

# **PPC MODBUS Protocol**

## **V2.2**

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<b>Revision History</b>			
Protocol Revision	Date	Author	Remark
V1.0	24-Feb-06	Poor	1. ASCII Mode for PPC Q1 、 Q2 、 WH 、 WA 、 BPS commands
V1.1	19-Jun-06	Poor	1. Add RTU Mode 2. Add write function code (0x06) and command data area (0xC0~0xCF) for change baud rate 3. Add hexadecimal and decimal comparison table
V1.2	06-Sep-06	Poor	1. Add ERD data area (0xE0~0xFF) for GD 、 GTS commands
V1.3	14-Jan-08	Selina	1. Modified (STATES DATA AREA) S00: Reserved(always 0)→0: Bat silence, only for Centralion
V1.4	29-Sep-10	Jinhua Junjing	1. Delete all information about ASCII mode 2. Modify some error words 3. Add CMC connection
V1.5	22-Oct-10	Junjing	1. Delete the list of Address Index(dec) In the Appendix A table
V1.6	17-Dec-10	Junjing	1. Support Gripower UPS 2. Add data area(0x86-0x87) for Q6 command 3. Add System Mode (0x31, S16-S19), fault(0x45-0x48), warning(0x52-0x55)
V1.7	12-Jan-11	Junjing	1. fault (0x45 : F80) Reserved 2. Modify data unit(0x6C-0x6E) for new ups type 3. Modify the definition of Gripower UPS name and States data area.
V1.8	31-Mar-11	Junjing	1. Modify data description (0x80-0x81)
V1.9	24-Jan-13	Jinhua	1. modify the page number of Contents 2. modify the content of page 20: the new content is “ let the pin6(R+) of CMC RJ45 connect the pin (T/R+) of Converter, and pin5(R-) of CMC RJ45 connect the pinping (T/R-) of Converter”. The old content is “let the pin6(T+) of CMC RJ45 connect the pin (T/R+) of Converter, and pin5(T-) of CMC RJ45 connect the pinping (T/R-) of Converter”
V2.0	1-April-14	Jinhua	Delete ERD address
V2.1	18-April-16	Jinhua	Delete all ERD address

V2.2	12-Dec-20	Jinhua	Add RS232 baud setting for CMC first communication
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## ➤ GENERAL MESSAGE FORMAT

### (1) RTU Transmission Mode

When devices communicate on a MODBUS serial line using the RTU (Remote Terminal Unit) mode, each 8-bit byte in a message contains two 4-bit hexadecimal characters.

#### • RTU Message Frame

Address	Function	Data	CRC
1 byte	1 byte	0 up to 2×252 byte(s)	2 bytes CRC Low   CRC Hi

Note : The maximum size of a MODBUS RTU frame is 256 bytes.

### (2) RS232 baud setting for CMC first communication

The default baud rate of CMC is **2400** bps. Byte size is **8**. Parity is **NONE**. Stop Bits is **1**.

## ➤ FUNCTION DESCRIPTION

### ✎ Read Function 0x03

- Master request message : 8 bytes

#### ⊙ RTU mode

Slave Address	Function	Starting Address		No. of Registers		CRC
		Hi	Lo	Hi	Lo	
1 byte	1 byte	1 byte	1 byte	1 byte	1 byte	2 bytes CRC Low   CRC Hi

- Slave response message :

#### ⊙ RTU mode

Slave Address	Function	Byte count	Data		Next data	CRC
			Hi	Lo		
2 chars	2 chars	2 chars	2 chars	2 chars	.....	2 bytes CRC Low   CRC Hi

### ✎ Write Single Register Function 0x06

- Master request message : 8 bytes

#### ⊙ RTU mode

Slave Address	Function	Register Address		Register Value		CRC
		Hi	Lo	Hi	Lo	
1 byte	1 byte	1 byte	1 byte	1 byte	1 byte	2 bytes CRC Low   CRC Hi

- Slave response message :

#### ⊙ RTU mode

Slave Address	Function	Register Address		Register Value		CRC
		Hi	Lo	Hi	Lo	
1 byte	1 byte	1 byte	1 byte	1 byte	1 byte	2 bytes CRC Low   CRC Hi

•Data Addresses in PPC Modbus Messages :

All data addresses in PPC Modbus messages are referenced to zero. The first occurrence of a data item is addressed as item number zero. For example: The register known as ‘MeasurementData 1’ in a programmable controller is addressed as register 0000 in the data address field of a PPC Modbus message. Register 127 decimal is addressed as register 007E hex (126 decimal). The function code field already specifies a ‘holding register’ operation. Therefore the holding register 108 is addressed as register 006B hex (107 decimal).

•Error :

Error code	2 chars	0x83
Exception	2 chars	01 or 02 or 03 or 04

➤For error example :

The master addresses a query to slave device 1 (01 hex). The function code (03 hex) is for a Read Holding Registers operation. It requests the data of the holding registers at address (0250 hex). If the Holding Registers address is non-existent in the slave device, the slave will return the exception response with the exception code shown (02 hex). This specifies an illegal data address for the slave. For example, if the slave is a 2–7 with 8 holding registers, this code would be returned.

<b>QUERY</b>		
Byte	Contents	Example
1.	Slave Address	01
2.	Function	03
3.	Starting Address Hi	02
4.	Starting Address Lo	50
5.	No. of Registers Hi	00
6.	No. of Registers Lo	03
7.	Error Check (CRC)	
<b>EXCEPTION RESPONSE</b>		
Byte	Contents	Example
1.	Slave Address	01
2.	Function	83
3.	Exception Code	02
4.	Error Check (CRC)	

**MODBUS Exception Codes**

Code	Name	Meaning
01	ILLEGAL FUNCTION	The function code received in the query is not an allowable action for the server (or slave). This may be because the function code is only applicable to newer devices, and was not implemented in the unit selected. It could also indicate that the server (or slave) is in the wrong state to process a request of this type, for example because it is non-configured and is being asked to return register values.
02	ILLEGAL DATA ADDRESS	The data address received in the query is not an allowable address for the server (or slave). More specifically, the combination of reference number and transfer length is invalid. For a controller with 100 registers, a request with offset 96 and length 4 will be success, a request with offset 96 and length 5 will generate exception 02.
03	ILLEGAL DATA VALUE	A value contained in the query data field is not an allowable value for server (or slave). This indicates a fault in the structure of the remainder of a complex request, such as that the implied length is incorrect. It specifically does NOT mean that a data item submitted for storage in a register has a value outside the expectation of the application program, since the MODBUS protocol is unaware of the significance of any particular value of any particular register.
04	SLAVE DEVICE FAILURE	An unrecoverable error occurred while the server (or slave) was attempting to perform the requested action.

➤ For read function (0x03) example :

The master query is a Read Holding Registers request to slave device address 01. The message requests data from two holding registers, 0x2AB through 0x2AC. Note that the message specifies the starting register address as 0683 (02AB hex).

The slave response echoes the function code, indicating this is a normal response. The 'Byte Count' field specifies how many 8-bit data items are being returned.

It shows the count of 8-bit bytes to follow in the data.

**How to Use the Byte Count Field:** When you construct responses in buffers, use a Byte Count value that equals the count of 8-bit bytes in your message data. The value is exclusive of all other field contents, including the Byte Count Field.

## Master Query

QUERY			
Field Name	Example	ASCII Characters	RTU 8-Bit Field
Header		: (colon)	None
Slave Address	01	0 1	0000 0001
Function	03	0 3	0000 0011
Starting Address Hi	02	0 2	0000 0010
Starting Address Lo	AB	A B	1010 1011
No. of Registers Hi	00	0 0	0000 0000
No. of Registers Lo	02	0 2	0000 0010
Error Check (LRC / CRC)		4 D (2 chars)	1011 0100 (16 bits) 0101 0011
Trailer		CR LF	None
Total Bytes :		17	8

## ©RTU mode

Slave Address	Function	Starting Address		No. of Registers		CRC	
		Hi	Lo	Hi	Lo		
0x01	0x03	0x02	0xAB	0x00	0x02	0xb4	0x53

## Slave Response

RESPONSE			
Field Name	Example	ASCII Characters	RTU 8-Bit Field
Header		: (colon)	None
Slave Address	01	0 1	0000 0001
Function	03	0 3	0000 0011
Byte Count	04	0 4	0000 0110
Data Hi	23	2 3	0010 0011
Data Lo	05	0 5	0000 0101
Data Hi	23	2 3	0010 0110
Data Lo	00	0 0	0000 0000
Error Check (LRC / CRC)		A D (2 chars)	1111 1000 (16 bits) 1000 0110
Trailer		CR LR	None
Total Bytes :		19	9

## ©RTU mode

Slave Address	Function	Byte count	Data		Data		CRC	
			Hi	Lo	Hi	Lo		
0x01	0x03	0x04	0x23	0x05	0x23	0x00	0xf8	0x86



➤ For write single register function (0x06) example :

The master query is a Writing Single Holding Registers request to slave device address 01. The message requested preset value which is specified in the data field into single holding registers 0193 (00C0 hex).

The normal response is an echo of the request, returned after the register contents have been written.

Master Query			
QUERY	Example	ASCII Characters	RTU 8-Bit Field
Header		: (colon)	None
Slave Address	01	0 1	0000 0001
Function	06	0 6	0000 0110
Register Address Hi	00	0 0	0000 0000
Register Address Lo	C0	C 0	1100 0000
Register value Hi	09	0 9	0000 1001
Register value Lo	60	6 0	0110 0000
Error Check (LRC / CRC)		D 0 (2 chars)	1000 1111 (16 bits) 1000 1110
Trailer		CR LF	None
	Total Bytes :	17	8

© RTU mode

Slave Address	Function	Register Address		Register Value		CRC	
		Hi	Lo	Hi	Lo		
0x01	0x06	0x00	0xC0	0x09	0x60	0x8f	0x8e

## Slave Response

QUERY			
Field Name	Example	ASCII Characters	RTU 8-Bit Field
Header		: (colon)	None
Slave Address	01	0 1	0000 0001
Function	06	0 6	0000 0110
Register Address Hi	00	0 0	0000 0000
Register Address Lo	C0	C 0	1100 0000
Register value Hi	09	0 9	0000 1001
Register value Lo	60	6 0	0110 0000
Error Check (LRC / CRC)		D 0 (2 chars)	1000 1111 (16 bits) 1000 1110
Trailer		CR LF	None
	Total Bytes :	17	8

## ©RTU mode

Slave Address	Function	Register Address		Register Value		CRC	
		Hi	Lo	Hi	Lo		
0x01	0x06	0x00	0xC0	0x09	0x60	0x8f	0x8e

## ➤ GENERAL TABLE DATA AREA DEFINITION

Data	Based address index	<sup>(1)</sup> Length in Word	Format	Information	MODBUS/JBUS Functions
<b>IDENTIFIERS</b>	0x0000	18	WORD	See related chapter	3 (read)
<b>STATES</b>	0x0030	2	BIT	32 States	3 (read)
<b>FAULT CODE<sup>(2)</sup></b>	0x0040	9	BIT	144 Fault codes	3 (read)
<b>WARNINGS<sup>(2)</sup></b>	0x0050	6	BIT	96 Warnings	3 (read)
<b>MEASUREMENTS</b>	0x0060	48	WORD	48 Measurements	3 (read)
<b>CONFIGURATIONS</b>	0x00A0	16	WORD	16 Configurations	3 (read)
<b>COMMAND</b>	0x00C0	1	WORD	1 Command	3(read) · 6(write)

Note : <sup>(1)</sup>Effective range of the No. Of Registers must be less than the length in word.

<sup>(2)</sup>Fault code and warnings data are only in support of 3C3 series.

## ➤ VECTOR DATA AREA DETAIL

### ⊗ IDENTIFIERS FRAME

Base address index = 0x00

WORD 0-14	WORD 15	WORD 16	WORD 17
UPS name	Slave address	Protocol number	UPS firmware Version

Description	Unit	Data representation	Explanation
UPS name	*char	###.....###	ASCII characters
Slave address (UPS ID)	Integer	##	
Protocol number	Integer	##.##	For example : 03.30
UPS firmware Version	Integer	##.##	For example : 09.90

### ▪ General UPS name

Byte No.	Description
Byte0-24	UPS name will form into sequence.
Byte25	Input source “ (Empty) : means only one input source “ 2 “ : means two input sources. (Bypass utility source and line utility source). If get this character (“2”), PC side need add to send the BPS command then get bypass utility data.
Byte26	Always empty.
Byte27	Input phase number.
Byte28	Always “/”.
Byte29	Output phase number.

Note : \* UPS name are represented by character. A character with an ASCII code less than ASCII 32(space) or greater than ASCII 123 (“z”), is not valid.

If mater requests data in this field , the LRC check regard one character as one byte.

### ▪ Gripower UPS name

**UPS Name:** TTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTT (30 Char)

E.g.

T29	T28	T27	T26	T25	T24	T23	T22	T21	T20
3	A	3		U	P	S			
T19	T18	T17	T16	T15	T14	T13	T12	T11	T10
T9	T8	T7	T6	T5	T4	T3	T2	T1	T0

T29-T0: UPS name

## ⊗ STATES DATA AREA

Base address index = 0x30

Code	Description (UPS status / System mode)	Explanation
S00	0: Bat silence(only for Centralion)	<ul style="list-style-type: none"> <li>•UPS Status is composed of &lt;S00&gt; to &lt;S07&gt;.</li> <li>•UPS System Mode is composed of &lt;S00&gt; to &lt;S07&gt; and &lt;S16&gt; to &lt;S19&gt;</li> <li>•&lt;S00&gt;..... &lt;S07&gt; is binary number "0" or "1".</li> </ul>
S01	1 : Shutdown active/Shutdown mode	
S02	1 : Test in process/BatTest mode	
S03	0 : Online UPS 1 : Offline UPS	
S04	1 : UPS failed/Fault mode	
S05	1 : Bypass/Boost active/Bypass mode	
S06	1 : Battery low warning	
S07	1 : Utility fail (immediate)/Battery mode	For Centralion <S00>is defined as Bat silence (0), besides it is reserved (always 0).
S08	1 : Idle	<ul style="list-style-type: none"> <li>•Status of Battery Test is composed of &lt;S08&gt; to &lt;S15&gt;.</li> <li>•&lt;S08&gt;..... &lt;S15&gt; is binary number "0" or "1".</li> </ul>
S09	1 : Processing	
S10	1 : Result : no failure	
S11	1 : Result : failure/warning	
S12	1 : Not possible or inhibit	
S13	1 : Test cancel	
S14	1 : Reserved	
S15	1 : Other values	
S16	1 : Standby mode	<ul style="list-style-type: none"> <li>•&lt;S16&gt;..... &lt;S19&gt; is binary number "0" or "1".</li> </ul>
S17	1 : Line mode	
S18	1 : Converter mode	
S19	1 : ECO mode	
S20-31	Reserved	

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	
S07							S00	Byte 0
S15							S08	Byte 1
S23							S16	Byte 2
S31							S24	Byte 3

### Example of data sequence:

WORD 0				WORD 1			
High		Low		High		Low	

S15.....S08	S07.....S00	S31.....S24	S23.....S16
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### ⊗ FAULT CODE AREA

Base address index = 0x40

Code	Description	故障表
F00	Temperature in converter too high	轉換器過溫
F01	Internal fault 34	內部故障
F02	Incorrect parameter(Inverter MLFB)	錯誤參數
F03	Inverter contactor defective	輸出電磁接觸器損壞
F04	Multiple inverter cut off as a result of over-current	變流器過電流切斷
F05	Failure power supply electronic	工作電源不正常
F06	Over-voltage in the intermediate circuit	內部電路過電壓
F07	External Quick Shutdown active	Not used
F08	Electronic defective(Signal Processor defective)	控制器損壞
F09	Defect in the Power Electronic(Rectifier)	整流器電力元件損壞
F10	Defect in the Power Electronic(UCE-supervision)	電力元件損壞
F11	Over current cutoff	過電流切斷
F12	False parameter input during (H/W Init.)	錯誤參數輸入
F13	UPS output out of tolerance	輸出超出規格
F14	Output overload(i2t-supervision)	輸出過載
F15	Not used	Not used
F16	Not used	Not used
F17	Bypass defective	旁路損壞
F18	Bypass defective(during Transfer)	旁路轉換期間損壞
F19	Bypass overload	旁路過載
F20	Not used	Not used
F21	Not used	Not used
F22	Electronic defective(EEPROM Inverter)	控制器損壞
F23	Communication with Battery Manager defective	電池管理通訊異常
F24	Electronic defective(Check-sum EPROM)	控制器損壞
F25	Environment temperature smaller than 0 grad or measurement defective	量測溫度異常
F26	Optional module failed or not put in	外加模組訊號異常
F27	Parallel Bypass failed	並聯旁路失敗
F28	Signal fault in the Parallel Module	併聯版異常
F29	Not used	Not used
F30	Not used	Not used
F31	Not used	Not used
F32	Not used	Not used
F33	Not used	Not used
F34	Not used	Not used
F35	Not used	Not used
F36	Not used	Not used
F37	Not used	Not used
F38	Not used	Not used

F39	Not used	Not used
F40	Not used	Not used
F41	Not used	Not used
F42	Not used	Not used
F43	Not used	Not used
F44	Not used	Not used
F45	Charger over charging	電池電壓過充
F46	Not used	Not used
F47	Not used	Not used
F48	Not used	Not used
F49	Not used	Not used
F50	Not used	Not used
F51	Not used	Not used
F52	Not used	Not used
F53	Not used	Not used
F54	Not used	Not used
F55	Reserved for led test(no fault)	Not used
F56	Not used	Not used
F57	Psdr to bus fuse open	功率板與BUS間Fuse損壞
F58	Load unbalance over 50%	負載不平衡超過50%
F59	Not used	Not used
F60	Not used	Not used
F61	Profibus fault	(PPC不會發生)
F62	System frequency out of tolerance	系統頻率超出容忍 (PPC不會發生)
F63	System voltage out of tolerance	系統電壓超出容忍 (PPC不會發生)
F64	Not used	Not used
F65	Not used	Not used
F66	LCD with Cudsmc Communication failure	內部通訊異常
F67-F79	Reserved	
F80	Reserved	Not used
F81	cBusSoftTimeOut	BUS软启动超时
F82	cBusOver	BUS高压Fault
F83	cBusUnder	BUS低压Fault
F84	cBusUnbalance	BUS不平衡Fault
F85	cBusShort	Bus短路故障
F86	cInvSoftTimeOut	逆变软启动超时
F87	cInvVoltHigh	逆变电压高压Fault
F88	cInvVoltLow	逆变电压低压Fault
F89	cOPVoltShort	输出电压短路
F90	cRInv VoltShort	R相逆变电压短路
F91	cSInv VoltShort	S相逆变电压短路
F92	cTInv VoltShort	T相逆变电压短路
F93	cRSInv VoltShort	RS相线电压短路
F94	cSTInv VoltShort	ST相线电压短路
F95	cTRInv VoltShort	TR相线电压短路

F96	cInvNegPow	负功Fault
F97	cInvRNegPow	R相负功Fault
F98	cInvSNegPow	S相负功Fault
F99	cInvTNegPow	T相负功Fault
F100	cTotalInvNegPow	三相总负功Fault
F101	cReactPowFault	不均流Fault
F102	cInvRlyOpenFault	INV Rly 无法闭合
F103	cInvRlyStickFault	INV Rly 粘死
F104	cLineSCRFault	市电输入SCR故障
F105	cBatScrFault	电池输入SCR故障
F106	cByPassScrFault	旁路输入SCR故障
F107	cWiringFault	输入输出接线错误
F108	cCommLineLoss	通讯线未连
F109	cHostlineFault	主机线故障
F110	cCanFault	CAN通讯线故障
F111	cSynLineFault	同步信号线故障
F112	cAllFansLockedFault	所有风扇全故障
F113	cOCCoreFault	DSP异常
F114	cChgOpSoftTimeOut	充电器输出软启动超时
F115	cUpsAllFault	UPS模块全故障
F116	cLineInNtcOpenFault	UPS市电输入NTC开路故障
F117	cLineInFuseOpenFault	市电输入fuse开路故障
F118	cCoherencyFault	输入不一致故障
F119	cEepromFault	Eeprom数据丢失
F120	cLinesupportFail	市电支援失效
F121	cPowerBreakDown	电源失效
F122	cSysOverCapacity	系统过容
F123	cADS7869Fault	ADS7869 Error
F124	cSTSHardwareFault	Bypass Mode No OP
F125	cOpBreakerOffFault	O/P Breaker OFF in Parallel Mode
F126	cNTCAbnormal	NTC故障
F127	cBatAbnormal	电池故障
F128	cWC1_ForbidComeBackFromByp	频繁过流故障
F129	cEpoFault	EPO故障(最高优先级故障, 此故障一旦置位就不能被其它故障码覆盖)
F130-F143	Not used	Not used

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	
F07							F00	Byte 0
F15							F08	Byte 1
F23							F16	Byte 2
F31							F24	Byte 3
F39							F32	Byte 4
F47							F40	Byte 5
F55							F48	Byte 6
F63							F56	Byte 7

F71						F64	<b>Byte 8</b>
F79						F72	<b>Byte 9</b>
F87						F80	<b>Byte 10</b>
F95						F88	<b>Byte 11</b>
F103						F96	<b>Byte 12</b>
F111						F104	<b>Byte 13</b>
F119						F112	<b>Byte 14</b>
F127						F120	<b>Byte 15</b>
F135						F128	<b>Byte 16</b>
F143						F136	<b>Byte 17</b>

**Example of data sequence:**

WORD 0		WORD 1		.....	WORD 8	
High	Low	High	Low		High	Low
F15.....F08	F07.....F00	F31.....F24	F23.....F16		F143.....F136	F135.....F128

**⊗ WARNING CODE AREA**

Base address index = 0x50

Code	Description	故障表
A00	Over-temperature inverter	變流器過溫
A01	Bypass mains failure	市電異常
A02	Rectifier mains failure	市電異常
A03	Load too high(i2-t-Supervision)	過載
A04	Under-voltage intermediate circuit	電路低電壓
A05	Over load	過載
A06	Phase sequence incorrect in Bypass	輸入相序錯誤
A07	Service bypass is on	Not used
A08	Battery operation	電池供電
A09	Battery rest time exceeded	供電時間太少
A10	Battery under-voltage	電池低電壓
A11	Operating condition commissioning, converter	執行設定模式
A12	Battery switch not engaged	電池未接
A13	Ventilator lifetime exceeded	建議更換風扇
A14	Connection to charger lost	充電器未接
A15	Internal warning 16	內部警告
A16   A21	Reserved	Reserved
A22	Battery charger communicate failure	充電器無通訊
A23	General battery charger failure	充電器異常
A24   A29	Reserved	Reserved
A30	Load unbalance	負載不平衡
A31	Internal warning 32	內部警告



A32	cWC1_EpoActive	EPO开关未接
A33	cWC1_ModuleUnLock	模块未锁
A34	cWC1_IPNLoss	输入中线丢失
A35	cWC1_SiteFail	L、N反接
A36	cWC1_BypassLoss	旁路异常
A37	cWC1_ByPassPhaseErr	旁路相序错误
A38	cWC1_OverChg	电池过充
A39	cWC1_BatReverse	电池反接
A40	cWC1_MaintainOn	维修旁路盖板打开
A41	cWC1_ErrorLocation	物理位置错误
A42	cWC1H_cTurnOnAbornaml	不满足开机条件，无法开机
A43	cWC1H_cRedundantLoss	冗余丢失
A44	cWC1_ModuleHotSwapActive	模块未插紧
A45	cWC1_BatteryInform	电池维护时间到
A46	cWC1_InspectionInform	巡检维护时间到
A47	cWC1_GuaranteeInform	过保维护时间到
A48	cWC1_TempLow	温度过低
A49	cWC1_BatOverTemp	电池过温
A50	cWC1_BusCapMainInform	BUS电容维护时间到
A51	cWC1_SysOverCapacity	系统过容
A52	cWC1_HighExternalWarning	外部告警高32位
A53-A63	reserved	保留
A64	cOuterWarningCode2L_ModuleFault	模块故障
A65	cOuterWarningCode2L_BypassNLoss	旁路N线丢失
A66	cOuterWarningCode2L_BatNLoss	电池N线断开
A67	cOuterWarningCode2L_ExChgFail	EXCHG故障
A68	cOuterWarningCode2L_BatTempLow	电池温度过低
A69	cOuterWarningCode2L_BatUnbalance	电池不平衡
A70	cOuterWarningCode2L_ADCalibrationFail	AD校准失败
A71-A95	Reserved	保留

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	
A07							A00	<b>Byte 0</b>
A15							A08	<b>Byte 1</b>
A23							A16	<b>Byte 2</b>
A31							A24	<b>Byte 3</b>
A39							A32	<b>Byte 4</b>
A47							A40	<b>Byte 5</b>
A55							A48	<b>Byte 6</b>
A63							A56	<b>Byte 7</b>
A71							A64	<b>Byte 8</b>
A79							A72	<b>Byte 9</b>
A87							A80	<b>Byte 10</b>
A95							A88	<b>Byte 11</b>

**Example of data sequence:**

WORD 0		WORD 1		.....	WORD 5	
High	Low	High	Low		High	Low
A15.....A08	A07.....A00	A31.....A24	A23.....A16		A95.....A88	A87.....A80

**⊗ MEASUREMENT DATA AREA**

Base address index = 0x60

Address Index	Description	Unit	Data representation	Explanation
0x60	I/P voltage R	V	###.#	
0x61	I/P voltage S	V	###.#	
0x62	I/P voltage T	V	###.#	
0x63	I/P fault voltage (R or S or T)	V	###.#	
0x64	Bypass I/P voltage R	V	###.#	
0x65	Bypass I/P voltage S	V	###.#	
0x66	Bypass I/P voltage T	V	###.#	
0x67	I/P frequency	Hz	##.#	
0x68	Bypass I/P frequency	Hz	##.#	
0x69	O/P voltage R	V	###.#	
0x6A	O/P voltage S	V	###.#	
0x6B	O/P voltage T	V	###.#	
0x6C	O/P current R	%(A)	###	This is a percent of maximum current for old UPS. This is an absolute value for new UPS type
0x6D	O/P current S	%(A)	###	
0x6E	O/P current T	%(A)	###	
0x6F	O/P current R	A	###.#	
0x70	O/P current S	A	###.#	
0x71	O/P current T	A	###.#	
0x72	O/P power R	KW	###.#	
0x73	O/P power S	KW	###.#	

0x74	O/P power T	KW	###.#	
0x75	Total power	KW	###.#	
0x76	O/P complex power R	KVA	###.#	
0x77	O/P complex power S	KVA	###.#	
0x78	O/P complex power T	KVA	###.#	
0x79	Total complex power	KVA	###.#	
0x7A	O/P load	%	###	W% is a percent of maximum real power. VA% is a percent of maximum VA.
0x7B	Battery cell voltage	V	###	
0x7C	Battery voltage/ Positive battery voltage	V	###.#	
0x7D	Temperature	°C	##.#	
0x7E	Charge in Status/ Battery capacity percentage	%	###	Provided range for the program : CCC=000.....to.....133
0x7F	Recharge time to 95%	hours	###	
0x80	Estimated run-time/	min	#####	##### in seconds.
0x81	Remain battery backup time	sec		
0x82	Hold time at 100% Load	min	###	###in minutes.
0x83		sec	.##	.## in seconds.
0x84	Hold time at 50% Load	min	###	###in minutes.
0x85		sec	.##	.## in seconds.
0x86	O/P frequency	HZ	##.#	
0x87	Negative battery voltage	V	###.#	
0x88   0x8F	Reserved			

### ⊠ CONFIGURATION DATA AREA

Base address index = 0xA0

Address Index	Description	Unit	Data representation	Explanation
0xA0	Nominal mains voltage	V	###	
0xA1	Nominal mains frequency	Hz	##.##	
0xA2	Nominal cell voltage	V	##.##	
0xA3	Maximum mains voltage	V	###	
0xA4	Minimum mains voltage	V	###	
0xA5	Maximum mains frequency	Hz	##.##	
0xA6	Minimum mains frequency	Hz	##.##	
0xA7	Maximum mains ambient temperature	°C	##	
0xA8	Minimum mains ambient temperature	°C	##	
0xA9	Battery cell number	Integer	#	
0xAA	Number of battery cells in series	Integer	###	
0xAB	Input transformer type Y or Delta	Boolean	Y	<ul style="list-style-type: none"> <li>•Y=1, Input transformer is Y type, LCD display phase voltage.</li> <li>•Y=0, Input transformer is Delta type, LCD</li> </ul>

				display Line voltage.
0xAC	LCD display output voltage Line or Phase	Boolean	0	<ul style="list-style-type: none"> <li>•O=1, LCD display output voltage is Phase.</li> <li>•O=0, LCD display output voltage is Line.</li> </ul>
0xAD   0xAF	Reserved			

### ⊗ COMMAND DATA CODE

Base address index = 0xC0

Address Index	Description	Unit	Data representation	Explanation
0xC0	Getting / Setting baud rate	Hz	This value can be only-- 1200 / 2400 / 4800 / 9600 / 19200	<ul style="list-style-type: none"> <li>•Using function code 0x03 can get baud rate at present.</li> <li>•Using function code 0x06 can set baud rate at present.</li> </ul>

## ➤ CMC Connection

### General CMC

1. The two pins of JP17 should be short as one pin together via a jumper part, the pins of JP18 should be also short as one pin via a jumper part.
2. Let the pin3(R+) of CMC RJ45 connect the pin (T/R+) of Converter, and pin4(R-) of CMC RJ45 connect the pin (T/R-) of Converter. Or let the pin6(T+) of CMC RJ45 connect the pin (T/R+) of Converter, and pin5(T-) of CMC RJ45 connect the pin (T/R-) of Converter.

### Mini CMC

1. Let the pin3(R+) of CMC RJ45 connect the pin (T/R+) of Converter, and pin4(R-) of CMC RJ45 connect the pin (T/R-) of Converter.

Notice: Please use the RS232/RS485 Converter that can't receive its echo data, and make sure that the pins connection between CMC and the converter is correct.

## ➤ CRC check

The RTU mode includes an error-checking field that is based on a Cyclical Redundancy Checking (CRC) method performed on the message contents. The CRC field checks the contents of the entire message. It is applied regardless of any parity checking method used for the individual characters of the message.

The CRC field contains a 16-bit value implemented as two 8-bit bytes. The CRC field is appended to the message as the last field in the message. When this is done, the low-order byte of the field is appended first, followed by the high-order byte. The CRC high-order byte is the last byte to be sent in the message.

The CRC is started by first preloading a 16-bit register to all 1's. Then a process begins of applying successive 8-bit bytes of the message to the current contents of the register. Only the eight bits of data in each character are used for generating the CRC. Start and stop bits and the parity bit, do not apply to the CRC.

During generation of the CRC, each 8-bit character is exclusive ORed with the register contents. Then the result is shifted in the direction of the least significant bit (LSB), with a zero filled into the most significant bit (MSB) position. The LSB is extracted and examined. If the LSB was a 1, the register is then exclusive ORed with a preset, fixed value. If the LSB was a 0, no exclusive OR takes place.

This process is repeated until eight shifts have been performed. After the last (eighth) shift, the next 8-bit character is exclusive ORed with the register's current value, and the process repeats for eight more shifts as described above. The final content of the register, after all the characters of the message have been applied, is the CRC value.

A procedure for generating a CRC is:

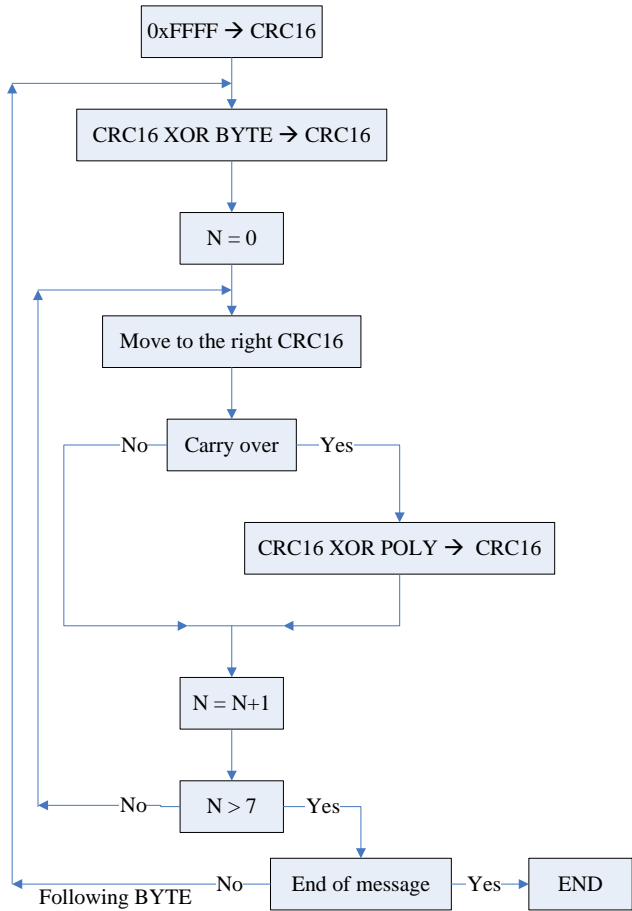
1. Load a 16-bit register with FFFF hex (all 1's). Call this the CRC register.
2. Exclusive OR the first 8-bit byte of the message with the low-order byte of the 16-bit CRC register, putting the result in the CRC register .
3. Shift the CRC register one bit to the right (toward the LSB), zero-filling the MSB. Extract and examine the LSB.
4. (If the LSB was 0): Repeat Step 3 (another shift).  
(If the LSB was 1): Exclusive OR the CRC register with the polynomial value 0xA001  
(1010 0000 0000 0001).
5. Repeat Steps 3 and 4 until 8 shifts have been performed. When this is done, a complete 8-bit byte will have been processed.
6. Repeat Steps 2 through 5 for the next 8-bit byte of the message. Continue doing this until all bytes have been processed.
7. The final content of the CRC register is the CRC value.
8. When the CRC is placed into the message, its upper and lower bytes must be swapped as described below.

### • Placing the CRC into the Message

When the 16-bit CRC (two 8-bit bytes) is transmitted in the message, the low-order byte will be transmitted first, followed by the high-order byte. For example, if the CRC value is 1241 hex (0001 0010 0100 0001) :

Addr.	Func.	Data Count	Data	Data	Data	Data	CRC Lo	LRC Hi
							0x41	0x12

• Calculation algorithm of the CRC 16



CRC register initialization	1111	1111	1111	1111
XOR 1 <sup>st</sup> character	0000	0000	0000	0000
Move1	1111	1111	1111	1101
	0111	1111	1111	1110   1
	1010	0000	0000	0001
Flag to 1, XOR polynomial	1101	1111	1111	1111
Move2	0110	1111	1111	1111   1
	1010	0000	0000	0001
	1100	1111	1111	1110
Move3	0110	0111	1111	1110   0
Move4	0011	0011	1111	1111   1
	1010	0000	0000	0001
	1001	0011	1111	1110
Move5	0100	1001	1111	1111   0
Move6	0010	0100	1111	1111   1
	1010	0000	0000	0001
	1000	0100	1111	1110
Move7	0100	0010	0111	1111   0
Move8	0010	0001	0011	1111   0
	1010	0000	0000	0001
XOR 2 <sup>nd</sup> character	1000	0001	0011	1110
	0000	0000	0000	0111
Move1	1000	0001	0011	1001
	0100	0000	1001	1100   1
	1010	0000	0000	0001
	1110	0000	1001	1101
Move2	0111	0000	0100	1110   1
	1010	0000	0000	0001
	1101	0000	0100	1111
Move3	0110	1000	0010	0111   1
	1010	0000	0000	0001
	1100	1000	0010	0110
Move4	0110	0100	0001	0011   1
Move5	0011	0010	0000	1001   1
	1010	0000	0000	0001
	1001	0010	0000	1000
Move6	0100	1001	0000	0100   0
Move7	0010	0100	1000	0010   0
Move8	0001	0010	0100	0001   0

XOR = exclusive or  
 N = number of information bits  
 POLY = calculation polynomial of the CRC 16 = 1010 0000 0000 0001  
 (Generating polynomial = 1 + X<sub>2</sub> + X<sub>15</sub> + X<sub>16</sub>)  
 In the CRC16, the 1st byte transmitted is the least significant one

Example: an example of a C language function performing CRC generation is shown below.

The function takes two arguments:

unsigned char \*puchMsg; A pointer to the message buffer containing binary data to be used for generating the CRC

unsigned short usDataLen; The quantity of bytes in the message buffer.

▪ CRC Generation Function

unsigned short CRC16 ( puchMsg, usDataLen ) /\* The function returns the CRC as a unsigned short type \*/

unsigned char \*puchMsg ; /\* message to calculate CRC upon \*/

unsigned short usDataLen ; /\* quantity of bytes in message \*/

```

{
    unsigned char uchCRCHi = 0xFF ; /* high byte of CRC initialized */

```

---

```

unsigned char uchCRCLo = 0xFF ; /* low byte of CRC initialized */
unsigned uIndex ; /* will index into CRC lookup table */
while (usDataLen--) /* pass through message buffer */
{
    uIndex = uchCRCLo ^ *puchMsgg++ ; /* calculate the CRC */
    uchCRCLo = uchCRCHi ^ auchCRCHi[uIndex] ;
    uchCRCHi = auchCRCLo[uIndex] ;
}
return (uchCRCHi << 8 | uchCRCLo) ;
}

```

### High-Order Byte Table

/\* Table of CRC values for high-order byte \*/

```

static unsigned char auchCRCHi[] = {
0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81,
0x40, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0,
0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01,
0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41,
0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81,
0x40, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0,
0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01,
0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40,
0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81,
0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0,
0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01,
0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41,
0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81,
0x40
};

```

### Low-Order Byte Table

/\* Table of CRC values for low-order byte \*/

```

static char auchCRCLo[] = {
0x00, 0xC0, 0xC1, 0x01, 0xC3, 0x03, 0x02, 0xC2, 0xC6, 0x06, 0x07, 0xC7, 0x05, 0xC5, 0xC4,

```

---



---

0x04, 0xCC, 0x0C, 0x0D, 0xCD, 0x0F, 0xCF, 0xCE, 0x0E, 0x0A, 0xCA, 0xCB, 0x0B, 0xC9, 0x09,  
0x08, 0xC8, 0xD8, 0x18, 0x19, 0xD9, 0x1B, 0xDB, 0xDA, 0x1A, 0x1E, 0xDE, 0xDF, 0x1F, 0xDD,  
0x1D, 0x1C, 0xDC, 0x14, 0xD4, 0xD5, 0x15, 0xD7, 0x17, 0x16, 0xD6, 0xD2, 0x12, 0x13, 0xD3,  
0x11, 0xD1, 0xD0, 0x10, 0xF0, 0x30, 0x31, 0xF1, 0x33, 0xF3, 0xF2, 0x32, 0x36, 0xF6, 0xF7,  
0x37, 0xF5, 0x35, 0x34, 0xF4, 0x3C, 0xFC, 0xFD, 0x3D, 0xFF, 0x3F, 0x3E, 0xFE, 0xFA, 0x3A,  
0x3B, 0xFB, 0x39, 0xF9, 0xF8, 0x38, 0x28, 0xE8, 0xE9, 0x29, 0xEB, 0x2B, 0x2A, 0xEA, 0xEE,  
0x2E, 0x2F, 0xEF, 0x2D, 0xED, 0xEC, 0x2C, 0xE4, 0x24, 0x25, 0xE5, 0x27, 0xE7, 0xE6, 0x26,  
0x22, 0xE2, 0xE3, 0x23, 0xE1, 0x21, 0x20, 0xE0, 0xA0, 0x60, 0x61, 0xA1, 0x63, 0xA3, 0xA2,  
0x62, 0x66, 0xA6, 0xA7, 0x67, 0xA5, 0x65, 0x64, 0xA4, 0x6C, 0xAC, 0xAD, 0x6D, 0xAF, 0x6F,  
0x6E, 0xAE, 0xAA, 0x6A, 0x6B, 0xAB, 0x69, 0xA9, 0xA8, 0x68, 0x78, 0xB8, 0xB9, 0x79, 0xBB,  
0x7B, 0x7A, 0xBA, 0xBE, 0x7E, 0x7F, 0xBF, 0x7D, 0xBD, 0xBC, 0x7C, 0xB4, 0x74, 0x75, 0xB5,  
0x77, 0xB7, 0xB6, 0x76, 0x72, 0xB2, 0xB3, 0x73, 0xB1, 0x71, 0x70, 0xB0, 0x50, 0x90, 0x91,  
0x51, 0x93, 0x53, 0x52, 0x92, 0x96, 0x56, 0x57, 0x97, 0x55, 0x95, 0x94, 0x54, 0x9C, 0x5C,  
0x5D, 0x9D, 0x5F, 0x9F, 0x9E, 0x5E, 0x5A, 0x9A, 0x9B, 0x5B, 0x99, 0x59, 0x58, 0x98, 0x88,  
0x48, 0x49, 0x89, 0x4B, 0x8B, 0x8A, 0x4A, 0x4E, 0x8E, 0x8F, 0x4F, 0x8D, 0x4D, 0x4C, 0x8C,  
0x44, 0x84, 0x85, 0x45, 0x87, 0x47, 0x46, 0x86, 0x82, 0x42, 0x43, 0x83, 0x41, 0x81, 0x80,  
0x40  
};

➤ **Appendix A — Index table comparison between hexadecimal and decimal**

Address Index(hex)	Description	Unit	Data representation
<b>IDENTIFIERS</b>			
0x00	UPS name (WORD 0 - 14)	Char	ASCII character
0x0F	Slave address (WORD 15)	Integer	##
0x10	Protocol number (WORD 16)	Integer	##.##
0x11	UPS firmware Version (WORD 17)	Integer	##.##
<b>STATES</b>			
0x30	States (WORD 0)	Bit	
0x31	States (WORD 1)	Bit	
<b>FAULT CODE</b>			
0x40	Fault code (WORD 0)	Bit	
0x41	Fault code (WORD 1)	Bit	
0x42	Fault code (WORD 2)	Bit	
0x43	Fault code (WORD 3)	Bit	
0x44	Fault code (WORD 4)	Bit	
0x45	Fault code (WORD 5)	Bit	
0x46	Fault code (WORD 6)	Bit	
0x47	Fault code (WORD 7)	Bit	
0x48	Fault code (WORD 8)	Bit	
<b>WARNINGS</b>			
0x50	Warnings (WORD 0)	Bit	
0x51	Warnings (WORD 1)	Bit	
0x52	Warnings (WORD 2)	Bit	
0x53	Warnings (WORD 3)	Bit	
0x54	Warnings (WORD 4)	Bit	
0x55	Warnings (WORD 5)	Bit	
<b>MEASUREMENTS</b>			
0x60	I/P voltage R	V	###.#
0x61	I/P voltage S	V	###.#
0x62	I/P voltage T	V	###.#
0x63	I/P fault voltage (R or S or T)	V	###.#
0x64	Bypass I/P voltage R	V	###.#
0x65	Bypass I/P voltage S	V	###.#
0x66	Bypass I/P voltage T	V	###.#
0x67	I/P frequency	Hz	##.#
0x68	Bypass I/P frequency	Hz	##.#
0x69	O/P voltage R	V	###.#
0x6A	O/P voltage S	V	###.#
0x6B	O/P voltage T	V	###.#
0x6C	O/P current R	%(A)	###
0x6D	O/P current S	%(A)	###
0x6E	O/P current T	%(A)	###

0x6F	O/P current R	A	###.#
0x70	O/P current S	A	###.#
0x71	O/P current T	A	###.#
0x72	O/P power R	KW	###.#
0x73	O/P power S	KW	###.#
0x74	O/P power T	KW	###.#
0x75	Total power	KW	###.#
0x76	O/P complex power R	KVA	###.#
0x77	O/P complex power S	KVA	###.#
0x78	O/P complex power T	KVA	###.#
0x79	Total complex power	KVA	###.#
0x7A	O/P load	%	###
0x7B	Battery cell voltage	V	#.##
0x7C	Battery voltage/ Positive battery voltage	V	###.#
0x7D	Temperature	°C	##.#
0x7E	Charge in Status/ Battery capacity percentage	%	###
0x7F	Recharge time to 95%	hours	###
0x80	Estimated run-time/ Remain battery backup time	min	#####
0x81		sec	
0x82	Hold time at 100% Load	min	###
0x83		sec	.##
0x84	Hold time at 50% Load	min	###
0x85		sec	.##
0x86	O/P frequency	HZ	##.#
0x87	Negative battery voltage	V	###.#
0x88   0x8F	Reserved		
<b>CONFIGURATIONS</b>			
0xA0	Nominal mains voltage	V	###
0xA1	Nominal mains frequency	Hz	##.##
0xA2	Nominal cell voltage	V	##.##
0xA3	Maximum mains voltage	V	###
0xA4	Minimum mains voltage	V	###
0xA5	Maximum mains frequency	Hz	##.##
0xA6	Minimum mains frequency	Hz	##.##
0xA7	Maximum mains ambient temperature	°C	##
0xA8	Minimum mains ambient temperature	°C	##
0xA9	Battery cell number	Integer	#
0xAA	Number of battery cells in series	Integer	###
0xAB	Input transformer type Y or Delta	Boolean	Y
0xAC	Lcd display output voltage Line or Phase	Boolean	O
0xAD   0xAF	Reserved		
<b>COMMAND</b>			
0xC0	Getting / Setting baud rate	Hz	This value can be only--

			1200 / 2400 / 4800 / 9600 / 19200
--	--	--	--------------------------------------

## ➤ Appendix B — States value table

- The comparison value between hexadecimal and decimal while states is enabled.

Code	Description (UPS status / System mode)	Explanation	
		Hex	Dec
<b>WORD0 (0x30)</b>			
S00	0: Bat silence(only for Centralion)	0x0000	0
S01	1 : Shutdown active/Shutdown mode	0x0002	2
S02	1 : Test in process/BatTest mode	0x0004	4
S03	0 : Online UPS 1 : Offline UPS	0x0008	8
S04	1 : UPS failed/Fault mode	0x0010	16
S05	1 : Bypass/Boost active/Bypass mode	0x0020	32
S06	1 : Battery low warning	0x0040	64
S07	1 : Utility fail (immediate)/Battery mode	0x0080	128
S08	1 : Idle	0x0100	256
S09	1 : Processing	0x0200	512
S10	1 : Result : no failure	0x0400	1024
S11	1 : Result : failure/warning	0x0800	2048
S12	1 : Not possible or inhibit	0x1000	4096
S13	1 : Test cancel	0x2000	8912
S14	1 : Reserved	0x4000	16384
S15	1 : Other values	0x8000	32768
<b>WORD1 (0x31)</b>			
S16	1 : Standby mode	0x0001	1
S17	1 : Line mode	0x0002	2
S18	1 : Converter mode	0x0004	4
S19	1 : ECO mode	0x0008	8
S20-31	Reserved	0x0000	0

## ➤ Appendix C — Fault Code value table

• The comparison value between hexadecimal and decimal while fault is occurred.

Code	Description	故障表	The value while fault is occurred	
			Hex	Dec
<b>WORD0 (0x40)</b>				
F00	Temperature in converter too high	轉換器過溫	0x0001	1
F01	Internal fault 34	內部故障	0x0002	2
F02	Incorrect parameter(Inverter MLFB)	錯誤參數	0x0004	4
F03	Inverter contactor defective	輸出電磁接觸器損壞	0x0008	8
F04	Multiple inverter cut off as a result of over-current	變流器過電流切斷	0x0010	16
F05	Failure power supply electronic	工作電源不正常	0x0020	32
F06	Over-voltage in the intermediate circuit	內部電路過電壓	0x0040	64
F07	External Quick Shutdown active	Not used	0x0080	128
F08	Electronic defective(Signal Processor defective)	控制器損壞	0x0100	256
F09	Defect in the Power Electronic(Rectifier)	整流器電力元件損壞	0x0200	512
F10	Defect in the Power Electronic(UCE-supervision)	電力元件損壞	0x0400	1024
F11	Over current cutoff	過電流切斷	0x0800	2048
F12	False parameter input during( H/W Init.)	錯誤參數輸入	0x1000	4096
F13	UPS output out of tolerance	輸出超出規格	0x2000	8912
F14	Output overload(i2t-supervision)	輸出過載	0x4000	16384
F15	Not used	Not used	0x8000	32768
<b>WORD1 (0x41)</b>				
F16	Not used	Not used	0x0001	1
F17	Bypass defective	旁路損壞	0x0002	2
F18	Bypass defective(during Transfer)	旁路轉換期間損壞	0x0004	4
F19	Bypass overload	旁路過載	0x0008	8
F20   F21	Not used	Not used	0x0000	0
F22	Electronic defective(EEPROM Inverter)	控制器損壞	0x0040	64
F23	Communication with Battery Manager defective	電池管理通訊異常	0x0080	128
F24	Electronic defective(Check-sum EPROM)	控制器損壞	0x0100	256
F25	Environment temperature smaller than 0 grad or measurement defective measurement defective	量測溫度異常	0x0200	512
F26	Optional module failed or not put in	外加模組訊號異常	0x0400	1024
F27	Parallel Bypass failed	並聯旁路失敗	0x0800	2048
F28	Signal fault in the Parallel Module	併聯版異常	0x1000	4096
F29   F31	Not used	Not used	0x0000	0
<b>WORD2 (0x42)</b>				
F32   F44	Not used	Not used	0x0000	0

F45	Charger over charging	電池電壓過充	0x2000	8912
F46   F47	Not used	Not used	0x0000	0
<b>WORD3 (0x43)</b>				
F48   F54	Not used	Not used	0x0000	0
F55	Reserved for led test(no fault)	Not used	0x0000	0
F56	Not used	Not used	0x0000	0
F57	Psdr to bus fuse opne	功率板與BUS間Fuse 損壞	0x0200	512
F58	Load unbalance over 50%	負載不平衡超過50%	0x0400	1024
F59   F60	Not used	Not used	0x0000	0
F61	Profibus fault	(PPC不會發生)	0x2000	8912
F62	System frequency out of tolerance	系統頻率超出容忍 (PPC不會發生)	0x4000	16384
F63	System voltage out of tolerance	系統電壓超出容忍 (PPC不會發生)	0x8000	32768
<b>WORD4 (0x44)</b>				
F64   F65	Not used	Not used	0x0000	0
F66	LCD with Cudsmc Communication failure	內部通訊異常	0x0004	4
F67-79	Reserved		0x0000	0
<b>WORD5 (0x45)</b>				
F80	Reserved	Not used	0x0000	0
F81	cBusSoftTimeOut	BUS软启动超时	0x0002	2
F82	cBusOver	BUS高压Fault	0x0004	4
F83	cBusUnder	BUS低压Fault	0x0008	8
F84	cBusUnbalance	BUS不平衡Fault	0x0010	16
F85	cBusShort	Bus短路故障	0x0020	32
F86	cInvSoftTimeOut	逆变软启动超时	0x0040	64
F87	cInvVoltHigh	逆变电压高压Fault	0x0080	128
F88	cInvVoltLow	逆变电压低压Fault	0x0100	256
F89	cOPVoltShort	输出电压短路	0x0200	512
F90	cRInvVoltShort	R相逆变电压短路	0x0400	1024
F91	cSInvVoltShort	S相逆变电压短路	0x0800	2048
F92	cTInvVoltShort	T相逆变电压短路	0x1000	4096
F93	cRSInvVoltShort	RS相线电压短路	0x2000	8912
F94	cSTInvVoltShort	ST相线电压短路	0x4000	16384
F95	cTRInvVoltShort	TR相线电压短路	0x8000	32768
<b>WORD6 (0x46)</b>				
F96	cInvNegPow	负功Fault	0x0001	1
F97	cInvRNegPow	R相负功Fault	0x0002	2
F98	cInvSNegPow	S相负功Fault	0x0004	4

F99	cInvTNegPow	T相负功Fault	0x0008	8
F100	cTotalInvNegPow	三相总负功Fault	0x0010	16
F101	cReactPowFault	不均流Fault	0x0020	32
F102	cInvRlyOpenFault	INV Rly 无法闭合	0x0040	64
F103	cInvRlyStickFault	INV Rly 粘死	0x0080	128
F104	cLineSCRFault	市电输入SCR故障	0x0100	256
F105	cBatScrFault	电池输入SCR故障	0x0200	512
F106	cByPassScrFault	旁路输入SCR故障	0x0400	1024
F107	cWiringFault	输入输出接线错误	0x0800	2048
F108	cCommLineLoss	通讯线未连	0x1000	4096
F109	cHostlineFault	主机线故障	0x2000	8912
F110	cCanFault	CAN通讯线故障	0x4000	16384
F111	cSynLineFault	同步信号线故障	0x8000	32768
<b>WORD7 (0x47)</b>				
F112	cAllFansLockedFault	所有风扇全故障	0x0001	1
F113	cOCCoreFault	DSP异常	0x0002	2
F114	cChgOpSoftTimeOut	充电器输出软启动超时	0x0004	4
F115	cUpsAllFault	UPS模块全故障	0x0008	8
F116	cLineInNtcOpenFault	UPS 市电输入NTC开路故障	0x0010	16
F117	cLineInFuseOpenFault	市电输入fuse开路故障	0x0020	32
F118	cCoherencyFault	输入不一致故障	0x0040	64
F119	cEepromFault	Eeprom数据丢失	0x0080	128
F120	cLinesupportFail	市电支援失效	0x0100	256
F121	cPowerBreakDown	电源失效	0x0200	512
F122	cSysOverCapacity	系统过容	0x0400	1024
F123	cADS7869Fault	ADS7869 Error	0x0800	2048
F124	cSTSHardwareFault	Bypass Mode No OP	0x1000	4096
F125	cOpBreakerOffFault	O/P Breaker OFF in Parallel Mode	0x2000	8912
F126	cNTCAbnormal	NTC故障	0x4000	16384
F127	cBatAbnormal	电池故障	0x8000	32768
<b>WORD8 (0x48)</b>				
F128	cWC1_ForbidComeBackFromByp	频繁过流故障	0x0001	1
F129	cEpoFault	EPO故障(最高优先级故障,此故障一旦置位就不能被其它故障码覆盖)	0x0002	2
F130-F143	Not used	Not used	0x0000	0



## ➤ Appendix D — Warnings value table

• The comparison value between hexadecimal and decimal while warning is occurred.

Code	Description	故障表	The value while warning is occurred	
			Hex	Dec
<b>WORD0 (0x50)</b>				
A00	Over-temperature inverter	變流器過溫	0x0001	1
A01	Bypass mains failure	市電異常	0x0002	2
A02	Rectifier mains failure	市電異常	0x0004	4
A03	Load too high(i2-t-Supervision)	過載	0x0008	8
A04	Under-voltage intermediate circuit	電路低電壓	0x0010	16
A05	Over load	過載	0x0020	32
A06	Phase sequence incorrect in Bypass	輸入相序錯誤	0x0040	64
A07	Service bypass is on	Not used	0x0000	0
A08	Battery operation	電池供電	0x0100	256
A09	Battery rest time exceeded	供電時間太少	0x0200	512
A10	Battery under-voltage	電池低電壓	0x0400	1024
A11	Operating condition commissioning,	執行設定模式	0x0800	2048
A12	Battery switch not engaged	電池未接	0x1000	4096
A13	Ventilator lifetime exceeded	建議更換風扇	0x2000	8912
A14	Connection to charger lost	充電器未接	0x4000	16384
A15	Internal warning 16	內部警告	0x8000	32768
<b>WORD1 (0x51)</b>				
A16   A21	Not used	Not used	0x0000	0
A22	Battery charger communicate failure	充電器無通訊	0x0040	64
A23	General battery charger failure	充電器異常	0x0080	128
A24   A29	Not used	Not used	0x0000	0
A30	Load unbalance	負載不平衡	0x4000	16384
A31	Internal warning 32	內部警告	0x8000	32768
<b>WORD2 (0x52)</b>				
A32	cWC1_EpoActive	EPO开关未接	0x0001	1
A33	cWC1_ModuleUnLock	模块未锁	0x0002	2
A34	cWC1_IPNLoss	输入中线丢失	0x0004	4
A35	cWC1_SiteFail	L、N反接	0x0008	8
A36	cWC1_BypassLoss	旁路异常	0x0010	16
A37	cWC1_ByPassPhaseErr	旁路相序错误	0x0020	32
A38	cWC1_OverChg	电池过充	0x0040	64
A39	cWC1_BatReverse	电池反接	0x0080	128
A40	cWC1_MaintainOn	维修旁路盖板打开	0x0100	256

A41	cWC1_ErrorLocation	物理位置错误	0x0200	512
A42	cWC1H_cTurnOnAbornaml	不满足开机条件， 无法开机	0x0400	1024
A43	cWC1H_cRedundantLoss	冗余丢失	0x0800	2048
A44	cWC1_ModuleHotSwapActive	模块未插紧	0x1000	4096
A45	cWC1_BatteryInform	电池维护时间到	0x2000	8912
A46	cWC1_InspectionInform	巡检维护时间到	0x4000	16384
A47	cWC1_GuaranteeInform	过保维护时间到	0x8000	32768
<b>WORD3 (0x53)</b>				
A48	cWC1_TempLow	温度过低	0x0001	1
A49	cWC1_BatOverTemp	电池过温	0x0002	2
A50	cWC1_BusCapMainInform	BUS 电容维护时间到	0x0004	4
A51	cWC1_SysOverCapacity	系统过容	0x0008	8
A52	cWC1_HighExternalWarning	外部告警高32位	0x0010	16
A53-A63	reserved	保留	0x0000	0
<b>WORD4 (0x54)</b>				
A64	cOuterWarningCode2L_ModuleFault	模块故障	0x0001	1
A65	cOuterWarningCode2L_BypassNLoss	旁路N线丢失	0x0002	2
A66	cOuterWarningCode2L_BatNLoss	电池N线断开	0x0004	4
A67	cOuterWarningCode2L_ExChgFail	EXCHG故障	0x0008	8
A68	cOuterWarningCode2L_BatTempLow	电池温度过低	0x0010	16
A69	cOuterWarningCode2L_BatUnbalance	电池不平衡	0x0020	32
A70	cOuterWarningCode2L_ADCalibration	AD校准失败	0x0040	64
A71-A79	Reserved	保留	0x0000	0
<b>WORDS5 (0x55)</b>				
A80-A95	Reserved	保留	0x0000	0