

# FS/VS Smart Camera Series



## Product Reference Guide



ZEBRA and the stylized Zebra head are trademarks of Zebra Technologies Corporation, registered in many jurisdictions worldwide. All other trademarks are the property of their respective owners.

©2021 Zebra Technologies Corporation and/or its affiliates. All rights reserved.

Information in this document is subject to change without notice. The software described in this document is furnished under a license agreement or nondisclosure agreement. The software may be used or copied only in accordance with the terms of those agreements.

For further information regarding legal and proprietary statements, please go to:

SOFTWARE: [zebra.com/linkoslegal](http://zebra.com/linkoslegal)

COPYRIGHTS: [zebra.com/copyright](http://zebra.com/copyright)

WARRANTY: [zebra.com/warranty](http://zebra.com/warranty)

END USER LICENSE AGREEMENT: [zebra.com/eula](http://zebra.com/eula)

## Terms of Use

### Proprietary Statement

This manual contains proprietary information of Zebra Technologies Corporation and its subsidiaries ("Zebra Technologies"). It is intended solely for the information and use of parties operating and maintaining the equipment described herein. Such proprietary information may not be used, reproduced, or disclosed to any other parties for any other purpose without the express, written permission of Zebra Technologies.

### Product Improvements

Continuous improvement of products is a policy of Zebra Technologies. All specifications and designs are subject to change without notice.

### Liability Disclaimer

Zebra Technologies takes steps to ensure that its published Engineering specifications and manuals are correct; however, errors do occur. Zebra Technologies reserves the right to correct any such errors and disclaims liability resulting therefrom.

### Limitation of Liability

In no event shall Zebra Technologies or anyone else involved in the creation, production, or delivery of the accompanying product (including hardware and software) be liable for any damages whatsoever (including, without limitation, consequential damages including loss of business profits, business interruption, or loss of business information) arising out of the use of, the results of use of, or inability to use such product, even if Zebra Technologies has been advised of the possibility of such damages. Some jurisdictions do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

# Contents

## Getting Started

xS40 Configurations .....	2
xS70 Configurations .....	4
FS/VS Smart Camera Accessories .....	5
External Lighting .....	5
Internal Ring Lighting (xS40 Only) .....	7
Internal and External Filters .....	9
Internal Filters (xS40 Only) .....	11
C-Mount Lenses (xS70 Only) .....	12
Lens Covers (xS70 Only) .....	12
Communication Cables .....	13
Brackets .....	15
Power Supplies .....	16
FS/VS Smart Camera Specifications .....	17
xS40 Specifications .....	17
xS70 Specifications .....	19

## Installation

Dimensional Drawings .....	21
xS40 Dimensional Drawings .....	21
xS70 Dimensional Drawings .....	23
Connection Interfaces .....	24
xS40 Connections .....	24
xS70 Connections .....	25
Torque Specification .....	26
Power Sources .....	27
12 Pin M12 Power Input .....	27
Power Over Ethernet .....	27
USB Type C .....	27
Grounding for Electro-Magnetic Compliance and ESD Safe .....	28
Cable Pin Outs .....	29
Power and I/O Connector .....	29
Ethernet Connector .....	30
External Light Connector .....	31
Setting up an FS/VS Smart Camera .....	32

## Contents

General Mounting Instructions .....	32
Mounting the Device Using the L-Bracket Accessory (BRKT-LMNT-U000) .....	32
Illumination System Installation (xS40 Only) .....	35
Illumination System Disassembly (xS40 Only) .....	35
Threaded Lens Cover Assembly Installation .....	36
C-Mount Lens Installation (xS70 Only) .....	36
Setting Focus .....	38
USB Type C .....	39
Supported Display Resolutions .....	39
User Interface .....	40
Decode LEDs .....	40
User Interface Label .....	41
LED and Beeper Indicators .....	42
User Interface Framework Codes .....	44
Data Capture .....	47
Aiming Patterns .....	47
xS40 Decode Ranges .....	47
xS70 Minimum Focus Distances .....	48
General Purpose Input and Outputs .....	48
Optically Coupled GPIO .....	48
Digital Industrial GPIO .....	50
Analog Output .....	51
Power and Thermal Management .....	52

## Zebra Aurora Software Overview

Human-Machine Interface (HMI) .....	53
Industrial Ethernet Information .....	53
Zebra Aurora Features .....	53
Device Discovery .....	54
Ethernet Setup .....	56
Configuring Device Settings .....	57
Communication Settings .....	58
General Settings .....	59
GPIO Mapping .....	60
Building and Deploying Fixed Scanning (FS) Jobs .....	61
Building and Deploying Vision System (VS) Jobs .....	62
Using the QuickDraw Tool .....	62
Accessing the Web Human-Machine Interface (HMI) .....	64
Live Monitoring with the Web HMI .....	65
Accessing the Device using the Web-HMI .....	66
Factory Reset .....	67
Software License Activation Methods .....	68
Supported Symbologies .....	69
Machine Vision Toolsets .....	69

## Contents

### Troubleshooting

Communicating with the Device .....	72
Pinging the Device via IP .....	72
Pinging the Device via Hostname .....	72
Device Discovery Troubleshooting Methods .....	73
Factory Reset the Device .....	73
Power Cycling the Device .....	73
Security Settings .....	74
Zebra Aurora Communication Port Usage .....	75

### Maintenance

Maintenance .....	76
Known Harmful Ingredients .....	76
Approved Cleaning Agents .....	76
Tolerable Industrial Fluids and Chemicals .....	77
Cleaning the Device .....	77

# About This Guide

The FS/VS Smart Camera Series Product Reference Guide provides general instructions for integrating, setting up, and programming the device.

## Service Information

If you have a problem with your equipment, contact Zebra Global Customer Support for your region. Contact information is available at: [zebra.com/support](http://zebra.com/support).

When contacting support, please have the following information available:

- Serial number of the unit
- Model number or product name
- Software type and version number.

Zebra responds to calls by email, telephone or fax within the time limits set forth in support agreements.

If your problem cannot be solved by Zebra Customer Support, you may need to return your equipment for servicing and will be given specific directions. Zebra is not responsible for any damages incurred during shipment if the approved shipping container is not used. Shipping the units improperly can possibly void the warranty.

If you purchased your Zebra business product from a Zebra business partner, contact that business partner for support.

# Getting Started

This section outlines the configurations, accessories, and specifications of the FS/VS Smart Camera Series.

## xS40 Configurations

**Table 1** xS40 Configurations

Model	SKU	Toolset	Focus	Range	Res.	Illumination
<b>FS40 Standard Range</b>						
	FS40-SR20D4-2C00W	DPM with Fast 2D Decoder Ethernet with PoE, Serial, USB and Industrial Protocols	Auto	Standard Range	2.3 MP	Red Illumination No Filter
	FS40-SR20D4-3X00W	DPM with Fast 2D Decoder Ethernet with PoE, Serial, USB and Industrial Protocols	Auto	Standard Range	2.3 MP	White Illumination RGB Filter
	FS40-SR20D4-6C00W	DPM with Fast 2D Decoder Ethernet with PoE, Serial, USB and Industrial Protocols	Auto	Standard Range	2.3 MP	Red, White and Infrared Illumination No Filter
	FS40-SR20F4-2C00W	Fast 2D Decoder Ethernet with PoE, Serial, USB and Industrial Protocols	Auto	Standard Range	2.3 MP	Red Illumination No Filter
	FS40-SR20F4-5C00W	Fast 2D Decoder Ethernet with PoE, Serial, USB and Industrial Protocols	Auto	Standard Range	2.3 MP	Infrared Illumination No Filter
	FS40-SR20F4-6C00W	Fast 2D Barcode Decoder Ethernet with PoE, Serial, USB and Industrial Protocols	Auto	Standard Range	2.3 MP	Red, White and Infrared Illumination No Filter

**Table 1** xS40 Configurations

Model	SKU	Toolset	Focus	Range	Res.	Illumination
	FS40-SR20Z4-2C00W	Standard 2D Barcode Decoder Ethernet with PoE, Serial, USB and Industrial Protocols	Auto	Standard Range	2.3 MP	Red Illumination No Filter
<b>FS40 Wide Angle</b>						
	FS40-WA20D4-2C00W	DPM with Fast 2D Decoder Ethernet with PoE, Serial, USB and Industrial Protocols	Auto	Wide Angle	2.3 MP	Red Illumination No Filter
	FS40-WA20D4-3X00W	DPM with Fast 2D Decoder Ethernet with PoE, Serial, USB and Industrial Protocols	Auto	Wide Angle	2.3 MP	White Illumination RGB Filter
	FS40-WA20D4-6C00W	DPM with Fast 2D Decoder Ethernet with PoE, Serial, USB and Industrial Protocols	Auto	Wide Angle	2.3 MP	Red, White, and Infrared Illumination No Filter
	FS40-WA20F4-2C00W	Fast 2D Barcode Decoder Ethernet with PoE, Serial, USB and Industrial Protocols	Auto	Wide Angle	2.3 MP	Red Illumination No Filter
	FS40-WA20F4-5C00W	Fast 2D Barcode Decoder Ethernet with PoE, Serial, USB and Industrial Protocols	Auto	Wide Angle	2.3 MP	Infrared Illumination No Filter
	FS40-WA20F4-6C00W	Fast 2D Barcode Decoder Ethernet with PoE, Serial, USB and Industrial Protocols	Auto	Wide Angle	2.3 MP	Red, White, and Infrared Illumination No Filter
	FS40-WA20Z4-2C00W	Standard 2D Barcode Decoder Ethernet with PoE, Serial, USB and Industrial Protocols	Auto	Wide Angle	2.3 MP	Red Illumination No Filter
<b>VS40 Standard Range</b>						
	VS40-SR20S4-2C00W	Sensor Toolset Ethernet with PoE, Serial, USB and Industrial Protocols	Auto	Standard Range	2.3 MP	Red Illumination No Filter
	VS40-SR20S4-2R00W	Sensor Toolset Ethernet with PoE, Serial, USB and Industrial Protocols	Auto	Standard Range	2.3 MP	Red Illumination Red Bandpass Filter

**Table 1** xS40 Configurations

Model	SKU	Toolset	Focus	Range	Res.	Illumination
<b>VS40 Wide Angle</b>						
	VS40-WA20S4-2C00W	Sensor Toolset Ethernet with PoE, Serial, USB and Industrial Protocols	Auto	Wide Angle	2.3 MP	Red Illumination No Filter
	VS40-WA20S4-2R00W	Sensor Toolset Ethernet with PoE Serial, USB and Industrial Protocols	Auto	Wide Angle	2.3 MP	Red Illumination Red Bandpass Filter

## xS70 Configurations

**Table 2** xS70 Configurations

Model	SKU	Toolset	Res.	Illumination
FS70	FS70-CM20D5-0C00W	DPM with Fast 2D Barcode Decoder Dual Ethernet (1 PoE), Serial, USB and Industrial Protocols	2.3 MP	Lens Not Included
	FS70-CM20F5-0C00W	Fast 2D Barcode Decoder Dual Ethernet (1 PoE), Serial, USB and Industrial Protocols	2.3 MP	Lens Not Included
VS70	VS70-CM20S5-0C00W	Sensor Toolset Dual Ethernet (1 PoE), Serial, USB and Industrial Protocols	2.3 MP	Lens Not Included
	VS70-CM20P5-0C00W	DPM with Fast 2D Barcode Decoder Dual Ethernet (1 PoE), Serial, USB and Industrial Protocols	2.3 MP	Lens Not Included

## FS/VS Smart Camera Accessories

### External Lighting

**Table 3** External Lighting Accessories

Part Number	Description
LGHT-B100RD-0000	LED Bar light, 100MM, red-625 wavelength, 5-Pin male M12 connector, semi-diffused, includes transparent and opaque diffusers
LGHT-B100BL-0000	LED Bar light, 100MM, blue-465 wavelength, 5-Pin male M12 connector, semi-diffused, includes transparent and opaque diffusers
LGHT-B100WH-0000	LED Bar light, 100MM, white wavelength, 5-Pin male M12 connector, semi-diffused, includes transparent and opaque diffusers
LGHT-B100IR-0000	LED Bar light, 100MM, IR-850 wavelength, 5-Pin male M12 connector, semi-diffused, includes transparent and opaque diffusers
LGHT-B300RD-0000	LED Bar light, 300MM, red-625 wavelength, 5-Pin male M12 connector, semi-diffused, includes transparent and opaque diffusers.
LGHT-B300BL-0000	LED Bar light, 300MM, blue-465 wavelength, 5-Pin male M12 connector, semi-diffused, includes transparent and opaque diffusers.
LGHT-B300WH-0000	LED Bar light, 300MM, white wavelength, 5-Pin male M12 connector, semi-diffused, includes transparent and opaque diffusers.
LGHT-B300IR-0000	LED Bar light, 300MM, IR-850 wavelength, 5-Pin male M12 connector, semi-diffused, includes transparent and opaque diffusers.

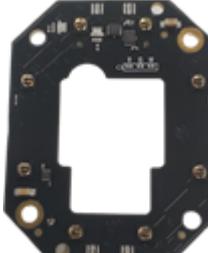


**Table 3** External Lighting Accessories (Continued)

Part Number	Description
<b>Rings</b>	
LGHt-R100BL-0000	LED Ring light, 100MM, blue-465 wavelength, 5-Pin male M12 connector, semi-diffused, includes transparent and opaque diffusers.
LGHt-R100WH-0000	LED Ring light, 100MM, white wavelength, 5-Pin male M12 connector, semi-diffused, includes transparent and opaque diffusers.
LGHt-R100IR-0000	LED Ring light, 100MM, IR-850 wavelength, 5-Pin male M12 connector, semi-diffused, includes transparent and opaque diffusers.
LGHt-R100RD-0000	LED Ring light, 100MM, red-625 wavelength, 5-Pin male M12 connector, semi-diffused, includes transparent and opaque diffusers.
<b>Polarizers</b>	
LGHt-A100BP-0000	100MM Bar Light Polarizer
	For use with 100mm External Light Bars (LGHt-B100xx-0000). Not for use with IR-850 wavelengths or when IR image capture is required.
LGHt-A300BP-0000	300MM Bar Light Polarizer
	For use with 300mm External Light Bars (LGHt-B300xx-0000). Not for use with IR-850 wavelengths or when IR image capture is required.
LGHt-A100RP-0000	Light Polarizer
	For use with 100mm External Ring Lights (LGHt-R100xx-0000). Not for use when IR image capture is required.

## Internal Ring Lighting (xS40 Only)

**Table 4** Internal Ring Lighting

Part Number	Description	
ZLED-XS40WH-0000	<p>xS40 Internal Ring Light, White LED</p> <p>For use with 100mm External Ring Lights (LGHt-R100xx-0000).</p> <p>Not for use when IR image capture is required.</p>	
ZLED-XS40RD-0000	<p>xS40 Internal Ring Light, Red LED</p> <p>Red lighting is typically used to capture images on paper.</p>	
ZLED-XS40IR-0000	<p>FS40/VS40 Internal Ring Light, IR LED</p> <p>IR lighting is typically used in environments where users do not want to see any external lighting, when detecting clear liquids, or when inspecting produce.</p>	
ZLED-XS40MC-0000	<p>FS40/VS40 Internal Ring Light, Multi-Color - White, Red, Blue, IR LED</p> <p>White LEDs are controllable in individual banks of 4 LEDs.</p> <p>IR and Red are controllable in individual banks of 2 LEDs.</p>	

**Table 4** Internal Ring Lighting

Part Number	Description
<b>Replacement Ring Light Covers</b>	
ZLED-XS40PW-0000	<p>Integrated Light Cover (Replacement) Cross Polarizer</p> <p>For use with Wide Angle (WA) xS40 configurations only.</p> <p>Not for use when IR image capture is required.</p>
ZLED-XS40PS-0000	<p>Integrated Light Cover (Replacement) Cross Polarizer</p> <p>For use with Standard Range (SR) xS40 configurations only.</p> <p>Not for use when IR image capture is required.</p>
ZLED-XS40CW-0000	<p>Integrated Light Cover (Replacement)</p> <p>For use with Wide Angle (WA) xS40 configurations only.</p>
ZLED-XS40CS-0000	<p>Integrated Light Cover (Replacement)</p> <p>For use with Standard Range (SR) xS40 configurations only.</p>

## Internal and External Filters

**Table 5** Internal and External Filters

Part Number	Description	Compatibility
<b>Internal Filters (In Between C-Mount Lens and Imager - xS70 Only)</b>		
FLTR-BP635-25400	Red Bandpass Filter, 635NM, 25.4MM For use between C-mount lens and imager.	
FLTR-BP850-25400	IR Bandpass Filter, 850NM, 25.4MM For use between C-mount lens and imager	
FLTR-BP550-25400	IR/UV Block Bandpass Filter, 550NM, 25.4MM For use between C-mount lens and imager.	
<b>External Filters (on the End of the C-Mount Lens - xS70 Only)</b>		
FLTR-BP550-25500	IR/UV Block B Filter, 550NM, 25.4MM For use on the end of the C-mount lens.	

## Getting Started

**Table 5** Internal and External Filters

Part Number	Description	Compatibility
FLTR-BP635-25500	Red Bandpass Filter, 635NM, 25.4MM For use on the end of the C-mount lens.	
FLTR-BP850-25400	IR Bandpass Filter, 850NM, 25.4MM For use on the end of the C-mount lens. Not for use with IR lighting.	
FLTR-BP470-25500	Blue Bandpass Filter, 470NM, 25.5MM For use on the end of the C-mount lens.	
FLTR-PZ120-25500	Ultra High Contrast Polarizer Filter, 25.4MM For use on the end of the C-mount lens. Not for use with IR lighting.	

## Internal Filters (xS40 Only)

**Table 6** Internal Filters

Part Number	Description
ZFLT-XS40RD-0000	Red Bandpass Zebra Filter
ZFLT-XS40BL-0000	Blue Bandpass Zebra Filter
ZFLT-XS40IR-0000	IR Bandpass Zebra Filter
ZFLT-XS40MC-0000	IR Blocker Zebra Filter

## C-Mount Lenses (xS70 Only)

**Table 7** External Lenses (xS70)

Part Number	Description
LENS-M0800-0100	C-mount Lens 8MM focal length, 25.5 filter thread
LENS-M1200-0100	C-mount Lens 12MM focal length, 25.5 filter thread
LENS-M1600-0100	C-mount Lens 16MM focal length, 25.5 filter thread
LENS-M2500-0100	C-mount Lens 25MM focal length, 25.5 filter thread
LENS-M3500-0100	C-mount Lens 35MM focal length, 25.5 filter thread



## Lens Covers (xS70 Only)

**Table 8** xS70 Lens Covers

Part Number	Description
LENS-XTC70-0000	Threaded Lens Cover Adapter
LENS-XRC70-0000	Replacement IP67 Lens Cover



## Communication Cables

**Table 9** Cables

Part Number	Description	Compatibility
<b>USB Cables</b>		
CBL-USB02000-USC00	USB 2M, IP67 locking USB-C to USB C, SuperSpeed Compatible with all FS/VS devices.	
CBL-USB04000-USC00	USB 4M, IP67 locking USB-C to USB C Compatible with all FS/VS devices.	
CBL-USB02000-USA00	USB 2M, IP67 locking USB-A to USB-C, SuperSpeed Compatible with all FS/VS devices.	
CBL-USB04000-USA00	USB 4M, IP67 locking USB-A to USB C Compatible with all FS/VS devices.	

**Table 9** Cables (Continued)

Part Number	Description	Compatibility
<b>Ethernet Cables</b>		
CBL-ENT05001-M1200	5M length, X-Coded M12 to RJ45 connectors  Compatible with all FS/VS devices that include an Ethernet port.	
CBL-ENT15001-M1201	15M length, X-Coded M12 to RJ45 connectors  Compatible with all FS/VS devices that include an Ethernet port.	
<b>External Light Control Cables</b>		
CBL-LGT00000-M1200	5-pin M12 to 5-pin M12 External Light Control C, 0.3M length  Only compatible with xS40 and xS70 devices that include an external light port.	
CBL-LGT00201-M1200	5-pin M12 to 5-pin M12 External Light Control C, 2M length  Only compatible with xS40 and xS70 devices that include an external light port.	
<b>Power Cables</b>		
CBL-PWR05001-M1200	12-pin M12 to flying lead breakout cable  Compatible with all FS/VS devices.	

**Table 9** Cables (Continued)

Part Number	Description	Compatibility
CBL-PWR15001-M1200	12-pin M12 to flying lead breakout cable Compatible with all FS/VS devices.	
CBL-USB00200-USC00	USB-C Cable, 4M length Compatible with all FS/VS devices.	
CBL-USB00400-USC00	USB-A Cable, 2M length Compatible with all FS/VS devices.	
CBL-USB00200-USA00	USB-A Cable, 4M length Compatible with all FS/VS devices.	

## Brackets

**Table 10** L-Mount Bracket

Part Number	Description	
BRKT-LMNT-U000	L-Mount Bracket For use with Wide Angle (WA) xS40 configurations only. See <a href="#">Mounting the Device Using the L-Bracket Accessory (BRKT-LMNT-U000) on page 32</a> for mounting instructions.	

## Power Supplies

**Table 11** Power Supplies

Part Number	Description	
PWR-24V03A-0000	Power Supply, 24VDC 3.3AMP, DIN Rail Mount	
PWR-24V05A-0000	Power Supply, 24VDC 5AMP, DIN Rail Mount	
PWR-POE30W-0000	Power over Ethernet Injector, 30W POE+, AC Input	

## FS/VS Smart Camera Specifications

The tables below describe the design, performance, environment and regulatory characteristics of the FS/VS Smart Camera series.

### xS40 Specifications

**Table 12** xS40 Specifications

Item	Description
<b>Physical Characteristics</b>	
Dimensions	2.1 in. H x 2.5 in. W x 3.6 in. D 54.0 mm H x 64.0 mm W x 91.4 mm D
Weight	14.1 oz./400.0 g
Power	10 to 30 VDC external power supply, 36W max at 24V <ul style="list-style-type: none"> <li>• Class 4 PoE+ source, 25.5W max</li> <li>• Class 3 PoE source, 13W max</li> <li>• USB Type-C host, 7.5W max at 5V 1.5A or 15W max at 5V 3.0A</li> </ul>
Configurable IO	(4) Four opto-isolated GPIO: GPIO0,1,2,3 (5) Five non-isolated GPIO: GPIO4,5,6*,7*,8* <small>*Unavailable when External Light Mode is enabled</small>
Interface Ports	(1) M12 X-Coded 1000/100/10 Mbps Ethernet (1) M12 12-pin Power/GPIO (1) M12 5-pin External Light Power & Control/GPIO (1) USB 3.0 SuperSpeed Type-C with DisplayPort <small>Alt Mode is Available with one or two Ethernet ports</small>
Communication Protocols	Ethernet/IP, PROFINET, CC-Link, Modbus TCP, TCP/IP
<b>Performance Characteristics</b>	
Image Sensor	Monochrome: 2.3 MP (1920 x 1200 pixels) CMOS Sensor with Global Shutter and 3.0 um Pixel Size
Acquisition Rate	Up to 60 frames/second
Aimer	Red Class II Laser; 8-point sunburst pattern
Illumination	Field replaceable modules: <ul style="list-style-type: none"> <li>• (8) 660nm Red LEDs</li> <li>• (8) 850nm IR LEDs</li> <li>• (8) 2700K (Color Temperature) White LEDs</li> <li>• (4) 660nm Red LEDs + (8) 850nm IR LEDs + (8) 2700K (Color Temperature) White LEDs</li> </ul>
Imager Field of View	SR (Standard Range): 10.8mm Liquid Lens (30° H x 19° V Nominal) WA (Wide Angle): 6.8mm Liquid Lens (46° H x 29° V Nominal)

**Table 12** xS40 Specifications

Item	Description
<b>User Environment</b>	
Operating Temperature	32° F to 113° F/0° C to 45° C (10-30VDC external power supply, duty cycle-dependent) 32° F to 104° F/0° C to 40° C (POE, duty cycle dependent)
Storage Temperature	-40°F to 113°F / -40° to 70°C
Vibration Resistance	EN 60068-2-6, 14 mm @ 2 to 10 Hz, 1.5 mm @ 13 to 55 Hz; 2 g @ 70 to 500 Hz; 2 hours on each axis
Shock Resistance	EN 60068-2-27, 30g; 11 ms; 3 shocks on each axis
Environmental Sealing	IP65 & IP67
Humidity	5% to 90% RH (Non Condensing)
Light Immunity	Product must operate in: Incandescent 450 ft candles, Sunlight <6000 ft candles, Fluorescent 450 ft candles, Mercury Vapor 450 ft candles, Sodium Vapor 450 ft candles, LED 450 ft candles
Electrostatic Discharge	±15 kV Air, ±8 kV Contact, ±8 kV Indirect
Trigger Durability	Withstand 1,000 cycles of operation with no degradation in functionality
<b>Regulatory</b>	
Environmental	EN 50581:2012 EN IEC 63000:2018
Electrical Safety	IEC 62368-1 (Ed.2) EN 62368-1:2014/A11:2017
Laser Safety (xS40 Only)	21CFR1040.10 & 21CFR1040.11 IEC/EN 60825-1:2014 (Ed.3)
LED Safety	IEC 62471: 2006 (Ed.1) EN 62471: 2008
EMI/EMS	EN 55032:2015/A11: 2020 EN 55035:2017/A11: 2020 EN 61000-3-2: 2014 EN 61000-3-3: 2013 EN 61000-6-2: 2005,2019 FCC 47 CFR Part 15, Subpart B ICES-003, Issue 7
EU Declaration of Conformity	2014/30/EU; 2014/35/EU; 2011/65/EU. Refer to the Declaration of Conformity (DoC) for details of compliance to the current standards. The DoC is available at: <a href="http://zebra.com/doc">zebra.com/doc</a>

## xS70 Specifications



**NOTE:** The xS70 is only to be used with the metal assembly in order to pass the ESD safe specification.

**Table 13** xS70 Environmental Specifications

Item	Description
<b>Physical Characteristics</b>	
Dimensions	2.5 in. H x 2.5 in. W x 3.75 in. D 63.0 mm H x 64.0 mm W x 95.0 mm D
Weight	22.9 oz./650.0 g
Power	10 to 30 VDC external power supply, 36W max at 24V <ul style="list-style-type: none"> <li>• Class 4 PoE+ source, 25.5W max</li> <li>• Class 3 PoE source, 13W max</li> <li>• USB Type-C host, 7.5W max at 5V 1.5A or 15W max at 5V 3.0A</li> </ul>
Configurable IO	(4) Four opto-isolated GPIO: GPIO0,1,2,3 (5) Five non-isolated GPIO: GPIO4,5,6*,7*,8* <small>*Unavailable when External Light Mode is enabled</small>
Interface Ports	(2) M12 X-Coded 1000/100/10 Mbps Ethernet* (1) M12 12-pin Power/GPIO/RS-232 (1) M12 5-pin External Light Power & Control/GPIO (1) USB 3.0 SuperSpeed Type-C with DisplayPort Alt Mode <small>*Available with one or two Ethernet ports, PoE is only supported by the primary Ethernet port</small>
Communication Protocols	Ethernet/IP, PROFINET, CC-Link, Modbus TCP, TCP/IP
<b>Performance Characteristics</b>	
Image Sensor	Monochrome: 2.3 MP (1920 x 1200 pixels) CMOS Sensor with Global Shutter and 3.0 um pixel size
Acquisition Rate	60 frames/second
Illumination	Supports many standard external illumination systems while powered by 24 VDC supply
Imager Field of View	Flexible; dependent upon C-mount lens selection
<b>User Environment</b>	
Operating Temperature	32° F to 113° F/0° C to 45° C (10-30VDC external power supply, duty cycle-dependent) 32° F to 104° F/0° C to 40° C (POE, duty cycle-dependent)
Storage Temperature	-40° F to 158° F/-40° C to 70° C
Vibration Resistance	EN 60068-2-6, 14 mm @ 2 to 10 Hz, 1.5 mm at 13 to 55 Hz; 2 g at 70 to 500 Hz; 2 hours on each axis
Shock Resistance	EN 60068-2-27, 30 g; 11 ms; 3 shocks on each axis
Environmental Sealing	IP65 and IP67
Humidity	5% to 90% RH, non-condensing

**Table 13** xS70 Environmental Specifications (Continued)

Item	Description
Light Immunity	Product must operate in: Incandescent 450 ft candles, Sunlight <6000 ft candles, Fluorescent 450 ft candles, Mercury Vapor 450 ft candles, Sodium Vapor 450 ft candles, LED 450 ft candles
Electrostatic Discharge	±15 kV Air, ±8 kV Contact, ±8 kV Indirect
Trigger Durability	Withstand 1,000 cycles of operation with no degradation in functionality
<b>Regulatory</b>	
Environmental	EN 50581:2012; EN IEC 63000:2018
Electrical Safety	IEC 62368-1 (Ed.2); EN 62368-1:2014/A11:2017
EMI/EMS	EN 55032:2015/A11: 2020 EN 55035:2017/A11: 2020 EN 61000-3-2: 2014 EN 61000-3-3: 2013 EN 61000-6-2: 2005,2019 FCC 47 CFR Part 15, Subpart B ICES-003, Issue 7
EU Declaration of Conformity	2014/30/EU; 2014/35/EU; 2011/65/EU. Refer to the Declaration of Conformity (DoC) for details of compliance to the current standards. The DoC is available at: <a href="http://zebra.com/doc">zebra.com/doc</a>

# Installation

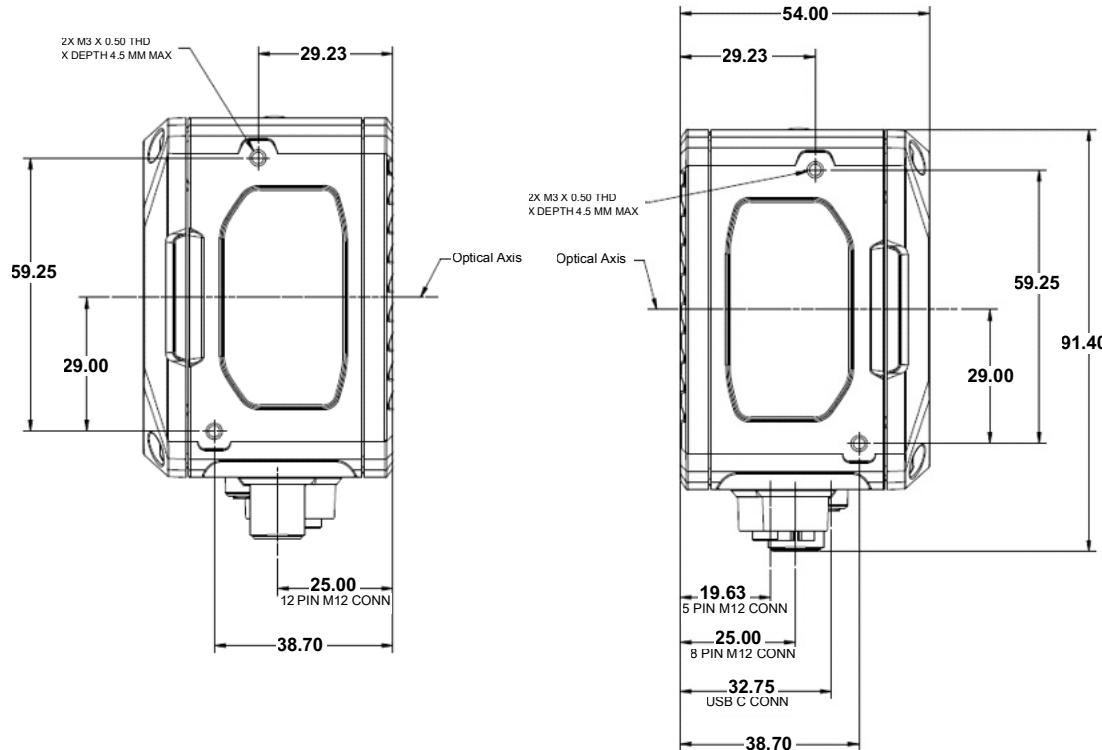
This section describes the steps to mount the FS/VS Smart Camera with an L-bracket and install an illumination system into the xS40 or a C-mount lens onto the xS70.

## Dimensional Drawings

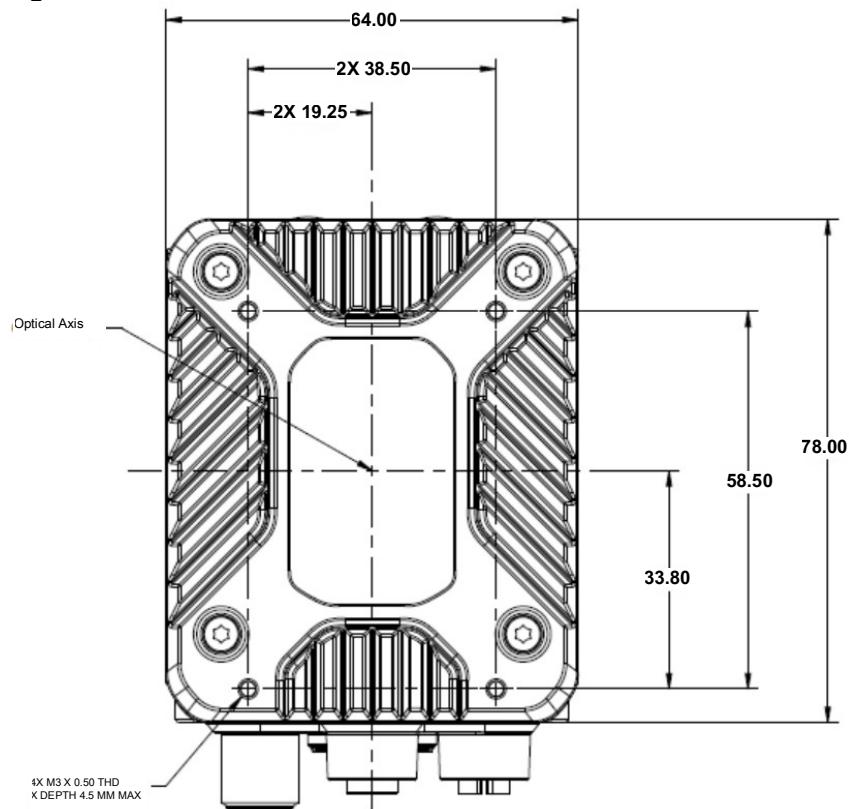
The dimensional drawings below illustrate the mounting patterns supported by the FS/VS Smart Camera. For additional information on mounting the device with the L-bracket accessory, see [Mounting the Device Using the L-Bracket Accessory \(BRKT-LMNT-U000\) on page 32](#).

### xS40 Dimensional Drawings

**Figure 1** xS40 Side Dimensions

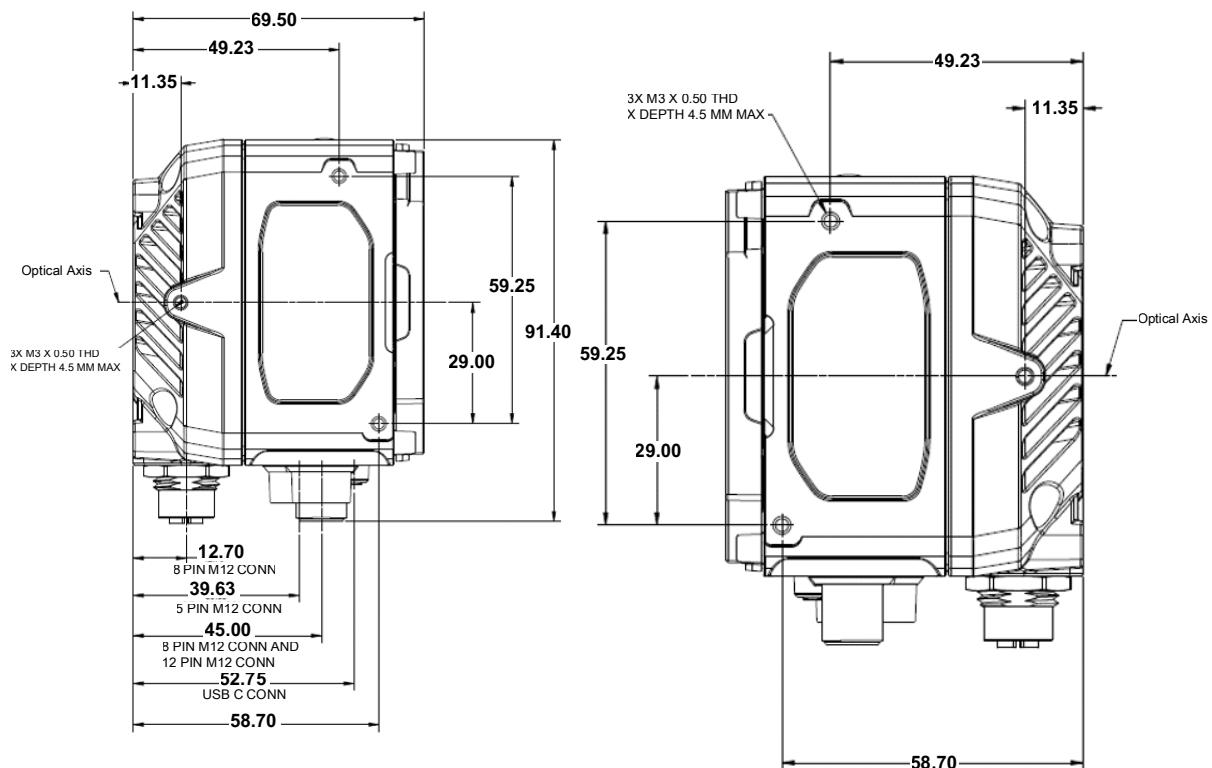


**Figure 2** xS40 Bottom Dimensions

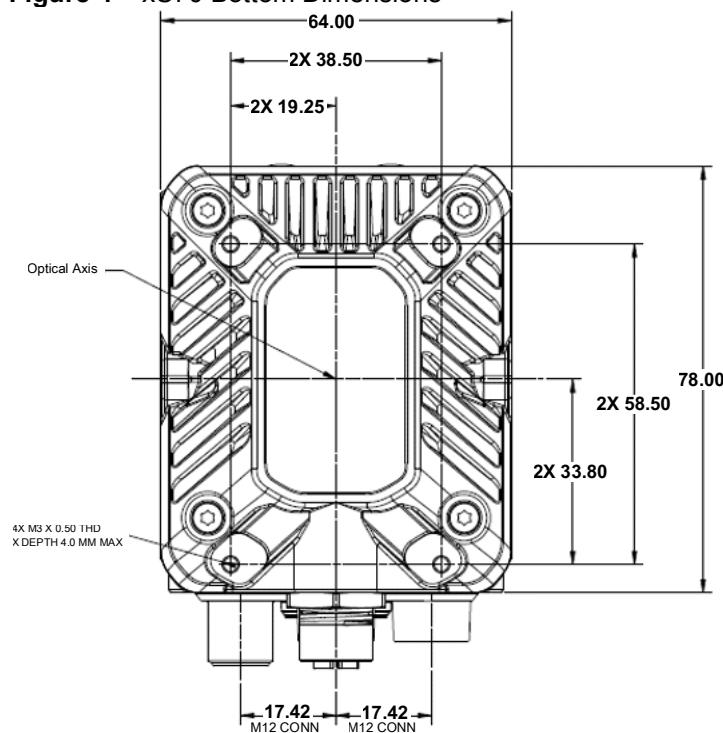


## xS70 Dimensional Drawings

**Figure 3** xS70 Side Dimensions



**Figure 4** xS70 Bottom Dimensions

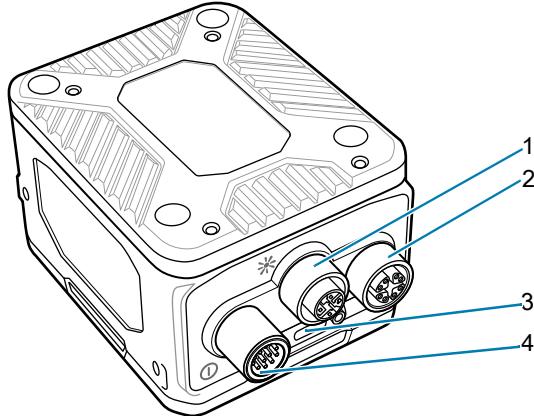


## Connection Interfaces

### xS40 Connections

The xS40 supports connections for USB-C with DisplayPort, power serial and GPIO, x-coded Ethernet and external lighting. For additional information about the connection interfaces, see [Cable Pin Outs on page 29](#).

**Figure 5** xS40 Connection Interfaces

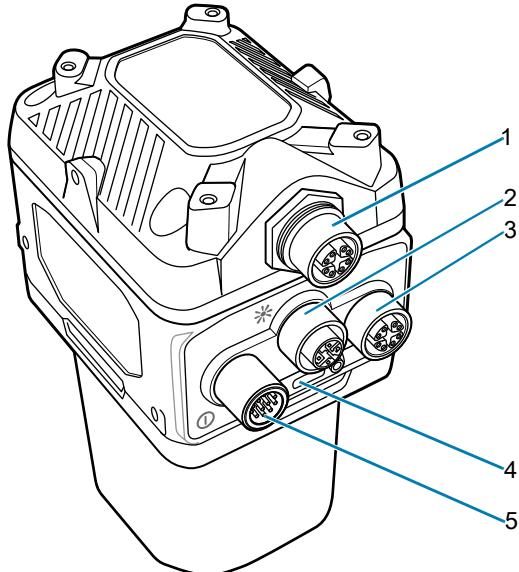


1	External Lighting
2	X-Coded Ethernet Port
3	USB-C (with DisplayPort)
4	Power Serial and GPIO

## xS70 Connections

The xS70 supports connections for USB C with DisplayPort, power serial and GPIO, x-coded Ethernet, and external lighting. For additional information about the connection interfaces, see [Cable Pin Outs on page 29](#).

**Figure 6** xS70 Connection Interfaces



1	X-Coded Ethernet Port (Secondary)
2	External Lighting
3	X-Coded Ethernet Port
4	USB C (with DisplayPort)
5	Power Serial and GPIO

## Torque Specification

To guarantee an IP65 & IP67 product specification, Zebra cables and/or connector covers must be torqued to the following specification:

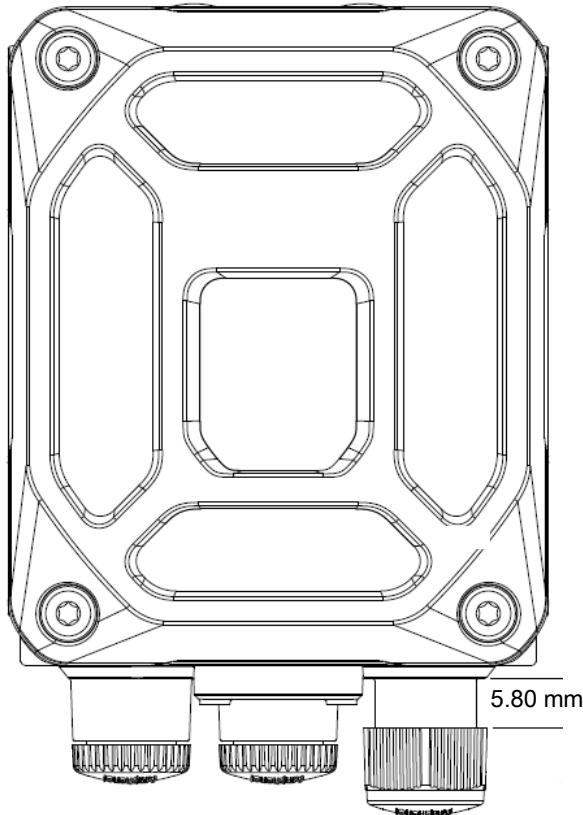
- Torque for M12 Zebra cables: 24.0 in-lbs
- Torque for connector covers: 10.0 in-lbs



**NOTE:** Connector covers are hand tightened from the factory to allow for easy hand removal. The covers must be torqued at installation to guarantee an IP65 and IP67 specification if cables are not used.

To ensure proper connector cover seating, see [Figure 7](#) for the reference dimension (in mm) of the 12 pin M12.

**Figure 7** 12 Pin M12 Reference Dimension



For additional information on Zebra cables, see [Communication Cables on page 13](#).

## Power Sources

The xS40 and xS70 devices can be powered through the 12-pin M12 connector, Power over Ethernet (PoE), or USB Type C for maximum flexibility. A power priority scheme selects power from the M12 connector over PoE, and PoE over USB-C to ensure the least restrictive power source is utilized. Changes to the power source trigger a reboot.

Since power from any source is finite, a budget is automatically derived by the vision system and dynamically allocated to prevent an overload condition. Allocation is based on sensor type and enabled features such as Ethernet PHY's, digital outputs, and advertised USB Type C port current. Models with internal illumination reduce illumination intensity or duration to operate within budget, and may disable internal illumination entirely if necessary.



**NOTE:** It is recommended to develop jobs with power sources and auxiliary equipment in the final intended configuration to prevent mismatch at deployment.

### 12 Pin M12 Power Input

If the input voltage is above 21.5 V, the vision system enables up to 1.5 A output to the USB Type C connector and allows for simultaneous operation of internal and external illumination. If the external light connector is placed in external light mode, power is shunted from the power supply directly to the light through a bypass circuit able to support the high peak currents of strobe lights. A self-resettable fuse prevents physical overload of the 12 pin M12 connector.

If less than 21.5 V is provided to the device, the advertised USB Type C current is lowered to 500 mA and overall power budget is reduced. This may impact allowable internal illumination configurations. As a result, a 24 V industrial power supply capable of high pulse currents of long duration is recommended for best performance.

### Power Over Ethernet

The xS40 and xS70 devices support operation from power sourcing equipment meeting the 802.3at class 4 (30 W) or 802.3af class 3 (15.4 W) IEEE Power Over Ethernet (PoE) standards. These are commonly referred to as PoE+ and PoE respectively by equipment providers.

Peak power draw must be strictly maintained within the power envelope of the power sourcing equipment. If the external light connector is enabled in external light mode, the vision system generates 24 V to power the external light with the following limitations in place:

- Simultaneous activation of the internal and external illumination is not permitted.
- Auto-strobe lights with high pulse current are not supported and trip over current protection in the vision system, disabling the external light connector.
- External lights with adjustable intensity may be used, provided the peak current draw is below the over current protection limit. It is recommended to start with the lowest intensity setting and work upwards, or to use the auto-tune feature.

Power over Ethernet requires an extra regulation step which incurs additional thermal buildup within the device. As a result, the specified operating temperature range is reduced when powered by PoE.

### USB Type C

USB Type C allows for novel and cost-effective installations provided the following constraints are acceptable:

- Digital GPIO are unavailable

- Optocoupled GPIO is still functional provided the COMMON\_IN and COMMON\_OUT are properly terminated.
- The External Light Connector is disabled and cannot be used in GPIO or External Light modes.
- 0 V to 10 V analog output is disabled.
- Internal illumination is limited or requires a USB power source with further capabilities to be enabled at any capacity.



**CAUTION:** The xS40 and xS70 devices boot from legacy USB host ports, however, current draw is not guaranteed to be under 500 mA and device functionality may be restricted to the extent that performance can be impaired. An override mode can be enabled for legacy host ports that are known by the operator to be capable of supplying up to 1.5 A. Ports of this type are often described as having USB BC1.2 or USB charging support.

## Grounding for Electro-Magnetic Compliance and ESD Safe

The vision system is designed with a rugged metal chassis connected internally to ground for robust Electro-Magnetic Compliance (EMC) and ESD Safe operation. Do not mount to any conductive object, body, structure, or mechanism that may become connected to line voltage or a voltage potential other than Protected Earth Ground. Chassis grounding via cable shield, mounting screws, or low inductance ground strap to a local Protected Earth Ground is acceptable.



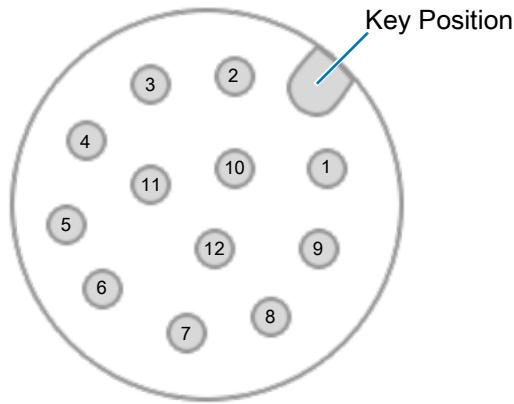
**NOTE:** There is no galvanic connection to Earth Ground when the device is powered over an unshielded Ethernet cable. In this scenario, grounding to local Earth Ground through another cable shield, mounting screw, or ground strap is required for ESD Safe compliance and best practice for EMC.

## Cable Pin Outs

This section provides pin and cable color information for the power and I/O, Ethernet, and external lighting connectors.

### Power and I/O Connector

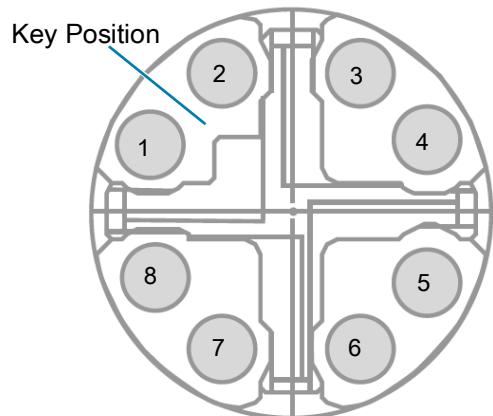
**Figure 8** Power and I/O Connector - 12 Pin Diagram



Pin	Color	Description
1	Yellow	GPIO2
2	White / Yellow	TXD
3	Brown	RXD
4	White / Brown	GPIO4
5	Violet	GPIO5
6	White / Violet	COMMON_IN
7	Red	DC_IN
8	Black	GND
9	Green	COMMON_OUT
10	Orange	GPIO0
11	Blue	GPIO1
12	Grey	GPIO3
SHELL	Bare	SHIELD

## Ethernet Connector

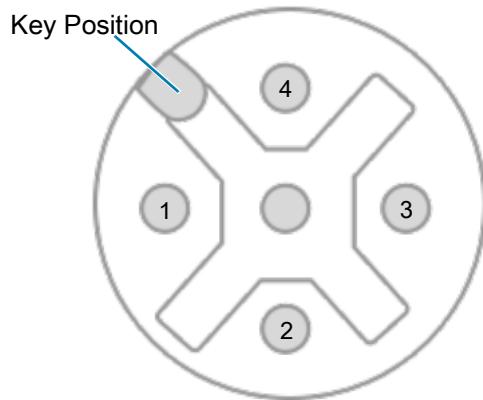
**Figure 9** Ethernet Connector - 8 Pin Diagram



Pin	Description
1	TP1+
2	TP1-
3	TP2+
4	TP2-
5	TP4+
6	TP4-
7	TP3-
8	TP3+
SHELL	SHIELD

## External Light Connector

**Figure 10** External Light Connector - 5 Pin Diagram



Pin	Color	Description
1	Brown	DC_OUT / GPIO8
2	White	GPIO7
3	Blue	GND
4	Black	GPIO6
5	Gray	ANALOG_OUT
SHELL	Bare	SHIELD

## Setting up an FS/VS Smart Camera

The sections below describe the steps to mount the xS40 or xS70 to the L-bracket accessory using [Figure 11](#) and [Figure 12](#) to understand its hole positions.

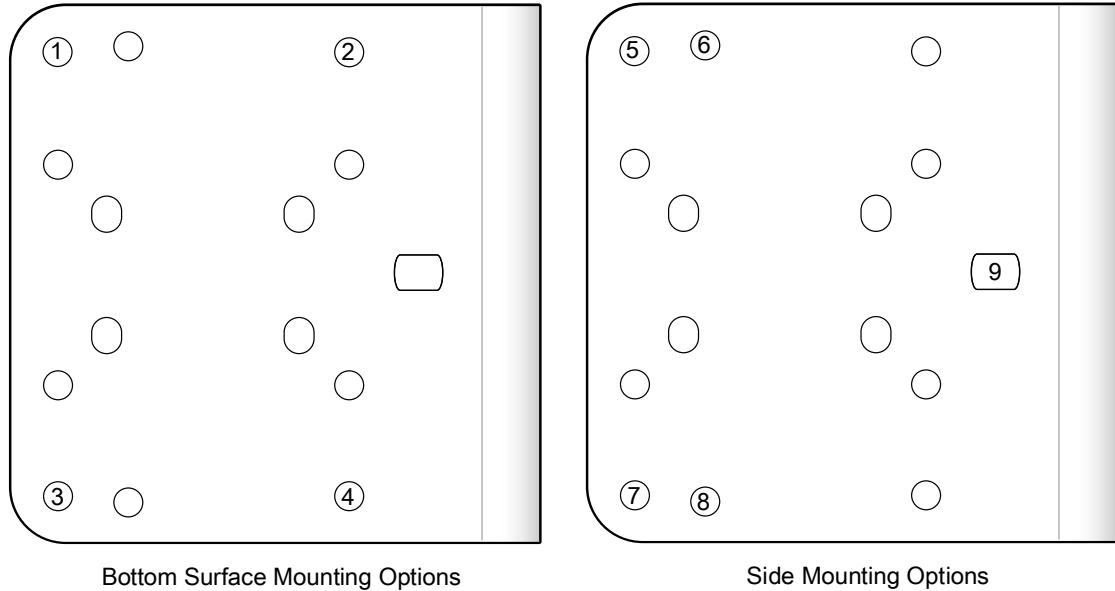
### General Mounting Instructions

1. Align the holes on the mounting surface with the mounting holes on the device.
2. Insert screws into the mounting holes and tighten. It is recommended to use four M3 screws to attach the camera on the bottom surface using a tightening Torque of 6.0 in-lbs.
3. See [Dimensional Drawings on page 21](#) for mounting hole placements on the devices to determine the proper screw lengths needed based on the provided tapping depths into the camera.

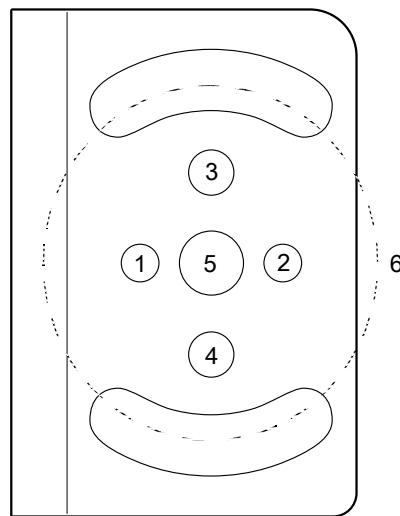
### Mounting the Device Using the L-Bracket Accessory (BRKT-LMNT-U000)

1. Use the mounting screws provided with the kit to attach the camera to the bracket. The recommended Torque is 6.0 in-lbs.
2. Refer to the L-bracket mounting options outlined below.

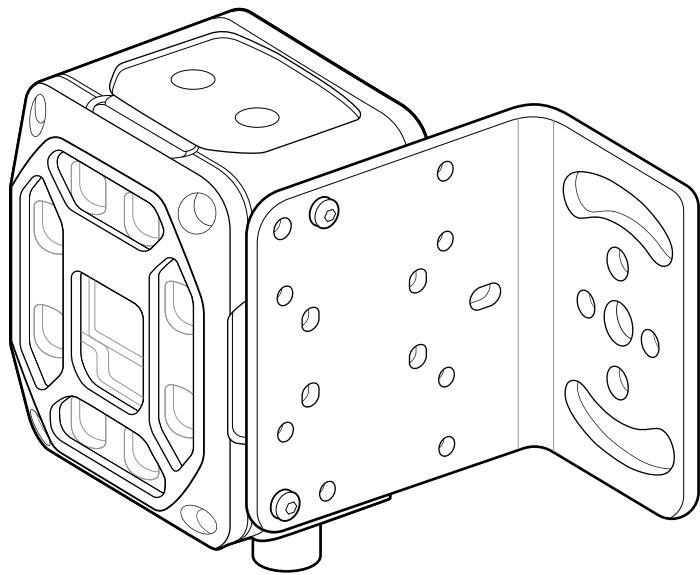
**Figure 11** Bottom and Side Mounting Hole Patterns



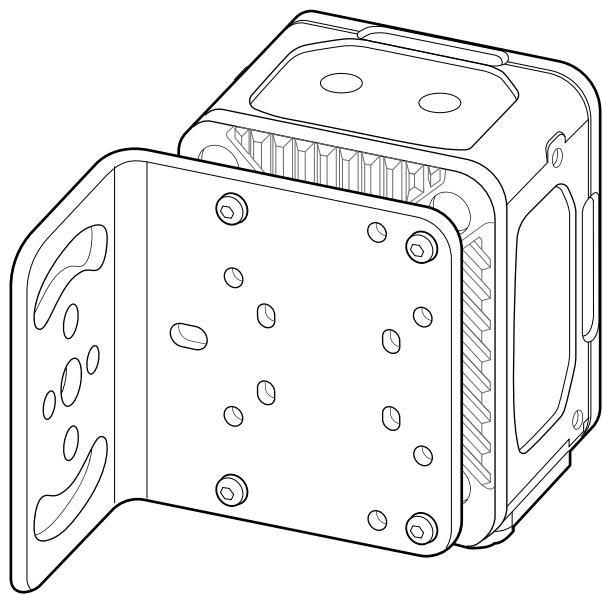
1-4	Bottom Surface Mounting Holes for the xS40 and xS70
5-8	Side Mounting Holes for the xS40
5-9	Side Mounting Holes for the xS70

**Figure 12** Mounting to the Structure Hole Pattern

1-2	M5 Clearance
3-4	1/4-20 Clearance
5	M8 Clearance
6	M8 Clearance Slots

**Figure 13** Side Mounting Option

**Figure 14** Bottom Mounting Option



## Illumination System Installation (xS40 Only)

To install the illumination system on the xS40, follow the steps below:

1. Place the gasket onto the camera.
2. Attach the Illumination PCB to the camera via the board to board connector and secure it with two screws. The recommended Torque is 6.0 in-lbs using the Torx T8 fasteners.
3. Place the filter onto the camera exit window, lining up the corner chamfer of the filter to the corner chamfer of the camera housing (if required).
4. Place the illumination plate assembly onto the camera.
5. Attach the top cover and secure with four screws. The recommended Torque is 6.0 in-lbs using the Torx T8 fasteners.

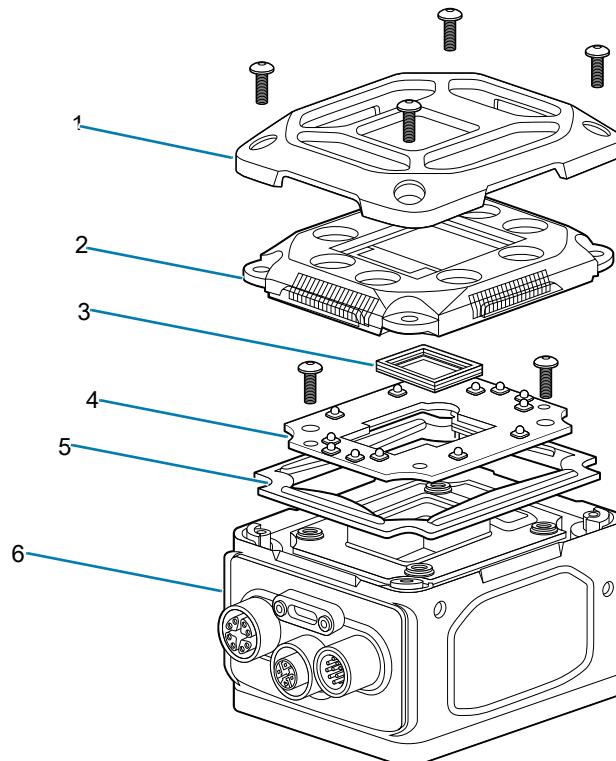
## Illumination System Disassembly (xS40 Only)

To disassemble the illumination system on the xS40, follow the steps below:

1. Remove the four screws and remove the top cover.
2. Remove the illumination plate assembly.
3. Remove the filter (if applicable).
4. Remove the two screws and gently lift the PCB to disconnect it from the camera.

The gasket can be left in place unless damaged. Replace the gasket if it is damaged to maintain its IP67 specification.

**Figure 15** Illumination System Installation



1	ESD Safe Cover (Four Screws)
2	Illumination Plate Sub-Assembly
3	Filter Assembly
4	Illumination PCB (Two Screws)
5	Illumination Plate Gasket
6	Main Assembly

## Threaded Lens Cover Assembly Installation

If a threaded lens cover assembly is preferable over the IP67 cover provided with the xS70, follow the instructions below for installation.



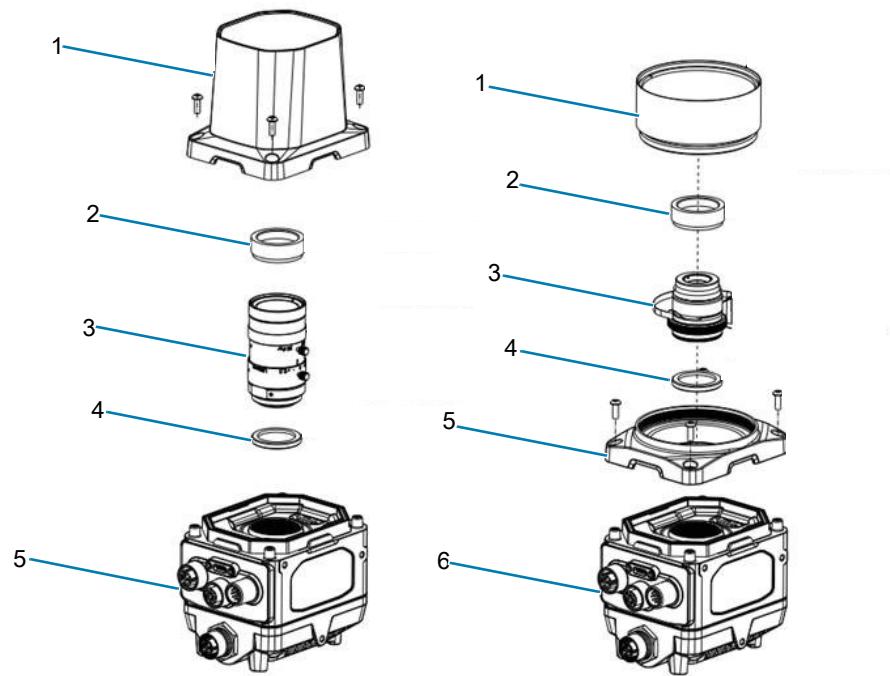
**NOTE:** The threaded lens cover assembly can only be used with C-Mount lenses.

1. Remove the lens cover.
2. Place threaded lens adapter accessory onto reader (HN-001466-01).
3. Insert and tighten the screws. The recommended torque is 6.0 in-lbs using the Torx T8 fasteners.
4. Install filter into reader (if required).
5. Thread the lens into the reader.
6. Place the reader at the desired working distance from the focal point.
7. Adjust lens (if necessary).
8. Thread on appropriate length cover to accommodate chosen lens.

## C-Mount Lens Installation (xS70 Only)

To install the c-mount lens onto the xS70, follow the steps below:

1. Remove the lens cover.
2. Install the filter into the reader (if required).
3. Thread the lens into the reader.
4. Place the reader at the desired working distance from the focal point.
5. Adjust the lens (if necessary).
6. Attach the front cover.
7. Insert and tighten the screws. The recommended Torque is 6.0 in-lbs using the Torx T8 fasteners.

**Figure 16** Optional Accessory Assembly Drawings

Number	Description	Number	Description
1	Lens Cover	1	Threaded Lens Cover
2	Polarizer	2	Polarizer
3	C-Mount Lens	3	C-Mount Lens
4	Filter	4	Filter
5	Assembly	5	Threaded Lens Cover Bracket (HN-001466-01)
		6	Assembly

## Setting Focus

To focus the device upon first use, calibrate the gain and exposure settings by utilizing the Live View feature in the Web HMI of the Zebra Aurora application. Users can also manually adjust the focus and the aperture of the C-mount lenses. For additional information on using the Web HMI, see [Accessing the Web Human-Machine Interface \(HMI\) on page 64](#).



**NOTE:** The set screws must be loosened before adjusting the lens. The set screws are fixed after the optimum focus and aperture are set.

# Using the Smart Camera

This section describes using the FS/VS Smart Camera and optimizing the device's utility for its use case by leveraging its connection interfaces.

## USB Type C

The xS40 and xS70 devices implement a full capability 5 Gbps USB 3.0 USB Type C port with support for DisplayPort Alt Mode. The sealed port implements a standard USB Type C dual screw lock mechanism for secure connections. When paired with the IP67 series of Zebra screw locking cables, the interface maintains a full IP67 seal.



**CAUTION:** The sealing gasket on IP67 series Zebra USB Type C cables require adequate pressure for proper seal and connector engagement. Always tighten the locking screws when using these cables, even if IP67 sealing is not required.

When connected as a peripheral to a USB host, the xS40 and xS70 devices can be configured to support the following functionality:

- RNDIS Ethernet over USB
- HID keyboard

When operating as a host, the USB Type C port supports many types of accessories and functionality, including:

- Native USB-C displays
- USB-C to Display Port and USB-C to HDMI adaptors
- HID compliant mice, keyboards, and trackpads
- USB mass storage devices for firmware updates
- USB docks and hubs



**NOTE:** DisplayPort output is only supported over USB Type C to Type C cables capable of SuperSpeed data rates. High speed cables, often described as charging cables, do not have the necessary data wires for DisplayPort functionality.

## Supported Display Resolutions

Display resolution is automatically negotiated upon connection. Displays with at least 1920 x 1080 resolution provide the best user experience.

The FS/VS Smart Camera series supports the following resolutions:

- 1024 x 768

- 1280 x 800
- 1280 x 1024
- 1366 x 768
- 1600 x 900
- 1600 x 1050
- 1920 x 1080
- 1920 x 1200



**NOTE:** Monitors with USB-C input offer an efficient method for quick and easy configuration over a single USB Type C to Type C cable. An attached xS40 or xS70 device powers directly from the monitor's USB Power Delivery and output the Human Machine Interface (HMI) directly to the display. A USB mouse and keyboard attached to the monitor hub ports provide the user with interface control. Battery powered portable USB Type C monitors are also compatible for easy status or manipulation in the field.

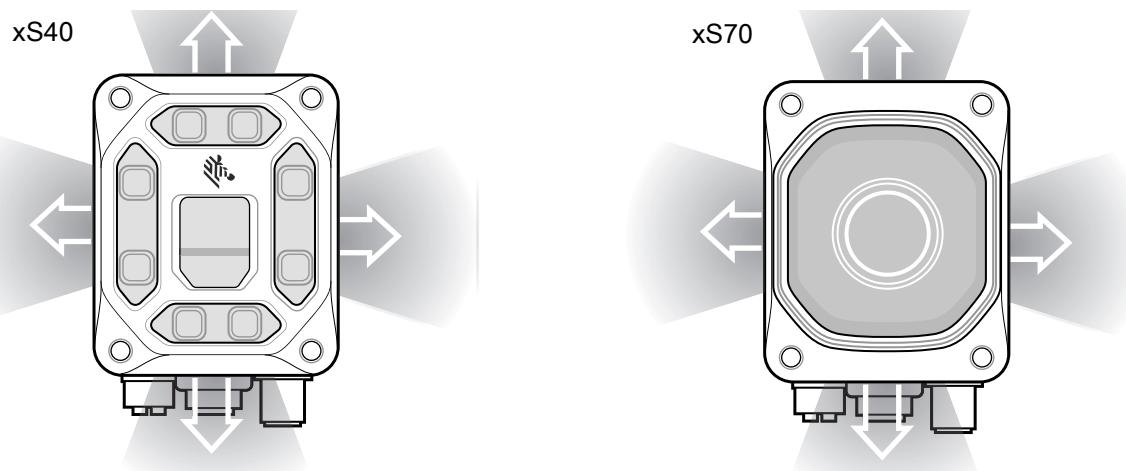
## User Interface

The FS/VS Smart Camera provides various forms of feedback in the form of decode LEDs, beeper indications, label LEDs, and UIF codes that keep the user aware of specific device states.

### Decode LEDs

The xS40 and xS70 have 360° LED decode indicators that flash green upon successful decode and red upon job failure. For information on configuring the 360° LEDs, see [General Settings on page 59](#).

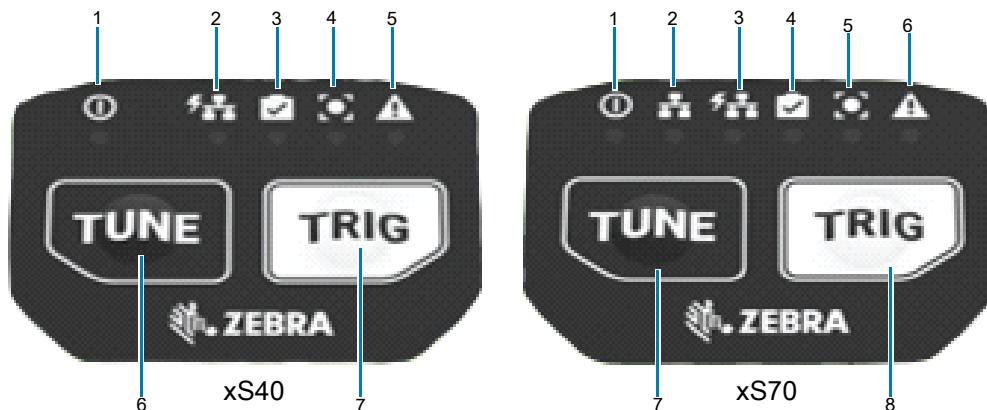
**Figure 17** xS40 and xS70 360° Decode LED



## User Interface Label

The xS40 and xS70 devices provide the user with LED indicators and switches to indicate the device state and optimize focus. [Table 14](#) below lists all LED indications for the FS/VS Smart Camera series. The xS40 and xS70 have trigger and tune buttons that are controlled by two switches on the sensor PCB. The TRIG switch acts a trigger, and the TUNE switch allows the user to adjust and optimize focus. For additional information on trigger configuration, see [Configuration of Trigger Modes on page 60](#).

**Figure 18** FS/VS Smart Camera Series UI Labels



Number	xS40 Indicator	Number	xS70 Indicator
1	Power	1	Power
2	Power over Ethernet (PoE)	2	Ethernet
3	Online	3	Power over Ethernet (PoE)
4	Focus	4	Online
5	Warning	5	Focus
6	Trigger	6	Warning
7	Tuning	7	Trigger
		8	Tuning

For additional information on using the TRIG button to perform a factory reset on the device, see [Factory Reset the Device on page 75](#)

## LED and Beeper Indicators

The table below describes the LED and beeper indications of the FS/VS Smart Camera upon device events such as power up, running a job, maintenance operations, and parameter programming.

**Table 14** LED Indicators

Event	Beeper	360° LEDs	Power	Device Status	Focus Status	Error Status	Description
<b>Power Up</b>							
Bootup - Uboot (Bootloader)	None	Off	Solid Red	Off	Off	Off	Hardware Controlled
Bootup - Linux, Low power (Developer Mode)	Low, Medium, High	Green (Single Blink)	Green (Slow Blink)	Off	Off	Off	Linux booted, Core Services not running yet, Low Power Condition applies to low USB or PoE Power.
Bootup - Linux, Full Power	Low, Medium, High	Green (Single Blink)	Solid Green	Off	Off	Off	Linux booted, Core Services not running yet
<b>Device States</b>							
Ready (Job Loaded /Active)	Low, High	Off	-	Green Blinking	Off	Off	Job is waiting on Trigger (Core Services in Standby state)
Running (Job Triggered)	As Configured	As Configured	-	Solid Green	As Configured	As Configured	Job is currently running (Core Services in Run state)
Stop	High, Low	Off	-	Off	Off	Off	No Activated Jobs (Core Services in Stopped state)
Setup	None	Off	-	Off	Off	Off	Job editing in progress (Core Services in App Connected state)
Error (Job Error)	Low, Low	Off	-	Solid Red	Off	Solid Red	Job has failed to complete properly
<b>Maintenance Operations</b>							
Firmware Update Start	-	Red Blinking	-	Red Blinking	Off	Off	Firmware Update in progress
Firmware Update Success	-	-	-	-	-	-	Firmware Update completed successfully. No success indication, boot normally.
Firmware Update Fail	Low, Low	Solid Red	-	Solid Red	Off	Off	Firmware Update has failed

**Table 14** LED Indicators (Continued)

Event	Beeper	360° LEDs	Power	Device Status	Focus Status	Error Status	Description
Reset to Defaults (Hold Trigger on Powerup)	Long Medium (on success by Config Manager)	Red (20s), Yellow (10s), Normal bootup	-	Red 1s, Green 1s alternating, Normal bootup	Off	Off	To Reset Defaults, hold trigger during Powerup and release when 360 LED is yellow. (Not Factory defaults. Do not lose licenses or Jobs).
AutoTune Start	Medium	Off	-	-	Green Blinking	Off	AutoTune in progress
AutoTune Success	High, High	Off	-	-	Solid Green	Off	AutoTune completed successfully
AutoTune Fail	Low, Low	Off	-	-	Solid Red	Off	AutoTune has failed
<b>Parameter Programming</b>							
Parameter Entry Accepted	High, Low, High, Low	Green (Single Blink)	-	Green (Single Blink)	Off	Off	Successful program exit with change in parameter setting.
Parameter Number Entry	High, Low	Green (Single Blink)	-	Green (Single Blink)	Off	Off	Number expected. Enter value using numeric bar codes.
Parameter Entry Error	Low, High	Red (Single Blink)	-	Red (Single Blink)	Off	Off	Input error: incorrect bar code, programming sequence, or Cancel scanned.

## User Interface Framework Codes

The table below describes specific system events and the feedback that the interface provides to convey certain device states to the user.

**Table 15** UI Codes

UIF Name	System Event	Beeper	LED
LINUX_BOOTUP_LOW_POWER	Not used	One medium volume, low tone, short duration beep. One medium volume, medium tone, short duration beep One medium volume, high tone, short duration beep	The decode LED flashes green for 250 ms once. The power LED continuously flashes green at 1 Hz with 50% duty cycle The run mode, focus, and warning LEDs are off.
LINUX_BOOTUP_FULL_POWER	Not used	One medium volume, low tone, short duration beep. One medium volume, medium tone, short duration beep. One medium volume, high tone, short duration beep.	The decode LED flashes green for 250 ms once. The power LED stays ON in green. The run mode, focus and warning LEDs are off.
JOB_READY	Not used	One medium volume, low tone, short duration beep. One medium volume, high tone, short duration beep.	The run mode LED continuously flashes in green at 2 Hz with 50% duty cycle. The power LED responds as configured. The decode, focus and warning LEDs are off.
JOB_RUNNING	Not used	No beeper feedback.	The run mode LED stays on in green. The power, decode, focus, and warning LEDs respond as configured.
JOB_STOP	Not used	One medium volume, high tone, short duration beep. One medium volume, low tone, short duration beep.	The power LED responds as configured The decode, run mode, focus, and warning LEDs are off.
JOB_SETUP	Not used	No beeper feedback.	The power LED responds as configured. The decode, run mode, focus, and warning LEDs are off.

**Table 15** (Continued)UI Codes

UIF Name	System Event	Beeper	LED
JOB_ERROR	The device becomes underpowered.	Two medium volume, low tone, short duration beeps.	The run mode LED stays on in red. The warning LED stays on in red. The power LED responds as configured. The decode and focus LEDs are off.
FIRMWARE_UPDATE_START	Firmware update Starts.	No beeper feedback.	The decode LED continuously flashes red at 2 Hz with 50% duty cycle. The run mode LED continuously flashes red at 2 Hz with 50% duty cycle The power LED responds as configured. The focus and warning LEDs are off.
FIRMWARE_UPDATE_END	Firmware update ends.	The beeper is off.	The power LED responds as configured. The decode, run mode, focus, and warning LEDs are off.
FIRMWARE_UPDATE_FAIL	Firmware update failure.	One medium volume, low tone, long duration beep.	The decode LED continuously flashes in red at 5 Hz with 50% duty cycle The run mode LED continuously flashes in red at 5 Hz with 50% duty cycle. The power LED responds as configured. The focus and warning LEDs are off.
AUTOTUNE_START	Autotune job starts	One medium volume, medium tone, short duration beep.	The focus LED continuously flashes in green at 2Hz with 50% duty cycle. The power LED responds as configured. The run mode LED responds as configured. The decode and warning LEDs are off.

**Table 15** (Continued)UI Codes

UIF Name	System Event	Beeper	LED
AUTOTUNE_SUCCESS	Autotune job completes	One high volume, high tone, short duration beep.	The focus LED stays on in green. The power LED responds as configured. The run mode LED responds as configured. The decode and warning LEDs are off.
AUTOTUNE_FAIL	Autotune job failure.	One low volume, low tone, short duration beep.	The focus LED stays on in red. The power LED responds as configured. The run mode LED responds as configured. The decode and warning LEDs are off.
BARCODE_DECODE_START	PreDecodeProcedure (asynchronous)	The beeper is off.	The run mode LED stays on in amber The decode LED is off. The power, focus and warning LEDs respond as configured.
BARCODE_DECODE_SUCCESS	PostDecodeProcedure when beep_on_decode is false.	One high volume, medium tone, short duration beep by default.	The run mode LED is off. The decode LED flashes in green for 50 ms once by default. The power, focus and warning LEDs respond as configured.
BARCODE_DECODE_FAILURE	PostDecodeProcedure when a decode fails.	No beeper feedback.	The run mode LED is off. The decode LED flashes red for 50 ms once by default. The power, focus, and warning LEDs respond as configured.
FACTORY_RESET	Factory Reset starts	Two medium volume, medium tone, short duration beeps.	The decode LED continuously flashes in red at 5Hz with 50% duty cycle. The power, run mode, focus, and warning LEDs respond as configured.

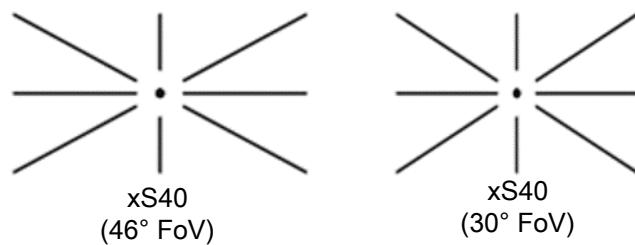
# Data Capture

This section describes aiming patterns and decode ranges for the xS40 as well as minimum focus distances for the xS70 while using a C-mount lens.

## Aiming Patterns

The xS40 has a red Class II laser aimer that generates the pattern shown below in [Figure 19](#). The aimer indicates the center and size of the field of view including diagonal corners 24 in. away from the subject.

**Figure 19** xS40 Laser Aiming Pattern



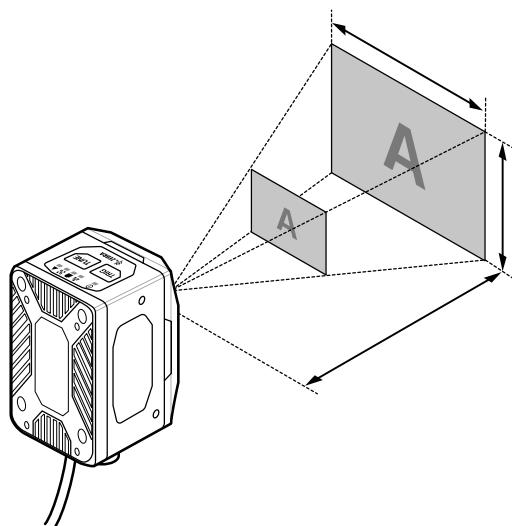
## xS40 Decode Ranges

The xS40 features a 30° and 46° field of view lens that meets the decode ranges specified in [Table 16](#) at room temperature under ambient conditions.

The device has two imaging FoVs:

- 30 (H) x 19 (V)
- 46 (H) X 29 (V)

**Figure 20** xS40 Imaging Fields of View



**Table 16** xS40 Decode Ranges

Symbology	FS40-SR 30° Mono		FS40-WA 46° Mono	
	Typical Near	Typical Far	Typical Near	Typical Far
5 mil Code 128	8 cm (3 in.)	61 cm (24 in.)	8 cm (3 in.)	36 cm (14 in.)
10 mil Code 128	8 cm (3 in.)	124 cm (49 in.)	8 cm (3 in.)	76 cm (30 in.)
15 mil Code 128	8 cm (3 in.)	178 cm (70 in.)	8 cm (3 in.)	107 cm (42 in.)
20 mil Code 128	8 cm (3 in.)	234 cm (92 in.)*	8 cm (3 in.)	142 cm (56 in.)*
5 mil Data Matrix	8 cm (3 in.)	33 cm (13 in.)	8 cm (3 in.)	20 cm (8 in.)
10 mil Data Matrix	8 cm (3 in.)	71 cm (28 in.)	8 cm (3 in.)	46 cm (18 in.)
15 mil Data Matrix	8 cm (3 in.)	102 cm (40 in.)	8 cm (3 in.)	69 cm (27 in.)
30 mil Data Matrix	8 cm (3 in.)	198 cm (78 in.)*	8 cm (3 in.)	132 cm (52 in.)*

**NOTE:** Near distance is limited by barcode width and will focus no closer than 3 in.

\*May be limited by illumination output from the power source, wavelength, or polarizer accessory (non-IR). The above ranges are also applicable to 24 VDC powered unpolarized red illumination without ambient light.

## xS70 Minimum Focus Distances

The table below outlines the minimum focus distances for C-mount lenses, provided by Zebra for use with the xS70 device. Decode ranges are dependent upon the selected lens effective focal length, focusing distance setting, and lens aperture setting.

**Table 17** Minimum Focus Distances

C-Mount Moritex Lens	8 MM	12 MM	16 MM	25 MM	35 MM
Minimum Focus Distance from the Lens	6.35 cm (2.5 in.)	11.43 cm (4.5 in.)	10.16 cm (4 in.)	11.43 cm (4.5 in.)	19.05 cm (7.5 in.)

## General Purpose Input and Outputs

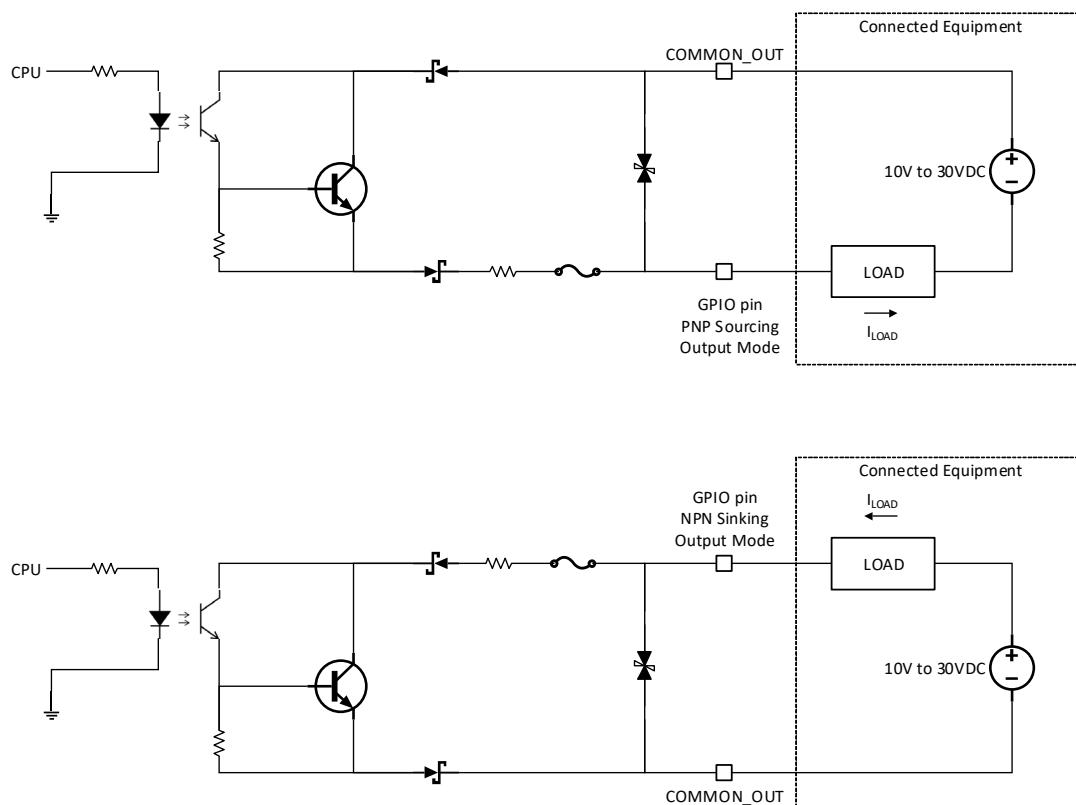
The xS40 and xS70 devices have two types of general-purpose inputs and outputs (GPIO). GPIO0 through GPIO3 are optically coupled to provide electrical isolation and wiring flexibility. GPIO4 through GPIO8 are 24 V Digital GPIO, which are not isolated and source power from the external power supply or Power over Ethernet (PoE). Digital GPIO is unavailable when the system is powered by USB, however, optocoupled GPIOs remain functional when COMMON\_IN and COMMON\_OUT are terminated appropriately.

### Optically Coupled GPIO

Optocoupled GPIO have the advantage of being electrically isolated from the rest of the vision system and require external reference through the COMMON\_IN and COMMON\_OUT wires. The termination of COMMON\_IN and COMMON\_OUT to an external voltage or ground determines if the input or output is Sinking (also known as NPN) type or Sourcing (also known as PNP) type.

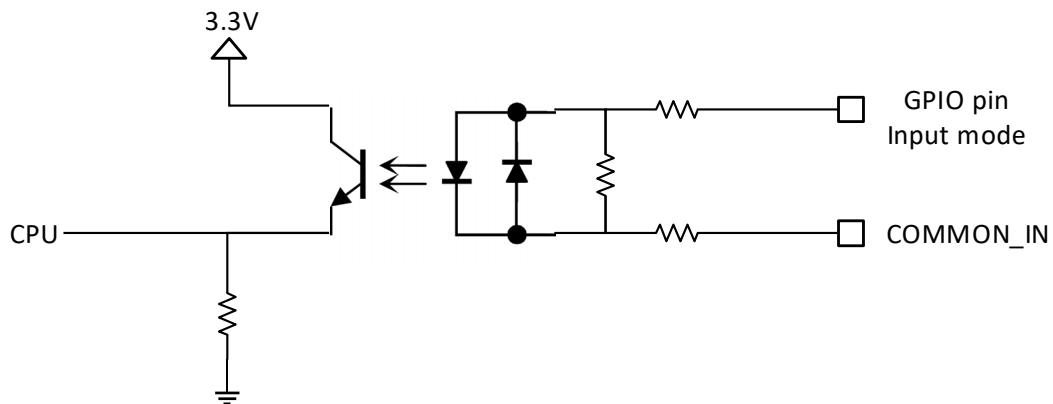
In output mode, these GPIO perform similarly to switches connecting the GPIO pin to COMMON\_OUT. When disabled, the GPIO pin is disconnected from COMMON\_OUT and allowed to float. As a result, optocoupled outputs turn on relatively quickly, while the turn off time is dependent upon how quickly the connected load dissipates charge.

**Figure 21** Output Mode Equivalent Circuit Diagram for NPN and PNP Mode



Optocoupled inputs are enabled when voltage is applied across the GPIO pin and COMMON\_IN.

**Figure 22** Input Mode Equivalent Circuit Diagram for NPN and PNP Mode



Optocoupled GPIO can be operated in a non-isolated fashion by terminating COMMON\_IN and COMMON\_OUT to the DC\_IN or GND wires used to power the device.

The following table provides a useful reference for such connections.

**Table 18** Connection References

Wire	Termination	Configuration
COMMON_IN	GND	Sinking Input (NPN)
COMMON_IN	DC_IN	Sourcing Input (PNP)
COMMON_OUT	GND	Sinking Output (NPN)
COMMON_OUT	DC_IN	Sourcing Output (PNP)

While it is possible to configure inputs and outputs of the same type, this is not recommended as inputs and outputs must be of opposite type to be compatible. All optocoupled GPIO share the COMMON\_IN for input mode and COMMON\_OUT for output mode. Therefore, all inputs must be of the same type and all outputs must be of the same type. For example, it is not possible to simultaneously configure sinking output on GPIO0 and sourcing output on GPIO1.

In practice, sinking inputs paired with sourcing outputs is very common. This combination is compatible with widely available digital industrial GPIO, which typically only support sinking type inputs.



**NOTE:** Refer to the documentation of the connected auxiliary equipment to ensure a compatible configuration, and remember to leave unused GPIO in a disabled state.

Optocoupled outputs are individually fused to protect against damage from short circuit or overload events. Since no power is consumed from the vision system, optocoupled GPIO are always available regardless of power source and have no impact on power budgeting.

## Digital Industrial GPIO

Unlike optocoupled GPIO, digital GPIO actively drive the output signal high and low for significantly faster turn on and turn off time. Digital GPIO is not isolated, and therefore referenced to the power supply and ground of the vision system. COMMON\_IN and COMMON\_OUT do not need to be terminated to use digital GPIO.



**NOTE:** Refer to the documentation of the connected auxiliary equipment to ensure a compatible configuration, and remember to leave unused GPIO in a disabled state.



**IMPORTANT:** A digital GPIO can be configured as a 24 V output and wired back in to COMMON\_IN or COMMON\_OUT to create the necessary bias voltage to operate optocoupled GPIO when the system is powered by PoE. It is important to be aware of the 100 mA total current budget per digital GPIO when attaching loads to any optocoupled outputs powered this way.

Digital inputs on xS40 and xS70 devices are of the sinking (NPN) input type and do not support the less common sourcing (PNP) input configuration. Voltage above the specified threshold relative to the vision system ground must be applied for a logic high to register. Drive these inputs with a sourcing (PNP) or push-pull output.

Configuring the 5-pin M12 External Light connector to GPIO Mode makes GPIO6 through GPIO8 available for general use. Configuring the External Light connector to External Light Mode switches GPIO8 into a high current output to provide power and sets up GPIO6 and GPIO7 to control the connected light.

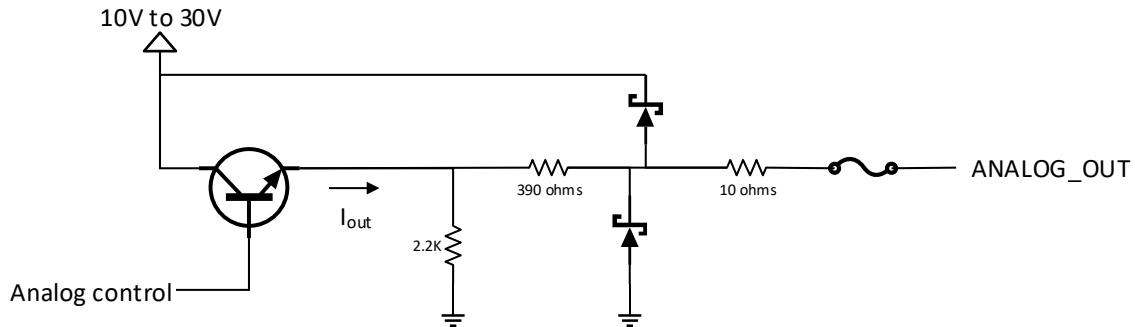


**IMPORTANT:** When the vision system is powered by an external power supply, and the External Light connector is configured for External Light mode, GPIO8 operates in a bypass mode capable of shunting input power directly to high power strobe lights. Extremely high peak currents are possible with adequate power supply capability, minimized cable losses, and observing duty cycle limits that keep average current into the entire system below 1500 mA.

## Analog Output

The vision system is equipped with an analog output on the External Light connector capable of generating between 0 V and 10 V. An output impedance of approximately 400 ohms protects the analog output driver against overload conditions, however, this introduces an offset in output voltage that is directly proportional to the output current. For optimal accuracy, connect devices with low input bias current.

**Figure 23** Analog Output Equivalent Circuit Diagram



# Power and Thermal Management

Sophisticated algorithms keep operation of the machine vision system within acceptable power and thermal parameters to ensure reliable operation over the product lifetime.



**CAUTION:** If the available power budget is not adequate for configured settings, a warning is indicated to the user. In some cases, the user can choose to ignore or override the warning, in which case, operational stability of the system should be evaluated by the integrator.

Temperature is actively monitored at critical points within the system. Whenever a safe limit is exceeded the system response may include disabling of certain features, reduction of processor performance, or stopping active jobs.

If overheating is a problem, effective mitigation strategies include:

- Reducing the average system power consumption
- Avoiding continuous trigger mode
- Lowering trigger rate
- Using external illumination
- Avoiding operating from PoE
- Operating in a cooler environment
- Actively cooling with a fan
- Heatsinking the chassis to a large thermally conductive mounting surface through a thermally conductive mounting system

For optimal performance, ensure that the device does not exceed the recommended operating ranges listed below:

**Table 19** Operating Temperature

Temperature	Operating Range <sup>1</sup>
Ambient Temperature	0°C - 40°C (POE, duty cycle-dependent) 0°C - 45°C (non-POE, duty cycle-dependent)

**Note 1:** If temperatures exceed the operating range, additional heat sinking strategies may be necessary, i.e. mounting to a metal infrastructure or forced convection via an external fan. Use of the Zebra Universal Mounting Bracket (BRKT-LMNT-U000) provides multiple options to mount to a metal infrastructure.

# Zebra Aurora Software Overview

The Zebra Aurora application provides a unified platform with an intuitive interface for setting up, deploying, and running Fixed Industrial Scanning or Vision System jobs to control enterprise-wide manufacturing and logistics automation solutions. This tool also has the capacity to scale in support of new codes and increase scanning speed with the potential to upgrade to machine vision functionality via software license upgrade.

## Human-Machine Interface (HMI)

Using the Web Human-Machine Interface (HMI), operators can view and interact with the Zebra Aurora Human Machine Interface (HMI) dashboard via web browser or by connecting a monitor directly to the xS40.

## Industrial Ethernet Information

For information regarding built-in EtherNet/IP, PROFINET or other network protocols to integrate with any common PLC or host system, refer to the FS/VS Smart Camera Industrial Ethernet User Guide.

## Zebra Aurora Features

Zebra Aurora provides several differentiating features to rapidly process, evaluate and compare multiple images in various lighting conditions without altering any hardware configurations.

Some notable features include:

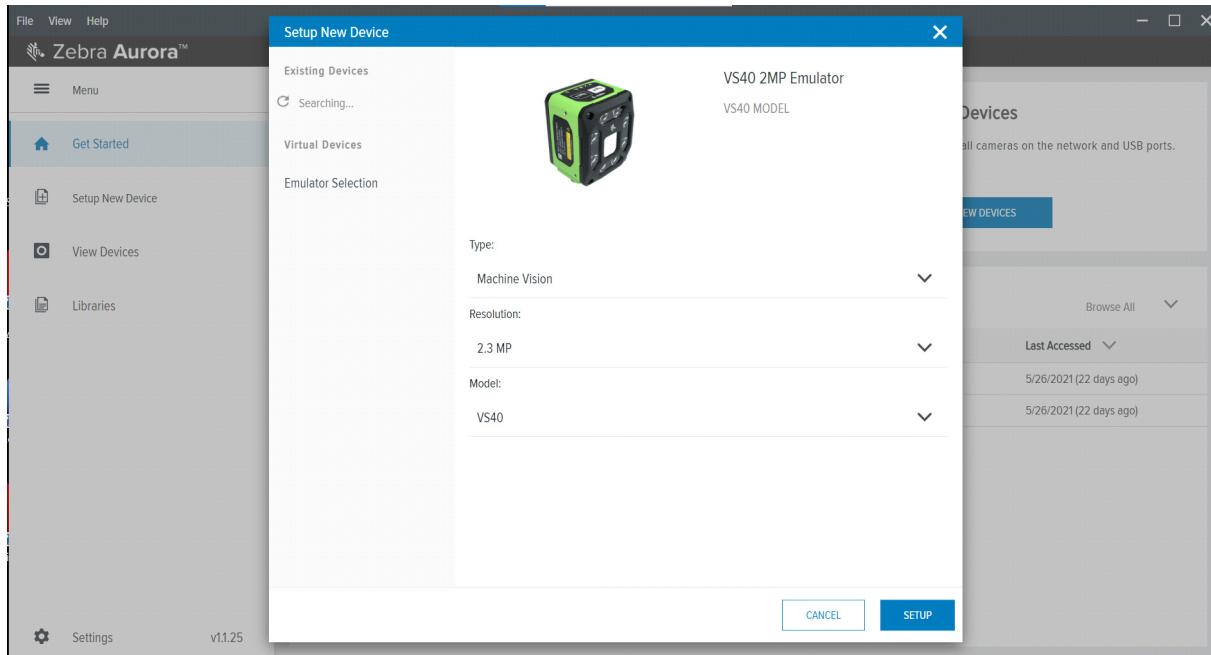
- Golden Image Compare – allows users to efficiently identify and resolve issues by comparing any image to an ideal image created at setup. This tool has the capacity to significantly expedite troubleshooting activities by immediately diagnosing and correcting the source of degradation.
- QuickDraw – enables the user to draw right on an image to create a tool with minimum steps.
- Object Locate and Pattern Matching – Zebra's algorithms and intuitively crafted default settings enable users to consistently create and deploy efficient tools with less trial and error involved.

For additional information on leveraging these features toward a specific use case, refer to the built-in tutorials, videos and walk-throughs available within the Zebra Aurora application.

## Device Discovery

Emulated devices are listed under **Virtual Devices** on the **Setup New Device** screen. Devices that are physically connected to the system and are available to connect and setup are listed under **Existing Devices**.

**Figure 24** Setup a Device

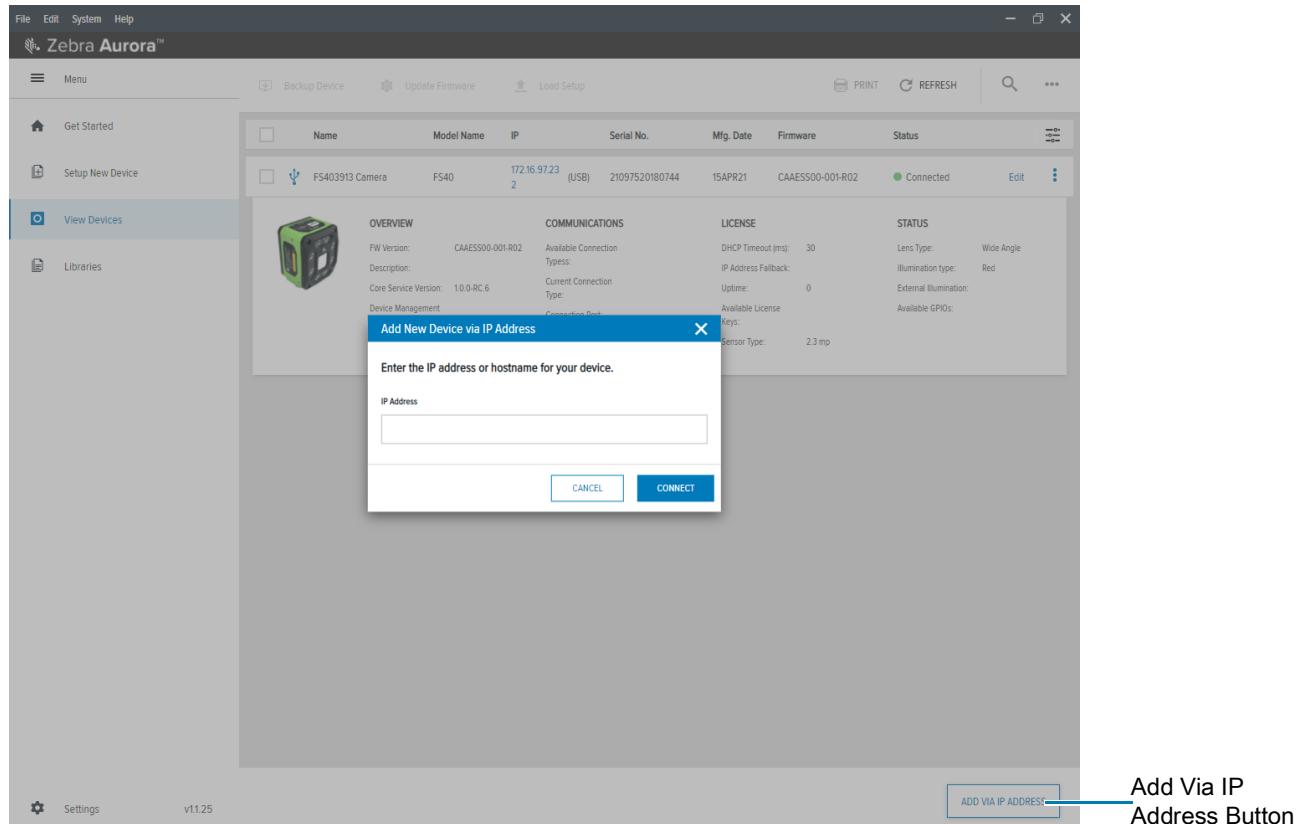


**NOTE:** If you are experiencing issues using Device Discovery, see the [Troubleshooting on page 41](#) and [Security Settings on page 76](#) sections for potential solutions.

## Setting an IP Address

Users can manually set up an IP address by clicking on the **Add Via IP Address** button in the bottom left corner of the **View Devices** screen. To connect via IP address, enter the IP address into the **Add New Device via IP Address** form field and click **Connect**.

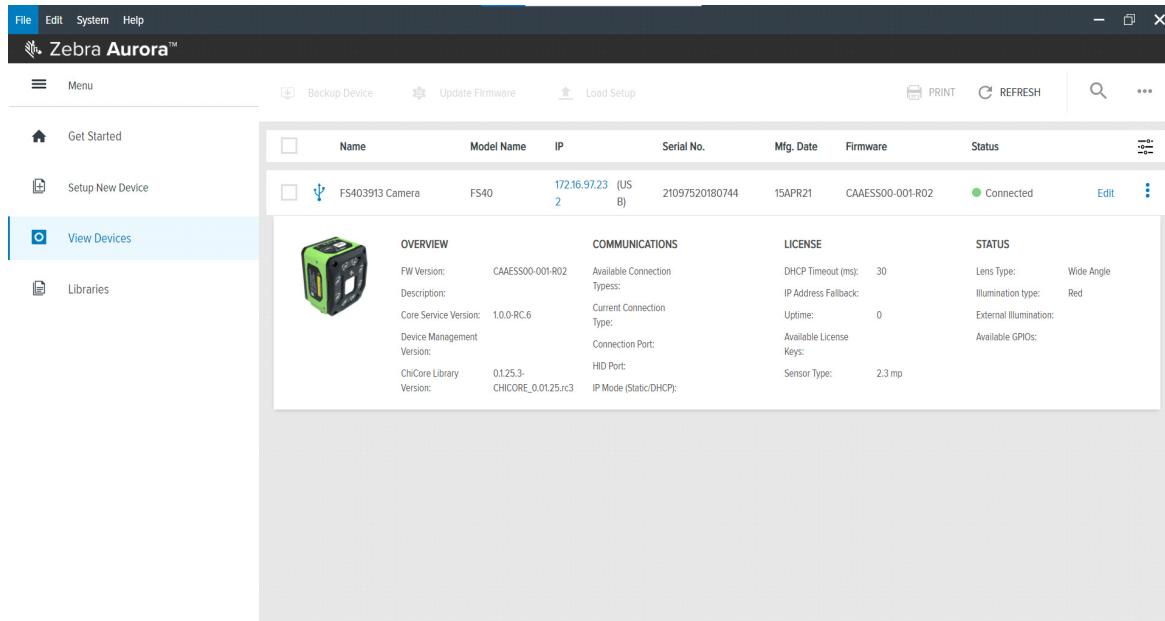
**Figure 25** Add a New Device via Static IP Address



## Ethernet Setup

Users can physically connect the device via Ethernet to a Network Switch, Power over Ethernet Injector, or directly to the Host PC. Users can also connect the device via USB-A to USB-C cable to the Host PC. Once connected, navigate to the **View Devices** screen to view all connected devices and their properties such as name, model name, IP address and the last time the device was accessed.

**Figure 26** Main Screen



## Configuring Device Settings

Device Settings that are configurable within the Zebra Aurora application include device details, communication, general settings, and GPIO mapping. Users can add a description to a specific set up, proceed to configure additional settings, or open the Job workflow to open an existing Job by importing a zjob file or creating a new one.



**NOTE:** Emulated device settings are read-only and cannot be edited by users.

**Figure 27** Device Settings

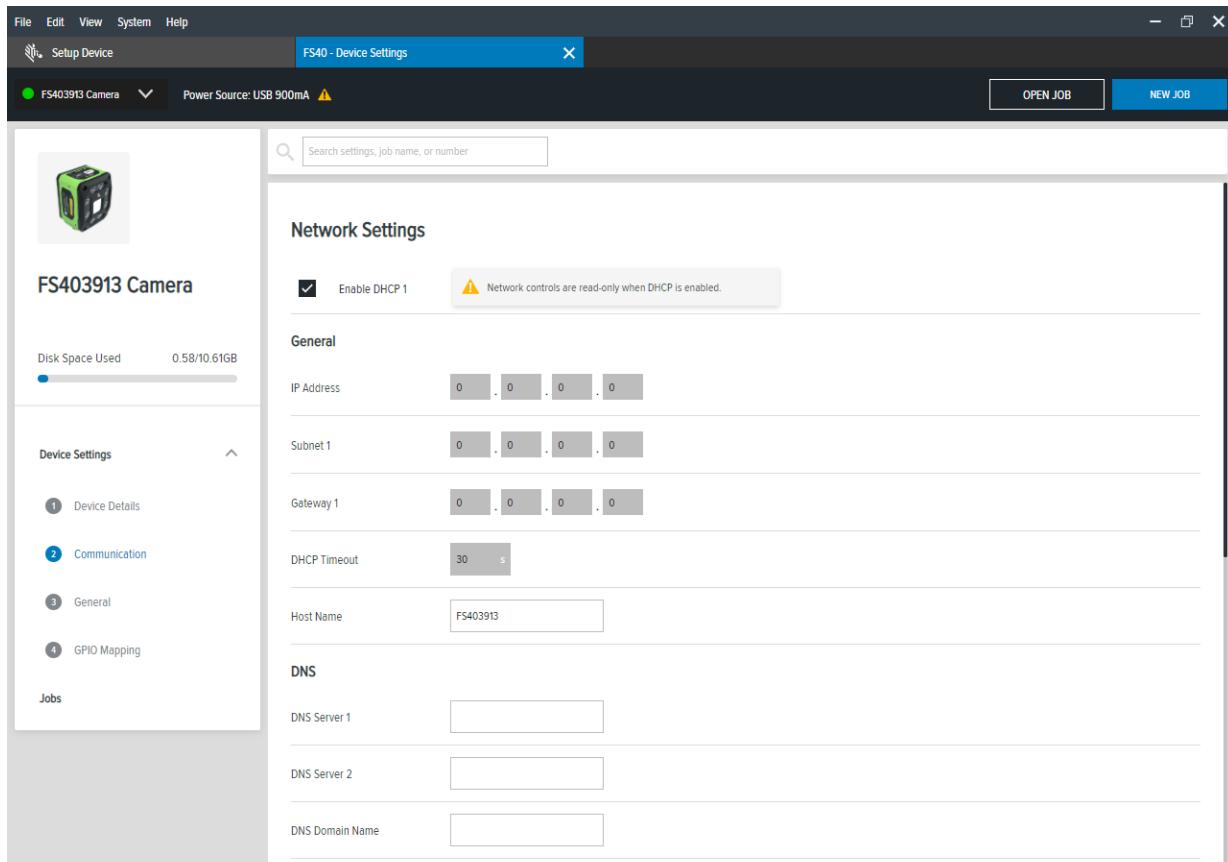
The screenshot displays the Zebra Aurora Software interface for managing device settings. The main title bar reads "FS40 - Device Settings". The left sidebar, titled "Device Settings", contains sections for "Device Details", "Communication", "General", and "GPIO Mapping". The central area shows "Disk Space Used" at 0.58/10.61GB. A large text input field for "Setup Description / Notes" is present, with a character count of 500/500 characters remaining. The "Device Info" table provides detailed information about the device, such as Model (FS40), IP (172.16.97.232), Serial Number (21097520180744), and various memory and service history fields. The "Jobs" section is also visible in the sidebar.

Model	FS40
IP	172.16.97.232
Serial Number	21097520180744
Description	-
Current Connection Type	-
Mfg. Date	15APR21
Firmware	CAAESS00-001-R02
Device Class	-
Last Service Date	-
Illumination Board	-
Expansion Board	-
Total Memory	-
Available Memory	-
Total Flash	-
Available Flash	-
Number Of GPIOs	9

## Communication Settings

Configurable communication settings include network settings, DNS, date/time, PLC protocol and USB settings. For additional information on PLC protocol and Industrial Ethernet, refer to the FS/VS Smart Camera Industrial Ethernet User Guide.

**Figure 28** Communication

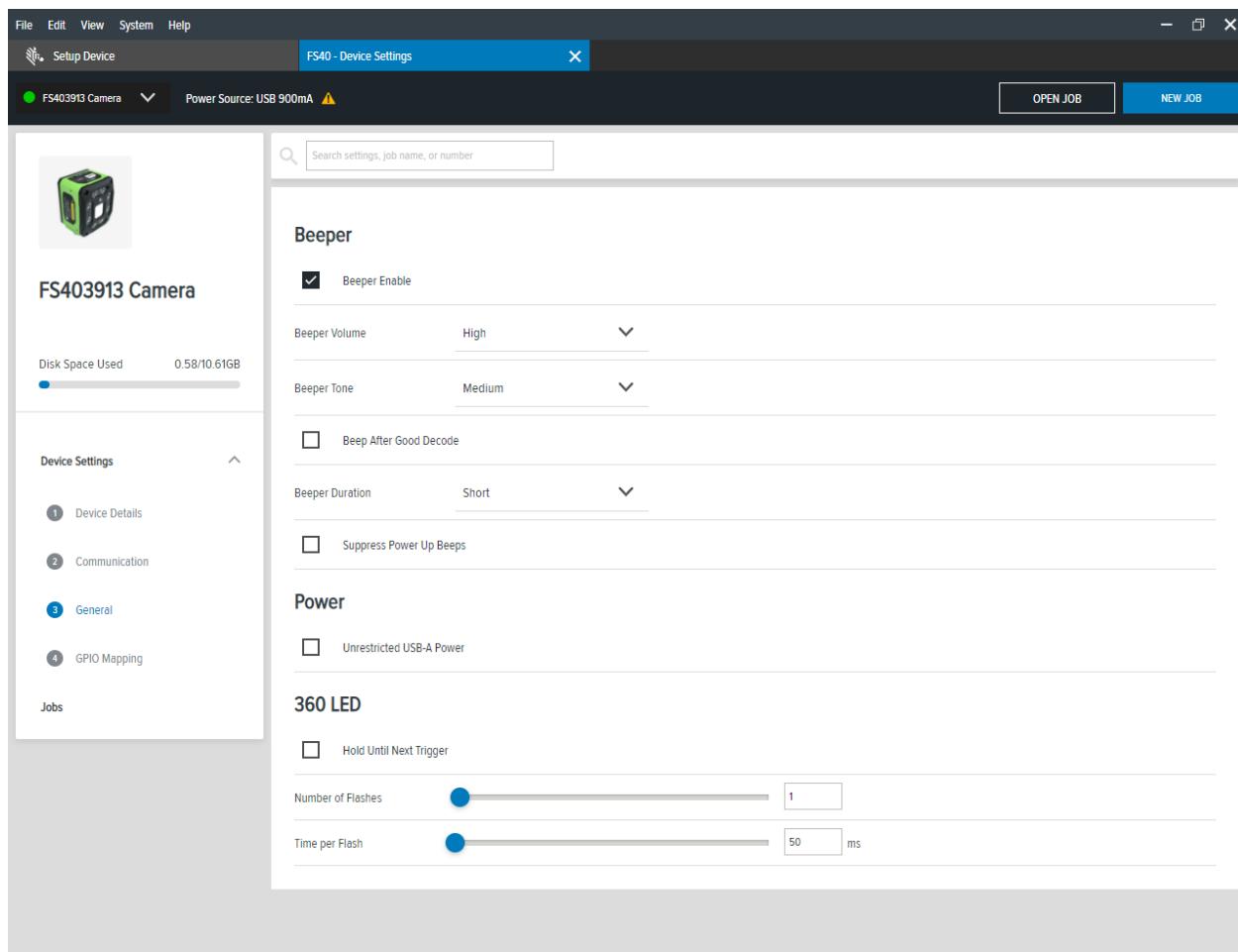


## General Settings

Under general settings, users can configure the beeper, power, and 360° LED settings. Beeper settings can be set to enable or disable and the volume, tone, and duration of the beep can be configured to fit the needs of a specific use case. The power settings can be altered to enable unrestricted USB-A power. Settings on the 360° LED of the device can be enabled to hold the flash until its next trigger. The number of flashes that occur and the length of time per flash (.ms) can also be configured.

For additional information on the FS/VS Smart Camera user interface, see [User Interface on page 40](#) and [LED and Beeper Indicators on page 42](#).

**Figure 29** General Settings



## GPIO Mapping

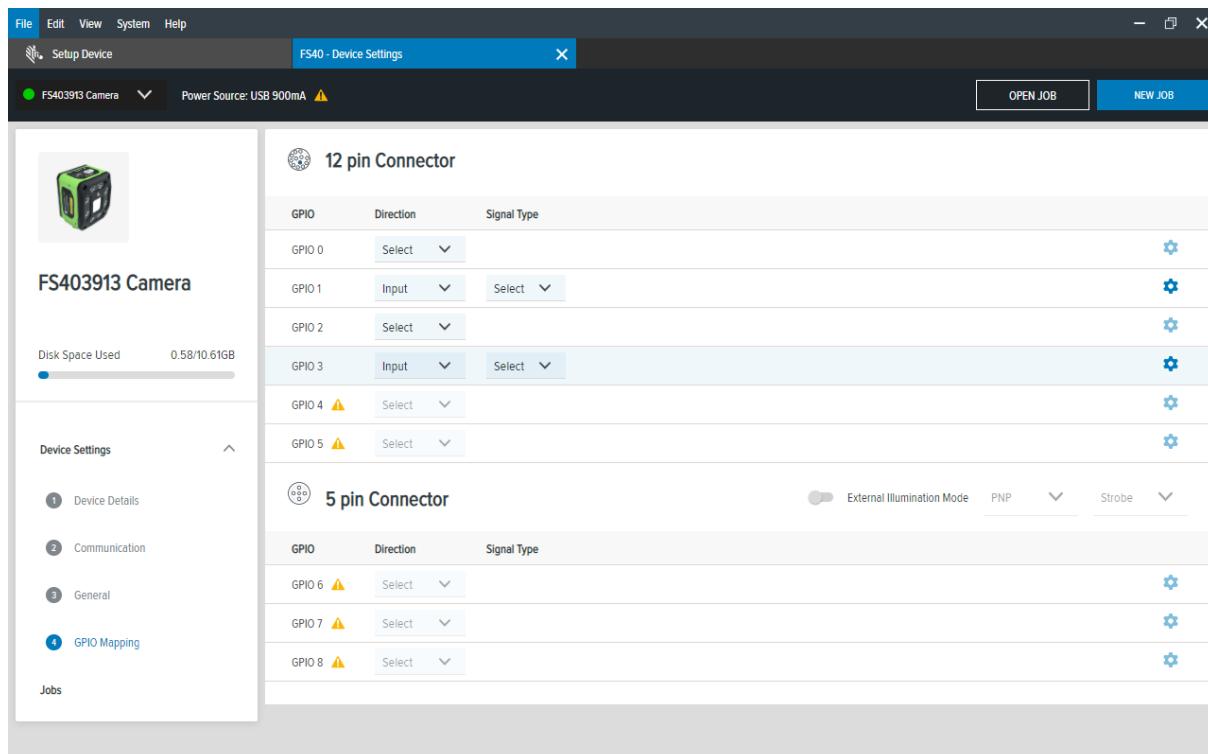
Configure GPIO settings including direction and signal type for both 12 pin and 5 pin connectors by accessing the GPIO mapping tool. The direction of each GPIO can be edited by using the dropdown menu and selecting input, output or none. For GPIO1 and GPIO3, the signal type can be changed to trigger or none. Input debounce on GPIO1 and GPIO3 can be also be increased by clicking on the settings icon.

For more information on the GPIO operation, see [General Purpose Input and Outputs on page 48](#).



**NOTE:** GPIO4-GPIO8 settings cannot be edited when the device is in low power mode.

**Figure 30** GPIO Mapping Configuration



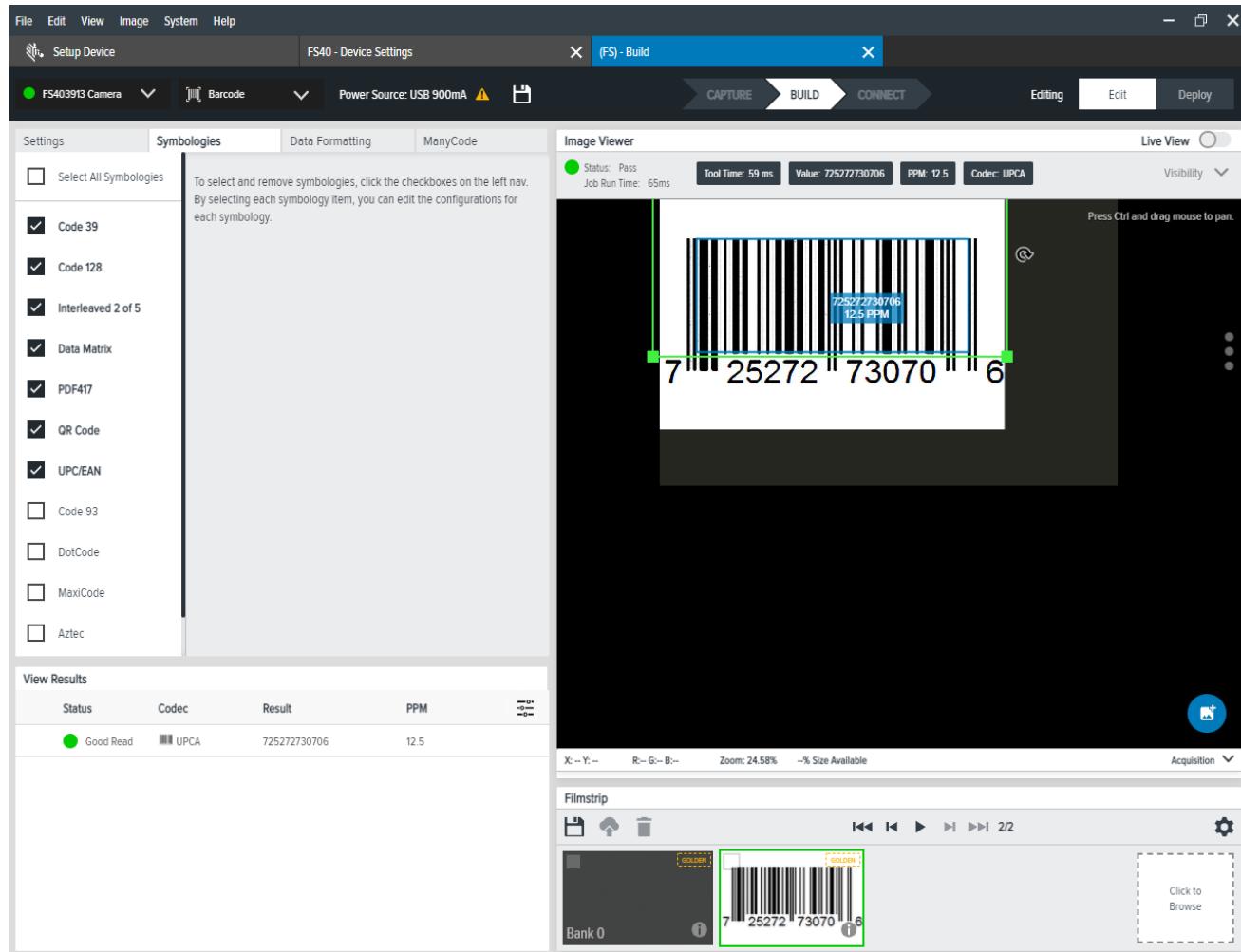
## Building and Deploying Fixed Scanning (FS) Jobs

To set up a FS Job, users can set decoder parameters, symbologies, OCR settings, code quality metrics, and data formatting rules. Begin by configuring the decode parameters and selecting the appropriate set of symbologies. A symbology is chosen by clicking **Symbologies Tab**. Next, select specific symbologies to be deployed by clicking the corresponding checkboxes.

Once the Job is in progress, monitor the **Image Viewer** and **Filmstrip** controls to view the Jobs progress. The **Image Viewer** contains a status bar that displays the Job result and run time. In FS editor, the status bar will show the decode time, decoded value, PPM and the type of symbology decoded.

**View Results** provides additional data on the decode, and displays the results for each Job instance.

**Figure 31** FS Job Builder



## Building and Deploying Vision System (VS) Jobs

To build and deploy a VS Job, start by selecting a machine vision tool and dragging it onto the **FlowBuilder**. Using **Flowbuilder**, stack additional tools onto the workflow or configure the intended results to deploy the Job. To streamline the creation of a specific toolset, use the QuickDraw tool.

### Using the QuickDraw Tool

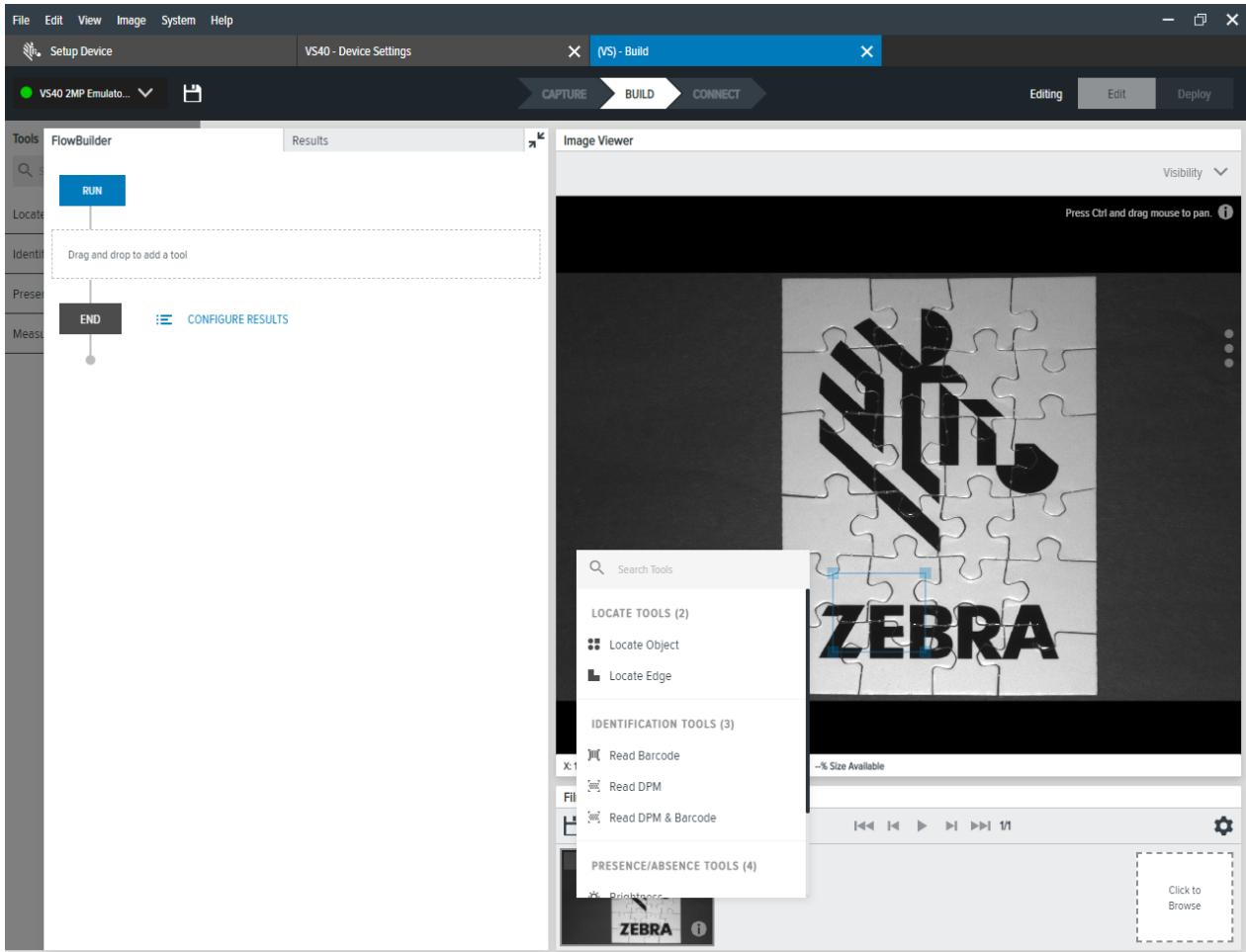
The QuickDraw tool provides an efficient way for users to rapidly select a region of interest on an image and deploy a Job based on that region.

To use the QuickDraw tool:

1. Hold shift and click to create a region of interest by dragging the mouse on the ImageViewer.
2. From the QuickDraw menu, select a tool.

The selected tool then gets added to the FlowBuilder. From here, follow the Flowbuilder workflow to deploy the Job.

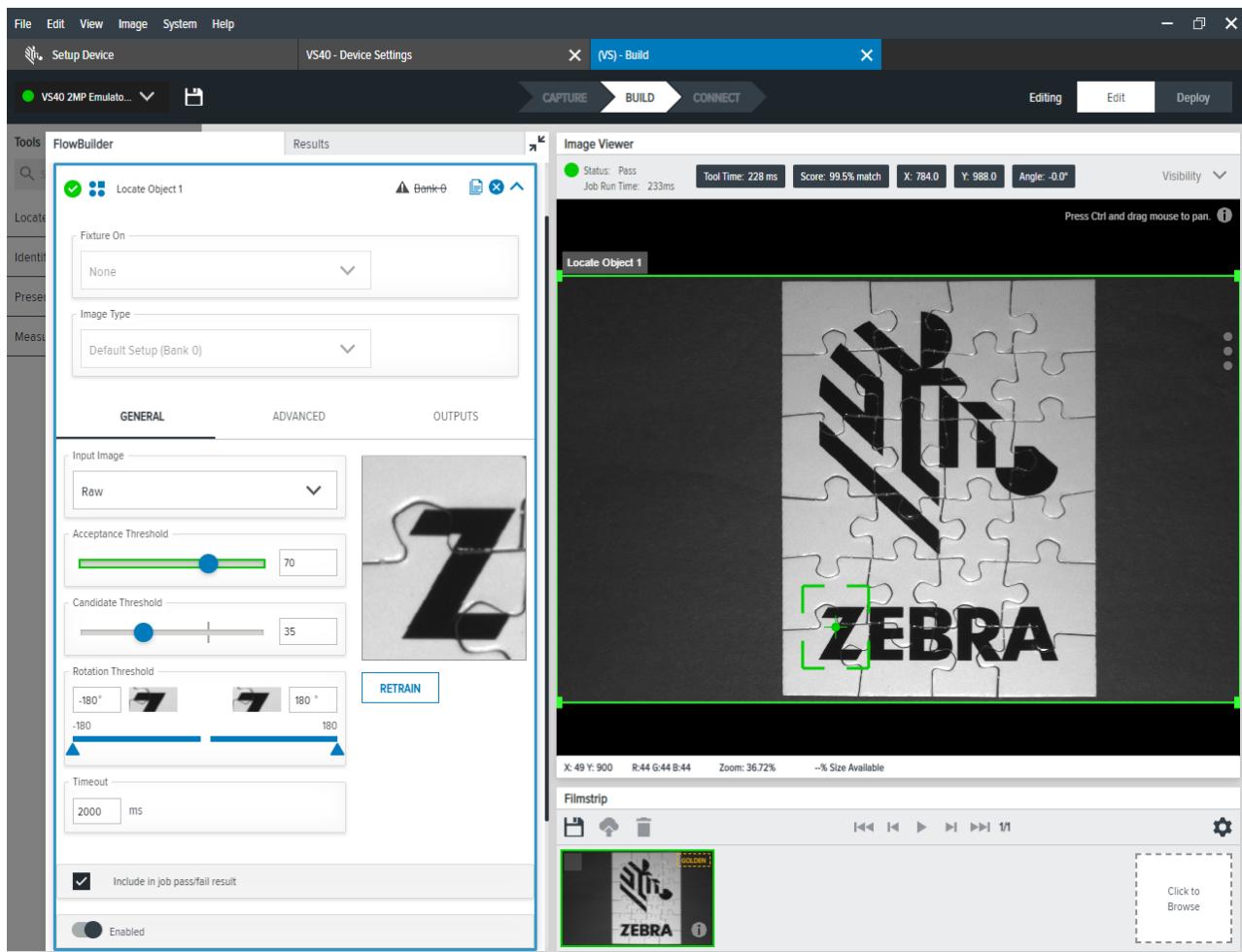
**Figure 32** QuickDraw Tool



Users can view the results of the Job in progress by monitoring the **ImageViewer** as it cycles through the images on the **Filmstrip** in the lower left corner of the application

# Zebra Aurora Software Overview

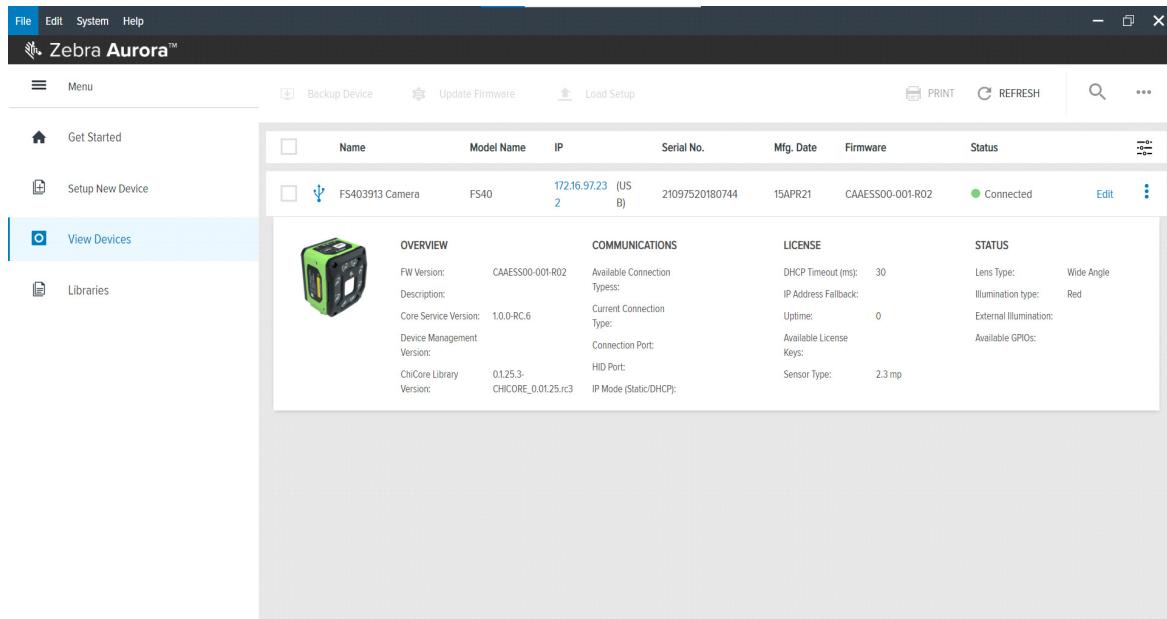
**Figure 33** FlowBuilder



## Accessing the Web Human-Machine Interface (HMI)

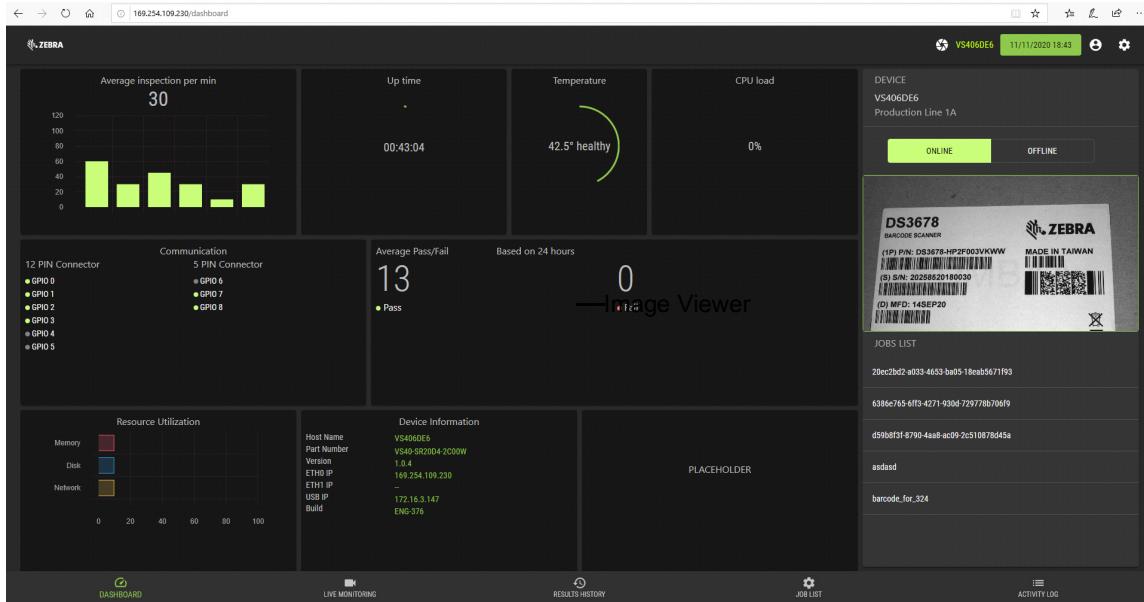
Access the Web HMI by entering the device IP address into a web browser. To obtain the device IP address, select **View Devices** from the menu on the left of the Zebra Aurora application.

**Figure 34** View Devices Screen



Once logged in to the Web HMI, the application presents a dashboard that provides key hardware metrics such as average inspection per minute, total up time, temperature, CPU load, communication status, average pass fail, and resource utilization.

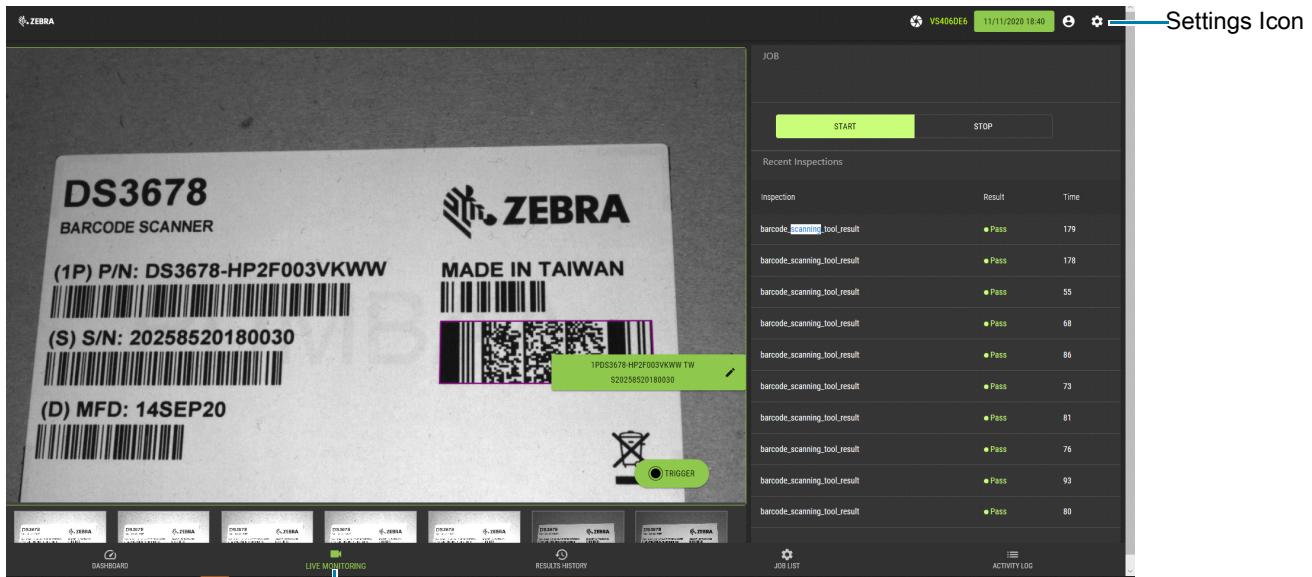
**Figure 35** Web HMI



## Live Monitoring with the Web HMI

The **Live Monitoring** feature allows users to view decode results as they occur in real-time by clicking the **Live Monitoring** tab on the bottom of the interface.

**Figure 36** HMI Live Monitoring



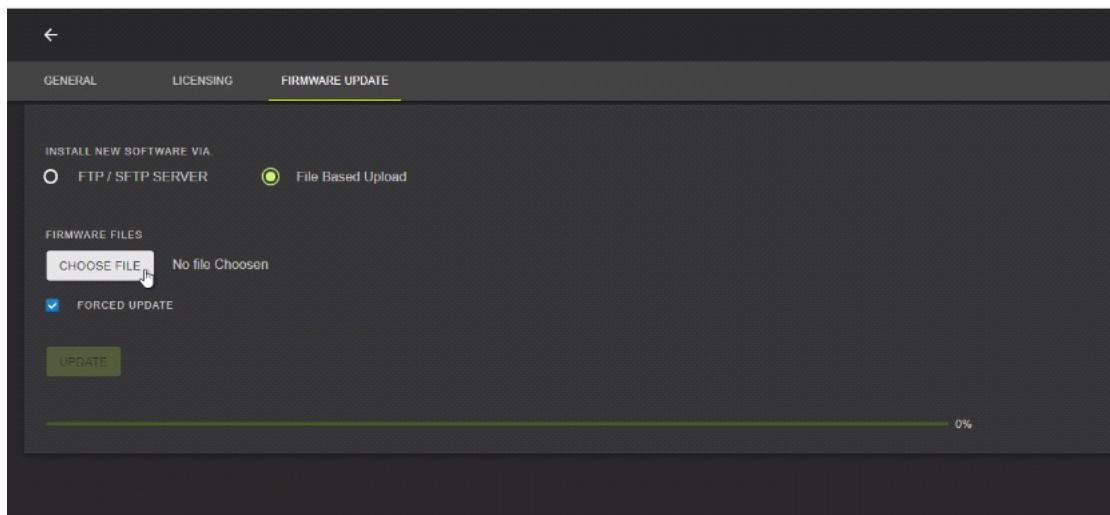
Live Monitoring Tab

The Web HMI also provides the capability to update the device firmware by selecting the settings icon in the top right corner of the application.

## Updating Firmware Using the Web HMI

On the settings screen, click the **Firmware Update** tab and click **Choose File** to select the file from the directory and click the **Update** button.

**Figure 37** Web HMI Settings



## Zebra Aurora Software Overview

Below the **Update** button, the progress bar shows the completion percentage of the Firmware update in progress. Once complete, a success or failure message appears to indicate the outcome of the update. On the device, the LEDs flash red to indicate success. The device then automatically reboots and beeps.

To confirm that the firmware update was successfully completed, check the firmware version on the device in the Device Information section of the Web HMI dashboard.



**NOTE:** A factory reset may be required to clear out old XML and zjob files and replace them with newer files.

## Accessing the Device using the Web-HMI

To access the device via the Web HMI, open a browser and enter the known IP address of the reader.

1. If connected via USB:

- View the device label and note the hostname field.

**Figure 38** Obtain Hostname from Label

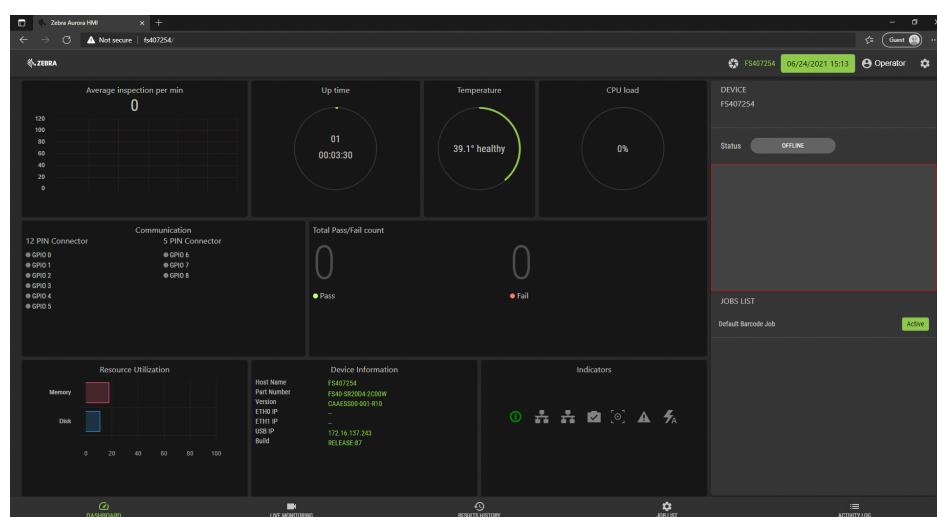


- Open a web browser and enter `http://<HOSTNAME>` and press enter.

**Figure 39** Enter Hostname into Browser



**Figure 40** Access Web HMI



Alternatively, the device's IP can be accessed directly by using six digits (shown below as X and Y) included in the serial number.

- Example:
  - 12XXX345678YYY - where the values for XXX and YYY form the third and fourth octet of the device's USB IP address:
  - The USB IP address is in the format: 172.16.XXX.YYY
    - If XXX is less than 256; XXX; otherwise XXX = XXX Modulo 256
    - If YYY is less than 256, YYY; otherwise YYY = YYY Modulo 256.

The two examples below show how to calculate the USB IP address:

- Example 1: Both XXX and YYY are less than 256

SN:21097520180161

XXX = 097

YYY = 161

USB IP Address = 172.16.97.161

- Example 2: XXX is greater than 256 and YYY is greater than 256:

SN:21364520180597

XXX = 364 (Since this value is greater than 256, perform a Modulo operation)

XXX = 364%256 = 108

YYY = 597 (Since this value is greater than 256, perform a Modulo operation)

YYY = 597%256 = 85

USB IP Address = 172.16.108.85

### 2. If connected via Ethernet directly to the PC:

- The IP address should fit the format 169.254.x.y., where x and y are the last four characters of the MAC address converted from hex to decimal.

- Example:

- MAC Address: 78:b:d6:5c:6d:f2
- 6D (hex) - 109 (decimal)
- F2 (hex) - 242 (decimal)
- IP = 169.254.109.242

### 3. If connected via Ethernet to a network via switch or hub, use the DHCP address from the network/router configuration.

For all connection methods, users are also able to access the device via hostname instead of IP address. The hostname consists of the device part number and the last four characters of the MAC address:

- Example:

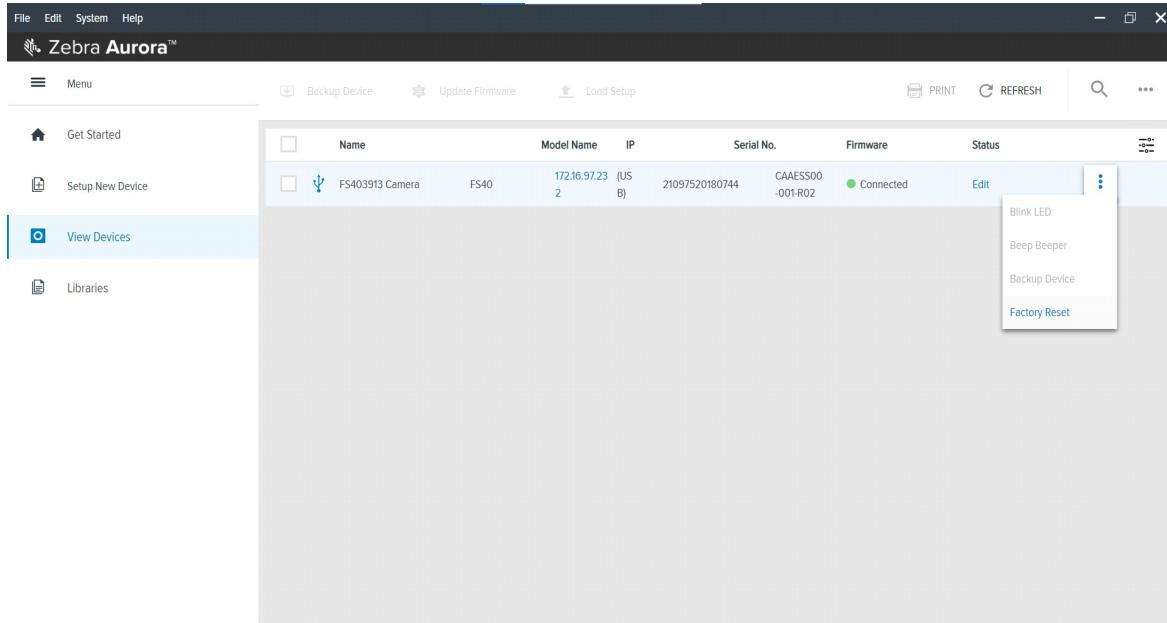
- Part Number - VS40
- MAC Address - 78:b:d6:5c:6d:f2
- Hostname = VS406df2

For the latest information on performing a firmware update, refer to [zebra.com/support](http://zebra.com/support)

## Factory Reset

To restore the factory settings on the device, use the Zebra Aurora application to navigate to the **View Devices** tab from the menu. Next, select the device to be reset and click on the dropdown to select **Factory Reset** to restore factory settings on the device.

**Figure 41** Factory Reset on the Aurora Application



## Software License Activation Methods

Users can activate their license via the desktop software or USB-C dongle.

### Activating a License with Zebra Aurora

To connect to the device from the Zebra Aurora application when it is online, launch the browser from within the application to connect to the Web HMI and enter the Activation ID.

To activate a license if the device is offline (intranet) or USB-only:

1. Connect the device to the desktop application.
2. From the License Manager screen, navigate to the license file.
3. Download the license file to the device.

### Activating a License via USB-C Dongle

To activate a license via USB-C dongle:

1. Stage the USB-C dongle with the license files (downloaded from the portal).
2. Plug in the USB-C dongle into the device to update the license.

## Supported Symbologies

The following table lists the supported symbologies for the FS/VS Smart Camera Series.

**Table 20** Supported Symbologies

Type	Symbology
1D	Base 32 (Italian Pharma), Codabar/NW7, Code 11, Code 39, Code 128, GS1 Databar, I 2 of 5, UPC/EAN, DPM
2D	Aztec, Composite Codes, DataMatrix, Dotted DataMatrix, DotCode, MaxiCode, PDF417, Micro PDF417, QR Code, Micro QR, DPM
OCR	OCR-A, OCR-B, MICR, US Currency, Trainable OCR (available on select models or via OCR license)

## Machine Vision Toolsets

The following table lists the various toolsets supported by Zebra Aurora.

**Table 21** Machine Vision Toolsets

Tool	Description	Toolset		
		Sensor	Standard	Advanced
Object Locate	Find high contrast features.	O	O	O
Pixel Counter	Count pixels with a set/given grey level in a specific area.	O	O	O
Brightness	Provides the average brightness for an area.	O	O	O
Contrast	Provides the average contrast for an area.	O	O	O
Edge Tool	Find edges for fixturing	O	O	O
Distance Tool	Measure the distance between two existing tool results.	O	O	O
Advanced Pattern	Find complex features.	-	O	O
Blob	Find, sort and count areas of joined pixels with a similar grey level.	-	O	O
Predefined OCR	Identifies the presence of text and corrects: OCR-A, OCR-B, US Currency, MICR.	-	O	O
Optical Character Verification (OCV)	Inspects the quality of joined pixels with a similar grey level.	-	O	O
Find Circle	Find and measure circles.	-	O	O
Caliper Tool	Find and measure the distance between two edges.	-	O	O
Filters	Enhance image quality for more robust inspection.	-	O	O
1D/2D/DPM	Read 1D, 2D, and DPM barcodes.	-	O	O
Trainable OCR	Create a unique text library/read any font.	-	-	-
<b>Boxes marked with an O are supported by the specified toolset.</b>				

**Table 21** (Continued)Machine Vision Toolsets

Tool	Description	Toolset		
		Sensor	Standard	Advanced
Flaw Detection	Detects complex defects.	-	-	-
Metrology	Precise measurement tools.	-	-	-
Bead Inspection	Find and measure RTV and other applied adhesive beads.	-	-	-
<b>Boxes marked with an O are supported by the specified toolset.</b>				

# Troubleshooting

This section describes potential issues that could arise while using the device and solutions that could correct the problem such as power cycling and pinging the device. Ensure that you are familiar with the recommended security settings to use the device and the communication ports that the Zebra Aurora application utilizes by referring to [Security Settings on page 74](#) and [Zebra Aurora Communication Port Usage on page 75](#).

**Table 22** Troubleshooting the Device

Problem	Cause	Solution
Device is not connecting to network when using Device Discovery.	Specific ports that are utilized by the application are blocked by Windows Defender Firewall.	Ensure that Zebra Aurora has access to Domain, Public and Private networks. See <a href="#">Security Settings on page 74</a> for additional information.
	Ensure that the device is visible in the Windows Network by viewing the File Explorer and selecting Network.	If the device is not viewable under the Network dropdown or listed under Other Devices, it is not connected.
	There is no RNDIS driver available to the device when connected via USB.	To verify that there is a NDIS driver, go to the Windows Device Manager and search under the Network Adapters dropdown.
Device is cycling power or data connection on USB port.	USB cable may be loose or intermittent.	Reseat the USB cable and tighten locking screws firmly. See <a href="#">Power Cycling the Device on page 73</a> for additional information.

## Communicating with the Device

Two common strategies that can be employed to communicate with the device are pinging via IP and pinging via hostname.

### Pinging the Device via IP

To ping the device via IP address:

1. Open a command prompt or powershell.
2. Enter the following command:

i.ping<ip address>

3. Check to see if the device responds or fails to respond.

- Example:

Pinging 192.168.4.100 with 32 bytes of data:

Reply from 192.168.4.100: bytes= 32 time=1ms TTL=64

Reply from 192.168.4.100: bytes= 32 time=1ms TTL=64

Reply from 192.168.4.100: bytes= 32 time=1ms TTL=64

### Pinging the Device via Hostname

To ping the device via hostname:

1. Open a command prompt or powershell.
2. Enter the following command (assuming the Hostname is FS20b1cc

i.ping FS20b1cc.local



**NOTE:** The above hostname example uses the Avahi service running in the device.

3. Check to see if the device responds or fails to respond.

- Example:

Pinging 192.168.4.100 with 32 bytes of data:

Reply from 192.168.4.100: bytes= 32 time=1ms TTL=64

Reply from 192.168.4.100: bytes= 32 time=1ms TTL=64

Reply from 192.168.4.100: bytes= 32 time=1ms TTL=64

## Device Discovery Troubleshooting Methods

Two common solutions to enable the device to re-connect via device discovery are performing a factory reset on the device and power cycling the device.

### Factory Reset the Device

To factory reset the device using the hardware buttons:

1. Disconnect all power sources.
2. Press and hold the TRIG button on the camera.
3. Connect to a power source.
4. Continue to hold the TRIG button. After 20 seconds, the LEDs on the device turn amber.
5. Immediately release the TRIG button once the LED turns amber and release within five seconds.

For information on how to perform a factory reset using the Web HMI, see [Factory Reset on page 68](#).

### Power Cycling the Device

To power cycle the device:

1. Remove all cables to ensure that no power is being directed to the device.
2. Reinsert a power source and allow the device approximately one minute to boot up.
3. Re-attempt to:
  - Discover a device in Aurora by restarting the application and clicking View Devices.
  - View a device in the Windows Network
  - Access a device using the Web HMI

If failure persists, repeat the steps above for all of the connection types being used with the device, including:

- USB-to-PC
- Ethernet directly to the PC (this requires a 24 V connection for power).
- Ethernet connected to a network via switch or hub (this requires a 24 V connection to a power source if not using Power over Ethernet).

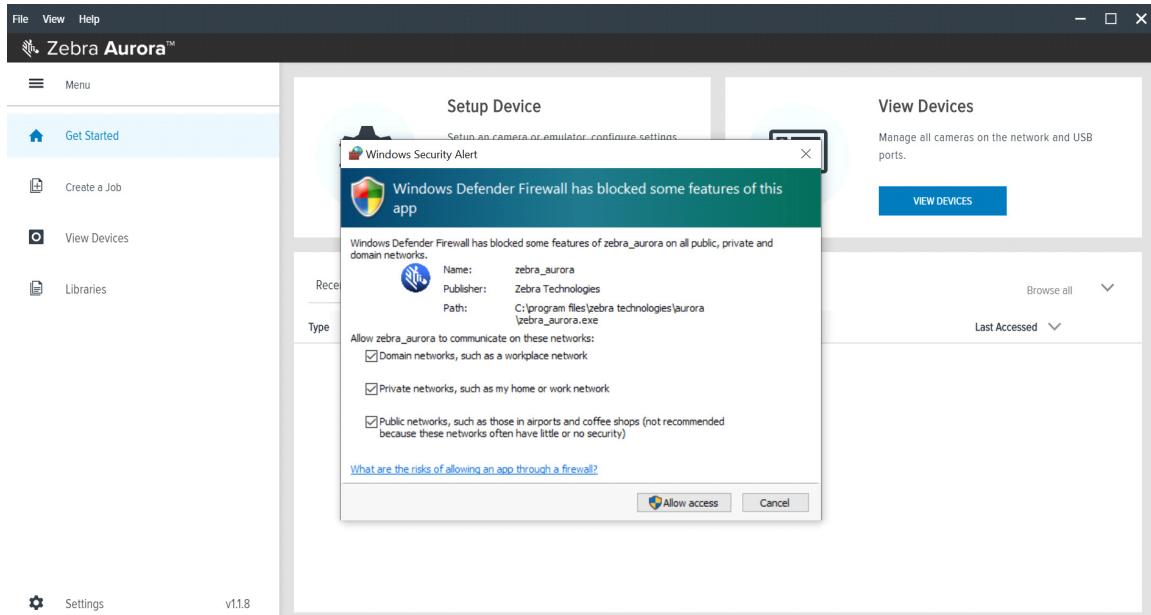


**NOTE:** If both Ethernet and USB are connected simultaneously, device discovery attempts to find the USB-based IP address by default.

## Security Settings

To ensure that all available application functionalities are enabled, select all three checkboxes in the Windows Defender Firewall settings window as shown in [Figure 39](#) and click **Allow Access**.

**Figure 39** Windows Defender Firewall Settings



These settings can be configured by clicking Change Settings and enabling the domain, private and public network settings for Zebra Aurora and Network Discovery applications. For specific information on the communication ports utilized by the Zebra Aurora application, see [Zebra Aurora Communication Port Usage on page 75](#).

## Zebra Aurora Communication Port Usage

The table below displays the ports utilized by the Zebra Aurora application

**Table 23** Communication Port Usage

Item	TCP	UDP
FTP - Data	20	
FTP - Communication	21	
DHCP Server		67
DHCP Client		68
Web HMI	80	443
NTP		123
Modbus	502	502
EtherNet/IP		2222
Discovery Port	3702	3702
TCP Port	4444	
mDNS		5353
mDNS Responder		5354
Listening Port	5555	5555
Communication Port	5556	5556
Output Image	7722	7722
Image Live View	7777	7777
Discovery Port (2)	8889	
Discovery Port (3)	9876	
Raw TCP Data	25250	
Profinet RT Unicast	34962	34962
Profinet RT Multicast	34963	34963
Profinet RT CM	34964	34964
EtherNet/IP	44818	44818
Profinet		49152

# Maintenance

This section describes the maintenance procedures that must be followed to maintain the FS/VS Smart Camera's performance.

## Maintenance

### Known Harmful Ingredients

The following chemicals are known to damage the plastics on Zebra scanners and should not come in contact with the device:

- Acetone
- Ammonia solutions
- Aqueous or alcoholic alkaline solutions
- Aromatic and chlorinated hydrocarbons
- Benzene
- Bleach
- Carabolic acid
- Compounds of amines or ammonia
- Ethanolamine
- Ethers
- Ketones
- TB-lysoform
- Toluene
- Trichloroethylene

### Approved Cleaning Agents

The following cleaning agents are approved for cleaning the plastics on Zebra scanners:

- Pre-moistened wipes
- Isopropyl alcohol 70%

## Tolerable Industrial Fluids and Chemicals



**NOTE:** Not all fluid variants and brands have been tested.

The following industrial fluids and chemicals were evaluated and deemed tolerable for the FS/VS Smart Camera series.

- Motor/Engine Oil
- Automatic Transmission Fluid (ATF)
- Continuously Variable Transmission Fluid (CVT)
- Industrial De-Greaser (Engine Brite Heavy Duty)

## Cleaning the Device

Routinely cleaning the exit window is required. A dirty window may affect scanning accuracy. Do not allow any abrasive material to touch the window.

To clean the device:

1. Dampen a soft cloth with one of the approved cleaning agents listed above or use pre-moistened wipes.
2. Gently wipe all surfaces, including the front, back, sides, top and bottom. Never apply liquid directly to the scanner. Be careful not to let liquid pool around the scanner window, trigger, cable connector or any other area on the device.
3. Be sure to clean the trigger and in between the trigger and the housing (use a cotton-tipped applicator to reach tight or inaccessible areas).
4. Do not spray water or other cleaning liquids directly into the exit window.
5. Wipe the scanner exit window with a lens tissue or other material suitable for cleaning optical material such as eyeglasses.
6. Immediately dry the scanner window after cleaning with a soft non-abrasive cloth to prevent streaking.
7. Allow the unit to air dry before use.
8. Scanner connectors:
  - a. Dip the cotton portion of a cotton-tipped applicator in isopropyl alcohol.
  - b. Rub the cotton portion of the cotton-tipped applicator back-and-forth across the connector on the Zebra scanner at least 3 times. Do not leave any cotton residue on the connector.
  - c. Use the cotton-tipped applicator dipped in alcohol to remove any grease and dirt near the connector area.

Use a dry cotton tipped applicator and rub the cotton portion of the cotton-tipped applicator back-and-forth across the connectors at least three times. Do not leave any cotton residue on the connectors.

