
</tr>
<tr>
<td>005</td>
<td>No-Read</td>
<td>006 (sequenced on No-Read)</td>
</tr>
<tr>
<td>006</td>
<td>No-Read</td>
<td>007 (sequenced on No-Read)</td>
</tr>
<tr>
<td>007</td>
<td>007</td>
<td>008</td>
</tr>
</tbody>
</table>

As an example of Sequence on No-Read Disabled, consider the following series of decodes:

<table>
<thead>
<tr>
<th>Master Symbol</th>
<th>Decoded Symbol</th>
<th>Master Symbol after Decode</th>
</tr>
</thead>
<tbody>
<tr>
<td>001</td>
<td>001</td>
<td>002</td>
</tr>
<tr>
<td>002</td>
<td>002</td>
<td>003</td>
</tr>
<tr>
<td>003</td>
<td>No-Read</td>
<td>003 (not sequenced)</td>
</tr>
<tr>
<td>003</td>
<td>003</td>
<td>004</td>
</tr>
<tr>
<td>004</td>
<td>No-Read</td>
<td>004 (not sequenced)</td>
</tr>
<tr>
<td>004</td>
<td>No-Read</td>
<td>004 (not sequenced)</td>
</tr>
<tr>
<td>004</td>
<td>004</td>
<td>005</td>
</tr>
</tbody>
</table>
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:

<table>
<thead>
<tr>
<th>Master Symbol</th>
<th>Decoded Symbol</th>
<th>Master Symbol after Decode</th>
</tr>
</thead>
<tbody>
<tr>
<td>001</td>
<td>001</td>
<td>002</td>
</tr>
<tr>
<td>002</td>
<td>002</td>
<td>003</td>
</tr>
<tr>
<td>003</td>
<td>abc</td>
<td>004 (sequenced on mismatch)</td>
</tr>
<tr>
<td>004</td>
<td>004</td>
<td>005</td>
</tr>
<tr>
<td>005</td>
<td>def</td>
<td>006 (sequenced on mismatch)</td>
</tr>
<tr>
<td>006</td>
<td>ghi</td>
<td>007 (sequenced on mismatch)</td>
</tr>
<tr>
<td>007</td>
<td>007</td>
<td>008</td>
</tr>
</tbody>
</table>

As an example of Sequence on Mismatch Disabled, consider the following decodes:

<table>
<thead>
<tr>
<th>Master Symbol</th>
<th>Decoded Symbol</th>
<th>Master Symbol after Decode</th>
</tr>
</thead>
<tbody>
<tr>
<td>001</td>
<td>001</td>
<td>002</td>
</tr>
<tr>
<td>002</td>
<td>002</td>
<td>003</td>
</tr>
<tr>
<td>003</td>
<td>abc</td>
<td>004 (sequenced because of previous match)</td>
</tr>
<tr>
<td>004</td>
<td>004</td>
<td>005</td>
</tr>
<tr>
<td>005</td>
<td>def</td>
<td>006 (sequenced because of previous match)</td>
</tr>
<tr>
<td>006</td>
<td>ghi</td>
<td>006 (not sequenced)</td>
</tr>
<tr>
<td>006</td>
<td>006</td>
<td>007</td>
</tr>
</tbody>
</table>
Sequence Step Interval

Usage: Useful in applications in which it is desirable to count by intervals other than 1.

Definition: Sequencing in Matchcode operations can occur in steps from 1 to 32,768.

Sequencing performs like a mechanical counter by displaying positive integers and a specific number of digits after roll-overs. For example, 000 – 3 = 997 (not -3) and 999 + 3 = 002 (not 1002).

Serial Cmd: `<K228,sequence step interval>`

Default: 1

Options: Any number from 1 to 32768

Example: If Sequence Step is set to 3 and Sequential Matching is set to Increment:

<table>
<thead>
<tr>
<th>Master Symbol</th>
<th>Decoded Symbol</th>
<th>Master Symbol after Decode</th>
</tr>
</thead>
<tbody>
<tr>
<td>003</td>
<td>001</td>
<td>003</td>
</tr>
<tr>
<td>003</td>
<td>002</td>
<td>003</td>
</tr>
<tr>
<td>003</td>
<td>003</td>
<td>006</td>
</tr>
<tr>
<td>006</td>
<td>004</td>
<td>006</td>
</tr>
<tr>
<td>006</td>
<td>005</td>
<td>006</td>
</tr>
<tr>
<td>006</td>
<td>006</td>
<td>009</td>
</tr>
</tbody>
</table>
Appendix L — Matchcode

Match Replace

Usage: Provides a convenient shortcut for applications that need to output a predefined text string whenever a symbol matches a master symbol.

Definition: Outputs a user-defined data string whenever a match occurs and Matchcode is enabled.

Serial Cmd: `<K735,status,replacement string>

Default: Disabled

Options: 0 = Disabled 1 = Enabled

Replacement String

Definition: User-defined data string that, when enabled, replaces symbol data whenever a match occurs.

Serial Cmd: `<K735,status,replacement string>

Default: MATCH

Options: An ASCII string up to 64 characters.
Mismatch Replace

**Mismatch Replace**

**Usage:** Provides a convenient shortcut for applications that need to output a predefined text string whenever a symbol does not match a master symbol.

**Definition:** Outputs a user-defined data string whenever a mismatch occurs and **Matchcode** is enabled.

**Serial Cmd:** `<K736,status,replacement string>`

**Default:** Disabled

**Options:**

0 = Disabled  1 = Enabled

**Replacement String**

**Definition:** User-defined data string that, when enabled, replaces symbol data whenever a mismatch occurs.

**Serial Cmd:** `<K736,status,replacement string>`

**Default:** **MISMATCH**

**Options:** An ASCII string up to 64 characters.
Appendix L — Matchcode

New Master Pin

**Definition:** If **Matchcode** and **New Master Pin** are enabled and the new master pin is momentarily activated (must be active for a minimum of 10 ms) master symbol information will be loaded into the database based on the next read cycle that achieves a Good Read, starting with **Index 1**.

**Note:** For the MicroHAWK ID-30, Input 1 (pin 12) is Default and Input 2 (pin 8) is New Master. For the MicroHAWK ID-40, Input 1 (pin 3) is Default and Input 2 (pin 4) is New Master.

**Serial Cmd:** `<K225,status>`
**Default:** Disabled
**Options:**
- 0 = Disabled
- 1 = Enabled

New Master Load Status

**Definition:** The new master status responds with the number of the next master position to be loaded, where 0 represents “idle” or “no master to be loaded.”

**Example:** If the user has the Number of Master Symbols set to 1, and then either sends a `<G>` or toggles an active **New Master Pin**, the state will be 1, and prior to reading and effectively loading position 1, the response to `<NEWM>` would be `<NEWM/1>`. Once a symbol has been read and loaded, the status will be cleared: `<NEWM/0>`.

**Serial Cmd:** `<NEWM>`
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.

To open nested options, single-click the +.

To change a setting, double-click the setting and use your cursor to scroll through the options.
**Appendix M — Camera and IP Setup**

## Camera and IP Setup Serial Commands

<table>
<thead>
<tr>
<th>Command Category</th>
<th>Command details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Window of Interest</td>
<td><code>&lt;K516,row pointer,column pointer,row depth,column width&gt;</code></td>
</tr>
<tr>
<td>Damaged Symbol</td>
<td><code>&lt;K519,damaged symbol status&gt;</code></td>
</tr>
<tr>
<td>Focus Setup</td>
<td><code>&lt;K525,focal distance,distance units, focus mode, no-read limit&gt;</code></td>
</tr>
<tr>
<td>Illumination Brightness</td>
<td><code>&lt;K536,brightness, light source, fixed light on time, fixed light on delay time&gt;</code></td>
</tr>
<tr>
<td>Camera Settings</td>
<td><code>&lt;K541, exposure, gain&gt;</code></td>
</tr>
<tr>
<td>Pixel Binning</td>
<td><code>&lt;K542, pixel binning status&gt;</code></td>
</tr>
<tr>
<td>Color Filter</td>
<td><code>&lt;K543, color filter&gt;</code></td>
</tr>
<tr>
<td>White Balance</td>
<td><code>&lt;K544, red gain, green gain, blue gain&gt;</code></td>
</tr>
<tr>
<td>Morphological Pre-Processing</td>
<td><code>&lt;K550, status&gt;</code></td>
</tr>
<tr>
<td>Morphological Operation</td>
<td><code>&lt;K551, morphological operation, operator size&gt;</code></td>
</tr>
<tr>
<td>Set License</td>
<td><code>&lt;K556, license file name, license key&gt;</code></td>
</tr>
<tr>
<td>Linear Security Level</td>
<td><code>&lt;K560, linear security level&gt;</code></td>
</tr>
<tr>
<td>Fast Linear Mode</td>
<td><code>&lt;K561, fast linear mode&gt;</code></td>
</tr>
</tbody>
</table>
**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).

- **Locate**
- **Calibrate**
- **Test**
- **Capture and Decode**
- **Contrast**
- **Number of Symbols**
- **Symbol #1**
- **Symbol Date**

- **Initiates Calibration routine.**
- **Activates the reader’s target pattern and initiates live video display of the symbol in the field of view.**
- **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.**
- **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.**
- **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.**
- **Symbol data and Test results are shown in this field.**
- **When enabled, shows the symbol in higher contrast than the default contrast value.**

---

**M-4**

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.
Evaluation

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.
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.
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

**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.

![Image](image.png)

**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:* QSXGA MicroHAWK ID: 0  
SXGA MicroHAWK ID: 0  
WVGA MicroHAWK ID: 0
*Options:* QSXGA MicroHAWK ID: 0 to (1944 – row depth)  
SXGA MicroHAWK ID: 0 to (1024 – row depth)  
WVGA MicroHAWK ID: 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:* QSXGA MicroHAWK ID: 0  
SXGA MicroHAWK ID: 0  
WVGA MicroHAWK ID: 0
*Options:* QSXGA MicroHAWK ID: 0 to (2592 – column width)  
SXGA MicroHAWK ID: 0 to (1280 – column width)  
WVGA MicroHAWK ID: 0 to (752 – column width)
Window of Interest

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: QSXGA MicroHAWK ID: 1944
SXGA MicroHAWK ID: 1024
WVGA MicroHAWK ID: 480

Options: QSXGA MicroHAWK ID: 3 to (1944 – row pointer)
SXGA MicroHAWK ID: 3 to (1024 – row pointer)
WVGA MicroHAWK ID: 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: QSXGA MicroHAWK ID: 2592
SXGA MicroHAWK ID: 1280
WVGA MicroHAWK ID: 752

Options: QSXGA MicroHAWK ID: 8 to (2592 – column pointer)
SXGA MicroHAWK ID: 8 to (1280 – column pointer)
WVGA MicroHAWK ID: 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.
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.
Appendix M — Camera and IP Setup

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 MicroHAWK ID readers. Each level corresponds to approximately 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:** \(<\text{K544, red gain, green gain, blue gain}>\)

**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 MicroHAWK, 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:** Disabled

**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.

**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.

When *Distance Units* is set to **Millimeters**, the *Focal Distance* parameter has a range of **25 to 4,000**. Any value outside this range will be rejected.

When *Distance Units* is set to **1/100 in.**, *Focal Distance* is limited to a range of **200 to 2,000**. If you attempt to set the Focal distance to less than 200 (2 in.), the parameter will be left as-is.

*Serial Cmd:* `<K525,focal distance,distance units,focus mode,no-read limit>

*Default:* 80

*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:

<table>
<thead>
<tr>
<th>Required Focal Distance</th>
<th>Distance Units = mm (0)</th>
<th>Distance Units = 1/100 in. (1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 inch, or 50 mm</td>
<td>&lt;K525,50,0&gt;</td>
<td>&lt;K525,200,1&gt;</td>
</tr>
<tr>
<td>3 inch, or 76 mm</td>
<td>&lt;K525,76,0&gt;</td>
<td>&lt;K525,300,1&gt;</td>
</tr>
<tr>
<td>6 inch, or 152 mm</td>
<td>&lt;K525,152,0&gt;</td>
<td>&lt;K525,600,1&gt;</td>
</tr>
</tbody>
</table>

**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
Focus Setup

**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 are continuously on once Brightness is set to Constant, and they will remain on during and after the read cycle to eliminate perceptible 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>`

Options:
- 0 = External Strobe
- 1 = Embedded White Only (Default for ID-20 5MP QSXGA)
- 2 = Embedded Red Only (Default for ID-20 WVGA and 1.2MP SXGA)
- 3 = External Only (Default for ID-30, ID-40, ID-45)

External Strobe

For Configurable Output 3 (K812), Output On, Use as External Illumination Strobe to function, Light Source must be set to External Strobe.
Illumination Brightness

**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 μs

**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 μs after capture starts. A 100 μs exposure will be able to freeze a moving object in the captured image.

**Setup:** Power Strobe with Fixed Light ON Time set to 100 μs and Fixed Light ON Delay Time set to 20 μs with exposure set to 120 μs.

**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 μs. A 100 μs exposure will be able to freeze a moving object in the captured image.

**Setup:** External Strobe with Fixed Light ON Time set to 50 μs and Fixed Light ON Delay Time set to 100 μs with exposure set to 150 μs.

**Serial Cmd:** `<K536,brightness,light source,fixed light on time,fixed light on delay time>`

**Options:** 0 – 100,000 μs

**Default** 0
Morphological Pre-Processing

Morphological Pre-Processing allows you to select the method for processing images, and to choose the operator size for that method.

**Important:** This command must be set to **Enabled** for Morphological Operation to function.

**Serial Cmd:** <K550,morphological pre-processing>

**Default:** Disabled

**Options:**
- 0 = Disabled
- 1 = Enabled
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: Erode

Options:
- 0 = Erode
- 1 = Dilate
- 2 = Open
- 3 = Close

Erode

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

Dilate increases the light cell size of a symbol. Useful for increasing the light cell size of a light-on-dark Data Matrix symbol.
Appendix M — Camera and IP Setup

Open

Open removes minor light defects of dark cells by performing a Dilate function followed by an Erode function.

Close

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
Appendix M — Camera and IP Setup

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.
This section concerns the various capture settings and processing settings that can be used to fine-tune the MicroHAWK ID’s performance in your application.
### Configuration Database Serial Commands

<table>
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<th>Command</th>
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<td>&lt;K252&gt;</td>
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<td>Configuration Database Status</td>
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<tr>
<td>Save Current Settings to Database</td>
<td>&lt;K255+&gt;</td>
</tr>
<tr>
<td>Load Current Settings from Database</td>
<td>&lt;K255-&gt;</td>
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<tr>
<td>Request Selected Index Settings</td>
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</tr>
<tr>
<td>Request All Database Settings</td>
<td>&lt;K255?&gt;</td>
</tr>
<tr>
<td>Database Mode</td>
<td>&lt;K256&gt;</td>
</tr>
</tbody>
</table>

- `<K252>`: number of active indexes, sort database
- `<K255>`: index, exposure, gain, focal distance, pixel binning, row pointer, column pointer, row depth, column width, symbology, morphology operator, morphology size
- `<K255+>`: index
- `<K255->`: index
- `<K255?>`: index
Appendix N — Configuration Database

**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).

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: 10,000
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: 25
Options: 0 to 100

Focal Distance
Definition: Provides the focal distance adjustment for the camera.
When Distance Units is set to Millimeters, the Focal Distance parameter has a range of 25 to 4,000. Any value outside this range will be rejected. When Distance Units is set to 1/100 in., Focal Distance is limited to a range of 200 to 2,000. If you attempt to set the Focal distance to less than 200 (2 in.), 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: 80
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: QSXGA MicroHAWK ID: 0 to (1944 – row depth) SXGA MicroHAWK ID: 0 to (1024 – row depth) WVGA MicroHAWK ID: 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: QSXGA MicroHAWK ID: 0 to (2592 – column width) SXGA MicroHAWK ID: 0 to (1280 – column width) WVGA MicroHAWK ID: 0 to (752 – column width)
Configuration Database Status

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:
- QSXGA MicroHAWK ID: 1944
- SXGA MicroHAWK ID: 1024
- WVGA MicroHAWK ID: 480

Options:
- QSXGA MicroHAWK ID: 3 to (1944 – row pointer)
- SXGA MicroHAWK ID: 3 to (1024 – row pointer)
- WVGA MicroHAWK ID: 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:
- QSXGA MicroHAWK ID: 2592
- SXGA MicroHAWK ID: 1280
- WVGA MicroHAWK ID: 752

Options:
- QSXGA MicroHAWK ID: 8 to (2592 – column pointer)
- SXGA MicroHAWK ID: 8 to (1280 – column pointer)
- WVGA MicroHAWK ID: 8 to (752 – column pointer)
Appendix N — Configuration Database

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.
## Configuration Database Status

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interleaved 2 of 5 (Add 128)</td>
<td>If enabled, Interleaved 2 of 5 will be active for this database index.</td>
<td></td>
</tr>
<tr>
<td>UPC/EAN (Add 256)</td>
<td>If enabled, UPC/EAN will be active for this database index.</td>
<td></td>
</tr>
<tr>
<td>PDF417 (Add 512)</td>
<td>If enabled, PDF417 will be active for this database index.</td>
<td></td>
</tr>
<tr>
<td>MicroPDF417 (Add 1024)</td>
<td>If enabled, MicroPDF417 will be active for this database index.</td>
<td></td>
</tr>
<tr>
<td>BC412 (Add 2048)</td>
<td>If enabled, BC412 will be active for this database index.</td>
<td></td>
</tr>
<tr>
<td>Pharmacode (Add 4096)</td>
<td>If enabled, Pharmacode will be active for this database index.</td>
<td></td>
</tr>
<tr>
<td>DataBar-14 (Add 8192)</td>
<td>If enabled, DataBar-14 will be active for this database index.</td>
<td>Important: If the stacked and non-stacked operation is required, the DataBar-14 command must be configured as follows: <code>&lt;K482,2&gt;</code>. If the DataBar-14 status parameter in the <code>&lt;K482&gt;</code> command is set to either Disabled or Enabled, the reader will only read non-stacked DataBar-14 symbols.</td>
</tr>
<tr>
<td>DataBar Limited (Add 16384)</td>
<td>If enabled, DataBar Limited will be active for this database index.</td>
<td></td>
</tr>
<tr>
<td>DataBar Expanded (Add 32768)</td>
<td>If enabled, DataBar Expanded will be active for this database index.</td>
<td>Important: If the stacked and non-stacked operation is required, the DataBar Expanded command must be configured as follows: <code>&lt;K484,2&gt;</code>. If the DataBar Expanded status parameter in the <code>&lt;K484&gt;</code> command is set to either Disabled or Enabled, the reader will only read non-stacked DataBar Expanded symbols.</td>
</tr>
<tr>
<td>Micro QR Code (Add 65536)</td>
<td>If enabled, Micro QR Code will be active for this database index.</td>
<td></td>
</tr>
<tr>
<td>Aztec (Add 131072)</td>
<td>If enabled, Aztec will be active for this database index.</td>
<td></td>
</tr>
<tr>
<td>Postal Symbologies (Add 262144)</td>
<td>If enabled, Postal Symbologies will be active for this database index.</td>
<td></td>
</tr>
</tbody>
</table>
Appendix N — Configuration Database

**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:* Erode

**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:* Disabled
**Database Mode**

**Switch Mode**

*Definition:* Selects the event that causes the reader to load the next database entry to current, active settings. When **Frame Count/Time** expires and **Image Process Looping** is enabled, the next database entry with modifications to camera settings will be used.

*Note:* The image capture event always occurs when the first database entry is used.

*Note:* The **Switch Mode** setting has no effect on **Rapid Capture Mode**, which always operates in **Number of Image Frames** mode with a frame count of 1.

**Serial Cmd:** `<K256, switch mode, frame count/time, image process looping, image dimensions>`

**Default:** 1

**Options:**
- 0 = Time
- 1 = Number of Image Frames

**Time**

When **Switch Mode** is set to **Time**, the reader will load the next database entry to current, active settings after a predefined time interval. The timer will start upon use of a database entry. If the timer expires during an image capture event, the timer will not start again until that database entry has been incremented and the new database entry has been loaded to current, active settings.

**Number of Image Frames**

When **Switch Mode** is set to **Number of Image Frames**, the database entry is incremented after the predetermined number of image capture events has occurred.

**Frame Count/Time**

*Definition:* Indicates the **Number of Image Frames** that must be captured or the amount of **Time** that must transpire before the reader will load the next database index entry.

**Serial Cmd:** `<K256, switch mode, frame count/time, image process looping, image dimensions>`

**Default:** 1 (frames/ms)

**Options:** 1 to 65535
Appendix N — Configuration Database

**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.
Database Mode

**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.
Appendix N — Configuration Database

**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.

![Diagram showing ROI settings](image)

**Full Image Size (SXGA Reader: 1280 x 1024; 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.
Database Mode

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.
Appendix N — Configuration Database

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

![Diagram of 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.
Appendix N — Configuration Database

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.
Request All Configuration Database Settings
This section describes the Terminal window and macro functions in ESP.
Terminal

Click this button to display the **Terminal** view.

This view will appear:

- **Copy, paste, save**
- **Clear screen**
- **Type text here to find matching text in the Terminal window.**
- **Terminal screen**
- **Type serial commands here.**

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.
Appendix O — ESP Terminal

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.

---

**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

Terminal Menus

Right-click on the Terminal window to display the following menu:

<table>
<thead>
<tr>
<th>Copy</th>
<th>Paste</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clear</td>
<td>Select All</td>
</tr>
<tr>
<td>Save...</td>
<td></td>
</tr>
<tr>
<td>Change Font...</td>
<td>Change Echo Font...</td>
</tr>
<tr>
<td>Enable Echo</td>
<td>Change Background Color</td>
</tr>
<tr>
<td>Non-Printable Characters</td>
<td>Default Settings</td>
</tr>
<tr>
<td>Keyboard Macros...</td>
<td></td>
</tr>
</tbody>
</table>

- 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.

<table>
<thead>
<tr>
<th>Terminal</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Capture Text...</td>
<td></td>
</tr>
<tr>
<td>Save Current Text...</td>
<td>Send File...</td>
</tr>
<tr>
<td>Change Font...</td>
<td>Change Echo Font...</td>
</tr>
<tr>
<td>Enable Echo</td>
<td>Change Background Color</td>
</tr>
<tr>
<td>Non-Printable Characters</td>
<td>Default Settings</td>
</tr>
<tr>
<td>Find Next</td>
<td>F3</td>
</tr>
<tr>
<td>Find Previous</td>
<td>Shift+F3</td>
</tr>
<tr>
<td>Keyboard Macros...</td>
<td></td>
</tr>
</tbody>
</table>

- 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.
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

### Counter Request/Clear

<table>
<thead>
<tr>
<th>Type</th>
<th>Command</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt;q&gt;</td>
<td>No-Reads Per Read Cycle Counter</td>
</tr>
<tr>
<td></td>
<td>&lt;q0&gt;</td>
<td>No-Reads Per Read Cycle Counter Reset</td>
</tr>
<tr>
<td></td>
<td>&lt;$&gt;</td>
<td>Mismatch Per Read Cycle Counter</td>
</tr>
<tr>
<td></td>
<td>&lt;$0&gt;</td>
<td>Mismatch Per Read Cycle Counter Reset</td>
</tr>
<tr>
<td></td>
<td>&lt;N&gt;</td>
<td>No-Read Counter</td>
</tr>
<tr>
<td></td>
<td>&lt;O&gt;</td>
<td>No-Read Counter Reset</td>
</tr>
<tr>
<td></td>
<td>&lt;T&gt;</td>
<td>Trigger Counter</td>
</tr>
<tr>
<td></td>
<td>&lt;U&gt;</td>
<td>Trigger Counter Reset</td>
</tr>
<tr>
<td></td>
<td>&lt;V&gt;</td>
<td>Match Code Counter</td>
</tr>
<tr>
<td></td>
<td>&lt;W&gt;</td>
<td>Match Code Counter Reset</td>
</tr>
<tr>
<td></td>
<td>&lt;X&gt;</td>
<td>Mismatch Counter</td>
</tr>
<tr>
<td></td>
<td>&lt;Y&gt;</td>
<td>Mismatch Counter Reset</td>
</tr>
</tbody>
</table>

### Firmware Verification

<table>
<thead>
<tr>
<th>Type</th>
<th>Command</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt;#&gt;</td>
<td>Request All Part Numbers</td>
</tr>
<tr>
<td></td>
<td>&lt;#a&gt;</td>
<td>Request Application Firmware Part Number</td>
</tr>
<tr>
<td></td>
<td>&lt;#b&gt;</td>
<td>Request Boot Code Firmware Part Number</td>
</tr>
<tr>
<td></td>
<td>&lt;!&gt;</td>
<td>Request All Firmware Checksums</td>
</tr>
<tr>
<td></td>
<td>&lt;!a&gt;</td>
<td>Request Application Firmware Checksum</td>
</tr>
<tr>
<td></td>
<td>&lt;!b&gt;</td>
<td>Request Boot Code Firmware Checksum</td>
</tr>
<tr>
<td></td>
<td>&lt;!s&gt;</td>
<td>Request Current Parameter Settings Checksum</td>
</tr>
</tbody>
</table>

### Read Rate

<table>
<thead>
<tr>
<th>Type</th>
<th>Command</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt;C&gt;</td>
<td>Decodes Per Second Test</td>
</tr>
<tr>
<td></td>
<td>&lt;Cp&gt;</td>
<td>Decode Percent Test</td>
</tr>
<tr>
<td></td>
<td>&lt;I&gt;</td>
<td>Exit Read Rate Tests</td>
</tr>
<tr>
<td></td>
<td>&lt;a1&gt;</td>
<td>Preface PDF417 Output with Data Attributes</td>
</tr>
</tbody>
</table>

### Device Control

<table>
<thead>
<tr>
<th>Type</th>
<th>Command</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt;L1&gt;</td>
<td>Pulse Programmable Output 1</td>
</tr>
<tr>
<td></td>
<td>&lt;L2&gt;</td>
<td>Pulse Programmable Output 2</td>
</tr>
<tr>
<td></td>
<td>&lt;L3&gt;</td>
<td>Pulse Programmable Output 3</td>
</tr>
</tbody>
</table>

### Read Cycle Enable/Disable

<table>
<thead>
<tr>
<th>Type</th>
<th>Command</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt;I&gt;</td>
<td>End Current Read Cycle until &lt;H&gt;</td>
</tr>
<tr>
<td></td>
<td>&lt;H&gt;</td>
<td>Enable Read Cycle after &lt;I&gt;</td>
</tr>
<tr>
<td></td>
<td>&lt;I1&gt;</td>
<td>Activate Targeting System</td>
</tr>
<tr>
<td></td>
<td>&lt;I0&gt;</td>
<td>Deactivate Targeting System</td>
</tr>
</tbody>
</table>

### Parameter Reset/Save

<table>
<thead>
<tr>
<th>Type</th>
<th>Command</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt;A?/1&gt;</td>
<td>Complete Reset when Resets or Save for Power-On Command Has Been Issued</td>
</tr>
<tr>
<td></td>
<td>&lt;A?/0&gt;</td>
<td>Warm Reset if Power-On Command Has Been Issued</td>
</tr>
</tbody>
</table>

### Resets

<table>
<thead>
<tr>
<th>Type</th>
<th>Command</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt;A&gt;</td>
<td>Software Reset, Current Parameters Retained</td>
</tr>
<tr>
<td></td>
<td>&lt;Ar&gt;</td>
<td>Software Reset, Recall Omron Microscan Default Parameters except Communication and Custom Unit Name Parameters</td>
</tr>
<tr>
<td></td>
<td>&lt;Arp&gt;</td>
<td>Software Reset, Recall Power-On Default Parameters</td>
</tr>
<tr>
<td></td>
<td>&lt;Arc&gt;</td>
<td>Software Reset, Recall Customer Default Parameters</td>
</tr>
</tbody>
</table>

1\(<l1> = lower case 'L', one
2\(<l0> = lower case 'L', zero
### Appendix P — ESP Utilities

<table>
<thead>
<tr>
<th>Save for Power-On</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>&lt;Z&gt;</strong></td>
<td>Software Reset, Save Current Settings for Power-On</td>
</tr>
<tr>
<td><strong>&lt;Zc&gt;</strong></td>
<td>Software Reset, Save Current Settings as Customer Default Parameters</td>
</tr>
<tr>
<td><strong>&lt;Zrc&gt;</strong></td>
<td>Software Reset, Recall Customer Default Parameters and Save for Power-On</td>
</tr>
<tr>
<td><strong>&lt;Zrd&gt;</strong></td>
<td>Software Reset, Recall Omron Microscan Default Parameters Except Communication and Custom Unit Name Parameters and Save for Power-On</td>
</tr>
<tr>
<td><strong>&lt;Zrdall&gt;</strong></td>
<td>Software Reset, Recall Omron Microscan Default Parameters Including Communication and Custom Unit Name Parameters and Save for Power-On</td>
</tr>
<tr>
<td>Master Database</td>
<td></td>
</tr>
<tr>
<td><strong>&lt;G&gt;</strong></td>
<td>Store Next Symbol Read to Database Index 1</td>
</tr>
<tr>
<td><strong>&lt;Gn&gt;</strong></td>
<td>Store Next Symbol Read to Database Index n</td>
</tr>
<tr>
<td><strong>&lt;NEWM&gt;</strong></td>
<td>New Master Load Status</td>
</tr>
<tr>
<td>Reader Status</td>
<td></td>
</tr>
<tr>
<td><strong>&lt;?&gt;</strong></td>
<td>Reader Status Request</td>
</tr>
<tr>
<td>Train/Optimize</td>
<td></td>
</tr>
<tr>
<td><strong>&lt;TRAIN&gt;</strong></td>
<td>Initiate Train Operation</td>
</tr>
<tr>
<td><strong>&lt;UNTRAIN&gt;</strong></td>
<td>Initiate Untrain Operation</td>
</tr>
<tr>
<td><strong>&lt;TRAIN?&gt;</strong></td>
<td>Train Status Request</td>
</tr>
<tr>
<td><strong>&lt;OPT&gt;</strong></td>
<td>Initiate Optimize Operation</td>
</tr>
<tr>
<td><strong>&lt;UNOPT&gt;</strong></td>
<td>Initiate Un-Optimize Operation</td>
</tr>
<tr>
<td><strong>&lt;OPT?&gt;</strong></td>
<td>Display Optimize Status</td>
</tr>
<tr>
<td>Barcode Configuration</td>
<td></td>
</tr>
<tr>
<td><strong>&lt;BCCFG&gt;</strong></td>
<td>Enter Barcode Configuration</td>
</tr>
</tbody>
</table>
Read Rate

Click the Utilities button and then the Read Rate tab to display the Read Rate view.

To see the number of decodes per second, click the Decodes/sec radio button and then the Start button.

To see the percentage of decodes, click the Percent radio button and then the Start button.

To end a Read Rate test, click the Stop button (the Start button becomes a Stop button during an active Read Rate test.)

Read Rate information is displayed in the lower portion of the Utilities view. Serial commands can also be sent to the reader from this screen.
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

Counters

Counter commands can be a numeric value from **00000** to **65535**. After reaching the maximum numeric limit of 65535, an error message will be displayed and the counter will automatically roll over and start counting again at 00000. To obtain the cumulative total of counts after the rollover has occurred, add 65536 per each rollover (the reader does not keep track of the number of rollovers) to the current count.

**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 count or **Clear** to set the counter to zero.

**Trigger**, **Good Read**, **No-Read**, and **Mismatch** counters can be requested and cleared simultaneously (**Request All** and **Clear All** buttons) or individually (**Request** and **Clear** buttons to the left of each item).
Appendix P — ESP Utilities

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 00000.

Trigger Counter
Sending <T> displays the total number of triggers since the last reset.

Trigger Counter Reset
Sending <U> sets the trigger counter to 00000.

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 00000.

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 zero.
**Device Control**

**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.

- To create a symbol containing any of the command settings in the table, click Generate Barcode.
- 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.

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;K200,3&gt;</td>
<td>Mode (External Edge)</td>
</tr>
<tr>
<td>&lt;K220,50&gt;</td>
<td>Read Cycle Timeout (50)</td>
</tr>
<tr>
<td>&lt;K474,2&gt;</td>
<td>Code 128 (Edge to Edge)</td>
</tr>
<tr>
<td>&lt;K810,3&gt;</td>
<td>Output On (No Read)</td>
</tr>
<tr>
<td>&lt;K811,1&gt;</td>
<td>Output On (Good Read/Match)</td>
</tr>
<tr>
<td>&lt;K812,2&gt;</td>
<td>Output On (Mismatch)</td>
</tr>
</tbody>
</table>

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.
Master Database

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.


**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

<table>
<thead>
<tr>
<th>Master Symbol Number</th>
<th>Maximum Characters</th>
<th>Master Symbol Number</th>
<th>Maximum Characters</th>
</tr>
</thead>
<tbody>
<tr>
<td># 1</td>
<td>3000</td>
<td># 6</td>
<td>500</td>
</tr>
<tr>
<td># 2</td>
<td>1500</td>
<td># 7</td>
<td>428</td>
</tr>
<tr>
<td># 3</td>
<td>1000</td>
<td># 8</td>
<td>375</td>
</tr>
<tr>
<td># 4</td>
<td>750</td>
<td># 9</td>
<td>333</td>
</tr>
<tr>
<td># 5</td>
<td>600</td>
<td># 10</td>
<td>300</td>
</tr>
</tbody>
</table>

**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.
Master Database

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 the Reader button.
Appendix P — ESP Utilities

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: In the Master Database tab under the Output Format menu,
1. 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**

**Firmware**

Click the **Utilities** button and then the **Firmware** tab to display the Firmware view.

![Firmware View](image)

**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.

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>.
**Firmware**

**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.

![Firmware Verification]

- **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>`
Appendix P — ESP Utilities

Default/Reset/Save

Understanding and controlling your reader’s active, saved, and default settings is critical to its successful operation.

<table>
<thead>
<tr>
<th>Function</th>
<th>Serial Cmd</th>
<th>ESP (first, right-click in any menu tree)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reset</td>
<td>&lt;A&gt;</td>
<td>Save to Reader, Send No Save</td>
</tr>
<tr>
<td>Reset and Recall Omron Microscan Defaults</td>
<td>&lt;Ard&gt;</td>
<td>No</td>
</tr>
<tr>
<td>Reset and Recall Power-On Parameters</td>
<td>&lt;Arp&gt;</td>
<td>No</td>
</tr>
<tr>
<td>Reset and Recall Customer Default Parameters</td>
<td>&lt;Arc&gt;</td>
<td>No</td>
</tr>
<tr>
<td>Save Current Settings for Power-On</td>
<td>&lt;Z&gt;</td>
<td>Save to Reader, Send and Save</td>
</tr>
<tr>
<td>Save Current Settings as Customer Default Parameters for Power-On</td>
<td>&lt;Zc&gt;</td>
<td>Save to Reader, Send and Save Customer Defaults for Power-Onb</td>
</tr>
<tr>
<td>Recall Omron Microscan Default Parameters and Save for Power-On</td>
<td>&lt;Zrd&gt;</td>
<td>No</td>
</tr>
<tr>
<td>Recall Customer Default Parameters and Save for Power-On</td>
<td>&lt;Zrc&gt;</td>
<td>No</td>
</tr>
</tbody>
</table>

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 Omron 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 Omron Microscan defaults, the user can then recall the previous customer saved settings with an <Arc> or <Zrc> command.

Omron Microscan Default Parameters

Omron Microscan default parameters are contained in the firmware and cannot be changed.

Software Defaults

Omron 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. Connect Pin 8 (Input Common) with Pin 2 (Power).
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.

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”.

<table>
<thead>
<tr>
<th>Bit</th>
<th>Binary</th>
<th>Reader Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>Command error detected</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>Command received</td>
</tr>
<tr>
<td>2</td>
<td>0</td>
<td>Communication error detected</td>
</tr>
<tr>
<td>3</td>
<td>0</td>
<td>Flash sector unprotect failure</td>
</tr>
<tr>
<td>4</td>
<td>0</td>
<td>Host port buffer overflow</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>Reader is in a read cycle</td>
</tr>
</tbody>
</table>

<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.
Reader Status Requests

<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 ESP’s 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.
Other Operational Serial Commands

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.
Appendix P — ESP Utilities

**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.

<table>
<thead>
<tr>
<th>File Source</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Nothing)</td>
<td>All files in &quot;root&quot; directory</td>
</tr>
<tr>
<td>/</td>
<td>All files in &quot;root&quot; directory</td>
</tr>
<tr>
<td>/saved</td>
<td>All files in &quot;saved&quot; directory</td>
</tr>
<tr>
<td><em>.</em></td>
<td>All files in all directories</td>
</tr>
<tr>
<td>/del</td>
<td>Deletes all files in the root director</td>
</tr>
<tr>
<td>/saved/del</td>
<td>Deletes all files in the saved directory</td>
</tr>
<tr>
<td>del*.*</td>
<td>Deletes files in all directories</td>
</tr>
</tbody>
</table>
Other Operational Serial Commands

**Barcode Configuration Mode**

**Definition:** Barcode Configuration Mode is a way of programming the reader by using ECC 200 Data Matrix symbols.

**Serial Cmd:** `<BCCFG>`

Barcode Configuration Mode can be entered in two different ways:

1. By forcing the reader into Barcode 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.¹

Once Barcode 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.

Barcode Configuration Mode can be exited by any reset `<A>`, `<Z>` or `<J>` command. The command to exit Barcode 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 Barcode 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 barcode 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

Contents
Output Format Serial Commands................................................................. Q-2
Output Format Status..................................................................................... Q-3
Format Assign............................................................................................... Q-4
Format Extract.............................................................................................. Q-5
Format Insert............................................................................................... Q-7
Output Filter Configuration .......................................................................... Q-9
Number of Filters....................................................................................... Q-14

This section explains how to control the formatting, filtering, and parsing 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>`

#### Ordered Output Filter
- `<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.

![Output Format Tab](image)

- **Set Number of Symbols:** 1
- **Output Phrases**
  - **Preamble:** CR
  - **Symbol #1:** CR LF
  - **Enable:** checked
  - **Parse:** checked
  - **Enable:** checked

- **Parse Symbols...**
- **Send and Save**
- **Receive**
- **Quality Parameters...**
- **Show Parse Table**
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

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Use the Set Number of Symbols spin box to determine the number of symbols to be included in the output phrase.

Then check the Parse boxes beneath the symbols that you wish to format for user-defined output.
Appendix Q — Output Format

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: \texttt{<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: \texttt{<K740,output index,start location,length>}
Default: 0
Options: 1 to \textit{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: \texttt{<K740,output index,start location,length>}
Default: 0 (disabled; end of format cell array)
Options: 1 to \textit{n} (maximum number of characters in the symbol data).
**Format Assign**

**Format Extract by ESP**

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.
Appendix Q — Output Format

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: 1 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.)
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).

Notice that **Extract** and **Insert** share the same **Parse Table**.
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:** \(<K744, \text{filter number}, \text{symbology}, \text{length}, \text{wildcard}, \text{placeholder}, \text{data}, \text{unused}, \text{database index}>\)

### 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.
Output Filter Configuration

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
Appendix Q — Output Format

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
Output Filter Configuration

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:  \(<K744,\text{filter number},\text{symbology},\text{length},\text{wildcard},\text{placeholder},\text{data},\text{unused},\text{database index}>\)

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:  \(<K744,\text{filter number},\text{symbology},\text{length},\text{wildcard},\text{placeholder},\text{data},\text{unused},\text{database index}>\)

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.
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