

EnerSolis

ES5000/ES5000H

Modbus/JBUS

Protocol

Introduction.....	2
Introduction JBUS Function	3
PV Protocol for J-BUS.....	5
GENERAL TABLE DATA AREA DEFINITION	6
JBUS Table	7
1. Alarms.....	7
GENERAL VECTOR INDEX.....	7
Alarms Data Sequence	7
Alarms Data Area.....	7
2. Errors.....	9
GENERAL VECTOR INDEX.....	9
Errors Data Sequence.....	9
Errors Data Area	9
3. Measurements	11
GENERAL VECTOR INDEX.....	11
Measurements Data Area	11

Introduction

This document describes the Helios Inverter protocol, adopted to communicate with all communication products, like Supervisor, Network communication, etc...

This protocol will be implemented in the PV equipment, in order to use the same driver for all products.

COMMUNICATION LAYERS

APPLICATIONS
<i>PV MONITOR</i>
DATA TABLE
<i>FIXED</i>
ADDRESS SPECIFICATION
<i>JBUS P</i>
JBUS TRANSPORT PROTOCOL
HARDWARE
<i>RS232 / RS485 / USB / TCP/IP</i>

GENERAL MESSAGE FORMAT

SLAVE NUMBER (1 byte)	Specified the destination node
FUNCTION CODE (1 byte)	Specified a READ or WRITE data command
DATA FIELD	Information to read or write data (Address, value, number of data...)
CONTROL WORD (CRC16) (2 bytes, 1 word)	Algorithm calculation of each data

JBUS FUNCTION

READ WORD:	code function 3
WRITE 1 WORD:	code function 6 (Ex. Commands)
WRITE SEVERAL WORDS:	code function 16 (Ex. Identifiers)

Introduction JBUS Function

FUNCTION 0x3

Ex. Request to slave number1, the data (10 words) beginning at 0xC000 (Address)

Request

Slave Number	Function READ	Address High	Address Low	0	Nb of word to read	CRC Low	CRC High
1	0x03	0xC0	0x00	0	10		

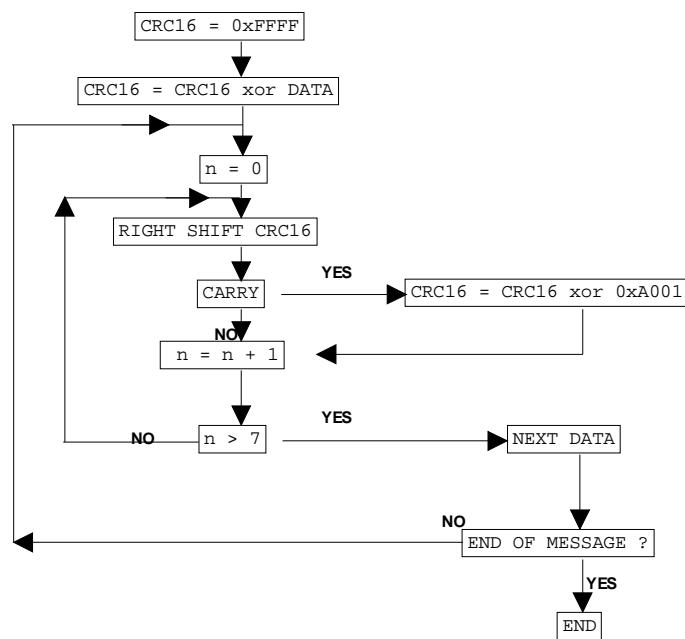
Slave message

Response

Slave Number	Function READ	Nb of byte	First data hi byte	First data low byte	Next data	CRC Low	CRC High
1	0x03	20	0x20	0x02		

Example: the first data is $(0x20 * 0x100) + 0x02 = 0x2002$

CRC 16 CALCULATION



Example of CRC calculation

```
unsigned int CALCUL_CRC(unsigned int *Msg)
{
    unsigned int Crc;
    int lenght,i,n;
    Crc = 0xFFFF;
    lenght = Msg[0];
    for ( i = 1 ; i <= lenght ; i++ )
    {
        Crc ^= Msg[i];
        for ( n = 1 ; n <= 8 ; n++ )
        {
            /* if CRC is even */
            if ((Crc % 2) == 0)
                /* to right decrement */
                Crc >>= 1;
            else
            {
                Crc >>= 1;
                Crc ^= 0xA001;
            }
        }
    }
    return( Crc );
}
```

PV Protocol for J-BUS

DATA BASE	INFORMATION CODING
Alarms	ALxx for Alarms
Errors	Erxx for Errors
Measurements	Mxx for measurements

GENERAL TABLE DATA AREA DEFINITION

DATA	Length in word	TYPE	Information	Jbus Function	Start Address	End Address
Alarms	2	bit	32 Alarms	3 (r)	0xC000	0xC001
Errors	2	bit	32 Error	3 (r)	0xC010	0xC011
Measurements	96	word	96 Measurements	3 (r)	0xC020	0xC07F

r : read

JBUS Table

1. Alarms

Ex. Request to slave number 1(Alarms)

Request

Slave Number	Function READ	Address High	Address Low	0	Nb of word to read	CRC Low	CRC High
1	0x03	0xC0	0x00	0	0x02		

Response

Slave Number	Function READ	Nb of byte	First data high byte	First data low byte	Next data	CRC Low	CRC High
1	0x03	0x04	AL15~AL08	AL07~AL00		

GENERAL VECTOR INDEX

Address High	Address Low	End Address	DATA AREA	LENGTH (IN WORDS)
0xC0	0x00	0xC001	Alarms	2

Alarms Data Sequence

Word 0		Word 1	
High	Low	High	Low
AL15.....AL08	AL07.....AL00	AL31.....AL24	AL23.....AL16

Alarms Data Area

CODE Type(bit)	Description	ES5000	ES5000H
AL00	Utility Voltage Over Rang	v	v
AL01	Utility Voltage Under Rang	v	v
AL02	Utility Frequency Over Rang	v	v
AL03	Utility Frequency Under Rang	v	v
AL04	Boost:1-Input Voltage Over Rang	v	v
AL05	Boost:1-Input Voltage Under Rang	v	v
AL06	Boost:2-Input Voltage Over Rang	v	v
AL07	Boost:2-Input Voltage Under Rang	v	v

AL08	Anti-islanding general alarm	v	v
AL09	Reserve		
AL10	Ground current fault general alarm	v	v
AL11	Ground impedance fault general alarm	v	v
AL12	Reserve		
AL13	Utility Phase Fault	v	v
AL14	Utility Wave Fault	v	
AL15~AL24	Reserve		
AL25	Over Temperature Derating		v
AL26 ~ AL31	Reserve		

2. Errors

Ex. Request to slave number 1(Errors)

Request

Slave Number	Function	Address High	Address Low	0	Nb of word to read	CRC Low	CRC High
1	0x03	0xC0	0x10	0	0x02		

Response

Slave Number	Function	Nb of byte	First data high byte	First data low byte	Next data	CRC Low	CRC High
1	0x03	0x04	Er15~Er08	Er07~Er00		

GENERAL VECTOR INDEX

Address High	Address Low	End Address	DATA AREA	LENGTH (IN WORDS)
0xC0	0x10	0xC011	Errors	2

Errors Data Sequence

Word 0		Word 1	
High	Low	High	Low
Er15.....Er08	Er07.....Er00	Er31.....Er24	Er23.....Er16

Errors Data Area

CODE Type(bit)	Description	ES5000	ES5000H
Er00	DC BUS Charge Fault	v	v
Er01	Reserve		
Er02	Slave CPU Fault		v
Er03	Reserve		
Er04	Reserve		
Er05	Reserve		
Er06	EPO (Emergency Power Off Mode)	v	v
Er07	DC BUS Voltage Over-Rang	v	v
Er08	Reserve		
Er09	Inverter output current Over-Rang	v	v
Er10	Reserve		

Er11	Inverter output power Over-Rang	v	v
Er12	Boost Charger Fault	v	v
Er13	Inverter output Short-Circuit	v	v
Er14	PLL(Phase-Locked Loop) Fault	v	v
Er15	Reserve		
Er16	Reserve		
Er17	EEPROM Data Error ,Use Default Value	v	v
Er18	Heatsink temperature Over-Rang	v	v
Er19	DCBUS voltage don't Discharge	v	v
Er20	Reserve		
Er21	Reserve		
Er22	Inverter Relay Fault	v	v
Er23	Reserve		
Er24	Inverter Current sense Fault	v	v
Er25	Booster _1 - Input current Over-Rang	v	v
Er26	Booster _2 - Input current Over-Rang	v	v
Er27	Booster Short Circuit	v	v
Er28	Reserve		
Er29	Inverter Output Current Balance Over-Rang	v	v
Er30	Reserve		
Er31	Reserve		

3. Measurements

Ex. Request to slave number 1(Measurements)

Request

Slave Number	Function READ	Address High	Address Low	0	Nb of word to read	CRC Low	CRC High
1	0x03	0xC0	0x20	0	10		

Response

Slave Number	Function READ	Nb of byte	First data high byte	First data low byte	Next data	CRC Low	CRC High
1	0x03	20	0x20	0x02		

Example: the first data is $(0x20 * 0x100) + 0x02 = 0x2002$

GENERAL VECTOR INDEX

Address High	Address Low	End Address	DATA AREA	LENGTH (IN WORDS)
0xC0	0x20	0xC07F	Measurements	96

Measurements Data Area

ADRESS INDEX	CODE	Description	Unit	Necessary
0xC020	M00	Output power	KW*100(1)	
0xC021	M01	AC voltage phase L1	V	
0xC022	M02	Reserve		
0xC023	M03	Reserve		
0xC024	M04	AC output current L1	A*10(2)	
0xC025	M05	Reserve		
0xC026	M06	AC frequency	Hz*10(2)	
0xC027	M07	DC-Bus Voltage	V	
0xC028	M08	Reserve		
0xC029	M09	Reserve		
0xC02A	M10	Inverter Heat sink temperature	°C	
0xC02B	M11	DC1 input voltage	V	
0xC02C	M12	DC2 input voltage	V	
0xC02D	M13	DC1 input current	A*10(2)	

0xC02E	M14	DC2 input current	A*10(2)	
0xC02F	M15	Input Power A	KW*100(1)	
0xC030	M16	Input Power B	KW*100(1)	
0xC031~ 0xC032	M17, M18	Total Output Power	KW-H(3)	
0xC033	M19	Reserve		
0xC034	M20	Reserve		
0xC035	M21	Reserve		
0xC036~ 0xC037	M22, M23	Reserve		
	M24~M96	Reserve		

P.S: (1) The number must be in unit*100 format.

Example: M04 = 1234 mean 12.34 KW

(2) The number must be in unit*10 format.

Example: M04 = 1234 mean 123.4 A

(3) The data is $(0xC031 * 65536) + 0xC032$.

Example: $0xC031 = 1234$, $0xC032 = 5678$, Total Power = $1234 * 65536 + 5678$.