

**COGNEX®**

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# DataMan® Fixed Mount Readers Reference Manual

4/24/2015  
Version 5.5.0

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### VisionPro

5481712, 5495537, 5548326, 5583954, 5602937, 5640200, 5751853, 5768443, 5825913, 5850466, 5872870, 5901241, 5943441, 5978080, 5978521, 5987172, 6005978, 6039254, 6064388, 6075881, 6137893, 6141033, 6167150, 6215915, 6240208, 6324299, 6381366, 6381375, 6411734, 6421458, 6459820, 6490375, 6516092, 6563324, 6658145, 6687402, 6690842, 6697535, 6718074, 6748110, 6771808, 6804416, 6836567, 6850646, 6856698, 6920241, 6959112, 6963338, 6973207, 6975764, 6985625, 6993177, 6993192, 7006712, 7016539, 7043081, 7058225, 7065262, 7088862, 7164796, 7190834, 7242801, 7251366, 7313761, EP0713593, JP3522280, JP3927239

### DataMan

5742037, 5943441, 6215915, 6236769, 6282328, 6381375, 6408109, 6457032, 6690842, 6941026, 7175090, 7181066, 7412106, 7427028, 7549582, 7604174, 7614563, 7617984, US-2005-0087601-A1, US-2006-0131418-A1, US-2006-0131419-A1, US-2006-0133757-A1, US-2007-0090193-A1, US-2007-0091332-A1, US-2007-0152064-A1, US-2007-0170259-A1, US-2008-0004822-A1, US-2008-0011855-A1, US-2008-0142604-A1, US-2008-0143838-A1, US-2008-0158365-A1, US-2009-0090781-A1, US-2009-0108073, US-2009-0121027-A1, US-2009-0166424-A1, US-2009-0294541-A1, WO06065619A1, EP1687752

### CVL

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### VGR

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6215915, 6381375, 6408109, 6421458, 6457032, 6459820, 6594623, 6804416, 6959112, 7383536

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5495537, 5548326, 5583954, 5602937, 5640200, 5717785, 5751853, 5768443, 5825483, 5825913, 5850466, 5859923, 5872870, 5901241, 5943441, 5949905, 5978080, 5987172, 5995648, 6002793, 6005978, 6064388, 6067379, 6075881, 6137893, 6141033, 6157732, 6167150, 6215915, 6240208, 6240218, 6324299, 6381366, 6381375, 6408109, 6411734, 6421458, 6457032, 6459820, 6490375, 6516092, 6563324, 6658145, 6687402, 6690842, 6718074, 6748110, 6751361, 6771808, 6798925, 6804416, 6836567, 6850646, 6856698, 6920241, 6959112, 6975764, 6985625, 6993177, 6993192, 7006712, 7016539, 7043081, 7058225, 7065262, 7088862, 7164796, 7190834, 7242801, 7251366, EP0713593, JP3522280, JP3927239

### SMD 4

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### BGA II and BGA III

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### Wire Bonder

5495537, 5532739, 5581632, 5602937, 5640199, 5640200, 5642158, 5676302, 5754679, 5757956, 5768443, 5825483, 5835622, 5850466, 5859923, 5861909, 5949905, 5978080, 5991436, 5995648, 6002793, 6005978, 6035066, 6061467, 6075881, 6137893, 6141033, 6157732, 6167150, 6215915, 6289492, 6324299, 6381375, 6408109, 6411734, 6421458, 6457032, 6459820, 6490375, 6516092, 6563324, 6658145, 6690842, 6748110, 6751361, 6771808, 6804416, 6836567, 6850646, 6856698, 6959112, 6975764, 6985625, 6993192, 7006712, 7016539, 7043081, 7058225, 7065262, 7088862, 7164796, 7171036, 7190834, 7242801, 7251366

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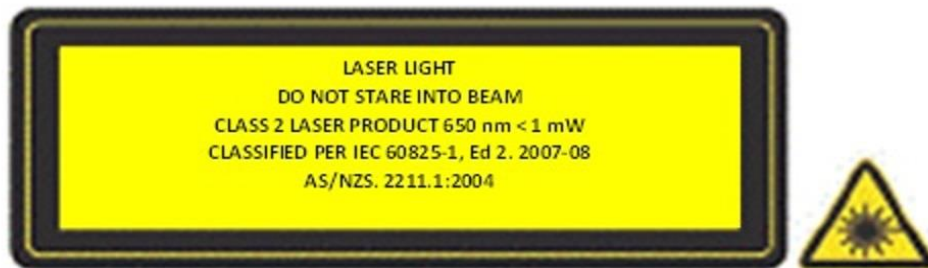
### About this Manual

The *DataMan Fixed Mount Readers Reference* provides detailed information on the configuration and operation of DataMan fixed-mount readers. It includes the following sections:

- Safety Information
- Mechanical Information
- Electrical Information
- Optical and Lighting
- Operation
- Application Guide

### Safety Information

DataMan 300, 360, 500, and 503 series readers have laser light.



If you need more information on the collection, reuse, and recycling systems, please contact your local or regional waste administration.

You may also contact your supplier for more information on the environmental performance of this product.

### Warnings and Notices



**CAUTION:** The DataMan 500 device requires the use of a PoE Class 3 or 48V DC LPS power supply.



**NOTE:** For product support, contact <http://support.cognex.com>



**CAUTION:** IP protection is ensured only when all connectors are attached to cables or shielded by a sealing cap.

- **CAUTION** - Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.
- Do not attempt to service or repair this product -- return it to Cognex for service.
- Do not permit anyone other than Cognex Corporation to service, repair, or adjust this product.
- Do not attempt to open or modify this device except as described in this document.
- Do not direct or reflect laser light toward people or reflective objects.

- Do not operate this device if it is damaged or if the covers or seals are missing or damaged.

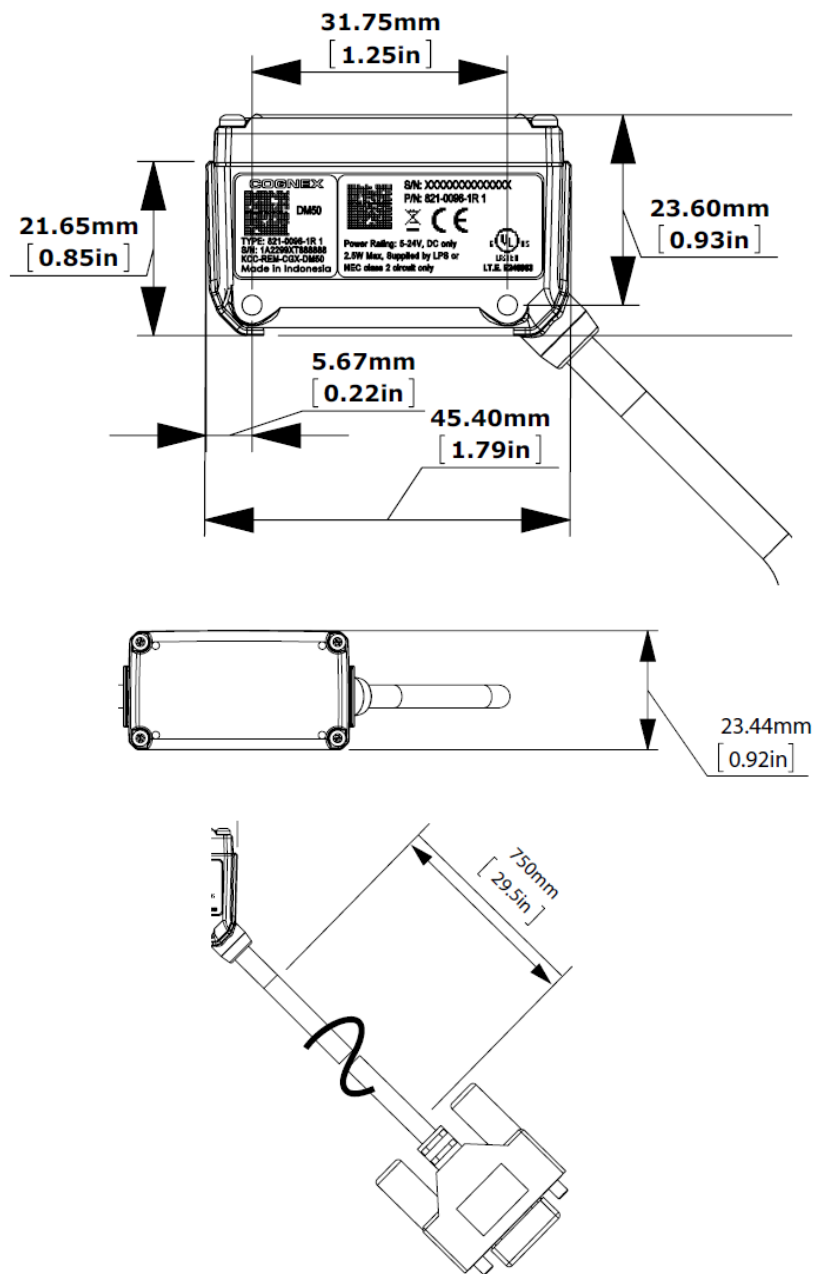
This Laser Product is designated as Class 2 during all procedures of operation.

Wavelength	650 nm
Laser power for classification	< 1mW
Beam Diameter	< 3mm at aperture
Divergence	< 1.5 mrad

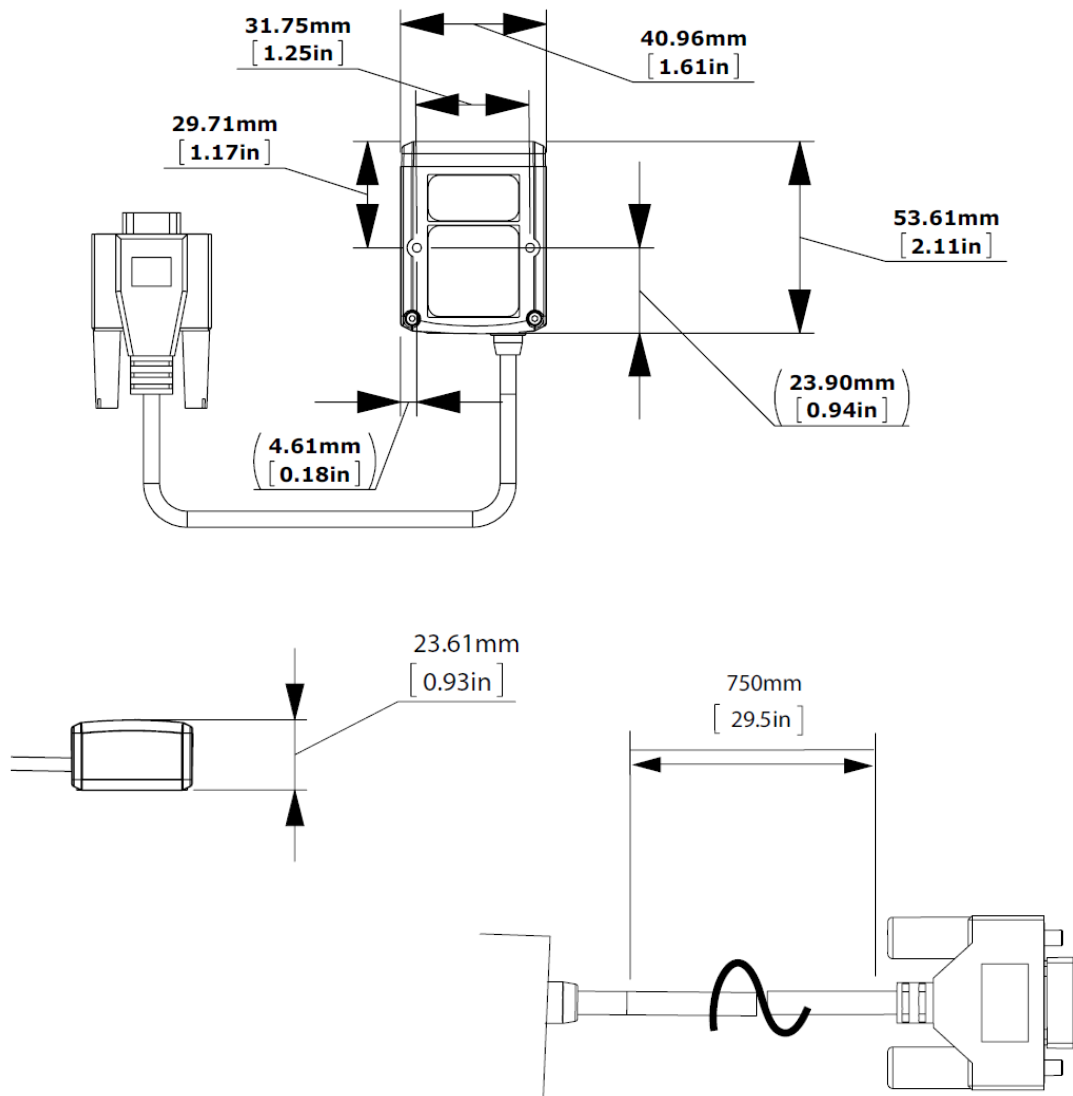
## Mechanical Information

This section provides information on various mechanical features of the DataMan 50, DataMan 60, DataMan 300, DataMan 360, DataMan 500, and DataMan 503 series readers, such as dimensions, lens replacement, mounting information, as well as thermal and environmental requirements.

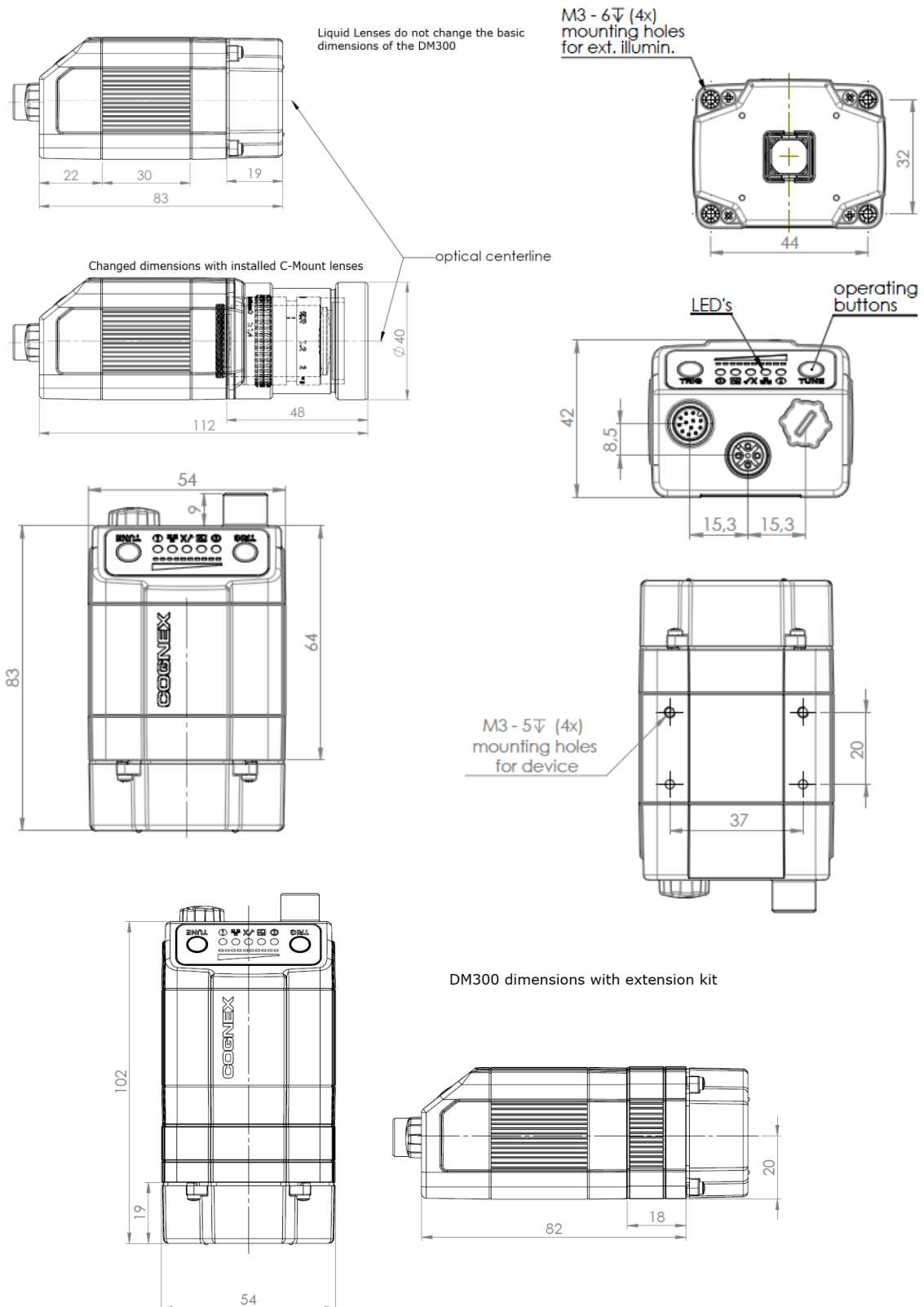
## DataMan 50 Reader Dimensions

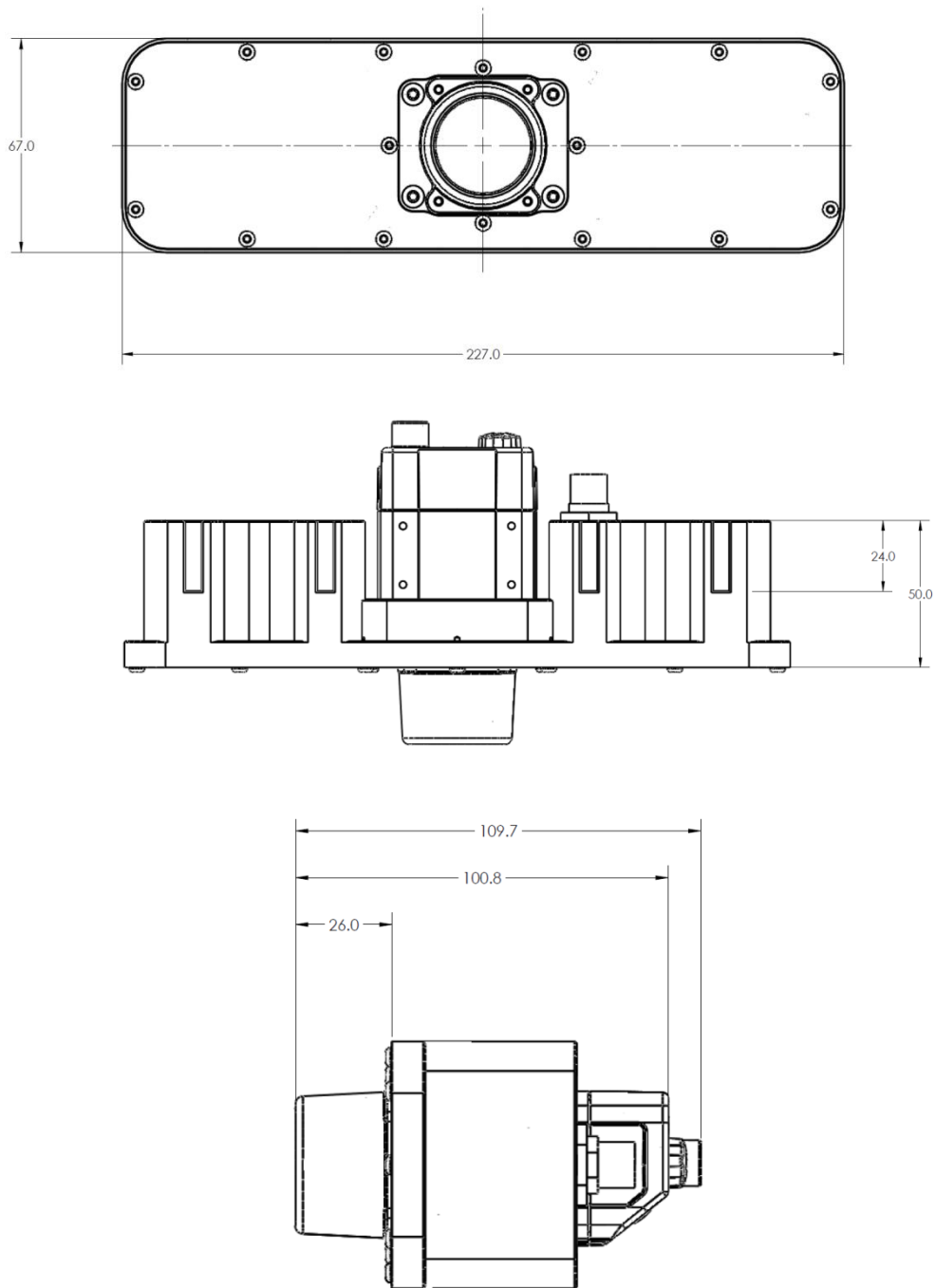


## DataMan 60 Reader Dimensions



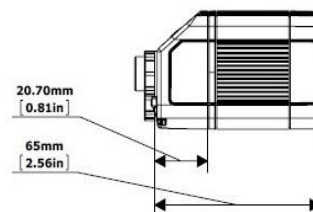
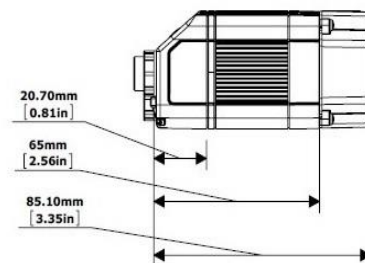
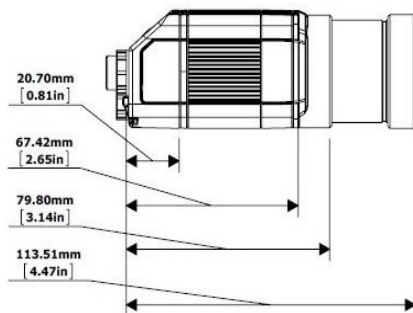
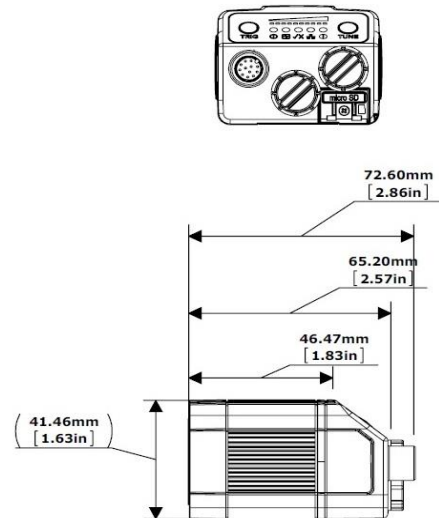
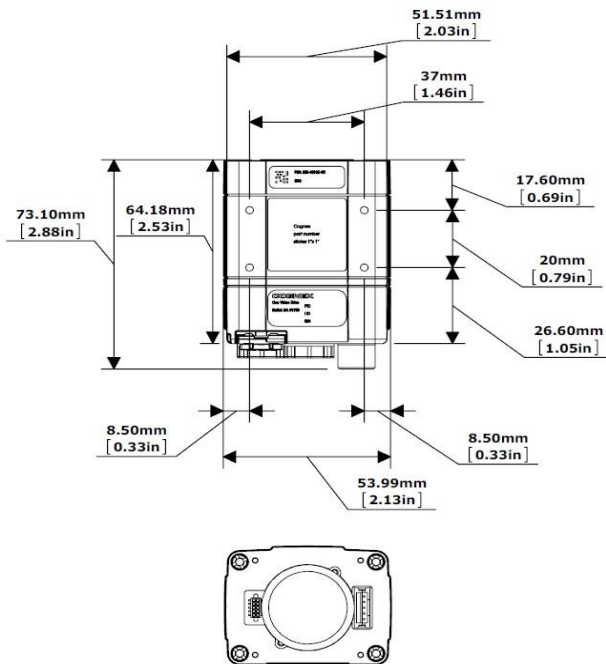
## DataMan 300 Series Reader Dimensions



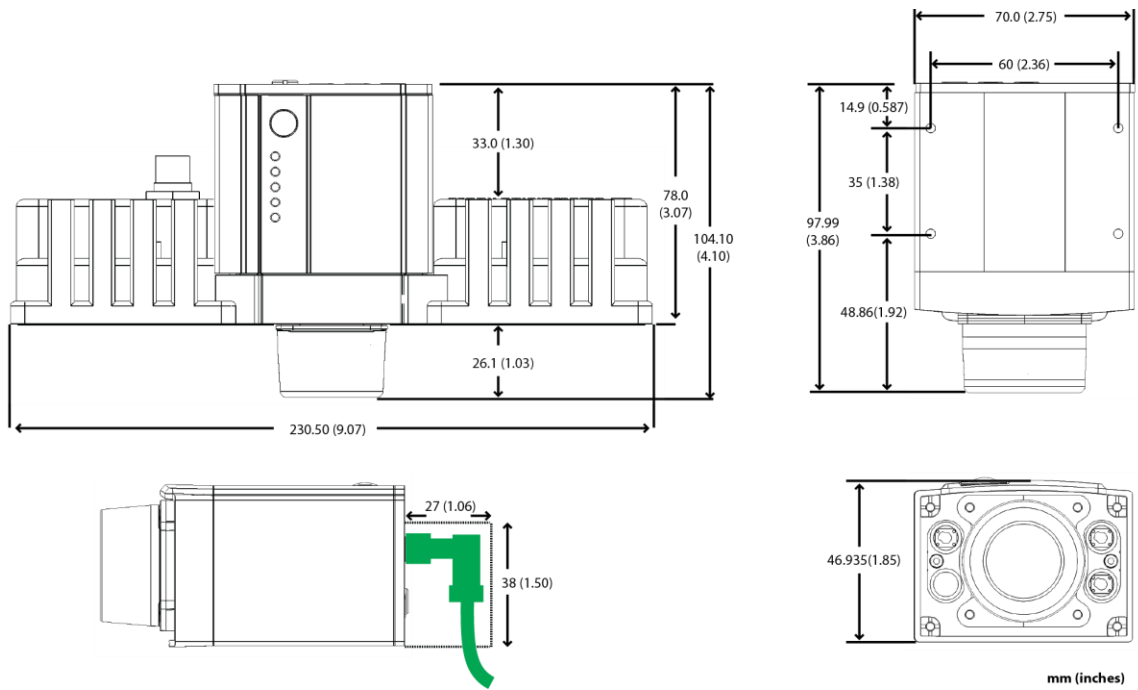




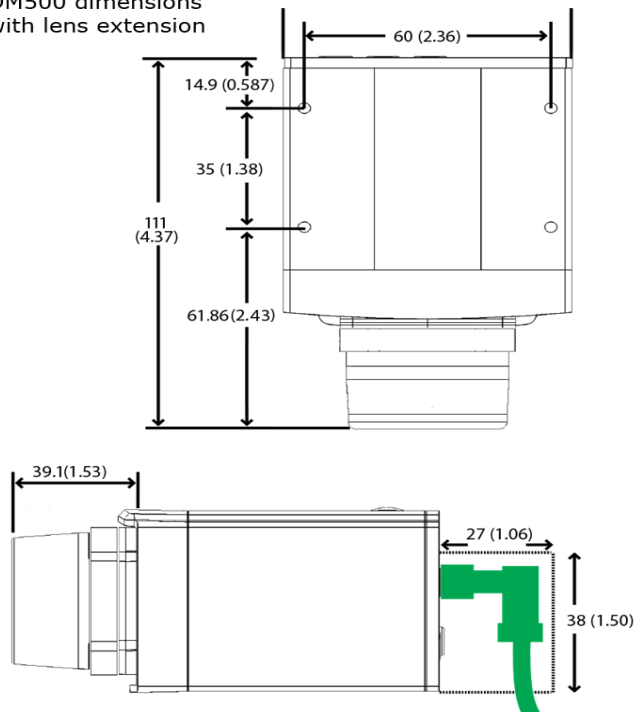
## DataMan 360 Series Reader Dimensions



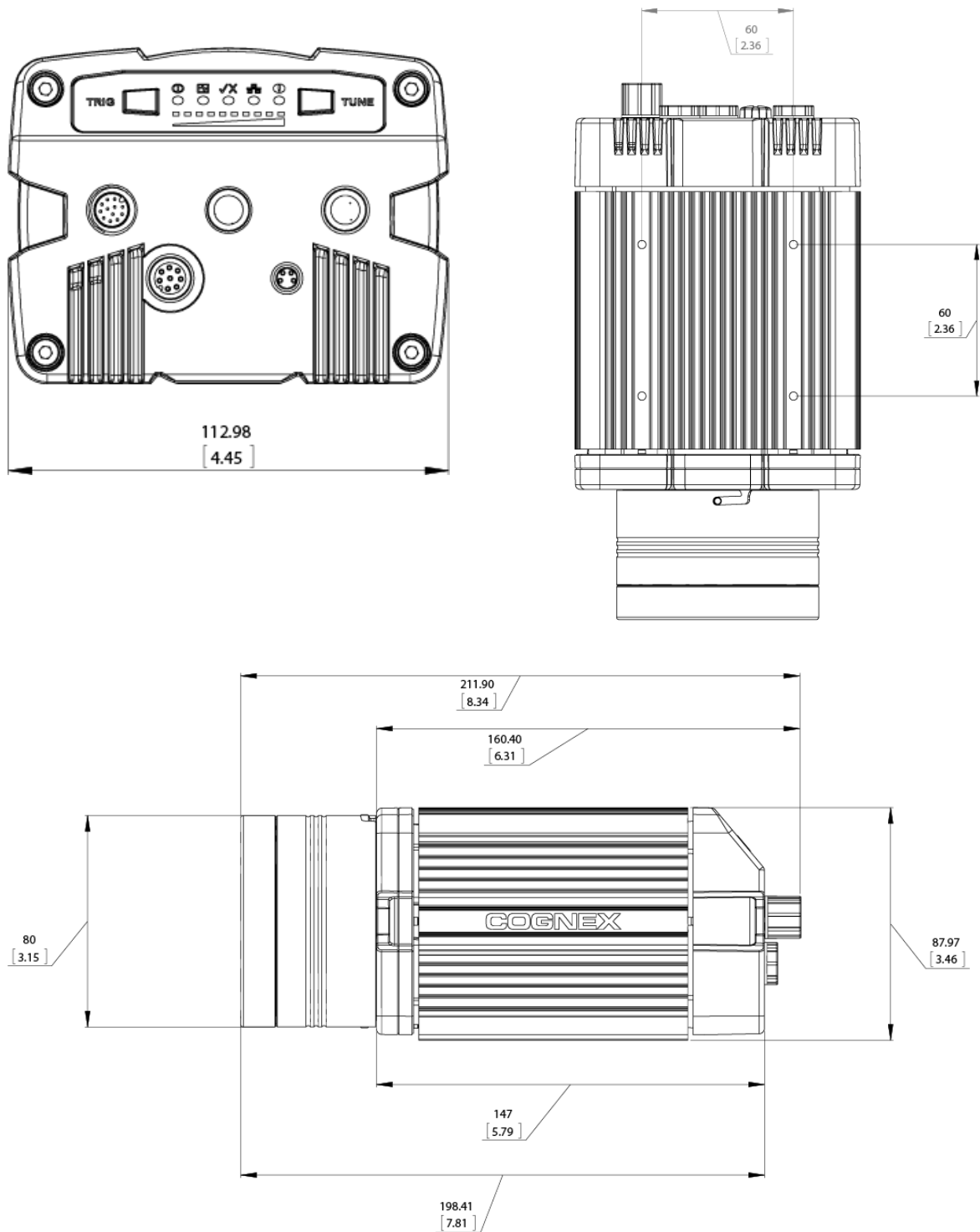
## DataMan 500 Reader Dimensions



DM500 dimensions  
with lens extension



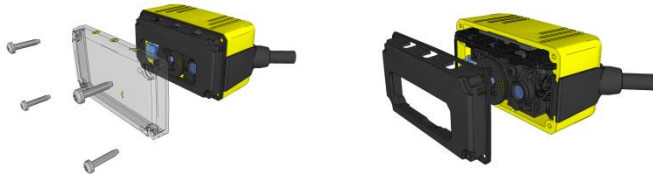
DataMan 503 Reader Dimensions



### DataMan 50 Service Procedures

DataMan 50 can operate in one of three distance ranges. To set the focus position:

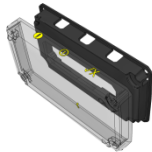
1. Remove screws, lens cover, and rubber part.



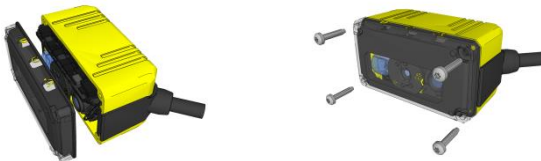
2. Set focus position, using a coin. Do not use a coin thicker than 2 mm. If no coin is available, use the edge of the back cover.



3. Make sure that the sealing and the sealing surface are clean before mounting.
4. Line up the holes with the icons, and attach the rubber part to the front window.



5. Attach both to housing and add screws.



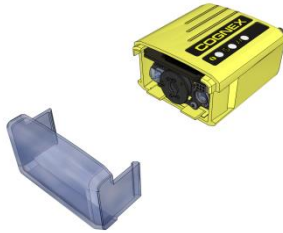
6. Tighten screws in order shown. Maximum torque for the cover screws is 8 N-cm (0.7 pound-inch).



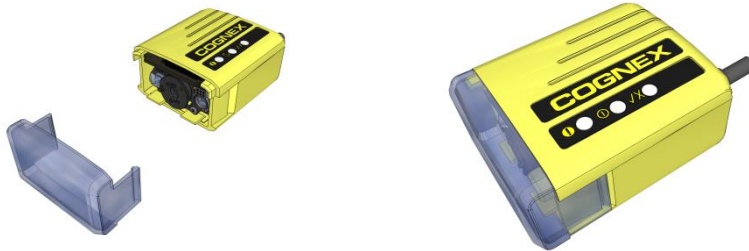
### DataMan 60 Service Procedures

DataMan 60 can operate in one of three distance ranges. To set the focus position:

1. Remove lens cover.



2. Set focus position to 45, 70, or 110. Turn the lens cap clockwise (45->70->110) for larger focus settings; turn the lens cap counter-clockwise (110->70->45) for smaller settings.
3. Reattach the front cover.



### DataMan 300 and 360 Series Service Procedures

#### 10.3 mm Lens Replacement

To remove and replace a 10.3 mm lens for a DataMan 300 or 360 series reader, follow these steps.

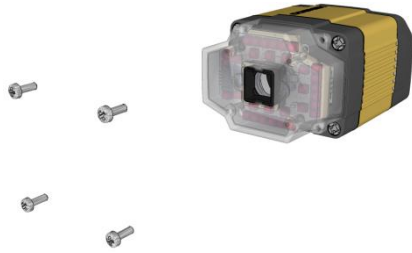


**WARNING:** Disconnect the DataMan from power before continuing.



**CAUTION:** Do not leave image sensor exposed to the environment.

4. Remove and retain the four screws at corners of front cover.



5. Remove front cover. The first image shows a reader with a liquid lens attached to the 10.3 mm lens. The second image shows a reader just with a 10.3 mm lens.



6. If you have a liquid lens module attached to your 10.3 mm lens, carefully disconnect the liquid lens module cable. If you only have a 10.3 mm lens inserted, jump to step 5 of this procedure.



**WARNING:** Do not pinch or pull the cable.

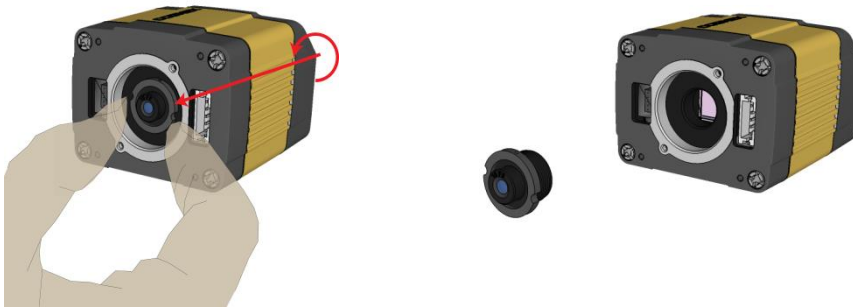


7. Loosen the lens locking ring and withdraw the module.

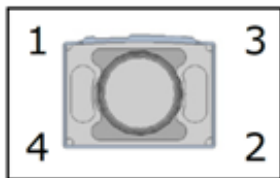


When reinstalling the module, observe the following precautions:

- Make sure that the liquid lens cable is not pinched, pulled or crimped during installation.
8. Loosen the locking ring and withdraw the lens.



- When reattaching the front cover, tighten the screws in the sequence shown and observe a torque limit of 9 N-cm(0.8 Lb-In).



### 16 mm (SHD) Lens Replacement

To remove and replace a 16 mm (SHD) lens, follow these steps.

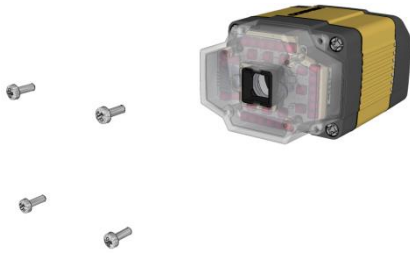


**WARNING:** Disconnect the DataMan from power before continuing.



**CAUTION:** Do not leave image sensor exposed to the environment.

1. Remove four screws at corners of front cover and remove cover.



2. Remove the cover.



3. Remove the rubber lens-locking cone from the lens.



4. Remove the lens.

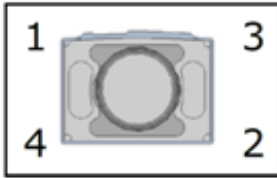


When replacing the lens, observe the following precaution:

- Avoid rotating the lens when you insert it. Press the rubber lens-locking cone into the reader until it snaps into place inside the C-mount threads and around the nose of the 16 mm lens.



When reattaching the front cover, tighten the screws in the sequence shown and observe a torque limit of 9 N-cm(0.8 Lb-In).



### C-Mount Lens Replacement

To remove and replace a C-Mount lens, follow these steps.



**WARNING:** Disconnect the DataMan from power before continuing.



**CAUTION:** Do not leave image sensor exposed to the environment.

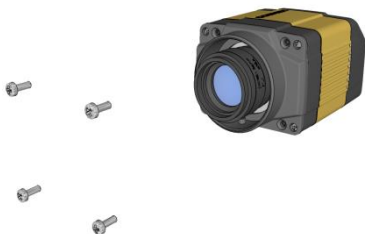
1. Remove the front cover.



### NOTE

Do not unscrew the front-most part of the nose of the cover to avoid risking the glass lens falling out.

2. Remove the screws from the C-mount cover base.



3. Remove C-Mount cover base.



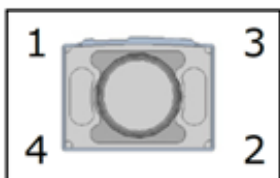
4. Remove the lens.



When replacing the lens, observe the following precaution:

- When you attach the front cover, align the peg on the reader and the slot on the cover so that the cover locks in place.

When reattaching the C-mount cover base, tighten the screws in the sequence shown and observe a torque limit of 9 N-cm(0.8 Lb-In).



## DataMan 500 Service Procedures

### Liquid Lens Module Replacement

To remove and replace a liquid lens module for a DataMan 500 series reader, follow these steps.

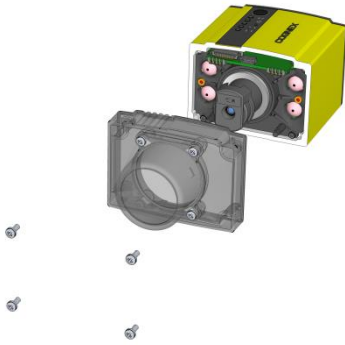


**WARNING:** Disconnect the DataMan from power before continuing.

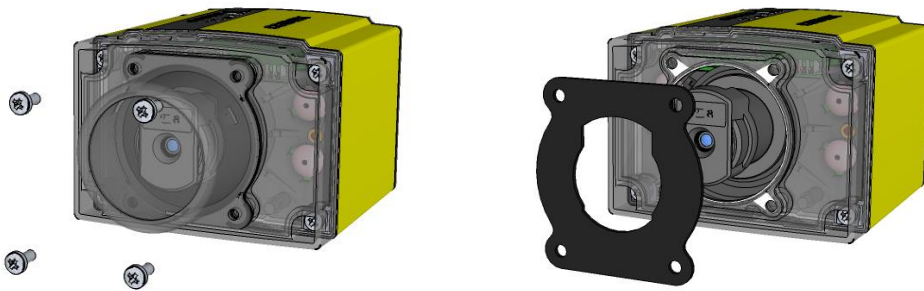


**CAUTION:** Do not leave image sensor exposed to the environment.

1. For the 18.8 mm lens, remove the four screws at the corners of the front cover and continue with step 3 of this procedure.



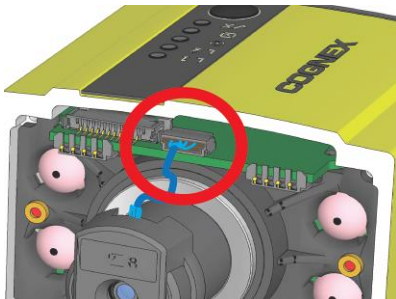
2. For the 13.3 mm lens, remove the four screws securing the front plastic cover, and also remove the light baffle, before you remove the screws and the plastic cover beneath it.



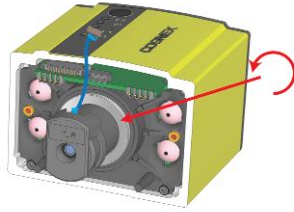
3. Carefully disconnect the liquid lens module cable.



**WARNING:** Do not pinch or pull the cable.

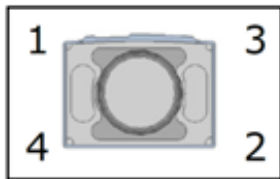


4. Loosen the lens locking ring and withdraw the module.



When reinstalling the module, observe the following precautions:

- Make sure that the liquid lens cable is not pinched, pulled or crimped during installation.
- Make sure that the slot in the liquid lens engages with the key on the DataMan 500 before tightening the locking ring.
- When reattaching the front cover, tighten the screws in the sequence shown and observe a torque limit of 9 N-cm(0.8 Lb-In).



### C, S, or CS-Mount Lens Replacement

To remove and replace a CS-mount lens, follow these steps.



**WARNING:** Disconnect the DataMan from power before continuing.

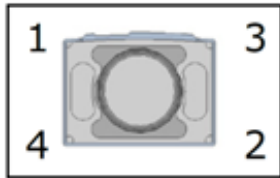


**CAUTION:** Do not leave image sensor exposed to the environment.

1. Remove four screws at corners of front cover and remove cover.
2. Unscrew the lens.
3. Screw in the new lens.
4. Reattach the cover.

When replacing the lens, observe the following precaution:

- When reattaching the front cover, tighten the screws in the sequence shown and observe a torque limit of 9 N-cm(0.8 Lb-In).



### DataMan 503 Service Procedures

#### C, S, or CS-Mount Lens Replacement

To remove and replace a CS-mount lens, follow these steps.



**WARNING:** Disconnect the DataMan from power before continuing.



**CAUTION:** Do not leave image sensor exposed to the environment.

1. Remove cover.
2. Unscrew the lens.
3. Screw in the new lens.
4. Reattach the cover.

When replacing the lens, observe the following precaution:

- When reattaching the front cover, make sure that the peg on the reader and the slot on the cover are properly aligned.

### Mounting Requirements

The DataMan 300, 360, 500, and 503 series readers provide four threaded attachment points, located as shown in the Sections [DataMan 300 Series Reader Dimensions](#), [DataMan 360 Series Reader Dimensions](#), [DataMan 500 Series Reader Dimensions](#) and [DataMan 503 Reader Dimensions](#). The attachment points have the following characteristics:

- M3 thread
- 5mm thread depth
- 9 N-cm (0.8Lb-In) maximum torque

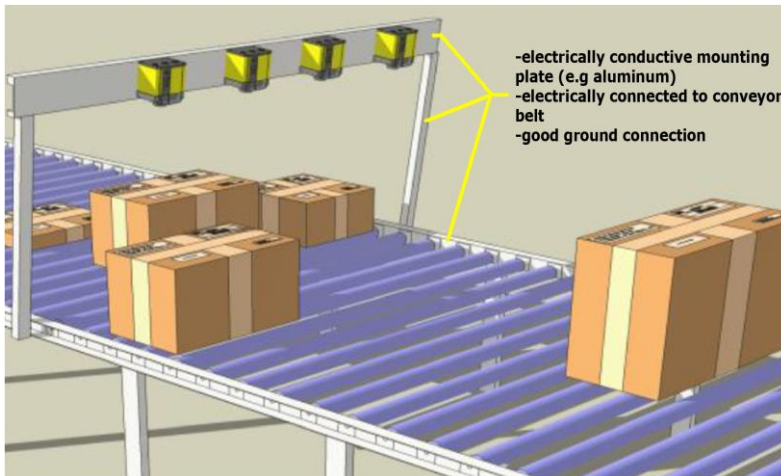


**CAUTION:** Use all four attachment points when mounting your DataMan.

### Grounding

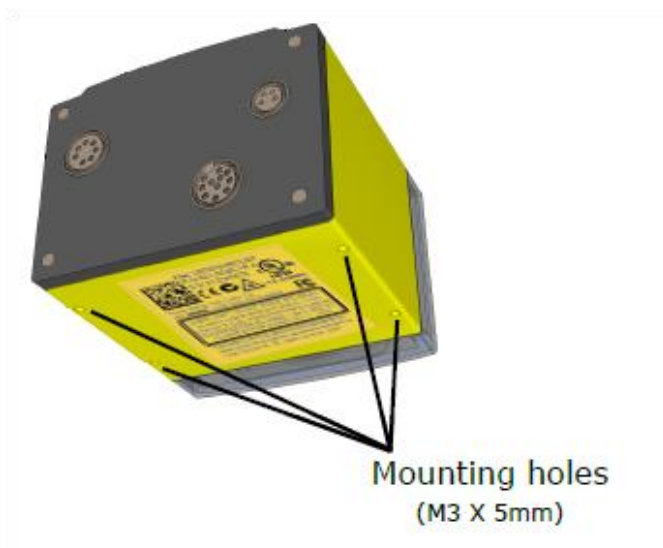
If you want to mount a DataMan fixed mount reader to a bracket or a plate, make sure that those parts make a proper connection to ground (PE).

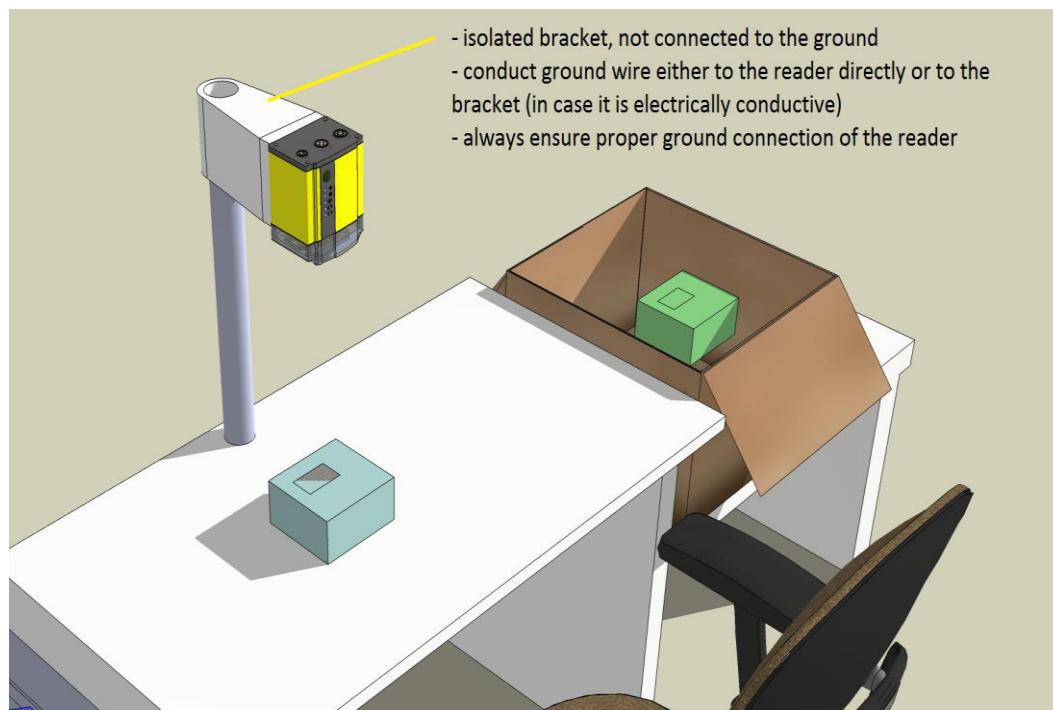
Cognex recommends that you use lock-washers between the mounting screws and the bracket to ensure permanent ground conductivity.



If you want to mount your reader to an electrically isolated bracket, the reader needs to be individually grounded.

For this purpose Cognex recommends that you connect at least one of the 4 mounting holes on the bottom of the device with a minimum 22 gauge grounding wire to system ground (PE). Use lock-washers to ensure a permanent and robust connection.





### Thermal and Environmental Requirements

See the following table for thermal and environmental requirements:

Operating temperature	0°C — 40°C (32°F — 104°F)
Storage temperature	-10°C — 60°C (-14°F — 140°F)
Maximum humidity	95% (non-condensing)

#### DataMan 50, 300, 360, 500, and 503 IP Rating

The DataMan 50, 500, 503, 300 and 360 series readers provide **IP 65** protection against dust and water intrusion. In order to meet this rating, the following conditions must be met:

- All connectors must have cables connected or be sealed with protective plugs.
- The reader front cover and lens cover must be correctly installed.
- The requirements for temperature, vibration, and shock must be met.

#### DataMan 60 IP Rating

The DataMan 60 readers provide **IP 40** protection against dust and water intrusion. In order to meet this rating, the following conditions must be met:

- All connectors must have cables connected or be sealed with protective plugs.
- The reader front cover and lens cover must be correctly installed.
- The requirements for temperature, vibration, and shock must be met.

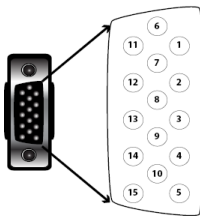
## Electrical Information

### DataMan 50 and 60 Discrete I/O Connector

The I/O cable provides access to trigger and high-speed outputs. Unused wires can be clipped short or tied back using a tie made of non-conductive material.

For RS-232, use the Power Supply return path for ground.

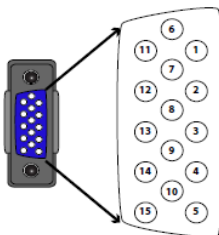
**NOTE:** GND (Pin 4) is connected to the reader housing, cable shield, and DB15 shell.



PIN	Color	Signal
1	Brown	Reserved
2	Green	TxD
3	Green/Black	RxD
4	Red & Red/Black	GND
5	Brown/White	DC+ (system power, 5-24 VDC)
6	Blue	RTS
7	Blue/White	Output-0
8	White	Input-0
9	White/Black	Input-1
10	Light Blue	CTS
11	Light Blue/Black	Output-1
12	Light Blue/Yellow	Output-Common
13	Light Blue/Green	Output-Strobe
14	Yellow	Reserved
15	Yellow/Black	Reserved

### DataMan 50 and 60 USB & Flying Leads I/O Cable

You can connect a cable with USB & flying leads to the cable that is attached to the device. The following table shows the pinout and color description of the flying leads.



This is a female connector/socket.

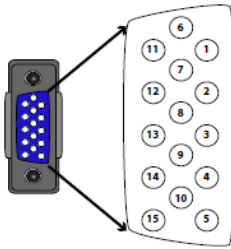
PIN	Color	Signal
4	Black	GND
7	Blue/White	Output-0
8	White	Input-0
9	White/Black	Input-1
11	Light Blue/Black	Output-1
12	Light Blue/Yellow	Output-Common
13	Light Blue/Green	Output-Strobe



## DataMan 50 and 60 RS-232 & Flying Leads I/O Cable

You can connect a cable with RS-232 & flying leads to the cable that is attached to the device.

The following table shows the pinout and color description of the flying leads.

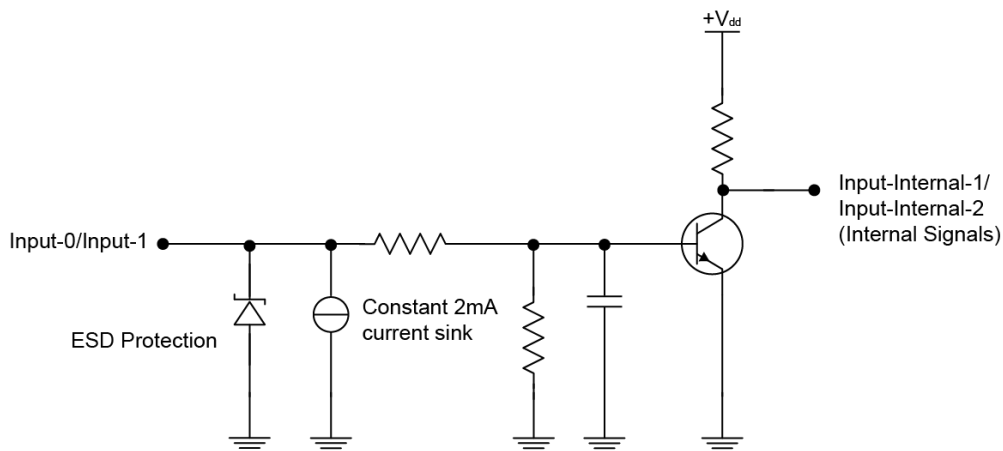


This is a female connector/socket.

PIN	Color	Signal
4	Black	GND
5	Brown/White	VDC
7	Blue/White	Output-0
8	White	Input-0
9	White/Black	Input-1
11	Light Blue/Black	Output-1
12	Light Blue/Yellow	Output-Common
13	Light Blue/Green	Output-Strobe

## DataMan 50 and 60 Digital Input Lines

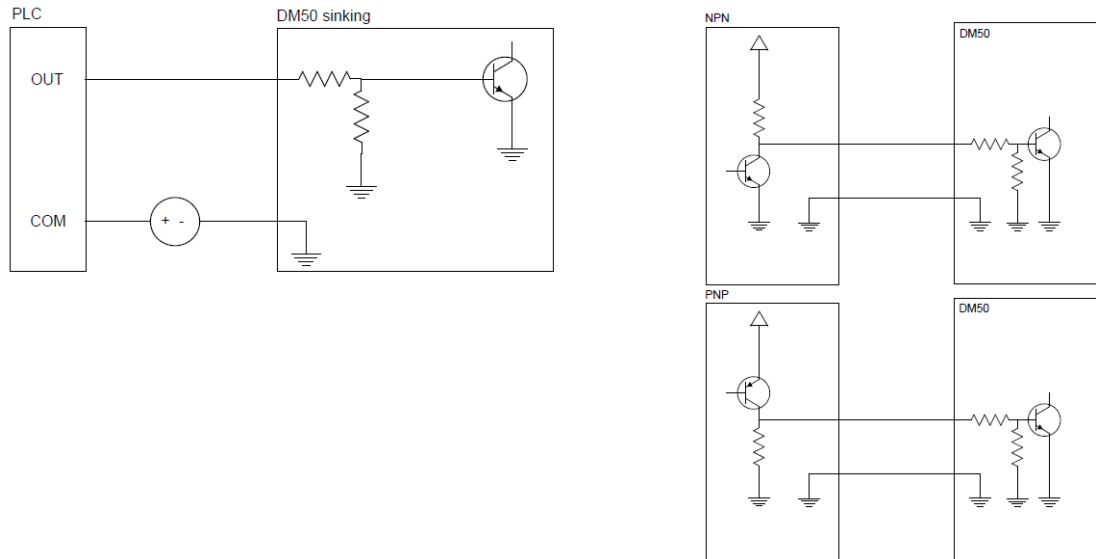
Inputs are not galvanic isolated but need to be referenced to ground.



## DataMan 50 and 60 External Wiring Examples: Digital Input Lines

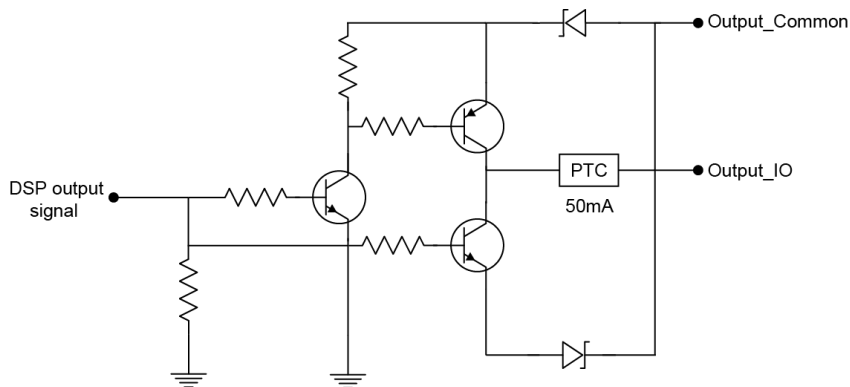
The following figure shows external wiring examples for digital input lines for the DataMan 50.

The DataMan 60 has the same characteristics.



## DataMan 50 and 60 Digital Output Lines

The digital outputs can be used as either NPN (pull-down) or PNP (pull-up) lines. For NPN lines, the external load should be connected between the output and the positive supply voltage (<26V). The outputs pull down to less than 3V when ON, which causes current to flow through the load. When the outputs are OFF, no current flows through the load. Outputs are not galvanic isolated but need to be referenced to ground.

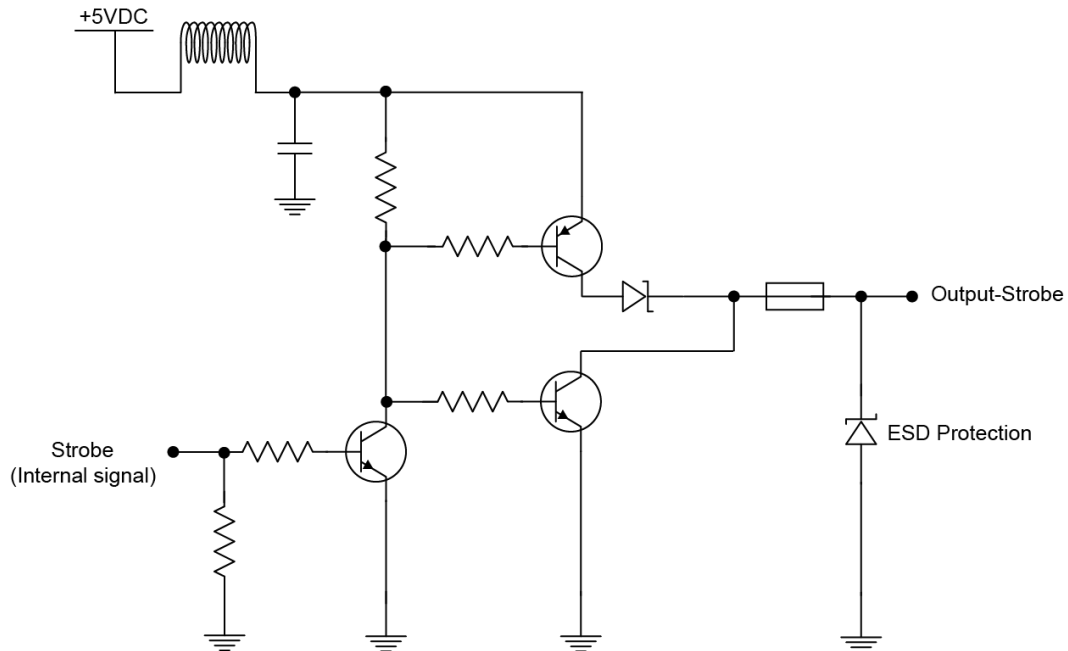


NPN (pull down) output type characteristics are the following:

Applied voltage	26 VDC or less
Residual voltage	0.85V or less
Maximum sink current	25mA
Short-circuit current	100mA or less
Short-circuit protection	multifuse – 50mA

PNP (pull up) output type characteristics are the following:

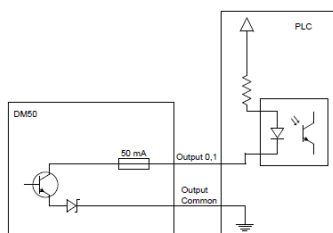
Applied voltage	26 VDC or less
Residual voltage	0.8V or less
Maximum sink current	25mA
Short-circuit current	50mA or less
Short-circuit protection	multifuse – 50mA



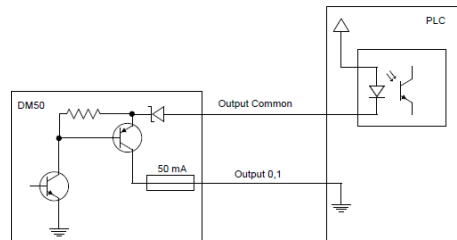
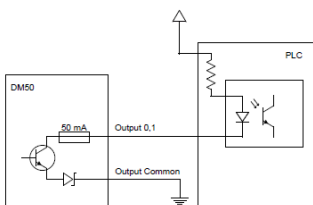
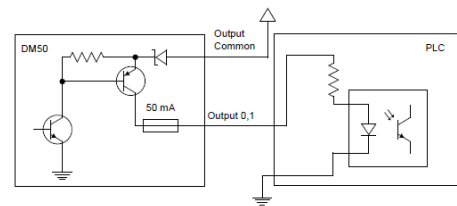
## DataMan 50 and 60 External Wiring Examples: Digital Output Lines

The following figure shows external wiring examples for digital input lines for the DataMan 50. The DataMan 60 has the same characteristics.

NPN

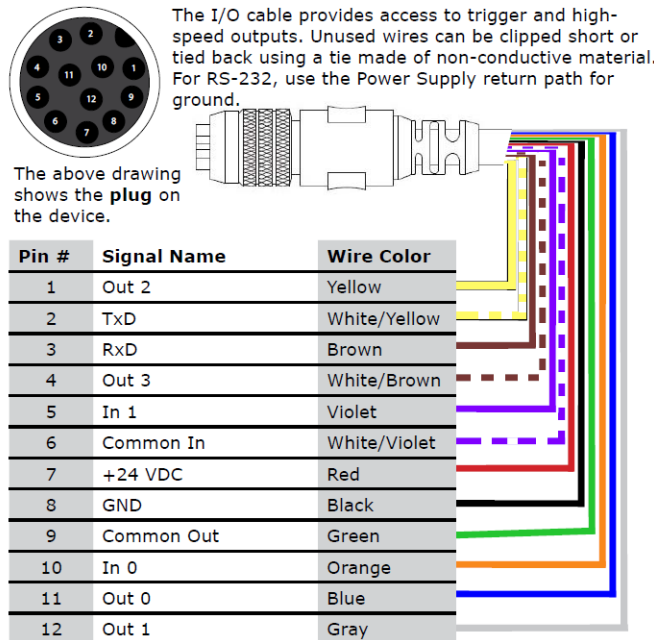


PNP

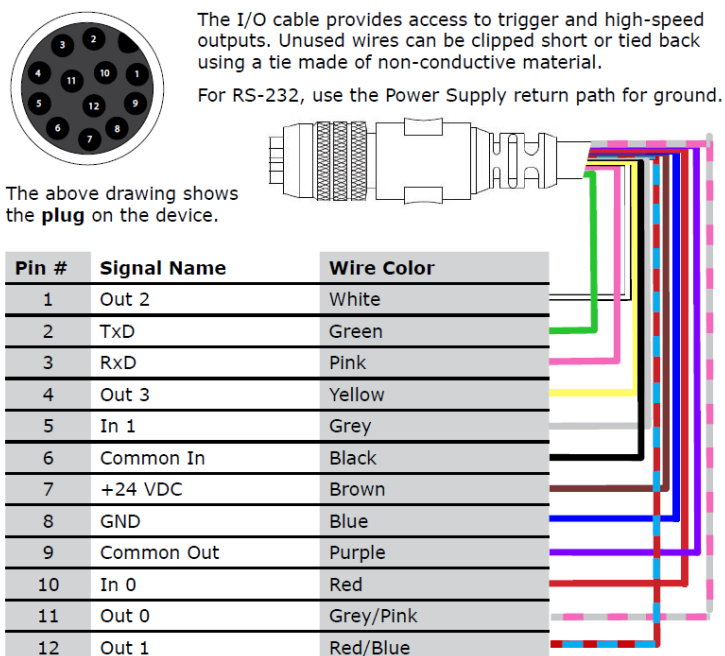


## DataMan 300 and 360 Series Readers Discrete I/O Connector

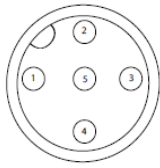
The following figure shows the pin-out numbering on the device, and information about the I/O cable on the DataMan 300 or 360 series reader. This is the I/O cable with part number **CCBL-05-01**.



The following figure shows the pin-out numbering on the device, and information about the I/O cable on the DataMan 300 or 360 series reader. This is the I/O cable with part number **CCB-M12xM12Fy-xx**.



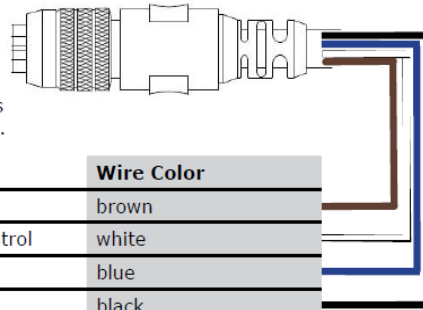
## DataMan 300 and 360 Series Readers External Light Control



A 4-pin cable is provided for the external light control.

The above drawing shows the **socket** on the device.

Pin #	Signal Name	Wire Color
1	+24 VDC	brown
2	Brightness Control	white
3	GND	blue
4	Strobe	black
5	Chassis	not connected

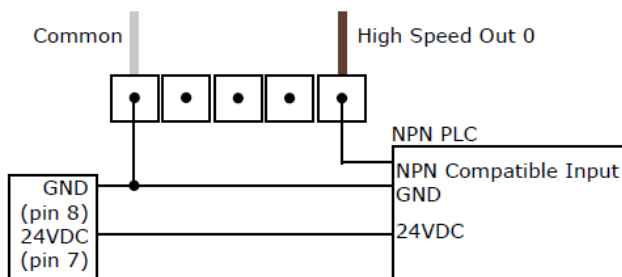


Current load: average: 500mA, peak: 1A (max. 100μs).

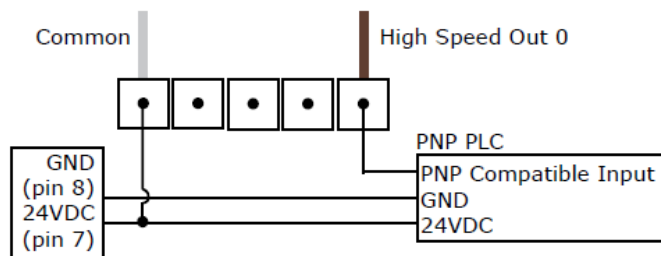
**NOTE** that this socket does not work if the external light is connected to one of the outputs on the I/O cable.

## DataMan 300 and 360 Series Readers High Speed Output Wiring

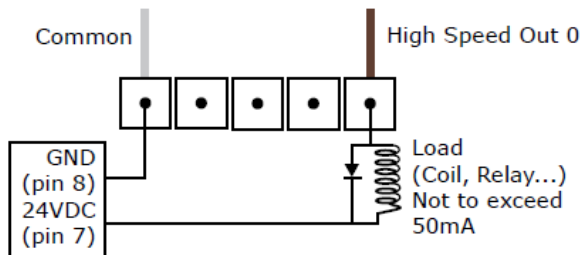
To connect to an NPN-compatible PLC input, connect Output 0, Output 1, Output 2, or Output 3 directly to the PLC input. When enabled, the output pulls the PLC input down to less than 3V.



To connect to a PNP-compatible PLC input, connect Output 0, Output 1, Output 2 or Output 3 directly to the PLC input. When enabled, the output pulls the PLC input up to greater than 21V.



To connect the high-speed outputs to a relay, LED or similar load, connect the negative side of the load to the output and the positive side to +24V. When the output switches on, the negative side of the load is pulled down to less than 3V, and 24 appears across the load. Use a protection diode for a large inductive load, with the anode connected to the output and the cathode connected to +24V.

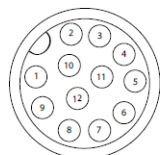


### DataMan 300 and 360 Series Readers Power Requirements

For the DataMan 300 and 360 series readers, 24V power is provided through the I/O+RS232+24V cable. Maximum power consumption is 5W (internal illumination) or 18W (internal and external lights).

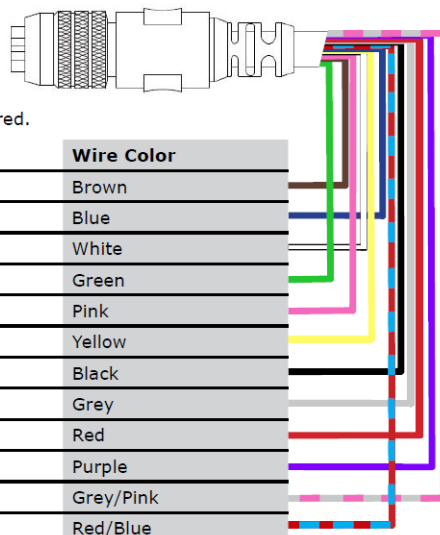
### DataMan 500 Discrete I/O Connector

The following figure shows the pin-out numbering on the device, and information about the I/O cable on the DataMan 500.



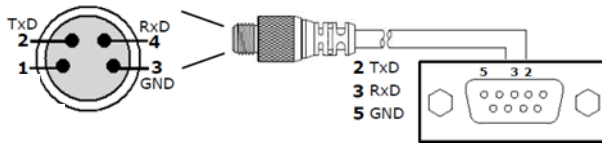
The drawing shows the **socket** on the device. Plug pin numbers are mirrored.

The I/O cable provides access to trigger and high-speed outputs. Unused wires can be clipped short or tied back using a tie made of non-conductive material.



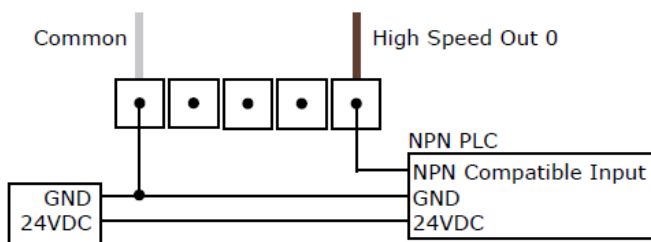
Pin #	Signal Name	Wire Color
1	Out 0	Brown
2	N/C	Blue
3	Common In	White
4	In 2	Green
5	In 1	Pink
6	Common Out	Yellow
7	Out 2	Black
8	Out 3	Grey
9	Out 1	Red
10	N/C	Purple
11	In 3	Grey/Pink
12	In 0	Red/Blue

## DataMan 500 RS-232 Serial Connector

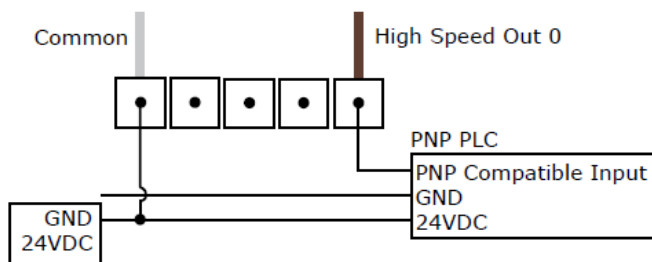


## DataMan 500 Series Readers High Speed Output Wiring

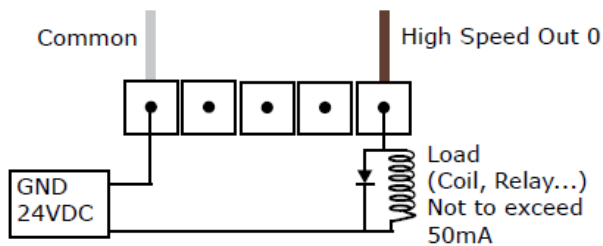
To connect to an NPN-compatible PLC input, connect Output 0, Output 1, Output 2, or Output 3 directly to the PLC input. When enabled, the output pulls the PLC input down to less than 3V.



To connect to a PNP-compatible PLC input, connect Output 0 or Output 1 directly to the PLC input. When enabled, the output pulls the PLC input up to greater than 21V.



To connect the high-speed outputs to a relay, LED or similar load, connect the negative side of the load to the output and the positive side to +24V. When the output switches on, the negative side of the load is pulled down to less than 3V, and 24 appears across the load. Use a protection diode for a large inductive load, with the anode connected to the output and the cathode connected to +24V.



## DataMan 500 Power Requirements

For the DataMan 500, power is provided through the Ethernet connection using a Class 3 PoE injector. Maximum power consumption is 5W (internal illumination) or 13W (High-Power Lighting Module).

## DataMan 503 Discrete I/O Connector

The following figure shows the pin-out numbering on the device, and information about the I/O cable on the DataMan 503.

### I/O Cable

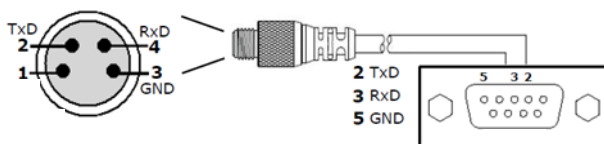


The above drawing shows the **plug** on the device.

The I/O cable provides access to trigger and high-speed outputs. Unused wires can be clipped short or tied back using a tie made of non-conductive material.

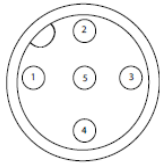
Pin #	Signal Name	Wire Color
1	Out 2	Yellow
2	In 3	White/Yellow
3	In 2	Brown
4	Out 3	White/Brown
5	In 1	Violet
6	Common In	White/Violet
7	+24 VDC	Red
8	GND	Black
9	Common Out	Green
10	In 0	Orange
11	Out 0	Blue
12	Out 1	Gray

## DataMan 503 RS-232 Serial Connector





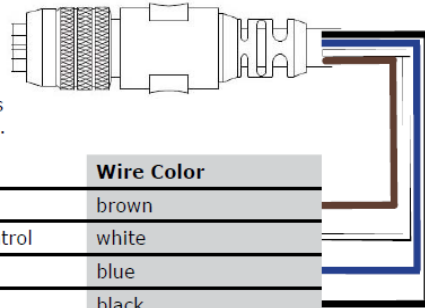
## DataMan 503 Series Readers External Light Control



A 4-pin cable is provided for the external light control.

The above drawing shows the **socket** on the device.

Pin #	Signal Name	Wire Color
1	+24 VDC	brown
2	Brightness Control	white
3	GND	blue
4	Strobe	black
5	Chassis	not connected

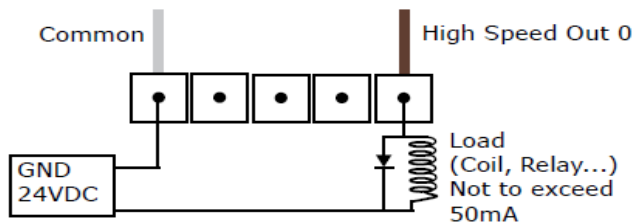


Current load: average: 500mA, peak: 1A (max. 100μs).

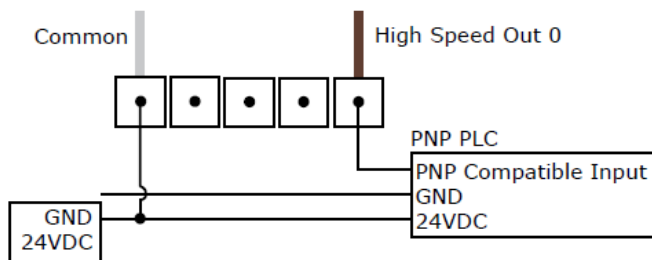
**NOTE** that this socket does not work if the external light is connected to one of the outputs on the I/O cable.

## DataMan 503 Series Readers High Speed Output Wiring

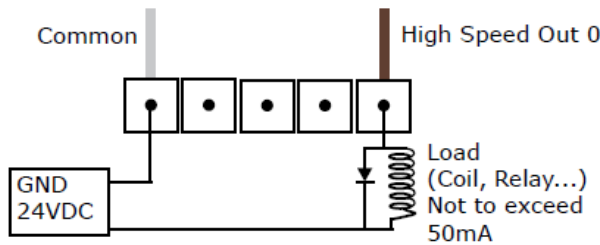
To connect to an NPN-compatible PLC input, connect Output 0, Output 1, Output 2, or Output 3 directly to the PLC input. When enabled, the output pulls the PLC input down to less than 3V.



To connect to a PNP-compatible PLC input, connect Output 0 or Output 1 directly to the PLC input. When enabled, the output pulls the PLC input up to greater than 21V.



To connect the high-speed outputs to a relay, LED or similar load, connect the negative side of the load to the output and the positive side to +24V. When the output switches on, the negative side of the load is pulled down to less than 3V, and 24 appears across the load. Use a protection diode for a large inductive load, with the anode connected to the output and the cathode connected to +24V.



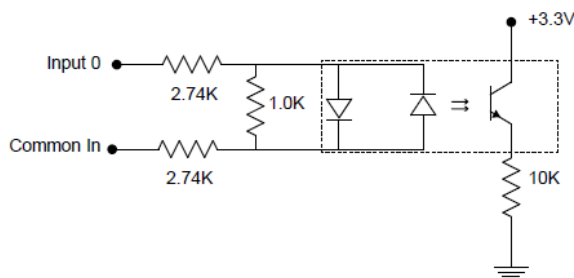
### DataMan 503 Power Requirements

For the DataMan 503 readers, 24V power is provided through the I/O+RS232+24V cable. Maximum power consumption is 13W (High-Power Lighting Module).

### DataMan 300, 360 and 500 Series Readers Acquisition Triggering

The acquisition trigger input on the reader is opto-isolated. To trigger from an NPN (pull-down) type photo-detector or PLC output, connect **Common In** to +24V and connect **In** to the output of the detector. When the output turns on, it pulls **In** down to 0V, turning the opto-coupler on.

To trigger from an PNP (pull-up) photo-detector or PLC output, connect **In 0** to the output of the detector and connect **Common In** to 0V. When the output turns on, it pulls **In 0** up to 24V, turning the opto-coupler ON.

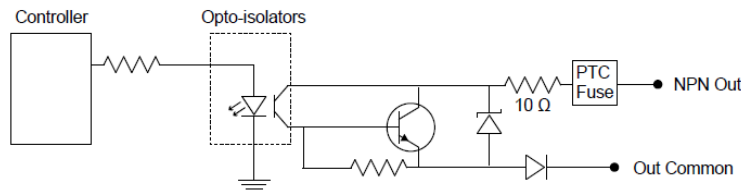


DataMan 300 and 360 series readers: 26.4V maximum across input pins – Transition approximately 12V (Min).

DataMan 500 series readers: 28V maximum across input pins – Transition approximately 12V (Min).

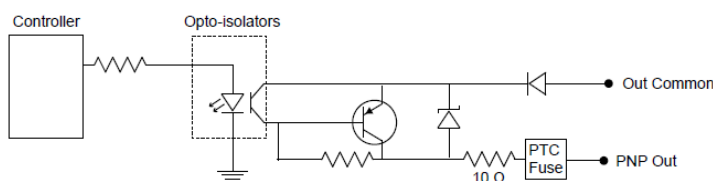
## DataMan 300, 360 and 500 Series Readers High Speed Output Lines

The high-speed outputs can be used as either NPN (pull-down) or PNP (pull-up) lines. For NPN lines, the external load should be connected between the output and the positive supply voltage (<26.4V for the DataMan 300 and 360 series readers, <28V for the DataMan 500 series readers). The outputs pull down to less than 3V when ON, which causes current to flow through the load. When the outputs are OFF, no current flows through the load.



Specification	DataMan 300 and 360 Series Readers and DataMan 503 Reader Description	DataMan 500 Readers Description
Voltage	26.4V maximum through external load	28V maximum through external load
Current	50mA maximum sink current	50mA maximum sink current
Current	OFF state leakage current 100μA	OFF state leakage current 100μA
	External load resistance 240 Ohms to 10K Ohms	External load resistance 240 Ohms to 10K Ohms
	Each line rated at a maximum 50mA, protected against over-current, short circuits and transients from switching inductive loads. High current inductive loads require external protection diode.	Each line rated at a maximum 50mA, protected against over-current, short circuits and transients from switching inductive loads. High current inductive loads require external protection diode.

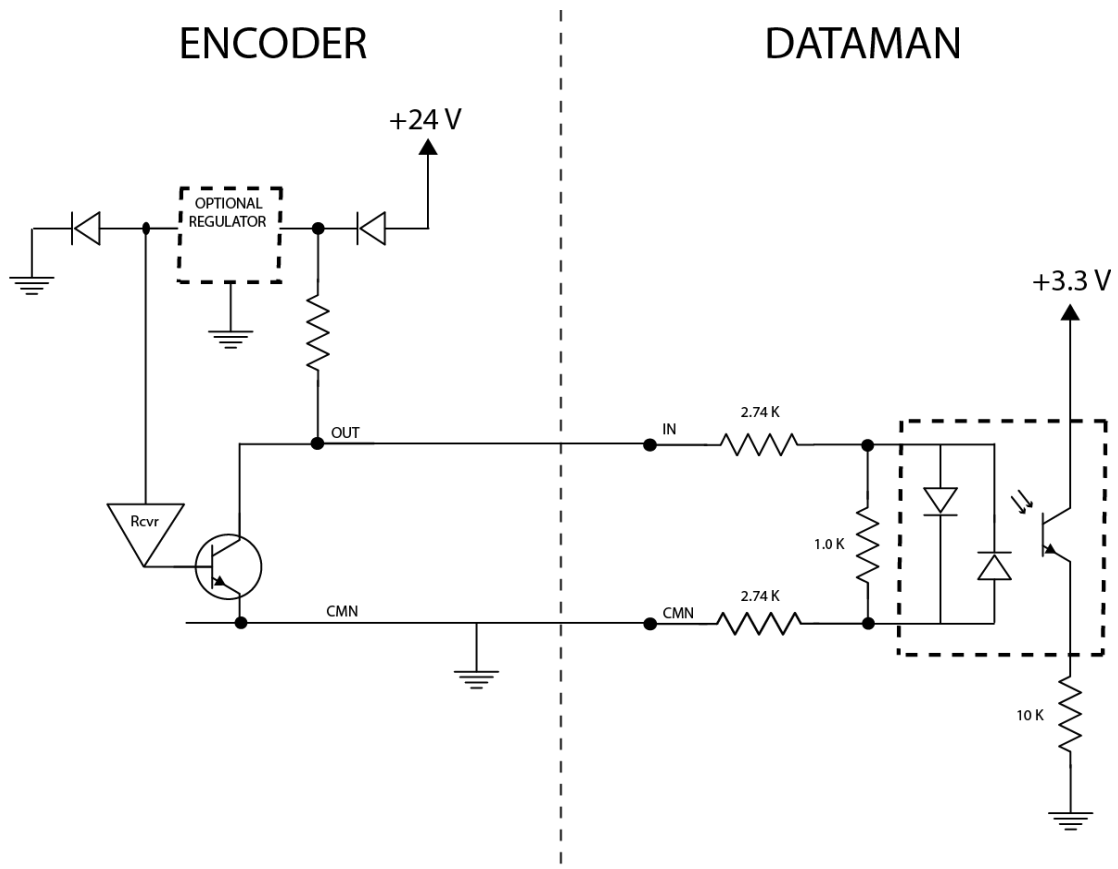
For PNP lines, the external load should be connected between the output and the negative supply voltage (0V). When connected to a 24VDC power supply, the outputs pull up greater than 21V when ON, and current flows through the load. When the outputs are OFF, no current flows through the load.



## Connecting the Encoder to a DataMan

The encoder has four wires. The color coding of the wires is the following:

Wire Color	Signal Name
Red	+24 V
Black	common- can be connected to either +24V (NPN) or ground (PNP)
White	the output connected to the input line of the DataMan 500 reader
Bare	ground



According to the speed of the line, set the number of pulses per revolution on the wheel by using the switches on the encoder (for more information, see encoder documentation). The number of pulses, however, must not exceed 150 Hz.

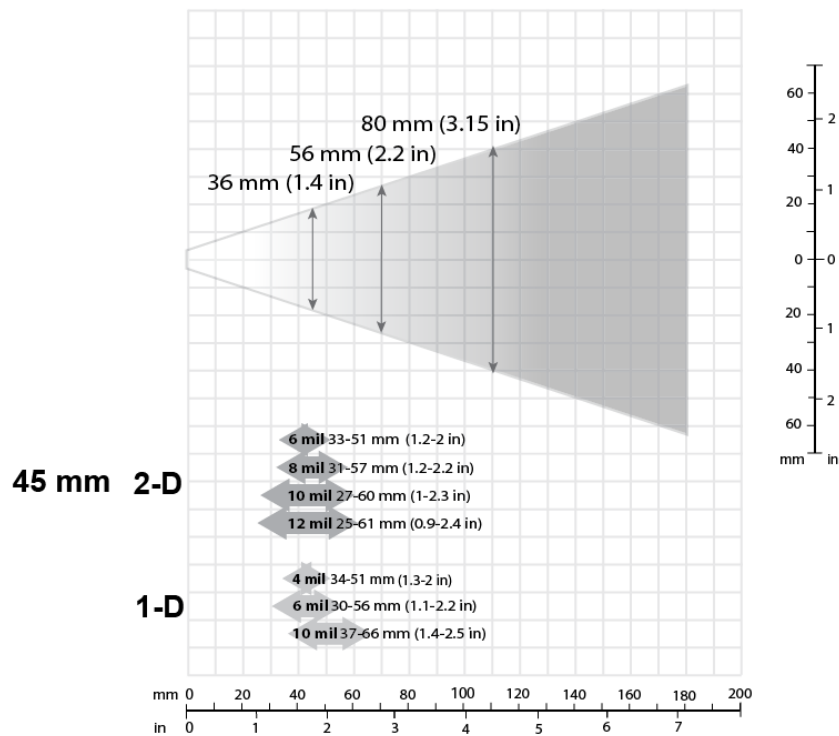
In the Setup Tool, configure the use of your DataMan reader with the encoder in the Pulse Encoder tab of the System Settings pane.

## Optics and Lighting

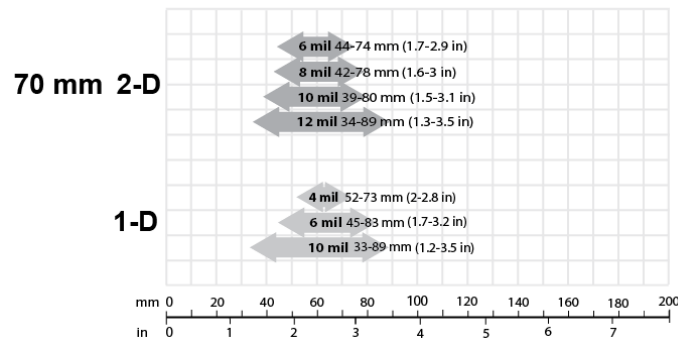
This section contains information about the image formation components of the DataMan 50, 60, 500, 503 and DataMan 300 and 360 series readers.

### DataMan 50 and 60 Reading Distance and Field of View

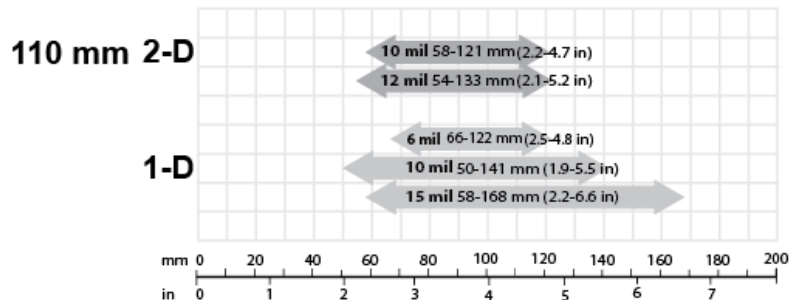
The following chart shows the horizontal field of view for the DataMan 50 and 60 at a range of working distances, together with the supported range of reading distances at 45 mm focus position.



This chart shows the supported range of reading distances at 70 mm focus position.



This chart shows the supported range of reading distances at 110 mm focus position.



The following table shows the Field of View widths at various distances.

distances in mm	DM50/DM60
45	36
70	56
110	80

### DataMan 300 and 360 Series Readers Reading Distance and Field of View

The DataMan 300 and 360 series readers: DataMan 300/360, DataMan 302/362, and DataMan 303/363 have different fields of view because of the different region of the sensor used by each reader.

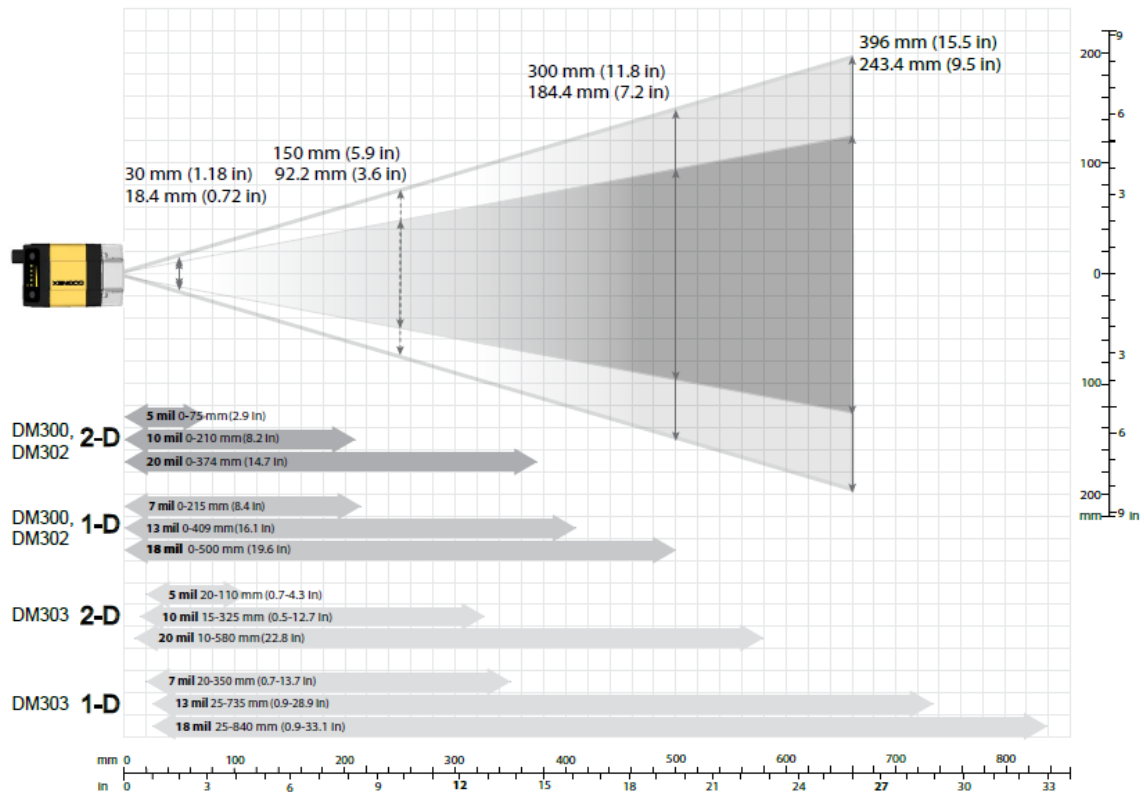
#### Scan Map for DataMan 300 and 360 Series Readers using a 10.3 mm Lens

This map shows the field of view of the DataMan 300/360, DataMan 302/362, and DataMan 303/363 readers with a 10.3 mm lens (with or without a liquid lens).

The FOV values are shown as follows:

- outer: DM302/362, DM303/363
- inner: DM300/360

The reading distances for the DM300/360 and DM302/362 readers are the same. The DM303/363 feature a higher resolution and more pixels in about the same sensor size.



The following table shows the Field of View widths in mm at various distances.

distances in mm	DM300, DM360	DM302/DM303, DM362/DM363
50	18.4	30
100	36.8	60
150	55.3	90
250	92.2	150
500	184.4	300

#### Scan Map for DataMan 300 and 360 Series Readers using a 16 mm Lens

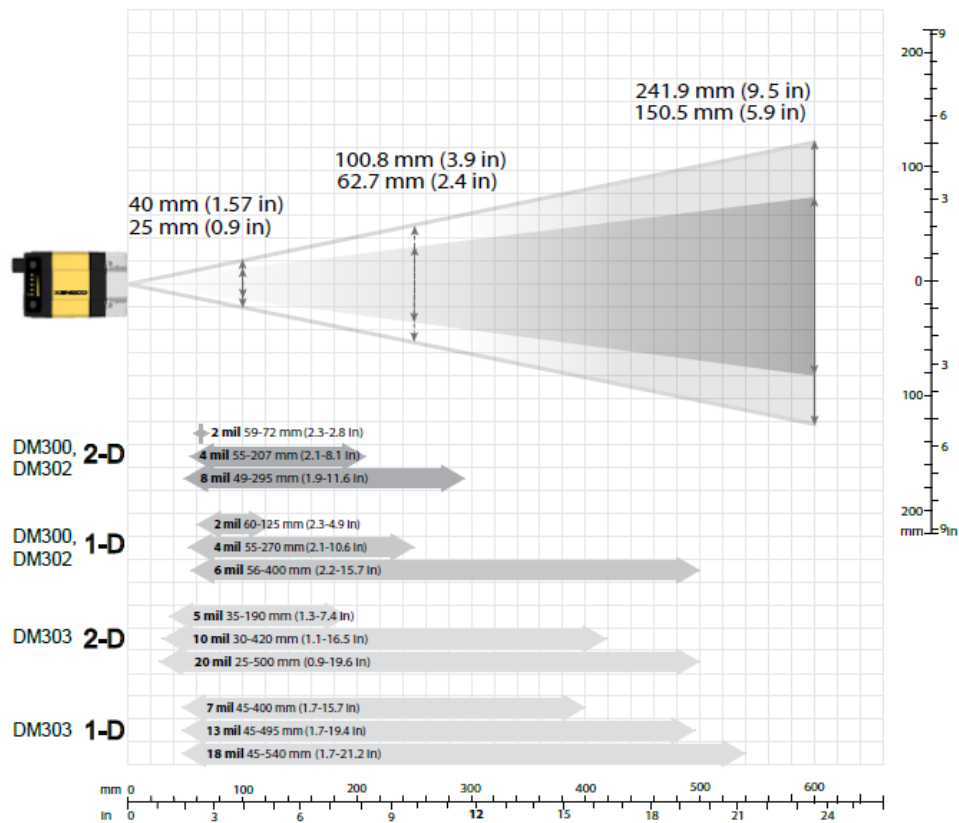
This map shows the field of view of the DataMan 300/360, DataMan 302/362, and DataMan 303/363 readers with a 16 mm lens.

The FOV values are shown as follows:

- outer: DM302/362, DM303/363
- inner: DM300/360

The reading distances for the DM300/360 and DM302/362 readers are the same. The DM303/363 feature a higher resolution and more pixels in about the same sensor size.

To make sure that your DM303/363 reader is able to decode at the minimum reading distances, use the reader in combination with the extension kit or without the front cover.



The following table shows the Field of View widths in mm at various distances.

distances in mm	DM300, DM360	DM302/DM303, DM362/DM363
50	12.5	20.1
100	25	40.3
150	37.6	60.4
250	62.7	100.8
500	125.4	201.6

### Scan Map for DataMan 300 and 360 Series Readers using a 25 mm Lens

This map shows the field of view of the DataMan 300/360, DataMan 302/362, and DataMan 303/363 readers with a 25 mm lens.

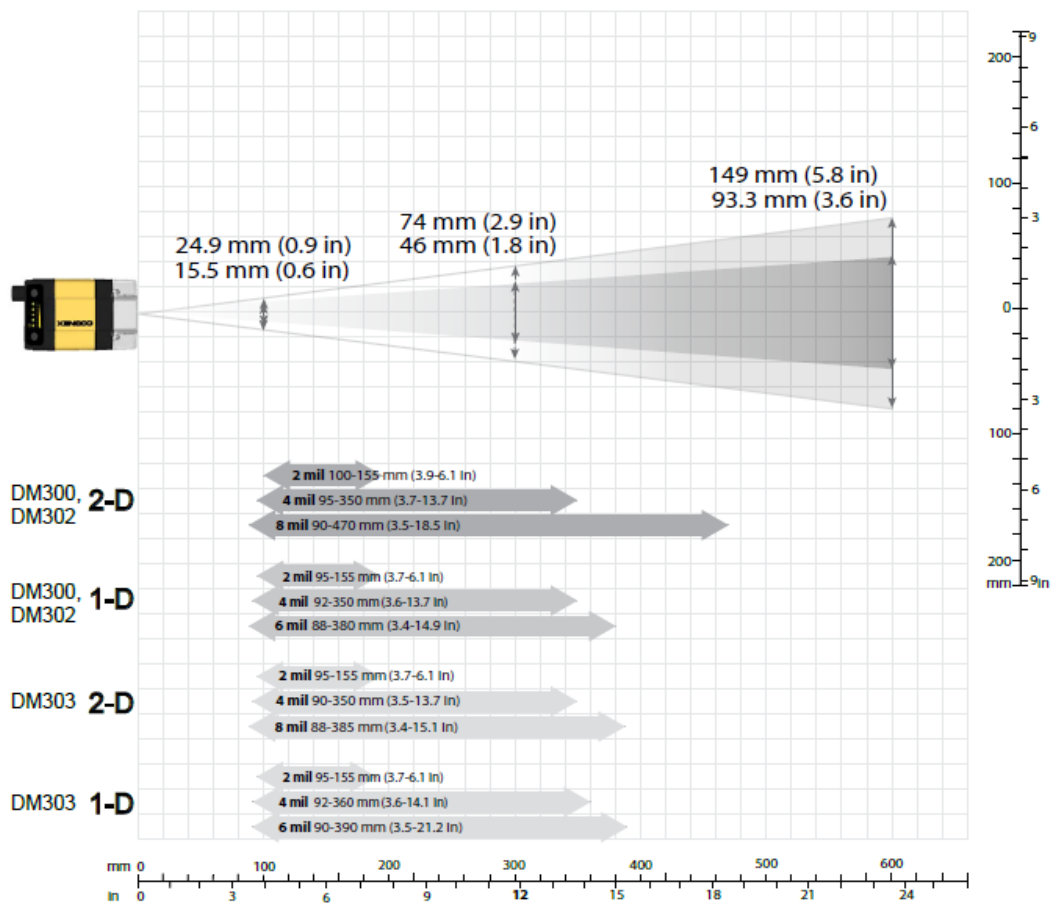
The FOV values are shown as follows:

- outer: DM302/362, DM303/363



- inner: DM300/360

The reading distances for the DM300/DM360 and DM302/DM362 readers are the same. The DM303/DM363 feature a higher resolution and more pixels in about the same sensor size.



The following table shows the Field of View widths in mm at various distances.

distances in mm	DM300, DM360	DM302/DM303, DM362/DM363
50	7.7	12.4
100	15.5	24.9
150	23.3	37.3
250	38.9	62.2
500	77.8	124.5

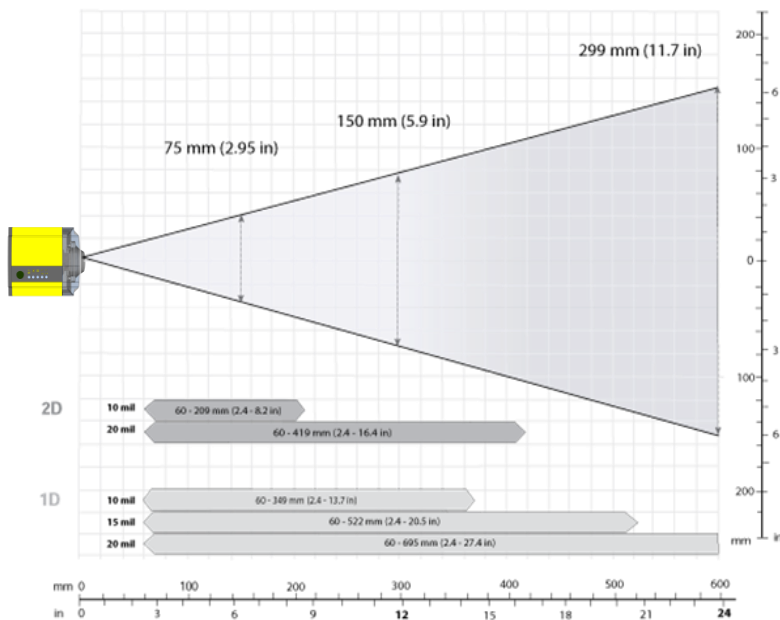
## DataMan 500 Reading Distance and Field of View

For the DataMan 500, two liquid lens modules are available:

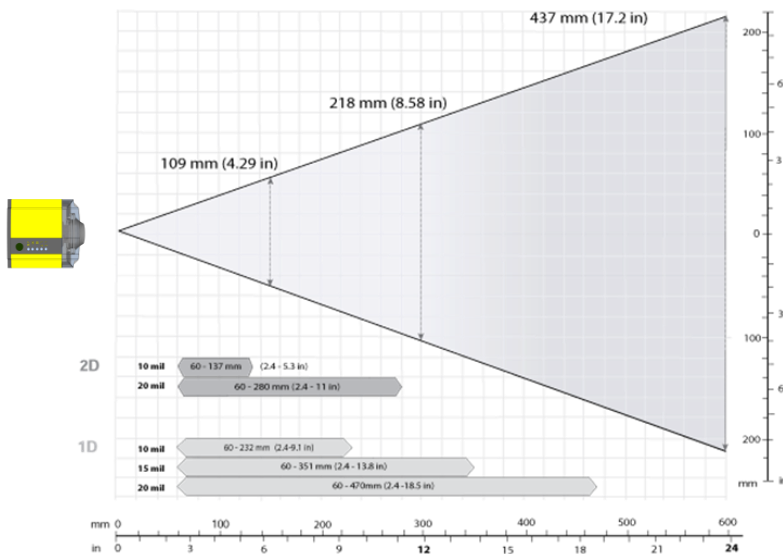
- an 18.8 mm lens (DM500-LLM-188) suitable for reading distant objects, such as on an assembly line or as a high-magnification lens
- a 13.3 mm lens (DM500-LLM-133) suitable for reading objects at close distances

Reading distance and field of view charts are provided for both modules.

### Scan Map for the 18.8 mm Liquid Lens Module



## Scan Map for the 13.3 mm Liquid Lens Module



For CS-mount lenses, the lens's focal length, focus setting, and aperture setting determine the field of view and reading distance.

## Liquid Lens Characteristics

The liquid lens provides an electronically controllable variable focus system. It offers rapid, hands-free, software-driven autofocus with no moving parts giving an increased depth of field flexibility.

You can use the Setup Tool to set the focus manually or optimize focus based on acquired images. You can also use a package height sensor to adjust focus automatically during operation.

### Package Height Sensor

If you connect a package height sensor (PHS) to your DataMan 500 which has liquid lens installed, the DataMan 500 can automatically set the focus of the liquid lens based on the height of the packages when you choose to do so.

**NOTE:** Do not connect to the serial line in the Setup Tool when you are setting up a PHS.

Cognex supports the use of the following light curtains as PHS:

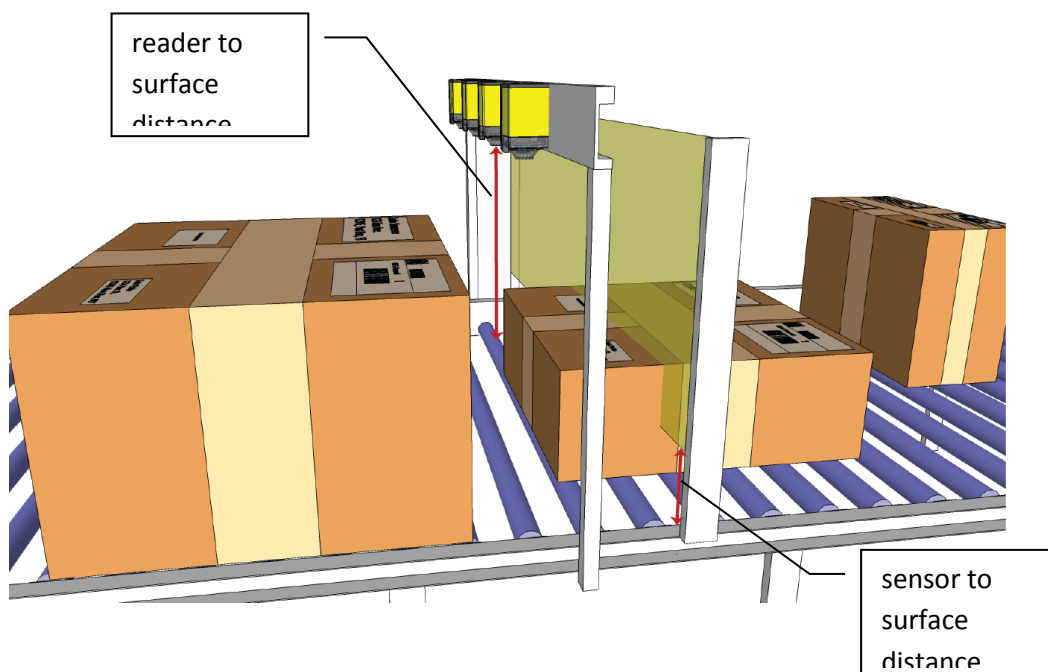
- Omron Light Curtain, model ValuScan VS6500 Series with C & D Controllers
- Baumer laser range finder, model OADM 13T6580/S35A

Connect the PHS through RS-232. For more information, refer to the documentation provided by Omron and Baumer.

You can use a PHS together with a DataMan 500 reader to read codes printed on the surfaces of boxes of different sizes that are travelling on a conveyor. When a box passes the PHS, the PHS senses the height of the box and transmits this information to the DataMan 500 readers. The reader uses the height information from the PHS along with the Sensor-to-Surface distance that you specified when you configured the reader to determine the distance from the reader to the box surface. It then uses this computed distance to set the liquid lens focus position.

The following steps explain the configurations you have to make:

1. Set up the height sensor at a 90 degree angle to the conveyor.
2. Make sure that the height sensor's baud rate is set to 38400.
3. Mount your DataMan 500 reader at a 0 to 15 degree angle to the conveyor.



4. Enable the PHS in the Setup Tool's Height Sensor tab of the System Settings pane. Set the *Sensor to Surface* distance according to the distance between the conveyor and the PHS. On the PHS, measure from the "zero height" point by using the calibration mark on the sensor.
5. In the Setup Tool's Auto Focus tab of the Focus Settings pane, set the *Reader to Surface* value. This is the distance between the conveyor and the DataMan 500 reader. This

distance is measured perpendicular to the conveyor. On the DataMan 500 reader, measure from the tip of the liquid lens module.

### NOTE

You have to set this distance individually for each reader in a master/slave group.

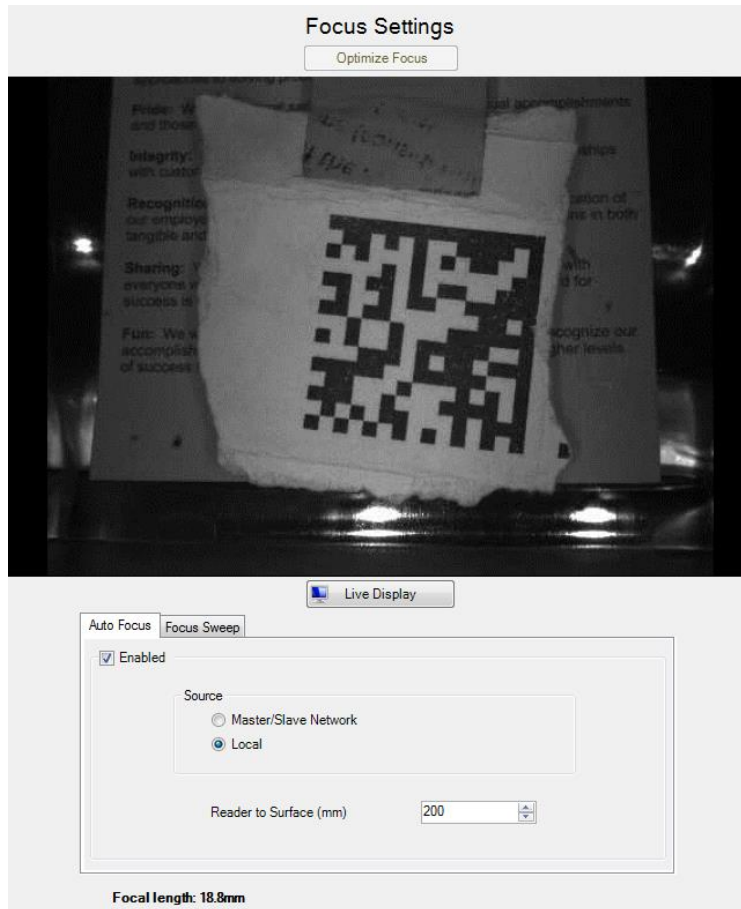
6. In addition, specify the beam spacing of the PHS on the Setup Tool's Height Sensor tab of the System Settings pane.
7. You can also read the current height on the Height Sensor tab.

### ***Configuring the Package Height Sensor for Multiple Readers***

If you are using multiple readers in a master/slave group setup (for more information, see [Master/Slave Configuration](#)), you can connect the PHS to any one of the readers in the group. If your master reader is using RS-232 communication to transmit its results, however, then you must connect the PHS to one of the slave readers in the group.

The reader you connect the PHS to will measure height. Configure this reader by performing the following steps:

1. Connect to the Setup Tool.
2. Go to the Focus Settings pane's Auto Focus tab and select Local.



This reader gets height information. If you want this information automatically transmitted to other readers in the master/slave setup, configure the other readers one by one by performing the following steps:

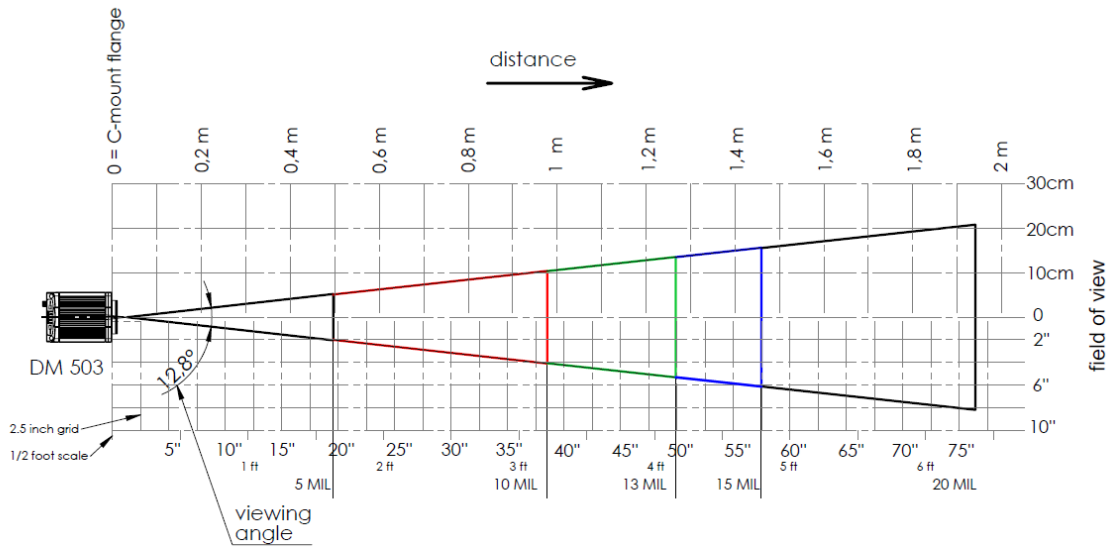
1. Connect to the Setup Tool.
2. On the Focus Settings pane's Auto Focus tab, select Master/Slave Network.
3. Set the *Reader to Surface* value for each reader in the group. This value might be different for each reader if the readers are mounted at different distances from the line.

### DataMan 503 Series Readers Reading Distance and Field of View

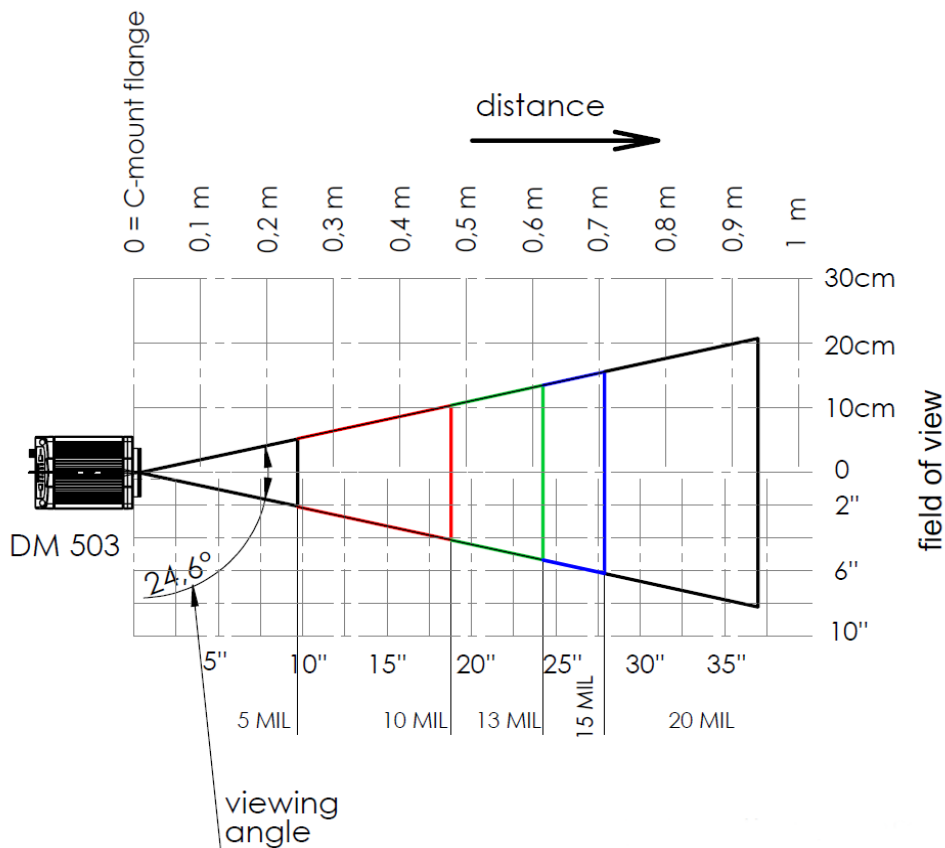
The following scan maps show the reading distance and field of view charts for the various lenses that can be used with the DataMan 503 reader.

#### Scan Map for DataMan 503 Series Readers using a 16 mm Lens

The following map shows the reading distance and field of view charts for the DataMan 503 reader with a 16 mm lens for **1-D codes**. The minimum 1-D resolution is at 1.2 pixels per module.



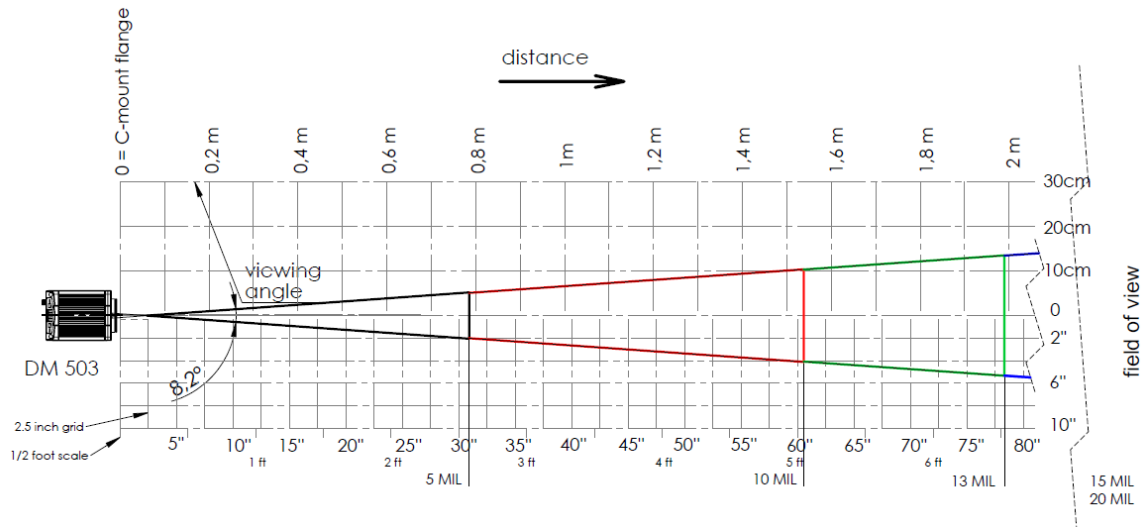
The following map shows the reading distance and field of view charts for the DataMan 503 reader with a 16 mm lens for **2-D codes**. The minimum 2-D resolution is at 2.5 pixels per module.



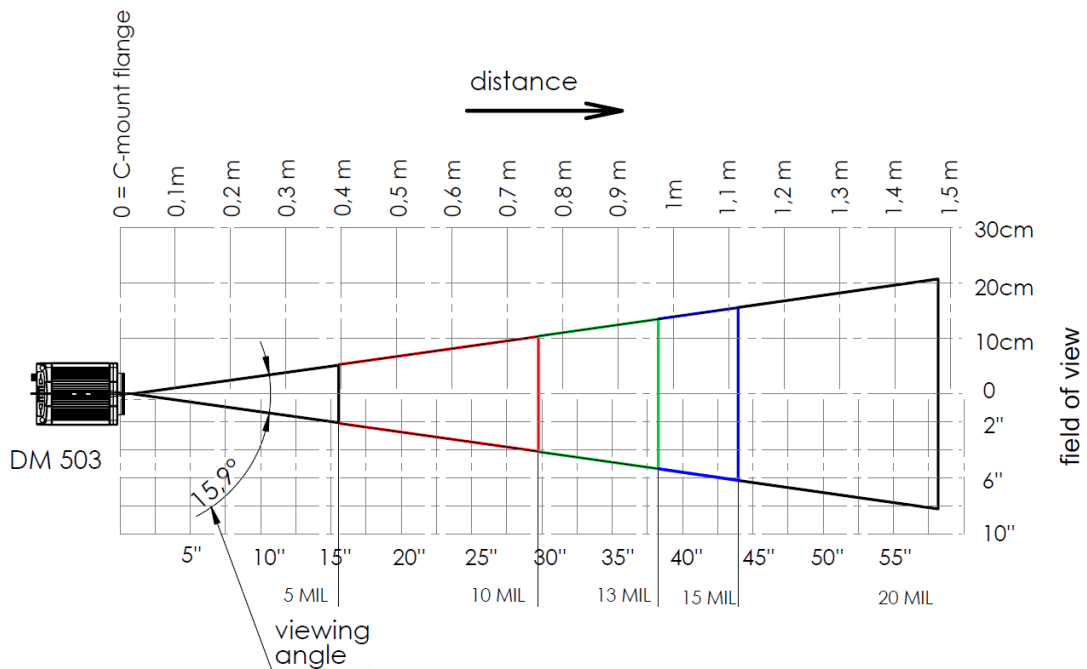
#### Scan Map for DataMan 503 Series Readers using a 25 mm Lens

The following map shows the reading distance and field of view charts for the DataMan 503 reader with a 25 mm lens for **1-D codes**. The minimum 1-D resolution is at 1.2 pixels per module.



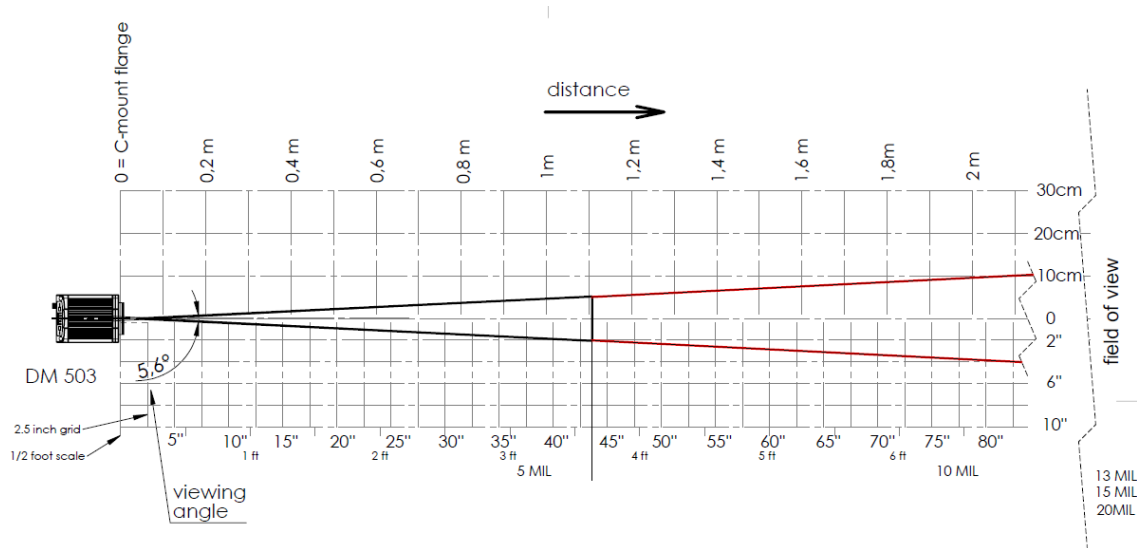


The following map shows the reading distance and field of view charts for the DataMan 503 reader with a 25 mm lens for **2-D codes**. The minimum 2-D resolution is at 2.5 pixels per module.

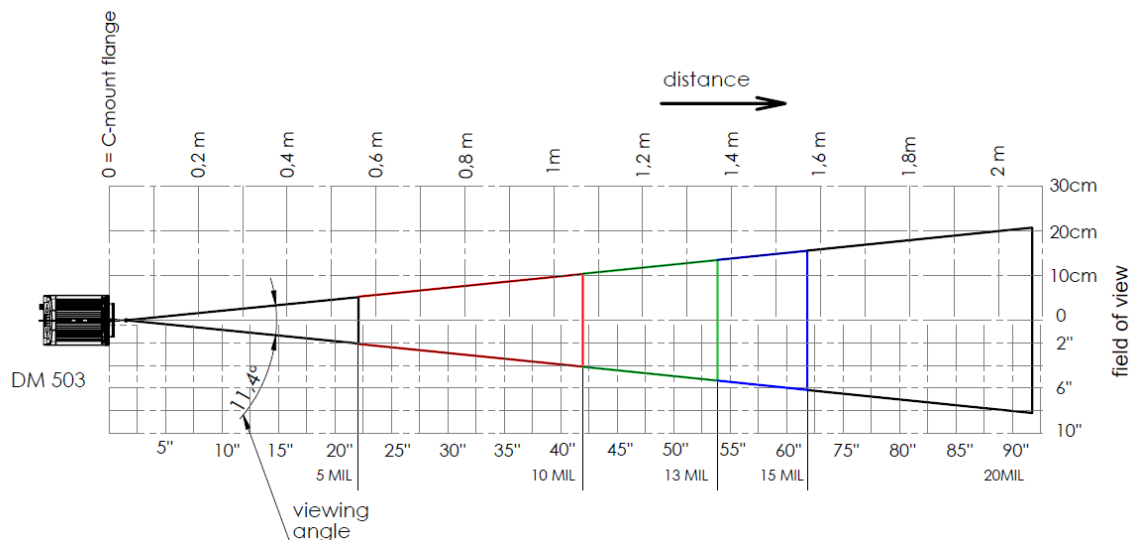


## Scan Map for DataMan 503 Series Readers using a 35 mm Lens

The minimum 1-D resolution is at 1.2 pixels per module.



The following map shows the reading distance and field of view charts for the DataMan 503 reader with a 35 mm lens for **2-D codes**. The minimum 2-D resolution is at 2.5 pixels per module.



## DataMan 500 CS-Mount Lens Characteristics

This section provides information on using CS-mount lenses.

### Mechanical Requirements for CS-Mount Lenses

CS-mount lenses must meet the following requirements to be used with DataMan 500:

- No aspect of the lens may protrude past the end of the lens threads.

- The threads must be no more than 4mm deep.
- The maximum size lens barrel that fits within the CS-mount lens cover is 30 mm long (measured from lens mount base) and 28 mm in diameter. You can remove the lens (and front) covers from DataMan to fit a larger lens, but the reader will not maintain its IP rating.

### DataMan 503 CS-Mount Lens Characteristics

This section provides information on using CS-mount lenses.

#### Mechanical Requirements for CS-Mount Lenses

CS-mount lenses must meet the following requirements to be used with DataMan 503:

- No aspect of the lens may protrude past the end of the lens threads.
- The threads must be no more than 4mm deep.
- The maximum size lens barrel that fits within the CS-mount lens cover is 30 mm long (measured from lens mount base) and 28 mm in diameter. You can remove the lens (and front) covers from DataMan to fit a larger lens, but the reader will not maintain its IP rating.

### Internal Lighting

#### DataMan 50 and 60 Internal Lighting

This section describes the working mechanism of the built-in lighting of DataMan 50 and 60.

All DataMan 50 and 60 readers include built-in (internal) lighting. During operation, the DataMan 50 and 60 automatically regulate image exposure time and imager gain to produce usable image quality at the highest possible frame rate.

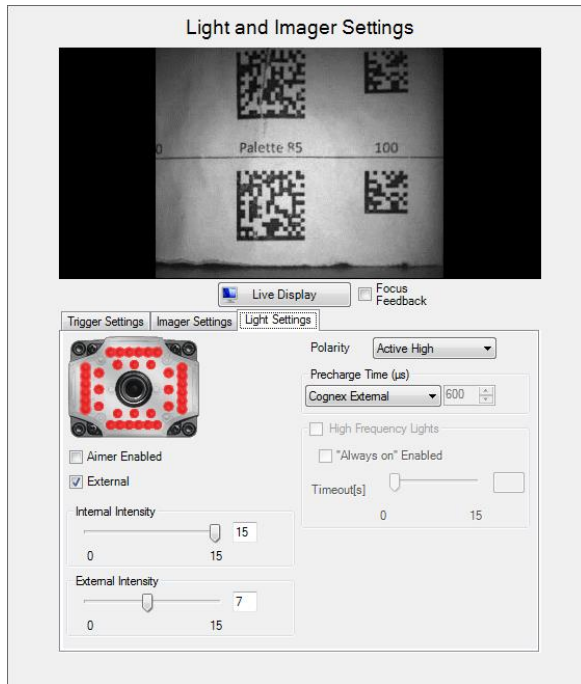
As the working distance between the reader and code increases, additional light intensity or longer exposure times are required to maintain the same image quality. When the maximum illumination intensity is reached, the frame rate may be reduced to permit a longer exposure time.

#### DataMan 300 and 360 Series Readers Internal Lighting

This section describes the working mechanism of the built-in lighting of the DataMan 300 and 360 series reader.

The internal illumination module offers two rings of LEDs with four quadrants each. Each quadrant is controllable individually, that is, ON/OFF and intensity.

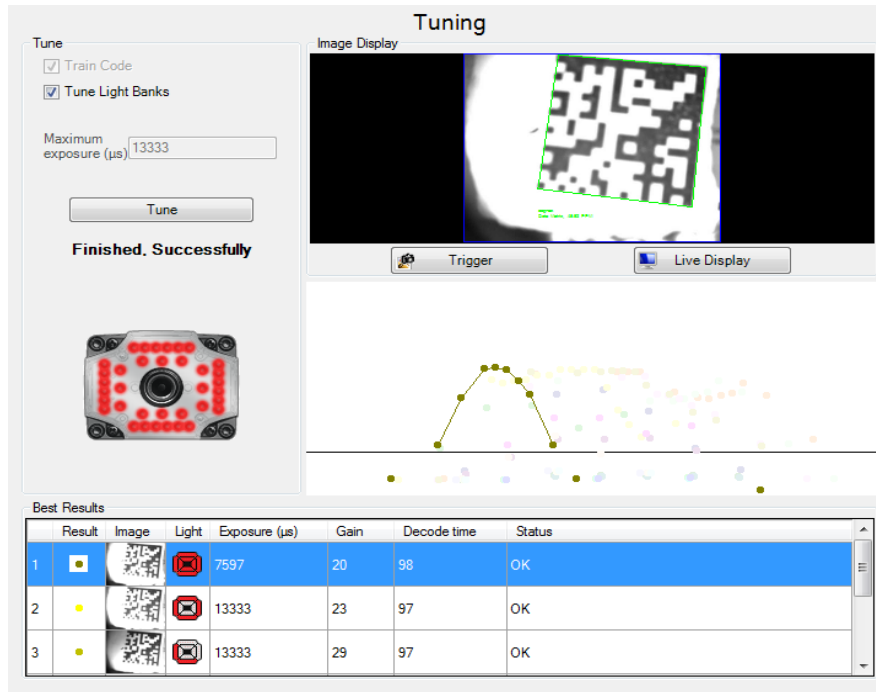
You can turn the quadrants ON or OFF by clicking on the dots (representing the LEDs) on the front image of the DataMan 300 or 360 in the Setup Tool's *Light and Imager Settings* pane's Light Settings tab. The quadrants that are ON are displayed in red, see example below.



## ***Tuning***

By tuning, your DataMan 300/360 series reader automatically selects the best settings for the given reading situation, based on parameters of illumination, camera and decoder properties, and focal distance. Use this feature to create an optimum setting to read your codes, both 1-D and 2-D.

In the following example, the best situation is when all quadrants are turned on.



## DataMan 500 Internal Lighting

This section describes the working mechanism of the built-in lighting of DataMan 500.

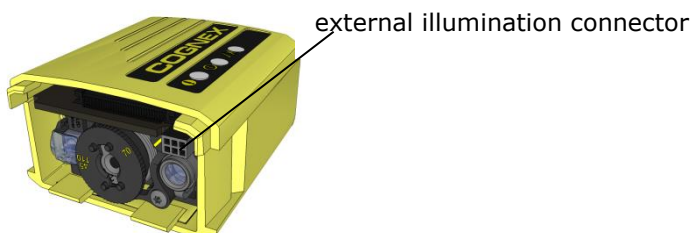
All DataMan 500 readers include built-in (internal) lighting. During operation, the DataMan 500 automatically regulates image exposure time and imager gain to produce usable image quality at the highest possible frame rate.

As the working distance between the reader and code increases, additional light intensity or longer exposure times are required to maintain the same image quality. When the maximum illumination intensity is reached, the frame rate may be reduced to permit a longer exposure time.

## External Lighting

### DataMan 50 and 60 External Lighting

The DataMan 50 and 60 readers have a dedicated output for external light control. In addition, the DataMan 60 has an external illumination connector in front of the reader.



You can control the intensity output of the external illumination connector if the external illumination you use supports this control. Go to the Setup Tool's *Light and Imager Settings* pane, check the **External** checkbox and change the intensity according to your needs.

### **DataMan 50 and 60 Illumination Strobe Output**

The strobe output is provided by a diode that is added to the push-pull circuit, with series to the pull-up transistor. This diode blocks the higher voltage when the output is pulled up when used as open-collector type driving, but enables the driving of high level in TTL mode.

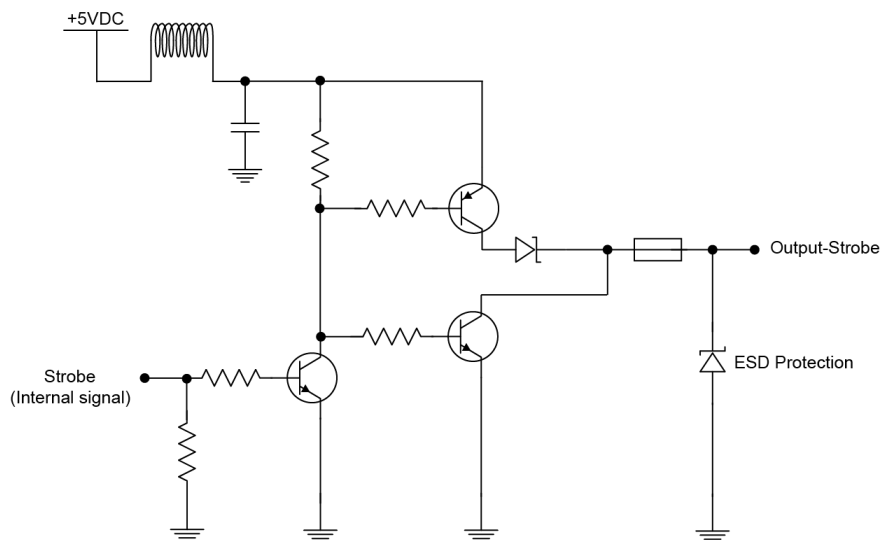
TTL output type characteristics are the following:

High level	4.0-5.0V
Low level	0-0.4V
Output current	25mA
Short-circuit current	125mA
Short-circuit protection	multifuse – 50mA

Open-collector output type characteristics are the following:

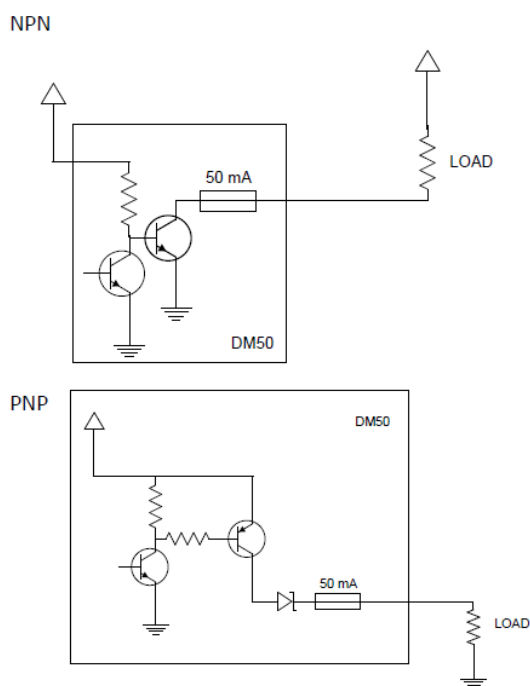
Output voltage range	0-26V
Low level	0-0.4V
Output current	25mA max
Short-circuit current	125mA
Short-circuit protection	multifuse – 50mA

The following figure shows the wiring diagram of the illumination strobe output.



## DataMan 50 and 60 External Load Strobe Output

The following image shows the external load strobe output for the DataMan 50. The DataMan 60 has the same characteristics.



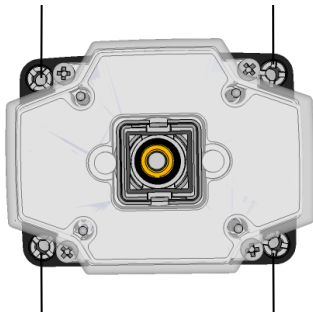
## DataMan 300/360 Series Reader External Lighting

On the back of the reader, there is a socket dedicated to external light control.



There are four mounting holes on the front of the reader to mount external illumination.

mounting holes for external illumination



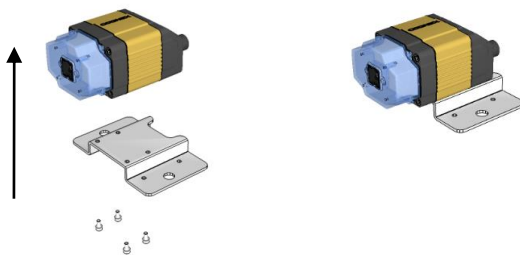
mounting holes for external illumination

You can control the intensity output of the external illumination connector if the external illumination you use supports this control. Go to the Setup Tool's *Light and Imager Settings* pane, check the **External** checkbox and change the intensity according to your needs.

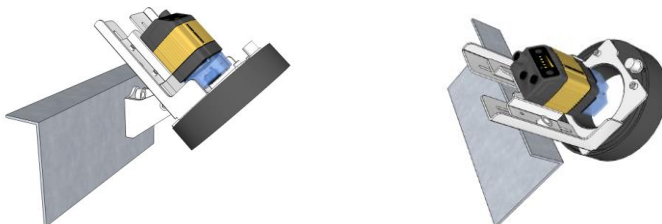
## External Light Mounting Brackets

You can mount your reader using external light mounting brackets. The brackets are intended to mount any of the different lights to the reader. They can also be used to mount the reader (with lights attached) to your machine. Pivot mounting, as illustrated, is optional. Perform the following steps:

1. Mount your reader on the camera plate and attach the screws.



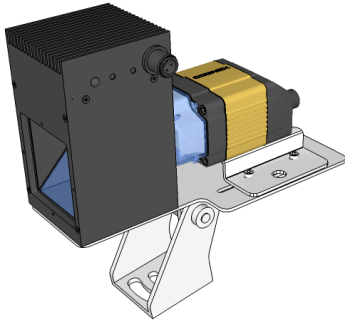
2. Mount your reader with the camera plate attached to any of the external light bracket adapters.



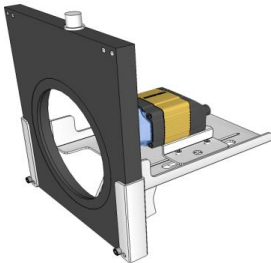


Choose one of the following light options:

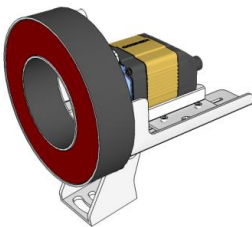
- Using coaxial (DOAL) light



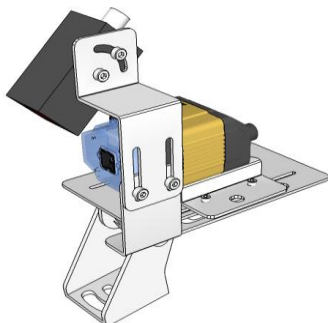
- Using dark field light



- Using ring light



- Using spot light



### DataMan 500 High Power Lighting Module

Light intensity can also be achieved by mounting the High Power Lighting Module, available as an accessory. This module allows you to work with higher line speeds and greater working distances than the built-in internal illumination.

#### Note:

Follow the steps below to install and remove the module.

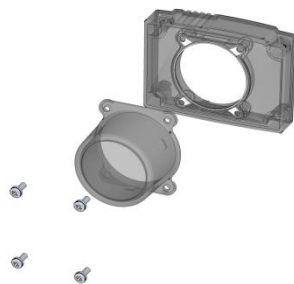


**WARNING:** Disconnect the DataMan from power before inserting/removing lighting module.

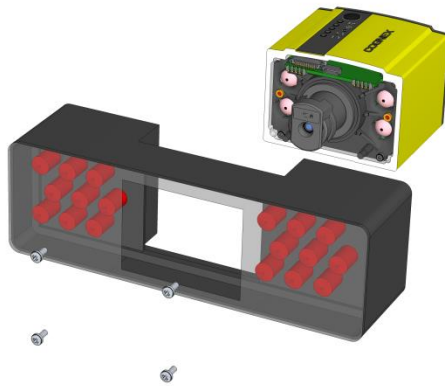
1. Remove and retain the four mounting screws from the corners of the front cover and remove the cover.



2. Separate the lens cover from the front cover by loosening and removing the four screws.

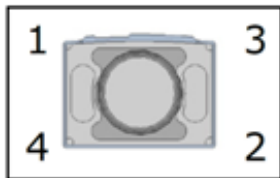


3. Attach the lighting module to the reader.

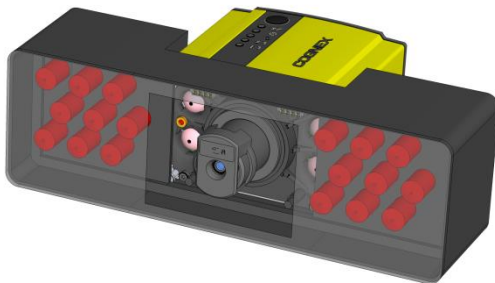


Observe the following precautions:

- Use the longer screws provided with the lighting module.
- Make sure that the liquid lens cable is not pinched or crimped during installation.
- Tighten the screws in the sequence shown and observe a torque limit of 9 N-cm(0.8 Lb-In).



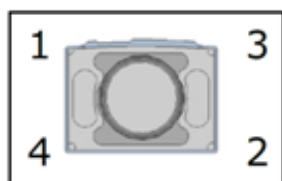
4. Attach the lens cover to the module.



Observe the following precautions:

- Use the screws removed in Step 2.

- Tighten the screws in the sequence shown and observe a torque limit of 9 N-cm (0.8 Lb-In).



### DataMan 50, 60, 300 and 360 Series Reader External Lighting Duration

This section provides information that you can use to determine how long external illumination is turned on for different types of configurations.

In all cases, as soon as the trigger is detected, external illumination is turned on. There is a 600 uSec pre-charge time before exposure starts; the lighting is on during this period. In the Setup Tool's Light and Imager Settings pane you can select Automatic Exposure (autoregulation) or Manual Exposure (non-autoregulation) according to your needs.

If you use a DataMan 302 reader with full Field of View (FoV), consider the following:

- In non-autoregulation cases, exposure occurs for an amount of time you specify. You can configure this time in the Setup Tool's Light and Imager Settings pane. When exposure ends, illumination is turned off. Altogether, the exposure duration equals the exposure time you set and the 600 uSec pre-charge time.
- If autoregulation is enabled, the duration can vary depending on the maximum allowed exposure value configured and the computed exposure time (which will be different for each acquisition). To calculate a "worst case" duration, set a maximum exposure value, and the longest the lights will be on is

600 uSec precharge time + max exposure time

Exposure occurs for the amount of time determined by autoregulation. When exposure ends, illumination is turned off. If you use a reduced FoV or a DataMan 50, 60, 300 or 360 reader, the image transfer time will scale proportionally to the FoV/Sensor size.

### DataMan 500 External Lighting Duration

**NOTE:** The information in this section applies to external illumination that is controlled using a DataMan 500 output line. This information does not apply to the High Power Illumination Module.

This section provides information that you can use to determine how long external illumination is turned on for different types of configurations.

In all cases, as soon as the trigger is detected, external illumination is turned on. There is a 280 uSec pre-charge time before either autoregulation turns on, or exposure starts; the lighting is on during this period. In the Setup Tool's Light and Imager Settings pane you can select Automatic Exposure (autoregulation) or Manual Exposure (non-autoregulation) according to your needs.

In non-autoregulation cases, exposure occurs for an amount of time you specify. You can configure this time in the Setup Tool's Light and Imager Settings pane. When exposure ends, illumination is turned off. Altogether, the exposure duration equals the exposure time you set plus the 280 uSec pre-charge time.

If autoregulation is enabled, the duration can vary depending on the number of autoregulation cycles (1 to 5) and the computed exposure time (which will be different for each cycle). To calculate a "worst case" duration, set a maximum exposure value, and the longest the lights will be on is

$$280 \text{ uSec precharge time} + 5 \times 1750 \text{ uSec analysis period} + 6 \times \text{max exposure time}$$

Exposure occurs for the amount of time determined by autoregulation. When exposure ends, illumination is turned off.

### DataMan 503 External Lighting Duration

This section provides information that you can use to determine how long external illumination is turned on for different types of configurations.

In all cases, as soon as the trigger is detected, external illumination is turned on. There is a user adjustable uSec pre-charge time before exposure starts; the lighting is on during this period. In the Setup Tool's Light and Imager Settings pane you can select Automatic Exposure (autoregulation) or Manual Exposure (non-autoregulation) according to your needs.

- In non-autoregulation cases, exposure occurs for an amount of time you specify. You can configure this time in the Setup Tool's Light and Imager Settings pane. When exposure ends, illumination is turned off. Altogether, the exposure duration equals the exposure time you set, the adjustable uSec pre-charge time, plus a maximum 17,15 ms image transfer time.
- If autoregulation is enabled, the duration can vary depending on the maximum allowed exposure value configured and the computed exposure time (which will be different for each acquisition). To calculate a "worst case" duration, set a maximum exposure value, and the longest the lights will be on is

$$\text{Max. allowed precharge time} + \text{max exposure time}$$

Exposure occurs for the amount of time determined by autoregulation. When exposure ends, illumination is turned off.

## Operations Guide

This section contains information about configuring and using your DataMan.

### Trigger Modes

The fixed mount DataMan readers provide the following trigger modes:

#### Self-Trigger

DataMan fixed mount readers support *self-triggered* operation. In self-trigger mode, the reader automatically detects and decodes codes in its field of view. The high-speed image acquisition and processing capabilities of the DataMan allow it to detect *and decode* codes.

Self-trigger mode has the following characteristics:

- Ease of setup. No external trigger is required.
- Flexible timing. Parts can arrive at irregular intervals.
- Maximum throughput.

#### Manual

Manual triggering starts acquiring and attempting to decode images when you send an external trigger. The reader continues to acquire and attempt to decode images until you stop the external triggering. 2-D DPM codes are automatically learned.

Manual trigger mode is typically used during debugging or system design.

#### Burst

Burst triggering acquires a pre-defined number of images when an external trigger is signaled, then attempts to decode the acquired images. You can control the interval between the acquired images. The number of images acquired per burst depends on the size of the region of interest that you specify.

#### Continuous (Default)

Continuous triggering begins acquiring images based on a single external trigger and continues to acquire and decode images at a user-specified interval until a symbol is found, or until multiple images containing as many codes as specified in multicode mode are located. The external trigger can be configured as a latch (acquisition continues while the line is held high) or acquisition can be started on the first pulse, stopped on the second pulse. If you scan items on a conveyor, make sure each item reaches trigger OFF before the next item generates trigger ON.

#### Single

Single triggering acquires a single image and attempts to decode any symbol it contains, or more than one symbol in cases where multicode is enabled. The reader relies on an external trigger source.

### Presentation

Presentation triggering repeatedly scans for a symbol and decodes it whenever one is detected. The reader relies on an internal timing mechanism to acquire images.

Presentation mode is similar to manual trigger mode, without using the trigger as a signal to start acquisition.

### Trigger Modes for 1-D Codes

Most applications that decode 1-D codes should be configured to use Self, Single, Burst or Continuous triggering.

### Package Detection Support

You can connect your package detection sensor to one of the digital inputs of your DataMan reader. When the reader receives a signal that a package is detected, images that the reader collected are not discarded at the end of the trigger. This way you can make sure that there was a package there, only the code was not readable. Looking at the No Read images will help you find out why there was no decode results.

Package detection is only supported with *Continuous* trigger mode. Continuous (external) trigger mode means that the trigger stops if the event generating the trigger stopped, or if there is a good read. Until the trigger stops, the reader collects images. These are No Read images (otherwise the trigger would stop).

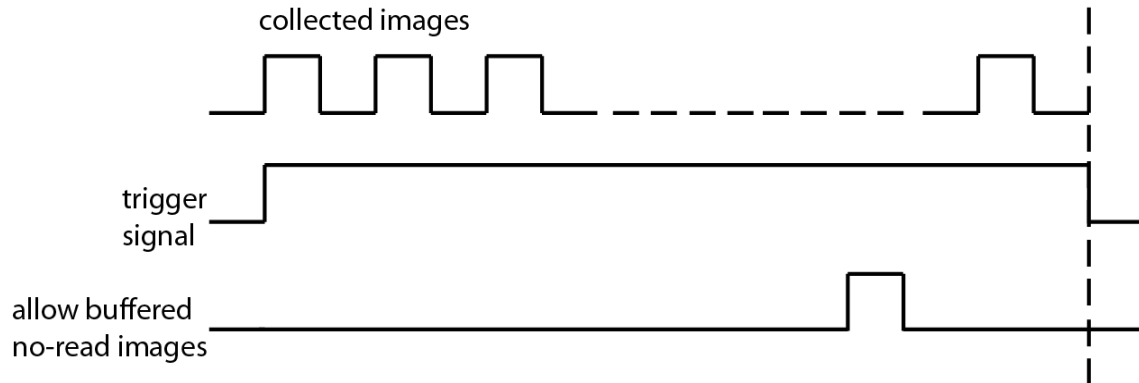
You can use this feature in a stand-alone configuration, or in a master/slave configuration. In the latter case, connect the sensor to the Master device. The Master will initiate a request to save images and collect the images from the slaves.

To make sure that the No Read images are collected, perform the following:

1. Connect your package detection device to one of the Inputs of your reader.
1. On the Setup Tool's System Settings pane's Inputs tab, check **Allow Buffered No-Read Images** on the input you connected your reader to.
2. On the Setup Tool's Image Record and Playback pane, change What Images to Buffer to **All**, or **No Read**.
  - In case of All, good reads are also saved together with No Reads.
  - In case of NoRead the image is buffered if the reader fails to read.

The following diagram shows the working mechanism:





The signal from the sensor tells the reader not to discard the collected images at the end of the trigger event.

## Test Mode

Test mode lets you configure and test a reader that is connected to a production line without needing to slow down or stop your line. To enter Test mode,

- Press the button (to which you previously assigned this function) on the device for 3 seconds
- Send a DataMan Control Command (DMCC)
- Click the Test Mode button in the Setup Tool

While in test mode, the reader, by default, ignores all external trigger sources and disables all input and output lines. Test mode provides two ways for you to test your reader configuration:

- Check **Automatic Triggering**, and the reader will simulate external triggers at the interval that you specify. This allows you to examine the result of each trigger and images with the configuration used in production but at a slower rate. Because inputs and outputs are disabled, the reader will not interfere with the normal operation of your line.
- If you click **Accept Trigger Batch**, the reader will accept and process a limited number of external triggers (you can specify the number) at production speed. You can then examine these results and corresponding images to verify how the reader is processing triggers in production.

If needed, you can enable both inputs and outputs during test mode, but you may encounter I/O process latencies.

## Code Training

You can train the DataMan fixed mount readers for single or multiple codes. Training can improve performance, since the reader does not have to determine code parameters as it reads the codes.

Code training is only supported for the following trigger modes:

- Burst
- Continuous
- Self (internal trigger)
- Single (external trigger)

You can train codes in the following ways:

- With an image showing the code or codes to train present in the Setup Tool **Results Display** pane, click the **Train Code** button.
- Use the **Button** tab in the **System Settings** pane to configure the button to train codes, then present the codes to the reader and press and hold the button for 3 seconds.
- Use the **Inputs** tab in the **System Settings** pane to configure a discrete input to perform code training.

### Automatic Code Training for DPM Symbols

Manual and presentation modes automatically train 2-D symbols. This improves robustness on DPM symbologies when reading consecutive parts of the same type. Sequential dissimilar parts will still decode.

## Image Buffering and Image Recording

You can configure the DataMan fixed mount readers to store selected images in memory on the reader. You can select the following options for which images to store:

- No images.
- No-read images. (Images where the reader was triggered but either no code was present or the code could not be decoded.)
- Images where a code was successfully decoded.
- All images.

If you select all images or no-read images, you can specify a sampling rate to control the number of images that are buffered.

### Retrieving Buffered Images

You can use the DataMan Setup Tool to view and download images from your DataMan device, or you can configure the DataMan to automatically transfer the buffered images to an FTP server that you specify.

## DataMan Master/Slave Configuration

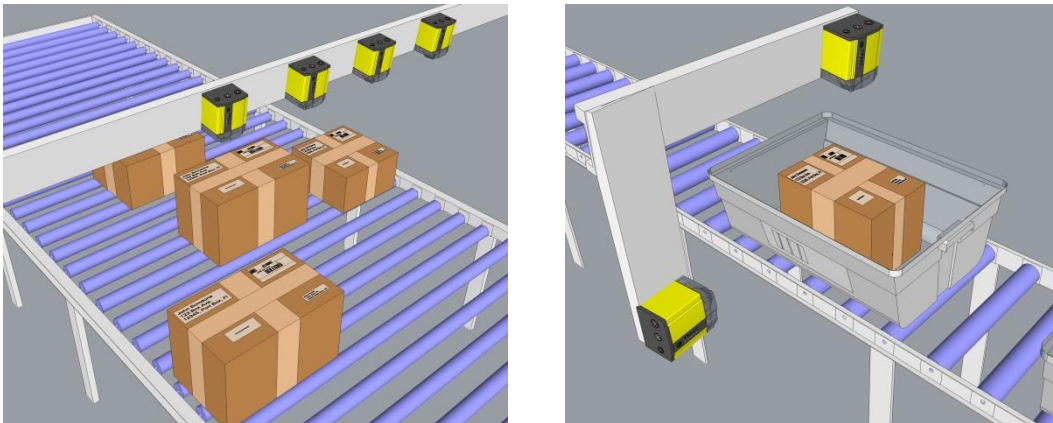
### Overview

If you have multiple DataMan fixed mount readers connected to the same network, you can configure at least two or more readers to use *group triggering*. Readers configured to use group triggering all acquire an image simultaneously, and then combine their individual read results to form a composite result.

There are two important aspects to group triggering:

- Readers configured for group triggering *consolidate* read results from among all readers in the group and transmit them from the master reader only. This simplifies the task of collecting and processing read results from multiple readers.
- Readers configured for group triggering can be triggered simultaneously based on a single input trigger signal received by the master reader.

Master/Slave configurations are typically used to expand the field of view for broad conveyor applications and to read codes from multiple surfaces of packages or objects:



### Master

Within a group, one reader is defined as the *master*. When the master reader is triggered (regardless of what type of trigger it uses), all the readers in the group are also triggered. For self-trigger mode, you must designate the master reader explicitly. For externally triggered modes (single, burst, and continuous), whichever reader receives the trigger is designated the master for that acquisition. (In most cases, only a single reader in the group will be connected to the external trigger.)

To account for network latency, you specify a trigger delay for the master reader in the group. When the master is triggered, it immediately sends triggers to the other group members, but delays its own acquisition for the specified delay, allowing the trigger signal to reach the other readers. You can also configure a separate trigger timeout, which will cause the master reader

to wait for a specified period of time for slave readers to send data before collecting the results and transmitting them.

After a read attempt, only the master reader transmits a result. It combines all of the available results from the other readers in the group in the same way that multicode results are combined.

### Slaves

In many applications, the master/slave configuration is set to trigger the slave readers whenever the master reader is triggered. If the slave readers are configured for Self triggering, then they will also trigger whenever they detect a code. In this case, the master reader will generate and transmit a read result whenever any reader detects a code. This result aggregation greatly simplifies multiple reader operation.

### Data Formatting

When the reader is triggered, the result string will be formatted as you specified, before it is transmitted to the master reader for aggregation. Note, however, that you have to check Standard Formatting Enabled for the master and supply the formatting tokens you want to use for the slaves. Any data formatting that you specify for the master reader will be applied to the formatted result strings produced by the slave readers. The data formatting pane includes a token that allows you to insert the name of the reader generating the result string; you can use this to identify which reader produced which result.

### Limitations

- No image buffering and recording is supported for any reader that is part of a group.
- Presentation mode triggering is not supported.
- Master-Slave triggering only works correctly if Master and Slave use specific, allowed combinations of trigger modes. They are the following:
  - Self/Self
  - Single/Burst, Single/Single, Burst/Burst, Burst/Single
  - Manual/Continuous, Manual/Manual, Continuous/Continuous, Continuous/Manual

### Synchronized Acquisition

Synchronized Acquisition is only available for the DataMan 503. In Single, Burst, Continuous, and Self trigger modes, it is possible to synchronize image acquisition on multiple devices using the synchronization interface.

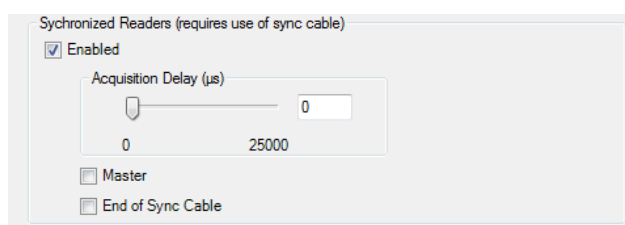
Synchronization allows using one shared strobe illumination to expose all sensors simultaneously. You can synchronize up to 16 readers, with optionally triggering them in a defined sequence to avoid that opposing readers blind each other.

Note that this and other imager settings will not get synchronized by this mechanism - for example, you must configure exposure and gain on each reader individually.

This feature only synchronizes the actual image acquisition, triggering happens through the existing master-slave mechanism.

Enable **Synchronized Exposure** on the Setup Tool's **Master/Slave** pane. Set the **Acquisition Delay** ( $\mu\text{s}$ ) (relative to the received signal through the synchronization interface) on each reader individually to optionally define an exposure sequence in case the illumination of some readers might affect other readers.

You must also set which two readers on the ends of the synchronization interface bus are bus terminators by checking the End of Sync Cable checkbox for the currently connected devices at the end of a sync cable.



### **Connecting DataMan 503 Devices Through the Synchronized Acquisition Cable**

Plug the synchronized acquisition cable into the dedicated connector on the DataMan 503.



Female  
connector for  
synchronized  
acquisition

If you are connecting more than two DataMan 503 devices, you need a Y connector with female ends to be able to use the synchronized acquisition cables.

### **Synchronized Acquisition based on Precision Time Protocol (PTP)**

Synchronized acquisition based on PTP is only available for DataMan 36x readers. In Single, Burst, Continuous, and Self trigger modes, it is possible to synchronize image acquisition on multiple devices using the synchronization interface.

Synchronization allows using one shared strobe illumination to expose all sensors simultaneously. You can synchronize up to 16 readers, with optionally triggering them in a defined sequence to avoid that opposing readers blind each other.

Note that this and other imager settings will not get synchronized by this mechanism - for example, you must configure exposure and gain on each reader individually.

This feature only synchronizes the actual image acquisition, triggering happens through the existing master-slave mechanism.

Enable **PTP** on the Setup Tool's **Master/Slave** pane under Synchronized Readers (IE1588). Set the Slave Only accordingly on each reader individually to define Master/Slave reader relations.

## Using C/CS-Mount Lenses

### Aperture Setting

Because of the extreme sensitivity of the DataMan image sensor, for most applications a small aperture (F8 or less) provides sufficient light for full-rate image processing while also maximizing depth of field.

### Selecting Optimum Focus

You can enter live video, but for best focus optimization, place the reader in automatic trigger mode and adjust the focus until the peak read rate is obtained.

## Optimizing Performance

### Read Interval and Timeout Configuration

Careful configuration of the read interval (self and continuous triggering) or timeout value (burst mode) can improve read rates and throughput.

- If your application uses clearly printed symbols, you can improve performance by reducing the interval or timeout value. This is because DataMan acquires images at such a high rate that a shorter timeout or interval allows the reader multiple chances to decode the symbol.
- If your application experiences poorly printed or degraded symbols, increasing the interval or timeout value can improve performance by allowing the DataMan to spend more time decoding difficult images.

In all cases, make sure to specify an interval that allows the reader to capture at least one image of the symbol.

### Optimizing Burst Trigger Parameters

Since a Burst trigger is ideal for moving applications, it is necessary to determine the correct burst size and interval in order to capture the desired length of the part as it moves under the camera. Once the interval time is determined, you can adjust the size of the burst depending on the length of the part. The variables necessary for this calculation are:

1. Line speed in mm per second
2. Code size w/quiet zone in mm
3. FOV = Field of View (x or y) in mm

You can then use the following equation to determine the interval time:

$$\text{Interval Time} = 1000 * ((\text{FOV} - 2(\text{Code Size})) / \text{Line Speed})$$

Once the interval time is determined, the size of the burst can be adjusted depending on the length of the code to capture. The max object length in mm is:

$$\text{Burst Size} * (\text{FOV} - (2 * \text{Code Size}))$$

The (2 \* Code Size) variable allows for overlap of the frames taken. This takes into consideration the condition where the code is slightly out of the field of view in one frame (acquisition). The (2 \* Code Size) will overlap the field of view between successive frames and allow the code to be viewed in the field of view of the next frame.

### Reduce DataMan Processing Requirements

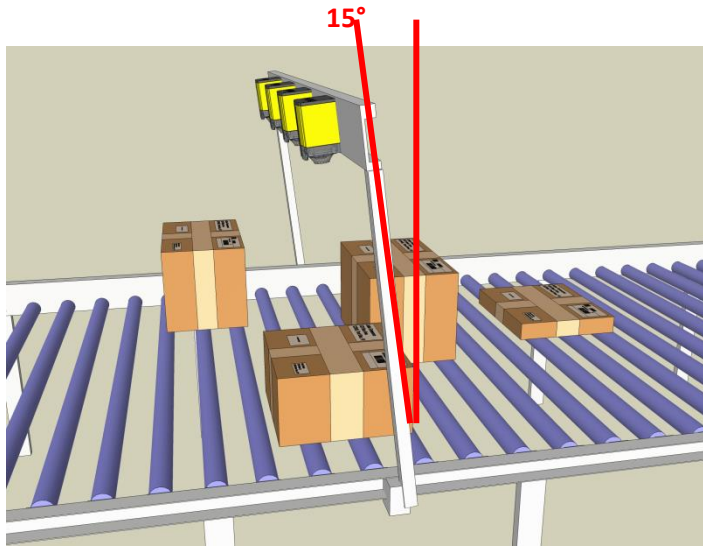
The more information that you can provide to DataMan about your application, the less work – and processing time – will be required to decode symbols.

- Only enable the symbologies that your application uses. Disabling unused symbologies reduces processing time.
- Train codes.
- Only enable extended mode decoding if your application requires it.

### Avoiding Reflections and Glare

If the DataMan is mounted perpendicular to the surface containing the code to be read, reflections from the built-in illumination system can cause reflections and glare that may reduce decoding performance.

You can avoid this problem by mounting the reader at a 15° angle from vertical.



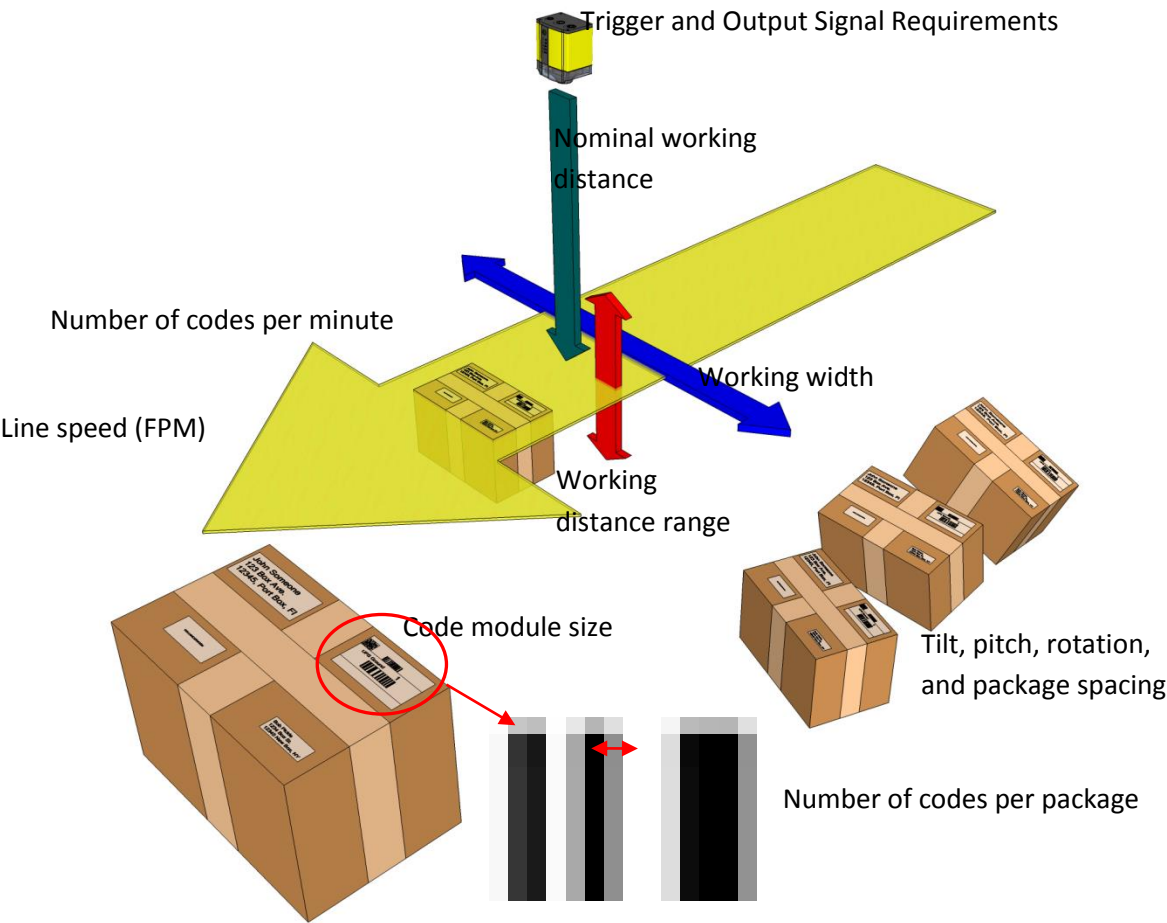


Application Guide

This section provides specific recommendations tailored to specific types of applications. Except for the sections about Multi-Reader Configurations and Variable Size Box Conveyor, all sections apply to all the DataMan fixed mount readers.

Understanding Your Application Envelope

A wide variety of factors affects the performance and capabilities of the DataMan in a given application. You can think of this collection of factors as your application’s *envelope*:



The following table describes the different parameters that define a DataMan application envelope.

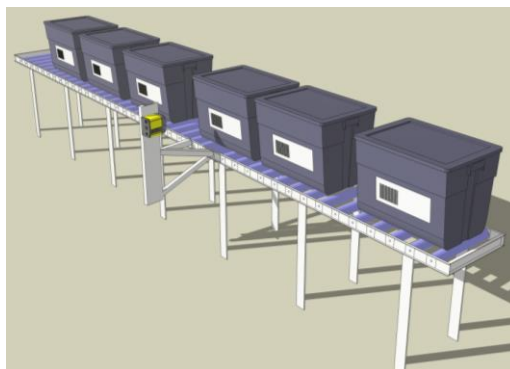
Parameter	Description
Linespeed	The linear speed of the part surface containing the code to decode.
Nominal working distance	How far the code is from the front of the DataMan.

Working distance range	The range of distances, with respect to the nominal working distance, at which codes may be present.
Working width	The width of the area in which codes may appear.
Tilt, pitch, rotation, and package spacing	<p>The degree to which a code may be rotated, tilted, or pitched with respect to a plane perpendicular to the DataMan optical axis.</p> <p>Package spacing means a distance in time. If you use a conveyor that moves very fast, you need more space between the boxes. If it moves very slow, you need less space. In general, the minimum time distance between boxes must be greater than the distance between trigger on and trigger off.</p> <p>Tilt and pitch should be limited to 15-20 degrees in most cases, while rotation may be absent or may occur up to 360 degrees (omnidirectional reading).</p> <p>As described in the section <a href="#">Reduce DataMan Processing Requirements</a>, the more information that you can provide to DataMan about your application, the less work – and processing time – will be required to decode symbols.</p> <ul style="list-style-type: none"> <li>• Only enable the symbologies that your application uses. Disabling unused symbologies reduces processing time.</li> <li>• Train codes.</li> <li>• Only enable extended mode decoding if your application requires it.</li> </ul> <p><a href="#">Avoiding Reflections and Glare</a>, you should mount the reader so that the surface containing the code to be read is not perpendicular to the reader. If your application includes tilt or pitch, make sure that the reader is mounted so that even at maximum tilt or pitch, the reader still is angled with respect to the surface being read.</p>
Code module size	The size of a code element (typically the smallest bar) in Mils.
Codes per minute	The maximum number codes that pass in front of the reader location per minute.
Codes per image	How many codes are visible at the same time.
Trigger and output signal requirements	Whether an external trigger signal is available or a discrete output signal is required.

The following sections describe typical application envelopes for typical DataMan code reading applications, along with suggested configuration values.

## Tote Scanning

Tote scanning applications typically involve reading a single barcode that is relatively well-fixed.

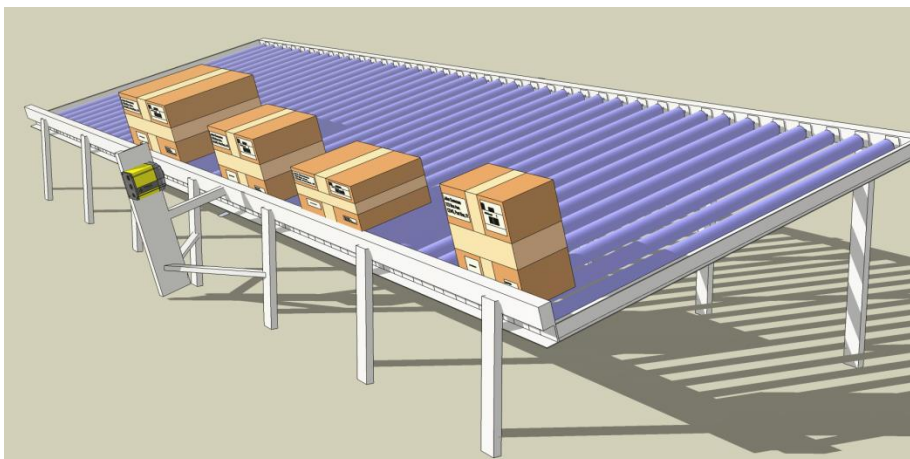


The following table lists typical values for this application:

Parameter	Typical Values
Line speed	50 FPM
Nominal working distance	6-12"
Working distance range	+/- 5"
Working width	6"
Tilt, pitch, and rotation	+/- 2°
Code module size	20 Mil
Codes per minute	20-30
Trigger and output signals	Optional

## Side Scanning

Side scanning applications typically involve reading a single barcode at a consistent distance but a variable offset.



The following table lists typical values for this application:

Parameter	Typical Values
Line speed	200-300 FPM
Nominal working distance	6-12"
Working distance range	+/- 1"
Working width	12-24"
Tilt, pitch, and rotation	+/- 2°
Code module size	20 Mil
Codes per minute	100-200
Trigger and output signals	Optional

## Side Scanning (Large Field)

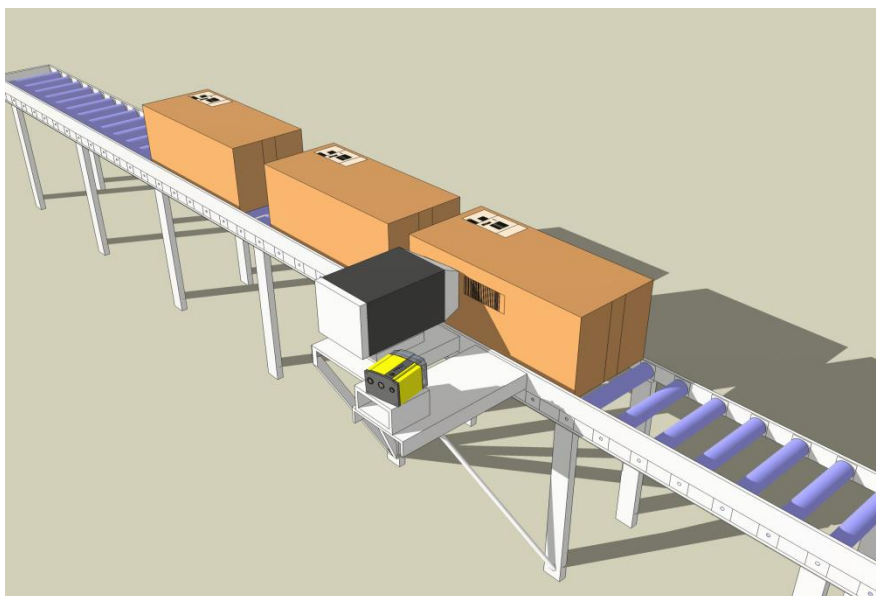
Side scanning applications typically involve reading a single barcode at a consistent distance but a variable offset.

The following table lists typical values for this application:

Parameter	Typical Values
Line speed	200-300 FPM
Nominal working distance	6-12"
Working distance range	+/- 1"
Working width	12-24"
Tilt, pitch, and rotation	+/- 2°
Code module size	20 Mil
Codes per minute	100-200
Trigger and output signals	Optional

## Print Verification (Carton Coding and Print & Apply)

This configuration reads and verifies codes from packages immediately after they are applied. The codes may be printed directly on the object (carton coding) or on a label (print & apply).



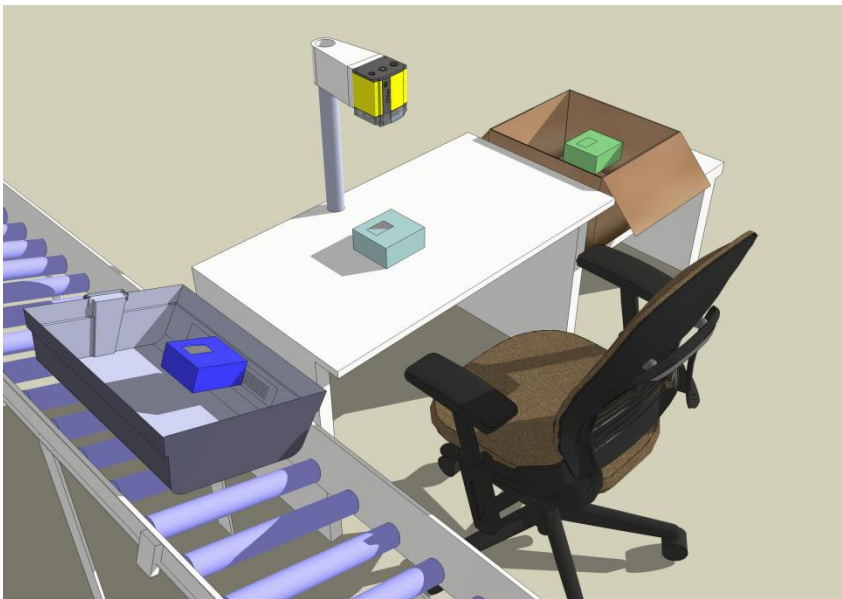
The following table lists the typical values for this application:

Parameter	Typical Values
Line speed	200-300 FPM
Nominal working distance	5-10"
Working distance range	+/- 0.5"
Working width	2-4"

Tilt, pitch, and rotation	+/- 2° (pitch ,tilt, and rotation)
Code module size	20 Mil
Codes per minute	Up to 200
Trigger and output signals	Likely

Manual Presentation Scanning

This configuration reads codes from objects presented manually.

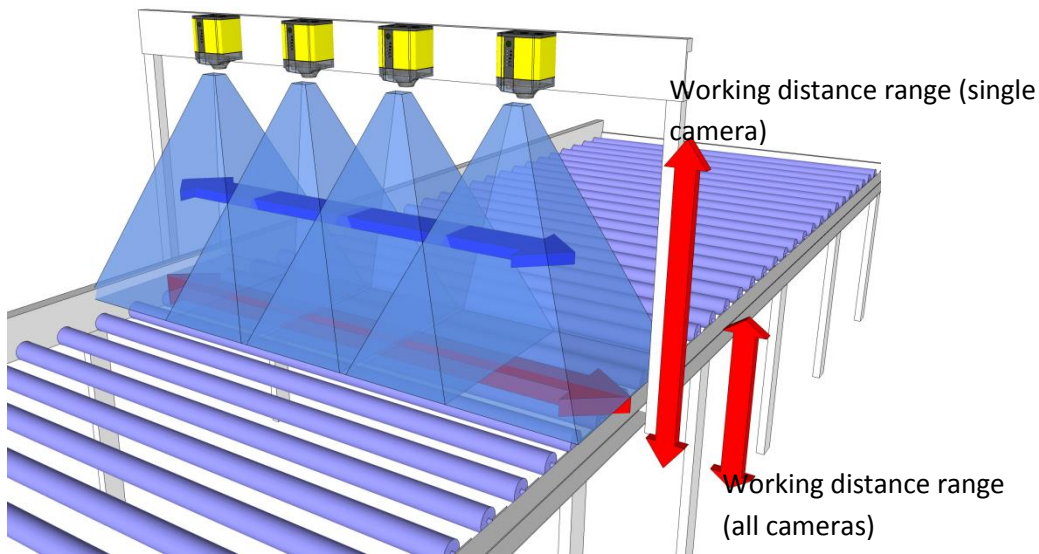


The following table lists the typical values for this application:

Parameter	Typical Values
Line speed	N/A
Nominal working distance	10-20"
Working distance range	+/- 10-
Working width	10-20
Tilt, pitch, and rotation	+/- 20° (pitch and tilt) 360° (rotation)
Code module size	20 Mil
Codes per minute	10-20
Trigger and output signals	Possible

DataMan 500: Working Distance for Multi-Reader Configurations

If you configure multiple DataMan 500 readers to read across a wide area conveyor, the effective range of working distances for the system as a whole may be less than an individual reader’s working distance, as shown in the following figure.



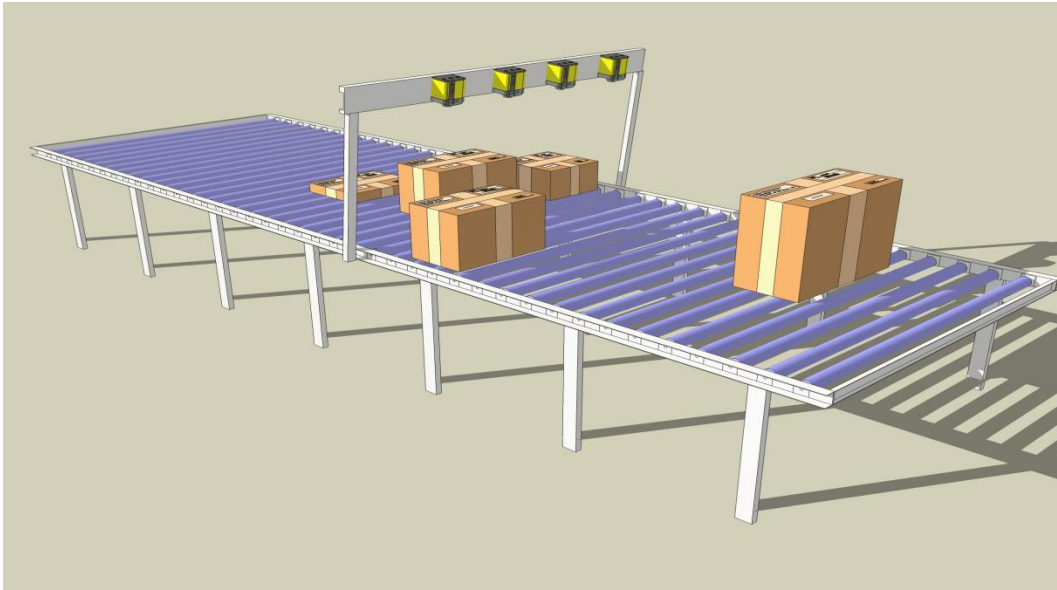
In general, you should observe the following guideline when configuring multiple readers:

- At the minimum working distance, the overlap between adjacent cameras' fields of view should be at least 1.5 times the width of the symbol being decoded.

**NOTE** that for large working distance ranges there may be substantial overlap between cameras at the maximum working distance. If the readers are configured for master/slave reading, duplicate reads are automatically consolidated.

### DataMan 500: Variable-Size Box Conveyor

This configuration reads codes from boxes of varying sizes located on a relatively wide conveyor. You can connect a package height sensor to your DataMan 500 reader to automatically set the focus. For more information, see [Package Height Sensor](#).



The following table lists the typical values for this application:

Parameter	Typical Values
Line speed	200-300 FPM
Nominal working distance	10-20"
Working distance range	+/- 10-20" Typically tallest box height minus smallest box height.
Working width	10-60+ Widths greater than 20" may require multiple readers.
Tilt, pitch, and rotation	+/- 5° (pitch and tilt) 360° (rotation)
Code module size	20 Mil
Codes per minute	Up to 1200
Trigger and output signals	Unlikely

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