

Date: 2011.11.25

Scanning Laser Range Finder UTM-30LX-EW Specification

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| Symbol | Amendment Details | | | Amendment | Date | Amended by | Number |
| Approved by | Checked by | Drawn by | Designed by | Title | UTM-30LX-EW | | |
| MORI | KAMITANI | TAGAMI | HINO | Drawing No. | Specification | | |
| | | | | | C-42-3785 | | 1/7 |

1. Introduction

1.1 Operation principles

The UTM-30LX-EW uses a laser source ($\lambda=905\text{nm}$) to scan a 270° semicircular field (Figure 1). It measures the distance for each angular step to objects in its range. The measurement data along with its angular step are transmitted via a communication channel. The laser safety is class 1.

2. Diagram of Scanned Area

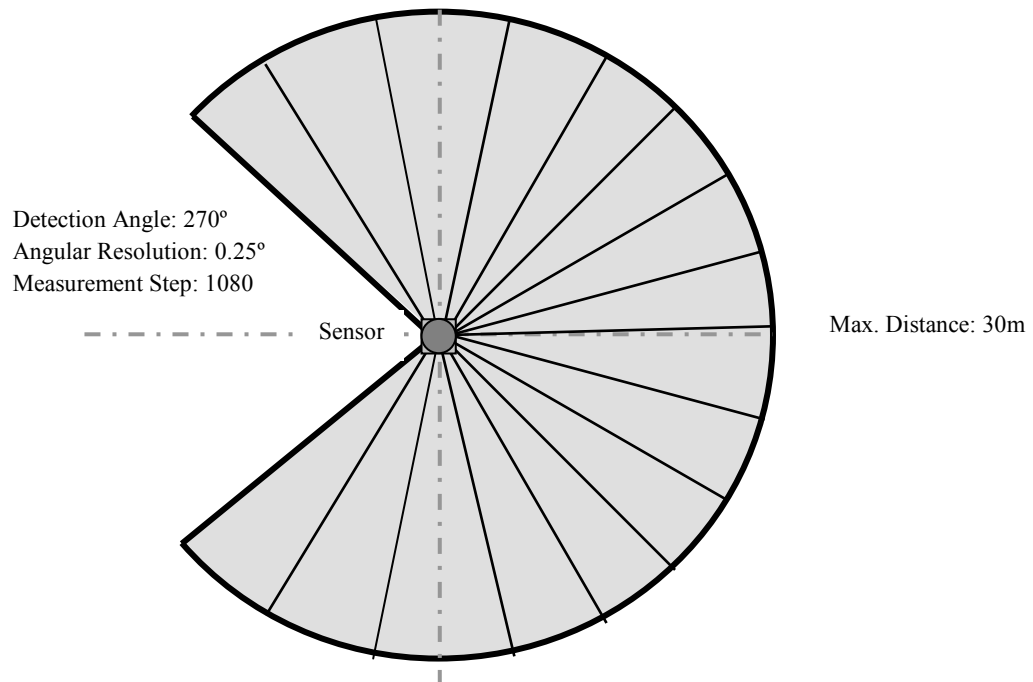


Figure 1

3. Important Notes

- This sensor is not a safety device/tool.
- This sensor is not for use in human detection.
- Hokuyo products are not developed and manufactured for use in weapons, equipment, or related technologies intended for destroying human lives or creating mass destruction. If such possibilities or usages are revealed, the sales of Hokuyo products to those customers might be halted by the laws of Japan such as Foreign Exchange Law, Foreign Trade Law or Export Trade Control Order. In addition, we will export Hokuyo products for the purpose of maintaining the global peace and security in accordance with the above laws of Japan
- Read specifications carefully before use.

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4. Specifications

| | |
|--|--|
| Product Name | Scanning Laser Range Finder |
| Model | UTM-30LX-EW |
| Light Source | Laser Semiconductor $\lambda = 905\text{nm}$ Laser Class 1 |
| Supply Voltage | 12VDC $\pm 10\%$ |
| Supply Current | Max: 1A, Normal : 0.7A |
| Power Consumption | Less than 8W |
| Detection Range and Detection Object | Guaranteed Range: 0.1 ~ 30m (White Kent Sheet) * ² Maximum Range : 0.1 ~ 60m Minimum detectable width at 10m : 130mm (Vary with distance) |
| Accuracy | 0.1 – 10m : $\pm 30\text{mm}$, 10 – 30m : $\pm 50\text{mm}$ (White Kent Sheet) * ² Under 3000lx : White Kent Sheet: $\pm 30\text{mm}^{*1}$ (0.1m to 10m) Under 10000lx : White Kent Sheet: $\pm 50\text{mm}^{*1}$ (0.1m to 10m) |
| Measurement Resolution and Repeated Accuracy | 1mm 0.1 – 10m : $\sigma < 10\text{mm}$, 10 – 30m : $\sigma < 30\text{mm}$ (White Kent Sheet) * ² Under 3000lx : $\sigma = 10\text{mm}^{*1}$ (White Kent Sheet up to 10m) Under 10000lx : $\sigma = 30\text{mm}^{*1}$ (White Kent Sheet up to 10m) |
| Scan Angle | 270° |
| Angular Resolution | 0.25° (360°/1440) |
| Scan Speed | 25ms (Motor speed : 2400rpm) |
| Interface | Ethernet 100BASE-TX(Auto-negotiation) |
| Output | Synchronous Output 1- Point |
| LED Display | Green: Power supply. Red: Normal Operation (Continuous), Malfunction (Blink) |
| Ambient Condition (Temperature, Humidity) | -10°C ~ +50°C Less than 85%RH (Without Dew, Frost) |
| Storage Temperature | -25~75°C |
| Environmental Effect | Measured distance will be shorter than the actual distance under rain, snow and direct sunlight* ² . |
| Vibration Resistance | 10 ~ 55Hz Double amplitude 1.5mm in each X, Y, Z axis for 2hrs. 55 ~ 200Hz 98m/s ² sweep of 2min in each X, Y, Z axis for 1hrs. |
| Impact Resistance | 196m/s ² In each X, Y, Z axis 10 times. |
| Protective Structure | Optics: IP67 (Except Ethernet connector) |
| Insulation Resistance | 10M Ω DC500V Megger |
| Weight | 210g (Without cable) |
| Case | Polycarbonate |
| External Dimension (W×D×H) | 63mm×63mm×87mm MC-40-3240 |

*¹ Under Standard Test Condition (Accuracy can not be guaranteed under direct sunlight.)

*² Indoor environment with less than 1000Lx.

Please perform necessary tests with the actual device in the working environment.

Use data filtering techniques to reduce the effect of water droplets when detecting objects under the rain.

5. Quality Reference Value

| | |
|---------------------------------------|--|
| Vibration resistance during operation | 10~150Hz 19.6m/s ² Sweep of 2min in each X,Y,Z axis for 30min |
| Impact resistance during operation | 49m/s ² X, Y,Z axis 10 times |
| Angular Speed | 2 π /s (1Hz) |
| Angular Acceleration | $\pi/2\text{rad}/\text{s}^2$ |
| Life-span | 5 Years (Varies with operating conditions) |
| Noise Level | Less than 25dB at 300 mm |
| Certification | FDA Approval (21 CFR part 1040.10 and 1040.11) |

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6. Interface

6.1 Robot Cable 4 Pin

| Color | Function |
|-------|--------------------|
| Brown | +12 V |
| Blue | 0 V |
| Green | Synchronous Output |
| White | COM Output (0V) |

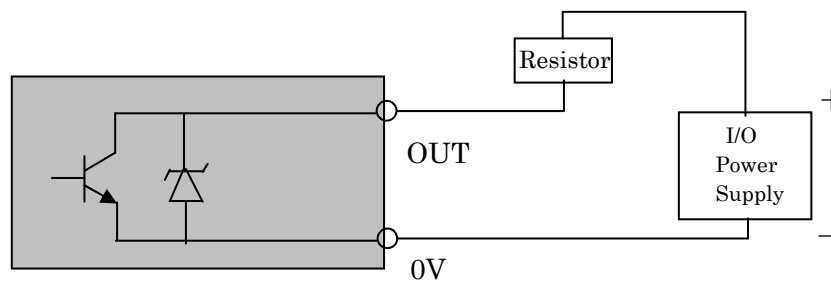
Note: 0 V of the power supply (Blue) and COM Output (0V) (White) are not internally connected. Connect them, when it is necessary.

6.2 Ethernet Cable

RJ-45 plug is attached to the cable. (Length: 300mm)

This sensor is compatible with SCIP2.2 communication protocol standard.

6.3 Output Circuit Diagram



Rated power: 30V, 30mA (or less)

Note: Rated resistor should be used for the output.

Figure 2

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7. Control Signal

Synchronous Output (UTM-30LX)

1 pulse is approximately 1 ms. Output signal Synchronization timing chart is shown below (Figure 3).

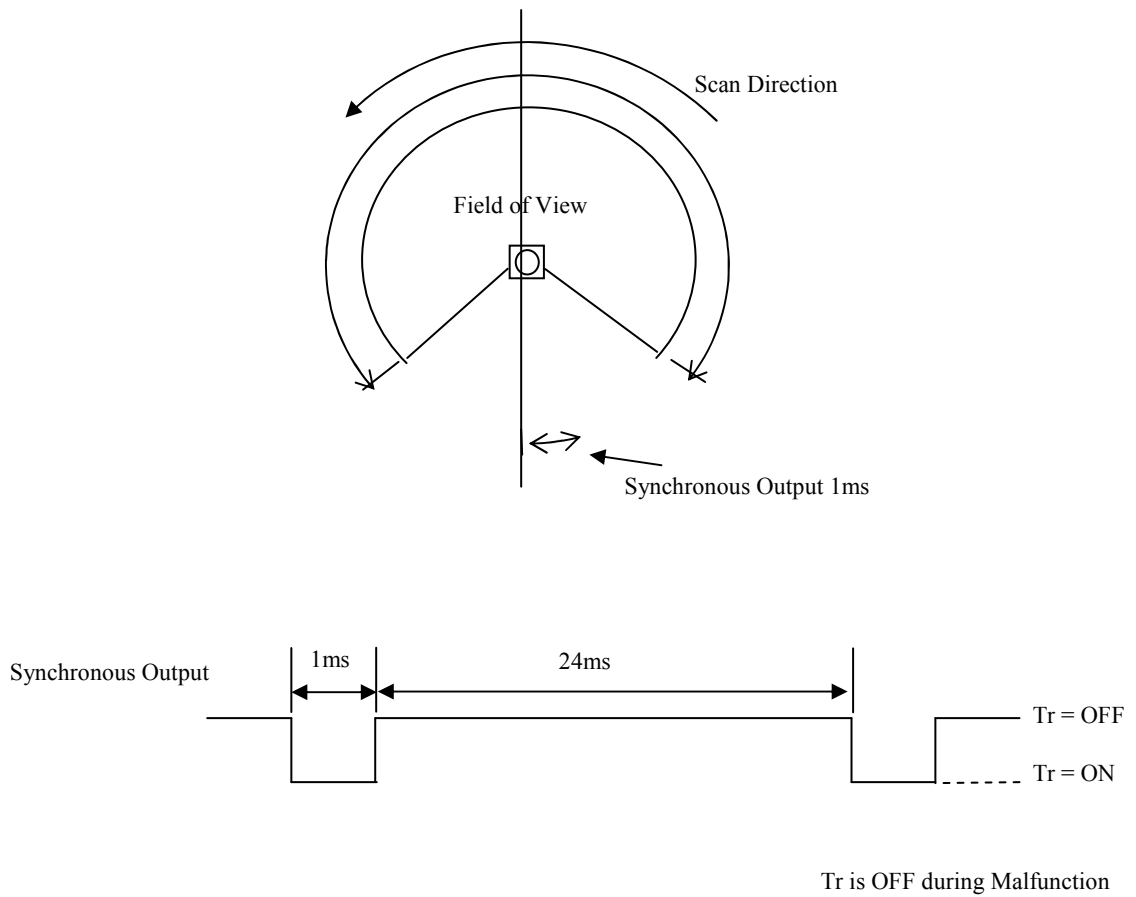


Figure 3

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8. Malfunction Output:

1. Laser malfunction: When the laser does not emit or exceeds safety class 1.
2. Motor malfunction: When the rotation speed differs from the default value (> 25 ms).

Synchronous/Warning signal will be turned OFF when these malfunctions are detected. The motor and laser will also stop. The details of error can be obtained via communication.

[Error code]

The cause of an error can be acquired from a "STAT" line of the "II" command response of the SCIP communications protocol. An error code and a solution acquired from a "STAT" line are as follows.

| ID | Message | Meaning | Solution |
|-----|----------------------------------|---|--|
| 000 | no error. | Normal | No action is required |
| 050 | internal chip access failed. | Abnormal sensor processing system | Sensor has failed and needs to be repaired |
| 100 | Internal chip access failed. | Abnormal sensor processing system | |
| 150 | internal chip access failed. | Abnormal sensor processing system | |
| 151 | internal chip initialize failed. | Sensor processing system failed to initialize | |
| 200 | encoder error. | Encoder error | |
| 250 | motor startup failed. | Abnormality of the motor | Reduce the vibration and noise to the sensor |
| 251 | motor rotation error. | Motor rotation is not stable | |
| 300 | laser too high. | Abnormality of the laser light | |
| 301 | laser too low. | Abnormality of the laser light | Reduce the ambient light and noise to the sensor |
| 302 | laser no echo | Abnormality of the laser light | |
| 303 | measurement error. | The control process for measuring distance failed | Reduce the vibration and ambient light and noise to the sensor |

[The meaning of the distance value]

The meaning of "x" distance value of each step is as follows.

| Distance value "x" | Meaning |
|---------------------|--|
| $x < 23$ | Measurement error. The distance cannot be measured due to light interference or noise. |
| $23 \leq x < 60000$ | Valid distance value [mm] |
| $60000 < x$ | Object does not exist or the object has low reflectivity. |

9. Ethernet Settings

① Initial value

IP address: 192.168.0.10

Port number: 10940

② IP initialization

Remove the rubber cap located at the side of the bottom cover of the sensor. Press and hold the switch inside this hole for more than two seconds in order to start the IP initialization process. Release the switch after the LED flashes in orange color. This indicates the restart of the sensor. Finally, please insert the rubber cap to its original position.

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10. Cautions

The heat is generated as the internal circuit of the sensor runs at a very high speed. The generated heat is concentrated at the bottom of the sensor. Please mount a heat sink or any appropriate component to release the heat. An aluminum plate (200mm x 200mm x 2mm) is recommended as the heat sink.

Mutual Interference could occur when two or more identical sensors are mounted at the same detection plane. This is because the sensor could not identify the origin of the received laser pulses. It causes measurement error for one or two steps. Performing data filtering could overcome this problem.

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