CTR-003 Series

Specified Low Power Radio Station Device

User manual

Ver 1.0

2017-02-01

Cathay Tri-Tech., inc.

【Revision History】

Rev.	Revised content	Division	Date	Officer
1.0	First edition	Create new	2017-02-01	CTT

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First

This product CTR-003 is communication device which is using specified low power radio. It has digital input/output and analog input/output as terminal interface. Also, it is capable to communicate measurement information such as AC, DC4-20mA, pulse, and contact via the wireless networks.

1. Appearance and parts name

1.1. Appearance

Appearance of this device indicated below

<Front appearance>

<Back side appearance and IO plug>

1.2. Appearance and parts name specification

1.2.1. Front face

LED for operation status display, power supply terminal, RS-232C terminal, micro USB terminal, and SMA connector for the antenna connection are placed on the front face of this device.

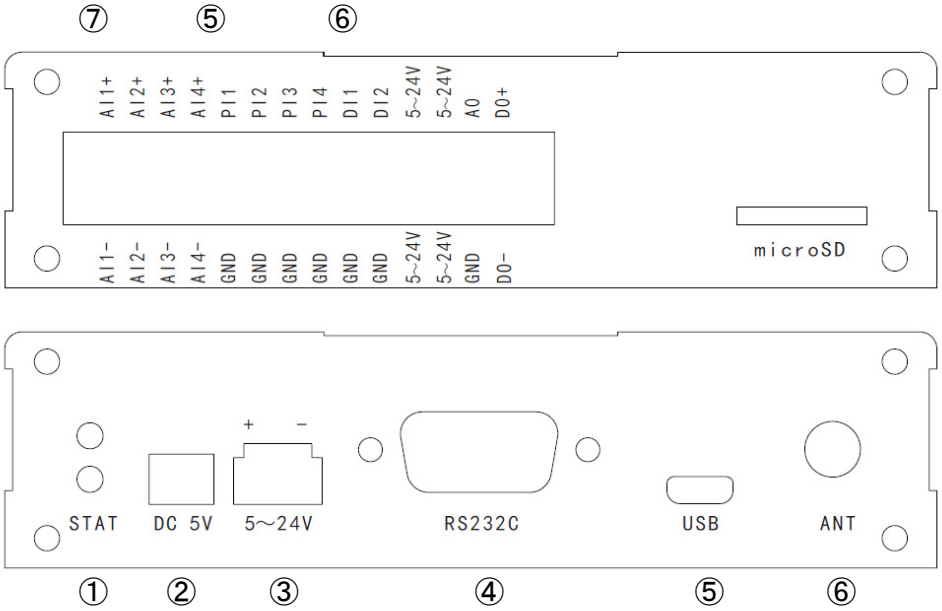
1.2.2. Back face

IO terminal block with dedicated IO connector of the interface for signal source connection, micro SD card slot are placed on back face. Power terminal has Molex 3 pins terminal and terminal for the AC adaptor connection, both of them will be connected by using accessories are 3 terminals power cable, and power adaptor.

1.2.3. Top and bottom face

The bottom face of this device are united with flange for attachment and fixity. Also, the nameplate are sealed on the top face.

1.3. Panel parts description



Details of panel parts

Panel	Numbers	Printing	Description
Front face	①	STAT	Top is red, below is green. LED functions (below) indicates conditions such as power, communication, abnormal status.
	②	DC 5V	The valuate input range of EIAJ jack (below) , connect with AC adaptor.
	③	＋ － 5～24V	Power source polarity (top) , voltage input range of 3 pins power cable. Connect with 3 pins power connector of power Molex.
	④	RS232C	Protocol of serial (below) Connect with D-SUB9 (female)
	⑤	USB	miniUSB terminal (below) Connect with miniUSB cable
	⑥	ANT	SMA connector (below) Connect with 824MHz～960MHz corresponding antenna
Back face	⑦	AI1+ AI2+ AI3+ AI4+ PI1 PI2 PI3 PI4 DI 1 DI2 5～24V 5～24V AO DO+	Connection characteristics of upper IO connector (top) Connect with two integrated dedicated stacking connectors (14x2)
	⑧	AI1- AI2- AI3- AI4- GND GND GND GND GND GND 5～24V 5～24V GND DO-	Connection characteristics of bottom IO connector (below) Connect with two integrated dedicated stacking connectors (14x2)
	⑨	microSD	microSD card slot (top) use for microSD card

2. Spec specifcation

2.1. Body

Spec of this device indicated below

Items		Specification
Product name		Specified Low Power Radio Station Device
dimension (W x H x D, mm)		103×30×70 (without protrusion)
weight		Approximately 260g
Power supply allowance input		DC5～24V±5%
Current consumption		MAX: 200mA (by 5V)
interface	Power supply input terminal	Molex 3Pin x 1, EIAJ-2 ○ x 1
	RS-232C terminal	D-SUB 9Pin male x 1
	USB terminal	Micro USB-B jack x 1
	Antenna terminal	SMA jack x 1
	IO terminal block	Separate insertion type x 28
	microSD slot	Insert type x 1
LED indication		2 (green x 1, red x 1)
Abnormality monitoring		By watchdog
Environmental condition	Operation guarantee	temperature：45℃ humidity：15～85%
	Storage guarantee	temperature：-20～70℃ humidity：5～95%
Wireless communication	module	SIMCOM product using SIM20-433/868/915
	Frequency band	CTR-003A：433.33～434.79MHz CTR-003B：863.55～870.00 MHz CTR-003C：900.84～928.00MHz
	Antenna power	Less than 20mW
	Distance	Approximately 1000m (open Sky)
	Communication rate	9600bps
CPU		Freescale KinetisL26 ARM Cortex M0 48MHz
ROM/RAM		32kB/256kB
OS		FreeRTOS8.2.2

3. Interface specification

3.1. IO port

IO port specification

Items	Standard		Remarks
Digital input	Number of input	6 channels	pules x 4 : PI1～PI4、GND contact x 2 : DI1～DI2、GND
	Input format	Photo coupler non insulated	Pull up resistor (1.8kΩ)
	Input voltage	DC5V～24V (±1V)	Same as power input voltage
	Input current	OFF : less than 0.1mA ON : more than 1mA	
	Chattering removal	＜1ms	More than 1ms supposed to be soft configuration, capable to be range 10～100ms
	Response speed	＜10ms	
Digital output	Number of output	1 channels	DO+、DO-
	Output format	Photo coupler, open collector output	
	Output voltage	MAX DC12V	
	Output current	MAX 20mA (per 1 point)	
	Output ON residual current	Less than 1V (output current＜20mA)	
Analog input	Number of input	4channels	AI1+、AI1-～AI4+、AI4-
	Input format	DC input of 4-20mA sensor AC input of current sensor CT	AC and DC use 4CH By setting it is capable to convert input format
	Termination resistance	AC : 8Ω、120Ω、1.8KΩ 4-20mADC : 120Ω	When AC is used, it automatically convert resistance depending on current range of signal source
	Measurement range (current)	AC : 0.01～125mAAC 4-20mADC : 0～25mADC	Numbers indicated by AC are 3 resistance patterns and total range
	Measurement accuracy	AC : ±2%F.S. 4-20mA : ±1%F.S.	
	Conversion rate	10 times／sec	
Analog output	Number of output	1 channel	
	Output format	Op amp output	
	Output voltage	DC1.5V±1.4V	
	Output current	MAX 20mA (per 1 point)	
	Output ON residual current	Less than 1V (output current＜20mA)	
Power output	Number of input	4 channels	
	output voltage	DC5V～24V (±0.45V)	Same as power input voltage
	Output current	MAX 1800mA	When AC adaptor is used, it will be total current value of 4 channels

3.2. RS-232C port

RS-232C specification

Items	Standard	Remarks
Interface	RS-232C compliance、 DCE type	
Connector	RS-232C 9Pin male	DCE type but uses male connector
Signal	TxD, RxD, DTR, DSR, RTS, CTS, DCD, RI, GND ※please refer annotation below	Signal name is seen from DTE
Communication protocol	Asynchronous type	
Communication speed (bps)	1200, 2400, 4800, 960029.2k, 38.4k, 57.6k, 115.2k	
Communication method	Full duplex / Half duplex	
Data length	7bit, 8bit	
Start bit	1bit	
Stop bit	1bit/2bit	
Parity bit	none/even/odd	
Flow control	none, hardware flow control (RTS/CTS)	

3.3. Power interface

Power interface specification

Items	Standard	Remarks
3 pins DC power terminal	Molex70553-0002 3 pins	2 pins will be used (+/-)
Power terminal for AC adaptor	EIAJ-2 round shape	Connect within the substrate
Input voltage	+5～+24V ±5%	
Current consumption	When output is 5V less than MAX1.0 A	Average less than 0.85A
3 pins power cable	Molex plug - open length 1ｍ	Product number 50-57-9403(old 70066-0177) + 2x16-02-0087 (old 70058-0024)
AC adaptor	AC input 100～240V 50/60Hz 0.3A DC output 5V±5%, MAX 2A	Cable length 2m

3.4. Antenna interface

Antenna interface specification

Items	Standard	Remarks
Connector type	SMA jack type	Antenna SMA plug for mating
Nominal impedance	50Ω	
frequency	CTR-003A :433.05~434.79MHz CTR-003B :868.00-869.70MHz CTR-003C: 902-928MHz	

4. Function specification

4.1. Wireless communication function

Wireless communication function specification

Items		Specification	Remarks
Wireless communication module		SIMCOM product SIM20-433/868/915	
Wireless communication function	Frequency band	CTR-003A：433.33～434.79MHz CTR-003B：863.55～870.00 MHz CTR-003C：900.84～928.00MHz	A band range：330kHz、４CH B band range：450kHz、１４CH C band range：480kHz、60CH
	Communication speed	9600bps	
	Destination designation	It is capable to set serial number of communication module	Channel of Communication frequency should be same
Measurement data response function		According to request of master device, it will send measurement time and data from SD card	
Master and slave device automatic identification function		It will be operated by connection of serial port and communication as master device	Changing the registration of the slave device connected to the wireless network must be performed via the master device.
Wireless relay function		When the master device / slave device can not communicate directly with distance.→ Automatically scans the slave device radio waves, make the connection and data communication.	Without master device, it can relay 3 levels
Maintenance control function		FW version, import and export of setting file, getting event log, and maintenance control command can be received and operated	

4.2. Serial communication function (only master device)

Serial communication function specification

Items		Specification	Remarks
Serial communication function	Connecting device	Our product CTL-001	
	Connector specification	RS232C port	
	Data communication speed	115200bps	
Slave device change registration function		It notifies update of measurement information received from the host device, registers, changes, and deletes each channel measurement of the slave device.	
Collection data notification function		Regularly patrol the slave device that is registered in the management information, you can be notified of the collected measurement data.	
Facility status notification function		Regularly monitor the slave device that was registered in the management information, it is possible to notice the connection and disconnection state.	
Maintenance control function		FW version, import and export of setting file,	

	getting event log, and maintenance control command can be received and operated	

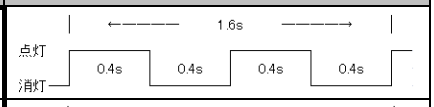
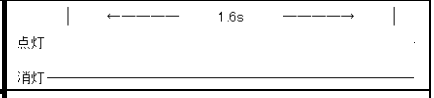
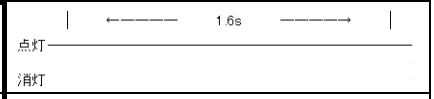
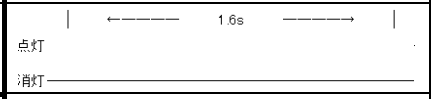
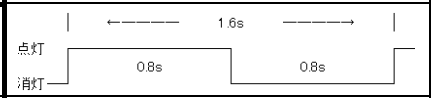
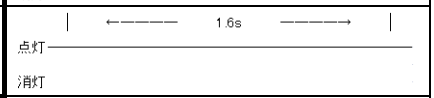
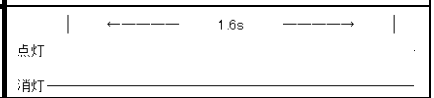
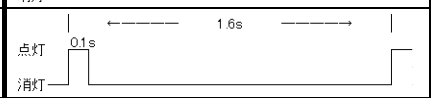
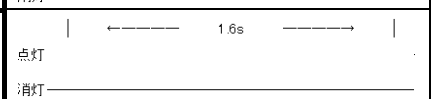
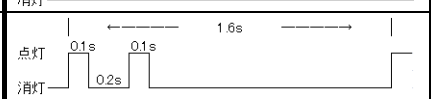
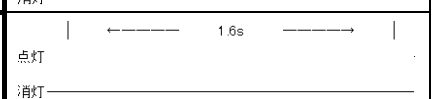
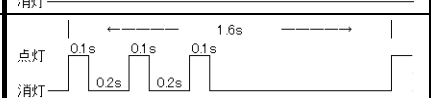
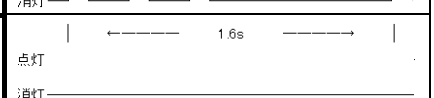
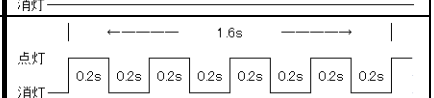
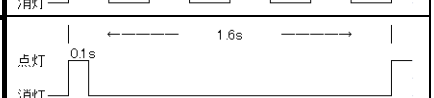
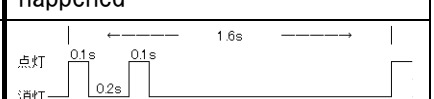
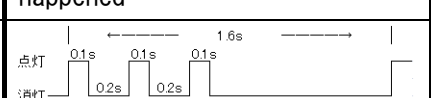
4.3. Measurement function

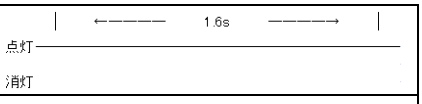
Measurement function specification

Item	Specification	Remarks
CT alternating current measurement function	Measure the single-phase or three-phase AC power supply through the current CT sensor on the general purpose secondary side of 0.01 mA to 125 mA and calculate the effective current. With the specified sampling period, time and accumulated value can be saved on the SD card.	It automatically convert the resistance by range of signal measurement
4 ~ 20mA direct current measurement function	Measure 4 to 20 mA DC current signal and calculate by moving average count by setting. It is possible to save the time and the accumulated value to the SD card at the specified sampling period.	it doesn't filter current value if it is out of normal range.
Pulse count measurement function	It is possible to count on the sampling cycle that specifies the pulse signal and save the time and count value to the SD card.	
Contact state monitoring function	When monitoring the on / off status of the connected contact signal at all times and detecting a state change (ON ⇒ OFF, OFF ⇒ ON), it is possible to save the occurrence time and state value to the SD card.	

4.4. Operating function LED indication

LED indication specification

Mode	Status		LED	On	Off	Lighting waveform (1.6s period)
Maintenance	All		Red	0.4s	0.4s	
			Green	×	○	
Operating	Initial activation		Red	○	×	
			Green	×	○	
	Disconnected		Red	0.8s	0.8s	
			Green	○	×	
	Wireless communication (Slave matches)	Strength 1	Red	×	○	
			Green	0.1s	1.5s	
		Strength 2	Red	×	○	
			Green	0.1s＊2	1.2s	
		strengeth3	Red	×	○	
			Green	0.1s＊3	0.9s	
	Serial communication (master device)		Red	×	○	
			Green	0.2s	0.2s	
	Abnormal status 1 ※ IO device access failed		Red	0.1s	1.5s	
			Green	—	—	Maintain status when soothing happened
	Abnormal status 2 ※SD card loading failed		Red	0.1s＊2	1.2s	
			Green	—	—	Maintain status when soothing happened
	Abnormal status 3 ※ Flash access failed		Red	0.1s＊3	0.9s	
			green	—	—	Maintain status when soothing happened

	Abnormal status 4 ※the other	red	○	×	
		green	—	—	Maintain status when soothing happened

5. Before using

5.1. Inspection

Before shipping this device, it is inspected enough but please confirm below.

1) Please confirm case corruption due to shipping accident.
2) Please confirm LED is correctly working such as red LED and green LED lighting. Please use SD card (need first setting) and connect power cable when you check.
3) Please check all accessories in and not broken.

5.2. Installation condition

Please hesitate to use in these circumstance

1) Dusty place, place where corrosive gas drifts.
2) High temperature and humidity, place intensely changes air condition
3) Place gets strong vibration or continuous vibration.
4) Direct sunlight place or windy place
5) Around strong magnetic field, electric filed, and high frequency filed
6) Dangerous place without space
7) Place where explosive gas drifts

5.3. Electrical connection

1) For your safety, please use ground wire.
2) Please only use AC adaptor from accessories or 3 pins power cable. If you use different one, it may cause troubles.
3) Please use electromagnetic shield wire for analog signals

5.4. Use of microSD

SD card have to be initialize before you use. How to initialize is indicated below

1) You insert microSD card to PC (when microSD slot is not worn, please use SD adaptor)
2) Format to SD drive is recognized by OS tool
   - ① . file system : FAT32
   - ② . allocation unit size : 32kbyte
3) Make folders in SD drive
   - ① . cfg ⇒ folder stores setting file (CTRConfigFile.cfg)
   - ② . dat ⇒folder stores measurement data from slave device (S_YYMMDD.DAT)
   - ③ . evt ⇒folder stores event log file for maintenance (E_YYMMDD.LOG)
   - ④ . fw⇒folder stores update firmware (XXYYZZ_YYYYMMDD.srec)
   - ⑤ . log ⇒folder stores system information (COMMPARA.LOG) , serial number (SNSRINFO.LOG) ,and debug log file (R_YYMMDD.LOG)
   - ⑥ . trx ⇒folder stores measurement date of master device collected from slave device (M_YYMMDD.DAT)
   - ⑦ . tmp ⇒folder stores processing file such as file transfer
4) In 「cfg」, you make text file of 「CTRConfigFile.cfg」, edit like below, and save.

```
# CTR-003 ConfigFile: (temp)Created by sys initial.
# You can edit parameters and a file version.
FILE_VERSION=01_00_201511250000;

#START
SIM20_CFG_CHA=0;
SIM20_CFG_CID=1;
PULSE_EDGE=0;
SEND_NEW_DATA=0;
RENTENTION_DAYS=10;
LOG_OUT_LEVEL=3;
LOG_FILE_NUM=10;
FW_UPDATE_FLAG=0;
GW_HEALTH_TIME=90;
CTR_HEALTH_TIME=120;
CHATTER_TIMES=10;
#END
```

※ Setting values are indicated below

Items		Specification	Remarks
Configuration version	FILE_VERSION	01_00_201511250000	Capable to change freely by setting
Wireless channel ID	SIM20_CFG_CHA	0～3/13/59	Specific low power channel number
Wireless network ID	SIM20_CFG_CID	1～255	Wireless network ID
PI edge method	PULSE_EDGE	0：Falling 1：Rising	When pulse counting, this edge is target.
New data transmission flag	SEND_NEW_DATA	0：Send all unsent data 1：Send only new data	Only new data will be sent flag
Days to keep data	RENTENTION_DAYS	1～30	Days to keep measurement data
Log output level	LOG_OUT_LEVEL	0：None output 1：Startup & abnormal 2：Disconnection & synchronize measurement information 3：Change & maintenance & synchronize time	Output message level to log file
days to keep log	LOG_FILE_NUM	1～30	Days to keep debug and event log
FW update flag	FW_UPDATE_FLAG	0：Unavailable 1：Available	Firmware update flag
GW alive monitoring interval	GW_HEALTH_TIME	60～120	HC interval（sec） to Communication GW
Slave device alive monitoring interval	CTR_HEALTH_TIME	60～300	HC interval (sec) between master and device
DI/PI chatter time	CHATTER_TIMES	0,10,20,30,40,50,60,70,80,90,100	Chattering prevention time by digital input

5) Take SD drive out from OS.

FCC Statement

This equipment has been tested and found to comply with the limits for a Class B digital device,

pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

FCC Radiation Exposure Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Caution!

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Hereby, Cathay Tri-Tech.,Inc, declares that this device is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.The full text of the EU declaration of conformity is available at the following internet address:
http://www.cathay.jp/support/oversea/eu-doc.html

Warning: Operation of this equipment in a residential environment could cause radio interference.

Contract us:
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