Smart Photo Sensor

# Smart Photo Sensor
# SPS02
# PRE-INSTASLLED DEMO APPLICATION GUIDE
## Presence Checker (AREA) for Trial

The demo application of Presence Checker (AREA) for Trial has already been pre-installed to the purchased Smart Photo Sensor (SPS02).
Please use SPS02 correctly after reading this guide book.

TOSHIBA TELI CORPORATION

Please confirm the function and performance by latest data sheet because it will be revised without any notes.



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**ATTENTION**

**PLEASE CAREFULLY READ THIS CONTRACT BEFORE USING THE DEMO APPLICATION (DEMO APPLICATION IS SAME AS FOLLOWING SOFTWARE).**

**YOU MAY USE THE SOFTWARE THAT PRE-INSTALLED IN THE SMART PHOTO SENSOR DEVELOPED BY COMPANY ONLY AFTER READING AND ACCEPTING THE TERMS OF THIS CONTRACT. FIRST RUNNING THE SOFTWARE IS DEEMED TO CONSTITUTE ACCEPTANCE OF THE TERMS OF THIS CONTRACT. DO NOT RUNNING THE SOFTWARE UNLESS YOU ACCEPT ALL OF THE TERMS OF THIS CONTRACT.**

## SOFTWARE LICENSE CONTRACT

This Software License Contract (“Contract” hereinafter) made by and between you (whether “you” is a natural person or a legal person) and Toshiba Teli Corporation (“Company” hereinafter) sets forth matters that you must observe when using the Software defined in Article 1 hereof. If you are a legal person, you are responsible for ensuring that all of your employees comply with the terms of this Contract.

The Japanese version of this Contract constitutes the original version. The Japanese version will prevail in the event of any inconsistencies between the Japanese and English versions.

Article 1. Definition

1. “Software” refers to the software product for the use of which the Company grants you license under this Contract.

Article 2. License granted

The Company grants you a nonexclusive and nontransferable license to use the Software in accordance with the terms of this Contract.

Article 3. Restrictions on use

1. You are permitted to use the Software as instructed in the Software user manual.
2. You shall use the Software only to the extent necessary for the purpose of use the Smart Photo Sensor developed by Company and may not use the Software for purposes other than such purposes.
3. You shall not reproduce, redistribute, decompile, reverse engineer, disassemble, attempt to derive the source-code of, decrypt, modify, or create derivative or incorporate into other applications.
4. You may not sell, sublicense, or offer as security to any third party the Software or its accessories.
5. You may not remove from the Software any copyright notices, labels, trademarks, or any other marks.
6. If the Company corrects any errors (bugs) in the Software, it will provide you with the corrected Software, software that implements the corrections ("Correction Software" hereinafter), or information concerning such corrections. All related matters, including the need to deploy the Correction Software and information concerning such corrections and the timing and method of such provision, shall be left to the discretion of the Company. The Correction Software provided to you, if any, shall be deemed to constitute part of the Software.
7. You agree not to take any action that may impair the credibility of or result in damage to the Company or any third party.

Article 4. Creating and maintaining an operating environment

Use of the Software may require Company-designated equipment, as well as all devices, software, etc., necessary and incidental thereto. You bear sole responsibility for such devices and software, including responsibility for the cost thereof and responsibility for establishing, maintaining, and managing the environment necessary to use the Software.

Article 5. Intellectual property rights

Copyrights and other intellectual property rights to the Software vest in the Company. This Contract does not license or assign any intellectual property rights other than the rights specifically granted

hereunder.

Article 6. No warranty or liability

1. The Software is provided on an as-is basis by the Company without warranties of any kind. The Company makes no warranty, express or implied, with respect to the Software, including warranty of merchantability, fitness for a particular purpose, or non-infringement of third-party rights. You agree to assume all risks concerning the quality, performance, and operation of the Software. The Company makes no warranty that the Software will operate without interruption, that the Software is free of defects, or that the functions of the Software will meet your requirements.
2. The Company shall not be liable for any damages (whether ordinary or special or foreseeable or unforeseeable) related to use of the Software.

Article 7. Compliance

1. In connection with this Contract, you agree to abide by the Foreign Exchange and Foreign Trade Act, the Export Trade Control Order, the Foreign Exchange Order and ministerial ordinances related thereto, and the United States Export Administration Act and Regulations (“Relevant Acts” hereinafter). You agree not to export, reexport, or cause any third party to export the Software, related products, or information, directly or indirectly, to any destination, natural person, or legal person, with regard to which such actions are prohibited under the Relevant Acts, without the permission of the Japanese government or other relevant governments required under the Relevant Acts. The Company rejects all liability in connection with these issues.
2. You agree to comply with the terms and conditions of all licenses applying to the computer or OS on which the Software runs.

Article 8. Termination of the license

If you breach any provision of this Contract, the license granted to you hereunder shall terminate immediately and without notice. In such cases, you must immediately remove the Software and the Software Alterations from your computer and the equipment, and destroy all relevant documents.

Article 9. Governing law and competent court

This Contract shall be governed by the laws of Japan. The Tokyo District Court shall have jurisdiction over all disputes arising in connection with this Contract.

Article 10. Mutual consultations

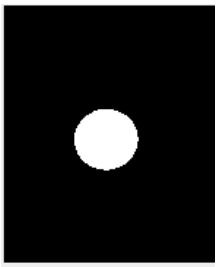
Any matters not specifically addressed herein and any questions regarding this Contract shall be resolved through consultations between you and the Company.

## 1 SOFTWARE

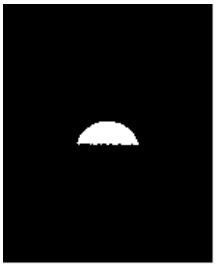
Presence check software(area type)（PREINSTALL　SOFTWARE）

## 2 MAIN FUNCTIONS

(1)Presence check：Area judgement（GPIO output）



OK



NG

**Process for detection**

The mass in the measurement area is measured, and "NG" is output when the measured result is smaller than the set area.

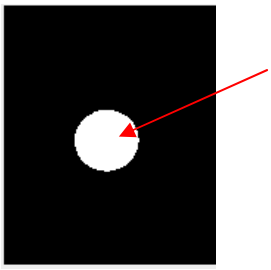
* judgment by the binarization image

**Application example**

：Presence check for parts
：Presence check for holl in parts and pattern
：Trigger sensor that detects person and object

(2)Output data(RS232C network）　* Please refer to the　communication feature for detail

●Area info output　(RS232C output）



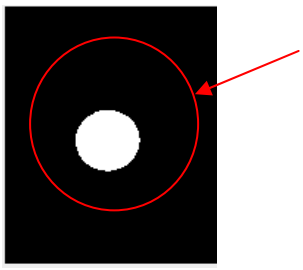

**Process for detection**

The mass area value (number of pixels) in inspection area is output

**Application example**

：Area value grasp of object work
：Size grasp of printing

●Number of blob output　(RS232C output）



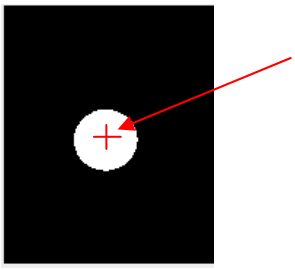

**Process for detection**

The blob number in the inspection area is output.

**Application example**

Number of blob of object

●Center of gravity output　(RS232C output）




**Process for detection**

The center of gravity position in the inspection area is detected, and then coordinates are output.

**Application example**

: Positioning of object
: Easy alignment

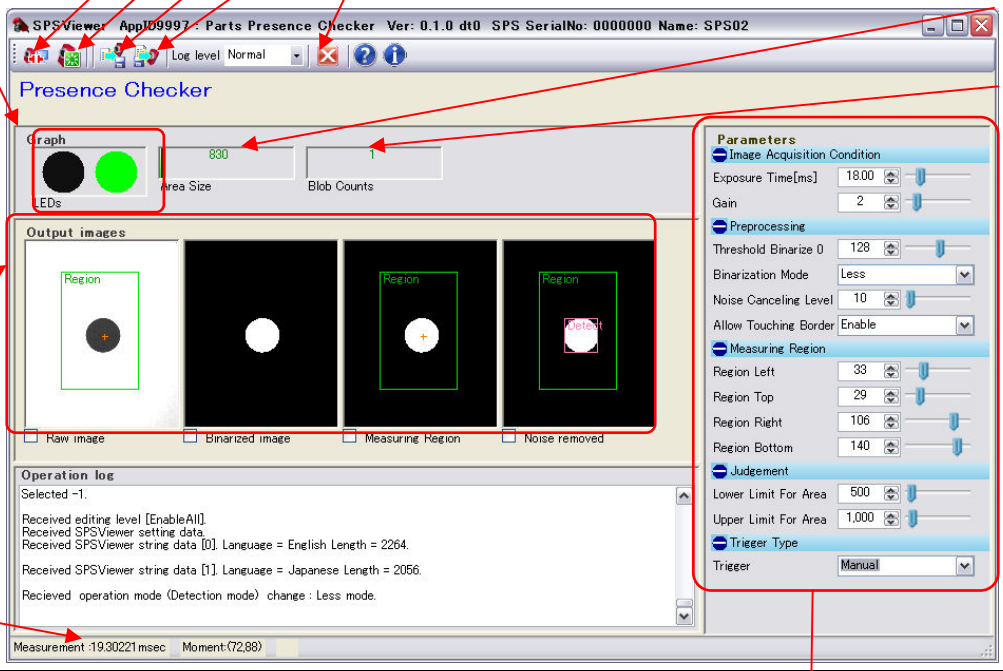
## 3 Operation　* More detail ,please refer to the SPS Viewer basic user manual

**Start the SPS Viewer and connect Smart Photo Sensor by USB cable**

- Left(red) : OUT1(Red lamp is synchronized to GPIO output1
- Right(green) : OUT0(Green lamp is synchronized to GPIO output0

- Start to communication : start communicate with SmartPhotoSensor
- Stop to communication : stop communicate with SmartPhotoSensor
- Reset : Reset SmartPhotoSensor and reload application from flash memory.
- Write current setting : The set value edited with SPSViewer is saved in PC as backup file, and it saved in the flash memory of Smart Photo Sensor.
- Write previous setting : The set up information saved in the PC file is written in Smart Photo Sensor. Also it can update the application file (file: Specified file)
- Quit : Stop communication and quit SPS Viewer

- Graph image of Area Size
  Green: Range of set value
  Red: out of range of set value
- Number of Blob Counts




- Input image and process image are displayed
- Process time is displayed

| Item | Function | Parameter | Remarks |
|---|---|---|---|
| Condition of image sensing | Exposure time（msec) | 0.5-100 | Set the exposure time |
| | Gain（times) | 1-10 | Set the gain |
| Binarization level Mask area (coordinates) | B-thresholdlevelforobject | 0-255 | Set the binarization level for object image |
| | B-mode | Greater equal | It becomes white if the object brightness is more than threshold , and if it is less than threshold ,it becomes black |
| | | Less | It becomes black if the object brightness is more than threshold , and if it is less than threshold ,it becomes white |
| | | In Range | If the brightness of the object is a range of threshold 0 and 1, it becomes white. |
| | | Out of range | If the brightness of the object is a range of threshold 0 and 1, it becomes black. |
| | Noise canceling level | 1-4095 | The object is removed if it is less than specified pixel. |
| | Allow Touching border | Enable | The object that touches the inspection area is also detected. |
| | | Disable | The object that touches the inspection area is not detected. |
| Measurement Region (coordinates) | Region Left | 0-143 | Set the left boundary of mask area |
| | Region Top | 0-175 | Set the upper boundary of mask area |
| | Region Right | 0-143 | Set the right boundary of mask area |
| | Region Bottom | 0-175 | Set the lower boundary of mask area |
| Judgment | Lower Limit For Area | 1-25344 | Set the judgment value for upper area |
| | Upper Limit For Area | 1-25344 | Set the judgment value for lower area |
| | Judgment | | Lower ＜ Area ＜ Upper ＝ 「OK」 |
| Trigger | | Manual,Ext Trigger1,2 | Please refer to output specification as next page. |

## 4 Output specifications

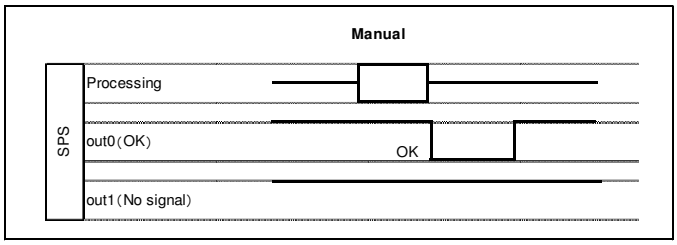
Trigger setting

- Manual　The judgment result is in real time output.
- Ext Trigger　The judgment result keeps outputting in [ON] period of external trigger
  (The judgment result is maintained.)
  In0 is input external trigger

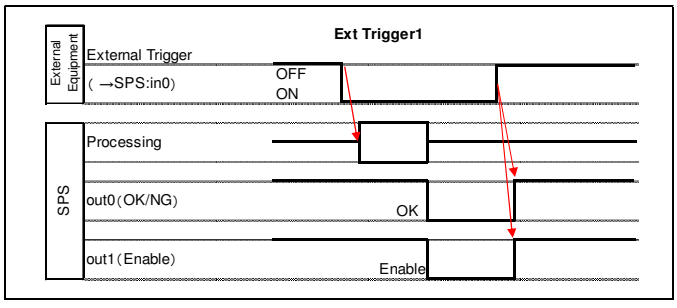
| Ext Trigger | Judge | Red sign (Out1) | Green sign (Out0) | Output signal |
|---|---|---|---|---|
| Ext Trigger1 | OK | ON | ON | Out0 : output the judgment result<br>Out1 : output the judgment result of chip existing |
| | NG | ON | OFF | |
| Ext Trigger2 | OK | OFF | ON | Out0 : OK is output as result<br>Out1 : NG is output as result |
| | NG | ON | OFF | |

## 5 Timing chart

: Manual mode



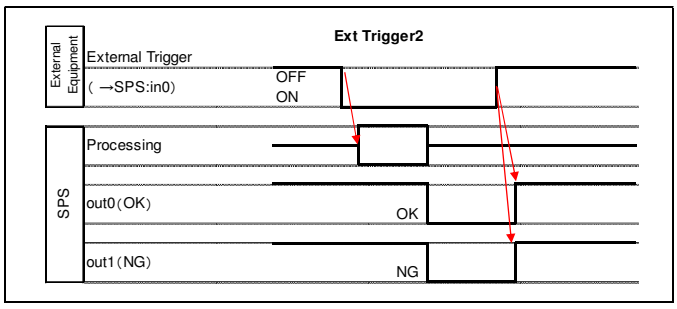

: Ext Trigger1 mode




**Trigger Latency**
This table contains the details of the trigger latency in the SPS system.

| | Exposure Start Latency (us) |
|---|---|
| Trigger Pre-select | 18.3 |

: Ext Trigger2 mode




**Trigger Latency**
This table contains the details of the trigger latency in the SPS system.

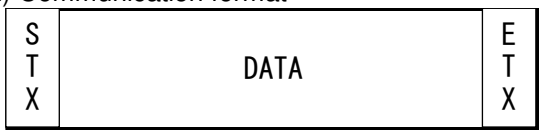
| | Exposure Start Latency (us) |
|---|---|
| Trigger Pre-select | 18.3 |

## 6 Communication specifications

(1) Communication protocol

| | |
|---|---|
| Baud rate | 19200bps |
| Start bit | 1bit |
| Data bit | 8bit |
| Stop bit | 1bit |
| Parity | None |

(2) Communication format




STX : Start of text (0x02)
DATA : Send command from PLC→SPS, Receive command from SPS→PLC (Refer to (3) Command)
ETX : End of text (0x03)

(3) Command

| Function | External equipment → SPS | | SPS → External equipment | |
|---|---|---|---|---|
| Area of Blob | "AREA" | Area of Blob inside FOV (Pixels) | "******" | Number of 5 digits（Exp. 00100） |
| | | | "CERR" | Invalid command |
| Number of Blob | "CNTS" | Number of Blob inside FOV (Pixels) | "******" | Number of 5 digits |
| | | | "CERR" | Invalid command |
| Surroundings length of Brob | "PEPI" | Surroundings length of Blob inside FOV (Pixels) | "******" | Number of 5 digits |
| | | | "CERR" | Invalid command |
| Blob Bounding Box | "BBOX" | Bounding Box of Blob inside FOV （Coordinate) | "BBOX,left,top,right,bottom" | |
| | | | left | Left edge coordinate of bounding box(3dig) |
| | | | top | Top edge coordinate of bounding box(3dig) |
| | | | right | Right edge coordinate of bounding box(3dig) |
| | | | bottom | Bottom edge coordinate of bounding box(3dig) |
| | | | "CERR" | Invalid command |
| Blob Bounding Box Width | "BWID" | Bounding Box of Blob inside FOV (Width) | "******" | Number of 5 digits |
| | | | "CERR" | Invalid command |
| Blob Bounding Box Height | "BHEI" | Bounding Box of Blob inside FOV (Height) | "******" | Number of 5 digits |
| | | | "CERR" | Invalid command |
| Center of Gravity Blob | "GRAV" | Blob inside FOV (Center of gravity) | "GRAV,xpos,ypos" | |
| | | | xpos | X coordinate of center of gravity(3dig) |
| | | | ypos | Y coordinate of center of gravity(3dig) |
| | | | "CERR" | Invalid command |

※Blob(Binary Large Object)

The especially big island (Two or more pieces are the connected data) made binarization is called Blob by a kind of the binary data of the image.

※Bounding Box

The boundary (boundary in the detection area) including the entire Blob is indicated.