

# ✓ Checker 101



## Quick Reference

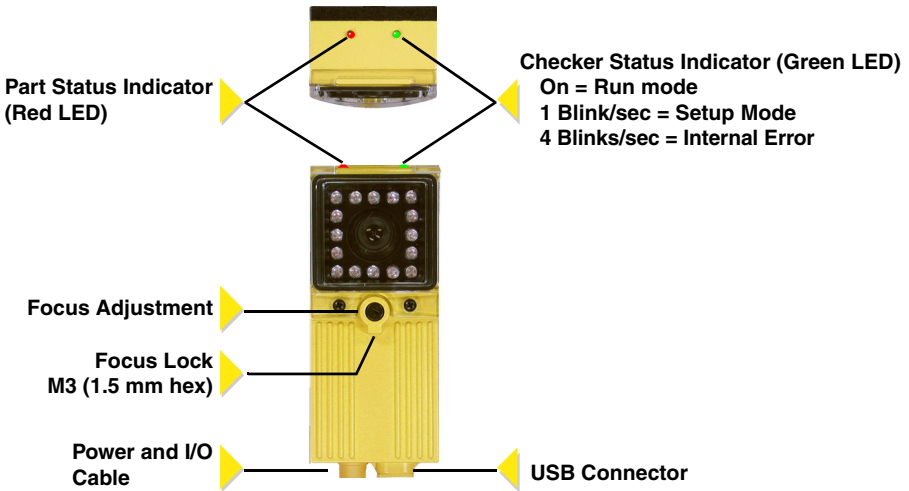
# About Checker™

- *Checker* is the sensor.
- *CheckMate™* is the software that runs on your PC. You use CheckMate to set up Checker.

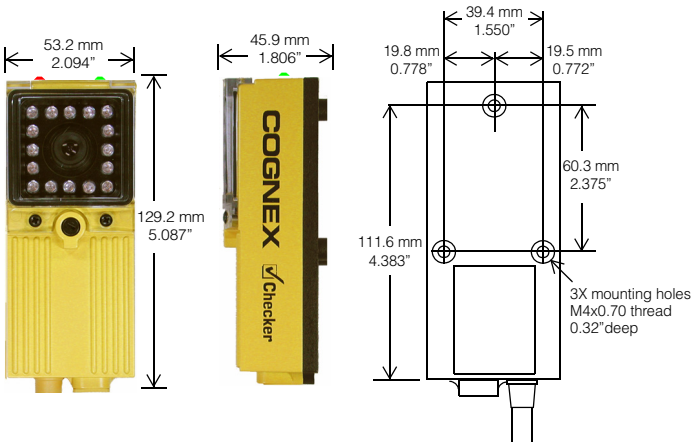
## ▶ Minimum PC Requirements

- Microsoft® Windows® 2000 or Windows XP
- 400MHz Pentium® III CPU
- 128 MB RAM
- USB version 1.1
- 1024 by 768 Display

## ▶ Physical Description



## ▶ Dimensions and Mounting



# Getting Started

## 1 Install the CheckMate Software

- 1 Insert the CheckMate CD-ROM in your PC's CD-ROM drive. The CheckMate install program will start automatically. You must have Administrator rights on your PC to install CheckMate.
- 2 Follow the on-screen prompts to install CheckMate.

## 2 Install the Checker Sensor

- 1 Mount Checker using 3 M4x0.70 screws. The mounting should provide a suitable path to earth ground.



Checker comes with three sets of mounting screws of different lengths; choose the correct length for your mounting.

- 2 Connect your 24 VDC power supply, as shown in the section *Connecting Checker*.
- 3 Connect Checker to your PC using supplied USB cable.
- 4 Connect input and output devices, as shown in the section *Connecting Checker*.

### 3 Start the CheckMate Software

Start CheckMate by double-clicking on the CheckMate icon. (The first time that you start CheckMate, it may take a moment before your PC recognizes Checker.)

#### Questions and Answers

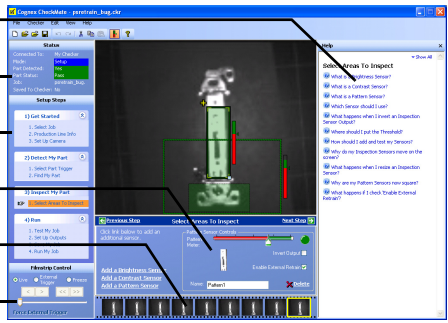
#### Checker Status

#### Job Setup Steps

#### Controls

#### Filmstrip

#### Filmstrip Control



CheckMate always displays a list of questions and answers related to the current state of CheckMate.



For detailed information on how Checker works and how to use CheckMate, click on the button to open the User's Manual.

## Setting Up Your Job

A Checker *job* contains all of the information that Checker needs to check your part. You set up a Checker job in four simple steps using CheckMate.

### 1. Get Started

- Create a new job.
- Enter your line speed and direction.
- Place a ruler at the same distance from Checker as your part will be, and enter the size of Checker's field of view.

If you specify a horizontal machine direction, this size is the distance between the left and right edges of what Checker can see; if you specify a vertical machine direction, the size is the distance between the top and bottom of what Checker can see.

- Adjust the image brightness and focus Checker on your part.



Checker is shipped with its focus unlocked. If you have tightened the focus lock, make sure to loosen it before adjusting the focus.

### 2 Detect My Part

Before Checker inspects your part, it must detect that your part is present. Checker can detect your part in two ways:

- 1 Checker can detect parts using a *Part Finding Sensor*. Simply create a Part Finding Sensor and place it over a part feature that Checker can always see.
- 2 You can use an external photoelectric sensor to tell Checker that the part is present. Checker uses the rising edge of the input signal.

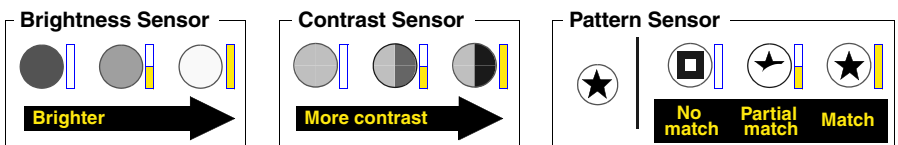


If you use both an external photoelectric sensor and a Part Finding Sensor, both the photoelectric sensor and the Part Finding Sensor must indicate that the part is present before Checker will inspect the part.

### 3 Inspect My Part

Create an *Inspection Sensor* for each part feature that you want to check. The result of an Inspection Sensor can be *pass* or *fail*. The results of all Inspection Sensors must be *pass* for Checker to pass your part. If the result of any Inspection Sensor is *fail*, Checker will fail your part.

Checker provides three types of Inspection Sensors: *Brightness Sensors* detect bright features; *Contrast Sensors* detect high-contrast features; and *Pattern Sensors* detect matching patterns.



To create an Inspection Sensor, click on the feature to check, then adjust the Sensor's threshold so that good parts are above the threshold and bad parts are below it. For Brightness and Contrast sensors, you can adjust the Sensor's range and sensitivity to better distinguish between good and bad parts.



You can invert the result of an Inspection Sensor if you need to detect dark features instead of bright features, low-contrast features instead of high-contrast features, or mismatched patterns instead of matching patterns.

## 4 Set up Outputs, Test, and Run

Checker has two user-configurable output lines: **Output 0** and **Output 1**. You can configure Checker to send a signal on either line when a part is detected, passed, or failed, or you can disable the output line.

Test your job at production speed to make sure that good parts pass and bad parts fail. After testing, adjust the timing of the job's output signals as required. Before disconnecting the PC from Checker, make sure to save your job to Checker and to the PC.

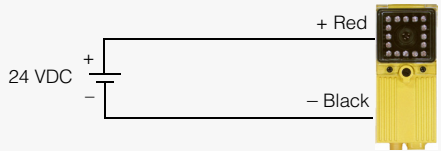
To put Checker to work, enter Run mode, disconnect the USB cable, and replace the rubber plug over the USB connector.

# Connecting Checker

## Power

**Voltage:** +24 VDC (22-26 VDC)

**Current:** 150 mA max

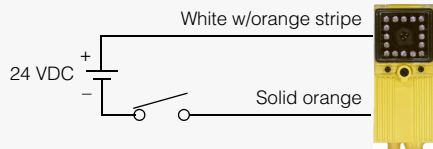


## Part Detect Signal Input

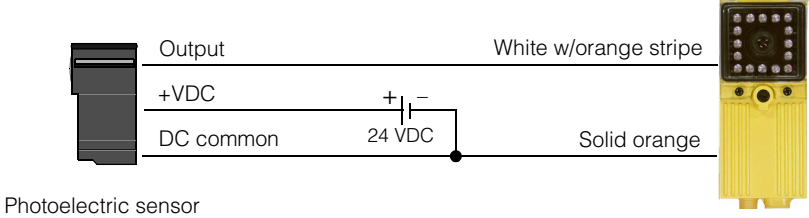
**Trigger ON:** +24 VDC (5 mA)

**Trigger OFF:** < 2 VDC ( $\leq 1.5$  mA)

**Protection:** Opto-isolated,  
polarity-independent



### Example: Connecting a Photoelectric sensor as an External Trigger



## Output 0 and Output 1

**Output 0:** Blue & White w/Blue Stripe

**Output 1:** Gray & White w/Gray Stripe

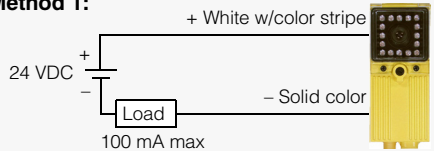
**Output:** Solid-state switch rated at  
100 mA and 24 VDC max

**Max voltage drop:** 3.5 VDC @ 100 mA  
resistive load

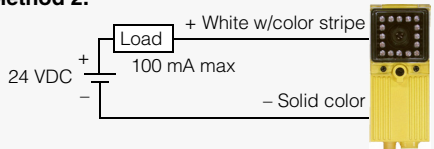
**Max off leakage current:** 200  $\mu$ A

**Protection:** Opto-isolated. Protected  
from short circuit, overcurrent,  
and reverse polarity.

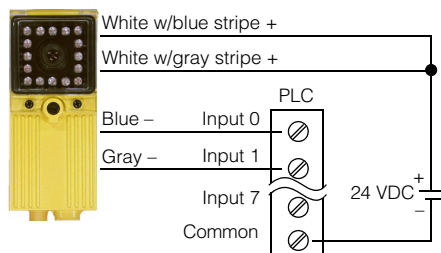
### Method 1:



### Method 2:

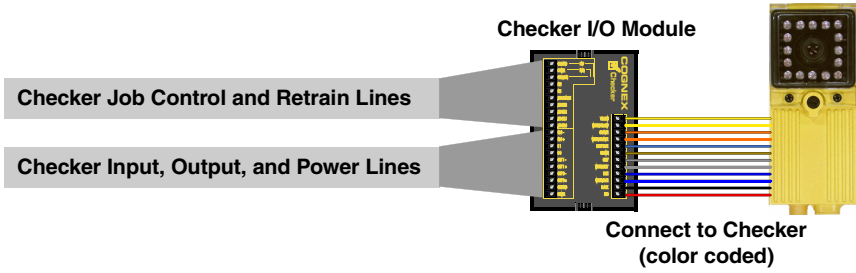


### Example: Connecting to a PLC



# Checker I/O Module

The optional *Checker I/O Module* (CKR-IOBOX-101) lets you switch between saved Checker jobs and retrain Checker sensors while Checker is running. The Checker I/O Module also provides a terminal block that lets you connect other devices to the standard Checker I/O lines. The following figure provides an overview of the Checker I/O Module:



## Working Distance and Field of View

The distance from Checker's lens cover to your part is the *working distance*; the *field of view* is what Checker can see at that distance. Checker must be able to see enough of your part, and with enough detail, to be able to check it. If the standard lens does not let Checker do this, an inexpensive set of additional lenses is available from Cognex. The following tables show the range of working distances and fields of view for the available lenses:

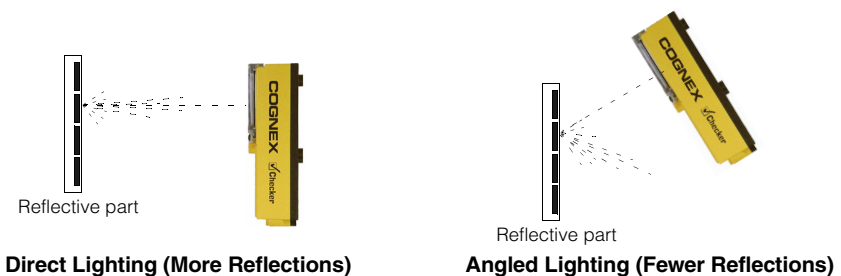
Field of View (Width x Height)		Field of View (inches)			
		16 mm lens	8 mm lens	5.8 mm lens (Standard)	3.6 mm lens
Working Distance (inches)	3	.46 x .35	.94 x .73	1.3 x 1.0	2.3 x 1.8
	6	.91 x .71	1.9 x 1.5	2.7 x 2.1	4.6 x 3.6
	9	1.4 x 1.1	2.8 x 2.2	4.0 x 3.1	6.9 x 5.4
	12	1.8 x 1.4	3.8 x 2.9	5.3 x 4.1	9.2 x 7.1
	18	2.7 x 2.1	5.6 x 4.4	8.0 x 6.2	13.9 x 10.7
	24	3.7 x 2.8	7.5 x 5.8	10.7 x 8.2	18.5 x 14.3
	30	4.6 x 3.5	9.4 x 7.3	13.3 x 10.3	23.1 x 17.9

Field of View (Width x Height)		Field of View (mm)			
		16 mm lens	8 mm lens	5.8 mm lens (Standard)	3.6 mm lens
Working Distance (mm)	75	11 x 9	24 x 18	33 x 26	58 x 45
	150	23 x 18	47 x 36	67 x 51	115 x 89
	250	38 x 29	78 x 61	111 x 86	192 x 149
	400	61 x 47	125 x 97	178 x 137	308 x 238
	600	91 x 71	188 x 146	266 x 206	462 x 357
	800	122 x 94	251 x 194	355 x 275	616 x 476
	1000	152 x 118	314 x 243	444 x 343	770 x 595

## Optimizing Lighting

Checker's built-in lighting is optimized for working distances from 3" to 15" (75 mm to 375 mm). Depending on how reflective your part is, you may need to use an external light for longer working distances.

You can mount Checker at an angle to reduce highlights and reflections from reflective parts, as shown below:



## Precautions

Observe these precautions when installing Checker to reduce the risk of injury or equipment damage:

- Do not attempt to adjust Checker's focus when moving parts and/or equipment are present.
- Use a listed power supply with an output rated 24VDC, at least 150mA, and marked Class 2, Limited Power Source (LPS). Any other voltage creates a risk of fire or shock and can damage Checker.
- Do not install Checker in locations that expose it to environmental hazards such as excessive heat, humidity, impact, vibration, corrosive substances, flammable substances, or static electricity.
- To reduce the risk of damage or malfunction, route all cables and wires away from high-voltage power sources.
- Do not attempt to modify Checker. Modifications will void the warranty.

## Getting Help

On-line support is available at [support.cognex.com](http://support.cognex.com), or you may contact Cognex directly:

Region	Telephone	Direct E-Mail
North America	+1-508-650-6300	support.us@cognex.com
Japan	+81-3-5977-5400	support.jp@cognex.com
Europe	+33 1 47771550	support.eu@cognex.com

## Additional Information

Cable (power and I/O)	24AWG, 12', pigtail
24V power fuse	500 milliamp, 60V rated resettable fuse that will recover after an overload is removed. Protects against over voltage and reverse wiring.
Output fuse	200 milliamp, 30v rated resettable fuse that will recover after an overload is removed. Protects each output from over current.
Weight	8.47 oz (240 g)
Operating temperature	32° to 122°F (0° to 50°C)
Storage temperature	-22° to 176°F (-30° to 80°C)
Operating humidity	0% - 90% non-condensing
Protection	IP67
Maximum altitude	2000 meters
Shock	80Gs for 5ms on each axis (per IEC 68-2-2)
Vibration	10Gs (10-500Hz) at 100 M/sec <sup>2</sup> / 15mm for 2 hours in each axis (per IEC 68-2-6)



**FCC**



**NOTE:** This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

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