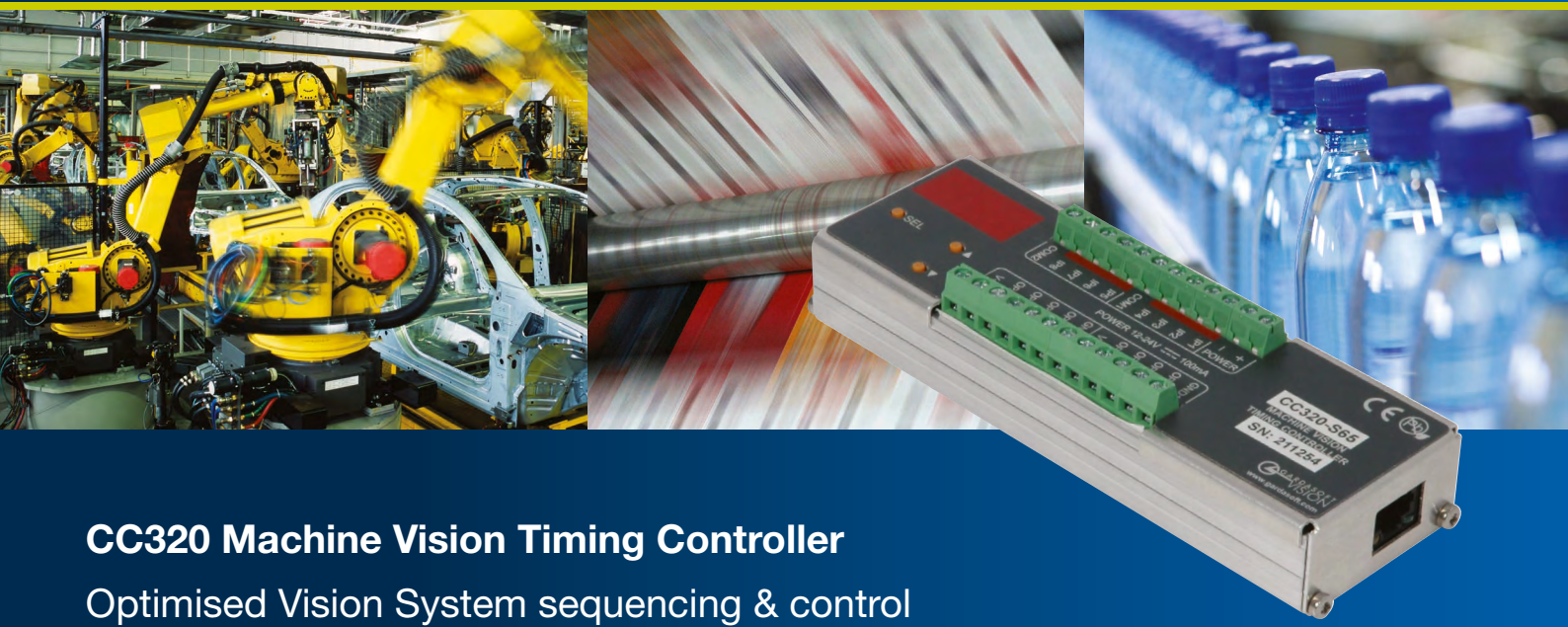
GARDASOFT
Industrial LED technology



CC320 Machine Vision Timing Controller

Optimised Vision System sequencing & control

When combining lighting, cameras, proximity sensors and encoders to generate an automated solution, the CC320 Trigger Timing Controller is the single component for fast affordable integration.

- Complete working solution
- Save days of project design time
- Allows cameras with single strobe output to trigger multiple lights in a sequence
- Encoder compatible
- Integrates with GigE™ Systems

Sensor, Camera and Reject Gate timing

Now there is an easy and complete working solution for accurate timing of component sensing, camera triggering and reject gates. Timing can be based on precise delays or on exact conveyor belt travel using an encoder. This controller saves days of engineering effort, solving the following time consuming problems often faced with machine vision systems:

- Delay from product sensor to camera trigger
- Delay from pass/fail result to reject gate
- Synchronising multiple cameras to trigger at different times
- Resynchronise the product result to the original trigger time
- Tracking product position on a belt that stops, reverses or has varying speed
- Handle multiple products with overlapping results
- Handling fast encoder pulses
- Producing timing with microsecond accuracy

Camera trigger timing

A sensor detects that a product is present. After a delay, based on time or belt distance, a camera is triggered. Multiple cameras can be triggered at different times. The width of the trigger signal can be used for controlling the camera exposure time.

Reject gate timing

A pass/fail reject signal is received. After a delay an output fires a reject gate. Using an encoder, it is possible to ensure that the reject gate is open for the whole time the product is at the reject position.

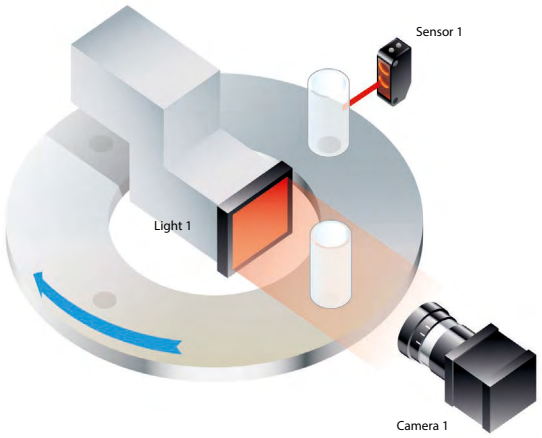
Resynchronise result

Image processing generally takes a variable time to complete. If the reject gate is timed from the completion of image processing, then the gate timing will vary. The solution is when the pass/fail result is obtained, the timing for the reject is synchronised to the initial component present sensor, so that the correct product is rejected.

CC320 Machine Vision Timing Controller

Machine Vision Timing Controller – application examples

On the CC320 there are 8 digital inputs labelled IP1 to IP8, and 8 digital outputs labelled OP1 to OP8. Each output can perform any function. Some application examples are given here



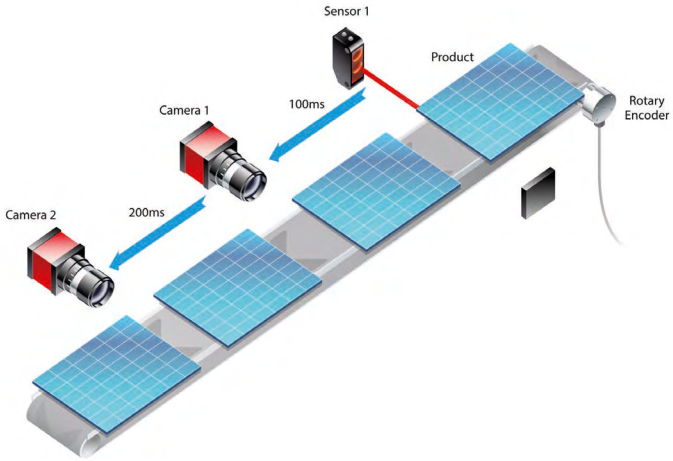
Delayed Signal mode

Delayed output following the detection of products

Example 1 - Principle of operation

A product sensor provides a signal when a product is present. This signal needs to be delayed so that an inspection light is only turned on when a product is present. The delay can be a time or a number of encoder counts.

After Sensor 1 detects a product, there is a delay of 500ms before Light 1 is turned on.



Delayed Signal mode

Delayed output following the detection of products – based on *timing*

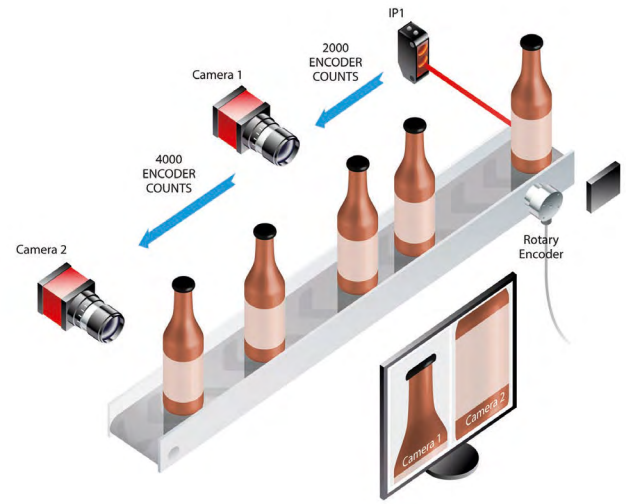
Example 2 - Constant belt speed

A sensor detects product presence, these products are evenly spaced on a guided rail. There are two cameras which need to take an image after different delays.

The leading edge of Sensor 1 is used as the trigger:

- OP1 triggers Camera 1 after 100ms

- OP2 triggers Camera 2 after 200ms



Delayed Signal mode

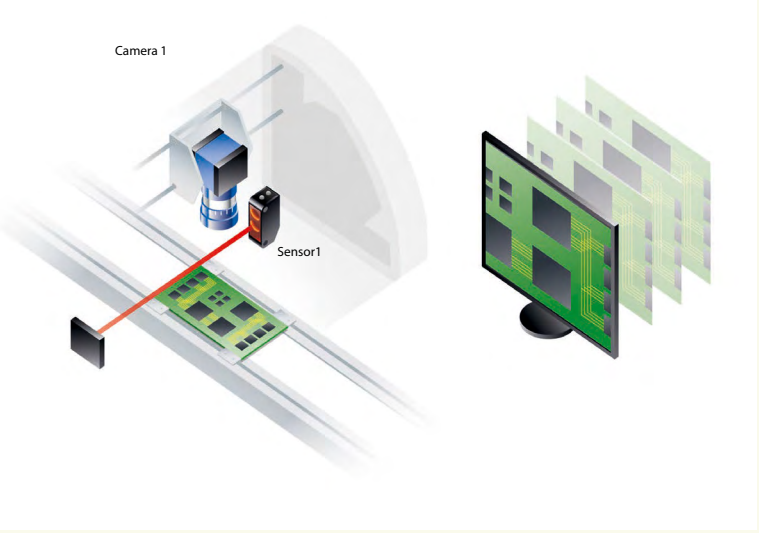
Delayed output following the detection of products – based on *distance*

Example 3 - Variable belt speed

On a conveyor with an encoder, a sensor detects product presence. There are two cameras which need to take an image at fixed distances along the belt.

The camera trigger pulses must be fixed width for exposure control. The trailing edge of Sensor 1 is used as the trigger. OP1 triggers the first camera after 2000 encoder counts. OP2 triggers the second camera after 4000 encoder counts.

By using encoders, the image will be captured correctly even if the conveyor changes speed.



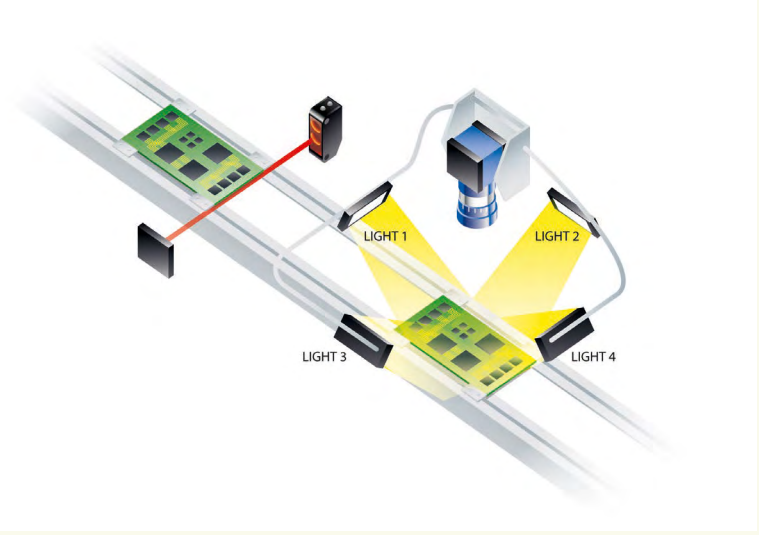
Gated Pulse mode

Where an output is required at a fixed frequency whenever a product is present

A camera needs to be triggered at 25Hz continuously, except when Sensor 1 is high to indicate that there is no product present or the machine has stopped.

Camera 1 is triggered on OP1, and will trigger continuously at 25Hz – only when Sensor 1 is low.

The 25Hz trigger is generated by the internal timer.



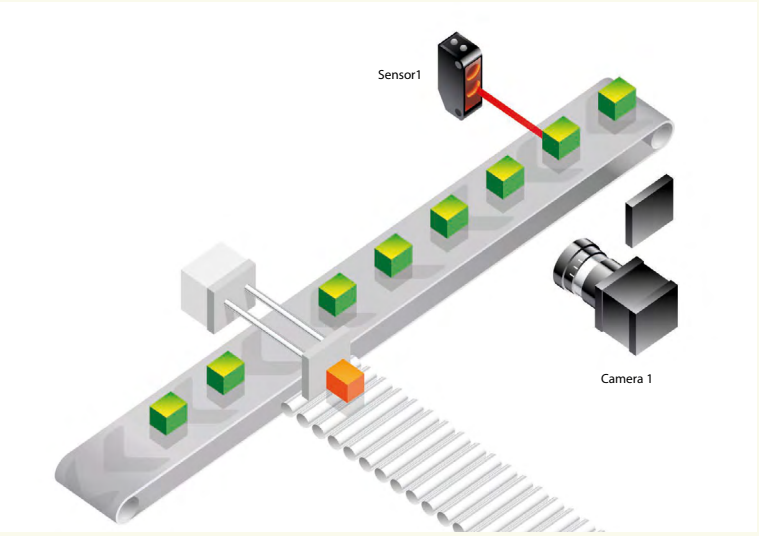
Pulse Burst mode

Multiple outputs are required from one trigger signal

In this example, a sensor on IP1 detects product presence. Four images need to be taken from one camera using four different lights at 40ms intervals. OP1, OP2, OP3, OP4 are used to output triggers to turn on the four lights in sequence.

OP5 is used to trigger the camera four times.

OP1 to OP4 are pulsed for 40ms in sequence. As each one is pulsed, OP5 is also pulsed for a short time to trigger the camera.



FIFO mode

A FIFO shift register function for reject synchronisation

At the end of the belt is a reject gate connected to OP2.

The timing for the reject gate must be synchronised to the original sensor, not to when the image processing gives pass/fail.

There might be multiple products between the sensor and reject gate. These products are individually tracked by the CC320 so that they are accepted or rejected at the correct time.

Remote digital input and output

With the increasing use of GigE™ (Ethernet) cameras, image processing software operates on a remote PC. Timing of Ethernet messages can vary and the CC320 Timing Controller allows local digital signals to be accurately controlled by the remote PC.

Three ways to configure

The CC320 contains a Web Server allowing the devices to be controlled by image processing software on a remote PC. Another option is a configuration program for the CC320 so that all parameters can be configured from a PC. The Gardasoft website, www.gardasoft.com, has a free download of a configuration program (with fully commented source code). Alternatively, simple string commands can be sent from an application program using TCP/IP or UDP.

The configuration is stored in non-volatile memory.

Encoder distance or Timed output

Some systems have fixed speed mechanics and the time from the camera trigger to the reject gate is well known. For other systems, an encoder may be used to determine belt movement. This has the advantage that the belt can be stopped or can even run backwards (maybe to clear a blockage in another part of the system) and the reject timing will still be preserved.

Two types of encoder input are supported. One wire systems have distance information only. Two wire systems have distance and belt direction information.

SPECIFICATIONS

Parameter	CC320 specifications
Digital inputs	8
Digital outputs	8
Configuration interface	Ethernet – TCP/IP or web browser or pushbutton and display
Digital input format	Common cathode opto input 5V to 24V at 3mA to 20mA
Digital output format	Open collector, switching 24V and 20mA
Supply voltage	Regulated 12V to 24V
Dimensions (excluding DIN rail fixing)	146mm by 49mm by 24mm
Weight	200g
Mounting	DIN rail or panel mounting

Other Gardasoft Lighting Controllers are available to cover all applications. See www.gardasoft.com