Revision History

Date	Changes
2019.09.15	Initial Release
2019.12.03	Update parameters regarding communication item

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Safety Guidelines

This chapter explains how to operate the "GAT1000" product safely.

By reading the following suggestions and requirements, you will effectively avoid dangerous situations.

You must read this guide carefully and strictly follow it during operation!

The external battery pack of the device needs to be periodically recharged (battery recharging for every two months to avoid over-discharge) if the external battery pack is not in use for a long period.

Do not disassemble the device without authorization. The device must be operated and installed by professionals.

To charge the battery pack, you must use a charger or adapter.

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1. GAT1000 Introduction

The GAT1000 device is a powerful GPS positioning tracker that supports remote sensing technology and has both safety and convenience. It is an ultra-low-power, water splash proof product. The device can detect motion, harsh driving behavior, collision and rollover events.

- Report on fixed timing, fixed distance, fixed turning angle, events.
- Local and Remote upgrade
- Anti-Jamming
- Automatic time zone selection and time calibration
- AGPS
- Over speed monitoring, mileage statistics, engine running hour statistics
- Power monitoring and low-power alerts
- Remote configuration

2. GAT1000 product parameters

Dimensions & Weight	Size	Approx. 137 (length) * 85 (width) * 40 (height) mm (refer to maximum dimension)
	Weight	About 243.8 G without battery
Working environment	Operating temperature	-40 ～ +85 ° C (without backup battery) -10 ～ +50 ° C (with backup battery)
	Relative humidity	95% RH @ 50 ° C non-condensing
	Vibration	U.S. military standard 202G and 810F, SAE J1455
	EMC / EMI	SAE J1113; FCC--Part 15B
	RoHS	Compatible (optional)
CPU	STM32L4 9 6 VX	
Power Supply	External	Power Adapter
	Internal	LI-PO 5000mAh (optional) Charging environment: 0 to + 45ºC
Power Consumption	Sleep mode	200uA 12V
	Active tracking mode	100mA 12V
Communication	Data support	SMS & UDP
	GSM Antenna	Built-in 4G antenna
	GSM module HL7688	LTE B2 / LTE B 4 / LTE B 5 / LTE B 17 / UMTS B2 / UMTS B 5
	GSM / GPRS output power	Level 4 (2W) for 700/ 850 frequency bands Level 1 (1W) for 1700/ 1800/1900 frequency bands
	GSM / GPRS down	GPRS Level 10
	HSPA data speed	5.76Mbps UL / 7.2Mbps DL (optional)
	SIM card (built-in)	1.8 / 3.3V

GPS	Antenna	Built-in (External type is optional)
	Positioning Technology	72 search channels Ublox M8 engine GNSS / GPS / GLONASS / BEIDOU
	Sensitivity	-162 dBm
	Accuracy	SBAS 2.0m CEP
	Assisted GPS	Supported
Detector	Built-in detector	3D sensor
Input / output	Digital Inputs	2
	IGNition input	1
	Analog inputs	2
	Digital outputs	2
	Serial port	RS232 serial port (Print Debug information)
	1-wire	1-Wire port
	LEDs	GPS / COMM / External Power
	Other input/output port: CAN-BUS; TTL serial port; RS485 Serial port	
Flash memory	GPRS / EDGE and UDP / SMS	
Communication mode	GPRS / EDGE and UDP / SMS	
Connection Type	12 PIN aviation plug	

3. **Product overview**

3.1 Unpacking

Before you start using the device, please check that the following standard accessories are complete. If anything is missing, please contact the supplier.

① Standard components:

Main body

Available options:
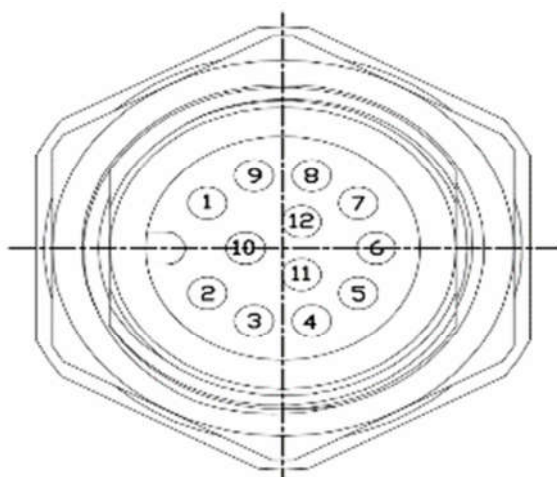

2 M / 9 M long connecting cable

Shell

3.2 Casing

Aviation plug

LED Indicators

Front side

Back side

3.3 Definition of connector pins

Pin	Name	Definition	Initial state	Wire Color
1	VCC	Positive power supply	24V DC	Red
2	GND	Negative power supply		Black
3	IGN_IN	Ignition signal input	High level	Yellow
4	RS232 _TXD	Serial data Transmit	RS232	Blue
5	RS232 _RXD	Serial data Receive	RS232	Purple
6	1-WIRE	1 BUS		Orange
7	ANALOG_IN1	Analog input 1	High level	Green
8	ANALOG_IN2	Analog input 2	High level	Green yellow
9	DIGITAL_IN1	Digital input 1	Low level	
10	DIGITAL_IN2	Digital input 2	Low level	
11	DIGITAL_OUT1	Digital output 1		
12	DIGITAL_OUT2	Digital output 2		

3.4 Product status identification and indicators

GAT1000 provides three LED indicators, which refer to the status of GPS, COMM (wireless network status) and external power.

◇ The definition of the prints on the front of the shell

G: GPS

C: COMM

B: External power

◇ GPS indicator status

Status	Indicator
GPS off	Light off
GPS signal is weak	Light flashes
GPS time synchronization	Light flashes quickly
GPS positioning	Light on stably

◇ COMM indicator status

Status	Indicator
Module closed	Light off
Communication turned on for searching	Light flashes slowly
Network signal available	Light flashes quickly
Registration completed, no access to Network	Fixed flash changed to quick flash 1 sec
Registration completed, access to Network	Light on stably

◇ External power indicator status

Status	Indicator
With external power supply	Light on stably
No external power supply	Light flashes

4. User Guide

4.1 Disassembly

Before disassembly, check if there are screws on the back side of the shell. If there are screws, use a cross screwdriver to loosen the eight screws on the back side of the shell.
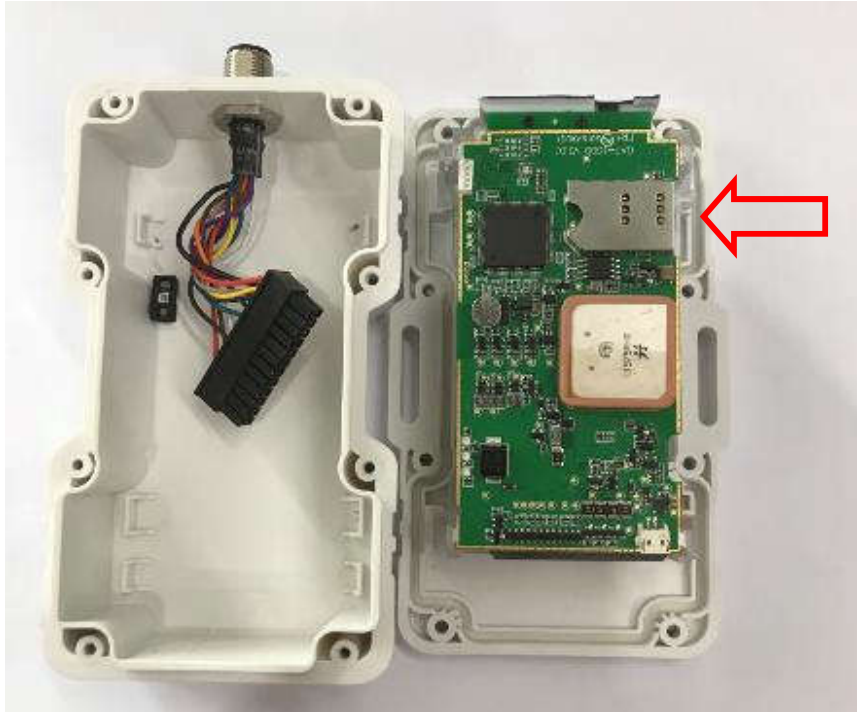

① Open the shell

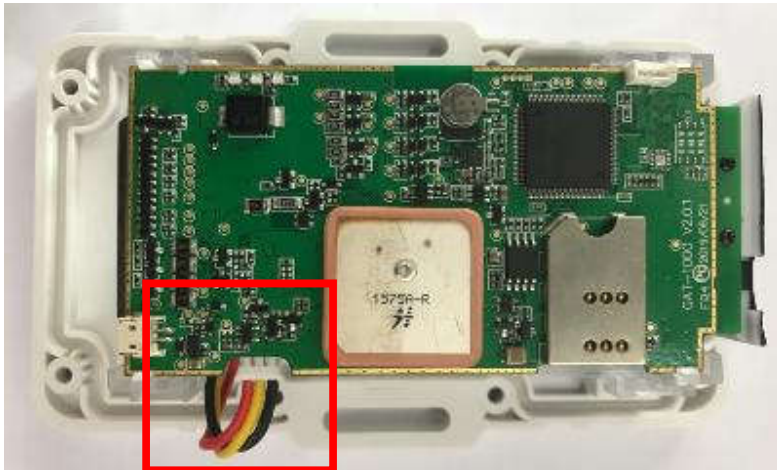② Install SIM card
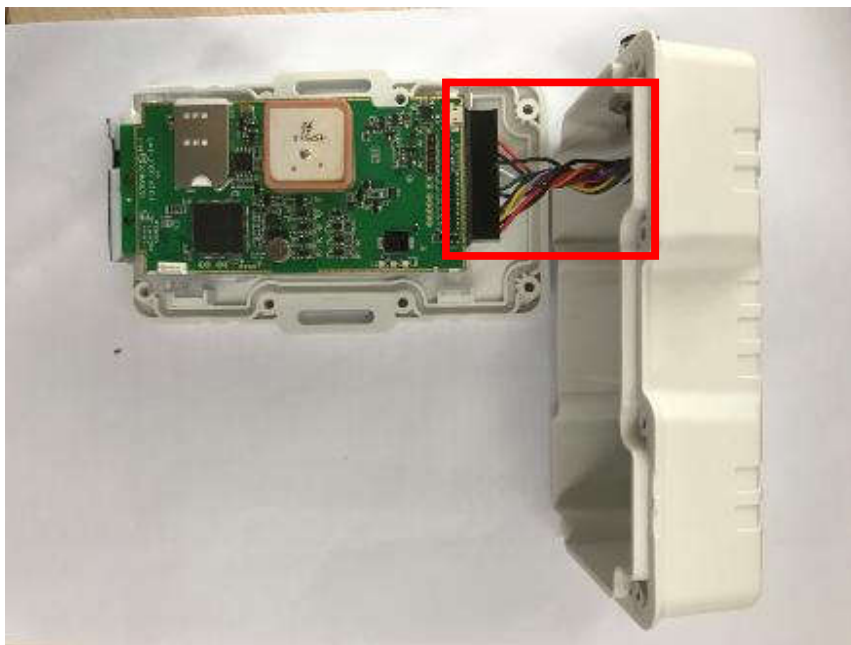
Insert the SIM card as shown in the picture below.

③Plug the Battery

✧ If use for the first time, please plug in the battery connector as shown below.

✧ Plug in the connector as below picture shows

③ Closing the device

✧ Close the shell and tighten the screws

4.2 Device installation direction

The 3D sensor of device can monitor accident and events of harsh driving behavior. The accuracy of 3D sensor is limited by the installation direction. Please follow the instructions given on the sticker pasted on the device.

Note: The front side of the shell must be facing upwards as shown in the picture below. If it is placed upside down than the GPS reception will be affected and the device will not be able to get an accurate GEO location.

4.3 Power connection

VCC (Positive power supply) and GND (Negative power supply) are used as power input ports. The input range of the power supply is 7V to 33V (max). The device can work normally between 12V and 24V.
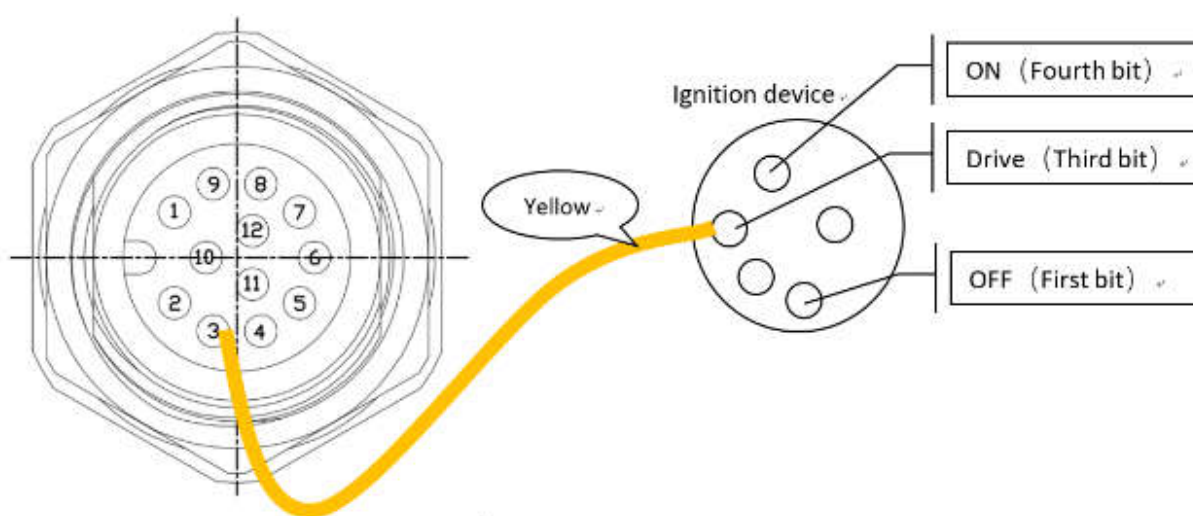
Note: GAT1000 must share the ground wire with the MDT device connected to its serial port.
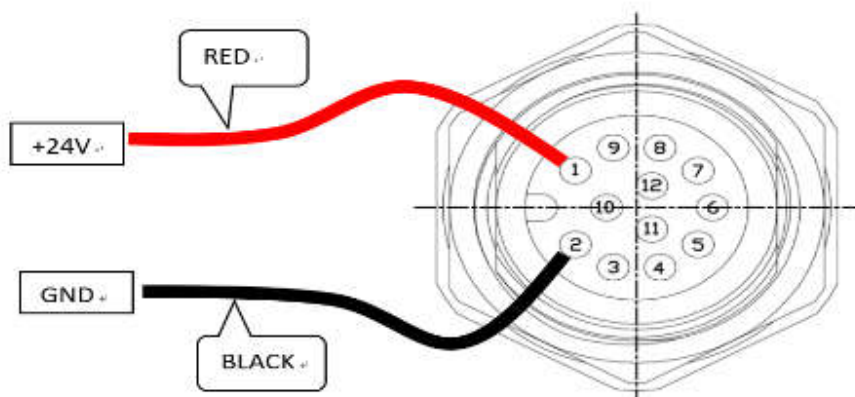
4.4 Engine Ignition ON/OFF detection

IGN stands for ignition switch, when the ignition input status is off, the device may be configured into a sleep mode.

Mode	Voltage
Ignition ON	> 5.7V
Ignition OFF	<= 5.7V

◇ GEM

Item	Script	Qualifier	Description
Event	Subevent IGN_ON;		Vehicle Ignition ON event
	Subevent IGN_OFF;		Vehicle stalls Event
State	Status IGN_ON		True if Vehicle Ignition is ON
	Status IGN_OFF		True if Vehicle Ignition is OFF
Action	No		

4.5 Digital Input port

Detect the input signal level on digital input pins of the device. The input signal level could be at High or Low level.

Mode	Voltage
High Level Input	> 5.7V
Low Level Input	<= 5.7V

◇ GEM
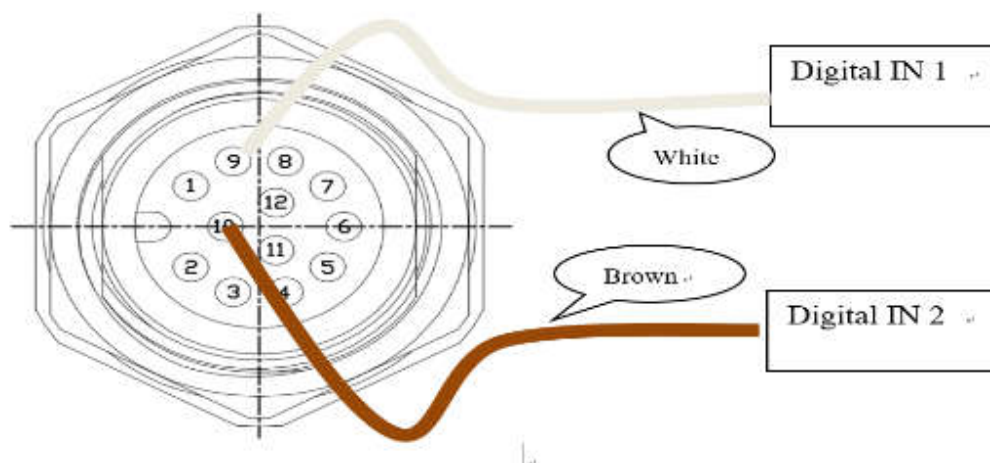
Item	Script	Qualifier	Description
Event	Subevent Input_High <Qualifier>;	Pin number, value is 0-15	Switch from low level to high level
	Subevent Input_Low <Qualifier>;	Pin number, value is 0-15	Switch from high level to low level
	Subevent Input_Chg <Qualifier>;	Pin number, value is 0-15	As long as it is level switching
	Subevent input_equate <Qualifier>	Value correspond to input bit0 = Ignition; bit1-bit7: Input 1 – Input7 It only judges in1- in7. It does not include in0 (IGN). SET: High CLEAR: Low	All input pin status meet the setting conditions, triggers.
Sate	Status input high <Qualifier>	Pin number, value is 0-15	Switch from low level to high level
	Status input compare < Qualifier>	Value correspond to input bit0 = Ignition; bit1-bit7: Input 1 – Input7 It only judges in1- in7. It does not include in0 (IGN). SET: High CLEAR: Low	check if multiple inputs meet set conditions, operate per each bit

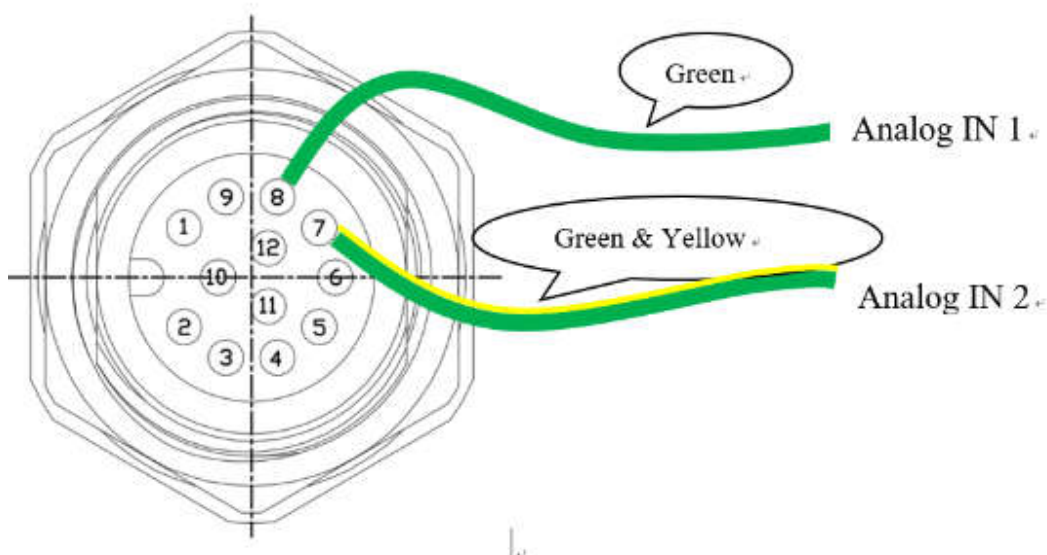|	Status input low <Qualifier>	Pin number, value is 0-15	Switch from high level to low level
Action	No		

◇ At command

AT Command	Description
AT+GEM Input?	Query the level status of input pin

4.6 Analog signal input

The device has two analog signal inputs, and the analog multi-channel input can be configured as digital input detection.

Channel	Input voltage range
AD1	0-36V
AD2	0-36V

4.7 Digital Output ports

The device can output periodic digital signals through its output ports. It can support high and low levels, flashing frequency of one second and flashing frequency of 0.25 second, and pulse counting.

◇ GEM

Item	Script	Qualifier	Description
Event	No		
State	No		
Action	Output Setup < Qualifier>;	Pin number, value is 0-8	Output high level

	Output Reset <Qualifier>;	Pin number, value is 0-8	Output low level
	Output Oneshot <Qualifier>;	Pin number, value is 0-8	Output high level for one second then turns low level
	Output Blink <Qualifier> 1;	Pin number, value is 0-8	Flash, 1 time per 1 second
	Output Blink <Qualifier> 4;	Pin number, value is 0-8	Flash, 1 time per 0.25 second
	Output Pulse <Qualifier>;	bit0-bit3: Times of the pulses, bit4-bit7: define the pin number. The original voltage level will be maintained after the pulses.	

◇ AT Command

| AT Command	Description
AT + GEM Output?	Query the level status of output pins
AT + GEM Output <Operator> <Index>	Operate the output level of pins

The device has two digital outputs, which are open-drain output types, and the maximum drain current is 200mA. Each output has a built-in PTC fuse to prevent over-current.

Default setting of the device is digital output, triggering any event will cause digital output behavior.
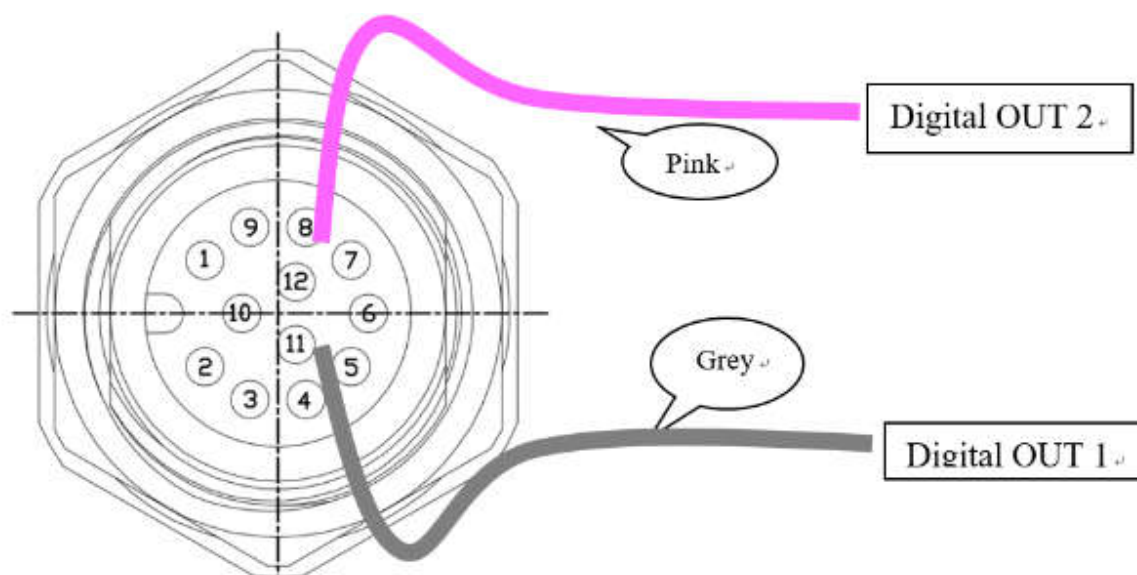
OUT1 is connected to the relay, as shown below:
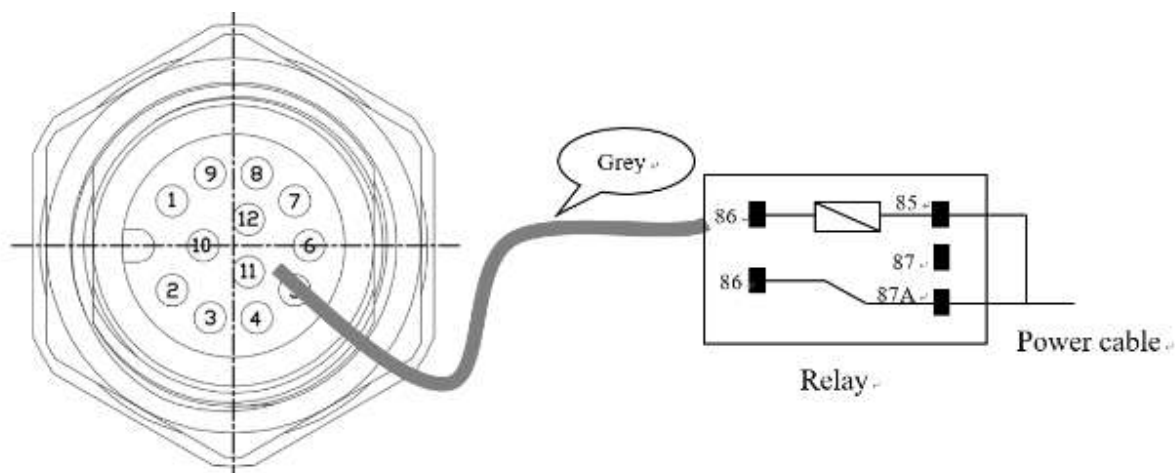
4.8 Serial port(s)

There are three lines for serial communication port (TXD, RXD and the GND). This port can have RS232, TTL, or RS485 level translation. Default speed is 115200 bps for communication.

Normally RS232/RS485 levels are used for communication with the external MDT devices while TTL level is required for communication with the computer devices. Any MDT device can send data through device serial port to the backend server. They can also receive commands from the server.
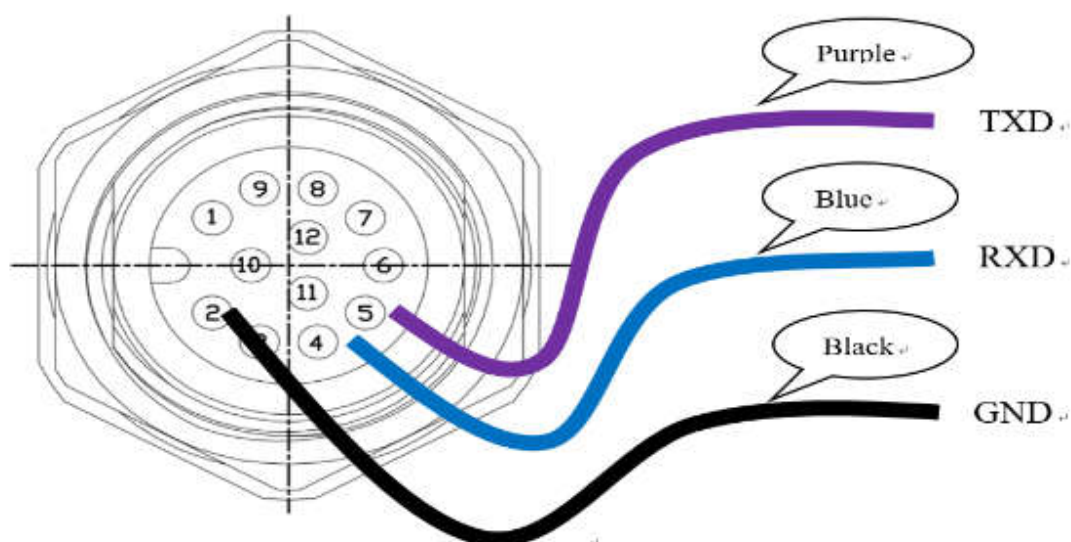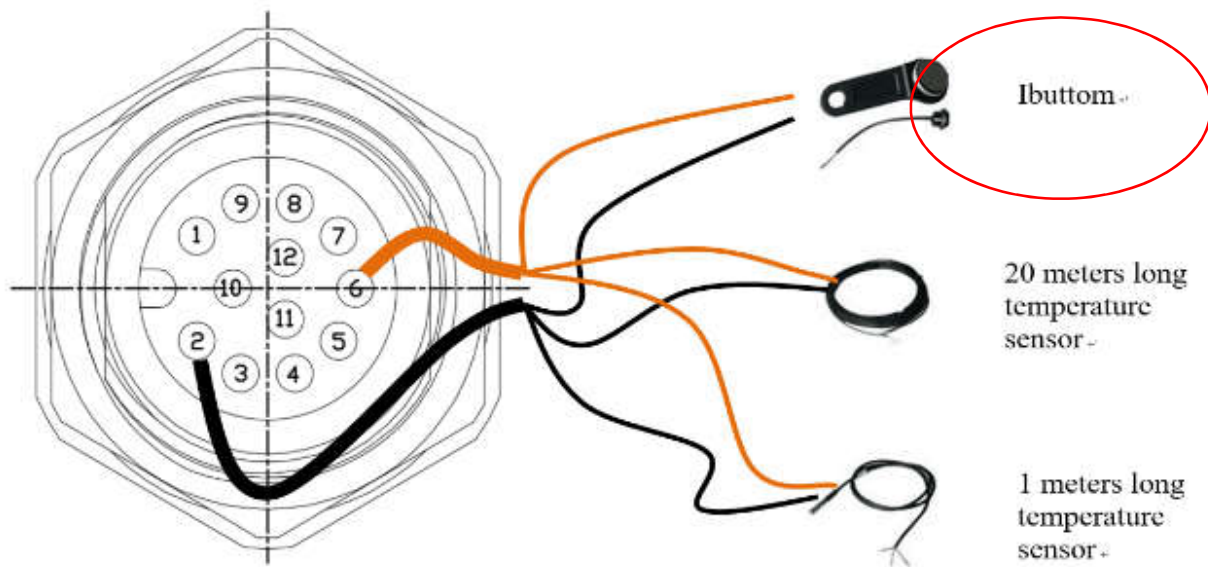
4.9 1-WIRE Interface:

1 WIRE can be connected to DS18B20 temperature sensor or the iButton to detect temperature or detect which driver is on duty.

The device temperature signal can trigger a temperature alarm event, and the iButton signal can trigger an iButton touch event.

The device can be connected to eight sensors at a time or one iButton. The cable for the temperature sensor can be 20 meters long.

◇ GEM

Item	Script	Qualifier	Description
Event	Subevent OneWire_Chg ;		Triggers If there are data updates on the 1 wire. In temperature mode: Triggers If there is a change in the temperature, in range of 0.1 degree centigrade. In iButton mode: Triggers If the iButton ID is changed. (No event on disconnection) HW CONTROL 171 Set working mode
State	Status OneWire Detect		True if any 1-wire device is connected on the bus, otherwise it is false.
	Status OneWire DriverID		True if the recent iButton ID does not match. (iButton ID is according to the parameter)
Action	no		

◇ AT Command

AT Command	Description

AT + GEM OneWire PWR ON	1 WIRE power ON
AT + GEM OneWire PWR OFF	1 WIRE power OFF
AT + GEM OneWire?	Query the value on 1WIRE. Temperature value in the temperature mode. iButton ID in the iButton mode.
AT + GEM DID List	Print contents of driver ID list
AT+ GEM DID Add <Driver ID>	Add Driver ID to the list
AT + GEM DID RM <Driver ID>	Remove Driver ID from the list
AT + GEM DID Eq <Driver ID>	Match Driver ID from the list

5. Warning

FCC Regulations:

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.

This device 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 in a residential installation. This equipment generates, uses and can radiated radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

-Reorient or relocate the receiving antenna.

-Increase the separation between the equipment and receiver.

-Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

-Consult the dealer or an experienced radio/TV technician for help.

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

RF Exposure Information

This device meets the government's requirements for exposure to radio waves.

This device is designed and manufactured not to exceed the emission limits for exposure to radio frequency (RF) energy set by the Federal Communications Commission of the U.S. Government.

This device complies with FCC radiation exposure limits set forth for an uncontrolled environment. In order to avoid the possibility of exceeding the FCC radio frequency exposure limits, human proximity to the antenna shall not be less than 20cm (8 inches) during normal operation.