User Manual

Original Instructions

Allen-Bradley

Bulletin 48CR Code Reader

Catalog Numbers 48CR-CB16R400-E8, 48CR-CB52R102-E8, 48CR-CB80R133-E8, 48CR-CB80R190-E8, 48CR-CC16RAF-E8, 48CR-CC50RAF-E8, 48CR-CC77RAF-E8

AB *Allen-Bradley* · *Rockwell Software*

**Rockwell
Automation**

Important User Information

Read this document and the documents listed in the additional resources section about installation, configuration, and operation of this equipment before you install, configure, operate, or maintain this product. Users are required to familiarize themselves with installation and wiring instructions in addition to requirements of all applicable codes, laws, and standards.

Activities including installation, adjustments, putting into service, use, assembly, disassembly, and maintenance are required to be carried out by suitably trained personnel in accordance with applicable code of practice.

If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

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Throughout this manual, when necessary, we use notes to make you aware of safety considerations.

> **WARNING:** Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.

> **ATTENTION:** Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you identify a hazard, avoid a hazard, and recognize the consequence.

> **IMPORTANT** Identifies information that is critical for successful application and understanding of the product.

Labels may also be on or inside the equipment to provide specific precautions.

> **SHOCK HAZARD:** Labels may be on or inside the equipment, for example, a drive or motor, to alert people that dangerous voltage may be present.

> **BURN HAZARD:** Labels may be on or inside the equipment, for example, a drive or motor, to alert people that surfaces may reach dangerous temperatures.

> **ARC FLASH HAZARD:** Labels may be on or inside the equipment, for example, a motor control center, to alert people to potential Arc Flash. Arc Flash will cause severe injury or death. Wear proper Personal Protective Equipment (PPE). Follow ALL Regulatory requirements for safe work practices and for Personal Protective Equipment (PPE).

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Update the Firmware with ControlFLASH Software

This user manual describes how to install, configure, and troubleshoot your 48CR code reader device.

The 48CR code reader can only be used in EtherNet/IP™ systems. See EtherNet/IP publications and this user manual for further guidance.

Who Should Use This Manual

This manual is intended for qualified personnel. You must be familiar with the Studio 5000® environment, EtherNet/IP network, and barcode reading terminology. If you do not qualify, refer to your software documentation or online help before attempting to use 48CR code reader devices.

Features

Features of 48CR code readers include:

- Smallest industrial barcode readers available
- Able to read any symbol on any surface
- Intuitive WebConnect user interface
- Customizable hardware and software options
- Premier integration into Allen-Bradley® controller via the full-featured Add-on Profile (AOP)

48CR Code Reader Communication

There are three ways to configure and test 48CR code readers:

- Browser-based WebConnect user interface — Allows you to access, configure, and test your code reader without having to install software or access files on a host system
- AOP — A Studio 5000 Logix Designer® component that can be separately installed and used to configure one or more devices.
- Message Instructions — Allows you to read and write the device parameters directly outside of WebConnect or the Studio 5000® AOP. This method is also known as Ladder Logic.

Warning and Caution Summary

⚠️ **ATTENTION:** The light-emitting diodes (LEDs) that are used in the 48CR code reader are classified as exempt. This classification is considered safe and represents no photobiological hazard. As with any light source, they must be used consistent with their intended use. Do not stare directly at the LED output.

Location of the 48CR code reader LED aperture window:

This code reader is intended for connection to a UL Listed direct plug-in power unit marked Class II and rated 10...28V DC at 5 W 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 code reader. Opening the imager voids the Rockwell Automation® warranty.

Additional Resources

These documents contain additional information concerning related products from Rockwell Automation.

Resource	Description
Bulletin 48CR Code Reader Installation Instructions, publication 48CR-IN001	Provides instructions to install your code reader.
EtherNet/IP Network Configuration User Manual, publication ENET-UM001	Provides detailed information on EtherNet/IP network configuration.
Integrated Architecture® and CIP Sync Configuration Application Technique, publication IA-AT003	Provides detailed information on the configuration of CIP Sync features for an EtherNet/IP network.
Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1	Provides general guidelines for installing a Rockwell Automation industrial system.
Product Certifications website, rok.auto/certifications	Provides declarations of conformity, certificates, and other certification details.

You can view or download publications at rok.auto/literature.

Introduction

Product Overview

The 48CR code reader is a camera-based product with internal light-emitting diodes capable of decoding the following:

- One-dimensional (1D) barcodes (for example, UPC codes)
- Two-dimensional (2D) codes (for example, QR Codes).

The code reader also includes the ability to read low-contrast, damaged, poor print, and direct part mark (DPM) codes. Each code reader features two digital inputs and two digital outputs along with EtherNet/IP connectivity.

The 48CR code reader is intended for use in fixed-mounted applications that are connected to an Allen-Bradley® ControlLogix®, CompactLogix™ (version 20 and above), or a MicroLogix™ controller using Class 3 commands for communication.

There are two connectors on the back of the code reader. The first is an 8-pin, M12 connector that accepts 5…30V DC power for operation and includes two digital inputs and two digital outputs that are optically isolated. This connection is the same standard connection that is used for Rockwell Automation® safety light curtain product line. The second connector is for EtherNet/IP communication. It couples with the standard 4-pin, M12 cordsets that Rockwell Automation currently offers for M12 EtherNet/IP connections.

The 48CR code reader IP address configuration state defaults to dynamic and requires a Dynamic Host Configuration Protocol (DHCP) server to assign the IP address automatically. For instructions, see .

You must use this code reader device with either Studio 5000® environment (version 20 or later) via the Add-on Profile (AOP) or with the WebConnect embedded browser tool.

Available Models

There are a total of seven standard and advanced models catalog numbers of 48CR code readers. See <u>Product Selection on page 14</u> for details.

Standard Models

All four standard models feature a 0.3 MP (752 x 480 pixels) imager and a fixed focus lens. The only variation within standard models is the lens that is used. The lenses that are offered are 5.2, 8.0, and 16.0 mm (0.2, 0.3, and 0.6 in.). See <u>Table 4 on page 14</u> for more information.

Advanced Models

All three advanced models feature a 1.2 MP (2592 x 1944 pixels) imager and an auto-focus lens. The only variation within the three advanced models is the lens that is used. The lenses that are offered are 5.0, 7.7, and 16.0 mm (0.2, 0.3, and 0.6 in.). See <u>Table 5 on page 14</u> for more information.

Quick Start

To prepare the 48CR code reader to work on your EtherNet/IP network, following these steps:

1. Mount the 48CR code reader — <u>page 18</u>
2. Connect the I/O, network, and auxiliary cables — see <u>page 18</u>
3. Configure your device for your EtherNet/IP network — see <u>page 21</u>
4. Add the 48CR code reader device to the Studio 5000® environment — see <u>page 32</u>

After completing the previous steps, you must configure your code reader parameter settings in one of two ways:
- Studio 5000 Add-on Profile (AOP)
- WebConnect browser tool (See <u>Access Parameter Settings with WebConnect on page 37</u>)

Hardware and Software Compatibility

The 48CR code reader and the applications that are described in this manual are compatible with the following firmware revisions and software releases.

Contact your local Allen-Bradley distributor or Rockwell Automation sales office if you need software upgrade or firmware updates to use this equipment. See Rockwell Automation Support.

See Appendix B on page 161 for how to upgrade the firmware using ControlFLASH Plus™ software.

Table 1 - 48CR Code Readers

Cat. No.	Firmware Version/Software Release
48CR-CB16R400-E8	Firmware rev. 1.001 or later
48CR-CB52R102-E8	
48CR-CB80R133-E8	
48CR-CB80R190-E8	
48CR-CC16RAF-E8	
48CR-CC50RAF-E8	
48CR-CC77RAF-E8	

Table 2 - Applications

Product	Firmware Version/Software Release
Studio 5000 Logix Designer® [1] application	V20 or later
Studio 5000 AOP	1.0.27 or later
RSLinx® software	2.56 or later
Internet browser	• Google Chrome™ (recommended) • Internet Explorer™ Version 11 or later
WebConnect	Version 1.2.2, build 3 or later

(1)   The Studio 5000 Logix Designer application is the replacement for RSLogix 5000® (v20 or later). It provides on software package for discrete, process, batch, safety, and drive-based applications.

System Setup

Figure 1 shows a simple code reader system topology. This user manual describes the setup, installation, configuration, and programming that is required to get an example system such as this running.

Figure 1 - Example Code Reader System
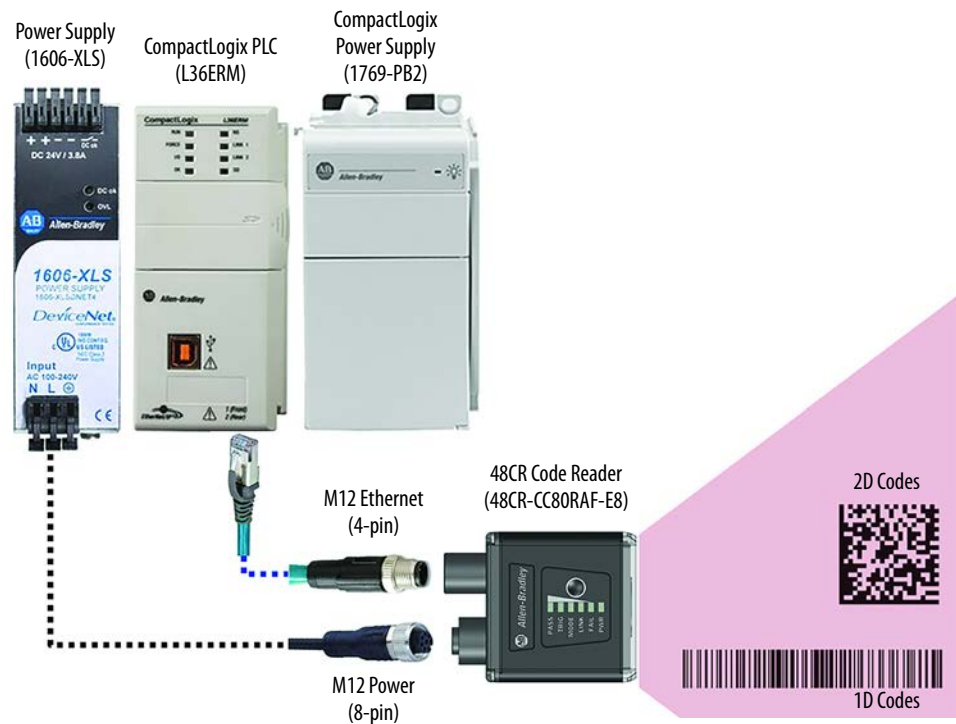
As shown in Figure 1, the 48CR code reader can read various 1D and 2D codes that are attached to objects within multiple application types wherein the information must be tracked. The code reader sends the object information to the controller via the EtherNet/IP protocol to track the information as required by the application constraints.
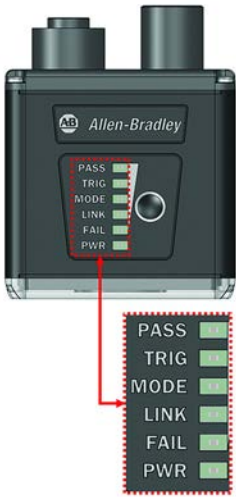
Components

This chapter covers the code reader catalog types, status indicators, and product selection.

Status Indicators

Table 3 provides information on how to interpret the status indicators.

Table 3 - 48CR Code Reader Status Indicators

	Indicator	Status	Description
	PASS	Off	Inactive status
		On	Active status
	TRIG	Off	Waiting for trigger event
		Flashing on	Trigger event
	MODE	Off	Unit not ready
		Flashing (0.5 Hz)	Unit is not configured
		On	Unit is configured
	LINK	Off	No power or no IP address
		Solid green	Connected in normal operation
		Flashing green	Standby. (No network connection, only power is connected).
	FAIL	Off	Inactive status
		On	Active status
	PWR	Off	No power is applied to unit.
		On	Power on

Catalog Number Explanation

48CR	–	C			R		–	E	8
		a	b	c	d	e		f	g

a	
Algorithms	
Code	**Description**
C	1D/2D

b	
Type	
Code	**Description**
B	Standard (752 x 480)
C	Advanced (1280 x 960)

c	
Lens Size	
Code	**Description**
50	5.0 mm (0.2 in.) lens
52	5.2 mm (0.2 in.) lens
77	7.7 mm (0.3 in.) lens
80	8 mm (0.3 in.) lens
16	16 mm (0.6 in.) lens

d	
Light-emitting Diode Color	
Code	**Description**
R	Red

e	
Focus	
Code	**Description**
AF	Auto focus
102	Fixed focus distance (mm)
133	Fixed focus distance (mm)
190	Fixed focus distance (mm)
400	Fixed focus distance (mm)

f	
Cabling	
Code	**Description**
E	4-pin DC-micro, EtherNet/IP

g	
Number of Pins	
Code	**Description**
8	8-pin

Product Selection

Table 4 - Standard Code Readers (0.3 MP Resolution)

Lens [mm (in.)]	Imager	Focus Type	Focus Distance [mm (in.)]	Decode Algorithms	Cat. No.
5.2 (0.2)	WVGA	Fixed	102 (4.02)	1D, 2D, and DPM	48CR-CB52R102-E8
8 (0.3)			133 (5.24)		48CR-CB80R133-E8
8 (0.3)			190 (7.48)		48CR-CB80R190-E8
16 (0.6)			400 (15.75)		48CR-CB16R400-E8

Table 5 - Advanced Code Readers (1.2 MP Resolution)

Lens [mm]	Imager	Focus Type	Decode Algorithms	Cat. No.
5.0 (0.2)	SXGA	Auto	1D, 2D, and DPM	48CR-CC50RAF-E8
7.7 (0.3)				48CR-CC77RAF-E8
16 (0.6)				48CR-CC16RAF-E8

Table 6 - Accessories

Description	Cat. No.
Polarizer — lens cover kit	48CR-POLARIZER
Diffuser — lens cover kit	48CR-DIFFUSER
L-bracket mounting	48CR-LBKT
Adjustable mounting bracket	48CR-ADJBKT
Right-angle mirror	48CR-45MIRROR
T-port	879D-F8D4M

Table 7 - Cables

Style	Connector Type	Pins	Shield	Wire Size [AWG]	Cat. No.
Ethernet Cables					
M12 D Code Patchcord	M12 male straight to RJ45 male straight	4	Unshielded	24	1585D-M4TBJM-x [1]
	M12 male right angle to RJ45 male straight				1585D-E4TBJM-x [1]
Power Cables					
DC Micro (M12) QD Code Cordset	M12 female straight to flying lead	8	Unshielded	24	889D-F8AB-x [2]
			Shielded		889-F8FB-x [2]
DC Micro (M12) QD Code Patchcord	M12 female straight to M12 male straight	8	Unshielded	24	889D-F8ABDM-x [2]
			Shielded		889D-F8FBDM-x [2]

(1) The *x* represents the cable length. Available in lengths of 0.15, 0.2, 0.3, 0.6, 1, 2, 2.5, 3, 4, 5, 10, 15, 20, 30, 40 m (0.5, 0.7, 1, 2, 3.3, 6.6, 8.2, 9.8, 13.1, 16.4, 32.8, 49.2, 65.6, 98.4, 131.2 ft) in increments of 5 m (16.4 ft) up to 75 m (246.1 ft).

(2) The *x* represents the cable length. Available in lengths of 0.3, 1, 2, 5, 10, 15 m (1, 3.3, 6.6, 16.4, 32.8, 49.2 ft) in increments of 5 m (16.4 ft) up to 75 m (246.1 ft).

Notes:

Installation and Wiring

This chapter describes how to install and wire the 48CR code reader. The only tools that you require are a flat or Phillips screwdriver and a drill.

Install the Code Reader

To install the 48CR code reader device, you must complete the following:

- Set the network address ()
- Mount and position the code reader ()
- Connect the power I/O and network cables to the code reader ()

Set the Network Address

There are two options to make a static connection to your code reader.

Option 1 — Initiate IP Address

1. The code reader IP address configuration state defaults to dynamic and requires a Dynamic Host Configuration Protocol (DHCP) server to assign the IP address automatically.

2. Manually assign the IP address through the Rockwell Automation® BootP/DHCP server tool.

Option 2 — Change IP Address

1. Navigate to Control Panel > Network and Sharing Center on your computer.

2. Click Local Area Connection 4. In the Status dialog box, click Properties. In the Local Area Connection Properties dialog box, select Internet.

3. Protocol Version 4 (TCP/IPv4) and click Properties again. Set the IP address to 192.168.1.x (for example, 192.168.1.80).

4. Click OK.

5. With the Rockwell Automation® BootP/DHCP server tool, assign an IP address to 192.168.1.x (for example, 192.168.1.90). It cannot be the same as the Protocol Version 4 (TCP/IPv4) address used in step 3.

6. Open a web browser and type the IP address of the code reader that was established in step 5.

7. The code reader connects to WebConnect.

Mount and Position the Code Reader

1. Position the code reader several inches from the symbol. The focal distance varies depending on the code reader catalog number and the 1D/2D barcode size. If needed, you can reposition the code reader a few times to find the ideal distance.

2. Tip the code reader relative to the symbol to avoid the glare of direct (specular) reflection.

3. Symbols can be rotated (tilted) at any angle. However, for best results, symbols must be aligned with the field of view. If there are linear symbols, align the bars in the direction of their movement (ladder orientation) to help minimize the chance of blurring. This alignment results in more consistent decodes.

> **IMPORTANT**   Avoid excessive skew or pitch. Maximum skew is ±30°; maximum pitch is ±30°. Figure 2 shows approximate skew axis, pitch axis, and tilt axis.

Figure 2 - Skew, Pitch, and Tilt
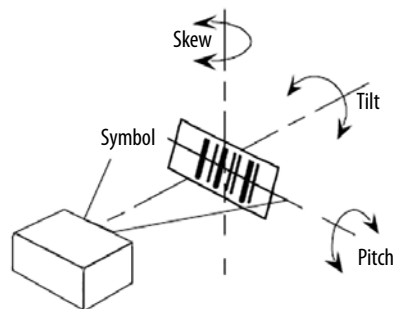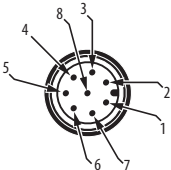
Connect the Power I/O and Network Cables to the Code Reader

The 48CR code reader has an 8-pin male DC micro-style M12 connector for power and 4-pin female DC micro-style M12 connector for Ethernet to the device. Connect the quick-disconnect cordsets that you selected for your code reader to the appropriate ports.

Figure 3 - 48CR Code Reader– Standalone Ethernet Configuration
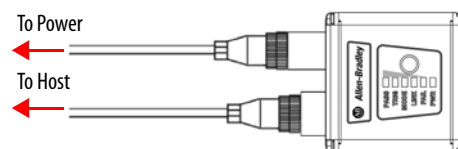
Power I/O Connectors

Table 8 - Micro-style 8-Pin Male Power I/O Connector

Face View of Male DC Micro	Color	Pin Number	Signal
			Receiver
	White	1	Trigger input
	Brown	2	+24V DC
	Green	3	Input 1
	Yellow	4	Output 1
	Gray	5	Output 2
	Pink	6	Output common
	Blue	7	0V DC
	Red	8	Input common

EtherNet/IP Connector

Table 9 - D-Code Micro Female Ethernet Connector

Face View of Female DC Micro	Color	Pin Number	Signal
			Receiver
	White-Orange	1	Transmit Data +
	White-Green	2	Transmit Data -
	Orange	3	Receive Data +
	Green	4	Receive Data -

IMPORTANT	The cabled assembly is rated for a maximum current of 1.5 A.

The power that the code reader requires is based on an 8-pin micro-style connector system. The code reader receives its required power through the male connector.

The code reader requires a 24V DC (nominal) power supplies for powering all aspects of the device including the digital inputs, digital outputs, and camera voltage.

Table 10 - Specifications

Attribute	Value
Electrical	4.75…30V DC, 200 mV p-p max ripple, 150 mA at 24V DC (typical)
Digital I/O	2 opto-isolator inputs, 2 opto-isolator outputs

Notes:

Configure for EtherNet/IP Network

Before using the 48CR coder reader in an EtherNet/IP network, you must configure it with an IP address, subnet mask, and optional Gateway address. This chapter describes the following configuration requirements and procedures for providing them:

- Use the Rockwell Automation BootP/DHCP utility (version 2.3 or greater) which ships with the Studio 5000® environment or RSLinx® software. You can also use this utility to reconfigure a device whose IP address must be changed.
- Use a third-party DHCP (Dynamic Host Configuration Protocol) server.
- Have your network administrator configure the module via the network server.

The following table lists where to find specific information in this chapter.

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Configuration Requirements

Before you can use your device, you must configure the IP address, subnet mask, and, optionally, the gateway address. You can use the Rockwell Automation BootP/DHCP utility (version 2.3 or greater) to perform the configuration. You can also use a DHCP server or the network address switches to configure these parameters.

Restore Device Defaults Via Hardware

If a software default and reset is not possible, it may be necessary to reset the code reader by shorting (connecting) specific pins.

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 code reader.

2. Locate Pin 3 (Default) and Pin 7 (Ground) on the connector. Access depends on wiring configuration. This step may require an accessory cable

> ⚠ **ATTENTION:** Verify that the correct pins are located. If you connect the wrong pins, damage to the code reader can occur.

3. Momentarily connect the wires (or pins).

4. Within 3 seconds, disconnect and then reconnect the two wires again.

Restore Device Defaults Via WebConnect

1. From the Start view, click the gear icon to open the Application Settings menu.

2. Click the Restore Default Settings button.
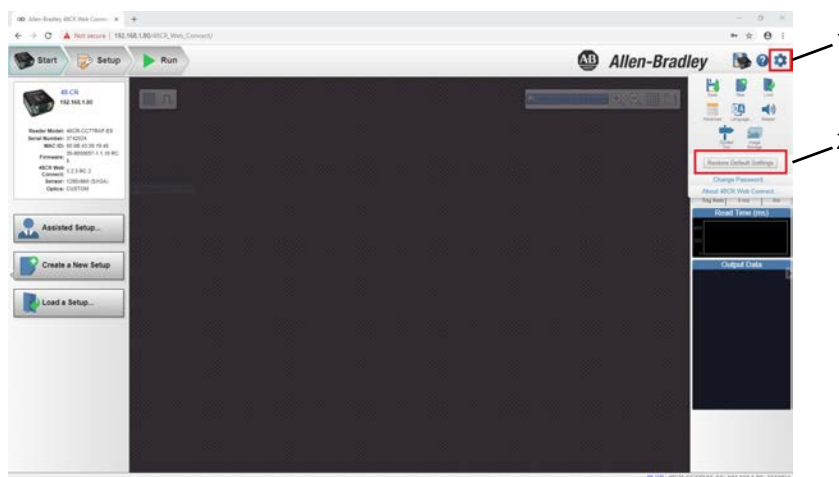
> **IMPORTANT** If you use the BootP/DHCP utility, you must know the Ethernet hardware address of your module. Rockwell Automation assigns each module a unique 48-bit hardware address at the factory. The address is printed on a label on the side of your module. It consists of six hexadecimal digits that are separated by colons. This address is fixed by the hardware and cannot be changed. If you change or replace the device, you must enter the new Ethernet hardware address of the module when you configure the new module.

IP Address

The IP address identifies each node on the IP network (or system of connected networks). Each TCP/IP node on a network (including your module) must have a unique IP address.

The IP address is 32 bits long and has a net ID part and a Host ID part. Networks are classified A, B, C, or other. The class of the network determines how an IP address is formatted.

	0	7	8				31
Class A	0	NetID			Host ID		
	0			15	16		31
Class B	10	NetID				Host ID	
	0				23	24	31
Class C	110		NetID				Host ID

You can distinguish the class of the IP address from the first integer in its dotted-decimal IP address as follows:

Table 11 - Classes of IP Addresses

Range of First Integer	Class
0…127	A
128…191	B
192…223	C
224…255	Other

Each node on the same logical network must have an IP address of the same class and must have the same net ID. Each node on the same network must have different Host IDs, which give them a unique IP address.

IP addresses are written as four decimal integers (0...255) separated by periods where each integer gives the value of 1 byte of the IP address.
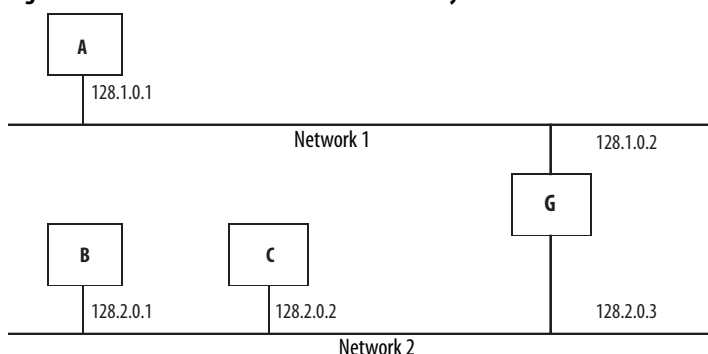
> **EXAMPLE** The 32-bit IP address: 10000000 00000001 00000000 00000001 is written as 128.1.0.1.

Gateway Address

This section applies to multi-network systems. If you have a single-network system, go to Subnet Mask on page 24. The gateway address is the default address of a network, it provides one domain name and point of entry to the site. Gateways connect individual networks into a system of networks. When a node must communicate with a node on another network, a gateway transfers the data between the two networks. Figure 4 shows gateway G, which connects Network 1 with Network 2.

Figure 4 - Two Network Connection with Gateway G

```
         ┌─────┐
         │  A  │
         └─────┘
            │ 128.1.0.1
  ──────────┴──────────────────────────────────┬──────────
                  Network 1              128.1.0.2 │
                                              ┌─────┐
                                              │  G  │
                                              └─────┘
    ┌─────┐         ┌─────┐                      │
    │  B  │         │  C  │                      │
    └─────┘         └─────┘                      │
       │ 128.2.0.1     │ 128.2.0.2      128.2.0.3 │
  ─────┴───────────────┴──────────────────────────┴────────
                     Network 2
```

When host B with IP address 128.2.0.1 communicates with host C, it knows from the IP address of C that C is on the same network. In an Ethernet environment, B then resolves the IP address of C into a hardware address (MAC ID) and communicates with C directly.

When host B communicates with host A, it knows from the IP address of A that A is on another network (the net IDs are different). To send data to A, B must have the IP address of the gateway that connects the two networks. In this example, the IP address of the gateway on Network 2 is 128.2.0.3.

The gateway has two IP addresses (128.1.0.2 and 128.2.0.3). The hosts on Network 1 must use the first and the hosts on Network 2 must use the second. To be usable, the gateway of the host must be addressed using a net ID that matches its own.

Subnet Mask

The subnet mask is used for splitting IP networks into a series of subgroups, or subnets. The mask is a binary pattern that is matched up with the IP address to turn part of the Host ID address field into a field for subnets.

> **EXAMPLE**   Take Network 2 (a Class B network) in the previous example and add another network. The selection of the following subnet mask would add two additional net ID bits, which allows for four logical networks:
>
> 1111111 11111111 11000000 00000001 = 255.255.192.0
>
> These two bits of the host ID used to extend the net ID

Two bits of the Class B host ID have been used to extend the net ID. Each unique combination of bits in the part of the Host ID where subnet mask bits are 1 specifies another logical network.

The new configuration is:

```
        ┌───┐
        │ A │
        └─┬─┘
          │ 128.1.0.1
──────────┴────────────────────────────┬──────────────
              Network 1                 │  128.1.0.2
                                     ┌──┴──┐
                                     │  G  │
    ┌───┐        ┌───┐               └──┬──┘
    │ B │        │ C │                  │ 128.2.64.3
    └─┬─┘        └─┬─┘                  │
      │ 128.2.64.1│                     │
──────┴───────────┴───────────────────┬┴──────────────
              Network 2.1             │
                                   ┌──┴──┐
                                   │ G2  │
    ┌───┐        ┌───┐             └──┬──┘
    │ D │        │ E │                │ 128.2.128.3
    └─┬─┘        └─┬─┘                │
      │ 128.2.128.1│ 128.2.128.2      │
──────┴───────────┴──────────────────┴─────────────────
              Network 2.2
```
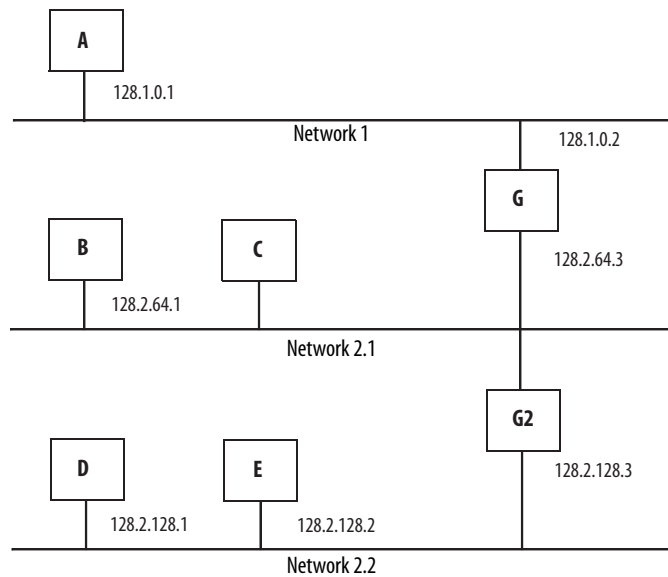
A second network with Hosts D and E was added. Gateway G2 connects Network 2.1 with Network 2.2.

Hosts D and E use Gateway G2 to communicate with hosts not on Network 2.2. Hosts B and C use Gateway G to communicate with hosts not on Network 2.1. When B is communicating with D, G (the configured gateway for B) routes the data from B to D through G2.

Set the Network Address

This code reader ships with DHCP enabled as default. To change the network address, you must do the following:

1. Use a Dynamic Host Configuration Protocol (DHCP) server, such as Rockwell Automation BootP/DHCP.

2. Retrieve the IP address from nonvolatile memory.

Use the Rockwell Automation BootP/DHCP Utility

The Rockwell Automation BootP/DHCP utility is a standalone program that incorporates the functionality of standard BootP/DHCP software with a user-friendly graphical interface. It is in the Utils directory on the Studio 5000 installation CD. The module must have DHCP enabled (factory default and the network address switches set to an illegal value) to use the utility.

To configure your module with the BootP/DHCP utility, perform the following steps:
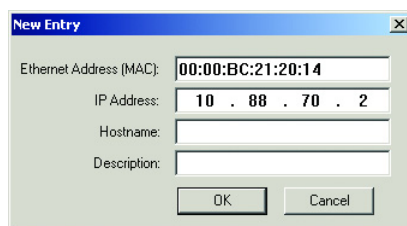
1. Run the BootP/DHCP software.

   The BOOT/DHCP Request History dialog appears and it shows the hardware addresses of devices that issue BootP/DHCP requests.
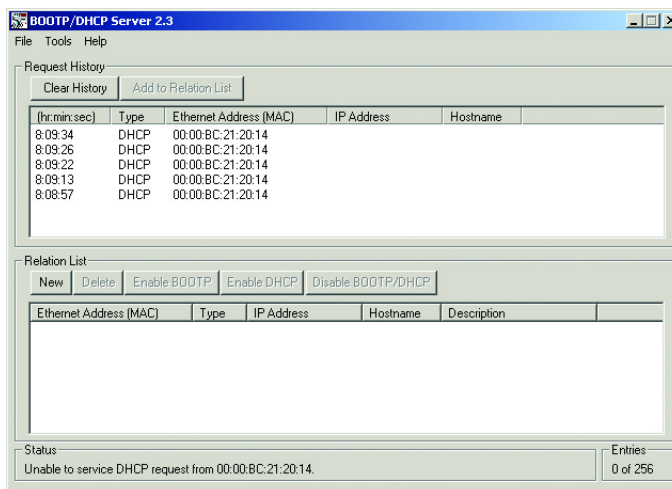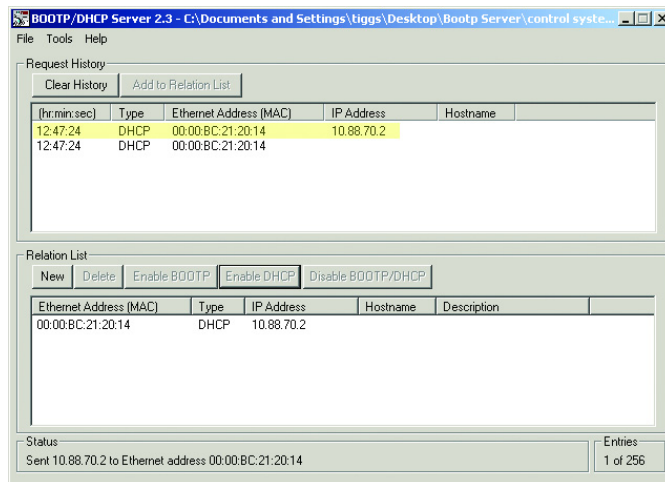

2. Double-click the hardware address of the device that you want to configure.

   The New Entry dialog appears and it shows the MAC ID of the device.

3. Enter the IP address that you want to assign to the device and click OK.

   The device is added to the Relation List, which displays the MAC ID and corresponding IP address, Hostname, and Description (if applicable).

When the IP address assignment is made, the address displays in the IP address column in the Request History section.

4. To assign this configuration to the device, highlight the device in the Relation List panel and click Disable BOOTP/DHCP. When power is cycled to the device, it uses the configuration you assigned and does not issue a DHCP request.
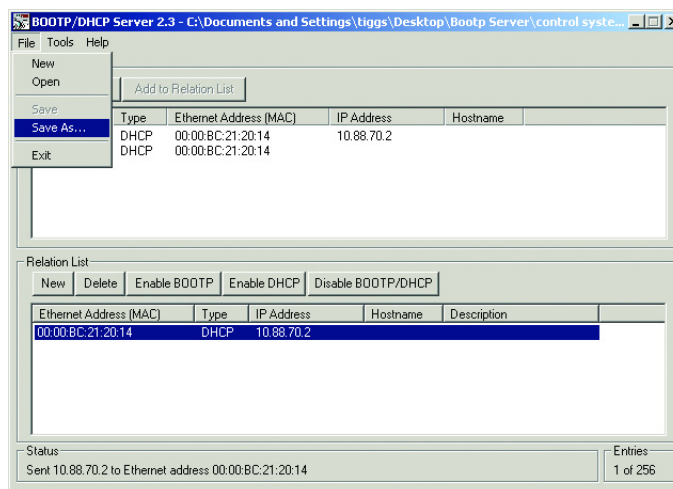
> **TIP** To enable DHCP for a device that has had DHCP disabled, highlight the device in the Relation List and click Enable DHCP. You must have an entry for the device in the Relation List panel to re-enable DHCP.
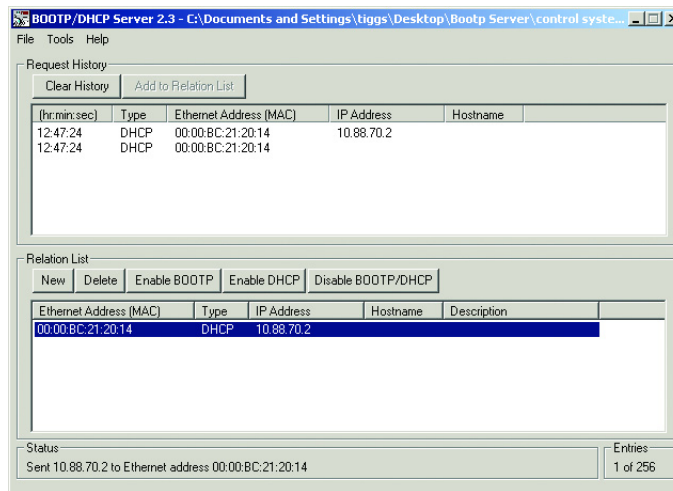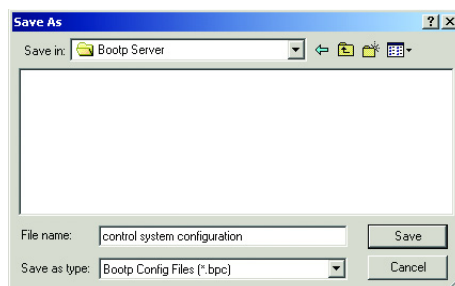

Save the Relation List

You can save the Relation List to use later. To save the Relation List, you must do the following:

1. Select Save As ... from the File Menu.

The Save As dialog box appears.

2. Select the folder that you want to save the list to.

3. Enter a file name for the Relation List (for example, control system configuration) and click Save.

4. If you want to see your saved file names in the Open dialog box, save your files with the default file type (*.bpc).

Use DHCP Software to Configure Your Module

Dynamic Host Configuration Protocol (DHCP) software automatically assigns IP addresses to client stations logging on to a TCP/IP network. DHCP is based on BOOTP and maintains some backward compatibility. The main difference is that BOOTP was designed for manual configuration, while DHCP allows for dynamic allocation of network addresses and configurations to newly attached devices.

A DHCP server typically assigns a finite lease time to the offered IP address. When 50% of the leased time has expired, the module attempts to renew its IP address with the DHCP server. The module could be assigned another IP address, which would cause communicating with the ControlLogix controller to cease.

> ⚠ **ATTENTION:** To avoid unintentional control, the device must be assigned a fixed IP address. The IP address of this device must not be dynamically provided. If a DHCP server is used, it must be configured to assign a fixed IP address for your device.
>
> Failure to observe this precaution can result in unintended machine motion or loss of process control.

Configure with the Studio 5000 Add-on Profile

Before you can use your code reader in the Studio 5000® environment, you must configure the module profile so that it can be recognized.

Follow these steps to configure the profile.

IMPORTANT	The illustrations of the Studio 5000 Module Profile Setup software dialog boxes that are shown in this manual are samples.
	Because your system configurations or the firmware kits are different, the dialog boxes you see when running the tool can differ from the ones you see here

Install Add-on Profile

1. In the installation package, double-click MPSetup.exe. The Welcome dialog box appears. Click Next.
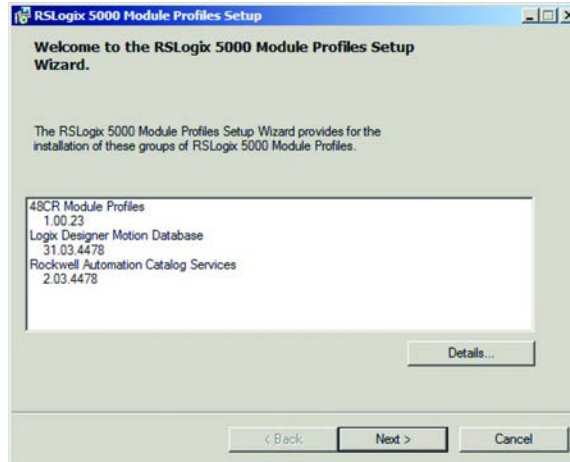
2. Read and accept the license, and then click Next.

3. Select Install and then click Next.
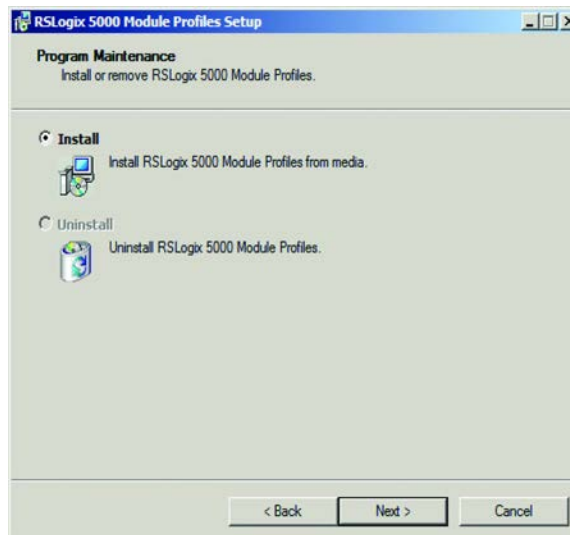
4. The Setup Wizard displays the profiles to be installed. Click Install to start the installation.
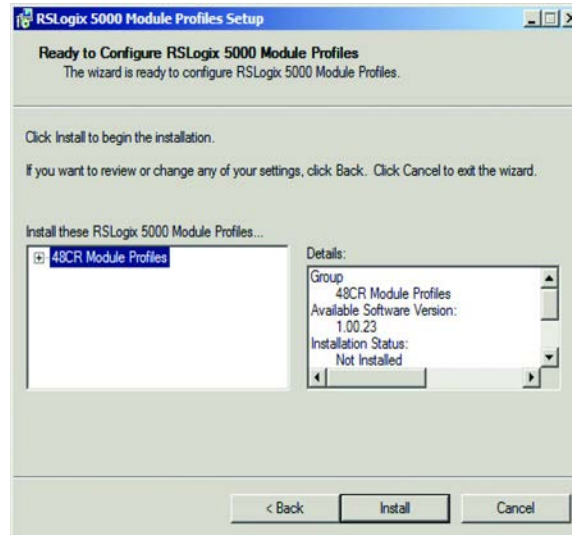
The Setup Wizard installs the profiles.

5. To complete the installation and configuration, follow the instructions on the next dialog boxes.
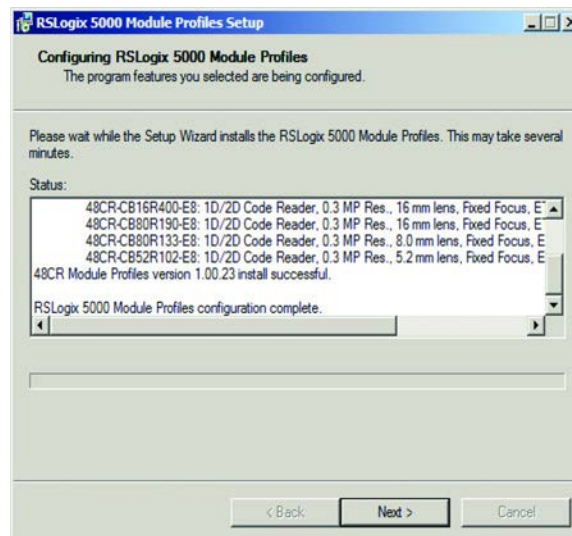
6. When installation is complete, the following dialog box appears. Click Finish.
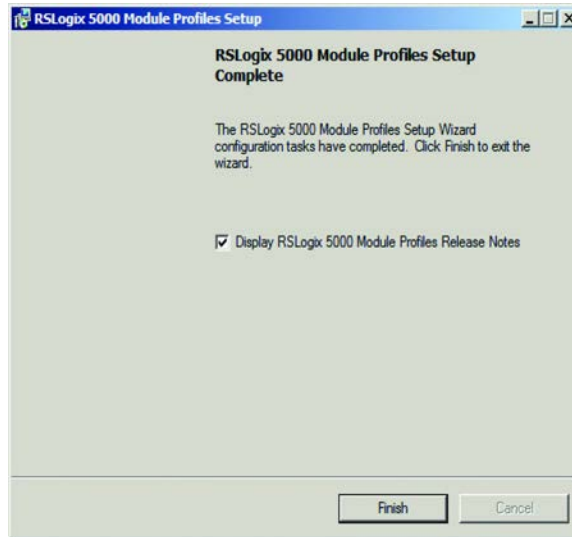
Add a 48CR Code Reader to Studio 5000

To add the code reader to Studio 5000, do the following.

1. In the I/O Configuration tree, find the Controller.
   In this example, we use the 1769-L36ERM CompactLogix™ controller.

2. Right-click the Ethernet and select New Module.
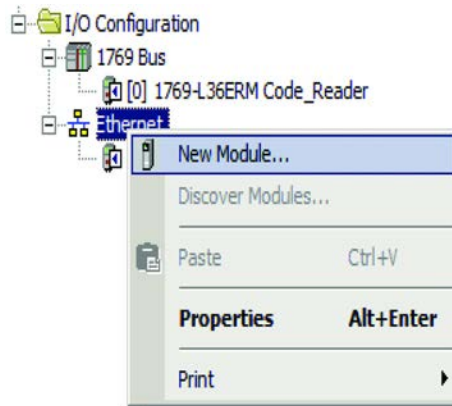
3. In the filter box, type in 48CR in the catalog tab. The following image shows the code reader catalog numbers that populate. Double-click the code reader catalog number that you are using. In this example, we use 48CR-CC77RAF-E8.
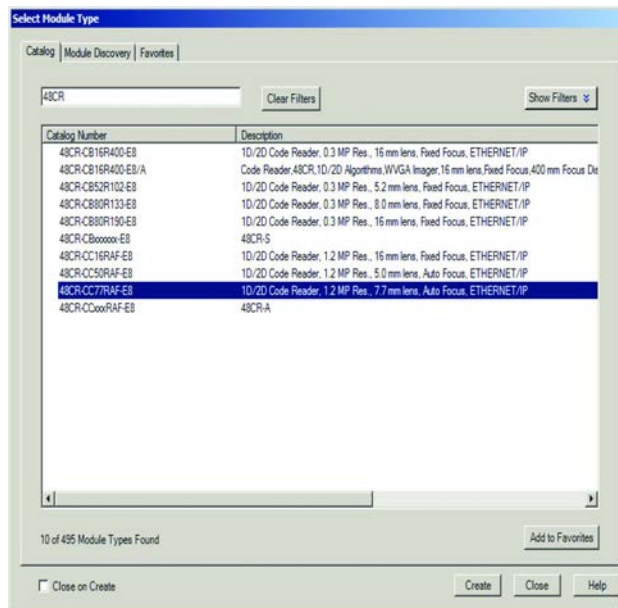
The General tab of the Add-on Profile (AOP) appears.

4. On the General tab, you can give the module a Name that is also used in the name of the Tag elements that get created for the module, change the Electronic Keying for the module, and change who configures the device with the Change button under Module Definition.
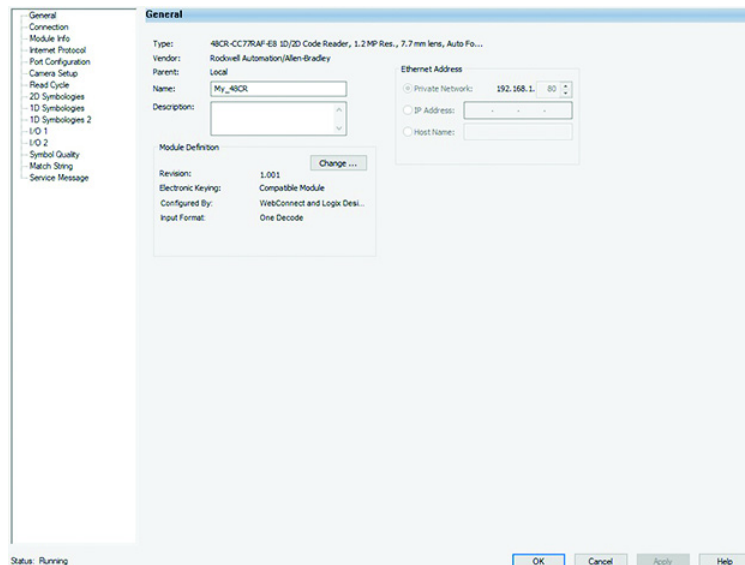
On the Connection tab, you can change the Requested Packet Interval (RPI) (the default is 20 ms.), choose to inhibit the module, configure the controller so that a loss of connection to this module causes a major fault, and view module faults. The lowest recommended RPI for the code reader is 8 ms. For certain application constraints, setting the RPI of the code reader to less than 8 ms can restrict its performance.
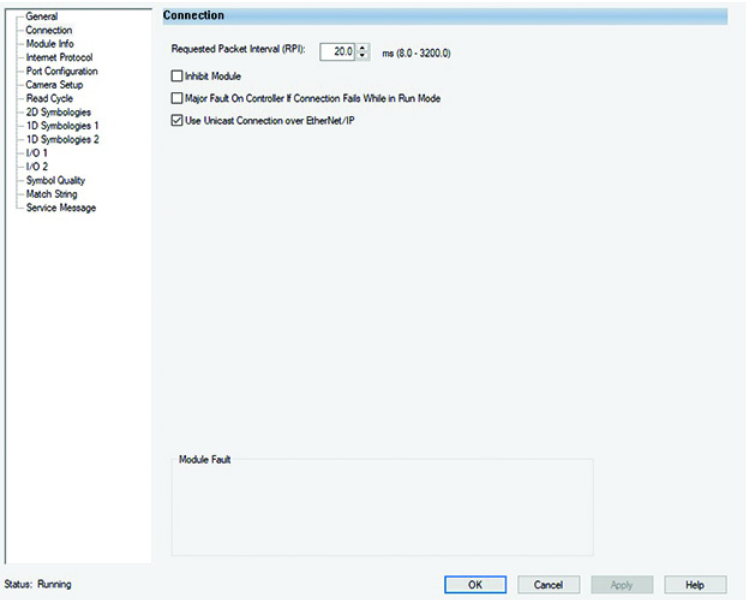
The Module Info tab displays the status and identity information of the code reader when the device is online.

On the Internet Protocol tab, you can edit the private address, which in this example is 192.168.1.80. This window populates automatically with the data if the IP address of the code reader was set on the device.

On the Port Configuration tab, the fields are active only when the controller is online. The number of ports that appear in this window do not change based on the code reader being used. In this example, Port 1 is shown as active.

I/O Tags

For channels that are configured for either standard digital input or standard digital output, standard Logix tag elements are created.

Configuration Data

A Configuration tag is created for each Master Module. The Configuration Data Type includes the following:

- Fault/Program mode setting: For channels configured as standard digital output and IO-Link.

  Valid values for channels that are configured as standard digital output are as follows:
  - Off: value set to 100 (default)
  - On: value set to 101
  - Hold: value set to 102

  Valid values for channels that are configured as IO-Link are as follows:
  - All Zeros: value set to 103 (default)
  - Hold: value set to 104
  - Device Decides: value set to 105. The IO-Link Master module gives the control to the IO-Link device. The IO-Link device follows what the device vendor had specified as a fault or program state for that device.

  For channels configured as disabled or standard digital input, the fault or program mode is -1 (default).

- Digital filter settings: For channels configured as standard digital input. The valid range is from 0…65 ms (default= 0).

Access Parameter Settings with WebConnect

IMPORTANT	Before you open an Internet browser, you must configure the 48CR code reader for Ethernet/IP Network as described in <u>Chapter 4 on page 21</u>.
	Follow recommended network practices for products with network interfaces, such as communication ports or web servers. These practices help minimize risk or exposure by unauthorized activity or users. For more information, see:
	• Converged Plantwide Ethernet (CPwE) Design and Implementation Guide, publication <u>ENET-TD001</u>
	• Ethernet/IP Network Devices User Manual, publication <u>ENET-UM006</u>
	• Configure System Security Features User Manual, publication <u>SECURE-UM001</u>

Default HTTP Protocol

When accessing WebConnect with the default HTTP protocol.

1. Start a web browser session and enter the assigned IP address of your 48CR code reader in the address bar. We recommend using the latest version of Google Chrome.

2. Once the page has loaded, accept the licensing agreement.
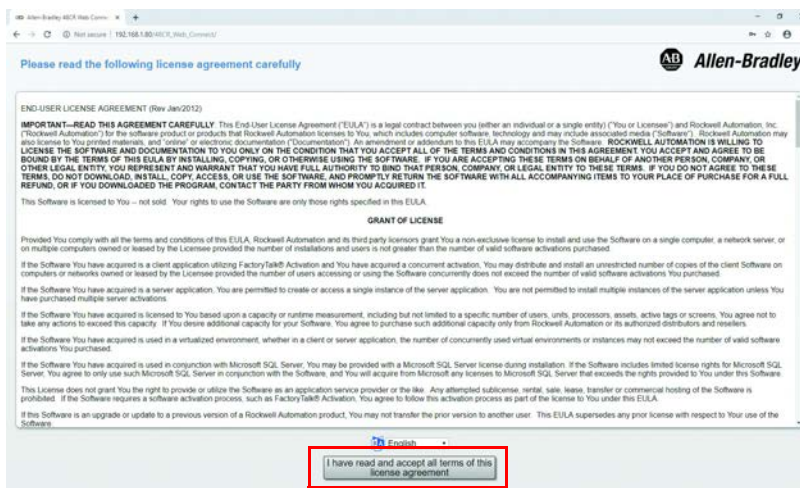
3. WebConnect requests a password for the code reader. Enter a unique case-sensitive password for the device. This password is required to access the WebConnect from now on unless the device is reset.

HTTPS Protocol Enabled

When accessing WebConnect with the HTTPS protocol enabled.

> **IMPORTANT**   When HTTPS is enabled, performance of the code reader is affected. After enabling HTTPS, verify that the code reader can achieve the decode speed that your application requires.

1. Start a web browser session and enter the assigned IP address of your 48CR code reader in the address bar. We recommend using the latest versions of Google Chrome.

2. When the following page comes up, click the Advanced button.

Your connection is not private

Attackers might be trying to steal your information from **192.168.1.80** (for example, passwords, messages, or credit cards). Learn more

NET::ERR_CERT_AUTHORITY_INVALID

☐ Help improve Safe Browsing by sending some system information and page content to Google. Privacy policy

Advanced   Back to safety
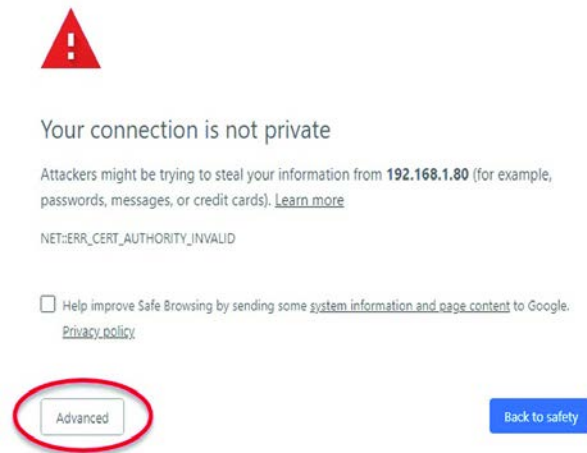
3. Click Proceed to xxx.xxx.x.xx (your assigned IP address).

Your connection is not private

Attackers might be trying to steal your information from **192.168.1.80** (for example, passwords, messages, or credit cards). Learn more

NET::ERR_CERT_AUTHORITY_INVALID

☐ Help improve Safe Browsing by sending some system information and page content to Google. Privacy policy

Hide advanced   Back to safety

This server could not prove that it is **192.168.1.80**; its security certificate is not trusted by your computer's operating system. This may be caused by a misconfiguration or an attacker intercepting your connection.

Proceed to 192.168.1.80 (unsafe)

4. Once the page has loaded, accept the licensing agreement.

5. WebConnect requests a password for the code reader. Enter a unique case-sensitive password for the device. This password is required to access the WebConnect from now on unless the device is reset.

Parameter Overview

General

Add-on Profile (AOP) View Only*

* Not available in WebConnect

Use this display to do the following:

- View module parameters
- Enter the name and description for the module
- Select the slot where the module resides
- View module definition parameters
- View configured by options

Type

Shows the catalog number and short module description.

Vendor

Shows the vendor for the module.

Parent

Shows the name of the parent module.

Name

The module name[1] following standard RSLogix 5000® software IEC-1131 naming conventions. This field appears dimmed in Hard Run mode.

Description

The module description (up to 128 printable characters). If you exceed the maximum length, the software ignores extra characters.

Module Definition

This section shows read-only module information. If you want to change this information, click the Change button to access the Module Definition dialog box.
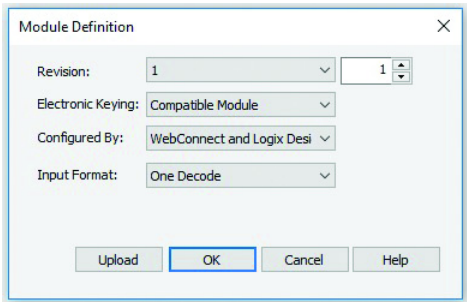
Item	Description
Series	The series type of the module for the device catalog number.
Revision	The major and minor revision of the module.
Electronic Keying	The Electronic Keying of the module. The selectable modes are: Compatible Module (default), Disable, Keying, and Exact Match.
Configured By	The code reader ownership options available for selection. You can select only one of the following options: • This Controller • WebConnect and Logix Designer • WebConnect
Input Format	The input assemblies available for selection. You can select only one of the three options, which are: • One Decode • Four Decodes • N Decodes

(1)   Once you apply the name (by clicking the OK or Apply button), you cannot change it.

Media Access Control Address

Shows the following three media access control address parameters. Click the radio button to toggle between the options. (Private Network is the default).

- Private Network: Click to have a private network for the Ethernet module. If Private Network is selected in offline mode, the last octet of the IP address is displayed. You can change the last octet by entering a valid value between 1…254. This field is dimmed when the controller is in Program, Remote Program, Remote Run, or Hard Run mode or when Private Network is not selected.

- IP Address[1]: Enter the IP address of the module. This field is dimmed in Program, Remote Program, Remote Run, and Run mode or when IP address is not selected.

- Host Name[1]: Click to enter a Host Name for the module up to 64 ASCII characters. This field appears dimmed in Program, Remote Program, Remote Run, and Run mode or when Host Name is not selected.

Connection

General
Connection
Module Info
Internet Protocol
Port Configuration
Camera Setup
Read Cycle
2D Symbologies
1D Symbologies
1D Symbologies 2
I/O 1
I/O 2
Symbol Quality
Match String
Service Message

AOP View Only*
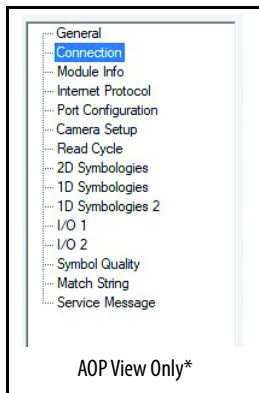
* Not available in WebConnect

Use this display to define controller-to-module behavior. You can do the following on this display:

- Select the requested packet interval
- Choose to inhibit the module
- Configure the controller so that a loss of connection to this module causes a major fault
- View module faults.

> **TIP** The data on this tab comes directly from the controller. This tab shows information about the condition of the connection between the module and the controller.

Connection

Requested Packet Interval (RPI):   20.0   ms (8.0 - 3200.0)

☐ Inhibit Module

☐ Major Fault On Controller If Connection Fails While in Run Mode

☑ Use Unicast Connection over EtherNet/IP

Module Fault

(1) You must enter either an IP address for the module or a host name. You do not have to enter both. These items are mutually exclusive; once you choose one, the other is disabled.

Requested Packet Interval (RPI)

This setting determines the period (in ms) at which data updates over a connection. The RPI control is dimmed because each controller can have its own individual RPI setting.

To set the RPI for that controller, access the Connection tab for the individual module. The minimum and maximum values are module-dependent and differ depending on the limits of the module.

IMPORTANT	If the RPI value is entered manually (rather than selecting a value from the list), and that value is not an even multiple of the RPI resolution, then the value is set to the next fastest increment.
	For example, if the RPI resolution is 0.5 ms, and you enter 3.4 ms, the value is reset to 3.0, which is the next fastest resolution supported. The 3.4 ms value is not rounded to 3.5 because that would be a slower resolution.

Inhibit Module

Check this box to inhibit, or clear it to uninhibit, your connection to the module.

⚠	**ATTENTION:** Inhibiting the module causes the connection to the module to be broken and can result in loss of data.

When you check this box and go online, the icon that represents this module in the controller organizer shows the uninhibit icon.

If You Are...	Check Inhibit Module to...
Offline	Put a place holder for a module you are configuring.
Online	Stop communication to a module. • If you inhibit the module while you are online and connected to the module, the connection to the module is nicely closed. The outputs of the module go to the last configured Program mode state. • If you inhibit the module while online but a connection to the module has not been established (due to an error condition or fault), the module is inhibited. • The module status information changes to indicate that the module is inhibited and not faulted. • If you uninhibit a module (clear the checkbox) while online and no fault condition occurs, a connection is made to the module and the module is dynamically reconfigured (if you are the owner controller) with the configuration you have created for that module. If you are a listener (have chosen a Listen Only Communications Format), you cannot reconfigure the module. • If you uninhibit a module while online and a fault condition occurs, a connection is not made to the module.

Major Fault on Controller If Connection Fails While in Run Mode

Check this box[1] to configure the controller so that failure of the connection to this module causes a major fault on the controller if the connection for the module fails.

This checkbox is automatically checked and disabled for the CompactBus Virtual Backplane adapter and all 1769 I/O modules that are children of the virtual adapter.

Use Unicast Connection on EtherNet/IP

Select between Unicast and Multicast for EtherNet/IP connections. This checkbox is enabled when the module supports Unicast at the current revision and any part of the module path crosses EtherNet/IP. It is checked and disabled when the module only supports Unicast and any part of the module path crosses EtherNet/IP.

The checkbox is not checked and disabled if the following are true:
- The current revision of the module does not support Unicast. If a module is Multicast only, no revision supports Unicast.
- The module is proxied (for example 1734, 1738, and 1794 I/O modules) and the current revision of the parent does not support Unicast.

By default, the checkbox (when enabled) is checked to use the Unicast connection unless redundancy is enabled for the controller. If redundancy is enabled, the default state of the checkbox is cleared.

IMPORTANT	• A change from Unicast to Multicast connection while online causes the connection to the module to close and reopen.
	• If the module path crosses ControlNet, the connection to the module is disabled until you start RSNetWorx™ to reconfigure the network.
	• A change to a Multicast connection fails to reconnect with the module if the connection crosses multiple subnets. Multicast connections are limited to one subnet.
	• A change from a module type with no connections to a module type with one or more connections causes the Unicast checkbox to appear in the tab. The checkbox is set to the default (checked unless redundancy is enabled for the controller).
	• A change from a module type with connections to another module type with connections, or a change in the major revision, causes the Unicast checkbox to be set to the default (checked unless redundancy is enabled for the controller).

(1)   This field does not appear in the tab when the module path does not cross EtherNet/IP or when the module has no connections.

Module Info
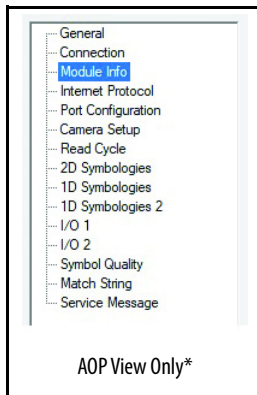
This display shows module and status information. You can also reset a module to its power-up state from this display. The information on this display is not shown if you are offline or currently creating a module

> **TIP**   The data on this display comes directly from the module. If you selected a Listen-only communication format when you created the module, this display is not available.

AOP View Only*

* Not available in WebConnect

Identification

Shows the following module information:

- Vendor
- Product type
- Product code
- Revision
- Serial number
- Product name

The name that is shown in the Product Name field is read from the module. This name shows the series of the module. If a 1756-L1 module is used, this field shows the catalog number of the memory expansion board (this selection applies to any controller catalog number even if additional memory cards are added).

Status

Shows the following status information that is read from the module:

- Major/Minor Fault

If You Are Configuring a...	This Field Shows the Following...
Digital module	• EEPROM fault • Backplane fault • None
Analog module	• Comm. Lost with owner • Channel fault • None
Any other module	• None • Unrecoverable • Recoverable

- Internal State

  Shows the current operational state of the module:

  - Self-test
  - Flash update
  - Communication fault
  - Unconnected
  - Flash configuration bad

  - Major fault
  - Run mode
  - Program mode
  - (16#xxxx) unknown

  If you selected the wrong module from the module selection tab, this field shows a hexadecimal value. A textual description of this state is only given when the module identity you provide is a match with the actual module.

- Configured

  Shows a Configured or No value that indicates whether an owner controller that is connected to the module has configured it. Once a module has been configured, it stays configured until the module is reset or power is cycled, even if the owner drops connection to the module. This information applies to I/O modules only and does not apply to adapters, scanners, bridges, or other communication modules.

- Owned

  Shows a Yes or No value that indicates whether an owner controller is connected to the module. This information applies to I/O modules only and does not apply to adapters, scanners, bridges, or other communication modules.

- Module Identity

Shows	If the Physical Module...

Match	• Agrees with what is specified on the General Tab.
	• In order for the Match condition to exist, the following must agree:
	  – Vendor
	  – Module Type (the combination of Product Type and Product Code for a particular Vendor)
	  – Major Revision

Mismatch	Does not agree with what is specified on the General Tab.

This field does not consider the Electronic Keying or Minor Revision selections for the module that are specified on the General tab.

> **IMPORTANT**   Generic modules, such as the catalog number 1756-MODULE, always show a Mismatch because the configured Generic Key does not match any target device.

Buttons

- Refresh

   Click this button to refresh the tab with new module data.

- Reset Module

   Verify that the module has been inhibited, then click this button to return a module to its power-up state by emulating the cycling of power.
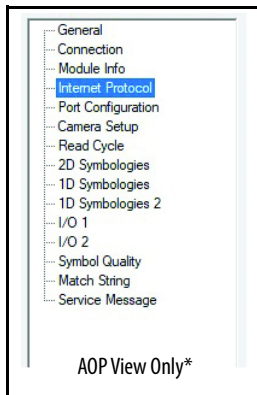
> **IMPORTANT**   The reset of a module causes all connections to, or through, the module to be closed. This action can result in loss of control.

The following modules return an error if a reset is attempted:
- 1756-L1 ControlLogix 5550 Programmable Controller
- 1336T AC Vector Drive
- 1395 Digital DC Drive

> **IMPORTANT**   A controller cannot be reset.

Internet Protocol

General
Connection
Module Info
Internet Protocol
Port Configuration
Camera Setup
Read Cycle
2D Symbologies
1D Symbologies
1D Symbologies 2
I/O 1
I/O 2
Symbol Quality
Match String
Service Message

AOP View Only*

* Not available in WebConnect

Use this display to configure the Internet Protocol (IP) settings. You must be online to configure IP settings.

Internet Protocol

○ Manually configure IP settings

● Obtain IP settings automatically using DHCP

Physical Module IP Address: 192 . 168 . 1 . 80   Subnet Mask: 255 . 255 . 255 . 0

Gateway Address: 192 . 168 . 244 . 2

Domain Name: RADomain   Primary DNS Server Address: 0 . 0 . 0 . 0

Host Name: 48-CR   Secondary DNS Server Address: 0 . 0 . 0 . 0

Refresh communication.   Set   ←

This display shows the IP settings configuration mode of the module. Click the appropriate button to configure the IP settings:
- Manually configure the IP settings
- Obtain IP settings automatically with DHCP

If you use the switches on the module to set the IP address, the fourth setting - IP settings set by switches on the module - is set automatically. You cannot select this control. This option appears dimmed if the module does not support setting the IP address via switches.

To disable this mode, change the switch settings on the module and then reset it. You can reset the module by cycling power to the module or by pressing the Reset button on the Module Info tab.

Internet Protocol (IP) Settings controls are dimmed when:
- The module is offline
- The module is online and a communication error occurs

Physical Module IP Address

Shows the physical IP address of the module or, if you selected to configure the IP settings manually, enter a valid physical module IP address.

See for valid values for the IP address.

Physical Module IP Address appears dimmed and has no value when offline or when online and a communication error occurs.

Physical Module IP Address appears dimmed when the following two conditions exist:

- The module supports the option to set the IP address with the switches on the module (That is, there are switches on the module. Not all modules have IP address switches)

- You choose to set the IP address with the switches on the module.

  Both a warning message and the IP address that is entered on the General tab shows when you enter a physical module IP address that does not match the IP address that is entered on the General tab.

  The warning message does not display when offline or when online and a communication error occurs.

Subnet Mask

Shows the subnet mask of the module or, if you selected to configure the IP settings manually, enter a valid subnet mask. See <u>Subnet Mask on page 24</u> for more information about the subnet mask.

Subnet Mask appears dimmed and is blank when offline or when online and a communication error occurs.

Subnet Mask appears dimmed when the following two conditions exist:

- The module supports the option to set the IP address with the switches on the module (That is, there are switches on the module. Not all modules have IP address switches).

- You choose to set the IP address with the switches on the module.

Gateway Address

Shows the gateway IP address of the module or, if you selected to configure the IP settings manually, enter a valid gateway address. See <u>Gateway Address on page 24</u> for more information about the gateway address.

Gateway Address appears dimmed and is blank when offline or when online and a communication error occurs.

Gateway Address appears dimmed when the following two conditions exist:

- The module supports the option to set the IP address with the switches on the module (That is, there are switches on the module. Not all modules have IP address switches).

- You choose to set the IP address with the switches on the module.

Domain Name

Shows the domain name of the module or to configure the IP settings manually, enter a valid domain name.

Domain Name appears only if the module supports a domain name. It appears dimmed and is blank when offline or when online and a communication error occurs.

Domain Name appears dimmed when the following two conditions exist:

- The module supports the option to set the IP address with the switches on the module (That is, there are switches on the module. Not all modules have IP address switches).
- You choose to set the IP address with the switches on the module.

Host Name

Shows the host name of the module or enter a valid host name.

A warning message appears when the host name in the physical module does not match the host name on the General tab. Verify that the host name that is entered here matches the host name on the General tab and click the Set button.

Host Name appears only if the module supports a host name. It appears dimmed and is blank when offline or when online and a communication error has occurred.

Primary DNS Server Address

Shows the primary DNS server IP address of the module or if you selected to configure the IP settings manually, enter a valid primary DNS server address.

Primary DNS Server Address appears only if the module supports a primary DNS server address. It appears dimmed and is blank when offline or when online and a communication error occurs.

Primary DNS Server Address appears dimmed when the following two conditions exist:

- The module supports the option to set the IP address with the switches on the module (That is, there are switches on the module. Not all modules have IP address switches).
- You choose to set the IP address with the switches on the module.

Secondary DNS Server Address

Shows the secondary DNS server IP address of the module or if you selected to configure the IP settings manually, enter a valid secondary DNS server address.

Secondary DNS Server Address appears only if the module supports a secondary DNS server address. It appears dimmed and is blank when offline or when online and a communication error occurs.

Secondary DNS Server Address appears dimmed when the following two conditions exist:

- The module supports the option to set the IP address with the switches on the module (That is, there are switches on the module. Not all modules have IP address switches).
- You choose to set the IP address with the switches on the module.
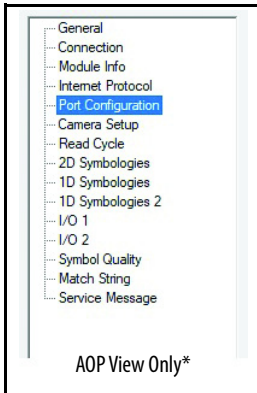
Refresh Communication

This link appears when communication with the module has failed. Click to attempt to restart communication with the module.

Set

Click this button to commit your modifications to the module. Set appears dimmed when:

- Offline
- Online and a communication error has occurred
- No pending edits exists on the tab

Port Configuration

AOP View Only*

* Not available in WebConnect

Use the settings on this tab to view and configure the port properties. The settings define how data is sent and received between the port and the attached module. The Port Configuration tab is only available for modules with an embedded Ethernet port and the configured values are only displayed when the module is online.

For controller modules, you can do the following on the Port Configuration tab:

- View the port configuration settings.
- Refresh communication to obtain the latest port configuration setting information from the module.

For non-controller modules, you can do the following on the Port Configuration tab:

- Configure the port settings.

> **IMPORTANT**   Configuration of the port settings involves writing data to the module, which interrupts the connection to the controller and to any other device that is connected through it. Connections from other controllers can be interrupted as well. Verify that a connection interruption is acceptable now before proceeding.

- Reset the module, if configuration setting changes were made that require a reset.

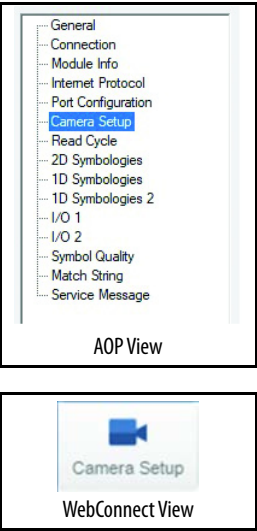If the controller requires a power cycle to apply the settings, the following message appears:

> Changes to Speed and Duplex require controller power cycle.

If the controller does not require a power cycle to apply the settings, the message does not appear.

- View the port configuration settings.
- Refresh communication to obtain the latest port configuration setting information from the module.

Camera Setup

General
Connection
Module Info
Internet Protocol
Port Configuration
Camera Setup
Read Cycle
2D Symbologies
1D Symbologies
1D Symbologies 2
I/O 1
I/O 2
Symbol Quality
Match String
Service Message

AOP View

Camera Setup

WebConnect View

Camera settings are typically obtained during the calibration process, and you do not have to modify them.

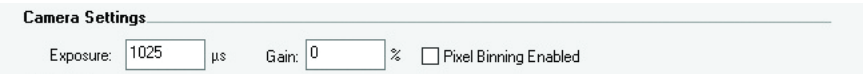| IMPORTANT	The default values shown in the AOP and WebConnect screen captures are for SXGA auto-focus devices.

Camera Settings

Figure 5 - AOP

Camera Settings

Exposure: 1025   µs   Gain: 0   %   ☐ Pixel Binning Enabled

Figure 6 - WebConnect

Camera Settings	
☆ Exposure	2500 µs
☆ *Gain*	0 %
☆ Pixel Binning	Disabled

Exposure

This value sets the exposure or integration time (in ms) for the image sensor pixels. The exposure setting in relation to the speed of the object is critical. If an object is moving fast and too long of an exposure value is selected, blurring or smearing of the object occurs. As exposure time is decreased, the movement of the object becomes less of a factor. As the duration of light collection by the pixels is reduced, the image sensor gain must be increased to compensate.

- Default: 2500 ms
- Options: 50...100,000 ms

IMPORTANT	This parameter is read-only when in Continuous Read mode.

Gain

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 increases the brightness of the image, but the noise performance of the system is reduced. Before configuring the gain, the required exposure must be set. Then, the gain can be configured to optimize the exposure setting.

- Default: SXGA (auto-focus devices) = 0%
             WVGA (fixed-focus devices) = 33%
- Options: Any number between 0...100%

Pixel Binning

Besides windowing the image sensor, small resolutions can be obtained downsampling 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 also improves low-light performance.

IMPORTANT	Enabling this feature does not affect the sensor frame rate as the pixels must still be processed to be averaged and binned.

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

  – Disabled

    Pixel binning is disabled.

  – Enabled

    Two column and two row pixels are averaged to create one pixel value providing a 2:1 reduction in the vertical pixels and a 2:1 in reduction in the horizontal pixels for a combined 4:1 reduction. An image with a dimension of 640 x 480 is scaled to 320 x 240. See following example:
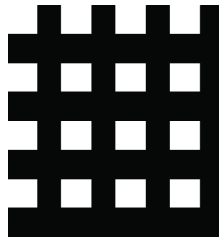
Illumination

Figure 7 - AOP

Figure 8 - WebConnect

Illumination Brightness

This feature allows you to adjust the brightness of the illumination light-emitting diodes (LEDs). Since the code reader has control over the brightness of the illumination, it can provide consistent brightness output between code readers through a factory calibration operation. Each of the brightness settings is calibrated to provide the same level of intensity for each code reader.

- Default: High
- Options: 0 = Off
             1 = Low
             2 = Medium
             3 = High
             4 = Constant

  – Off

    Light source is turned off.
  – Low

    Light source sets a calibrated low setting.
  – Medium

    Light source sets a calibrated medium setting.
  – High

    Light source sets a calibrated high setting.
  – Constant

    This setting is the same power level as high. However, this setting is always on during the read cycle and only turned off in between read cycles to cut down on human perception of flashing. High was chosen for the power setting because of the scanner power usage that is associated with a constant light source. There are no breaks to cut down on average power.

Light Source

This setting allows you to change the illumination light source.

- Default: Outer LED only

- Options: 1 = Inner white LED only
              2 = Inner red LED only
              3 = Outer LED only

  – Inner white LED only
    White LED lights.
  – Inner red LED only
    Red LED lights.
  – Outer LED only
    External lights that are attached to the device.

Window of Interest (WOI)

The active pixel area of the image sensor is called the Window of Interest (WOI). The WOI allows you to select an area of the field of view in which the desired symbol is located.

The programmable WOI increases decode speed, improves threshold, and makes it easy to select specific symbols from among several in the field of view. You provide the upper-left pixel location and the size of the window in rows and columns to define the WOI.

> **IMPORTANT**   WOI shrinks the field of view and therefore could cause some symbols to be missed in dynamic applications.

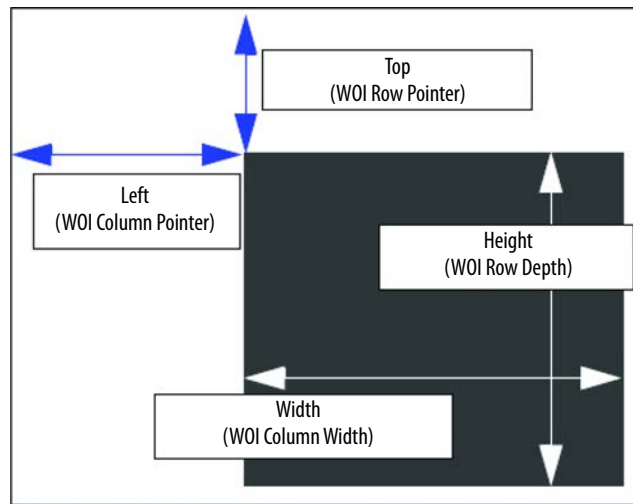**Figure 9 - AOP**

Window of Interest

Top: 0	Left: 0	Height: 960	Width: 1280

Figure 10 - WebConnect

Window of Interest	
☆ Top	0
☆ Left	0
☆ Height	960
☆ Width	1280

Figure 11 - WOI Details

Top (Row Pointer)

Defines the row position of the upper-left starting point of the image window.

- Default: SXGA (auto-focus devices) = 0
             WVGA (fixed-focus devices) = 0

- Options: SXGA (auto-focus devices): 0...(1024 – row depth)
             WVGA (fixed-focus devices): 0...(480 – row depth)

Left (Column Pointer)

Defines the column position of the upper-left starting point of the image window.

- Default: SXGA (auto-focus devices) = 0
             WVGA (fixed-focus devices) = 0

- Options: SXGA (auto-focus devices): 0...(1280 – column width)
             WVGA (fixed-focus devices): 0...(752 – column width)

Height (Row Depth)

Defines the size, in rows, of the image window. Maximum value is defined as the maximum row size of image sensor minus the row pointer value.

- Default: SXGA (auto-focus devices) = 960
             WVGA (fixed-focus devices) = 480

- Options: SXGA (auto-focus devices): 3...(1024 – row pointer)
             WVGA (fixed-focus devices): 3...(480 – row pointer)

Width (Column Width)

Defines the size, in columns, of the image window. Maximum value is defined as the maximum column size of image sensor minus the column pointer value.

- Default: SXGA (auto-focus devices) = 1280
  WVGA (fixed-focus devices) = 752

- Options: SXGA (auto-focus devices): 8...(1280 – column pointer)
  WVGA (fixed-focus devices): 8...(752 – column pointer)

Image Processing Settings

Figure 12 - AOP
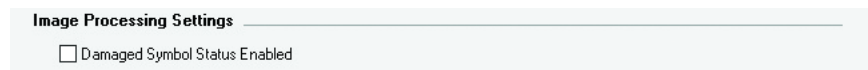
Figure 13 - WebConnect
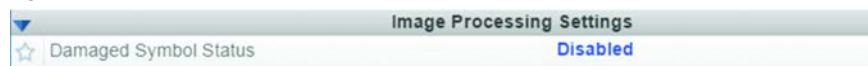
Damaged Symbol Status

- Default: Disabled

- Options: 0 = Disabled
  1 = Enabled

  – Disabled

  Damaged symbol status is disabled by default.

  – Enabled

  When this value is enabled, it tries additional processes to decode a damaged symbol (currently Code128 and Code 39 only), such as high noise or a partial bar missing. However, with this feature enabled decode time can increase significantly.

  > **IMPORTANT** The code reader cannot handle symbols with one bar completely missing.

Focus

Figure 14 - AOP

Figure 15 - WebConnect

Focus Distance

Provides the focal distance adjustment for the camera.

When the Distance Units parameter is set to millimeters, the Focus Distance parameter has a range of 50...300. Any value outside this range is rejected and is set to the nearest acceptable value.

When the Distance Units parameter is set to 1/100 in., Focus Distance is limited to a range of 196...1182. Any value that is entered outside this range is rejected and is set to the nearest acceptable value.

- Default: 102
- Options: 50...300 (mm)
              196...1182 (1/100 in.)

Distance Units

Defines the measurement unit of value of the Focus Distance parameter.

- Default: Inches
- Options: 0 = Millimeters
              1 = Inches

For example, the following are valid configurations to set the Focal Distance to three distances:

Required Focal Distance [mm (in.)]	Distance Units = mm (0)	Distance Units = 1/100 in. (1)
102 (4.02)	<102,0>	<402,1>
133 (5.24)	<133,0>	<524,1>
190 (7.48)	<190,0>	<748,1>
400 (15.75)	<400,0>	<1575,1>

Focus Mode

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.

- Default: No-read Autofocus
- Options: 0 = Normal
          1 = No-read Autofocus

No-read Limit

This parameter is the number of no-reads that are encountered consecutively in a Continuous Read mode to trigger an Autofocus pass.

- Default: 5
- Options: 0...255

Morphological Preprocessing

Figure 16 - AOP
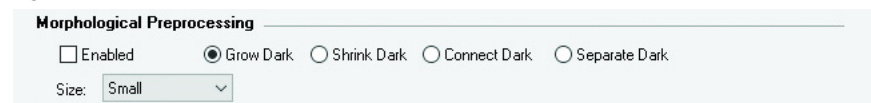
Figure 17 - WebConnect

Morphological preprocessing allows you to select the method for image processing, and to choose the operator size for that method.

> **IMPORTANT** This command must be enabled for morphological operations to function.

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

Operation

Operation allows you to select the method for processing captured images.

- Default: Grow Dark
- Options: 0 = Grow Dark
             1 = Shrink Dark
             2 = Connect Dark
             3 = Separate Dark

  – Grow Dark

    Increases the dark cell size of a symbol. Useful for increasing the dark cell size of a dark-on-light Data Matrix symbol.
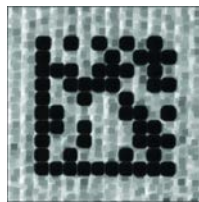
  – Shrink Dark

    Increases the light cell size of a symbol. Useful for increasing the light cell size of a light-on-dark Data Matrix symbol.

  – Connect Dark

    Removes minor light anomalies of dark cells by performing a Shrink Dark function followed by a Grow Dark function.

  – Separate Dark

    Removes minor dark anomalies of light cells by performing a Grow Dark function followed by a Shrink Dark function.

Size

Size determines the size of the area or pixel neighborhood (measured in pixels) in which the morphological operation is being performed.

- Default: Small
- Options: 3 = Small (3 x 3 pixels)
            5 = Medium (5 x 5 pixels)
            7 = Large (7 x 7 pixels)

Preamble

Useful for identifying and controlling incoming data. For example, if you define the preamble as a carriage return and a line feed, it causes each dec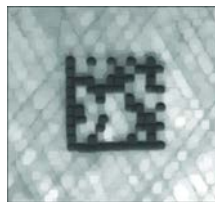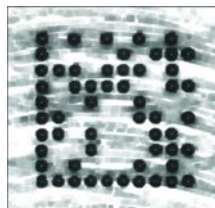oded message to be displayed on its own line. This parameter defines a 1…4 character data string that can be added to the front of the decoded data.

Figure 18 - AOP
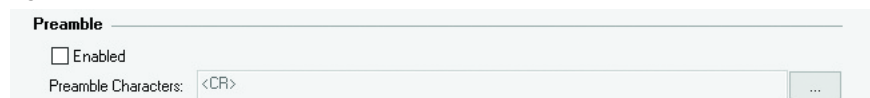
- Default: Disabled
- Options: 0 = Disabled
            1 = Enabled (with any protocol)

Preamble Characters

When using Multi-drop or ACK/NAK protocols, do not configure preamble or postamble to have the same character values as the protocol.

- Default: CR LF (0x0D)
- Options: 1…64 ASCII Characters

Postamble

Useful for identifying and controlling incoming data. For example, if you define the postamble as a carriage return and a line feed, it causes each decoded message to be displayed on its own line. This parameter allows you to enable or disable up to four postamble characters that can be added to the end of the decoded data.

Figure 19 - AOP

- Default: Enabled
- Options: 0 = Disabled
           1 = Enabled (with any protocol)

Postamble Characters

When using Multi-drop or ACK/NAK protocols, do not configure preamble or postamble to have the same character values as the protocol.

- Default: CR LF (0x0D, 0x0A)
- Options: 1...64 ASCII characters

Communications

Use the Communications tab configure communication with a host.

WebConnect View Only*

* Not available in AOP.

Ethernet

Ethernet

Set Ethernet port 1 to enable or disable.

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

IP Address

IP address of this unit when it is in Static IP address mode.

- Default: 0.0.0.0
- Options: 0.0.0.0...255.255.255.255

Gateway

Gateway IP address for this unit when it is in Static IP address mode.

- Default: 0.0.0.0
- Options: 0.0.0.0...255.255.255.255

IP Address Mode

Determines how the IP address of the code reader is defined.

- Default: DHCP
- Options: 0 = Static
             Scanner uses IP address that is configured via K
             command/ESP/embedded menu.
             1 = DHCP
             Scanner acquires IP, subnet, and gateway addresses from
             a DHCP/BOOTP server whenever it boots up.

Web Security

▼	Web Security	
☆ HTTPS		Disabled

HTTPS

Determines the security of your web environment.

IMPORTANT	Follow recommended network practices for products with network interfaces, such as communication ports or web servers. These practices help minimize risk or exposure by unauthorized activity or users. For more information, see:
	• Converged Plantwide Ethernet (CPwE) Design and Implementation Guide, publication ENET-TD001
	• Ethernet/IP Network Devices User Manual, publication ENET-UM006
	• Configure System Security Features User Manual, publication SECURE-UM001

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

Preamble

See <u>Preamble on page 61</u> for definitions.

▼	Preamble	
☆	Preamble	**Disabled**
☆	Preamble Characters	**<CR>**

Postamble

See <u>Postamble on page 61</u> for definitions.

▼	Postamble	
☆	Postamble	**Enabled**
☆	Postamble Characters	**<CR><LF>**

Read Cycle

Use the Read Cycle tab to address the spatial and timing parameters that are associated with your application.

General
Connection
Module Info
Internet Protocol
Port Configuration
Camera Setup
Read Cycle
2D Symbologies
1D Symbologies
1D Symbologies 2
I/O 1
I/O 2
Symbol Quality
Match String
Service Message

AOP View

Read Cycle

WebConnect View
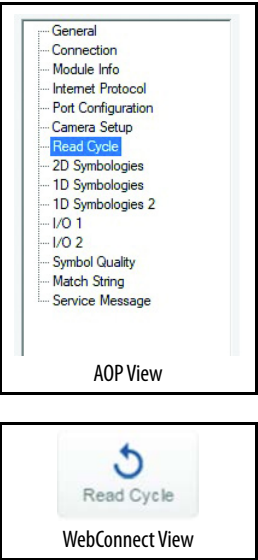
Multisymbol

Multisymbol is commonly used in shipping applications where a shipping symbol contains individual symbols for part number, quantity, and so on. This feature allows on trigger to pick up all symbols.

Figure 20 - AOP

Multisymbol

Number of Symbols: 1   Multisymbol Separator: ,   ...

Figure 21 - WebConnect

▼	Multisymbol	
☆	Number of Symbols	1
☆	Multisymbol Separator	,

This parameter allows you to define up to 100 symbols that can be read in one read cycle under the following conditions:

- Each symbol must be different to be read, unless in Rapid Capture mode, which is configured for triggered capture.
- The maximum number of characters in a read cycle is 3000 for all symbols.
- All No-Read messages are posted at the end of the data string, unless output filtering is enabled.
- If multiple symbols are within the field of view simultaneously, 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 code reader behaves as if Number of Symbols were set to 1, regardless of the user-defined configuration.

Number of Symbols

The number of different symbols that can be read in one read cycle.

- Default: 1
- Options: 1...100

Multisymbol Separator

Used to delimit or separate data fields with a user-defined character. This parameter can be any valid ASCII character, which is inserted between each symbol read when Multisymbol is set to any number greater than 1.

- Default: , <comma>
- Options: Any available ASCII character.

IMPORTANT	If No-Read messages are disabled and there are No-Reads occurring, separators are only inserted between symbol data outputs.

Trigger

Figure 22 - AOP

Figure 23 - WebConnect

Mode

The Trigger is the event that initiates a read cycle.

IMPORTANT	When the code reader is calibrated or the read rate is tested, the current trigger setting is disregarded.

- Default: Serial Data

- Options: 0 = Continuous Read
              1 = Continuous Read 1 Output
              2 = External Level
              3 = External Edge
              4 = Serial Data
              5 = Serial Data and Edge
              6 = Continuous Read Auto

  – Continuous Read

    Useful when you test symbol readability or code reader functions. It is not recommended for normal operations.

    In Continuous Read, trigger input options are disabled, the code reader is always in the read cycle, and it attempts to decode and transmit every capture. If one symbol stays within read range for multiple read cycles, its data is transmitted repeatedly until it leaves the read range.

    The code 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 code reader can take longer than the timeout to process a captured image.

    > **IMPORTANT**   Output and No-Read options have no effect on Continuous Read.

  – Continuous Read 1 Output

    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.

    In Continuous Read 1 Output, the code 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 1 second, the code reader sends the symbol data immediately and repeats the output at intervals of 1 second for as long as it continues to capture the symbol.

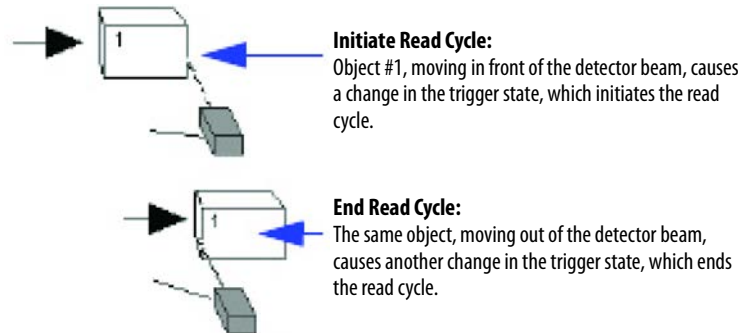   If End of Read Cycle is set to New Trigger, the code reader sends the current symbol data immediately, but only once. A new symbol that appears in the range of the code reader is read and sent immediately, provided it is not identical to the previous symbol.

    > ⚠ **ATTENTION:** In automated environments, Continuous Read 1 Output is not recommended because there is typically no reliable way to verify that a symbol was missed.

IMPORTANT	If Trigger Mode is set to Continuous Read 1 Output, the code reader behaves as if Number of Symbols were set to 1, regardless of the user-defined configuration.

– 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.
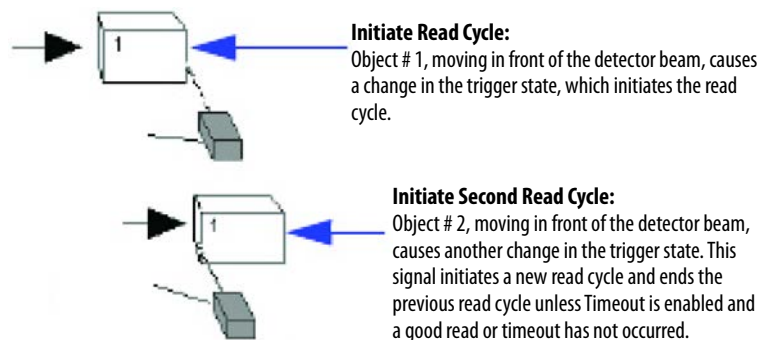
This mode is effective in an application where the conveying speeds are variable and the time the code reader spends reading each object is not predictable. It also helps you determine if a No-Read has occurred.

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.

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 that is associated with the appearance of an object. Falling edge is the trigger signal that is associated with the subsequent disappearance of the object. These definitions apply to both 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.

This mode is recommended in any application where conveying speed is constant, or if spacing, object size, or read cycle timeouts are consistent.

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 Data

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 when you must determine if a No-read has occurred.

In Serial Data, the code 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>.

IMPORTANT	In Serial Data, when a non-delimited start serial character is sent a read cycle starts; however, a non-delimited stop serial character has no effect.

– Serial Data and Edge

Serial Data or External Edge is seldom used but can be useful in an application that primarily uses an external sensing device but occasionally must be triggered manually.

In this mode, the code reader accepts either a serial ASCII character or an external trigger pulse to start the read cycle.

IMPORTANT	In Serial Data, when a non-delimited start serial character is sent a read cycle starts; however, a non-delimited stop serial character has no effect.

– Continuous Read Auto

Behaves identically to Continuous Read but maintains optimal self-adjusting photometry and focus parameters. As a result, the photometry parameters (Exposure and Gain) 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 Auto Focus Mode field is set to 1, and if there is a series of no-reads, this mode self-starts a focus pass. This mode also defines how many no-reads must occur before the focus pass starts.

Leading Edge

Used to ignore spurious triggers when Trigger Mode is set to External Edge or External Level. 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 code reader triggers 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 occurs.

- Default: 32 μs
- Options: 1…65,535 (trigger filter range: 32 μs…2.10 s)

Trailing Edge

Used to ignore spurious triggers when Trigger Mode is set to External Edge or External Level. 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 code reader triggers 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 is deemed inactive.

- Default: 32 μs
- Options: 1…65,535 (trigger filter range: 32 μs…2.10 s)

External Trigger State

Allows you to select the trigger polarity that is used in your application. Determines the active state of the trigger signal that is applied to the cable input of the code reader.

- Default: Active Closed
- Options: 0 = Active Open
             1 = Active Closed

End of Read Cycle

The read cycle is the time during which the code reader attempts to capture and decode a symbol. A timeout, a new trigger, or by the last frame in a capture sequence (or a combination these options), can end a read cycle.

Figure 24 - AOP

Figure 25 - WebConnect

Mode

IMPORTANT	When operating in Continuous Read or Continuous Read 1 Output, the code reader is always in the read cycle.

- Default: Timeout

- Options: 0 = Timeout
             1 = New Trigger
             2 = Timeout or new Trigger
             3 = Last Frame
             4 = Last Frame or New Trigger

– Timeout

   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 helps verify that a read cycle ends before the next symbol appears, which gives the system extra time to decode and transmit the data to the host.

   Timeout ends the read cycle, which causes the code reader to stop reading symbols and send the symbol data or No-Read message when the time set in Timeout elapses (times out), if When to Output is set to End of Read Cycle.

   If in Continuous Read 1 Output, a timeout initiates a new read cycle and allows the same symbol to be read again.

   With External Edge, Serial Data, or Serial Data or External Edge enabled, a timeout ends the read cycle and symbol data or a No-Read message is sent to the host.

   With External Level enabled, the read cycle does not end until the falling edge trigger occurs or a timeout occurs. The next read cycle does not begin until the next rising edge trigger.

– New Trigger

New Trigger is an effective way to end a read cycle when objects move past the code reader at irregular intervals (not timing-dependent).

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.

With 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

Useful in applications that require an alternative way to end the read cycle. For example, if an assembly line must stop or the intervals between objects are highly irregular.

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

Useful in applications in which the number of captures that are needed can be defined but the timeout duration varies.

Last Frame only applies to Rapid Capture Mode.

– Last Frame or New Trigger

Useful in applications in which line speeds are irregular and a new labeled object could appear before the last frame in a Rapid Capture sequence.

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

Read Cycle Timeout is the duration of the read cycle.

- Default: 500 ms
- Options: 1...65535

Decodes Before Output

This value specifies the number of times a symbol must be read to qualify as a good read.

- Default: 1
- Options: 1...255

Capture Mode

Capture Mode relates to the way that images are captured and processed.

Figure 26 - AOP

Figure 27 - WebConnect

Capture Mode

- Default: Continuous

- Options: 0 = Rapid Capture
   1 = Continuous

    – Rapid Capture

      In a rapid capture mode, one or multiple captures (as many as 32) can be taken at an interval that the time-between-captures parameter specifies. In this mode, the only limiting time factor is integration and transfer timing.

    – Continuous

      Continuous mode is useful in applications with slower line speeds or where symbol spacing is random or not time dependent.

      In Continuous mode, image captures are taken throughout the read cycle in a multi-buffered format (see Figure 28). The code reader begins processing the first captured image simultaneously with the capture of the second image. Captures continue to occur throughout the read cycle until an end condition occurs. End conditions can be a timeout, a new trigger, the last frame in a capture sequence, or a combination of the previous options.

Figure 28 - Continuous Mode Image Capture
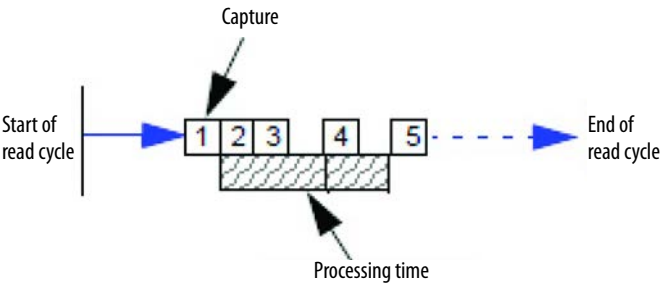
Number of Captures

Number of Captures is used to specify the number of captures to be processed in Rapid Capture Mode.

Sets the total number of captures that are processed during a read cycle in Rapid Capture Mode. This feature is used with Capture Timing parameters to specify the capture sequence of a rapid capture read cycle.

- Default: 1
- Options: 1...255

IMPORTANT	The range of maximum number of captures is dynamic. This range is dependent on the maximum image size in the system. A full-size image (1280 x 1024) reduces the maximum number of images to 6. The smaller the image size, the greater the maximum number of captures. Once the image size is reduced to small enough dimensions, the maximum number of captures are capped at 64.
	If you enter a maximum capture value greater than that allowed, the value is limited to the number of system images. This command also affects the number of stored images that are allowed in the system. If the maximum number of captures is selected, the number of stored images that are allowed is 0.

Rapid Capture Mode

In Rapid Capture Mode, one or multiple captures (as many as 32) can be taken at an interval that the time-between-captures parameter specifies. In this mode, the only limiting time factor is integration and transfer timing.

- Default: Timed Capture
- Options: 0 = Timed Capture
            1 = Triggered Capture

  – Timed Capture

    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.

    In Timed Rapid Capture, decoding occurs independent of and simultaneous with capturing, which allows precise timing or no delay between captures. Also, consecutive captures are regarded as the same symbol if the output data is the same.

Figure 29 - Timed Capture
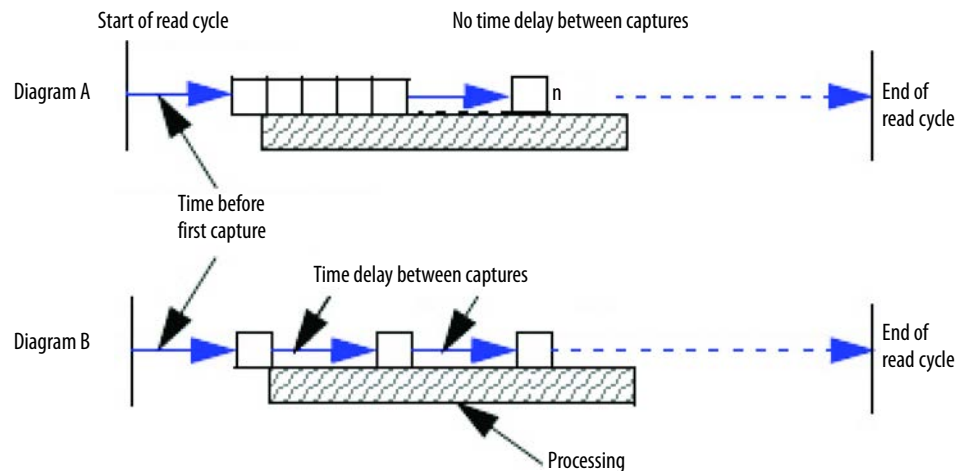
– Triggered Capture

Useful in applications where each decode must be treated as a discrete event, regardless of symbol data.

The first trigger event starts the read cycle, and subsequent triggers continue until the predetermined Number of Captures is met, or until the predetermined End of Read Cycle condition is met — whichever occurs first.

IMPORTANT	If End of Read Cycle is set for New Trigger and the read cycle qualifications have not been met, the read cycle only ends once it receives the first trigger after reaching the predetermined Number of Captures setting.

Figure 30 - Triggered Capture
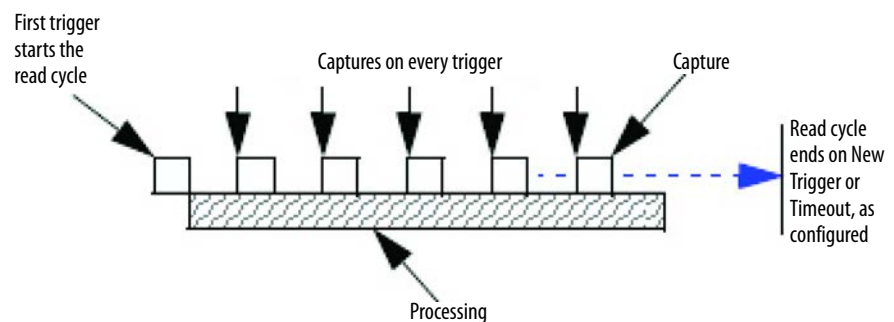
Number of Continuous Captures

Specifies the number of captures to process in Continuous Capture mode.

- Default: 2
- Options: 1 and 255

Images Per Read Cycle Limit

Specifies the number of captures to process in a read cycle.

- Default: 5
- Options: 3 and 255

Read Cycle History

Specifies the number of images that can be stored in read cycle history.

- Default: 10
- Options: 0 and 255

Capture Time

Figure 31 - AOP

Figure 32 - WebConnect

Time before First Capture

In almost any moving line application, a time delay is required to confirm that a symbol is in the field of view of the code reader at the beginning of the capture sequence.

Time Before First Capture in a moving line application is the time between an external trigger event and the occurrence of the first capture.

- Default: 0
- Options: 0...65,535 (2.097 seconds, in 32 µs increments)

Figure 33 - Time before First Capture
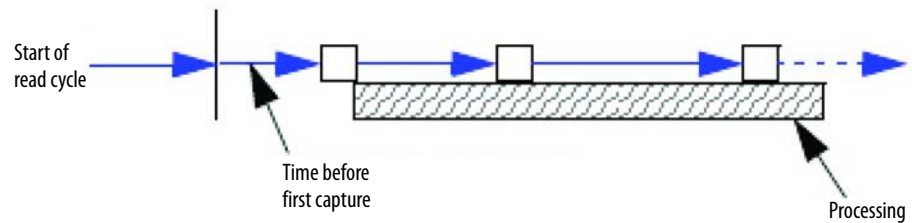
Time between Captures 1…8

This option is useful in applications where multiple symbols can appear during one read cycle (multisymbol). It is also useful where line speeds are slow enough that captured frames can overlap or miss a symbol.

A time delay can be inserted between individual frame captures in Rapid Capture Mode. If you enter zeros, the result is no time between captures. If you enter a different value in each field, the time delay varies accordingly.

- Default: 0
- Options: 0...65,535 (2.097 seconds, in 32 μs increments)

IMPORTANT	If the code reader is configured to capture more than eight images, the last (or eighth) delay value is repeated for the remaining captures.

Figure 34 - Time between Captures
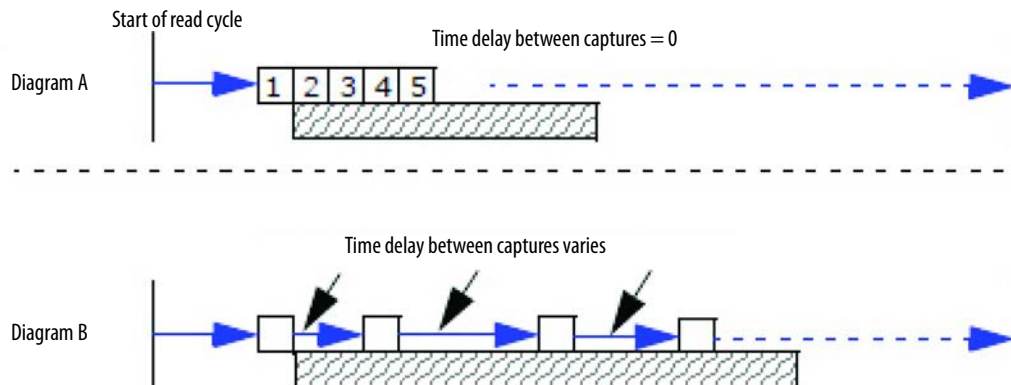
Store No Read Image

Figure 35 - AOP

Store No Read Image
☐ Store Image on No Read   ☐ Store Last Image

Figure 36 - WebConnect

Store No Read Image	
☆ Image Storage Type	**Disabled**
☆ Image Storage Mode	**First Image**

Store Image on No Read (AOP)/Image Storage Type (WebConnect)

Allows you to store images from separate read cycles and retrieve them later. The number of available slots for storage depends on the mode of operation. If the code 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 code reader is in Continuous Capture Mode, a number of images equivalent to the maximum number of the rapid count minus 3.

- Default: Checkbox cleared/Disabled
- Options: 0 = Checkbox cleared/Disabled
             1 = Store on No-read

  – Checkbox cleared/Disabled

    Upon selection of this option, all saved images are cleared and the code reader does not store images for later viewing.

  – Store on No-read

    This option causes the code reader to store an image upon exiting the read cycle for retrieval later. If multiple captures are present during the duration of a read cycle, the stored image is the last image that is processed for that read cycle. This image is stored in RAM and can be retrieved as long as power is not cycled to the code reader and as long as the code 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 code reader in a test capture mode.

Store Last Image (AOP)/Image Storage Mode (WebConnect)

- Default: Checkbox cleared/First Mode
- Options: 0 = Checkbox cleared/First Mode
             1 = Last Mode

  – Checkbox cleared/First Mode

    This mode allows the code reader to store images until the available image memory has been filled. At that point, the code reader stops saving additional images. In this mode, you always have the first image that is 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 always have the most recent stored image.

Image Processing Settings

Figure 37 - AOP


Figure 38 - WebConnect

Image Processing Timeout

Useful in higher speed applications where image-processing time is long enough that not all captures have an opportunity to be processed. 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 and with the Configuration Database.

IMPORTANT	The timeout period excludes capture time. If a timeout occurs during processing and no symbols in the field of view have been decoded, the image is recorded as a No Read. For this reason, a longer timeout must be tried to allow the symbol to decode successfully.

- Default: 5000 ms (5 s)
- Options: 1...65,535 (in 1 ms increments)

Symbologies

AOP View

WebConnect View
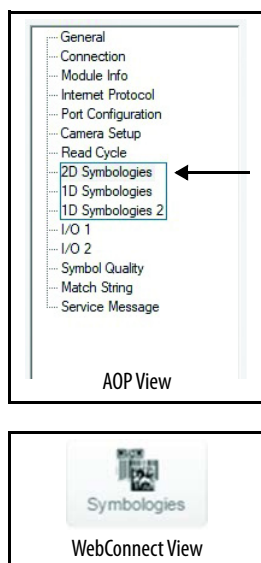
Use the Symbology displays/tab to determine the various symbol types that your 48CR code reader decodes.

Data Matrix

Useful where information must be packed into a small area, and/or where symbols must be applied directly to the substrate with laser etching, chemical etching, dot peen, or other methods.

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...144x144. Some symbols, however, are rectangular, with sizes from 8x18...16x48. All ECC 200 symbols are recognized by the upper-right corner module being light (binary 0) instead of dark.

Figure 39 - AOP — 2D Symbologies

Figure 40 - WebConnect

ECC 200 Status

When enabled, decodes ECC 200 Data Matrix symbols.

- Default: Enabled[1]

- Options: 0 = Disabled
            1 = Enabled

(1) This symbol type is the only one that is enabled by default.

ECC 000 Status

When enabled, decodes ECC 000 symbols.

- Default: Disabled

- Options: 0 = Disabled
            1 = Enabled

ECC 050 Status

When enabled, decodes ECC 050 symbols.

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

ECC 080 Status

When enabled, decodes ECC 080 symbols.

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

ECC 100 Status

When enabled, decodes ECC 100 symbols.

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

ECC 140 Status

When enabled, decodes ECC 140 symbols.

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

ECC 120 Status

When enabled, decodes ECC 120 symbols.

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

ECC 130 Status

When enabled, decodes ECC 130 symbols.

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

QR Code

QR Code can handle numeric, alphanumeric, and byte data along with kanji and kana characters. Up to 7366 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, which lowers the cost of labeling.

Three Position Detection Patterns in the symbol make omni-directional, 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.

QR Codes are widely implemented in the Japanese automotive industry and throughout their worldwide supply chain.

Figure 41 - AOP — 2D Symbologies

QR Code
☑ Enabled

Figure 42 - WebConnect

▼	QR Code	
☆	QR Code	**Enabled**

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

Micro QR Code

Micro QR Code is a 2D matrix symbology that comes in four different symbol sizes, the largest capable of encoding 35 numeric characters.

Micro QR Codes are used in various applications that require higher data density than that provided by standard QR Code. Some application examples are automotive inventory, vehicle ID, and mobile phone URL encoding.

Figure 43 - AOP — 2D Symbologies

Micro QR Code
☑ Enabled

Figure 44 - WebConnect

▼	Micro QR Code	
☆	Micro QR Code	**Enabled**

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

Aztec

A 2D matrix symbology that is built on a square grid with a square bullseye pattern at the center. Aztec can encode up to 3832 numeric or 3067 alphabetical characters, or 1914 bytes of data.

The level of Reed-Solomon error correction that is used with Aztec is configurable, from 5...95% of the total data region. The recommended error correction level is 23% of symbol capacity plus codewords.

Used in document imaging, railway ticket validation, and some postal applications.
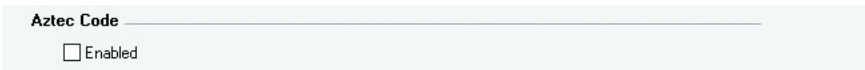
Figure 45 - AOP — 2D Symbologies

Figure 46 - WebConnect

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

DotCode

IMPORTANT	When DotCode is enabled, no other symbologies are decodable. You must disable DotCode to decode symbols of any other type.

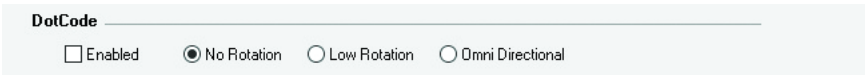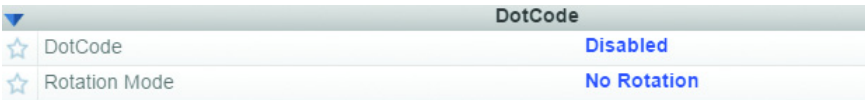**Figure 47 - AOP — 2D Symbologies**

Figure 48 - WebConnect


DotCode

This parameter enables or disables the decoding of DotCode symbols.

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

Rotation Mode

This parameter provides you with horizontal and vertical symbol angle options for reading DotCode symbol types.

- Default: No Rotation

- Options: 0 = No Rotation
           1 = Low Rotation
           2 = Omni-directional

  – No Rotation

    The code reader decodes horizontal and vertical symbols (±3°).

  – Low Rotation

    The code reader decodes ±10° from the horizontal or vertical symbols. It is slightly slower than the No Rotation option.

  – Omni-directional

    The code reader supports 360° reading. Omni-directional is much slower than no or low rotation.
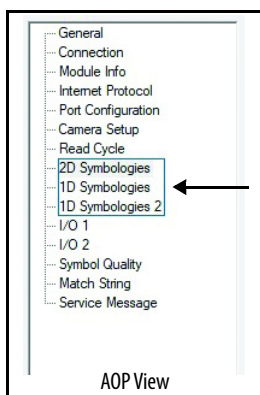
Code 39

Code 39 is considered the standard for non-retail 1D symbology. An alphanumeric symbology with unique start/stop code patterns, which are composed of nine black and white elements per character, of which three are wide.

Figure 49 - AOP — 1D Symbologies

Figure 50 - WebConnect

Enabled (AOP)/Code 39 (WebConnect)

- Default: Enabled

- Options: 0 = Disabled
           1 = Enabled

AOP View

WebConnect View

Check Character Status

This option is not typically used, but it can be enabled for additional security in applications where the host requires redundant check character verification. An error correcting routine in which the check character is added.

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

Check Character Output Status

Check Character Output Status, added to the symbol, provides additional data security. When enabled, the provided character is read and compared along with the symbol data. When disabled, symbol data is sent without the check character.

IMPORTANT	When the Check Character Output Status and an External or Serial trigger option is enabled, an invalid check character calculation causes a No-Read message to be transmitted at the end of the read cycle.

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

Large Intercharacter Gap

Large Intercharacter Gap is helpful for reading symbols that are printed out of specification. When enabled, the code reader can read symbols with gaps between symbol characters that exceed three times (3x) the narrow element width.

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

Fixed Symbol Length Status

When enabled, the code reader checks the symbol length against the symbol length field. If disabled, any length is considered valid.

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

Fixed Symbol Length

Fixed Symbol Length helps prevent truncations and increases data integrity by verifying that only one symbol length is accepted. Specifies the exact number of characters that the code reader recognizes (this number excludes check character, start, and stop characters). The code reader ignores any symbology that does not match the specified length.

- Default: 10
- Options: 1...64

Full ASCII Set

Must be enabled when reading characters outside the standard character set (0...9, A...Z, and so on). You must know in advance whether to use the Full ASCII Set option. Since Full ASCII Set requires two code words to encode one character, it is less efficient. Standard Code 39 encodes 43 characters; 0...9, capital letter (A...Z), minus symbol, plus symbol, forward slash, space, decimal point, dollar sign, and percent symbol. When Full ASCII Set is enabled, the code reader can read the full ASCII character set, from 0...255.

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

Code 128

Code 128 is a smaller symbology useful in applications with tight spots and high security needs. A dense alphanumeric symbology. It encodes all 128 ASCII characters, it is continuous, has variable length, and uses multiple element widths measured edge-to-edge.

Figure 51 - AOP — 1D Symbologies

Figure 52 - WebConnect

Enabled (AOP)/Code 128 (WebConnect)

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

Fixed Symbol Length Status

When enabled, the code reader checks the symbol length against the symbol length field. If disabled, any length is considered a valid symbol.

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

Fixed Symbol Length

Fixed Symbol Length helps prevent truncations and increases data integrity by verifying that only one symbol length is accepted. This parameter specifies the exact number of characters that the code reader recognizes (this number excludes check character, start, and stop characters). The code reader ignores any symbol not having the specified length.

- Default: 10
- Options: 1...64

EAN Status

When this field is disabled, the code reader does not check any Code 128 labels for conformance to EAN requirements, or perform any special formatting.

When enabled, the code 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 are also subject to the special output formatting options available in this command.

IMPORTANT	Code 128 status must be enabled for EAN status to be active. If EAN status is required, the code reader only decodes symbols that have a function 1 character in the first position and that conform to EAN format. All symbol reads are subject to the special output formatting options available in this command.

- Default: Disabled
- Options: 0 = Disabled
             1 = Enabled
             2 = Required

Output Format

In Standard, the code reader does not apply special EAN output formatting options.

In Application, the code reader applies the special EAN output formatting options to decoded EAN-conforming symbols.

- Default: Standard
- Options: 0 = Standard
             1 = Application

Application Record Separator Status

When enabled, an EAN separator is inserted into the output between fields whenever an EAN-conforming symbol is decoded and EAN output formatting applies.

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

Application Record Separator Character

An ASCII character that serves as an EAN separator in formatted EAN output.

- Default: , <comma>
- Options: Any ASCII character (7 bit)

Application Record Brackets

If an EAN-conforming symbol is decoded and EAN formatting applies, this feature places bracket characters around the application identifiers in the formatted output.

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

Application Record Padding

This parameter causes the code reader to pad variable-length application fields with leading zeros. Zeros are not added to the last field of a symbol.

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

BC412

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 four bars in 12 module positions. All bars have one width; it is the presence (1) or absence (0) of bars in each of the 12 module positions that make BC412 binary.

This symbology is also bidirectional and self-clocking, with a start character and a stop character.

BC412 is widely used in semiconductor manufacturing. Useful where speed, accuracy, and ease of printing are required.

Figure 53 - AOP — 1D Symbologies

Figure 54 - WebConnect

Enabled (AOP)/BC412 (WebConnect)

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

Check Character Output

Check Character Output, added to the symbol, provides additional security. 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.

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

Fixed Symbol Length Status

When enabled, the code reader checks the symbol length against the symbol length field. If disabled, any length is considered valid.

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

Fixed Symbol Length

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.

- Default: 10
- Options: 1…64

Interleaved 2 of 5

Interleaved 2 of 5 has been popular because it is the most dense symbology for printing numeric characters fewer than 10 characters in length. However, we do not recommend this symbology for any new applications because of inherent problems such as truncation.

A dense, continuous, self-checking, numeric symbology. Characters are paired together so that each character has five elements (two wide and three narrow) that represent numbers 0…9. The bars represent the first character and the interleaved spaces represent the second character. (A check character is highly recommended).

Figure 55 - AOP — 1D Symbologies

Figure 56 - WebConnect

Interleaved 2 of 5

IMPORTANT	You must set Symbol Length to decode Interleaved 2 of 5 symbols, unless Range Mode is enabled.

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

Check Character Status

This option is not typically used, but it can be enabled for additional security in applications where the host requires redundant check character verification. An error correcting routine in which the check character character is added.

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

Check Character Output Status

When enabled, a check character character is sent along with the symbol data for added data security.

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

Symbol Length #1

Useful in applications where Interleaved 2 of 5 symbols of a specific length are required. The Symbol Length #1 field is one of two fields against which the decoded symbol is compared before it is accepted as valid or rejected.

- Default: 16
- Options: 0...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

Useful in applications where Interleaved 2 of 5 symbols of a specific length are required. The Symbol Length # 2 field is one of two fields against which the decoded symbol is compared before it is accepted as valid or rejected.

- Default: 6
- Options: 0...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

Useful when Interleaved 2 of 5 multisymbols are enabled to help prevent false data output, which typically occurs with highly tilted or skewed symbols.

A guard bar is a heavy bar (at least twice the width of the wide bar) that surrounds the printed Interleaved 2 of 5 symbol and helps prevent false reads.

IMPORTANT	Whenever Guard Bar is enabled, the presence of guard bars (also called bearer bars) is required for decoding to take place.

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

Range Mode Status

Useful in applications where Interleaved 2 of 5 symbols of a specific length are required.

When Range Mode is disabled, the code 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.

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

Codabar

Codabar is a 16-bit character set (0...9, and the characters $, :, /, ., +, and –) with start/stop codes and at least two distinctly different bar widths.

Codabar is used in photo-finishing and library applications. Previously, it was used in medical applications, but not typically in newer medical applications.

Figure 57 - AOP — 1D Symbologies

Figure 58 - WebConnect

Enabled (AOP)/Codabar (WebConnect)

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

Start and Stop Match Status

When disabled, the code reader decodes Codabar symbols regardless if the start and stop characters are the same or not.

When enabled, the code reader does not decode Codabar symbols unless the start and stop characters are the same.

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

Start and Stop Output Status

When disabled, the start and stop characters are not present in the data output of the decoded symbol.

When enabled, the start and stop characters are present in the data output of the decoded symbol.

- Default: Enabled [1]
- Options: 0 = Disabled
             1 = Enabled

(1)   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.

Large Intercharacter Gap

When disabled, the spaces between characters (the intercharacter gap), are ignored during the decode process.

IMPORTANT	If the intercharacter space is large enough to be considered a margin, the symbol does not decode, regardless of the setting of this parameter.

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

Fixed Symbol Length Status

When disabled, the code reader accepts any Codabar symbol provided it does not exceed the maximum capabilities of the system.

When enabled, the code reader rejects any Codabar symbol that does not match the fixed length.

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

Symbol Length

The value against which all Codabar symbol lengths are compared.

- Default: 10
- Options: 1...64

Check Character Type

When disabled, the code reader does not perform any character checking calculations on decoded Codabar symbols.

When set to Mod 16, the code reader performs a modulus 16 check character calculation on the symbol. If the symbol does not pass this calculation, it is not decoded.

When set to NW7, the code reader performs an NW7 modulus 11 check character calculation on the symbol. If the symbol does not pass this calculation, it is not decoded.

When set to Mod 16 and NW7, the code reader performs both the Mod 16 and NW7 modulus 11 check character calculations on the symbol. If the symbol does not pass either calculation, it is not decoded.

- Default: Disabled
- Options: 0 = Disabled
             1 = Mod 16
             2 = NW7 (Mod 11)
             3 = Mod 16 and NW7

Check Character Output (Codabar)

When this field is disabled and a check character calculation is enabled, the code reader strips 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 code reader outputs the check character as part of the symbol data. This condition must be accounted for if a fixed length is also being used.

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

UPC/EAN

UPC (Universal Product Code) is a fixed length, numeric, continuous symbology. UPC can have two- or five-digit supplemental barcode 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.

UPC/EAN is used primarily in point-of-sale applications in the retail industry. It is commonly used with code 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.

Figure 59 - AOP — 1D Symbologies

Figure 60 - WebConnect

Enabled (AOP)/UPC/EAN (WebConnect)

When enabled, the code reader reads UPC Version A and UPC Version E only.

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

EAN Status

EAN is the European version of the UPC symbology and is used in European market applications.[1]

EAN is a subset of UPC. When enabled, the code reader reads 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 the transmission of 13 digits when reading UPC Version A symbols is not desired, disable EAN.[2]

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

Supplementals Status

Reads supplementals that are typically used in publications and documentation. A supplemental is a 2-…5-digit symbol that is appended to the main symbol.

When set to Enabled or Required, the code reader reads supplemental code data that has been appended to the standard UPC or EAN codes.

---

(1)   UPC must be enabled for EAN to take effect.
(2)   The extra character identifies the country of origin.

- Default: Disabled

- Options: 0 = Disabled
  1 = Enabled
  2 = Required

  – Disabled

    UPC supplementals are not decoded.

  – Enabled

    When enabled, the code reader tries to decode a main and a supplemental. However, if a supplemental is not decoded, the main is 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 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.

IMPORTANT Under no circumstances can the supplemental symbol data be sent without a main symbol.

IMPORTANT If additional symbols—other than the main or supplemental—are read in the same read cycle, Number of Symbols must be set accordingly.

Separator Status

Allows you to distinguish between the main and Supplemental symbols. A character can be inserted between the standard UPC or EAN symbology and the supplemental symbology when Supplementals is set to Enabled or Required.

- Default: Disabled

- Options: 0 = Disabled
  1 = Enabled

Separator Character (UPC/EAN)

Allows you to change the separator character from a comma to a new character. Used as required by the application.

IMPORTANT	If Separator Character has been changed to any other character and you wish to redefine the separator as a comma, you must use ESP.

- Default: , <comma>
- Options: Any ASCII character.

IMPORTANT	Whenever Separator Character is defined as a comma (,) it returns the current settings, including the separator character comma that appears after the separator status comma.

Supplemental Type

Allows you to select two-character or five-character supplements, or both. Used as required by symbology that is used in application.

- Default: Both
- Options: 0 = Both
              1 = Two Characters Only
              2 = Five Characters Only

   – Both

     Either two character or five character supplementals are considered valid.

   – Two Characters Only

     Only two character supplementals are considered valid.

   – Five Characters Only

     Only five character supplementals are considered valid.

UPC-E as UPC-A

When disabled, the code reader outputs the version E symbols in their encoded 6-character format.

When enabled, the code reader formats 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.

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

Code 93

Code 93 is a variable-length, continuous symbology that employs four element widths. Each Code 93 character has nine modules that can be either black or white. Each character contains three bars and three spaces. Sometimes used in clinical applications.

Figure 61 - AOP — 1D Symbologies

Figure 62 - WebConnect

Enabled (AOP)/Code 93 (WebConnect)

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

Fixed Symbol Length Status

When disabled, the code reader accepts any Code 93 symbol provided it does not exceed the maximum capabilities of the system.

When enabled, the code reader rejects any Code 93 symbol that does not match the fixed symbol length.

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

Symbol Length

The symbol length value against which all Code 93 symbols are compared.

- Default: 10
- Options: 1...64

Pharmacode

Encodes up to five different numbers, each with its own color, which can 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.

Used mostly with packaging for the pharmaceuticals industry.

Figure 63 - AOP — 1D Symbologies

Pharmacode						
☐ Enabled	☐ Fixed Symbol Length Status	☐ Reverse Direction	☑ Black Background	Bar Width:	Mixed	▽
	Symbol Length: 5	Minimum Bars: 4	Fixed Threshold: 10			

Figure 64 - WebConnect

▼	Pharmacode	
☆	Pharmacode	Disabled
☆	Fixed Symbol Length Status	Disabled
☆	Symbol Length	5
☆	Minimum Bars	4
☆	Bar Width Status	Mixed
☆	Direction	Forward
☆	Fixed Threshold Value	10
☆	Background Color	White

Enabled (AOP)/Pharmacode (WebConnect)

IMPORTANT   When Pharmacode is enabled, other linear symbologies do not decode properly. Disable Pharmacode before reading other linear symbologies.

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

Fixed Symbol Length Status

When enabled, the code reader checks the symbol length against the symbol length field. If disabled, any length is considered valid.

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

Symbol Length

Specifies the exact number of bars that must be present for the code reader to recognize and decode the Pharmacode symbol.

- Default: 5
- Options: 1...16

Minimum Bars

Sets the minimum number of bars that a Pharmacode symbol must have to be considered valid.

- Default: 4
- Options: 1...16

Bar Width (AOP)/Bar Width Status (WebConnect)

If set to Mixed, the code reader autodiscriminates between narrow bars and wide bars. If set to All Narrow, all bars are considered as narrow bars. If set to All Wide, all bars are considered as wide bars. If set to Fixed Threshold, the code reader uses the fixed threshold value to determine whether the bars are narrow or wide. The Bar Width Status setting is ignored when the code reader is able to tell the difference between the narrow and the wide bars.

- Default: Mixed
- Options: 0 = Mixed
             1 = All Narrow
             2 = All Wide
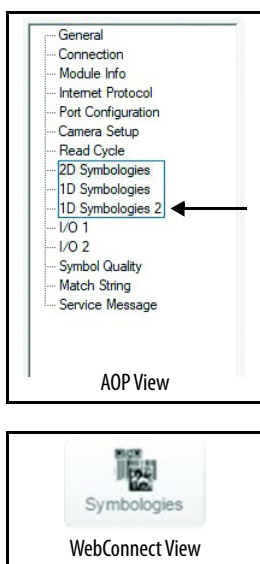   3 = Fixed Threshold

Direction

Specifies the direction in which a symbol can be read.

- Default: Forward
- Options: 0 = Forward
             1 = Reverse

Fixed Threshold Value

Used when Bar Width Status is set to Fixed Threshold. Defines the minimum difference in pixels that distinguishes a narrow bar from a wide bar.

- Default: 10
- Options: 1...65,535

AOP View

WebConnect View

DataBar Expanded

DataBar Expanded is a variable length symbology that can encode supplementary information and the 14-digit EAN item identification number. It can also encode up to 74 numeric or 41 alphabetic characters.

Used to encode primary and supplementary data in retail point-of-sale and other applications.

Figure 65 - AOP — 1D Symbologies 2

Figure 66 - WebConnect

Enabled (AOP)/DataBar Expanded (WebConnect)

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

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

Fixed Symbol Length Status

When enabled, the code reader checks the symbol length against the symbol length field, minus the embedded check character. If disabled, any length is considered valid.

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

Fixed Symbol Length

Fixed Symbol Length helps prevent truncations and increases data integrity by verifying that only one symbol length is accepted.

Specifies the exact number of characters that the code reader recognizes (this number excludes check character, start, and stop characters). The code reader ignores any symbol not having the specified length.

- Default: 14
- Options: 1…74

DataBar Limited

Encodes a smaller 14-digit symbol (74 modules wide) that is not omni-directional. Laser and CCD readers can read DataBar Limited. It is not recommended for omni-directional slot scanners.

Figure 67 - AOP — 1D Symbologies 2

Figure 68 - WebConnect

Enabled (AOP)/DataBar Limited (WebConnect)

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

DataBar Omnidirectional

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.

Used in the grocery, retail, and prescription drug industries where 14-digit EAN item identification is required.

Figure 69 - AOP — 1D Symbologies 2

DataBar Omnidirectional
☑ Enabled

Figure 70 - WebConnect

DataBar Omnidirectional	
☆ DataBar Omnidirectional	**Enabled**

Enabled (AOP)/DataBar Omnidirectional (WebConnect)

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

Postal Symbologies

IMPORTANT	Postal Symbologies must have a minimum pixels-per-element value of 4 to be decoded reliably by the 48CR code reader.

The code reader must be configured to specific read range, field of view, and camera parameters before postal symbologies can be decoded.

For optimal decode results, position the symbol as close to the center of the field of view of the code reader as possible.

Figure 71 - AOP — 1D Symbologies 2

Postal Symbologies
☐ Enabled ☑ POSTNET Status ☑ PLANET Status ☑ USPS4CB Status   Type: Disabled ▾

Figure 72 - WebConnect

Postal Symbologies	
☆ Postal Symbologies	**Disabled**
☆ POSTNET Status	**Enabled**
☆ PLANET Status	**Enabled**
☆ USPS4CB Status	**Enabled**

Type (AOP)/Postal Symbologies (WebConnect)

Determines the postal symbology that the code reader decodes.

The following 1D Postal Symbologies are used in mail sorting, auditing, certified mail, registered mail, metered mail, and point-of-sale (POS) applications.

- Default: Disabled

- Options: 0 = Disabled
            1 = U.S. Post (POSTNET, PLANET, USPS4CB)
            2 = Australia Post
            3 = Japan Post
            4 = Royal Mail
            5 = KIX
            6 = UPU

    – U.S. Post (POSTNET, PLANET, USPS4CB)

    When U.S. Post is enabled, the code reader only decodes 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, the code reader does not decode symbols of that type even when U.S. Post is enabled.
>
> For example, if U.S. Post is enabled but POSTNET Status is disabled, the code reader does not decode POSTNET symbols.

    See POSTNET Status, PLANET Status, and DataBar Expanded for more detail about U.S. Post symbologies.

    – Australia Post

    When Australia Post is enabled, the code reader only decodes Australia Post symbols.

    – Japan Post

    When Japan Post is enabled, the code reader only decodes Japan Post symbols.

    – Royal Mail

    When Royal Mail is enabled, the code reader only decodes Royal Mail symbols.

    – KIX

    When KIX is enabled, the code reader only decodes KIX symbols.

    – UPU

    When UPU is enabled, the code reader decodes UPU symbols. For example, if Postal Symbology Type is set to UPU and POSTNET Status is enabled, the code reader attempts to decode both UPU and POSTNET symbols.

POSTNET Status

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, which makes 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.

If U.S. Post and POSTNET Status are both enabled, the code reader decodes POSTNET symbols.

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

PLANET Status

PLANET (Postal Alphanumeric Encoding Technique) is a symbology that is 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, which makes PLANET a 2-state symbology. The symbol always starts and ends with a full-height bar (guard rail), and a set of five bars in which two of the bars are always short represents each individual digit.

If U.S. Post and PLANET Status are both enabled, the code reader decodes PLANET symbols.

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

USPS4CB Status

USPS4CB, also called Intelligent Mail, is used by the United States Postal Service to sort and track individual items and 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 symbol height and width flexibility.

Data is encoded in four types of bars (states), where a name and a value identifies each. This type of postal symbol is known as 4-state. Each bar has a tracker (middle section), to which an ascender (top section) or descender (bottom section) can 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 various media, including dot matrix, inkjet, and laser.

If U.S. Post and USPS4CB Status are both enabled, the code reader decodes USPS4CB symbols.

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

PDF417

Used in applications where a large amount of information (over 32 characters) must be encoded within a symbol, typically where the symbol is transported from one facility to another. For example, an automobile assembly line can use one symbol with multiple fields of information that is read at several stations along the way, without reference to a database.

A two-dimensional, multi-row (3...90), continuous, variable length symbology that has high data capacity for storing up to 2700 numeric characters, 1800 printable ASCII characters, or 1100 binary characters per symbol. Each symbol character consists of four bars and four spaces in a 17-module structure.

Figure 73 - AOP — 1D Symbologies 2

Figure 74 - WebConnect

Enabled (AOP)/PDF417 (WebConnect)

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

Fixed Symbol Length Status

When enabled, the code reader checks the symbol length against the symbol length field, minus the embedded check character. If disabled, any length is considered valid.

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

Fixed Symbol Length

Used to increase data integrity by verifying that only one symbol length is accepted.

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 code reader ignores any symbol without the specified length.

- Default: 10
- Options: 1...2710

> **IMPORTANT**   Fixed Symbol Length Status must be enabled for Fixed Symbol Length to take effect.

Micro PDF417

Used for labeling small items that need big data capacity.

A variant of PDF417, an efficient and compact stacked symbology that can encode up to 250 alphanumeric characters or 366 numeric characters per symbol.

Figure 75 - AOP — 1D Symbologies 2

Figure 76 - WebConnect

Enabled (AOP)/Micro PDF417 (WebConnect)

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

Fixed Symbol Length Status

When enabled, the code reader checks the symbol length against the symbol length field, minus the embedded check character. If disabled, any length is considered valid.

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

Fixed Symbol Length (MicroPDF417)

Used to increase data integrity by verifying that only one symbol length is accepted.

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 code reader ignores any symbol without the specified length.

- Default: 10
- Options: 1...366

IMPORTANT	Fixed Symbol Length Status must be enabled for Fixed Symbol Length to take effect.

Composite

Allows reading by both linear and 2D code readers.

Combines 2D and linear width-modulated symbology on the same symbol where each code reader type can read different messages.

Figure 77 - AOP — 1D Symbologies 2

Figure 78 - WebConnect

Enabled (AOP)/Composite (WebConnect)

When set to Enabled or Required, decodes 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.

- Default: Disabled
- Options: 0 = Disabled
             1 = Enabled
             2 = Required

  – Enabled

    The code reader decodes both the 2D composite and linear components. However, if the 2D composite component is not decoded, the linear data is sent by itself at the end of the read cycle.
  – Required

    The code reader must decode both components, or a No-Read occurs.

Separator Status

Allows you to distinguish between the main and Supplemental symbols.

Separates the linear and the composite component.

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

Separator Character

> **IMPORTANT**   The Separator Character is the same as the character defined in the Multisymbol Separator field of the command.

Allows you to change the separator character from a comma to a new character. Used as required by the application.

- Default: , <comma>
- Options: Any ASCII character.
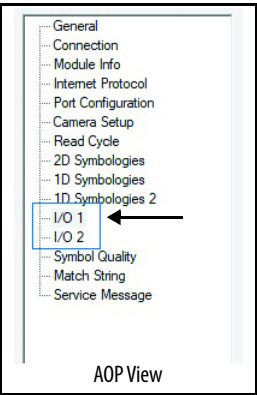
Linear Security Level

This parameter is intended to help prevent misreads. When it is set to a higher level, it requires more scan lines to decode the same result, which makes it more secure.

Figure 79 - WebConnect [1]

Linear Security Level	
☆ Linear Security Level	**Aggressive**

- Default: Aggressive
- Options: 0 = Aggressive
            1 = Normal
            2 = Secure

I/O

General
Connection
Module Info
Internet Protocol
Port Configuration
Camera Setup
Read Cycle
2D Symbologies
1D Symbologies
1D Symbologies 2
I/O 1
I/O 2
Symbol Quality
Match String
Service Message

AOP View

I/O

WebConnect View

Use the I/O diplays/tab to create conditions for changing input/output electrical transitions for control of internal and external devices of the code reader. A digital I/O (in/out) signal is an electrical transition from one voltage level to another so that digital switching can occur.

Symbol Data Output

IMPORTANT	Symbol Data Output relates to data and must not be confused with Outputs 1, 2, and 3 listed in the Output Parameters that describe output states and functions.

Figure 80 - AOP

Symbol Data Output
Symbol Output Data: Any Good Read   ☐ Include Symbology Identifier
When to Output Symbol Data: As Soon As Possible

Figure 81 - WebConnect

Symbol Data Output	
☆ Symbol Data Output	**Any Good Read**
☆ When to Output Symbol Data	**As Soon As Possible**
☆ Include Symbology Identifier	**Disabled**

(1) The Linear Security Level parameter is available in WebConnect view only.

Symbol Data Output

Useful when the host needs symbol data only under certain conditions.

Defines the conditions under which decoded symbol data is transmitted to the host.

- Default: Any Good Read
- Options: 0 = Disabled
  1 = Match
  2 = Mismatch
  3 = Any Good Read
  4 = Only If All Good Reads

IMPORTANT	Symbol Data Output Status, if set to Match or Mismatch, does not take effect unless Matchcode Type is enabled and a master symbol is loaded into memory.

– Disabled

It is useful when an application only must use the discrete outputs and can allow the code 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.

When set to Disabled, the code reader does not transmit any data that is generated during a read cycle (symbols, No-Reads, and so on)

– Match

Match is used in an application that requires specific symbol information and must sort, route, or verify based on matching the specific symbol data.

When set to Match, the code reader transmits symbol data whenever a symbol matches a master symbol. However, if Matchcode Type is Disabled, it transmits on any good read.

IMPORTANT	A No-Read can still be transmitted if Enabled.

– Mismatch

Mismatch is typically used as a flag within the host system to help prevent an item from being routed in the wrong container.

With Mismatch enabled, the code reader transmits symbol data whenever the symbol data information does not match the master symbol.

IMPORTANT	A No-Read can still be transmitted if Enabled.

– Any Good Read

Any Good Read is used when an application requires all symbol data to be transmitted. It is typically used in tracking applications in which each object is uniquely identified.

With Any Good Read enabled, the code 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

With Only If All Good Reads enabled, the code reader outputs symbol data only when all symbols in the read cycle are qualified. No Read is output if no symbols are qualified.

Output at End of Read Cycle (AOP)/When to Output Symbol Data (WebConnect)

This command allows you to choose when symbol data can be sent to the host.

- Default: As Soon As Possible

- Options: 0 = As Soon As Possible
            1 = End of Read Cycle

– As Soon As Possible

This option is useful in applications where symbol data must be moved quickly to the host, typically when the host makes decisions that are based on symbol data.

When enabled, symbol data is sent to the host immediately after a symbol is successfully decoded.

> **IMPORTANT** Multiple decodes can be required to qualify as a good read, depending on how Decodes Before Output is set.

– End of Read Cycle

This option is useful in timing-based systems in which the host is not ready to accept data at the time that it is decoded.

When enabled, symbol data does not get sent to the host until the read cycle ends with a timeout or new trigger.

Start of read cycle   End of read cycle

Read cycle duration

Host activates trigger   When host
                                                       expects output
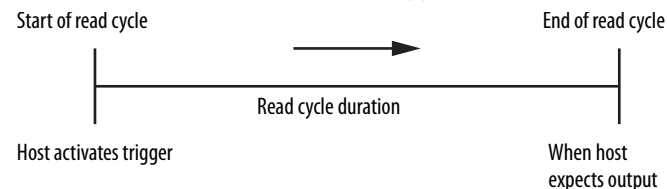
Include Symbology Identifier

This command allows you to choose when symbol data can be sent to the host.

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

  – Disabled

    When disabled, the symbol data output does not contain symbology information.
  – Enabled

    When enabled, the symbol data output contains a three-character symbology identifier sequence.

No Read Message

Figure 82 - AOP

Figure 83 - WebConnect

Enabled (AOP)/No Read Message (WebConnect)

Used in applications where the host needs serial verification that a symbol has not been read and especially useful in new print verification.

When enabled, and if no symbol has been decoded before timeout or the end of the read cycle, the No-Read message is transmitted to the host.

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

Message

Any combination of ASCII characters can be defined as the No Read message.

- Default: NOREAD
- Options: Any string of up to 64 ASCII characters.

IMPORTANT	No Read messages are only transmitted if Symbol Data Output is set to Match, Mismatch, or Good Read.

Read Duration

Useful to evaluate actual read cycle timing results, especially when initially configuring an application to determine maximum line speed (obtainable based on symbol spacing.)

When enabled, the duration of the read cycle (in ms) is appended to the symbol data. The read duration is the time from the beginning of the read cycle until data is output.

Figure 84 - AOP
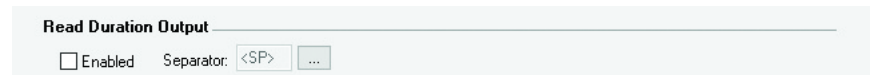
Figure 85 - WebConnect

Enabled (AOP)/Read Duration Output (WebConnect)

- 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 for a duration of over 49 days; if exceeded, the "OVERFLOW" message is output in place of the duration.

Separator

User-defined character that separates the symbol information from the Read Duration Output.

- Default: [space character]
- Options: Any ASCII character.

Object Output Info

Figure 86 - WebConnect [1]

Output Object Info	
☆ Output Object Info	Disabled
☆ Output Coordinates	Disabled

Output Object Info

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

  – Disabled

    The frame number is not output as part of the symbol data.
  – Enabled

    The number of the frame in which the symbol was first decoded is attached to the symbol output information. The output format is F*xxx*, where *xxx* is a three-digit decimal value from 0...255. The frame number rolls over to 0 once it passes 255.

    If this feature is enabled, the frame information follows the symbol data, and it precedes 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

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

  – Disabled

    The coordinates are not output as part of the symbol data.
  – Enabled

    The four sets of object coordinates for the first successfully decoded symbol are attached to the symbol data output in the following format: (*xxx*,*yyy*) where *xxx* is a three-digit X-coordinate and *mmm* is a three-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 is output first, followed by the next three points in a clockwise direction.

    Example: (032,040)(287,056)(287,279)(048,271)

(1)   Not available in AOP.

Output Indicators

The 48CR code reader has three light-emitting diode (LED) arrays:

1.   A target pattern of blue LEDs for centering the field of view, which is projected from the front of the code reader.

2.   An array of green LEDs projected from the front of the code 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 code reader.

Figure 87 - AOP

Figure 88 - WebConnect

Green Flash Mode

An array of green LEDs in the front of the code reader can be programmed to flash in response to user-defined conditions. These LEDs are used as a visual verification that a good read has occurred.

- Default: Static Presentation

- Options: 0 = Disabled
              1 = Good Read
              2 = Static Presentation
              3 = Match
              4 = Mismatch
              5 = Strobe

  – Disabled

    Green flash LEDs are disabled.

  – Good Read

    Green flash LEDs flash when a good read condition is met or when Matchcode is enabled and a match occurs.

  – Static Presentation Mode

    This option is used with Continuous Read mode.

When operating in Static Presentation mode, the red LEDs illuminate while the code 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 illuminate and stay on during the time set in Green Flash Duration. Only one read occurs during that time unless Multisymbol is enabled in Number of Symbols (see Multisymbol on page 64).

IMPORTANT	If Static Presentation Mode is selected but the code reader is not in Continuous Read, the Green Flash does 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 flash when a match condition is met. If Multisymbol is enabled, then green flash LEDs illuminate only if all symbols qualify as a match. If matchcode is disabled, then this mode activates the LEDs on a good read.

– Mismatch

Same as Match, except that LEDs illuminate on a mismatch.

– Strobe

Green flash LEDs 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.

Targeting

Assists you to position and locate symbols in the center of the field of view of the code reader. You can control when the targeting system is ON or OFF, and can save this condition for power-on.

- 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 always remains OFF 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 always remains on.

– ON Only When in the Read Cycle

The target pattern remains OFF except during the read cycle. If the operational command overrides this setting, the target pattern always remains on.

– Always ON

The target pattern is always ON.

Green Flash Duration

Provides visual verification that a good read has occurred. When a good read occurs, the green LEDs illuminate and stay on for the time set in the Green Flash Duration value.

- Default: 250 ms
- Options: 0…65,535 (in 10 ms increments)

LED Configuration

Useful as a visible indicator of read rates and symbol quality. Determines the mode in which the status LEDs operate.

Figure 89 - AOP

Figure 90 - WebConnect

LED Mode

Useful as a visible indicator of read rates and symbol quality. Determines the mode in which the status indicators operate.

- Default: Standard
- Options: 0 = Standard
            1 = AIM Grade

– Standard

In Standard mode, the STATUS LED indicates the 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.

– AIM Grade

When the LED mode is set to AIM grade, this parameter determines which AIM grade to output via the LEDs. Using the read rate scale as reference, if the AIM grade result was a grade A, all LEDs from 20…100% illuminate, if the result was a grade F, only the 20% LED would illuminate.

ISO/IEC 16022 Grade

Provides visual grading of specific ISO/IEC 16022 parameters. Determines which ISO/IEC 16022 parameter the code reader grades via the LEDs.

- Default: Final Grade

- Options: 0 = Final Grade
              1 = Symbol Contrast
              2 = Print Growth
              3 = Axial Non-Uniformity
              4 = Unused ECC

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.

Figure 91 - WebConnect [1]

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

(1)   The Calibration Options parameter is available in WebConnect view only.

Gain

When enabled, gain is calibrated to provide the best available image quality and performance.

When disabled, gain is fixed and is not part of the calibration process.

> **IMPORTANT**   If you choose to calibrate the code reader, a decode is also required for the calibration process to be completed successfully.

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

    – 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 a decodable symbol 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 results 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 sensitivity range region of the image sensor, achieving optimal image luminance. The image sensor converges on the optimal gain value within a few image frames.

Exposure

Unless the application is static, exposure must be configured based on the line speed of the application. shows a general guideline for exposure configurations at various line speeds.

> **IMPORTANT**   If you choose to calibrate the code reader, a decode is also required for the calibration process to be completed successfully.

Table 12 - Exposure Configurations

Exposure[1]	Line Speed
100,000…4000	Static
4000…1250	5 in./sec
1250…700	10 in./sec
700…500	15 in./sec
500…400	20 in./sec

(1) This table shows guidelines for exposure settings that are based on various line speeds. The settings that are shown depend on the optical configuration of the code reader and symbol element size.

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

– 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 a decodable symbol 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 results 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 sensitivity range region of the image sensor, achieving optimal image luminance. The image sensor converges on the optimal exposure value within a few image frames.

Focus Position

The focus position of the code reader 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 use either of the following methods.

- Default: Quick Focus

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

    – Disabled

      The focus position is fixed and is not part of the calibration process.

    – Enabled (Decode Required)

      Focus position is calibrated to provide the best image quality and performance. This method is a simple search algorithm that cycles through focus settings and configures camera settings to try to locate the desired focus as quickly as possible. The desired focus is located 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 can be time-consuming if the focus is not found on the first pass.

    – Quick Focus

      Quick Focus quickly locates the focus setting for an object at the center of the field of view. The focus setting is located 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.

IMPORTANT   This method may not work for all applications. This method is not ideal for small symbols.

Symbol Type

This parameter 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 of the devices.

- Default: Calibrate
- Options: 0 = Don't Calibrate
             1 = Calibrate

  – Don't Calibrate

    When disabled, only the current enabled symbologies are considered during the calibration process.

  – Calibrate

    When enabled, autodiscrimination is in effect during the calibration process. All supported symbologies except PDF417 and Pharmacode are attempted during calibration. Any new symbologies that are successfully decoded during calibration remain enabled at the end of the process. All enabled symbologies 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 and Code 39 are enabled.

Window of Interest Framing

If WOI Framing mode is enabled, calibration sets the WOI of the camera to a full-size image. When a symbol is decoded, the WOI of the camera is zoomed in both vertically and horizontally (regardless of which WOI mode is enabled) to include the symbol plus an additional margin, which speeds up the calibration process. After calibration is successfully completed, the WOI of the camera is adjusted according to the mode enabled. Otherwise, the original WOI configuration is retained.

If WOI framing is not enabled, the current WOI configuration is 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.

- Default: Don't Calibrate
- Options: 0 = Don't Calibrate
             1 = Row and Column
             2 = Row
             3 = Column
             4 = Straight Line
             5 = Straight Line Framed

  – Don't Calibrate

    When disabled, the WOI is not modified after the calibration process is complete.

- Row and Column

  If the calibration process is successful, the WOI is modified to frame the symbol and an additional margin area around the symbol, which the WOI determines.

- Column

  If the calibration process is successful, the WOI columns are modified to frame the symbol vertically, plus an additional margin area around the symbol, which the WOI Margin parameter determines.

- Row

  If the calibration process is successful, the WOI rows are modified to frame the symbol horizontally, plus an additional margin area around the symbol, which the WOI Margin parameter determines.

- 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 WOI is modified according to the symbol orientation. The scan line orientation is determined to be vertical if the symbol tilt is between 225...315°, or between 45...135°. Otherwise, the scan line is horizontal. If the symbol is vertical, the scan height parameter sets the image column size, and is configured for full row resolution. If the symbol is horizontal, the scan height parameter sets the image row size, and is configured for full column resolution. The scan line is centered in the middle of the symbol. If the symbol is tilted such that the scan line does not pass completely through the symbol, the scan width is adjusted to include the entire symbol. See Figure 92.

Figure 92 - Straight-line Scan

- Straight Line Framed

  This parameter is the same as Straight Line, except that the WOI also frames the scan line on the symbol length. The scan line includes the symbol plus an additional margin area that the WOI Margin parameter determines.

Window of Interest Margin

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 maximum image size, it is reduced accordingly.

- Default: 75 (pixels)
- Options: 20...1280

Linescan Height

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.

- Default: 64 (pixels)
- Options: 3...1280

Processing

This setting defines the amount of time and effort the code reader spends attempting to decode a symbol for each parameter configuration.

- Default: Medium
- Options: 0 = Low
              1 = Medium
              2 = High
              3 = Definable

  – Low

    The code reader spends a low amount of effort decoding the given symbol for each parameter configuration.

  – Medium

    The code reader spends a medium amount of effort decoding the given symbol for each parameter configuration.

  – High

    The code reader spends a high amount of effort decoding the given symbol for each parameter configuration.

  – Definable

    Image Processing Timeout defines the processing time for each image frame.

Quality Output

Figure 93 - AOP

Figure 94 - WebConnect

Separator (AOP)/Quality Output Separator (WebConnect)

The separator character separates quality output data from symbol data.

- Default: , <comma>
- Options: Any ASCII character.

Enabled (AOP), Decodes/Trigger Status (WebConnect)

When this feature is enabled, the code 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 code reader outputs any decoded symbol data along with the decodes per trigger count.

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

Setup Button

The Setup Button indicates how the button is programmed. When the button is depressed, the device sequences through each button option. When the button is released, the device executes the action that is programmed for that button position. The status LEDs and the green LEDs also illuminate to signal the current position. All button positions have the same configurable options.

Figure 95 - AOP

Figure 96 - WebConnect

Setup Button	
☆ Setup Button	**Enabled**
☆ Default On Power-on	**Enabled**
☆ Load Config DB	**Enabled**
☆ Save For Power-on	**Disabled**
☆ Single Green Flash	**Target System**
☆ Two Green Flashes	**Calibrate**
☆ Three Green Flashes	**Read Rate**
☆ Four Green Flashes	**Save for Power-on**

Setup Button

Serves as a master switch to enable/disable the Setup button status.

- Default: Enabled

- Options: 0 = Disabled
            1 = Enabled
            2 = Trigger
            3 = Unlatch Outputs
            4 = Parameter Switch

  – Disabled

    When set to Disabled, the Setup button does not function.

  – Enabled

    When selected, the Setup button is enabled and the Setup Button Mode command selects the function of each button position.

  – 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. 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 unlatches 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 sending the <Arc> and <Arp> commands consecutively.

Default on Power-on

When enabled, if the Setup button is held down on power-on the imager defaults to customer defaults and save for power-on.

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

Load Configuration Database

Allows you to load the Configuration Database with calibration results. When you perform a calibration with the Setup button, all database entries are moved down one index and the results of the calibration are saved to index 1. The result is also saved as current settings.

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

Save for Power-on

If enabled, after calibration is complete, all parameters are saved for power-on.

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

Single/Two/Three/Four Green Flashes

These parameters define the selectable options for Green Flash on the code reader LED push button settings further detailed in the following selectable options.

- Default: Single: Target System
             Two: Calibrate
             Three: Read Rate
             Four: Save for Power-on
- Options: 0 = Disabled
             1 = Read Rate
             2 = Calibrate
             3 = Save for Power-on
             4 = Load New Master
             5 = Target System
             6 = Barcode Configuration

  – Disabled

    The Green LED options do not illuminate.

– Read Rate

Percentage read rate is initiated upon release of the button in this position.

– Calibrate

Causes the device to adjust photometry and optical settings (if applicable) for optimal decoding performance.

– Save for Power-on

User parameters are saved and hardware reset occurs upon release of the button.

– Load New Master

The decoded symbol read is loaded into the first position of the master database upon release of the button.

– Target System

Targeting pattern is turned OFF if the target pattern is OFF and turned ON if the target pattern is ON.

– Barcode Configuration

A way of programming the device by using ECC 200 Data Matrix symbols when this mode has been entered.
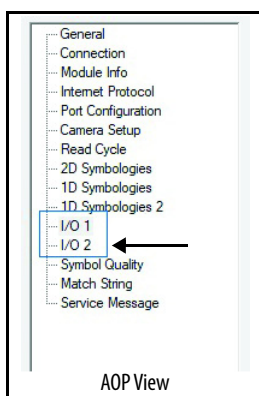
Output 1 and 2 Parameters

IMPORTANT	Output 1 Parameters are shown as an example in Figure 97 and Figure 98. Output 2 Parameters have the same options.

Figure 97 - AOP

Figure 98 - WebConnect

Output On

This option provides discrete signaling to host software to control external devices such as PLCs and relays. It is useful for routing, sorting, and helping prevent mispackaging and misrouting.

It sets the discrete output functions for specific user-selected conditions. Allows you to determine when an output (or outputs) is activated.

AOP View

WebConnect View

- 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

> **IMPORTANT**   If Output On is set to any mode that contains Match or Mismatch, the transition (switching) only occurs if Matchcode Type is enabled and Master Symbols 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.

  – Trend Analysis

  Typically used when successful decodes are occurring but a discrete output is required to flag a trend in quality issues.

  Activates discrete output when a trend analysis condition is met, depending on the trend analysis option that is enabled.

  – Symbol Quality

  Typically used when a discrete indication is required to flag a symbol quality condition.

  Activates discrete output when a symbol quality condition is met, depending on the symbol quality option that is enabled.

  – Diagnostic Warning

  Typically used when a discrete indication of a diagnostic condition is needed.

  Activates discrete output when a diagnostic warning condition is met, depending on the diagnostic option that is enabled.

  – In Read Cycle

  Activates a discrete output when the code reader is in a read cycle.

Output State

Sets the active electrical state of the discrete output.

- Default: Normally Open
- Options: 0 = Normally Open
              1 = Normally Closed

Pulse Width

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

- Default: 500 ms
- Options: 0...255 (0...2.55 seconds)[1]

(1)   Divide the number that is entered on the command line by 100 for time in seconds.

Output Mode

Sets the condition in which the discrete output is deactivated.

- Default: Pulse
- Options: 0 = Pulse
              2 = Latch Mode 2
              3 = Latch Mode 3

  – Pulse

    The default mode of operation in which the programmable output is
    activated when the Output On condition has been met and held active
    during 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 goes active on a No-Read and remains active
    until the opposite condition, a good read, occurs.

  – Latch Mode 3 (Unlatch Reenter 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.

> **IMPORTANT**   All Output On modes are inhibited when any Output on Warning is
> active for Output 1.

Trend Analysis — Output 1 and 2

IMPORTANT	Trend Analysis (Output 1) is shown as an example in Figure 99 and Figure 100. Trend Analysis (Output 2) has the same options.

Useful in cases where you do not want to shut down for one condition but want to monitor quality and read conditions. Applies Trend Analysis settings to Output 1. With Trend Analysis, you 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 code reader activates an output when four No-Reads occur within a period of 25 triggers (read cycles).

Figure 99 - AOP

Figure 100 - WebConnect

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

Mode

Sets the trend condition (Mismatch, No-Read, or Decodes per Trigger) that activates the output.

- Default: No-Read
- Options: 0 = Mismatch
  1 = No-Read
  2 = Decodes per Trigger

  – Mismatch

  Output activates when the number of mismatches equals the value that is entered for Number to Output On within the trigger window that is selected in Number of Triggers.

– No-Read

Output activates when the number of No-Reads equals the value that is entered for Number to Output On within the trigger window that is selected in Number of Triggers.

– Decodes per Trigger

Output activates when the number of decodes equals the value that is entered for Number to Output On within the trigger window that is selected in Number of Triggers.

Number of Triggers

The number of triggers to examine for the trend analysis condition.

- Default: 0
- Options: 0…255

Number to Output On

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.

For example, if Number to Output On is set to 3 and Trend Analysis Mode is set to No-Read, then the output does not activate until three No-Reads have occurred.

- Default: 0
- Options: 0…255

Decodes Per Trigger Threshold

The appropriate output activates if, at the end of the read cycle, the symbol decode count is below this setting.

IMPORTANT	To activate this feature, the code reader must be in Decodes per Trigger mode. To put the code 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. With this setting enabled, the decode count also appends to the symbol data.

- Default: 0
- Options: 0…65,535

Symbol Quality (ISO/IEC 16022) — Output 1 and 2

IMPORTANT	Symbol Quality (ISO/IEC 16022) — Output 1 is shown as an example in Figure 101 and Figure 102. Symbol Quality (ISO/IEC 16022) — Output 2 has the same options.

Figure 101 - AOP [1]

Figure 102 - WebConnect

Output on Symbol Contrast

Lets you know if symbol quality is less than acceptable. If enabled, Output 1 is toggled to an active state when Symbol Contrast Threshold is met.

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

Grade A, B, C, D (AOP)/Symbol Contrast Threshold (WebConnect)

Lets you set the acceptable level of symbol quality. Conforms to ISO/IEC 16022 symbol quality grading (A,B,C,D).

- Default: Grade C
- Options: 0 = Grade A
             1 = Grade B
             2 = Grade C
             3 = Grade D

    – Grade A
      (4.0) if Symbol Contrast >70%

(1)   Output 1 shown as example. Output 2 has the same parameters.

– Grade B

(3.0) if Symbol Contrast >55%

– Grade C

(2.0) if Symbol Contrast C >40%

– Grade D

(1.0) if Symbol Contrast >20%

Output on Print Growth

Lets you know if symbol quality is less than acceptable. If enabled, Output 1 is toggled to an active state when Print Growth Threshold is met.

- Default: Disabled

- Options: 0 = Disabled
             1 = Enabled

Grade A, B, C, D (AOP)/Print Growth Threshold (WebConnect)

Lets you set the acceptable level of symbol quality. Conforms to ISO/IEC 16022 symbol quality grading (A,B,C,D).

- Default: Grade C

- Options: 0 = Grade A
             1 = Grade B
             2 = Grade C
             3 = Grade D
             See [Grade A, B, C, D (AOP)/Symbol Contrast Threshold (WebConnect) on page 134](#) for grade definitions.

Output on Axial Non-uniformity

Lets you know if symbol quality is less than acceptable. If enabled, Output 1 is toggled to an active state when Axial Non-Uniformity Threshold is met.

- Default: Disabled

- Options: 0 = Disabled
             1 = Enabled

Grade A, B, C, D (AOP)/Axial on Non-uniformity Threshold (WebConnect)

Lets you set the acceptable level of symbol quality. Conforms to ISO/IEC 16022 symbol quality grading (A,B,C,D).

- Default: Grade C
- Options: 0 = Grade A
             1 = Grade B
             2 = Grade C
             3 = Grade D
             See [Grade A, B, C, D (AOP)/Symbol Contrast Threshold (WebConnect) on page 134](#) for grade definitions.

Output on Unused ECC

Lets you know if symbol quality is less than acceptable. If enabled, Output 1 is toggled to an active state when UEC Threshold is met.

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

Grade A, B, C, D (AOP)/Unused ECC Threshold (WebConnect)

Lets you set the acceptable level of symbol quality. Conforms to ISO/IEC 16022 symbol quality grading (A,B,C,D).

- Default: Grade C
- Options: 0 = Grade A
             1 = Grade B
             2 = Grade C
             3 = Grade D
             See [Grade A, B, C, D (AOP)/Symbol Contrast Threshold (WebConnect) on page 134](#) for grade definitions.

Diagnostics — Output 1 and 2

> **IMPORTANT**   Diagnostics (Output 1) shown as an example in <u>Figure 103</u> and <u>Figure 104</u>. Diagnostics (Output 2) has the same options.

Figure 103 - AOP

Diagnostics (Output 1)
☐ Service Unit

Figure 104 - WebConnect

Diagnostics (Output 1)
☆ Service Unit   **Disabled**
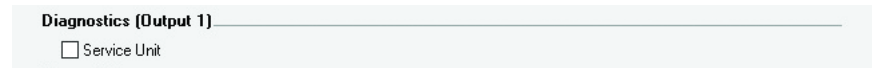
> **IMPORTANT**   Output On under Output 1 Parameters must be set to Diagnostic Warning for this output to function.

Service Unit

When Diagnostic Warning is enabled, the Output On configuration has no effect. The output remains active as long as one of the diagnostic warning conditions is met. The output becomes inactive once it detects that there are no diagnostic warning conditions. Allows you to configure the output to toggle to active when the service timer has expired. This condition is only held for one service timer click. [1]

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

Output Cycle ID

Output Cycle ID outputs a read cycle ID for each read cycle.

Figure 105 - AOP

Output Cycle ID
Output Cycle ID: Disabled   ⌄   Separator: <SP>   [...]

Figure 106 - WebConnect

Output Cycle ID
☆ Output Cycle ID   **Disabled**
☆ Separator   **<SP>**
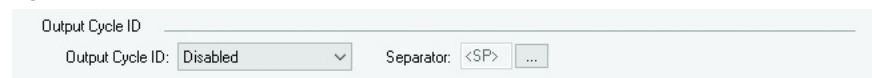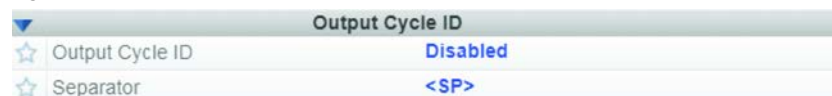
(1)   This feature cannot be used if the code reader is in a Continuous Read mode.

Output Cycle ID

If enabled, the read cycle ID number (in hex) is displayed after the separator.

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

Separator

Inserts a separator between each enabled field of the output cycle ID output.

- Default: [Space character]
- Options: Any ASCII character

Symbol Quality
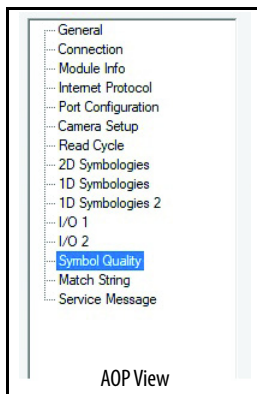
Use the Symbol Quality/Symbologies display/tab to configure parameters that, when enabled, output detailed symbol quality evaluations.

General
Connection
Module Info
Internet Protocol
Port Configuration
Camera Setup
Read Cycle
2D Symbologies
1D Symbologies
1D Symbologies 2
I/O 1
I/O 2
Symbol Quality
Match String
Service Message

AOP View

Symbol Quality

WebConnect View

Global

Figure 107 - AOP

Global
Symbol Quality Separator: <SP>   ...   Output Mode: Grade

Figure 108 - WebConnect

	Global	
☆	Symbol Quality Separator	<SP>
☆	Output Mode	Grade
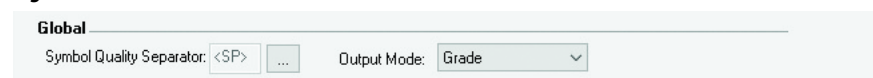
Symbol Quality Separator

Inserts a separator between each enabled field of the symbol quality output.

- Default: [Space character]
- Options: Any ASCII character

Output Mode

Specifies how the four output parameters, if enabled, are formatted.

IMPORTANT   Output Mode applies to ISO / IEC 16022 symbol quality parameters.

- Default: Grade
- Options: 0 = Grade
             1 = Value

ISO/IEC 16022 Parameters

Figure 109 - AOP

Figure 110 - WebConnect

Symbol Contrast

Lets you know if contrast settings are less than acceptable. All pixels that fall within the area of the test symbol, including its required zone, are 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 as following:

- 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.

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

Print Growth

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 as following:

- A (4.0) if -0.050 < PG < 0.50
- B (3.0) if -0.070 < PG < 0.70
- C (2.0) if -0.085 < PG < 0.85
- D (1.0) if -0.10 < 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.

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

Axial Non-uniformity

Lets you know if symbol quality is less than acceptable. If enabled, toggles Output 1 to an active state when Axial Non-Uniformity Threshold is met.

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

Unused ECC

Lets you know if symbol quality is less than acceptable. If enabled, toggles Output 1 to an active state when UEC Threshold is met.

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

Grading

Figure 111 - AOP

Figure 112 - WebConnect

Percent Cell Damage

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

IMPORTANT	For Data Matrix symbol types only.

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

Total Read Time

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.

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

Capture Time

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.

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

Locate Time

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.

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

Decode Time

The time (in milliseconds) required to decode a symbol. When enabled, the decode time is appended to the symbol data.

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

Pixels Per Element

The number of pixels for each element, either dark or light for both x and y directions. When enabled, the pixel per element value is appended to the symbol data.

> **IMPORTANT**   For Data Matrix symbol types only.

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

ECC Level

Outputs the Data Matrix ECC level. When enabled, the ECC level is appended to the symbol data.

> **IMPORTANT**   For Data Matrix symbol types only.

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

Matrix Size

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.

> **IMPORTANT**   For Data Matrix symbol types only.

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

Quiet Zone

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.

> **IMPORTANT**   For Data Matrix symbol types only.

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

Symbol Angle

When enabled, the symbol orientation is appended to data output as a degree value that represents the angle of the L-shaped finder pattern of the Data Matrix symbol relative to the code reader.

> **IMPORTANT**   For Data Matrix symbol types only.

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

Match String

AOP View

WebConnect View

Use the Match String display/tab to configure the matchcode output functions and the master symbol database setup.
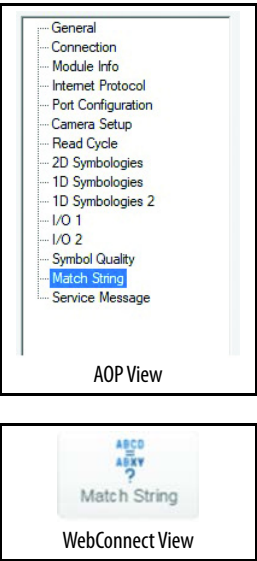
Matchcode Type

> **IMPORTANT**   First set Triggering Mode to External or Serial. See Trigger on page 65.

Figure 113 - WebConnect [1]

Matchcode Type	
Matchcode Type	Disabled
Sequential Matching	Increment
Match Start Position	0
Match Length	1
Wildcard	*
Sequence on No Read	Enabled
Sequence on Mismatch	Disabled
New Master Pin	Disabled
Sequence Step Interval	1

(1)   The Matchcode Type parameter is available in WebConnect view only.

Matchcode Type

Allows you to choose the way that master symbols are compared with symbols read later.

- Default: Enabled
- Options: 0 = Disabled
             1 = Enabled
             2 = Wild Card
             3 = Sequential

  – Disabled

    Has no effect on operations.
  – Enabled

    Instructs the code reader to compare symbols or portions of symbols with the master symbol.
  – Wild Card

    Allows you to enter user-defined wildcard characters in the master symbol.
  – Sequential

    Instructs the code reader to sequence after each match (numeric only) and compare symbols or portions of symbols for sequential numbers.

    > **TIP** If Matchcode Type is set to Sequential, the code reader behaves as if Number of Symbols were set to 1, regardless of the user-defined configuration.

Sequential Matching

When enabled, Sequential Matching determines if a count is in ascending (incremental) or descending (decremental) order. Useful in tracking product serial numbers that increment or decrement sequentially.

- Default: Increment
- Options: 0 = Increment
             1 = Decrement

Match Start Position

Match Start Position determines the portions of symbols that are matched by defining the first character in the symbol (from left to right) that is compared with those characters of the master symbol, when Matchcode Type is set to Enabled or Sequential. Useful to define 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 code reader to sort only the part number and ignore the other characters.

EXAMPLE	If Match Start Position is set to 3, the first two characters that are read in the symbol are ignored and only the third and subsequent characters to the right are compared, up to the number of characters specified by Match Length.

- Default: 0
- Options: 0...3000

Match Length

Defines the length of the character string that is compared with the master symbol when Match Start Position is set to 1 or greater. When Match Start Position is set to 0, no comparison occurs.

EXAMPLE	If Match Length is set to 6 in a 10-character symbol, and Match Start Position is set to 2, only the second through seventh characters (from left to right) are compared.

- Default: 1
- Options: 1...3000

Wildcard

Wildcard character allows you to define a wildcard character as part of the master symbol.

EXAMPLE   With Wildcard character defined as the default asterisk, when CR*34 is defined as the master symbol, it results in matches for CR134 and CR234, but not CR2345. Entering URGENT** as your master symbol results in matches for URGENT, URGENT1, and URGENT12 but not for URGENT123. This definition means that any wildcards that are appended to the master symbol data result in matches of symbols in variable lengths up to the master symbol lengths but not over. However, wildcards in the beginning or center of a symbol (for example, UR**NT) do not allow for variable symbol lengths.

- Default: * <asterisk>
- Options: Any ASCII character

Sequence on No Read

When Sequence on No-Read is enabled and Matchcode is set to Sequential, the code reader sequences the master symbol on every match or No-Read. When disabled, it does not sequence on a No-Read. Useful when the code reader must stay in sequence even if no decode occurs.

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

Table 13 shows an example of a series of decodes with the Sequence on No-Read parameter enabled:

Table 13 - Decodes with Sequence on No-Read Enabled

Master Symbol	Decoded Symbol	Master Symbol after Decode
001	001	002
002	002	003
003	No-Read	004 (sequenced on No-Read)
004	004	005
005	No-Read	006 (sequenced on No-Read)
006	No-Read	007 (sequenced on No-Read)
007	007	008

Table 14 shows an example of a series of decodes with the Sequence on No-Read parameter disabled:

Table 14 - Decodes with Sequence on No-Read Disabled

Master Symbol	Decoded Symbol	Master Symbol after Decode
001	001	002
002	002	003
003	No-Read	003 (not sequenced)
003	003	004
004	No-Read	004 (not sequenced)
004	No-Read	004 (not sequenced)
004	004	005

Sequence on Mismatch

> **IMPORTANT** Matchcode Type (page 144) must be set to Sequential for this command to function.

When enabled, the master symbol sequences on every decode, match, or mismatch. Enable this parameter if every trigger event must have a decode and multiple consecutive mismatches may occur. When disabled, the master symbol does not sequence whenever consecutive mismatches occur. Disable this parameter if every trigger event must have a decode, but no multiple consecutive mismatches may occur.

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

New Master Pin

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), the master symbol information is loaded into the database based on the next read cycle that achieves a Good Read, starting with Index 1.

> **IMPORTANT** For the 48CR code reader, Input 1 (pin 3) is Default and Input 2 (pin 4) is New Master.

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

Sequence Step Interval

Sequencing in Matchcode operations can occur in steps from 1...32,768. Sequencing performs like a mechanical counter by displaying positive integers and a specific number of digits after rollovers. For example, 000-3 = 997 (not -3) and 999+3 = 002 (not 1002). Useful in applications where it is desirable to count by intervals other than 1.

- Default: 1
- Options: 1...32,768

Table 15 shows an example if your Sequence Step is set to 3 and sequential Matching is set to Increment:

Table 15 - Sequence Step Interval Example

Master Symbol	Decoded Symbol	Master Symbol after Decode
003	001	003
003	002	003
003	003	006
006	004	006
006	005	006
006	006	009

Match Replace

Outputs a user-defined data string whenever a match occurs and Matchcode is enabled. Provides a convenient shortcut for applications that must output a predefined text string whenever a symbol matches a master symbol.

Figure 114 - AOP

Figure 115 - WebConnect

Enabled (AOP), Match Replace (WebConnect)

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

Replacement String

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

- Default: MATCH
- Options: An ASCII string up to 64 characters.

Mismatch Replace

Outputs a user-defined data string whenever a mismatch occurs and Matchcode is enabled. Provides a convenient shortcut for applications that must output a predefined text string whenever a symbol does not match a master symbol.

Figure 116 - AOP

Figure 117 - WebConnect

Enabled (AOP), Mismatch Replace (WebConnect)

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

Replacement String

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

- Default: MISMATCH
- Options: An ASCII string up to 64 characters.

Diagnostics
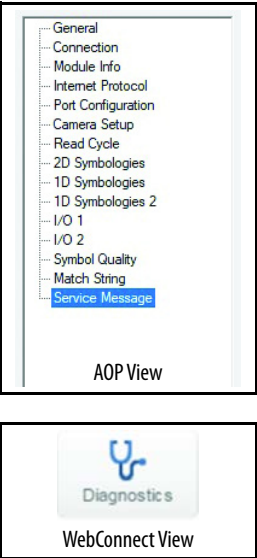
The Diagnostics display/tab shows commands that allow you to change various service messages and the name of the reader.

General
Connection
Module Info
Internet Protocol
Port Configuration
Camera Setup
Read Cycle
2D Symbologies
1D Symbologies
1D Symbologies 2
I/O 1
I/O 2
Symbol Quality
Match String
Service Message

AOP View

Diagnostics

WebConnect View

Counts (Read-only)

Figure 118 - WebConnect [1]

Counts	
⭐ **Power-on**	**35** readonly
⭐ **Resets**	**5** readonly
⭐ **Power-on Saves**	**16** readonly
⭐ **Custom Default Saves**	**4** readonly
⭐ **Total Reset Count**	**75** readonly
⭐ **Flash Writes**	**118** readonly

Power-on

Uses a 16-bit counter that increments each time that the code reader is powered-on.

- Default: —
- Options: 16-bit counter (0 … 65,535)

Resets

Uses a 16-bit counter that increments each time that the code reader is reset. This value is reset at power-on.

- Default: —
- Options: 16-bit counter (0 … 65,535)

Power-on Saves

Uses a 16-bit counter that increments each time that a code reader setting is saved for power-on.

- Default: —
- Options: 16-bit counter (0 … 65,535)

Custom Default Saves

Uses a 16-bit counter that increments each time that a code reader custom default is saved.

- Default: —
- Options: 16-bit counter (0 … 65,535)

(1)   The Counts parameter is available in WebConnect view only.

Total Reset Count

Uses a 16-bit counter that increments each time that a code reader reset count is saved.

- Default: —
- Options: 16-bit counter (0 ... 65,535)

Flash Writes

Uses a 16-bit counter that increments each time that a code reader setting is saved to the customer parameter section of nonvolatile memory is saved.

- Default: —
- Options: 16-bit counter (0 ... 65,535)

Hours Since Reset (Read-only)

Figure 119 - WebConnect [1]

Hours

This parameter uses a 16-bit counter that increments every 60 minutes.

- Default: —
- Options: 16-bit counter (0 ... 65,535)

Minutes

This parameter uses a 16-bit counter that increments every 60 seconds.

- Default: —
- Options: 16-bit counter (0 ... 60)

(1)   The Hours Since Reset parameter is available in WebConnect view only.

Service Message

Figure 120 - AOP

Figure 121 - WebConnect

Enabled (AOP)/Status (WebConnect)

When Service Message is enabled, a message of up to 10 ASCII characters is sent whenever the system detects that the limit of the service timer has been reached. The service timer is reset at power-on, meaning that the limit of the service timer is the amount of time since last reset. Service timer increments can be set in seconds or minutes.

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

Service Message

When enabled, up to a 10-character message is sent whenever the system detects that the service elapsed time has expired. The service timer is reset on powerup, therefore the timer is time since last reset. The service timer has a resolution field for configuring the timer increment; options are seconds our minute increments.

- Default: SERVICE
- Options: An ASCII string from 1...10 characters

Threshold

The threshold value that the service timer sends the service message.

- Default: 300 (5 min)
- Options: 0 = Seconds
                1 ... 65,535

Resolution

Resolution of the service message timer. Default is seconds, but when enabled this bit sets the timer resolution from seconds to minutes.

- Default: Seconds
- Options: 0 = Seconds
              1 = Minutes

User-defined Name

Allows you to enter any string of ASCII characters to help you identify your code reader. The user-assigned name is saved at power-on and custom defaults.

- Default: 48-CR
- Options: ASCII String, up to 19 characters

Image Storage

Image Storage

WebConnect View *

* Not available in AOP.

Use the Image Storage tab to configure how images are processed.

Image Storage

▼	Image Storage	
☆	Image Storage Status	Disabled
☆	Stored Image Type	No Read
☆	Image Storage Mode	First image in a read cycle
☆	Image File Format	PNG - High Resolution
☆	Image Quality	90 %
☆	Image Scale	Full scale
☆	File Save Options	Image

Image Storage Status

Image Storage Status determines if Image Logging is active.

IMPORTANT   Only images that the decoder has processed are saved.

If Image Storage Status and RAM Drive Size in MB in <K764> are switched from Disable to Enable, a cold boot of the reader is required to create the required RAM Drive, and it will take additional time for the reader to reinitialize. Switching from Enable to Disable does not require a cold boot.

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

Stored Image Type

Defines what kind of image you want to log in a read cycle.

- 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 Mode

Defines which image is 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.

- Default: First Image in a Read Cycle

- Options: 0 = First Image in a Read Cycle
            1 = All Images in a Read Cycle

Image File Format

Defines the image format that you want to use.

- Default: PNG

- Options: 0 = PNG
            1 = JPG

Image Quality

Defines the amount of image compression you want the image to have.

- Default: 90

- Options: 1...100

Image Scale

Defines the size that you want the image to be.

- Default: Full

- Options: 0 = Full
            1 = 1/4th
            2 = 1/8th

File Save Options

Determines which files you want to save.

- Default: Image
- Options: 1 = Image
2 = Read Cycle Report
3 = Image + Read Cycle Report

Image Storage Location

▼	Image Storage Location	
☆	Image Storage Location	RAM (Volatile Memory)
☆	RAM Drive Size	20 MB
☆	Save Image Until	New Read Cycle
☆	Action at Image Storage Limit	Stop

Image Storage Location

Defines where the saved image is going to be stored.

IMPORTANT	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 ([page 155](#)). The actual system path is /imagesd0/ Images/. When saving images to FTP, the path is <last 6 digits of the MAC Address of the device>_Images/ on the host FTP director. The FTP server must grant the user with create directory rights as the system must create a directory on the FTP server to store all uploaded images.

- Default: RAM
- Options: 0 = RAM
1 = FTP

RAM Drive Size

Defines the maximum RAM drive size on the system. It is also limited to the memory available on the system and affects the maximum rapid image count in Capture mode since the onboard memory may be taken up by the RAM drive.

- Default: 20
- Options: 1...50

Save Image Until

Defines how long the image is stored in the system when the Image Storage Location is RAM.

If set to New Read Cycle, the saved image is erased upon entering the next read cycle.

If set to System Reset, the saved image is erased upon the next system reset.

- Default: New Read Cycle
- Options: 0 = New Read Cycle
                   1 = System Reset

Action at Image Storage Limit

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 are erased.

- Default: Stop
- Options: 0 = Stop
                   1 = Erase Oldest First

Specifications

Mechanical

Figure 122 - Approximate Dimensions [mm (in.)]
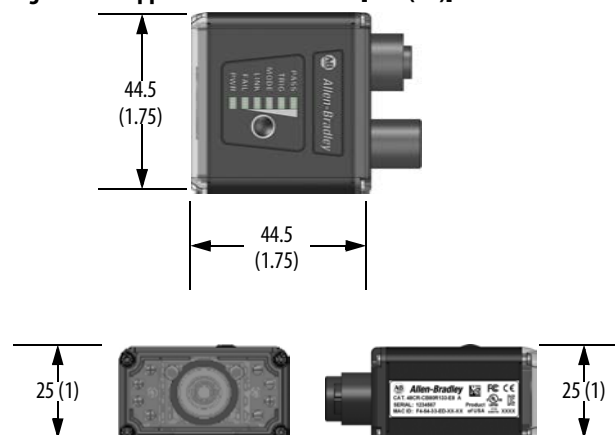
Attribute	48CR-CB16R400-E8, 48CR-CB52R102-E8, 48CR-CB80R133-E8, 48CR-CB80R190-E8, 48CR-CC16RAF-E8, 48CR-CC50RAF-E8, 48CR-CC77RAF-E8
Weight	68 g (2.4 oz)

Environmental

Attribute	48CR-CB16R400-E8, 48CR-CB52R102-E8, 48CR-CB80R133-E8, 48CR-CB80R190-E8, 48CR-CC16RAF-E8, 48CR-CC50RAF-E8, 48CR-CC77RAF-E8
Enclosure	IP65/67, aluminum
Humidity	5…95% (noncondensing)
Operating Temperature	0…45 ℃ (32…113 ℉)
Storage Temperature	-50…+75 ℃ (-58…+167 ℉)

Illumination

Attribute	48CR-CB16R400-E8, 48CR-CB52R102-E8, 48CR-CB80R133-E8, 48CR-CB80R190-E8, 48CR-CC16RAF-E8, 48CR-CC50RAF-E8, 48CR-CC77RAF-E8
Inner light-emitting diodes	4 red (625 nm), 4 white, 2 blue (target pattern), 2 green (green flash on good read)
Outer light-emitting diodes	Optional red (617 nm) or white light-emitting diode Expansion – 8 high-intensity light-emitting diodes

Light Collection Options

Attribute	48CR-CB16R400-E8, 48CR-CB52R102-E8, 48CR-CB80R133-E8, 48CR-CB80R190-E8, 48CR-CC16RAF-E8, 48CR-CC50RAF-E8, 48CR-CC77RAF-E8
Options	• Progressive scan, square pixel • Software-adjustable exposure • Electronic shutter • Fixed focus, factory-configurable, 50…300 mm (1.97…11.81 in.) • Standard density or high density
WVGA (fixed-focus devices)	752 x 480 pixels (global shutter)
SXGA (auto-focus devices)	1280 x 960 pixels (global shutter)

Symbologies

Attribute	48CR-CB16R400-E8, 48CR-CB52R102-E8, 48CR-CB80R133-E8, 48CR-CB80R190-E8, 48CR-CC16RAF-E8, 48CR-CC50RAF-E8, 48CR-CC77RAF-E8
2D	Data Matrix (ECC 0…200), QR Code, Micro QR Code, Aztec, DotCode
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 Post, Australian Post, Royal Mail, Intelligent Mail, KIX

Read Parameters

Attribute	48CR-CB16R400-E8, 48CR-CB52R102-E8, 48CR-CB80R133-E8, 48CR-CB80R190-E8, 48CR-CC16RAF-E8, 48CR-CC50RAF-E8, 48CR-CC77RAF-E8
Pitch	±30° skew: ±30° tilt: 360°
Frames Per Second	• 60 (WVGA [fixed-focus devices]) • 42 (SXGA [auto-focus devices])
Decoder	• Standard (High-Contrast 1D) • Plus (High-Contrast 1D/2D) • X-Mode (All 1D/2D and DPM)
Speed	Standard speed or high speed

Certifications

- FCC
- UL/c-UL
- CE
- RoHS/WEEE

Connector

- Dual M12 12-Pin (A = Power)
- M12 8-Pin (B = Ethernet)

Status Indicators

- Power
- Link (Ethernet)
- Trigger
- Mode
- Pass
- Fail
- Green flash on Good Read

Communication Interface

- Serial
- Ethernet 10/100
- I/O
- Power

Digital I/O

Attribute	48CR-CB16R400-E8, 48CR-CB52R102-E8, 48CR-CB80R133-E8, 48CR-CB80R190-E8, 48CR-CC16RAF-E8, 48CR-CC50RAF-E8, 48CR-CC77RAF-E8
Inputs	Trigger Input; New Master: Bidirectional, opto-isolated, 4.5…28V rated (10 mA @ 28V DC)
Outputs (1, 2, 3)	Bidirectional, opto-isolated, 1…28V rated (ICE <100 mA at 24V DC, current limited by user)

Read Ranges

Table 16 - WVGA High Density

Focal Distance [mm (in.)]	Field of View [mm (in.)]	Typical 2D Mil Size	Depth of Field [mm (in.)]		Minimum 2D Mil Size
			Inside	Outside	
133 (5.2)	80 (3.1)	15	90 (3.5)	176 (6.9)	10
190 (7.5)	114 (4.5)	20	133 (5.2)	246 (9.7)	15
400 (15.7)	180 (7.1)	30	179 (7.0)	422 (16.6)	30

Table 17 - WVGA (Fixed-focus Devices) Standard Density

Focal Distance [mm (in.)]	Field of View [mm (in.)]	Typical 2D Mil Size	Depth of Field [mm (in.)]		Minimum 2D Mil Size
			Inside	Outside	
102 (4.0)	94 (3.7)	20	52 (2.0)	152 (6.0)	15

Table 18 - SXGA (Auto-focus Devices) High Density

Focal Distance [mm (in.)]	Field of View [mm (in.)]	Typical 2D Mil Size	Depth of Field [mm (in.)]		Minimum 2D Mil Size
			Inside	Outside	
133 (5.2)	123 (4.8)	10	88 (3.5)	161 (6.3)	10
190 (7.5)	175 (6.9)	15	115 (4.5)	265 (10.4)	15
400 (15.7)	277 (10.9)	20	224 (8.8)	427 (16.8)	20

Notes:

Update the Firmware with ControlFLASH Software

This appendix shows how to update the firmware in a 48CR using ControlFLASH Plus™ software. To download the latest 48CR firmware revision, go to rok.auto/pcdc and select your desired revision or use ControlFLASH Plus to auto-locate the latest firmware online for you.

Verify Communication

Through USB connection, verify successful RSLinx Classic communication with your 48CR code reader by using RSWho.
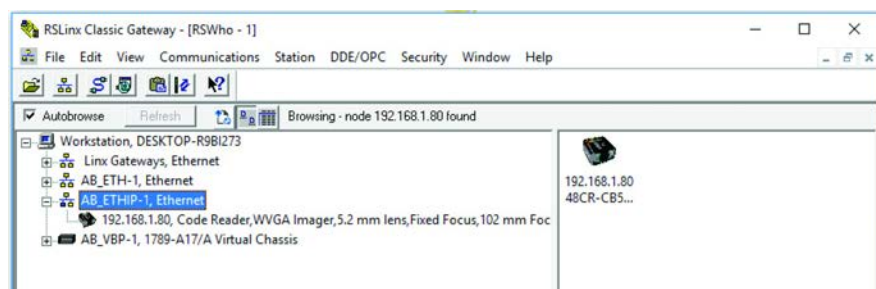
Firmware Update Procedure

1. Open ControlFLASH Plus

   Click Start > FLASH Programming Tools > ControlFLASH Plus

2. Select Browsing from path. Under EtherNet, AB_ETHIP-1 select the 48CR code reader that you want to update and click OK.
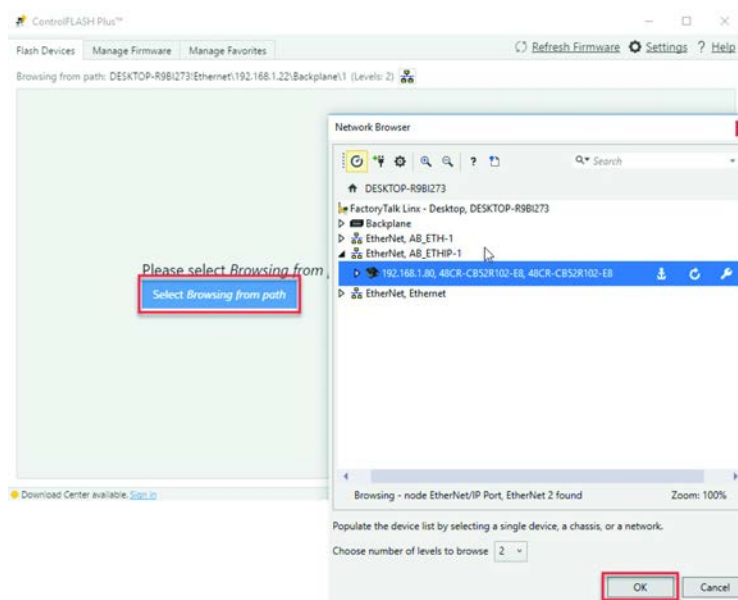
3. Select whether you want to update the device from the following options:
   - Latest on Computer
   - Latest from Download Center

4. Check the gray box next to the unit Catalog number you want to flash on the left side of the screen.

5. Click Next.

> **IMPORTANT** If you have an Internet connection, selecting Latest from Download Center lists the latest firmware available automatically. If you do not have an Internet connection and select Latest on the Computer, you must manually locate the files. Locating the files can be done in ControlFLASH Plus by going to Settings > Firmware Locations > + Add Location and browse to the folder with the firmware you want.
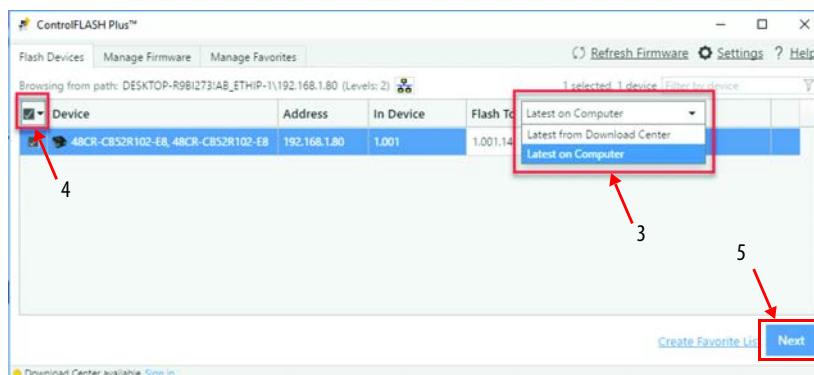
A Warning appears. Click Close and read the Status cell. If connected through a controller, verify that it is inhibited.

6. Click Flash
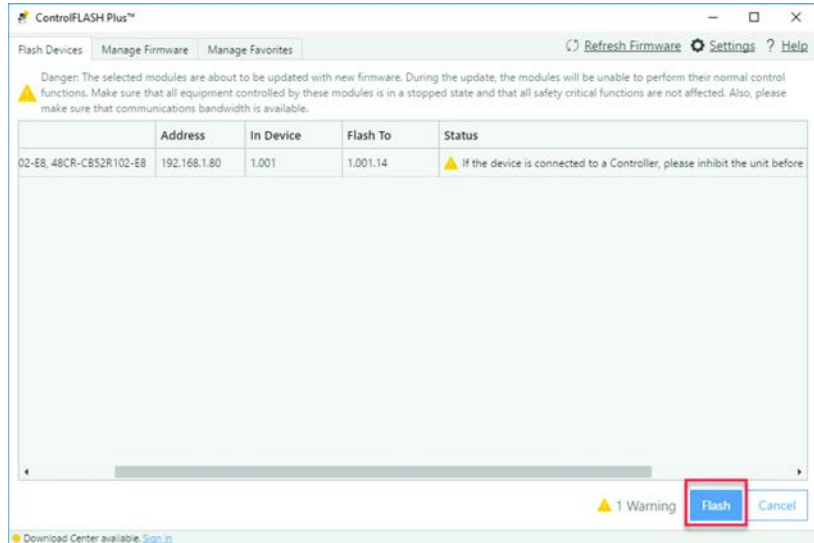
7. Wait for ControlFlash Plus to finish transmitting the updates. At the end of the update, a Flash interrupted warning appears. Maximize your window and click Resolve.
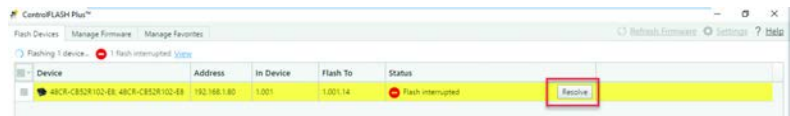
8. The following prompt appears. As the device requires a factory reset, verify that you have BootP running to reassign the device with an IP address. Once BootP is open, click OK to continue the firmware update.
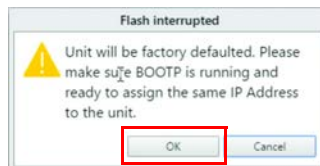
9. Once the Flash Results window with a green checkmark and 1 Succeeded appears, you have successfully updated the firmware on your device. Click Close on the Flash Results and Done in the bottom-right corner of the window to complete the firmware update process.
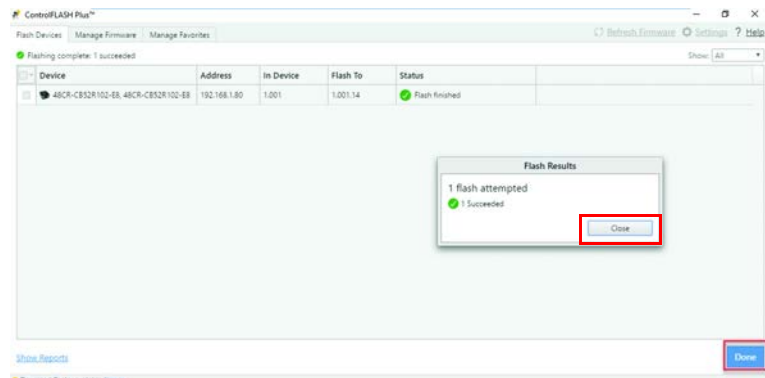
The following terms and abbreviations are used throughout this manual. For definitions of terms that are not listed here, refer to the Allen-Bradley Industrial Automation Glossary, publication [AG-7.1](#).

aberration The failure of an optical lens to produce an exact point-to-point correspondence between the object and its resulting image. Various types are chromatic, spherical, coma, astigmatism, and distortion.

absorption The loss of light of certain wavelengths as it passes through a material and is converted to heat or other forms of energy.

active illumination Lighting an area with a light source that is coordinated with the acquisition of an image. Strobed flash tubes and pulsed lasers are examples.

ambient light Light that is present in the environment of the imaging front end of a vision system and generated from outside sources. This light, unless used for actual illumination, is treated as background noise by the vision system.

analog A smooth, continuous voltage or current signal or function whose magnitude (value) is the information.

analog-to-digital converter (A/D converter or ADC) A device that converts an analog voltage or current signal to a discrete series of digitally encoded numbers (signal) for computer processing.

application-specific integrated circuit (ASIC) An integrated circuit that is customized for a particular use, rather than general use. All vision-system elements including firmware can be integrated into one ASIC.

architecture The hardware organization of a vision system that is designed for high-speed image analysis.

aspect ratio The ratio between the height and width of a sensor or display. Found by dividing the vertical number of pixels (height) by the horizontal number of pixels (width) left in fractional format.

automatic gain control (AGC) Adjustment to signal strength that seeks to maintain a constant level regardless of the distance between a code reader and symbol.

auxiliary port RS-232 connection to an auxiliary terminal or device for remote viewing.

blooming A situation in which too many photons are being produced for a pixel to receive. The pixel overflows and causes the photons to go to adjacent pixels. Similar to overexposure in film photography, except that in digital imaging, the result is a number of vertical and/or horizontal streaks that appear from the light source in the picture.

capture The act of acquiring and storing video images in an imager or host computer. Also, the image captured.

charge-coupled device (CCD)	A semiconductor device with an array of light-sensitive elements that converts light images into electrical signals.
check character	A Modulus 43 or Modulus 10 character that is added to encoded symbol data for additional data integrity.
communication rate	The number of discrete signal events per second; bits per second.
complementary metal oxide semiconductor (CMOS)	Like CCDs, CMOS imagers include an array of photo-sensitive diodes, one diode within each pixel. Unlike CCDs, however, each pixel in a CMOS imager has its own individual amplifier that is integrated inside.
connector	A plug or socket on a device or cable providing in/out connectivity for various circuits and pins.
concentrator	Intermediary device that relays data from imagers to a host and commands from the host to the imagers or other devices.
counter	Memory space that is allocated to track imager events.
daisy chain	Linkage of primary and secondary imagers allowing data to be relayed up to the host via auxiliary port connections.
decode	A good read. The successful interpretation and output of the information encoded in a symbol.
default	Restores ROM or flash settings, initializes serial commands and resets all counters.
delimited	Predefined characters bracket a delimited command or field.
decode rate	The number of good reads per second achieved by an imager.
dark field illumination	Lighting of objects, surfaces, or particles at shallow or low angles, so that light does not directly enter the optical hardware of the code reader.
depth-of-field	The in-focus range of an imaging system. Measured from the distance behind an object to the distance in front of the object with all objects in focus.
diffused lighting	Scattered soft lighting from a wide variety of angles that are used to minimize shadows and specular glints from profiled, highly reflective surfaces.
digital-to-analog converter (DAC)	A VLSI circuit is used to convert digitally processed images to analog for display on a monitor.
digital I/O	Inputs and outputs that are characterized by discrete signal transitions from one voltage level to another so that digital switching can occur.
digital imaging	Conversion of an image into pixels with an analog-to-digital converter where the level of each pixel can be stored digitally.

digital signal processor (DSP) A VLSI chip that is designed for ultra-high-speed arithmetic processing. Often imbedded in a vision engine.

direct memory access (DMA) A capability that is provided by some computer bus architectures that allows data to be sent directly to memory from an attached device.

dynamic range The difference between the minimum and maximum thresholds of discernible images; the amount of usable signal.

edge enhancement Method of image-processing that strengthens the high-spatial frequencies of the image.

embedded memory Onboard memory device such as EPROM or flash.

end of read cycle The time or condition at which the imager stops expecting symbol information to decode.

erasable programmable read-only memory (EPROM) A memory chip that retains data when its power supply is turned off; nonvolatile memory.

error correcting code (ECC) The process of adding redundancy to the transmitted information by using an algorithm to help control errors when data is passed over unreliable or noisy communication channels.

external edge Allows a trigger signal from an object detector when it detects the appearance of an object (rising edge) to initiate a read cycle. The read cycle ends with a good read, a timeout, or a new trigger.

external level Allows a trigger signal from an object detector to initiate a read cycle. The read cycle ends when the object moves out of the range of the detector.

falling edge A change of state (to inactive) associated with a level trigger.

field-programmable gate array (FPGA) A semiconductor device that contains programmable interconnects and logic components.

fill factor Percentage of pixel area that is used for light collection.

firmware Software hard-coded in nonvolatile memory (ROM), and closely tied to specific pieces of hardware.

fixed symbol length Increases data integrity by confirming that only one symbol length is accepted.

focal distance In camera-based vision, the distance from the front of the camera to the object being viewed. (In optics, the distance from the lens to the focal plane.)

focal plane Found at the image sensor, it is a plane perpendicular to the lens axis at the point of focus (–).

focus Any given point in an image at which light converges; the focal point.

frame The total area that is captured in an image sensor while the video signal is not blanked.

frame grabber A device that interfaces with a camera and, on command, samples the video, converts the sample to a digital value and stores that in the memory of a computer.

front-end system The object, illumination, optics, and imager blocks of a vision system. Includes all components useful to acquire a good image for subsequent processing.

full-duplex A communications system in which signals can travel simultaneously between devices.

gain The amount of energy that is applied to pixel grayscale values before output, expressed in dB; optimal signal strength.

good read A decode. The successful scan and decode of the information encoded in a barcode symbol.

gradient The rate of change of pixel intensity (first derivative).

grayscale Variations of values from white, through shades of gray, to black in a digitized image with black assigned the value of zero and white the value of one.

half-duplex A communications system in which signals can travel between devices in both directions, but not simultaneously.

histogram A graphical representation of the frequency of occurrence of each intensity or range of intensities (gray levels) of pixels in an image. The height represents the number of observations occurring in each interval.

host A computer, PLC, or other device that is used to execute commands and process data and discrete signals.

image Projection of an object or scene onto a plane (that is, screen or image sensor).

image processing (IP) Transformation of an input image into an output image with desired properties.

image resolution The number of rows and columns of pixels in an image. A higher resolution means that more pixels are available per element of the symbol being read. Examples: 640 x 480 (VGA); 854 x 480 (WVGA); 1280 x 1024 (SXGA).

image sensor A device that converts a visual image to an electrical signal; a CCD or CMOS array.

initialize Implement serial configuration commands into the active memory of the imager.

input A channel or communications line. Decoded data or a discrete signal that a device receives.

integration Exposure of pixels on a CMOS sensor.

ladder orientation	A linear symbol orientation in which the bars are parallel to the direction of travel of the symbol.
light-emitting diode (LED)	A semiconductor device that emits light when conducting current.
lens	A transparent piece of material with curved surfaces that either converge or diverge light rays.
machine vision	The automatic acquisition and analysis of images to obtain desired data for controlling a specific activity.
multi-drop	A communications protocol for networking two or more imagers or other devices with a concentrator (or controller) and characterized by the use of individual device addresses and the RS-485 standard.
noise	Any unwanted electrical signal that interferes with the read and transfer of an image by the imager.
normally closed (N.C.)	A discrete output state that is only active when open.
normally open (N.O.)	A discrete output state that is only active when closed.
object plane	An imaginary plane in the field of view, focused by the optical system of an imager at the corresponding image plane on the sensor.
output	A channel or communications line. Data or discrete signals that a device transmits or displays.
parity	An error detection routine in which one data bit in each character is set to 1 or 0 so that the total number of 1 bits in the data field is even or odd.
picket fence orientation	A linear symbol orientation in which the bars are perpendicular to the direction of travel of the symbol.
pitch	Rotation of a linear or 2D symbol around an axis parallel to the symbol length on the Substrate.
pixel	An individual element in a digitized image array; "picture element".
port	Logical circuit for data entry and exit. (One or more ports can be included within one connector.)
processing time	The time that is used by a vision system to receive, analyze, and interpret image information. Often expressed in parts per minute.
programmable logic controller (PLC)	An electronic device that is used in industrial automation environments such as factory assembly lines and automotive manufacturing facilities.
progressive scan	A non-interlaced scan that doubles the number of visible picture lines per field by displaying all picture lines at once.

protocol	The rules for communication between devices, providing a means to control the orderly flow of information between linked devices.
random access memory (RAM)	A data storage system that is used in computers, which are composed of integrated circuits that allow access to stored data in any sequence without movement of physical parts.
read cycle	A programmed time or condition during which a code reader accepts symbol input.
read-only memory (ROM)	A data storage medium that is used in computers and other electronics, primarily used to distribute Firmware.
real-time processing	In machine vision, the ability of a system to perform a complete analysis and act on one part before the next one arrives for inspection.
region	Area of an image. Also called a region of interest for image-processing operations.
saturation	The degree to which a color is free of white. One of the three properties of color perception, along with hue and value.
scattering	Redirection of light that reflects off a surface or through an object.
skew	Rotation of a linear or 2D symbol around an axis parallel to the symbol height on the substrate.
substrate	The surface upon which a linear or 2D symbol is printed, stamped, or etched.
symbol transitions	The transition of bars and spaces on a symbol, used to detect the presence of a symbol on an object.
symbology	A symbol type, such as Code 39 or Code 128, with special rules to define the widths and positions of bars and spaces to represent specific numeric or alphanumeric information.
tilt	Rotation of a linear or 2D symbol around an axis perpendicular to the substrate.
trigger	A signal, transition, or character string that initiates a read cycle.
very large-scale integration (VLSI)	The creation of integrated circuits by combining thousands of transistor-based circuits on one chip.
watchdog timer	A security device that detects system crashes and attempts to reset the imager.

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Rockwell Automation Support

Use the following resources to access support information.

Technical Support Center	Knowledgebase Articles, How-to Videos, FAQs, Chat, User Forums, and Product Notification Updates.	https://rockwellautomation.custhelp.com/
Local Technical Support Phone Numbers	Locate the phone number for your country.	http://www.rockwellautomation.com/global/support/get-support-now.page
Direct Dial Codes	Find the Direct Dial Code for your product. Use the code to route your call directly to a technical support engineer.	http://www.rockwellautomation.com/global/support/direct-dial.page
Literature Library	Installation Instructions, Manuals, Brochures, and Technical Data.	http://www.rockwellautomation.com/global/literature-library/overview.page
Product Compatibility and Download Center (PCDC)	Get help determining how products interact, check features and capabilities, and find associated firmware.	http://www.rockwellautomation.com/global/support/pcdc.page

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