RF-PIO SPECIFICATION

*** Materials that absorb electromagnetic fields should be kept away from the device to maximize performance.**

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cantops
캔탑스

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1. Introduction

The CTS-RCOM Series is a device that enables a wide range of devices to exchange 8-bit input/output data through wireless data transfer at 2.4GHz. It has resolved the previous difficulties of the IR installation.
When interfered by other wireless communication devices or surrounding electromagnetic waves, this device enhances its stability and efficiency of transferring data by detecting and analyzing the failure of performance.
This device helps to wirelessly exchange protocols such as SEMI-E84 or SEMI-E23 at a maximum of 8-bit I/O ports mainly for master/slave communication of control signals.

2. Key Feature

- Wide selection of positions or directions to mount a sensor
- Operating distance of maximum 2M (However, there must be no electromagnetic wave obstacles or RF interference in the middle)
- Possible to select or verify the maximum of 999998 address
- Application of various data error detection algorithms
- 8-bit input/output
- Can replace the existing IR PIO sensors
- Can process overhead operation using wireless communications to reduce tact time
- Transmitted/received data logging
- Can control the RF operation through a serial port

3. RF and Electric Characteristics

- RF communications using a 2.4GHz ISM(Industrial, Scientific and Medical) band can be used without permission
- Name of equipment: Wireless device for a wireless data communication system
- High-speed data communication of 1Mbps per channel
- GFSK modulation method, 1MHz bandwidth
- Excellent expandability with a function to select a serial number (ID) of 10 bytes and a frequency (CH) of 2 bytes
- Channel switching time of less than 200uS to minimize interference with other wireless devices
- 25ms frequency of wave
- There may be frequency interference with 2.4GHz Bluetooth and wireless communication devices
- Maximum RF output power: 0dBm (PA ver.: +10dBm)
- Sensitivity of the receiver : -85dBm

4. Ordering information

Item	Connection type
CTS-RCOM-BA02-W[1)] (EQ, Slave)	25 Pin DSUB, Male Type (For equipment)
CTS-RCOM-BB02-W[1)] (OHT, Master)	25 Pin DSUB, Male Type (For OHT)
CTS-RCOM-BB02-W[1)]-XXyy[2)]-z[3)] (OHT, Master)	Hirose 26 Pin, HIF6-26D-1.27R (For OHT or AGV)
CTS-RCOM-PB02-W[1)]-XXyy[2)]-z[3)] (OHT, Master)	Hirose 26 Pin, HIF6-26D-1.27R (For OHT or AGV)
CTS-RCOM-PA02-W[1)] (EQ, Slave)	25 Pin DSUB, Male Type (Power Amp version, equipment)
CTS-RCOM-HM02-W[1)]-XXyy[2)]-z[3)] (Hoist Master)	Hirose 26pin, HIF6-26D-1.27R (For Hoist)
CTS-RCOM-HS02-W[1)] (Hand Slave)	-

1) W : Blank : SAMSUNG Group , H : General User

2) XXyy : Connector Type

3) z : Cable Length classification

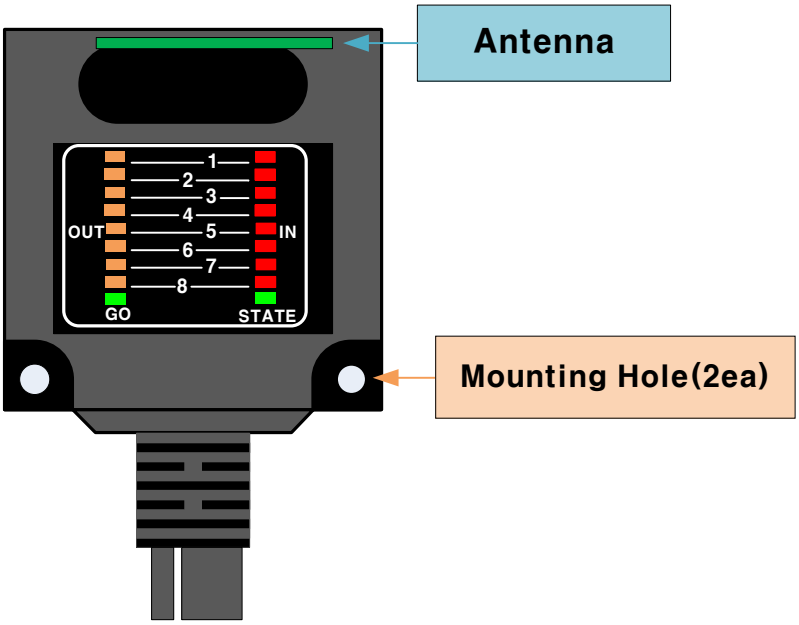
< Product Code Table>

Division	Product Code	Data Cable		Serial Cable	
		Con.	length (mm)	Con.	length (mm)
EQ	CTS-RCOM-BA02	DSUB 25P	2500	D-SUB 9Pin	300
	CTS-RCOM-PA02	DSUB 25P	2500	D-SUB 9Pin	300
	CTS-RCOM-BA02-H	DSUB 25P	2500	D-SUB 9Pin	300
	CTS-RCOM-PA01-H	DSUB 25P	2500	D-SUB 9Pin	300
	CTS-RCOM-BA02-H3-30	HIF3-26D	3000	D-SUB 9Pin	300
OHT(VHL)	CTS-RCOM-BB02-H	DSUB 25P	2500	D-SUB 9Pin	300
	CTS-RCOM-PB02-H	DSUB 25P	2500	D-SUB 9Pin	300
	CTS-RCOM-BB02-H-AJ01-1	AMP 12핀 (172170)	900	JST 9Pin (SMR-09V-N)	900
	CTS-RCOM-PB01-H-AJ01-2	AMP 12핀 (172170)	500	JST 9Pin (SMR-09V-N)	500
	CTS-RCOM-BB02-AA03-1	HIF6-26D	700	Molex 4Pin (5557-4R)	800
	CTS-RCOM-BB02-AB01-1	HIF6-26D	700	Molex 4Pin (5557-4R)	800
	CTS-RCOM-BB02-AC01-1	HIF6-26D	900	-	-
	CTS-RCOM-BB02-AD01-1	HIF6-26D	1000	-	-
	CTS-RCOM-BB02-AD01-2	HIF6-26D	1200	-	-
	CTS-RCOM-BB02-AG01-1	HIF6-26D	500	Molex 4Pin (51103-0410)	880
	CTS-RCOM-BB02-AH01-1	HIF6-26D	500	Molex 3Pin (51103-0310)	880
	CTS-RCOM-BB02-AH02-1	HIF6-26D	500	Molex 3Pin (51103-0310)	880
EQ PA Ver.	CTS-RCOM-PA02	DSUB 25P	2500	D-SUB 9P	500
OHT(VHL) PA Ver.	CTS-RCOM-PB02-AA03-1	HIF6-26D	700	Molex 4Pin (5557-4R)	800
	CTS-RCOM-PB02-AB01-1	HIF6-26D	700	Molex 4Pin (5557-4R)	800
	CTS-RCOM-PB02-AC01-1	HIF6-26D	900	-	-
	CTS-RCOM-PB02-AD01-1	HIF6-26D	1000	-	-
	CTS-RCOM-PB02-AD01-2	HIF6-26D	1200	-	-

	CTS-RCOM-PB02-AG01-1	HIF6-26D	500	Molex 4Pin (53375-0410)	880
	CTS-RCOM-PB02-AH01-1	HIF6-26D	500	Molex 3Pin (53375-0310)	880
	CTS-RCOM-PB02-AH02-1	HIF6-26D	500	Molex 3Pin (53375-0310)	880

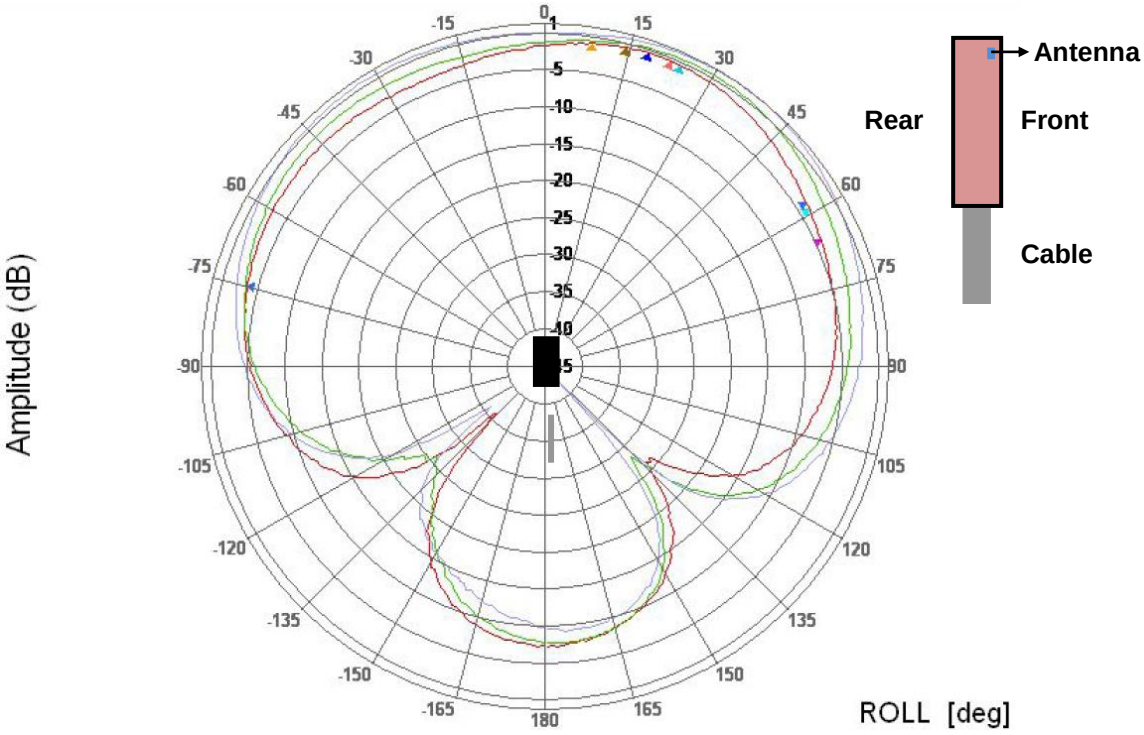
5. Antenna Radiation Characteristics

A PCB antenna used in this product is located at the position shown in the following figure in a case. To eliminate any possible obstacles to cause jamming, it requires a clearance around the entire components of the product except its mounting hole. Especially keep the antenna away from metal obstructions or other objects that may cause electromagnetic interference.

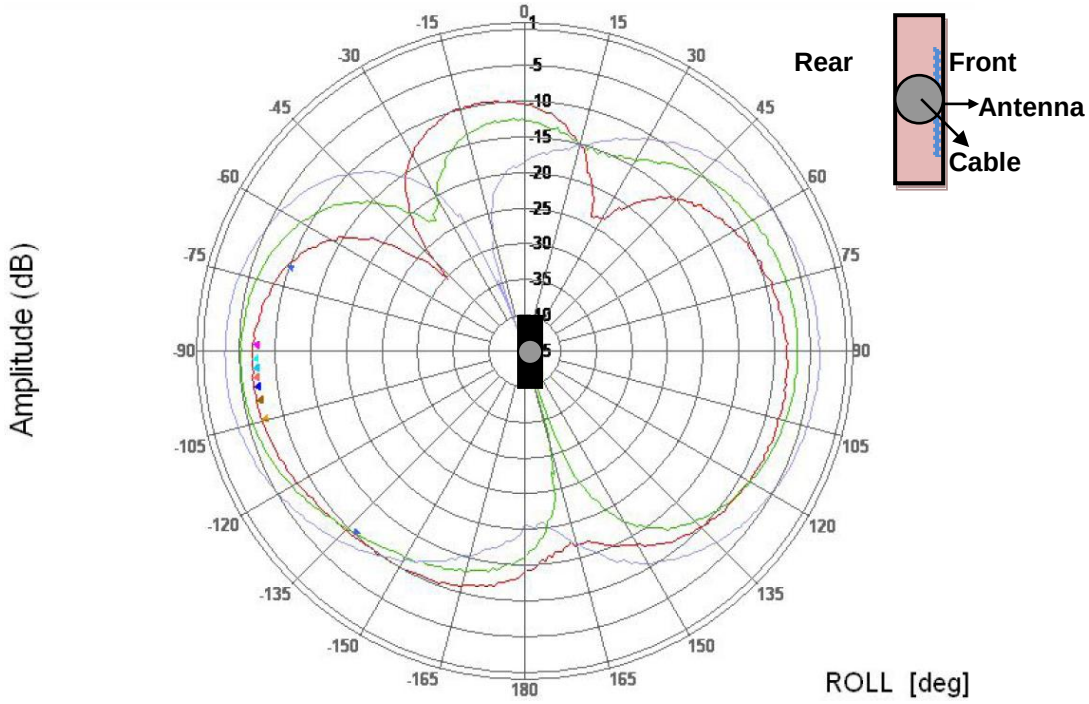


The PCB antenna used in this product has the following characteristics of radiation in general. Referring to this feature, arrange this product in a direction you can enhance the receiver sensitivity (gain) of the antenna.

- Figure 1 Vertical Orientation Pattern: Intensity of electromagnetic wave at 3M away with the antenna oriented vertically

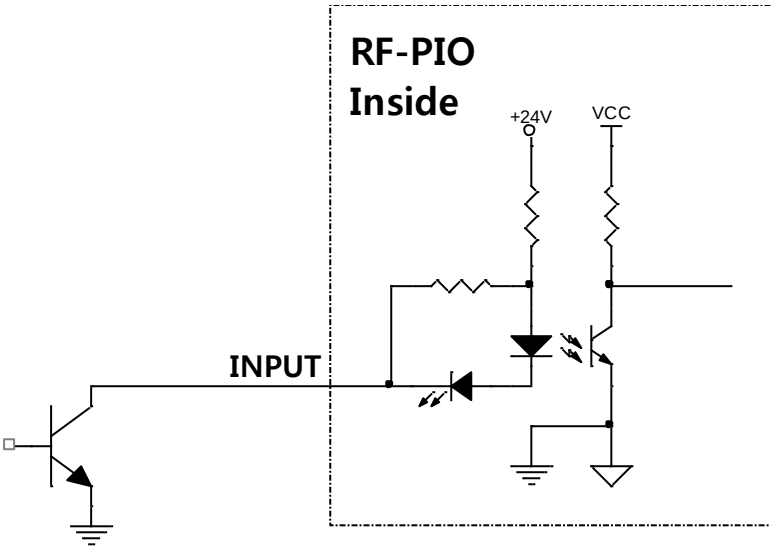


- Figure 2 Horizontal Orientation Pattern: Intensity of electromagnetic wave at 3M away with the antenna oriented horizontally

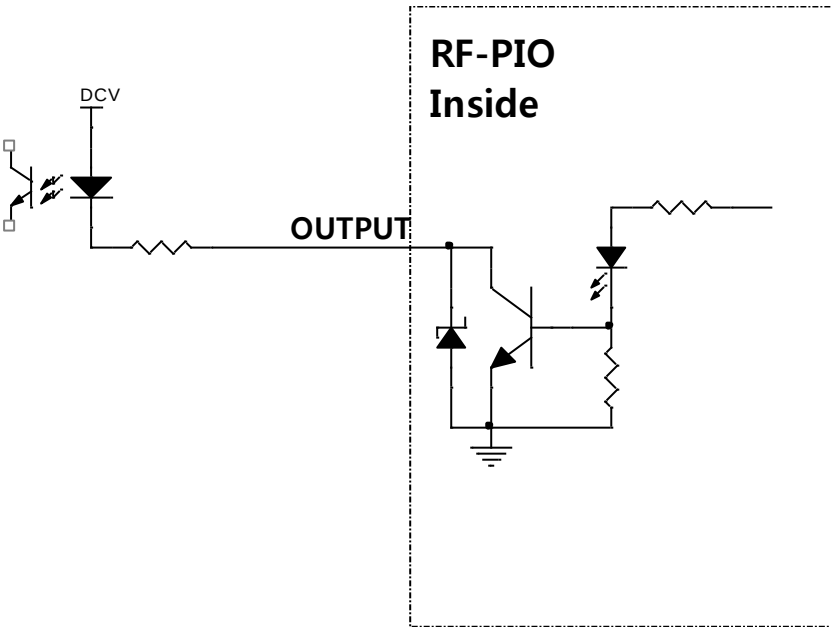


6. I/O Interface

- Input circuit: Maximum 10mA, connected to the output circuit of equipment or OHT



- Output circuit: Maximum NPN open-collector output at 50mA or less (30V or less)
  V_{CE} - max. 100mV / 10mA, connected to the input circuit of equipment or OHT

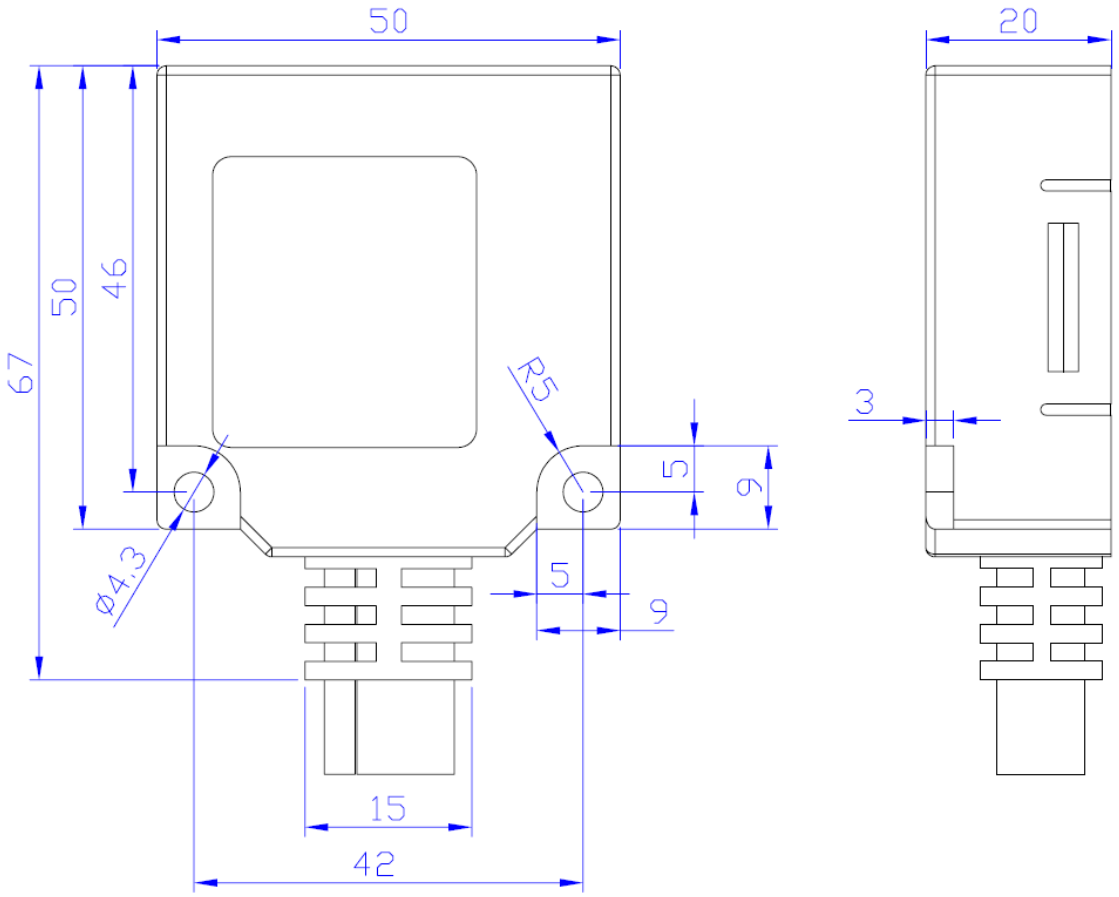


7. Product Specification

Division	Specific item	Contents
Display part	GO	Display when wireless master/slave communication starts
	STATE	Glimmer with the external 24V power supply, serving as a watchdog signal to display the operating state(performance state)
	IN	Display the operating state of a 8Bit input port
	OUT	Display the operating state of a 8Bit output port
Function	Communication media	2.4GHz, bandwidth 1MHz
	Frequency band	2.4GHz, 80 channels*1)
	Communication period	About 25ms
	Safety function	Check the serial number (ID), checksum (CRC-16)
	Communication method	1:1 communication, Half Duplex
	Connector	BA02 Model : 25 Pin DSUB
		BB02 Model : Hirose 26 Pin, 1.27mm pitch for OHT
	ID setting	Select a serial number of equipment PIO (10Byte); ID should not overlap with other IDs in order not to interfere with other PIO.
	Channel setting	Set the frequency (3Byte) to communicate between PIO and arrange the channels not to overlap with neighboring PIO.
	Setting function	Configure tasks using a serial port and I/O bit
Environment	Storage environment	Storage temperature : -25 ~ 70°C Storage humidity : 5 ~ 95 %RH (However, there shall be no dew condensation)
	Operating environment	Operating temperature: 0 ~ 40°C Operating humidity:35~85 %RH (However, there shall be no dew condensation) Vibration : 4~150 Hz, 4.9m/s^2 or less
Power	Input voltage	DC 24V±10%
	Consumed current	130mA or less @ 24V
Operating distance		2M@0dBm(provided that there is no object that causes jamming in the middle)
Size(W×H×D)		50×53×20mm (Except connector extrusions)
Weight		About 400g

*1) Should be kept away from frequency interference with other wireless devices (e.g. wireless LAN, Bluetooth)

8. Mechanical Specifications



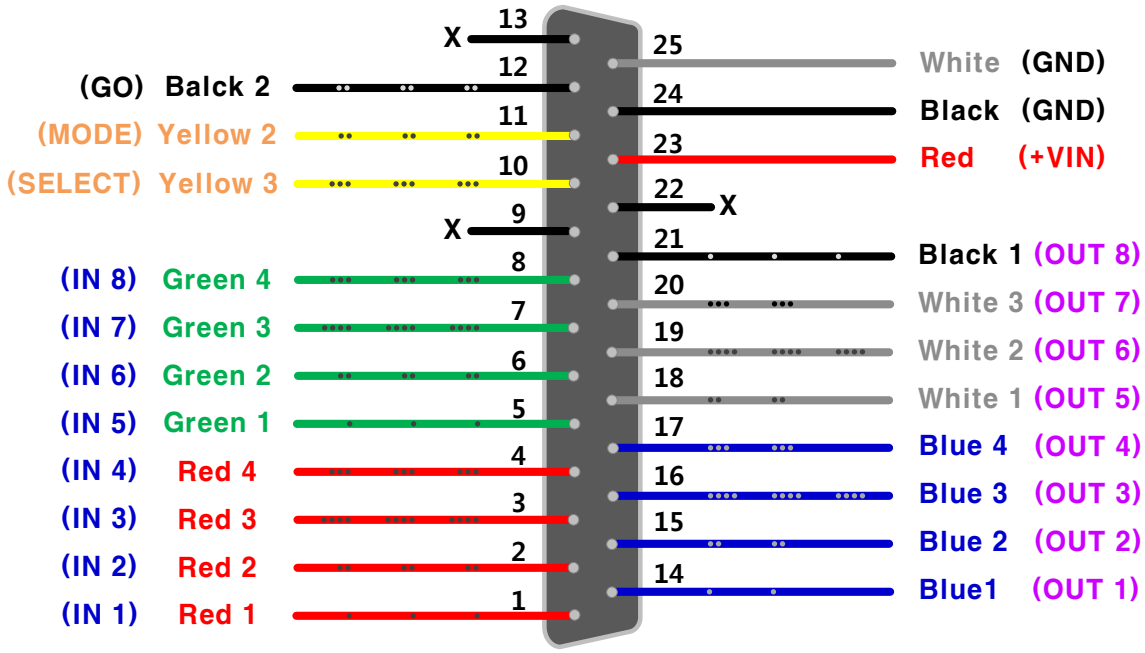
Unit: mm

9. Cable and Pin Information

- For equipment (CTS-RCOM-BA02) : Slave, DSUB 25Pin, Pin Type, cable length 2.5M

Function	Pin No.	Color	Function	Pin No.	Color
Input 1	1	Red 1	Output 1	14	Blue 1
Input 2	2	Red 2	Output 2	15	Blue 2
Input 3	3	Red 3	Output 3	16	Blue 3
Input 4	4	Red 4	Output 4	17	Blue 4
Input 5	5	Green 1	Output 5	18	White 1
Input 6	6	Green 2	Output 6	19	White 2
Input 7	7	Green 3	Output 7	20	White 3
Input 8	8	Green 4	Output 8	21	Black 1
Not Connected	9	X	Not Connected	22	X
SELECT	10	Yellow 3	+VIN	23	Red
MODE [1)]	11 (GND)	Yellow 2	GND	24	Black
Go (Ready)	12	Black 2	GND	25	White
Not Connected	13	X	x	x	
Serial port (DSUB 9 Pin, Female)			TxD	2	Black
			RxD	3	Brown
			GND	5	Red

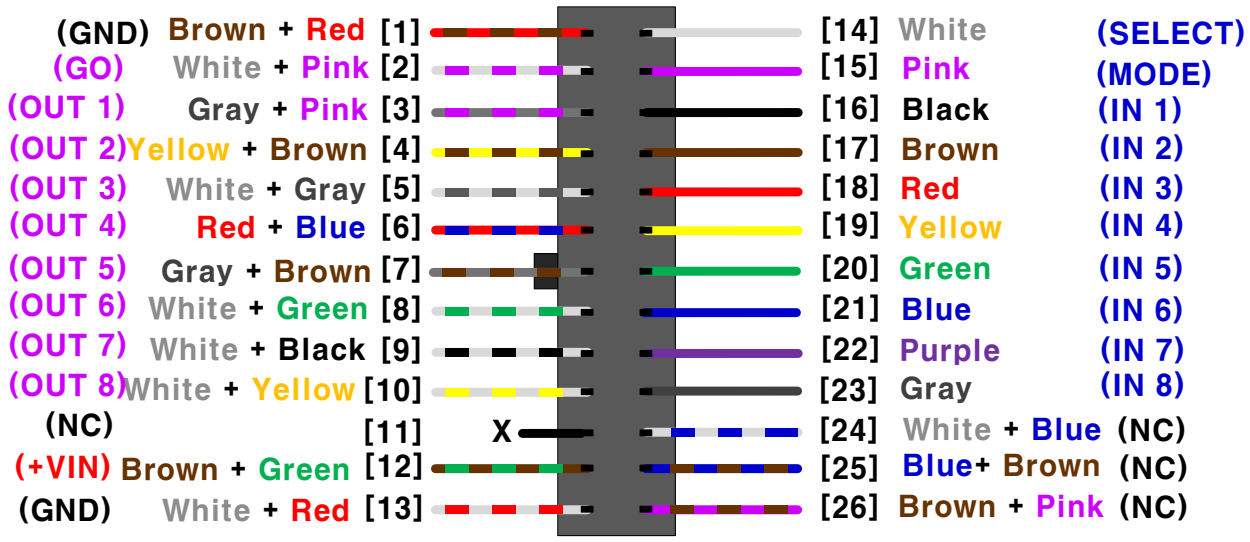
1) You do not have to additionally connect Mode pin (11) from the outside because it is already linked to GND from the inside.



< Cable Wiring Diagram For equipment >

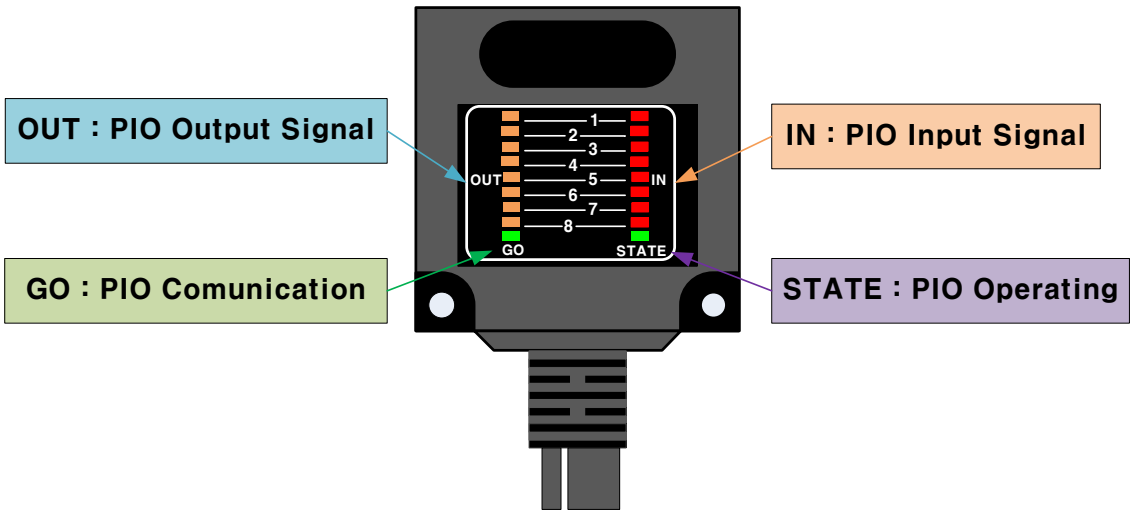
- For OHT(CTS-RCOM-BB02) : Hirose 26 Pin, 1.27mm IDE Connector

Function	Pin No.	Color	Function	Pin No.	Color
Input 1	16	Black	Output 1	3	Gray + Pink
Input 2	17	Brown	Output 2	4	Yellow + Brown
Input 3	18	Red	Output 3	5	White + Gray
Input 4	19	Yellow	Output 4	6	Red + Blue
Input 5	20	Green	Output 5	7	Gray + Brown
Input 6	21	Blue	Output 6	8	White + Green
Input 7	22	purple	Output 7	9	White + Black
Input 8	23	Gray	Output 8	10	White + Yellow
SELECT	14	White	Ready (Go)	2	White + Pink
MODE	15	Pink	+VIN	12	Brown + Green
X	11, 24	X	GND	1	Brown + Red
X	25, 26	X	GND	13	White + Red
Serial port (DSUB 9 Pin, Female)			TxD	2	Black
			RxD	3	Brown
			GND	5	Red



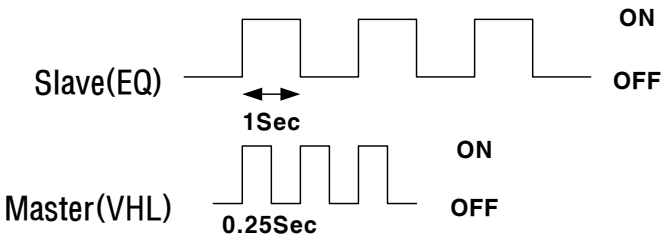
< Cable Wiring for OHT >

10. Status Display Mode



LED name	Description
1~8	IN : Input status, turned ON during low input OUT : Output status, turned ON during low Output
GO	Turned ON when the two RF-PIO have successfully transmitted or received the data from each other Shows the delay time until the GO LED is turned OFF after the device has stopped transmission or reception: CTS-RCOM-BA02 : 10 sec CTS-RCOM-BB02 : Turned ON continuously CTS-RCOM-Hx0x : 3 sec
STATE[1)]	Used as a watchdog signal to check the performance status of RF Module. • Master mode: 0.25 sec. • Slave mode: 1 sec. • Standby mode: 0,05 sec.

1) STATE indicates the interval of time each flicker lasts.



11. Operating Mode Selection

Signal name	Usage
Mode (Input)	Input to select a PIO mode ▪ GND : Slave mode ▪ OPEN : Master mode
Select (Input)	Input to operate a PIO ▪ GND : PIO function stops ▪ OPEN : PIO works
GO (Output)	Turned ON when communicating between Master and Slave PIO

- Master mode: An equipment transmits the RF—data generated from the input port of the vehicle controller to the channel when RF-PIO starts to work by opening the Select signal. open select signal open You can use this mode by mounting the device onto OHT or AGV.

- Slave mode: Even though the RF-PIO starts to work by opening the Select signal, this device only receives the signals, not transmitting. When it receives the RF from the Master, it then wirelessly transmits the data, which is generated from the input port input port You should use this mode by mounting the device onto an equipment.

12. ID & CH Setting Method

Due to its wireless accessibility, CTS-RCOM Series may cause simultaneous interference with multiple devices. In order to communicate with only one device, you should try to set the same ID and CH (channel) of another device in advance. You can set your ID and CH only by using serial communication command.
The following are the setting of serial port and structure of commands.

- Setting of serial communication: 57600,8,n,1, no flow control
- All commands start with “<” and end with “>.”
- Response to command starts with “[”and ends with “].”
- Master Mode (used in the AGV or OHT)
  - When you have determined a specific device to communicate, you should set the same ID and channel of the equipment (Slave) through the serial port.

  *) ID and Channel Setting sequence

  ① Select On(Wait Mode)
  - Controller: Select On
  - RF PIO: Before starting wireless communication
  - Controller: Set the same ID and channel of the counterpart equipment
  - RF PIO: Maintain the configured setting of your ID and channel.

  ② Select Off(Communication Mode)
  - Controller: Select Off
  - RF PIO: Start to communicate with PIO of the counterpart equipment
  - Controller: Wirelessly exchange the I/O data with the equipment

  ③ Select On(Wait Mode)
  - Controller: Select On
  - It switches to the pending status for communication and maintains the data of ID and channel for 3 seconds. After 3 seconds, the ID and channel are being initialized as zero values. (ID=0, CH=0) Find the next equipment and set your ID and channel again in the order explained above.

- Slave Mode (used in the device)
  - After connecting with the serial port, set the ID and channel using the communication command. The configured data remains the same in the EERPROM even after the power is turned off.

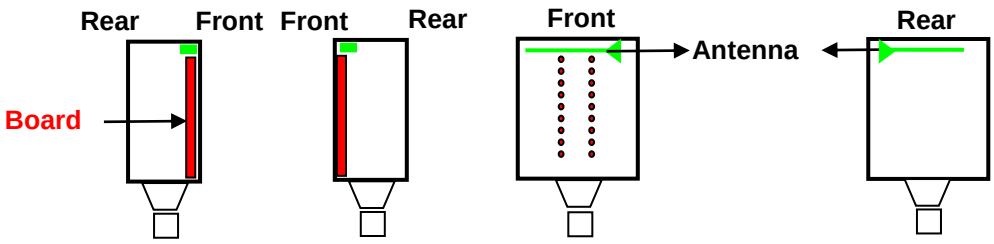
13. RF-PIO Serial Communication Command

<table>
<tr><th>`</th><th>Function</th><th>Setting</th><th>Response</th></tr>
<tr><td rowspan="2"><A></td><td rowspan="3">Address Setting
〈A=569A-XXXXXX〉
6-digit hex
Unique number</td><td><A=569A-123456></td><td rowspan="3">[A=569A-123456]</td></tr>
<tr><td><A=123456></td></tr>
<tr><td><A></td></tr>
<tr><td colspan="3">*) Default Setting : 0000-000000
*) Adjustable ID and CH with the RF PMAN (Refer to 'RF Pman manual')</td></tr>
<tr><td rowspan="2"><C></td><td rowspan="2">Channel Setting
〈C=XX〉
1~80</td><td><C=56></td><td rowspan="2">[C=56]</td></tr>
<tr><td><C></td></tr>
<tr><td colspan="4">*) Default Setting : 00, programmable range of 1~80</td></tr>
<tr><td rowspan="3"><B></td><td rowspan="3">〈B=569A-XXXXXX:YY〉
1~80
6-digit hex
Unique number
Set the address and channel simultaneously</td><td><B=569A-123456:56></td><td rowspan="3">[B=569A-123456:56]</td></tr>
<tr><td><B=123456:56></td></tr>
<tr><td><B></td></tr>
<tr><td colspan="4">*) Default Setting : 0000-000000:00</td></tr>
<tr><td rowspan="2"><P></td><td rowspan="2">Transmission Power Setting
〈P=X〉
0~3</td><td><P=3></td><td rowspan="2">[P=3]</td></tr>
<tr><td><P></td></tr>
<tr><td colspan="4">*) Default Setting: 3, programmable range of 0~3
(3 = maximum transmit power)</td></tr>
<tr><td rowspan="2"><D></td><td rowspan="2">Monitor the data of communication in real time
〈D=X〉
0~2</td><td><D=0></td><td rowspan="2">[D=0]</td></tr>
<tr><td><D></td></tr>
<tr><td colspan="4">*) Default Setting: 0, 0 : No response, 1,2 : data output of communication</td></tr>
<tr><td rowspan="2"><T></td><td rowspan="2">Time setting
〈T=XX/XX/XX YY:YY:YY〉
Year, Month, Day Hours, minutes, seconds</td><td><T=11/11/11 11:11:11></td><td rowspan="2">[T=11/11/11 11:11:11]</td></tr>
<tr><td><T></td></tr>
<tr><td colspan="4">*) Default Setting: 0, 0 : No response, 1,2 : data output of communication</td></tr>
<tr><td><V></td><td>Check the F/W Ver.</td><td><V></td><td>[V=6.2H]</td></tr>
<tr><td rowspan="2"><M></td><td rowspan="2">Switch between RF-IO and HOIST PIO
〈M=X〉
0,1</td><td><M=1></td><td rowspan="2">[M=1]</td></tr>
<tr><td><M></td></tr>
<tr><td colspan="4">*) Default Setting: varies by purpose of usage, 0:RF-PIO, 1:HOISTPIO
*) Features when switching to Hoist PIO
- HOIST PIO(M) : Install in ICON board
- HAND PIO(S) : Install in HAND board
- Use the command A only; the commands B and C are not allowed (The channel is only one)
- Set the HOIST PIO ID <A=A9B6-5XXXXX>
- Remember the ID even after turning it OFF in the Master Mode
- The HAND PIO GO signals are maintained only for 3 seconds after communication is disconnected</td></tr>
</table>

*) Refer to the user manual of the RF-PIO command for the detailed setting.

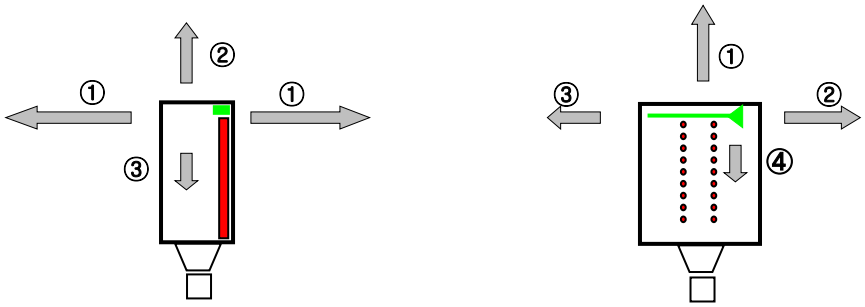
14. RF PIO Installation Method

The basic antenna layout and configuration of RF PIO are as follows:



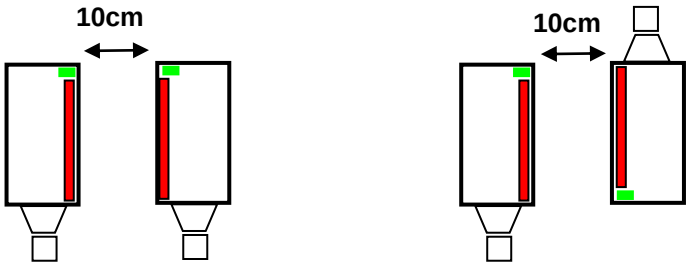
<Antenna layout>

The intensity of antenna transmission output, depending on PIO directions, is as following: the order for relative intensity of outputs is indicated with each number, depending on the directions of PIO

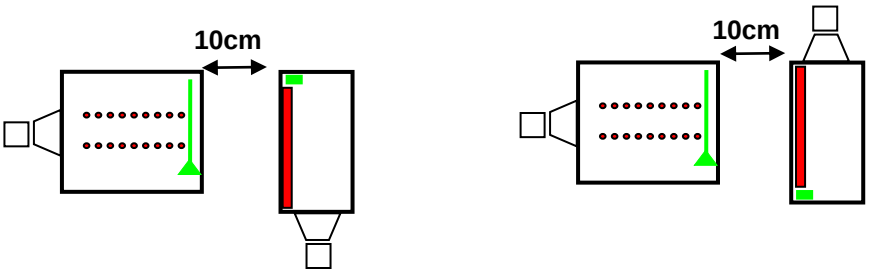


<Comparison of Antenna Output Intensity>

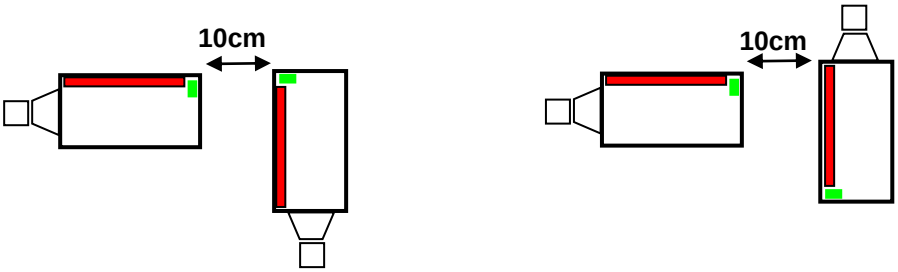
This is an example of measuring the reception attenuation depending on various installation directions in a distance of 10cm between the Master and the Slave PIO. Remember that the figures suggested in this section are relative values with a measurement error. The reception sensitivity can vary by installation directions even at a short distance as the figure below shows; this difference can impact the performance of RF communication. Therefore, when installing a PIO in practice, make sure you check if the RF characteristics are at the optimal condition before using.



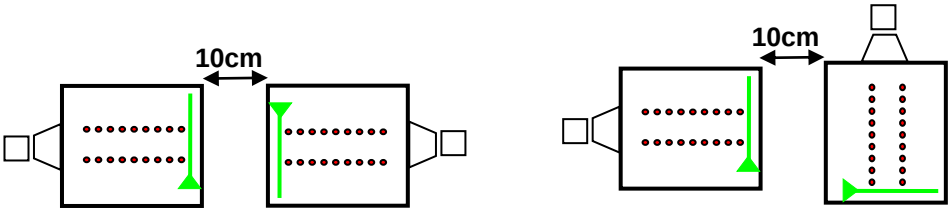
<-12dB attenuation>



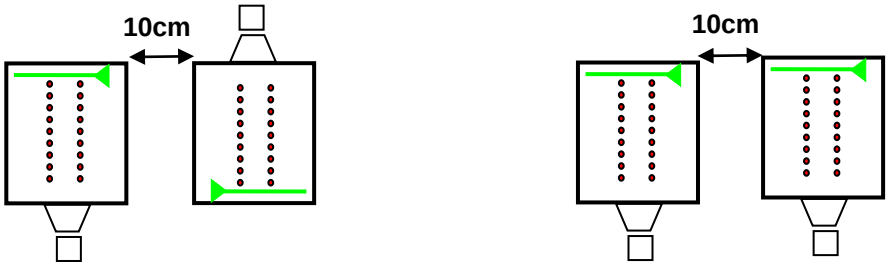
<-15dB attenuation>



<-20dB attenuation>

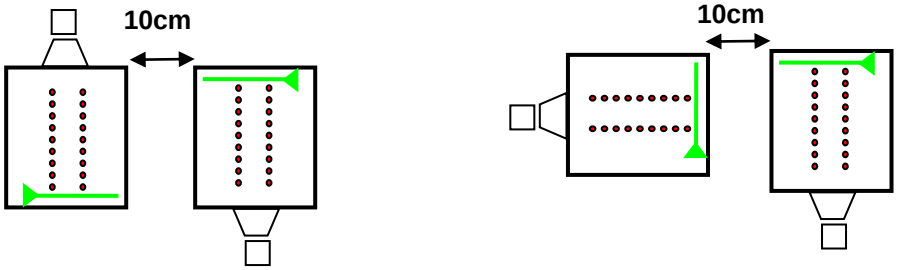


<-20dB attenuation>



<-22dB attenuation>

<-26dB attenuation>



<-28dB attenuation>

• Caution

1) Other objects such as metals, mirrors, etc., placed in a linear distance of two sensors, obstruct the wireless performance. Remove the obstacles on the wireless path as many as possible.
2) You can use this product without any communication errors when no other wireless devices interfere with it in an open space.
3) The antenna is located around the green section in the figure above. As with the antenna, care should be taken not to place conductive materials like metals within a 6mm radius around this antenna.
4) Other neighboring RF devices may interfere with the frequency of the product. For its reliable operation, you should use it in the environment without any frequency interference.
5) Especially, when you are using this product with other devices of 2.4 GHz band, assign its channel such that the channels do not overlap each other.
6) Keep the distance between the PIOs for equipment more than 20cm.
7) With the equipment using magnetrons in the same place, you should shield this device from the electromagnetic waves of the equipment by all means.

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

CERTIFICATION

SRRC

无线电发射设备
Radio Transmission Equipment
型号核准证
Type Approval Certificate

根据《中华人民共和国无线电管理
In accordance with the provisions on the Radio
条例》，经审查，下列无线电发射设备
Regulations of the People's Republic of China, the following
符合中华人民共和国无线电管理规定和
radio transmission equipment, after examination, conforms
技术标准，其核准代码为：
to the provisions with its CMIIT ID: