

PCS communication protocol

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Contents

Contents	1
1 Version Notes	2
2 Physical interface	2
3 Protocol Description	3
4 Protocol address	3
5 Addendum	12
5.1 Troubleshooting Information	12
5.1.1 Hardware fault word 1 0x1700 parsing	12
5.1.2 Hardware fault word 2 0x1701 parsing	13
5.1.3 Power grid fault word 0x1702 parsing	13
5.1.4 Bus fault word 0x1703 parsing	14
5.1.5 AC capacitor fault word 0x1704 parsing	15
5.1.6 System fault word 0x1705 parsing	15
5.1.7 Switch fault word 0x1706 parsing	16
5.1.8 Other fault word 0x1707 parsing	17
5.2 On/off related information	18
5.2.1 Operation command	18
5.2.2 Charging operation	18
5.2.3 Discharge operation	18
5.2.4 Other instructions	19

1 Version Notes

Version	Effective Date	Modifier	Modify the description/acknowledge status
V1.17	2024/3/31	-	Added part of the register for insulation detection resistance.
V1.18	2024/5/16	-	1 Refresh the format; 2. Update the description in the external program version number.
V1.19	2024/5/30	-	1. Added on-grid/off-grid status; 2. Add module SN code; 3. Increase the maximum charge/discharge current limit on the battery side; 4. Increase the charge zero instruction; 5. Add one key safety setting interface; 6. Increase heartbeat signal.
V1.19	2024/8/12	-	1. Added AC main relay adhesion fault remarks description; 2. Added remarks about other fault words. 3. Increase the maximum charge and discharge power.
V1.19	2024/8/27	-	Added dehumidification enable config bit.
V1.20	2024/9/21	-	1. Fault resolution information related word bit name content modification, addition and deletion; 2. Add positive and negative remarks of active power and reactive power.
V1.21	2024/11/26	-	Added the description of PCS timing interval
V1.22	2025/2/21	-	Delete heartbeat signal

2 Physical interface

Specifically refers to the A /B end of the RS485 signal of the PCS module.

3 Protocol Description

Standard Modbus, support 03 read data and 06 write data function code; Maximum support to read 16 words of data.

Baud Rate	Parity check bit	Data bit	Stop bit
9600bps	None	8	1

4 Protocol address

Items	Address	Instructions
Output AB line voltage	0x6020	I16, Read only, in V, magnified 10x; (e.g. 400 V for grid voltage L1 and 4000 (0x0FA0) for read data)
Output BC line voltage	0x6021	I16, Read only, in V, magnified 10x;
Output CA line voltage	0x6022	I16, Read only, in V, magnified 10x;
Output A-phase voltage	0x6023	I16, Read only, in V, magnified 10x;
Output B-phase voltage	0x6024	I16, Read only, in V, magnified 10x;
Output C-phase voltage	0x6025	I16, Read only, in V, magnified 10x;
Output A-phase current	0x6026	I16, Read only, unit A, magnified 10x;
Output B-phase current	0x6027	I16, Read only, unit A, magnified 10x;
Output C-phase current	0x6028	I16, Read only, unit A, magnified 10x;
Inductance A-phase current	0x6029	I16, Read only, unit A, magnified 10x;
Inductance B-phase current	0x602A	I16, Read only, unit A, magnified 10x;
Inductance C-phase current	0x602B	I16, Read only, unit A, magnified 10x;
Grid frequency	0x602C	I16, Read only, unit Hz, magnified 100x;
Current grid phase sequence	0x602D	I16, read-only, 0 positive order, 1 negative order;
PCS derating coefficient	0x602E	I16, Read Only, Normal: 4096; (3686 indicates derated 0.9, derated 3686/4096=0.9) -- for software versions 5.13.0 and later

PCS derating mark	0x602F	I16, read-only, 0: normal; 1: IGBT overtemperature derating, 2: ambient temperature derating, 3: both IGBT and ambient temperature derating. -- Applicable to software versions 5.13.0 and later
AC A-phase active power	0x6030	I16, read only, in kW, magnified 10x; (positive indicates discharge power; Negative indicates charging power)
AC B-phase active power	0x6031	I16, read only, in kW, magnified 10x; (positive indicates discharge power; Negative indicates charging power)
AC C-phase active power	0x6032	I16, read only, in kW, magnified 10x; (positive indicates discharge power; Negative indicates charging power)
AC A-phase apparent power	0x6033	I16, Read only, in kVA, magnified 10x;
AC B-phase apparent power	0x6034	I16, Read only, in kVA, magnified 10x;
AC C-phase apparent power	0x6035	I16, Read only, in kVA, magnified 10x;
AC A-phase reactive power	0x6036	I16, Read only, in kvar, magnified 10x; (positive for inductive reactive power, negative for capacitive reactive power)
AC B-phase reactive power	0x6037	I16, Read only, in kvar, magnified 10x; (positive for inductive reactive power, negative for capacitive reactive power)
AC C-phase reactive power	0x6038	I16, read only, unit kvar, magnified 10x; (positive for inductive reactive power, negative for capacitive reactive power)
AC output total active power	0x6039	I16, read only, in kW, magnified 10x; (positive indicates discharge power; Negative indicates charging power)
AC output total reactive power	0x603A	I16, Read only, in kvar, magnified 10x; (positive for inductive reactive power, negative for capacitive reactive power)
AC output total apparent power	0x603B	I16, Read only, in kVA, magnified 10x;

AC power factor	0x603C	I16, Read only, magnified 100x;
Total bus voltage	0x6050	I16, read-only, unit V, magnified 10x;
Positive bus voltage	0x6051	I16, Read only, in V, magnified 10x;
Negative bus voltage	0x6052	I16, Read only, in V, magnified 10x;
Battery voltage	0x6053	I16, Read only, in V, magnified 10x;
Battery current	0x6054	I16, Read only, unit A, magnified 10x;
DC power	0x6055	I16, read only, in kW, magnified 10x;
Total DC current	0x6056	I16, read-only, unit A, magnified 10x, for modules in parallel;
Working condition	0x6057	<p>【 Stop, standby, Run, fault 】</p> <p>Stop: All zeros, indicating stop;</p> <p>In startup: Bit0 is 1, Bit1 is 1;</p> <p>Standby: Bit0 and Bit2 are both 1; (0 power instruction)</p> <p>To run:</p> <p>Both Bit0 and Bit3 are 1; (If off-grid is enabled and the device is running, it is judged to be off-grid operation or DC voltage source mode)</p> <p>Both Bit0 and Bit8 are 1; (for grid-connected operation)</p> <p>Fault: Bit6 is 1;</p> <p>PCS panel indicator description: green slow blinking for stop, green fast blinking for standby, green steady on for running, red steady on for fault.</p>
IGBT temperature	0x6058	I16, read-only, unit °C, magnified 10 times;
Ambient temperature	0x6059	I16, Read only, unit °C, magnified 10x;
Inductance temperature	0x605A	I16, read only, unit °C, magnified 10x;
Current actual charge and discharge working mode	0x605B	U16, read-only, 1: AC current source mode (constant current, constant power), 0: DC voltage source mode; (ACDC source use)

Grid-connected/off-grid state	0x605C	U16, Read only, 0: Stop; 1: power on; 2: standby; 3: off-grid operation; 4: grid-connected operation; 5: fault; 6: debugging. (Note: Applies to new software programs only)
DSP version	0x6000 0x6001 0x6002	U16, Read only, Software V Info U16, Read only, Software B information U16, Read only, Software D message (Note: The values corresponding to VBD together are the version number of the program, each occupying two bytes. For example, V is 5, B is 13, and D is 0, which means the device program version number is 5.13.0.)
CPLD version	0x6003 0x6004 0x6005	U16, Read only, Software V Info U16, Read only, Software B information U16, Read only, Software D message
A-Phase power factor	0x0189	I16, Read only, magnify 100x;
B-phase power factor	0x018A	I16, Read only, magnify 100x;
C-Phase power factor	0x018B	I16, Read only, magnify 100x;
DC history charge amount	0x6010	UI16, read only, high 16 bits; Unit kWh;
	0x6011	UI16, read only, low 16 bits; Unit kWh;
DC daily charge amount	0x6012	UI16, read only, high 16 bits; Unit kWh;
	0x6013	UI16, read only, low 16 bits; Unit kWh;
DC history discharge amount	0x6014	UI16, read only, high 16 bits; Unit kWh;
	0x6015	UI16, read only, low 16 bits; Unit kWh;
DC daily discharge amount	0x6016	UI16, read only, high 16 bits; Unit kWh;
	0x6017	UI16, read-only, low 16 bits; Unit kWh;

AC historical charge amount	0x6018	UI16, read only, high 16 bits; Unit kWh;
	0x6019	UI16, read only, low 16 bits; Unit kWh;
AC daily charge amount	0x601A	UI16, read only, high 16 bits; Unit kWh;
	0x601B	UI16, read only, low 16 bits; Unit kWh;
AC historical discharge amount	0x601C	UI16, read only, high 16 bits; Unit kWh;
	0x601D	UI16, read only, low 16 bits; Unit kWh;
AC daily discharge amount	0x601E	UI16, read only, high 16 bits; Unit kWh;
	0x601F	UI16, read only, low 16 bits; Unit kWh;
Insulation detection value Rx	0x0913	UI16, read only, Unit kΩ;
Insulation detection value Ry	0x0914	UI16, read only, Unit kΩ;
Module SN code	0x6070 ~0x607F	UI16, read-only, 0x6070~0x607F, 16 characters long; 0x6070 corresponds to the highest SN code word; 0x607F corresponds to the lowest SN code word; Each word represents two letters, with the high byte representing the first letter and the low byte representing the second letter; Valid characters: ASCII code;
Configurable parameters		
Set the active charge/discharge power	0x0D57	I16, read and write, unit kW, amplified 10 times, is indicating discharge power; Negative indicates charging power;
Reactive power compensates for power Settings	0x0D58	I16, read/write, in kvar, magnified 10x; (positive for inductive reactive power, negative for capacitive reactive power)
Off-grid mode Settings	0x5066	U16, Read and write, 1: Off-network enabled; 0: network-connected.
Module operation mode setting	0x501B	U16, Read/write, 1: current source mode; 0: DC voltage source mode;
Grid-connected single-phase power independent control	0x5060	U16, read-write, 1: enabled (single-phase power control). 0: disabled (default total power control);

Settings		
Module host Settings	0x5068	U16, Read/write, 1: host; 0: slave; (off-network host, there is and only one module set as the master module);
Module current source parallel enable setting	0x5054	U16, Read and write, 1: Enabled; 0: Disable (disabled by default); (for common DC bus system);
PCS dehumidification enabled	0x506A	U16, read and write, default data 0,0: disabled, 1: enabled;
Set the number of parallel modules	0x5021	U16, read and write, when the module current source is in parallel, the number of parallel modules is set;
Off-grid voltage setting	0x2227	I16; Read and write, default 4096, (4096 corresponds to line voltage 400V)), (3891 corresponds to line voltage 380V);
Off-grid frequency setting	0x0103	I16; Read and write, unit Hz, amplified 100 times, default 50Hz;
A-Phase active power is set	0x02A6	I16, read and write, in kW, magnified 10x; (single-phase power control, indicating discharge power; Negative means charging power) Write 200 for phase A discharge power of 20kW Write -200 for phase A charging power of 20kW
A-phase reactive power is set	0x02A7	I16, read/write, unit kvar, magnified 10x; (For single-phase power control, positive indicates inductive reactive power, negative indicates capacitive reactive power)
B-phase active power is set	0x02A8	I16, read and write, in kW, magnified 10x; (single-phase power control, indicating discharge power; Negative means charging power)
B-phase reactive power is set	0x02A9	I16, read and write, unit kvar, magnified 10 times; (For single-phase power control, positive indicates inductive reactive power, negative indicates capacitive reactive power)
C-phase active power is set	0x02AA	I16, read and write, in kW, magnified 10x; (single-phase power control, indicating discharge power; Negative means charging power)

C-phase reactive power is set	0x02AB	I16, read and write, in kvar, magnified 10x; (For single-phase power control, positive indicates inductive reactive power, negative indicates capacitive reactive power)
Insulation detection enabled	0x0900	I16, read and write; (Set to 1 to enable, start detection; Automatically reset after detection.) -- Applicable to 5.13.0 and later software version, and the order must be noted with insulation function.
Maximum charge power	0x5078	I16, in kW, amplified 10x, set 1000 for maximum charge power 100kW;
Maximum discharge power	0x5079	I16, unit kW, amplified 10x, set 1000 for maximum discharge power 100kW;
Maximum charge current limit on the battery side	0x163F	I16, read and write, unit A, magnified 10x; (Note: DC side, active limit value)
Maximum discharge current limit on the battery side	0x1640	I16, read and write, unit A, magnified 10x; (Note: DC side, active limit value)
DC source bus voltage Settings	0x0D16	DC source mode, bus voltage set; U16, read/write, unit V, amplified 10x, Set 7500 (table 750V, 0x1D4C=7500); Module DC source mode is valid when parallel operation; (valid only for DC voltage source mode) ;
Bus voltage Settings	0x0D10	Bus voltage setting in single module; U16, read-write, unit V, 10x magnification, Set 7500 (table 750V, 0x1D4C=7500); Module Valid when single module (non-DC source mode parallel operation); (valid only in DC voltage source mode)
Protection parameters		
Grid overfrequency protection	0x1604	U16, read/write, unit Hz, 100 times magnification;
Grid underfrequency protection	0x1605	U16, read/write, unit Hz, 100 times magnification;

Island overfrequency protection	0x1631	U16, read/write, unit Hz, 100 times magnification;
Island underfrequency protection	0x1632	U16, read/write, unit Hz, 100 times magnification;
Battery overvoltage protection point	0x1633	U16, read/write, unit V, magnification 10x;
Battery undervoltage protection point	0x1634	U16, read and write, unit V, magnified 10x;
Busbar overvoltage protection point	0x1611	U16, read and write, unit V, magnified 10x;
Busbar undervoltage protection point	0x1612	U16, read and write, unit V, magnified 10x;
DC overcurrent protection point	0x1641	U16, read and write, unit A, magnified 10x;
AC line voltage overvoltage protection point	0x1600	U16, read and write, unit V, magnified 10x;
AC line voltage undervoltage protection point	0x1601	U16, read and write, unit V, magnified 10x;
AC overcurrent protection point	0x1603	U16, read and write, unit A, magnified 10x;
Module overtemperature protection point	0x1620	U16, read/write, unit °C, magnified 10x;
Other parameters can be set		
Constant current constant voltage rechargeable battery voltage point	0x1643	U16, read and write, unit V, magnified 10x; For non-standard demand;
Battery constant voltage charging voltage	0x1644	U16, read and write, unit V, magnified 10x; For non-standard demand;
Maximum time limit for constant voltage charging	0x1650	U16, read and write, minute, 10x magnification, for lead-acid batteries;
Constant-voltage turn float charging current point setting	0x1651	U16, read and write, unit A, 10x magnification, for lead-acid batteries;

Battery float charge voltage point setting	0x1653	U16, read/write, unit V, 10x magnification, for lead-acid batteries;
Float charge turn constant current point setting	0x1654	U16, read and write, unit A, magnification 10 times, for lead-acid batteries, floating charge state, DC current greater than the threshold to constant current state;
Power-on, power-off instruction	0x0291	I16, Read and write, write 1 On, write 0 off;
Fault reset instruction	0x1400	U16, (Bit15) 15th position;
Cure parameter instruction	0x1405	Position 8 1 (write data 0x0100 to address 0x1405), will automatically clear Bit8 after curing parameter; (PCS can be set in the off state, has and can only be set once)
ReModbus address	0x1010	U16, read and write, (except modules with address dip codes);
ReModbus baud rate	0x1007	U16, read and write, 96 means 9600 baud rate;
HMIModbus address	0x1011	U16, read and write, (except modules with address dip codes);
HMIModbus baud rate	0x1004	U16, read and write, 96 means 9600 baud rate;
EMS (BMS) communication failure time threshold	0x1648	U16, read and write, unit s;
Charge reset command	0x508C	U16, Read/write, write 1 Clear charge (PCS is valid in off state);
Safety one key set interface	0x508D	U16, read/write, reserved;
PCS timing function (It is recommended that the timing period be one day or one week, the time interval must be at least 1 minute)		
year	0x1020	U16, write;
month	0x1021	U16, write;
day	0x1022	U16, write;
hour	0x1023	U16, write;

minute	0x1024	U16, write;
second	0x1025	U16, write;
Fault info		
Hardware fault word 1	0x1700	U16, Read only;
Hardware fault word 2	0x1701	U16, Read only;
Grid fault word	0x1702	U16, Read only;
Bus fault word	0x1703	U16, Read only;
AC capacitor fault word	0x1704	U16, read-only;
System fault word	0x1705	U16, Read only;
Switch fault word	0x1706	U16, Read only;
Other fault words	0x1707	U16, Read only;

5 Addendum

5.1 Troubleshooting Information

5.1.1 Hardware fault word 1 0x1700 parsing

Hardware failure word bit	Instructions
bit0	The EPO is faulty.
bit1	IGBT OCP failure;
bit2	Bus hardware overvoltage failure;
bit4	Power module current limiting by wave failure;
bit5	Wave by wave current limiting failure of balance module;
Description: 1 is fault, 0 is normal; Other bits reserved;	

5.1.2 Hardware fault word 2 0x1701 parsing

Hardware fault word bit	Instructions
bit0	24V power failure;
bit1	The fan is faulty.
bit2	Connection failure;
bit6	External input dry contact 3 failure;
bit7	Inductance overtemperature fault flag;
bit8	Power module overtemperature fault;
bit9	Balance module overtemperature fault;
bit10	15V power failure;
bit11	System fire alarm failure;
bit12	External input dry contact 1 is faulty.
bit13	External input dry contact 2 failure;
bit14	Ambient temperature overtemperature fault;
bit15	Dry contact overtemperature fault;
Description: 1 indicates fault, 0 indicates normal; Other bits reserved;	

5.1.3 Power grid fault word 0x1702 parsing

Grid fault word bit	Instructions
bit0	Power grid phase A overvoltage failure;
bit1	Power grid B phase overvoltage failure;
bit2	C-phase overvoltage fault of power grid;
bit3	Power grid phase A undervoltage fault;

bit4	Power grid B phase undervoltage fault;
bit5	Power grid phase C undervoltage fault;
bit6	Grid overfrequency failure;
bit7	Grid underfrequency failure;
bit8	Grid phase sequence error fault;
bit9	Phase A software overcurrent failure;
bit10	B phase software overcurrent fault;
bit11	Phase C software overcurrent fault;
bit12	Grid voltage unbalance fault;
bit13	Power grid current imbalance failure;
bit14	Grid phase-out failure;
bit15	N-line overcurrent failure;
Description: 1 is fault, 0 is normal; Other bits reserved;	

5.1.4 Bus fault word 0x1703 parsing

Bus fault word bit	Instructions
bit0	Overvoltage fault of pre-filled bus;
bit1	Precharged bus undervoltage fault;
bit4	Running bus overvoltage failure;
bit5	Run bus undervoltage fault;
bit6	Positive and negative bus unbalanced fault;
bit7	Battery undervoltage failure;
bit9	Battery overvoltage failure;
bit10	Dc precharge overcurrent failure;

bit11	Dc overcurrent fault;
bit12	Balance module software overcurrent fault;
bit15	Battery backconnection failure;
Description: 1 is fault, 0 is normal; Other bits reserved;	

5.1.5 AC capacitor fault word 0x1704 parsing

AC Capacitor fault word bit	Instructions
bit0	Pre-charge timeout failure;
bit1	Precharge A-phase overcurrent failure;
bit2	Precharge B-phase overcurrent failure;
bit3	Precharge C-phase overcurrent failure;
bit6	Leakage overcurrent failure;
Description: 1 is fault, 0 is normal; Other bits reserved;	

5.1.6 System fault word 0x1705 parsing

System failure word bit	Instructions
bit0	Control board RAM failure;
bit1	Control board EEPROM failure;
bit2	AD zero drift fault;
bit3	Back-end communication protocol failure;
bit4	CAN communication protocol failure;
bit5	CPLD communication protocol failure;
bit6	DataLog data failure;

bit8	Insulation detection failure;
bit9	Software firmware mismatch failure;
bit11	BMS battery status failure;
bit12	STS communication failure;
bit13	BMS communication failure;
bit14	CAN communication failure of parallel system;
bit15	EMS communication failure;
Description: 1 is fault, 0 is normal; Other bits reserved;	

5.1.7 Switch fault word 0x1706 parsing

Switch fault word bit	Instructions
bit0	Precharge relay closure failure;
bit1	Precharge relay disconnect failure;
bit2	Precharge relay closed state failure;
bit3	Precharge relay disconnected state failure;
bit4	Main relay closure failure;
bit5	Main relay disconnection failure;
bit6	Main relay closed state failure;
bit7	Main relay disconnected state failure;
bit8	Ac main relay adhesion failure; (Note: no power, please contact the manufacturer in time; If it is powered off, do not power it on again.)
bit9	Dc relay open circuit failure; (Note: no power, please contact the manufacturer in time; If it is powered off, do not power it on again.)
bit10	Ac main relay open circuit failure; (Note: no power, please contact the manufacturer in time; If it is powered off, do not power it on again.)

Note: 1 indicates fault and 0 indicates normal. Other bits reserved;

5.1.8 Other fault word 0x1707 parsing

Other fault word bits	Instructions
bit0	Inverter voltage A phase overvoltage fault;
bit1	Inverter voltage B phase overvoltage fault;
bit2	Inverter voltage C-phase overvoltage fault;
bit3	Grid island failure;
bit5	System resonance failure;
bit6	Software overvoltage and overcurrent fault;
bit8	High voltage crossing timeout fault;
bit9	Inverter voltage phase A undervoltage fault;
bit10	Inverter voltage B phase undervoltage fault;
bit11	Inverter voltage C-phase undervoltage fault;
bit12	Off-grid no synchronization signal failure;
bit14	Off-grid output short circuit fault;
bit15	Low voltage crossing timeout fault;
Description: 1 is fault, 0 is normal; Other bits reserved;	



Instructions

- ① If the AC main relay adhesion fault, DC relay open circuit fault, AC main relay open circuit fault, etc., please contact the manufacturer in time; If it is powered off, do not power it on again.
- ② Hardware fault words 1, hardware fault words 2 (except SPD fault, power module overtemperature fault) need to be powered off and reset.
- ③ Battery voltage fault, battery overvoltage fault, battery reverse connection fault, power module

overtemperature fault, after fault recovery, you can automatically reset;

- ④ Other faults (except ①②③ all faults), when the module is shut down (after the shutdown instruction is issued), the fault reset instruction can be reset.

5.2 On/off related information

5.2.1 Operation command

Operations	Remarks
Boot	Need to set 0x0291 to 1;
Power off	Need to set 0x0291 to 0;
Reset	In the off state, set the 15th position of 0x1400 to 1;
Cure parameter command	In the non-grid-connected state, set the 8th position 1 of 0x1405, and automatically clear Bit8 after DSP curing; (PCS can be set in the off state, there is and can only be set once)

5.2.2 Charging operation

Standby -> Charge -> Power Off

1. Write 1 to 0x0291 to turn on, after 10s the machine turns on;
2. Write a negative value to 0x0D57 to adjust the charging power, such as -200, which represents the charging power of 20kW
3. The EMS determines that the battery is full and shuts it down by writing 0 to 0x0291.

5.2.3 Discharge operation

Standby -> Discharge -> Power Off

1. Write to 0x0291 1 Power on, 10s after the machine power on;
2. Write a positive value to 0x0D57 to adjust the discharge power, such as 200, which represents the discharge power of 20kW
3. After the EMS determines that the battery is exhausted, it can be shut down by writing 0 to 0x0291.

5.2.4 Other instructions

- Conventional boot process: first give the boot command, then give power;
- Conventional shutdown process: first power down to 0, and then give shutdown instructions.