PowerGo MQTT API Protocol V1.0

- Document Version: V1.0
- Product Models: Applicable to[PowerGo 2500-1208, PowerGo 5000-1208, PowerGo 5000-1208 BK]
- Protocol Type: MQTT 5.0
- Release Date: 2023-09-02

§1. Protocol Overview

- **Overview**
  This document describes the MQTT open interface specification for the PowerGo residential energy storage battery system. It is designed to assist third-party Energy Management Systems (EMS) in communicating with the battery system via the MQTT protocol to achieve data monitoring and remote control.
- **Terms and Definitions:**
  - **APP**：Client applications such as third-party Energy Management Systems (EMS).
  - **ClientID**：Each PowerGo device is mapped to an independent instance within the third-party EMS application (client). The PowerGo device possesses a unique serial number as its identity. On the corresponding application side, the PowerGo management platform assigns a dedicated ClientID for this device, which is used for device management and communication authentication within the EMS platform.
    > The ClientID is a 4-byte random number and **must be used in uppercase.**

§2. ClientID Application and Management

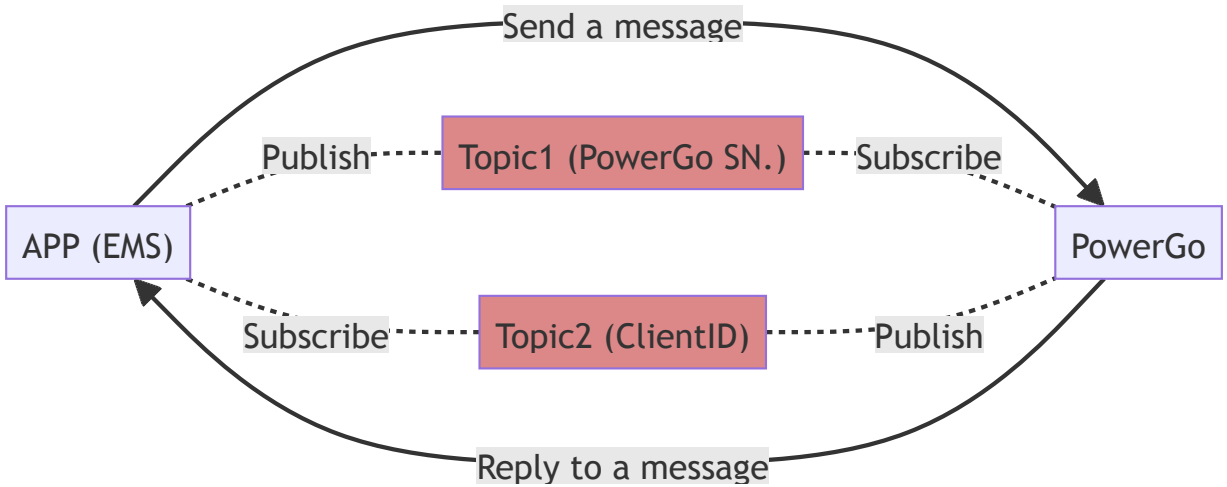
Before the APP can initiate MQTT communication for the first time, it must apply to the platform for a 4-byte ClientID for each PowerGo device. The application process is as follows:

1. **Call Platform API to Apply for ClientID**
   The APP uses the API interface provided by the platform, submits the username and password assigned by the platform, and applies for a ClientID.
   - API Request Parameters:
     - `username`：The username assigned by the platform.
     - `password`：The password assigned by the platform.
   - API Return Value:
     - `app_code`：The 4-byte ClientID (as a hexadecimal string or byte stream).
2. **Storage and Use of the ClientID**
   - Upon receiving the ClientID assigned by the platform, the third-party APP must securely save it locally (e.g., in a local database or secure storage).
   - This ClientID must be used as the unique identifier for all subsequent MQTT communications (e.g., in client_id, topics)

3. **Important Notes**
    - Each ClientID code corresponds to only one PowerGo instance. Do not disclose or reuse it.
    - If the APP is uninstalled or data is cleared, a new APP code must be applied for.。

> Subsequent MQTT communication can only proceed normally after successfully obtaining and using the ClientID.

2. Communication Foundation



2.1 MQTT Communication Parameters

Configuration based on **WebSocket**.

```
{
  "host": "3.122.9.160",
  "port": 8083,
  "QoS": QoS 0
  "path:": "/mqtt",
}
```

Configuration based on **TCP**.

```
{
  "host": "3.122.9.160",
  "port": 1883,
  "QoS": QoS 0
```

```
}
```

MQTT Configuration Parameters

```
{
  "client_id": "APP" + ClientID,
  "username": "optional",
  "password": "optional"
}
```

2.2 MQTT Communication Frame Structure

```
|<- 4 Bytes ->|<---- 4 Bytes --->|<--1 Bytes->|<------- Modbus RTU Message Body ------>|
| Source Seq. | Destination Seq. | MQTT Func. | Addr | Func. Code | Data | CRC16 Check |
|    (hex)    |       (hex)      | (1 Bytes)  |(1 Bytes)|(1 Bytes)|(N Bytes)| (2 Bytes)|
```

Field Descriptions

Field Position	Name	Length（Byte）	Type	Description	Example Value
0-3	Source Seq. No.	4	hex	The topic that the device itself subscribes to.	`F1000001`
4-7	Destination Seq. No.	4	hex	The target topic to subscribe to.	`15020115`
8	MQTT Function Code	1	uint8	For transparent transmission of MQTT messages (Fixed value: 0x03).	`0x03`
9	Address Code	1	uint8	Standard Modbus address code (Fixed value: 0x51).	`0x51`
10	Function Code	1	uint8	Standard Modbus function code.	`0x03`
10-(N+9)	Data Field	Variable	hex	The data, which varies according to the Modbus function code.	`00 01`
(N+10)-end	CRC16	2	uint16	CRC checksum calculated starting from the Address Code (Position 9).	`85 EC`

3. Typical Message Examples

Read Register Request:

```
// Read PowerGo version number
05 34 61 ad 15 02 01 15 03 51 03 00 01 00 01 d9 9a
```

```
■ Breakdown::
- Source Seq. No. : 05 34 61 ad  (Sequence number of the sender, corresponding to a 4-byte random code from ClientID)
- Destination Seq. No. : 15 02 01 15  (Sequence number of the target device, the PowerGo's unique identifier)
- MQTT Function Code: 03 (Fixed value 0x03, indicates transparent MQTT message transmission)
- Address Code:    51 (Standard Modbus address code)
- Function Code:    03 (Read Holding Registers)
- Data Field:    00 01 (Starting address)
            00 01 (Number of registers to read)
- CRC16:    d9 9a


// Response
15 02 01 15 05 34 61 ad 03 51 03 02 a0 30 00 5c

■ Breakdown:
- Source Seq. No: 15 02 01 15  (Sequence number of the sender; the response is sent from the device, hence the source is the device's sequence number)
- Destination Seq. No. : 05 34 61 ad  (Sequence number of the target, corresponding to the 4-byte random code from the APP)
- MQTT Function Code: 03 (Fixed value 0x03, indicates transparent MQTT message transmission)
- Address Code:    51 (Standard Modbus address code)
- Function Code:    03 (Read Holding Registers)
- Data Field Length: 02 (2 bytes)
- Data Field:    a0 30 (The value of the requested register, representing the communication board version A030)
- CRC16:    00 5c (CRC16 checksum)
```

Read Register Request:

```
// Read device status, starting from address 529, read 15 registers
05 34 61 ad 15 02 01 15 03 51 03 02 11 00 0f 58 23

■ Breakdown:
- Source Seq. No. : 05 34 61 ad  (Sequence number of the sender, corresponding to a 4-byte random code from the APP)
- Destination Seq. No. : 15 02 01 15  (Sequence number of the target device, the device's unique identifier)
- MQTT Function Code: 03 (Fixed value 0x03, indicates transparent MQTT message transmission)
- Address Code:    51 (Standard Modbus address code)
- Function Code:    03 (Read Holding Registers)
- Data:    02 11 (Starting address, decimal 529)
            00 0f (Number of registers to read, decimal 15)
- CRC16:    58 23


// Response
15 02 01 15 05 34 61 ad 03 51 03 1e 00 44 00 00 02 13 00 00 00 10 00 11 00 12 00 13 00 14 00 15 00 16 00 00 e2 40 00 01 00 00 80 42

■ Breakdown:
- Source Seq. No. : 15 02 01 15  (Sequence number of the sender; the response is sent from the PowerGo, hence the source is the PowerGo's sequence number)
- Destination Seq. No. : 05 34 61 ad  (Sequence number of the target, corresponding to the 4-byte random code from the ClientID)
- MQTT Function Code : 03 (Fixed value 0x03, indicates transparent MQTT message transmission)
- Address Code:    51 (Standard Modbus address code)
```

```
- Function Code:    03 (Read Holding Registers)
- Data  Length: 1e (30 bytes)
- Data :    00 44  (Register 529: SOC)
            00 00  (egister 530: Grid A-Phase Active Power)
            02 13  (Register 531: Grid A-Phase Active Power)
            00 00  (Register 532: Grid A-Phase Active Power)
            00 10 00 11 00 12 00 13 00 14 00 15 00 16 (Registers 533-539: Historical data of battery discharge energy for the last 7 days; multiplier 0.1,
corresponding to values 1.6kwh, 1.7kwh, 1.8kwh, 1.9kwh, 2.0kwh, 2.1kwh, 2.2 kWh)
            00 00 (Register 540: Today's AC Generated Energy)
            e2 40 00 01 (Register 541: Total AC Generated Energy; multiplier 0.1, corresponding to 12345.6 kWh)
            00 00 (Register 543)
- CRC16:    80 42 (CRC16 checksum)
```

4. Best Practices and Recommendations

- Read and write operations are supported for a single register or a consecutive batch of registers. Each operation must be either a read or a write; combining them in one instruction is prohibited. Additionally, the total length of an instruction and its associated data **cannot exceed 100 bytes.**
- Data Persistence: It is recommended that the EMS locally stores critical received data (e.g., status and alarms) to facilitate the generation of historical reports and for analysis purposes.

5. Device Register Definition Manual

Note

	Byte Order	Character Order
INT16	Big-Endian	-
UINT16	Big-Endian	-
INT32	Big-Endian	Little-Endian
UINT32	Big-Endian	Little-Endian
Byte Stream / String	Little-Endian	-

5.1 PowerGo Communication Configuration Register

Register Name	Address(DEC)	RegisterType	Data Type	Length	R/W	Format	Default Value	Description

`Ethernet Static IP`	220	Holding_Register	UINT16	2	R/W	%d	0xC0A801C8	PowerGo's static IP defaults to 192.168.1.200. **Example:** The default value read from the register is 0xC0A801C8. Explanation: C0 => 192 A8 => 168 01 => 001 C8 => 200
`Ethernet Subnet Mask`	222	Holding_Register	UINT16	2	R/W	%d	0xFFFFFF00	PowerGo Default Subnet Mask: 255.255.255.0 Example: The default value read from the register is **0xFFFFFF00.** **Explanation:** FF => 255 FF => 255 FF => 255 00 => 0
`Ethernet Gateway`	224	Holding_Register	UINT16	2	R/W	%d	0xC0A80101	PowerGo Default Subnet Mask: 192.168.1.1 **Example:** The default value read from the register is 0xC0A80101 **Explanation:** C0 => 192 A8 => 168 01 => 001 01 => 001
`Ethernet Mode`	230	Holding_Register	UINT16	1	R/W	%d	0x0000	This register configures the operating mode of the PowerGo Ethernet port. 0x0000 => TCP(Server); 0x0100 => TCP(Client); 0x0200 => UDP(Server); 0x0300 => UDP(Client); **Example:** The default value read from the register is 0x0000 **Explanation:** The current operating status of PowerGo is TCP (Server)
`Ethernet Port`	231	Holding_Register	UINT16	1	R/W	%d	1000	Default port: 1000
								The field has a length of 20 bytes. The first byte shall

`Wifi SSID`	110	Holding_Register	String	10	R/W	%d	yihui	be set to 0x0000 or 0xFFFF to indicate that Wi-Fi is not connected.
`Wifi Password`	120	Holding_Register	String	10	R/W	%d	yihui223	20字节长度
`Wifi Static IP`	130	Holding_Register	UINT32	2	R/W	%d	0xFFFFFFFF	**FF FF FF FF = DHCP** **Example:** The default value read from the register is 0xC0A801C8. **Explanation:** C0 => 192 A8 => 168 01 => 001 C8 => 200
`Wifi Mask`	132	Holding_Register	UINT32	2	R/W	%d	0xFFFFFFFF	**Example:** The default value read from the register is 0xFFFFFFFF. **Explanation:** FF => 255 FF => 255 FF => 255 FF => 255
`Wifi Gateway`	134	Holding_Register	UINT32	2	R/W	%d	0xFFFFFFFF	**Example:** The current value read from the register is 0xC0A80101. **Explanation:** C0 => 192 A8 => 168 01 => 001 01 => 001
`Wifi DNS`	136	Holding_Register	UINT16	2	R/W	%d	0xFFFFFFFF	**Example:** The current value read from the register is 0x08080808. **Explanation:** 08 => 008 08 => 008 08 => 008 08 => 008
`DHCP-Assigned IP Address`	138	Holding_Register	UINT32	2	R	%d	-	Once DHCP is enabled on the PowerGo, the assigned IP address may be obtained from the register.

`Wifi Mode`	140	Holding_Register	UINT16	1	R/W	%d	0x0003	This register configures the operating mode of the PowerGo Wifi port. 0x0000 => TCP(Server); 0x0001 => TCP(Client); 0x0002 => UDP; 0x0003 => mqtt; 0x0004 => Wi-Fi Only, Do Not Connect; **Example:** The default value read from the register is 0X0003 **Explanation:** The current connection is MQTT
`Source Port`	141	Holding_Register	UINT16	1	R/W	%d	5000	
`Destination IP`	142	Holding_Register	UINT32	2	R/W	%d	0xFFFFFFFF	Writing FFFFFFFF is interpreted as using a URL-based address instead of an IP. A URL is required for the MQTT connection.
`Destination IP`	144	Holding_Register	string	25	R/W	%d	"3.122.9.160"	Target URL or MQTT Server URL: Maximum Length: 50 bytes. To Disable Connection: Enter 0000 or FFFF.
`Destination Port`	169	Holding_Register	UINT16	1	R/W	%d	1883	Target Port or MQTT Server Port
`Mqtt id`	170	Holding_Register	string	10	R/W	%d	MQ123	
`Mqtt name`	180	Holding_Register	string	10	R/W	%d	mqtt	
`Mqtt password`	190	Holding_Register	string	10	R/W	%d	11	
`Mqtt topic1`	200	Holding_Register	UINT32	2	R/W	%d	0xF0000001	Defaults to this PowerGo's serial number.
`Mqtt topic2`	202	Holding_Register	UINT32	2	R/W	%d	0xF0000011	reserve
`Mqtt topic3`	204	Holding_Register	UINT32	2	R/W	%d	0xF0000012	reserve
`Mqtt topic4`	206	Holding_Register	UINT32	2	R/W	%d	0xF0000013	reserve
`Wifi Signal Quality`	208	Holding_Register	INT16	1	R	%d	-	
`Network Configuration`	265	Holding_Register	INT16	1	R	%d	-	After modifying the network configuration parameters, you must write the value 2345 to Holding Register 265 to activate the Ethernet changes or write the value

`Deployment`								1234 to Holding Register 265 to activate the Wifi changes

5.2 Grid-Side Environmental Data Register

Register Name	Address(DEC)	RegisterType	Data Type	Length	R/W	Format	Default Value	Description
`Grid-Side Voltage`	573	Holding_Register	UINT16	1	R	%.1 V	-	The device samples the current grid voltage from the power grid.
`Grid-Side Power`	530	Holding_Register	INT16	1	R	%d W	-	AC input/output port power，where: • Positive values indicate power flow from grid to divice • Negative values indicate power flow from device to grid

5.3 PowerGo Status Register

Register Name	Address(DEC)	RegisterType	Data Type	Length	R/W	Format	Default Value	Description
`Main Software Version`	1	Holding_Register	UINT16	1	R	%d	-	Main Software Version Number
`Serial Number`	12	Holding_Register	UINT32	2	R	%d	-	Product serial identifier (Byte order: big-endian, Word order: little-endian)
`Device Current Operating Status`	306	Holding_Register	UINT16	1	R	%d	-	Charge/Discharge Status Flag (1-byte): • **Bit 0:** Charge enable - 0: Charging allowed - 1: Charging prohibited • **Bit 1:** Discharge enable - 0: Discharging allowed - 1: Discharging prohibited
`Device Current Operating Time`	548	Holding_Register	UINT16	1	RW	%d	-	Year(from 2000): High 8, Month: Low 8
	549	Holding_Register	UINT16	1	RW	%d	-	Day: High 8, Hour: Low 8
	550	Holding_Register	UINT16	1	RW	%d	-	Hour: High 8, Second Low 8

`Sate of Charge(SOC)`	529	Holding_Register	UINT16	1	R	%d	-	Remaining Battery Capacity
`Backup Power (Off-Grid)`	568	Holding_Register	INT16	1	R	%d	-	The PowerGo 5000 BK model with backup power (off-grid) function supports off-grid port output power.
`Fault Information`	508	Holding_Register	UINT16	1	R	%d	-	For details and examples, refer to the 'Fault Information Table.
	509	Holding_Register	UINT16	1	R	%d	-	
	510	Holding_Register	UINT16	1	R	%d	-	
	521	Holding_Register	UINT16	1	R	%d	-	
	522	Holding_Register	UINT16	1	R	%d	-	
	523	Holding_Register	UINT16	1	R	%d	-	
	524	Holding_Register	UINT16	1	R	%d	-	
	525	Holding_Register	UINT16	1	R	%d	-	
	526	Holding_Register	UINT16	1	R	%d	-	
`Daily Cumulative Discharge Energy`	540	Holding_Register	UINT16	1	R	%d.1f kWh	-	Daily Power Generation
`7-Days Cumulative Discharge Energy`	533	Holding_Register	UINT16	1	R	%d.1f kWh	-	Registers 533-539 store the device's energy generation data for the most recent 1-7 days respectively.
	534	Holding_Register	UINT16	1	R	%d.1f kWh	-	
	535	Holding_Register	UINT16	1	R	%d.1f kWh	-	
	536	Holding_Register	UINT16	1	R	%d.1f kWh	-	
	537	Holding_Register	UINT16	1	R	%d.1f kWh	-	
	538	Holding_Register	UINT16	1	R	%d.1f kWh	-	

	539	Holding_Register	UINT16	1	R	%d.1f kWh	-	
`Total Discharge Energy`	541	Holding_Register	UINT16	1	R	%.1f kWh	-	Cumulative Total Power Generation of the Equipment (Low Register)
	542	Holding_Register	UINT16	1	R	%.1f kWh	-	

5.4 PowerGo Control Register

Register Name	Address(DEC)	RegisterType	Data Type	Length	R/W	Format	Default Value	Description
`Operating Mode`	281	Holding_Register	UINT16	1	RW	%d	-	0: Schedule Mode, **1:** Smart Meter Mode &Auto Feed with CT, **2:** Smart Meter Mode & Self Cunsumption with CT **3:** HEMS Mode, **4:** Smart Meter Mode & Auto Feed with ShellyEM, **5:** Smart Meter Mode &Self Cunsumption with ShellyEM, **6:** Smart Meter Mode & Auto Feed with Shelly Plug G3, **7:** Smart Meter Mode & Self Cunsumption with Shelly Plug G3
`Grid-Side Power(DS)`	532	Holding_Register	INT16	1	RW	%d W	-	HEMS updates the register with real-time household power (W). PowerGo executes charge/discharge control using this register value.
`Charging Power`	280	Holding_Register	UINT16	1	RW	%d W	800	Maximum Charging Power Note: Adjusting this value enables dynamic control of device charging power.
`Charge Enable`	551	Holding_Register	UINT16	1	RW	%d	-	Charge Enable Flag: 0: Charging disabled 1: Charging enabled **Priority Rule:** Charging function has higher priority than discharging When both charge and discharge areenabled (charge_en=1 ANDdischarge_en=1), the system will always execute charging
								Time Encoding Format (HH:MM):

`Period 1 Charging Start Time`	552	Holding_Register	UINT16	1	RW	%d	-	High Byte (Bits 15-8): Hour(0-23), Low Byte(Bits 7-0): Minute(0-59) Example: 23:59 = 23 * 256 + 59 = 5947(Dec) / 0x173B (Hex) **Discharge Time Windows:** Period 1: Start=HH1:MM1, End=HH2:MM2, Period 2: Start=HH3:MM3, End=HH4:MM4 PowerGo System will compare current time with these windows to enable/disable discharge. **Default Charging Periods:** Period 1: 00:00-23:59 (All-day charging allowed), Period 2: 00:00-00:00 (Disabled bydefault)
`Period 1 Charging End Time`	553	Holding_Register	UINT16	1	RW	%d	-	
`Period 2 Charging Start Time`	554	Holding_Register	UINT16	1	RW	%d	-	
`Period 2 Charging End Time`	555	Holding_Register	UINT16	1	RW	%d	-	
`Disharging Power`	543	Holding_Register	UINT16	1	RW	%d W	800	Maximum Discharge Power Note: Adjusting this value for dynamic control of device discharging power.
`Disharge Enable`	558	Holding_Register	UINT16	1	RW	%d	-	Discharge Enable Flag: 0：Discharging disabled 1：Discharging Enabled **Please note that the charge enable signal has higher priority over the discharge enable signal. When both charge enable and discharge enable are active, the system will initiate charging. To initiate discharging, set charge enable to 0 and discharge enable to 1.**
								Time is encoded in 16-bit format: High byte (Bits 15-8): Hour (0-23), Low byte (Bits 7-0): Minute (0-59) Example: 23:59 = 23×256 + 59 = 5947 (0x173B in hex), **Two configurable discharge periods:**

`Period 1 Discharging Start Time`	559	Holding_Register	UINT16	1	RW	%d	-	Period 1: Start=HH1:MM1, End=HH2:MM2, Period 2: Start=HH3:MM3, End=HH4:MM4 The PowerGo system automatically enables discharge when current time falls within either active period. **Pre-set charging windows:** Period 1: 00:00-23:59 (always enabled by default), Period 2: 00:00-00:00 (disabled by default, requires manual configuration)
`Period 1 Charging End Time`	560	Holding_Register	UINT16	1	RW	%d	-	
`Period 2 Charging Start Time`	561	Holding_Register	UINT16	1	RW	%d	-	
`Period 2 Charging End Time`	562	Holding_Register	UINT16	1	RW	%d	-	

§6. Fault Information Table

Bit 0-15	508-Word0	509-Word1	510-Word2
Bit0			
Bit1			
Bit2			
Bit3		Low State of Charge(SOC) Protection	
Bit4			Cell Failure Alarm
Bit5			
Bit6			
Bit7			
Bit8			

Bit9	Cell Overvoltage Protection		
Bit10			
Bit11	Cell Undervoltage Protection		
Bit12			
Bit13	Total Overvoltage Protection		
Bit14			
Bit15	Total Undervoltage Protection		

Bit 0-15	521-Word3	522-Word4	523-Word5
Bit0	Battery Lowvoltage Alarm	Busbar Short Circuit	Control CAN Communication Fault
Bit1	Battery EOD	PV Input Overvoltage	Communication CAN Bus Fault
Bit2	Battery Current Software Overcurrent Alarm	PV Current Software Overcurrent	Parallel Mode Configuration Error
Bit3	Battery Hardware Overcurrent Alarm	PV Hardware Overcurrent	Parallel Current Sharing Fault
Bit4	Battery Open Circuit	PV Insulation Resistance Low	Parallel ID Conflict
Bit5	Battery Overvoltage Alarm	PV Heat Sink Overtemperature	Parallel Battery Inconsistency Alarm
Bit6	Low Battery Capacity Rate	Inverter Heat Sink Overtemperature	Parallel Grid Input Mismatch
Bit7	Battery Low Capacity Shutdown	Transformer Overtemperature	Parallel Communication Signal Anomaly
Bit8	Bypass Output Overload	Grid Input Relay Short Circuit	Parallel Firmware Incompatibility
Bit9	Inverter Output Overload	Output Relay Short Circuit	Parallel Cable Connection Fault
Bit10	Inverter AC Output Short Circuit	Fan Failure	Invalid Product Serial Number
Bit11	Inverter Hardware Overcurrent Alarm	EEPROM Fault	System Low Battery Voltage Shutdown
Bit12	Inverter DC Component High Alarm	SPI Communication Fault	Slave IC Abnormal Shutdown
Bit13	Busbar Hardware Overvoltage	Model Configuration Error	DC Bus Voltage Imbalance
Bit14	Busbar Software Overvoltage	Busbar Soft Start Failure	External CT Master Configuration
Error			

Bit15	Busbar Undervoltage Alarm	Leakage Current Abnormal	Grid Input Phase Abnormality

Bit 0-15	521-Word6	522-Word7	523-Word8
Bit0	BMS Communication Fault	Grid Overvoltage	Reserve
Bit1	BMS Abnormal Alarm	Grid Undervoltage	Reserve
Bit2	BMS Battery Overtemperature	Grid Overfrequency	Reserve
Bit3	BMS Battery Overcurrent	Grid Underfrequency	Reserve
Bit4	BMS Battery Overvoltage	Grid 10-Minute Average Overvoltage	Reserve
Bit5	BMS Battery Undervoltage	LVRT (Low Voltage Ride-Through) Fault	Reserve
Bit6	BMS Battery Low Temperature	HVRT (High Voltage Ride-Through) Fault	Reserve
Bit7		System Grounding Fault	Reserve
Bit8		DC Arc Fault Detection Error	Reserve
Bit9		Anti-Islanding Protection	Reserve
Bit10		Reserve	Reserve
Bit11	BMS System Fault	Reserve	Reserve
Bit12		Reserve	Reserve
Bit13		Reserve	Reserve
Bit14		Reserve	Reserve
Bit15		Reserve	Reserve