

# JY1000-EV Series Insulation Monitoring Device

(JY1000-EVDC; JY1000-EVAD)

## User Manual



**Version: 1.11**

**Revision: 2025.05**

## Read me

**When you use JY1000-EV series, be sure to read this user manual carefully, and be able to fully understand the implications, the correct guidance of operations in accordance with user manual, which will help you make better use of JY1000-EV series, and help to solve the various problems at the scene.**

1. Before turning on the power supply, be sure that the power supply within the provisions of the instrument;
2. When installation, the current input terminal must non-open, voltage input terminals must Non-short circuit;
3. Communication terminal (RS485) is strictly prohibited to impose on high pressure;
4. Be sure the instrument wiring consistent with the internal system settings;
5. When communicating with the PC, instrument communication parameters must be consistent with the PC.



- **Please read this user manual carefully**
- **Please save this document**

## Directory

<b>1.- SUMMARIZE .....</b>	<b>- 3 -</b>
1.1.- BASIC PRINCIPLE INTRODUCTION .....	- 4 -
<b>2.- TECHNICAL PARAMETERS .....</b>	<b>- 6 -</b>
<b>3.- INSTALLATION AND START-UP .....</b>	<b>- 7 -</b>
3.1.- DIMENSION (UNIT: MM) .....	- 7 -
3.2.- DEFINITION OF INDICATOR LIGHT .....	- 7 -
3.3.- CONNECTION TERMINAL .....	- 8 -
<b>4.- APPLICATION INTRODUCTION .....</b>	<b>- 9 -</b>
4.1.- TYPICAL APPLICATION .....	- 9 -
4.2 - WIRING INDICATION FOR ACTUAL VEHICLE APPLICATION .....	- 10 -
4.3.- CAN COMMUNICATION CIRCUIT .....	- 11 -
4.4 - ALARM CIRCUIT .....	- 11 -
<b>5.- COMMUNICATION PROTOCOL .....</b>	<b>- 12 -</b>
5.1 - COMMUNICATION PARAMETERS .....	- 12 -
5.2 - DATA DEFINITION .....	- 12 -
<b>6.- MODEL SELECTION SHEET .....</b>	<b>- 14 -</b>
<b>7.- SAFETY CONSIDERATIONS .....</b>	<b>- 16 -</b>
<b>8.- FAQs .....</b>	<b>- 16 -</b>

## 1.- SUMMARIZE

JY1000-EV series insulation monitor is used to monitor the insulation resistance between high voltage components (0-1000 Vdc. /0-750Vac.) and automobile chassis (earth) of power battery pack (pure electric or hybrid) power supply system in real time.

The measuring technology used in this product can monitor the insulation faults of DC side, AC side and motor side; can simultaneously monitor the asymmetric insulation faults of positive and negative poles and symmetrical insulation faults; can monitor the internal insulation faults of battery packs and locate the fault points; can monitor under the condition of short circuit of high voltage DC side; in the case of high intensity interference, such as acceleration, deceleration, energy recovery, the insulation resistance can be reliably monitored. fault information (insulation fault, overvoltage, self-error, etc.) is output through CAN bus interface.

### FEATURES

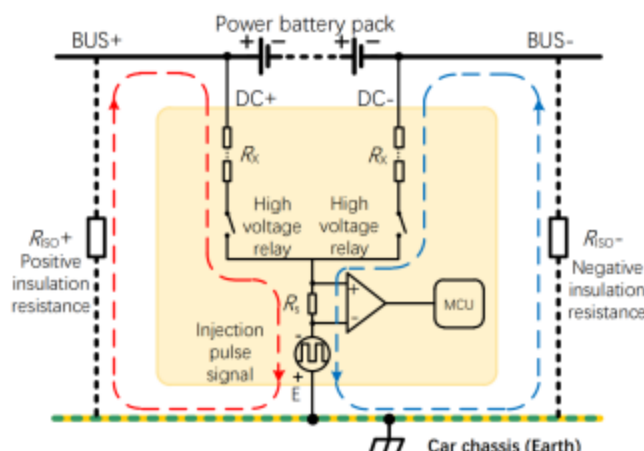
- Monitor the positive and negative insulation resistance separately;
- Monitor the total insulation resistance;
- report the location of the battery insulation fault;
- Automatically adapt to existing system Y capacitor  $C_Y$  ( $C_Y \leq 4\mu F$ );
- High internal resistance up to 10M $\Omega$  Injected signal amplitude  $\pm 15V$ ;
- Fault response time  $\leq 5s$ ;
- High and low voltage side isolation voltage 3500 VD.C./2500 Vac.(rms);
- With CAN Bootloader, upgrade program by CAN.

### APPLICATIONS

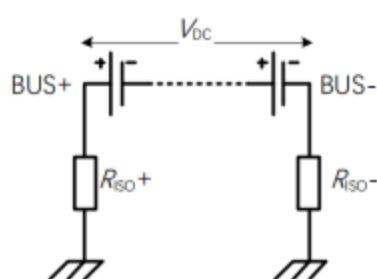
- Monitor the insulation state;
- DC floating system (IT system);
- Measuring battery pack DC voltage;
- Continuous measurement of insulation resistance of 0~50M $\Omega$ ;
- Using the CAN bus interface.

## 1.1.- Basic principle introduction

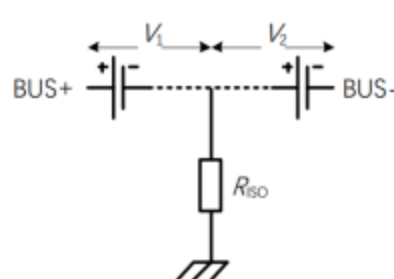
JY1000-EV series insulation monitor produces a symmetrical low-frequency AC square wave pulse signal with an amplitude of  $\pm 15\text{ V}$ . Pulse signal is injected between DC bus of electric vehicle battery system and vehicle chassis (earth). Pulse signal is composed of current limiting resistor series  $R_x$ , sampling resistor  $R_s$ ,  $R_{ISO+}$ , negative resistor  $R_{ISO-}$ . By using the real-time sampling signal on  $R_s$  and MCU algorithm, the insulation resistance values  $R_{ISO+}$ ,  $R_{ISO-}$ ,  $R_{ISO}$  of the system to be measured on the chassis (earth) of the automobile can be obtained.



There are two kinds of output modes of insulation resistance: one is output positive pole and negative pole respectively for ground insulation resistance value  $R_{ISO+}$  and  $R_{ISO-}$  the other is output positive and negative pole to ground insulation resistance parallel value  $R_{ISO}$ . The output mode of insulation resistance is shown in Figs. (a) and (b).



(a) Positive and Negative



(b) Parallel

$R_{ISO+}$  and  $R_{ISO-}$ , respectively, refer to the value of insulation resistance of positive BUS+ to automobile chassis (earth) and negative BUS- to automobile chassis (earth), which is convenient to distinguish between positive and negative insulation faults.

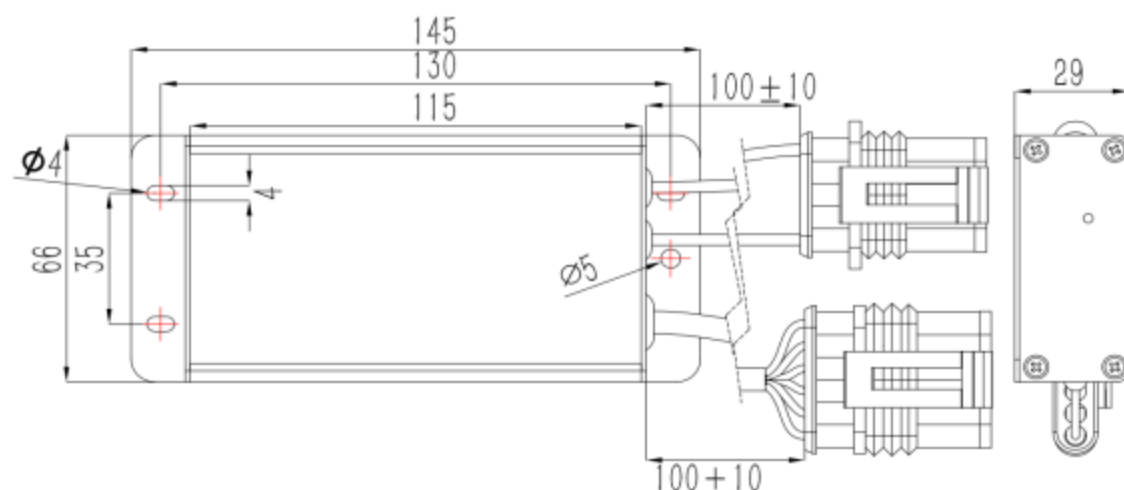
The parallel value  $R_{ISO}$  of positive and negative pole-to-ground insulation resistance refers to the parallel value of all insulation resistance. Its fault grounding position is expressed by voltage  $V_1$  and  $V_2$ :  $V_1$  is the voltage of positive pole BUS+ to grounding point,  $V_2$  is the voltage of grounding point to negative pole BUS- of battery,  $V_1 + V_2$  is the DC voltage value of battery. By reading  $V_1$  data, users can easily find and determine the location of insulation failure points within the battery pack.

## 2.- TECHNICAL PARAMETERS

Parameters	Value
Insulation resistance output mode	DC Bus voltage 20~1000 Vdc. Output $R_{ISO+}$ and $R_{ISO-}$
	JY1000-EVDC Output $R_{ISO+}$ and $R_{ISO-}$
	DC Bus voltage 0~20Vdc. But force $R_{ISO+} = R_{ISO-} = R_{ISO+}/R_{ISO-} = R_{ISO}$
	DC Bus voltage 0~1000 Vdc. Output $R_{ISO}$
	JY1000-EVAD
	AC Bus voltage 0~750 Vac. Output $R_{ISO}$
Power supply	9~36VDC, Input power $\leq 2W$
Standard	IEC 61851-23 (2014-03):2014-11
AC voltage range	0V~750VAC (Unable to measure AC voltage)
DC voltage range	0V~1000VDC, accuracy 1 %
Insulation resistance measurement range	0~50M $\Omega$
Insulation resistance measurement accuracy	0~100 K $\Omega$ , $C_Y \leq 2\mu F$ , Bus voltage stability: $\pm 12$ K $\Omega$ 100 k $\Omega$ ~1 M $\Omega$ , $C_Y \leq 2\mu F$ , Bus voltage stability: $\pm 10$ % 1 M $\Omega$ ~50 M $\Omega$ , $C_Y = 0\mu F$ , Bus voltage stability: $\pm 10$ %
Insulation resistance Measurement response time	$R_{ISO} \geq 500$ K $\Omega$ , $C_Y = 0\mu F$ , Bus voltage stability: 4 s $R_{ISO} < 500$ K $\Omega$ , $C_Y = 0\mu F$ , Bus voltage stability: 5 s $R_{ISO} = 1$ M $\Omega$ , $C_Y = 1\mu F$ , Bus voltage stability: 8 s $R_{ISO} = 1$ M $\Omega$ , $C_Y = 2\mu F$ , Bus voltage stability: 12 s
High-voltage impedance	When powered on (internal high-voltage relay closed) Positive and negative poles to ground: 5.1 M $\Omega$ respectively When powered off or not operating (internal high-voltage relay open) Positive and negative poles to ground: > 500 M $\Omega$
DC equivalent internal resistance	Power on: 10.2 M $\Omega$
Amplitude of injection pulse signal	$\pm 15$ V
Injection pulse signal frequency	Self-adaptive, depending on the Y-capacitance ( $C_Y$ ) value and insulation resistance ( $R_{ISO}$ ) value.
High to low voltage withstanding voltage	3 500 Vd.c. 2 500 Va.c.(rms)
CAN to high voltage withstanding voltage	3 500 Vd.c. 2 500 Va.c.(rms)
Environment	Storage: - 40°C ~+85°C; Work: - 40°C ~85°C Humidity:85%

## 3.- INSTALLATION AND START-UP

### 3.1.- Dimension (Unit: mm)



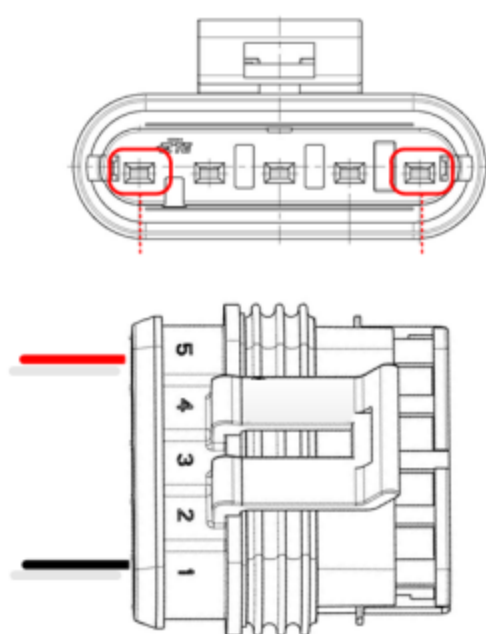
### 3.2.- Definition of indicator light

The JY1000 series insulation monitor has a flashing LED indicator. Users can judge the status of the device under test based on the flashing mode of the LED indicator.

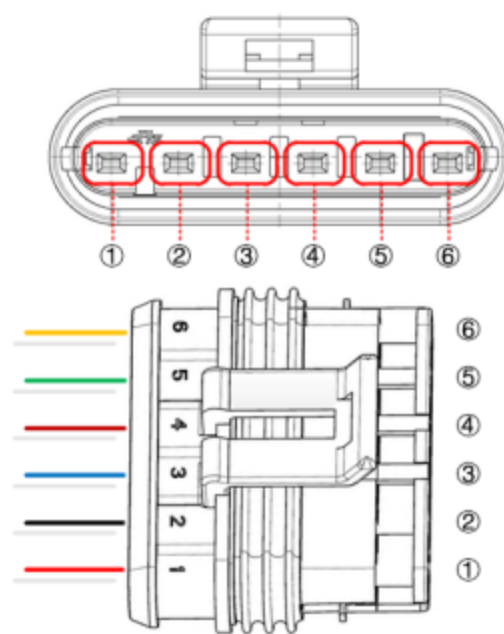
Device status	LED flashing mode	Definition
Normal operation (no alarm)	Flash once, pause 1 second	
Level 1 insulation alarm	Flash continuously	Default 500 $\Omega$ /V, adjustable
Level 2 level insulation alarm	Flash twice, pause 1 second	Default 1000 $\Omega$ /V, adjustable
Overvoltage alarm	Flash 3 times, pause 1 second	Default $\infty$ V, means no overvoltage alarm, adjustable

Priority: Level 1 Insulation Alarm > Level 2 Insulation Alarm > Overvoltage Alarm > Normal Operation (No Alarm).

### 3.3.- Connection terminal



**(a) Class B voltage  
high voltage side) connector**



**(b) Class A voltage  
(low voltage side) connector**

#### Connector Pin Definition:

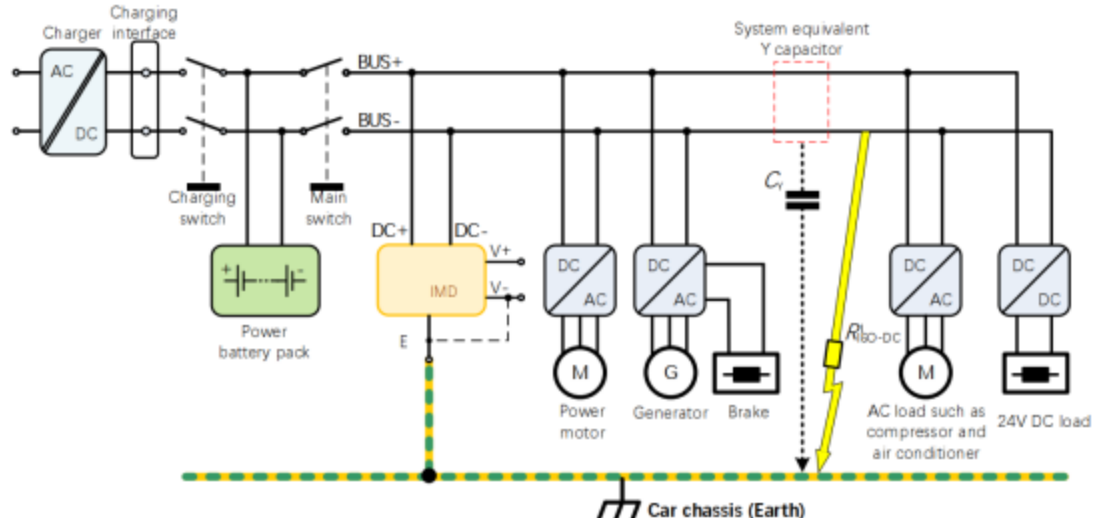
Voltage grade	Number/Color	Name	Wiring instructions
Class B voltage (High voltage side)	V red	DC+	Connect to battery positive BUS+
	I black	DC-	Connect to battery negative BUS-
Class A voltage (Low voltage side)	⑥ orange	H	Connect to CAN bus H port
	⑤ green	L	Connect to CAN bus L port
	④ brown	E	Connect the chassis of the car (earth)
	③ blue	A	Alarm output terminal (suspended if not required)
	② black	V-	Connect to auxiliary power supply negative pole
	① red	V+	Connect to auxiliary power supply positive pole



## 4.- Application introduction

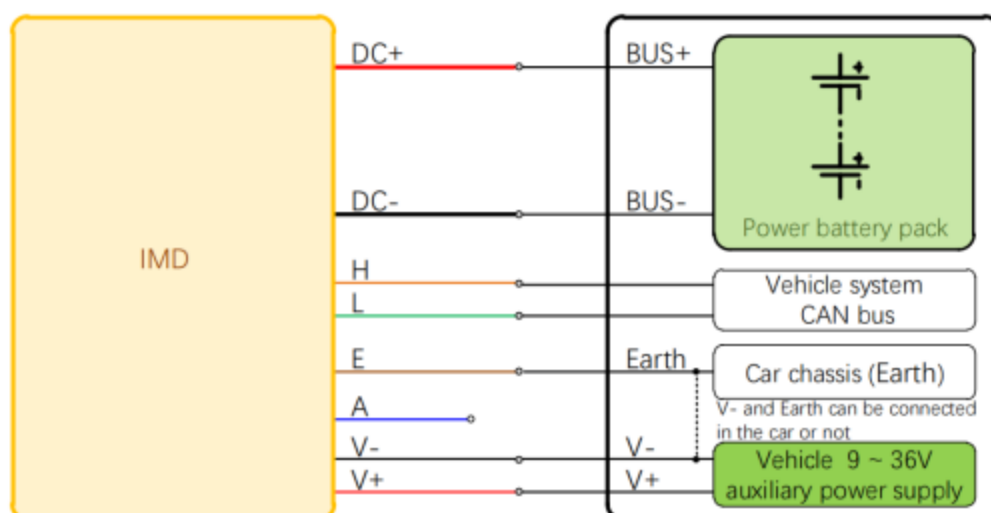
### 4.1.- Typical application

JY1000-EV series insulation monitor can be used in electric vehicle and hybrid electric vehicle, backup battery system, power grid energy storage and other occasions.

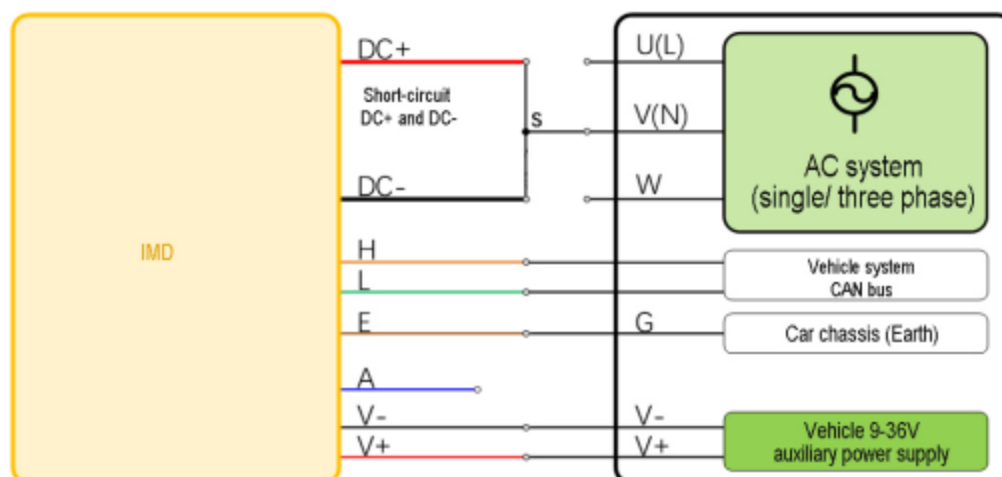


## 4.2 - Wiring indication for actual vehicle application

### DC system wiring diagram:



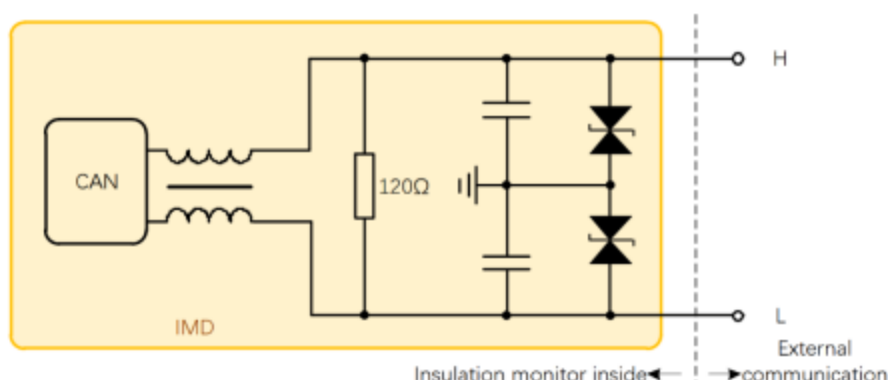
### AC system wiring diagram:



**Note: Terminal "S" can be connected to any one of U, V, W, or L/N.**

### 4.3.- CAN communication circuit

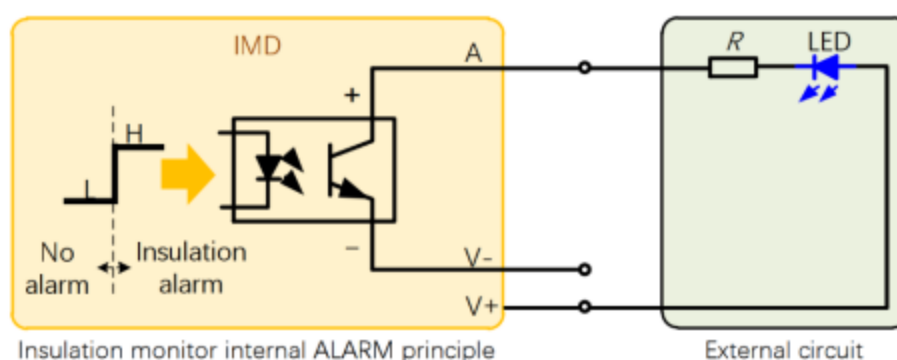
The CAN communication circuit of JY1000-EV series insulation monitor default connected with a terminal resistance of 120Ω.



### 4.4 - ALARM circuit

The ALARM function of JY1000-EV series insulation monitor consists of optocoupler output. The negative end of the output of the optocoupler device in the insulation monitor has been connected with the negative end of the auxiliary power supply in the insulation monitor. Therefore, when the ALARM function is selected, users need to connect a resistor R and alarm indicator LED in series between the "A" port and the "V+" port to form a circuit and ensure that the maximum current of the circuit does not exceed 100 mA.

After wiring as shown, when the measured insulation resistance reaches the preset "Level 1 Insulation Alarm" value, the monitor's internal optocoupler closes. At this time, the "A" port is connected to the negative pole "V-" of the auxiliary power supply through the optocoupler inside the insulation monitor. With the external circuit, the purpose of alarming through LED or relay is achieved.



**Note:** If no alarm is needed, leave the "A" terminal unconnected.

## 5.- COMMUNICATION PROTOCOL

### 5.1 - Communication parameters

Data	Parameter	Definition
Receiving ID	0x1819A1A5 (Extended frame)	Turn on insulation resistance monitoring: 00 01 02 03 04 05 06 07 Turn off insulation resistance monitoring: 07 06 05 04 03 02 01 00 Default: 0x1819A1A5, adjustable
Receiving cycle	10 ms	
Send ID	0x1819A1A4 (Extended frame)	Default: 0x1819A1A4, adjustable
Send cycle	1s	Default: 1s, adjustable
Baud rate	250 kbps	Default: 250 kbps, adjustable

### 5.2 - Data definition

Byte	Bit	Definition
Byte 0	7	1: Insulation resistance monitoring function already started. 0: Insulation resistance monitoring function already stopped.
	6	1: Output the insulation resistance value of the positive and negative poles to the ground, $R_{ISO+}$ and $R_{ISO-}$ ; 0: DC system: Output the parallel value of the insulation resistance of the positive and negative poles to the ground, $R_{ISO}$ ; AC system: Output the insulation resistance value of the entire AC system to the ground, $R_{ISO}$ .
	5	10: $R_{ISO+} > R_{ISO-}$ ; (The insulation resistance of the negative poles to the ground is relatively small) 01: $R_{ISO+} < R_{ISO-}$ ; (The insulation resistance of the positive poles to the ground is relatively small)
	4	00: $R_{ISO+} = R_{ISO-}$ ; ((The insulation resistance of the positive and negative poles to the ground is equal))
	3	Reserved (Default 0)
	2	1: Battery Overvoltage Alarm (Default: $\infty$ V, adjustable) 0: No Battery Overvoltage Alarm
	1	1: Level-2 Insulation Alarm (Default: 1 000Ω/V, adjustable) 0: No Level-2 Insulation Alarm
	0	1: Level-1 Insulation Alarm (Default: 500Ω/V, adjustable) <sup>①</sup> 0: No Level-1 Insulation Alarm

<b>Byte 1~7</b>	JY1000-EVDC (output $R_{ISO+}$ and $R_{ISO-}$ )	JY1000-EVAD (output $R_{ISO}$ )
<b>Byte 1</b>	$R_{ISO+}$ High byte /Unit $k\Omega$	$R_{ISO}$ High byte/Unit $k\Omega$
<b>Byte 2</b>	$R_{ISO+}$ Low byte	$R_{ISO}$ Low byte
<b>Byte 3</b>	Battery Voltage VDC High byte <sup>②</sup> /Unit 0.1V	
<b>Byte 4</b>	Battery Voltage VDC Low byte	
<b>Byte 5</b>	$R_{ISO-}$ High byte/Unit $k\Omega$	Grounding position V1 High byte/Unit 0.1V
<b>Byte 6</b>	$R_{ISO-}$ Low byte	Grounding position V1 Low byte
<b>Byte 7</b>	Counting / 00~FF(HEX) cycle, plus 1 for each transmission cycle	

**Notes:**

1. The JY1000-EVAD model uses the parallel value of the positive and negative poles to ground insulation resistance ( $R_{ISO}$ ) as the insulation resistance of the monitored device for insulation alarm triggering.

The JY1000-EVDC model uses the smaller value between the positive-to-ground insulation resistance ( $R_{ISO+}$ ) and the negative-to-ground insulation resistance ( $R_{ISO-}$ ), i.e.  $\min(R_{ISO+}, R_{ISO-})$ , as the insulation resistance of the monitored device for alarm evaluation.

2. The data converted from two bytes of battery voltage VDC to decimal contains one decimal point. Example: The two-byte data of battery voltage VDC is 04D2 (HEX), and the data converted into decimal system is 1234, then the battery voltage VDC = 123.4 V.

## 6.- MODEL SELECTION SHEET

Model	Description
<b>JY1000-EVDCN</b>	Only applicable to DC system; Default starts insulation resistance monitoring function.
<b>JY1000-EVDCJ</b>	Only applicable to DC system; Default stop insulation resistance monitoring function, need to be started by giving a command.
<b>JY1000-EVADN</b>	Applicable to AC and DC system; Default start insulation resistance monitoring function.
<b>JY1000-EVADJ</b>	Applicable to AC and DC system; Default stop insulation resistance monitoring function, need to be started by giving a command.

**Note:** AD- Applicable to AC and DC system; DC-Only applicable to DC system.

Differences between JY1000-EVDC and JY1000-EVAD	
JY1000-EVDC	JY1000-EVAD
Only for DC floating systems	For both AC and DC floating systems
Measures the insulation resistance of the positive and negative poles of the output DC floating system to the ground, which are defined as $R_{ISO+}$ and $R_{ISO-}$ .	<p><b>For DC:</b> measuring the parallel connection value of the positive and negative poles of the DC floating system to the ground insulation resistance, defined as <math>R_{ISO}</math>.</p> <p><b>For AC:</b> measuring the ground insulation resistance of the AC floating system, without distinguishing a specific phase Line insulation fault, also defined as <math>R_{ISO}</math>.</p>

### Note 1:

when the measured DC system voltage VC (the voltage between DC+ and DC- terminals of the insulation monitor):

1. When the battery voltage  $VDC > 20 Vdc$ , the output positive and negative poles of the insulation monitor is  $R_{ISO+}$  and  $R_{ISO-}$ , respectively.
2. When the battery voltage  $VDC > 0 Vdc$  and  $VDC \leq 20 Vdc$ , the output positive and negative poles of the insulation monitor are equal to the ground insulation resistance respectively, and both are equal to the parallel value of the two.  $R_{ISO+} = R_{ISO-}$

**Note 2: items that can be adjustable according to user needs**

- (1) CAN Communication Baud Rate: Default 250 kbps. (**Adjustable**)
- (2) Send ID: default 0x1819A1A4 (Extended frame).
- (3) CAN communication transmission cycle: Default 1s (Adjustable, but not recommended).
- (4) "Level-1 Insulation Alarm" Value: Default 500  $\Omega/V$  (Unit:  $\Omega/V$  or  $k\Omega$ , adjustable).
- (5) "Level-2 Insulation Alarm" Value: Default 1000  $\Omega/V$  (Unit:  $\Omega/V$  or  $k\Omega$ , adjustable).
- (6) "DC overvoltage alarm" Value: Default  $\infty$  V, it is equivalent to no overvoltage alarm. (Adjustable).

## 7.- SAFETY CONSIDERATIONS



All installation specification described at the previous chapters named:  
**INSTALLATION AND STARTUP, INSTALLATION MODES and SPECIFICATIONS.**

Please note that with the instrument powered on, the terminals could be dangerous to touching and cover opening actions or elements removal may allow accessing dangerous parts. This instrument is factory-shipped at proper operation condition.

- ◆ The device must have a professional installation and maintenance
- ◆ Any operation of the device, you must cut off the input signal and power;

## 8.- FAQs

<b>Question 1:</b>	The insulation monitoring resistance is infinite after the simulation of insulation resistance
<b>Solution</b>	Check whether the ground cable is connected reliably at GND port.
<b>Question 2:</b>	The insulation monitoring resistance is much smaller than actual value
<b>Solution</b>	The DC ground capacitance may be too large. Check the DC ground capacitance
<b>Question 3:</b>	The insulation monitoring resistance is 0
	The measured voltage is unstable or the system Y capacitance is too large, which will cause the test value to fluctuate and be lower than the actual value. Solution: Shield or ignore the 0 value on the host computer;
<b>Solution</b>	Affected by interference signals, the problem can be solved by adding signal filtering or adding judgment logic. For example, the true value is determined only when the value is 0 for multiple consecutive cycles.

For any inquiry about the instrument performance or any failure,  
contact to Blue Jay's technical service.

*Blue Jay - After-sales service*

E-mail: [tech@cqbluejay.com](mailto:tech@cqbluejay.com)