# IR-PIO SPECIFICATION

CTS-ICOM-AA01 (EQ-PIO)
CTS-ICOM-AB01 (OHT-PIO)

* The wireless equipment concerned can result in jamming during operation.

2014. 3. 11 ( Ver 0.9 )

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## 1. Product Outline

The CTS-ICOM Series is an IR communication device used to give and receive 8-bit data in a non-contact type, and is a product with various convenient functions using a 2.4GHz wireless communication technology.

This device is used to give and receive a SEMI-E84/E23 protocol or maximum 8-bit input/output data wirelessly for an exchange of control signals mainly between an AGV or OHT(Master or Active device), etc. and equipment(Slave or Passive device).

This is a product to grasp causes quickly and establish measures easily by providing various functions to analysis the causes in case of an abnormality in data given and received during use.

## 2. Product Feature

- IR communication : For giving and receiving input/output data
- 2.4GHz wireless communication : Additional function such as downloading of transmission/reception data and F/W, etc.
- The wireless communication operating distance is maximum 5M (However, there shall be no obstacles to electromagnetic waves in the middle.)
- Designation of a wireless communication ID(address) : 6 digits (hexadecimal code)
- For 8-bit input/output signals
- Storage of various information using a large-capacity SRAM : About 200 pieces of work such as communication data, absolute time, reception signal intensity, etc. (Erased when power is OFF)
- Serial communication port : Setting change, communication data information receiving, F/W downloading, etc.

## 3. Wireless Communication Characteristics

- RF communication using a 2.4GHz ISM(Industrial, Scientific and Medical) band that can be used without permission
- Equipment name: Wireless device for a wireless data communication system
- High-speed data communication of 1Mbps per channel
- GFSK modulation type, 1MHz bandwidth
- Superior expandability with an optional function of 6-byte serial number

and 2-byte frequency

- 200uS or less channel switching time to minimize interference with other wireless devices
- Possibility of frequency interference with 2.4GHz Bluetooth and wireless communication devices
- RF maximum output power : 0dBm
- Sensitivity of the reception part : -90dBm

## 4. IR Communication Characteristics

- Wavelength : 870nm (infrared ray)
- Ambient brightness : 4000lx or less incandescent lamp and fluorescent lamp, where there is no direct sunshine
- Transmission and reception method : Half Duplex
- Modulation method : Pulse Modulation
- Operating distance and angle : 0.5m at 0°, 0.25m at ±15°
- Communication distance regulation : Serial communication command
- Reception level regulation : For serial communication command and ambient light noise removal
- Input signal and GO output filtering function : $0^{th}$ ~ $10^{th}$ (Serial communication command)

## 5. Product Code Configuration

| Item name | Feature |
|---|---|
| CTS-ICOM-AA01-xx-y-zz<br>(EQ, Slave) | 25-pin DSUB, Male Type<br>(For equipment) |
| CTS-ICOM-AB01-xx-y-zz<br>(OHT, Master) | Hirose 26-pin, HIF6-26D-1.27R<br>(For OHT, AGV) |

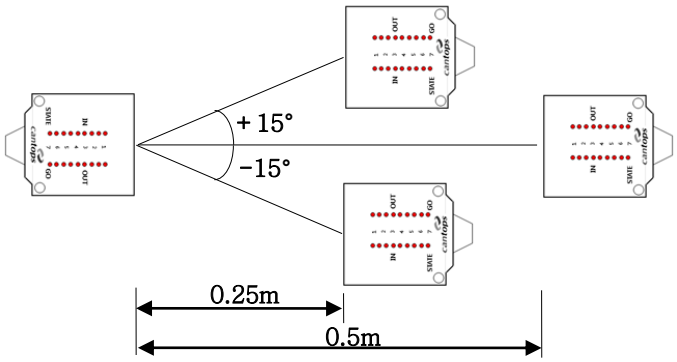
*) xx : The communication distance and unit are 0.1m, **05=0.5m**, 10=1.0m

*) y : Transmission and reception window position, T=Top View, F=Front View

*) zz : The cable length and unit are 0.1m, **25=2.5m**

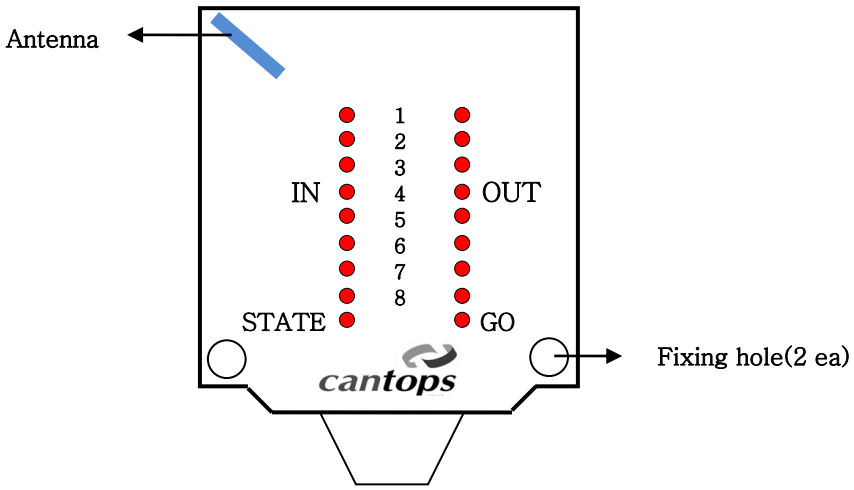
## 6. IR Radiation Characteristics

As shown in the figure below, the communicable angle is 30°, and communication is possible from a 0.25m away distance at ±15° and from a 0.5m away distance at 0°. If lighting, sunshine, IR remote control, IR type sensor, etc. applies light directly to the transmission and reception window, then there may happen loss of communication. In this case, shield the external light and then use it.



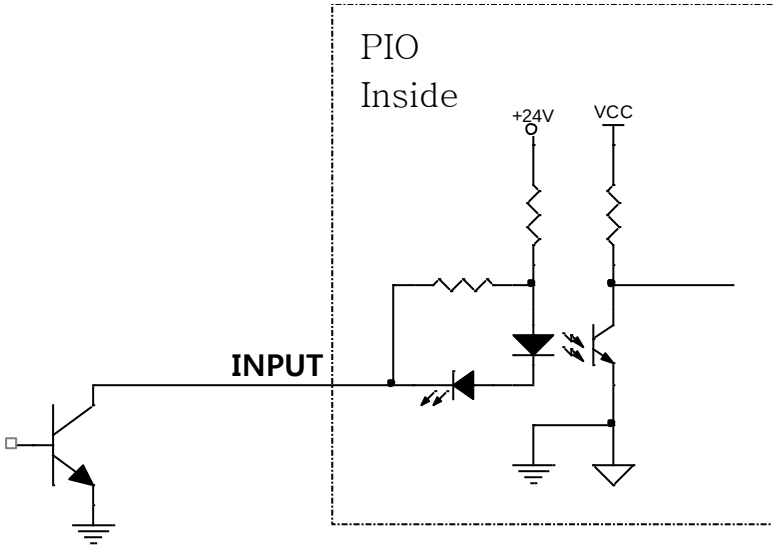

## 7. Antenna Radiation Characteristics

The antenna used for this product is located at the position like the figure below in the case. In order to exert the maximum performance without jamming, the whole product except the fixing hole part had better be arranged such that there may be no object that can cause jamming. Especially, avoid metals or other objects that can cause jamming around the antenna.



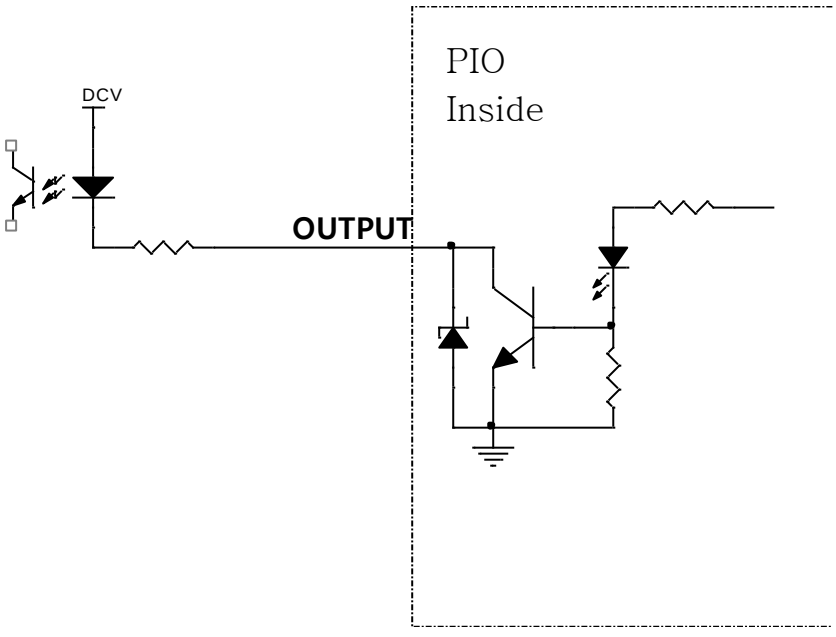
## 8. Input/output Circuit

- Input circuit : Maximum 10mA




- Output circuit : NPN type Open Collector, maximum operating current of 50mA / 30V

$V_{CE}$ max. 100mV / 10mA



## 9. Product Specification

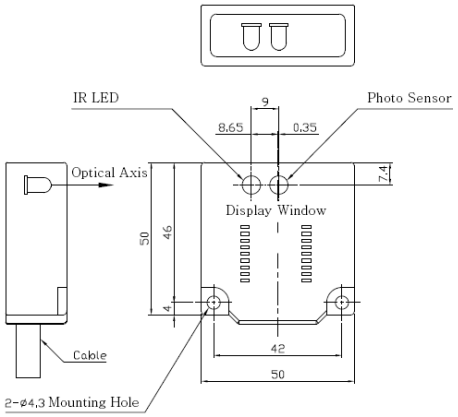
| Division | Specific item | Content |
|---|---|---|
| Display part | GO | Displayed when IR communication starts |
| | STATE | Flashing as watchdog signals for operating conditions |
| | IN | Display of operating conditions of the 8Bit input port |
| | OUT | Display of operating conditions of the 8Bit output port |
| External equipment connection | Connection connector | AA01 Model : 25-pin DSUB, Male, 2.5m, 5m |
| | | AB01 Model : Hirose 26-pin, 1.27mm pitch, 1m |
| | Cable | 26AWG x 22C + 24AWG x 3C, Foil Shield |
| | Input | 8 Bit, Photo-Coupler, 24V<br>On : 10mA, Off : 0.1mA or less |
| | Output | 8Bit, Open Collector, NPN, 30V<br>Maximum operating current 50mA |
| IR Communication function | Communication media | 870nm, Infrared |
| | Communication distance | 0.5m (0°), 0.25m (+15°, -15°) |
| | Communication angle | 30° ( ±15°) |
| | Communication method | 1:1 communication, Half Duplex |
| | Communication window location | T Type : Top View<br>F Type : Front View |
| | Optical modulation type | Pulse Modulation |
| | Communication error check | Parity |
| | Communication period | About 24ms when linked, about 48ms when communication is lost |
| Additional communication(RF) function | Communication media | 2.4GHz, bandwidth 1MHz |
| | Frequency band | 2.4GHz, 80 channels*1) |
| | Safety function | Serial number confirmation function, CRC-16 |

| | | |
|---|---|---|
| | Communication type | 1:1 communication, Half Duplex |
| | ID setting | PIO serial number to avoid interference with neighboring PIOs, which is composed of 16 digits(hexadecimal code) |
| | Channel setting | Communication frequency to avoid interference with neighboring PIOs, which is composed of 3 digits |
| | ID setting method | Serial communication command |
| | Major function | F/W download, data download, time setting, etc. |
| | Operating distance | 5m@0dBm(However, when there is no objects causing jamming in the middle) |
| Environment | Storage environment | Storage temperature : −25 ~ 70°C<br>Storage humidity : 5 ~ 95%RH<br>(However, there shall be no dew condensation phenomenon) |
| | Operating environment | Ambient brightness : 4000lx or less (Incandescent lamp, fluorescent lamp)<br>*) Install it such that no external light may enter the reception part.<br>Operating temperature : 0 ~ 40°C<br>Operating humidity : 35~85 %RH<br>(However, there shall be no dew condensation phenomenon)<br>Vibration : 4~150 Hz, 4.9m/s$^2$ or less |
| Power | Input voltage | DC 24V±10% |
| | Consumed current | 100mA or less @ 24V |
| Case material | | Polycarbonate |
| Size(W×H×D) | | 50×53×20mm (Except the connector overhang) |
| Weight | | About 100g |

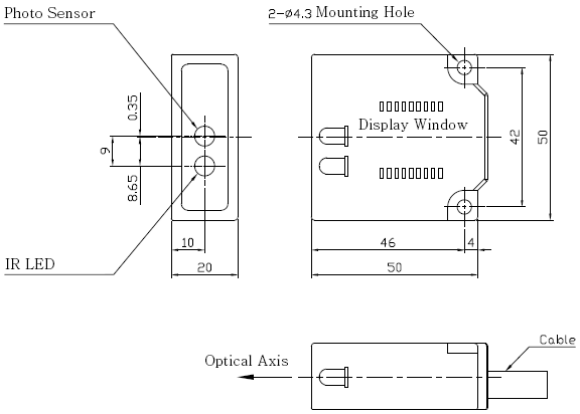
*1) Can be used in an environment without frequency interference with other wireless equipment(wireless LAN, Bluetooth, etc.)

# 10. Tool Specification

< F Type : Front View >




< T Type : Top View >




Unit: mm

## 11. Connector Connection Specification

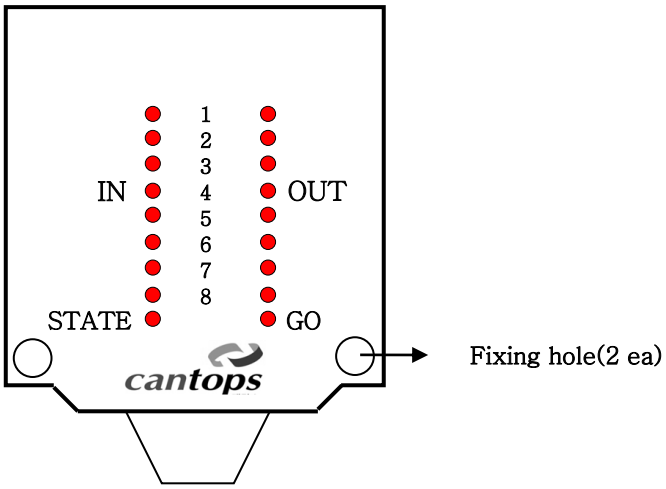
- For equipment(CTS-ICOM-AA01) : For equipment(Slave), DSUB 25 pin, Pin Type, cable length 2.5m, 5m
- The Mode pin(#11) is connected to GND in the product, so it doesn't need to be connected.

| Function | Pin No. | Function | Pin No. |
|---|---|---|---|
| IN 1 | 1 | OUT 1 | 14 |
| IN 2 | 2 | OUT 2 | 15 |
| IN 3 | 3 | OUT 3 | 16 |
| IN 4 | 4 | OUT 4 | 17 |
| IN 5 | 5 | OUT 5 | 18 |
| IN 6 | 6 | OUT 6 | 19 |
| IN 7 | 7 | OUT 7 | 20 |
| IN 8 | 8 | OUT 8 | 21 |
| Not Connected | 9 | Not Connected | 22 |
| SELECT | 10 | +VIN | 23 |
| MODE | 11 (GND) | GND | 24 |
| Go (Ready) | 12 | GND | 25 |
| Not Connected | 13 | x | x |
| Serial port (DSUB 9 pins, arm) | | TxD | 2 |
| | | RxD | 3 |
| | | GND | 5 |

- For OHT(CTS-ICOM-AB01) : Master, Hirose 26 pins, 1.27mm IDE Connector

| Function | Pin No. | Pin No. | Function |
|---|---|---|---|
| Input 1 | 16 | 3 | Output 1 |
| Input 2 | 17 | 4 | Output 2 |
| Input 3 | 18 | 5 | Output 3 |
| Input 4 | 19 | 6 | Output 4 |
| Input 5 | 20 | 7 | Output 5 |
| Input 6 | 21 | 8 | Output 6 |
| Input 7 | 22 | 9 | Output 7 |
| Input 8 | 23 | 10 | Output 8 |
| SELECT | 14 | 2 | Ready (Go) |
| MODE | 15 | 12 | +VIN |
| X | 11, 24 | 1 | GND |
| X | 25, 26 | 13 | GND |
| Serial port (DSUB 9 pins, arm) | | 2 | TxD |
| | | 3 | RxD |
| | | 5 | GND |

## 12. LED Display Content




| LED name | Display content |
|---|---|
| 1~8 | The IN side displays the input condition, which is turned ON when the Low is inputted.<br>The OUT side displays the output condition, which is turned ON when the TR is turned ON. |
| GO | Turned ON when data transmission/reception is realized between PIOs.<br>Delay time until the GO LED is turned OFF after wireless transmission/reception is disconnected: The filtering can be set 2 ~ 20 times(48ms*The number of filtering times). |
| STATE | Used as watchdog signals to check whether there is an abnormality in this product or not, and the period of flashing differs depending on master mode(0.25 sec), slave mode(1 sec) or standby mode(0.05 sec). |

## 13. Major Pin Function

| Signal name | Usage |
|---|---|
| Mode (Input) | Input to select a mode of PIO<br>▪ GND : Slave Mode (equipment)<br>▪ OPEN : Master Mode (OHT) |
| Select (Input) | Input to operate the PIO<br>▪ GND : PIO function stop<br>▪ OPEN : PIO operation |
| GO (Output) | Turned ON if communication is normally realized between the Master PIO and the Slave PIO |

- Master Mode : Opening the Select signal and operating the PIO transmits optical signals. This is a mode attached to OHT or AGV and used.
- Slave Mode : Even opening the Select signal and operating the PIO doesn't transmit light, but only receives light, and then receiving optical signals from the master transmits the data entering the input port wirelessly. This is a mode attached to the equipment and used.

## 14. ID & CH Setting Method

The wireless function of CTS-ICOM Series is simultaneously connected to many devices due to its wireless characteristics to be crossed, so in order to communicate with a device, the ID and CH(channel) of the communication counterparty shall be set before starting communication and then communication shall be tried. This ID and CH setting is possible using serial communication.

- Slave Mode : Connect it to the serial port of this device, and then set the ID, channel and transmission power to use by using a communication command. The set data is stored in EEPROM, so even though power is turned OFF after set once, it doesn't need to be set again.

- Serial communication setting value: 57600,8,n,1, no flow control
- The starting letter for all commands is "<", and the ending letter is ">".
- The starting letter for a reply to a command is "[", and the ending letter is "]".
- The ID uses 6 digits and hexadecimal codes

<A> Command to change the address
1) Setting : <A=623456>
2) Confirmation : <A>➔Reply : [A=AB95-623456]
3) Setting value during shipment: 0000-000000

<B> Command to change the address and the channel at a time
1) Setting : <B=B54321:34>
2) Confirmation : <B>➔Reply[B=AB95-B54321:34]
3) Setting value during shipment: 0000-000000:00

<C> Command to set a channel
1) Setting : <C=40>
2) Confirmation : <C>➔Reply : [C=40]
3) Setting value during shipment: 00

<P> Command to set the transmission power
1) Setting : <P=3>
2) Confirmation : <P>➔Reply : [P=3]
3) Setting value during shipment: 3

<D> Command to receive real-time communication data in serial
1) Setting : <D=1> data output, <D=0> no output
2) Confirmation : <D>➔Reply : [D=0]
3) Setting value during shipment: 0

<T> Command to set the time

1) Setting : <T=10/08/17 23:33:30>

2) Confirmation : <T>➔Reply : [T=10/08/17 23:33:41-2]

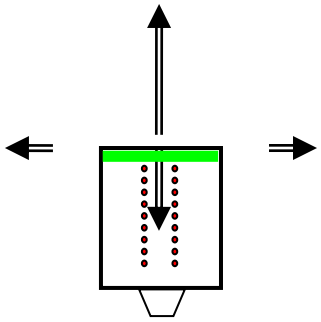
3) Setting value during shipment: 10/01/01 00:00:00

<V> Check the F/W version.

1) Confirmation : <V>➔Reply : [V=1.30]

## 15. RF Consideration when Installing a PIO

• Intensity of electromagnetic wave : The length of the arrow in the figure below indicates the size of electromagnetic waves emitted from the PIO, so the electromagnetic waves are emitted the most to the up direction. Therefore, a structure facing a possible sensor end(green part, the area with an antenna) is the most desirable.



• Caution

1) Metals, mirrors and other objects existing in a space at the straight-line distance between two sensors reduce the wireless performance. Remove the obstacles on the wireless path as far as possible.
2) You can use it stably without communication errors when there is no interference with other wireless devices in an open space.
3) There is an antenna around the green part in the above figure. Take care so that there may be no metals or other obstacles within a 60mm radius around this antenna.
4) There may happen frequency interference due to other RF devices around. Use this in an environment without frequency interference for stable operation.
5) Especially, when using this together with a device using a 2.4GHz band, allocate a channel such that the used channels may not be overlapped.
6) Maintain an 20cm or more interval between PIOs for equipment that are installed in the equipment.

*) The specification of this product is subject to changes without prior notice to improve the performance of the product.