CARLO GAVAZZI
Automation Components

CARLO GAVAZZI

ISMG3xx
Communication Protocol

Ver. 2.01 - 06/12/2010

EcoEnergy

Command 3 : Read Single Holding Register

Master Query

Start Byte	Slave Address	Function	Starting Address HiByte	Starting Address LoByte	No. of Data HiByte	No. of Data LoByte	CS (CRC) LoByte	CS (CRC) HiByte	Stop Byte
0AH	1~0FFH	03	0~1	1~0FFH	0	1	_	_	0DH

Slave Response

Start Byte	Slave Address	Function	Byte Count	Data Hi	Data Lo	CS (CRC) LoByte	CS (CRC) HiByte	Stop Byte
0AH	1~0FFH	03	2	*	*	_	_	0DH

** CS(Check Sum) : CRC16

Command 3 : Read n Holding Registers (n < =15)

Master Query

Start Byte	Slave Address	Function	Starting Address HiByte	Starting Address LoByte	No. of Data HiByte	No. of Data LoByte	CS (CRC) LoByte	CS (CRC) HiByte	Stop Byte
0AH	1~0FFH	03	0~1	1~0FFH	0	n	_	_	0DH

Slave Response

Start Byte	Slave Address	Function	Byte Count	Data 1 HiByte	Data1 LoByte	……	Data n HiByte	Datan LoByte	CS (CRC) LoByte	CS (CRC) HiByte	Stop Byte
0AH	1~0FFH	03	2*n	*	*		*	*	_	_	0DH

Command 6 : Preset Single Register

Master Query

Start Byte	Slave Address	Function	Register Address HiByte	Register Address LoByte	Preset Data HiByte	Preset Data LoByte	CS (CRC) LoByte	CS (CRC) HiByte	Stop Byte
0AH	1~0FFH	06	0	1~16H	*	*	_	_	0DH

Slave Response

Start Byte	Slave Address	Function	Register Address HiByte	Register Address LoByte	Preset Data HiByte	Preset Data LoByte	CS (CRC) LoByte	CS (CRC) HiByte	Stop Byte
0AH	1~0FFH	06	0	1~16H	*	*	_	_	0DH

Command 8 : Setting new 485 Address

Master Query

Start Byte	Slave Address	Function	MODEL HiByte	MODEL LoByte	SN_ HIGH HiByte	SN_ HIGH LoByte	SN_ LOW HiByte	SN_ LOW LoByte	New Address	CS (CRC) LoByte	CS (CRC) HiByte	Stop Byte
0AH	XX	08	7	D0H	3	EAH	0	1	1~0FFH	_	_	0DH

XX:DON'T CARE (MODEL=2000 , SN_HIGH=1002 , SN_LOW=1)

Slave Response

Start Byte	Slave Address	Function	TYPE HiByte	TYPE LoByte	SN_ HIGH HiByte	SN_ HIGH LoByte	SN_ LOW HiByte	SN_ LOW LoByte	New Address	CS (CRC) LoByte	CS (CRC) HiByte	Stop Byte
0AH	XX	08	7	D0H	3	EAH	0	1	1~0FFH	_	_	0DH

XX:DON'T CARE (TYPE=2000 , SN_HIGH=1002 , SN_LOW=1)

Command 6C :

Master Query

Start Byte	Slave Address	Function	Register Address HiByte	Register Address LoByte	Preset Data HiByte	Preset Data LoByte	CS (CRC) LoByte	CS (CRC) HiByte	Stop Byte
0AH	1~0FFH	6C	0	XXH	*	*	_	_	0DH

Slave Response

Start Byte	Slave Address	Function	Register Address HiByte	Register Address LoByte	Preset Data HiByte	Preset Data LoByte	CS (CRC) LoByte	CS (CRC) HiByte	Stop Byte
0AH	1~0FFH	6C	0	XXH	*	*	_	_	0DH

Command AA :

Master Query

Start Byte	Slave Address	Function	Register Address HiByte	Register Address LoByte	Preset Data HiByte	Preset Data LoByte	CS (CRC) LoByte	CS (CRC) HiByte	Stop Byte
0AH	1~0FFH	AA	3	9DH	*	*	_	_	0DH

Slave Response

Start Byte	Slave Address	Function	Register Address HiByte	Register Address LoByte	Preset Data HiByte	Preset Data LoByte	CS (CRC) LoByte	CS (CRC) HiByte	Stop Byte
0AH	1~0FFH	AA	3	9DH	*	*	_	_	0DH

SN COMMAND

Master Query

Start Byte	Slave Address	Function	Starting Address HiByte	Starting Address LoByte	No. of Data HiByte	No. of Data LoByte	CS (CRC) LoByte	CS (CRC) HiByte	Stop Byte
0AH	1~0FFH	03	1	9	0	3	_	_	0DH

Slave Response

Start Byte	Slave Address	Function	Byte Count	Type Hi	Type Lo	SN_H Hi	SN_H Lo	SN_L Hi	SN_L Lo	CS (CRC) LoByte	CS (CRC) HiByte	Stop Byte
0AH	1~0FFH	03	6	*	*	*	*	*	*	_	_	0DH

BROADCAST COMMAND

Query

Start Byte	Slave Address	Function	Register Address HiByte	Register Address LoByte	Preset Data HiByte	Preset Data LoByte	CS (CRC) LoByte	CS (CRC) HiByte	Stop Byte
0AH	0	0BH	0	xxH	0	XX	_	_	0DH

* xxH=13H ADDRESS = XX (XX= 0~255) → No Response

* xxH=14H Baudrate = XX (XX= 0~1, 0:9600, 1:19200) → No Response

* xxH=18H XX=1

ADDRESS = S/N MOD 250 (IF 0=>250) → No Response

(ADDRESS=DEFAULT)

The CRC field is two bytes, containing a 16-bit binary value. The CRC value is calculated by the transmitting device, which appends the CRC to the message. The receiving device recalculates a CRC during receipt of the message, and compares the calculated value to the actual value it received in the CRC field. If the two values are not equal, an error results.

The CRC is started by loading a 16-bit register with FFFF hex(all '1's), called the CRC register. Then exclusive OR the first 8-bit byte of the message with the low order byte of the 16-bit CRC register. Then the result is shifted in the direction of the least significant bit(LSB), zero-filling the most significant bit(MSB). The LSB is extracted and examined. If the LSB was a 1, the register is then exclusive ORed with a preset, fixed value A001 hex. 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 eight-bit byte is exclusive ORed with the current CRC register, and the process repeats for eight more shifts as described above. The final contents of the register, after all the bytes of the message have been applied, is the CRC value.

When the CRC is appended to the message, the low order byte is appended first, followed by the high order byte.

EX: Stop inverter

Master :	0AH	01H	06H	00H	89H	00H	00H	58H	20H	0DH
Slave :	0AH	01H	06H	00H	89H	00H	00H	58H	20H	0DH

BAUDRATE=9600 => 1 BYTE=1 mS
READ COMMAND(3) Read 10 Parameters
10 (Query)+ 7 (Response)+2*10 (Response)=37(Bytes)
=➔ 40 mS
READ COMMAND(3) Read 40 Parameters
40*4=160
=➔ 160 mS
BAUDRATE=19200 => 1 BYTE=0.5 mS
=➔ 80 mS READ 40 Parameters

WRITE COMMAND(6) Needs 20mS to finish writing EEPROM.

Parameter List

READ COMMAND (3)

No.	Addr.	Variable	Description	Range	Unit	RS485 Command	Password Level
1	1H	FacH_TRIP	Higher limits of the allowable utility frequency, before the utility grid monitoring system disconnects the device from the utility grid.	5~450	0.01Hz	3&6	0
2	2H	FacH_CYCLE	Trip cycles of the higher limits frequency	1~250	CYCLE	3&6	0
3	3H	FacL_TRIP	Lower limits of the allowable utility frequency, before the utility grid monitoring system disconnects the device from the utility grid.	5~450	0.01Hz	3&6	0
4	4H	FacL_CYCLE	Trip cycles of the lower limits frequency	1~250	CYCLE	3&6	0
5	5H	VacH_TRIP	Higher limits of the allowable nominal utility voltage, before the utility grid monitoring system disconnects the device from the utility grid.	2350~2760	0.1V	3&6	0
6	6H	VacH_CYCLE	Trip cycles of the higher limits voltage	1~150	CYCLE	3&6	0
7	7H	VacL_TRIP	Lower limits of the allowable nominal utility voltage, before the utility grid monitoring system disconnects the device from the utility grid.	1600~2250	0.1V	3&6	0
8	8H	VacL_CYCLE	Trip cycles of the lower limits voltage	1~150	CYCLE	3&6	0
9	9H	DC_INJ	Dc injection of AC current trip setting	100~800	1mA	3&6	0
10	AH	DC_INJ_CYCLE	Dc injection clearing time	1~150	CYCLE	3&6	0

No.	Addr.	Variable	Description	Range	Unit	RS485 Command	Password Level
11	BH	FastIearth_TRIP	Change of the leakage current trip setting	5~30	1mA	3&6	0
12	CH	SlowIearth_TRIP	Leakage current trip setting	5~300	1mA	3&6	0
13	DH	Riso_TRIP	Insulation resistance trip setting	5~100	0.1MOhm	3&6	0
14	EH	Vpv_START	The DC voltage required before the ISMG3 begins feeding power into the utility grid.	2500~8000	0.1V	3&6	0
15	FH	ONGRID_DELAY	On grid delay time	20~600	Sec	3&6	0
16	10H	VacH_LIMIT	Higher clamp voltage of the nominal utility	2530~2640	0.1V	3&6	0
17	11H	VacH_LIMIT_CYCLE	The maximum cycles over clamp voltage	30~600	Sec	3&6	0
18	12H	STANDARD	Standard	0~4	0 : DK5940 1 : VDE0126-1-1 2 : RD1663 3 : AS4777 4 : User	3&6	1
19	13H	ADDRESS	RS485 address	1~255		3&6	0
20	14H	BAUDRATE	Communication baudrate	0~1	9600/19200	3&6	0
21	15H	LANGUAGE	Language	0~4	0 : English 1 : Italian 2 : Spanish 3 : French 4 : German	3&6	0
22	16H	Alarm	Alarm ON/OFF	0~1	0:OFF 1:ON	3&6	0

* Parameters 1~18 ,21~22are not allowed to change in output mode

* Parameters 19,20 don’t need to stop in changing value

READ COMMAND (3)

No.	Addr.	Variable	Description	Range	Unit	RS485 Command	Password Level
25	19H	Reserved					
26	1AH	Reserved					
27	1BH	TIME_HR_CNT	Total output hours	0~65535	hour	3&6C	2
28	1CH	TIME_MIN_CNT	Total output minutes	0~59	minuit	3&6C	2
29	1DH	TIME_SEC_CNT	Total output seconds	0~59	second	3&6C	2
30	1EH	Eac_H	Total output energy high word	0~65535	1000kWh	3&6C	2
31	1FH	Eac_L	Total output energy low word	0~9999	0.1kWh	3&6C	2
32	20H	Reserved					
33	21H	EpvA_H	Total input energy high word	0~65535	1000kWh	3&6C	2
34	22H	EpvA_L	Total input energy low word	0~9999	0.1kWh	3&6C	2
35	23H	Reserved					
36	24H	EpvB_H	Total input energy high word	0~65535	1000kWh	3&6C	2
37	25H	EpvB_L	Total input energy low word	0~9999	0.1kWh	3&6C	2
38	26H	Reserved					
39	27H	Reserved					
40	28H	Reserved					
41	29H	Power_Rating		1500 2000 2500	1500 : 15KW 2000 : 20KW 2500 : 25KW	3&6C	2
42	2AH	PV_NUM		1~2		3&6C	2

Bridge Relay turn ON/OFF count = BridgeRelay_ON_NumH*65536 + BridgeRelay_ON_NumL

H(total operation time) = TIME_HR_CNT hours + TIME_MIN_CNT minuits + TIME_SEC_CNT seconds

Eac(total output power) = Eac_H*10000kWh + Eac_LkWh

Epv(total input power) = Epv_H*10000kWh + Epv_LkWh

READ COMMAND (3)

No.	Addr.	Variable	Description	Range	RS485 Command	Password Level
103 | 110	67H | 6EH	BRAND_NAME	LCD display BRAND DATA (16 Bytes of ASCII Code)	0~65535	3&6C	3
111 | 118	6FH | 76H	TYPE_NAME	LCD display TYPE DATA (16 Bytes of ASCII Code)	0~65535	3&6C	3
119 | 126	77H | 7EH	SN_NAME	LCD display SN DATA (16 Bytes of ASCII Code)	0~65535	3&6C	3

Address	77H	78H	79H	7AH	7BH	7CH	7DH	7EH
Content	532FH	4E20H	3332H	3030H	3130H	3034H	3030H	3031H

CD Display "S/N 320010040001"

READ COMMAND (3)

No.	Addr.	Variable	Description	Unit	RS485 Command	Read / Write
181	B5H	State	See P.20		3	R
182	B6H	Error_Code1	See P.20		3	R
183	B7H	Error_Code2	See P.21		3	R
184	B8H	Error_Code3	See P.21		3	R
185	B9H	Error_Code4	See P.22		3	R
186	BAH	Vpv_A	input voltage A	0.1V	3	R
187	BBH	Vpv_B	input voltage B	0.1V	3	R
188	BCH	Ipv_A	input current A	0.1A	3	R
189	BDH	Ipv_B	input current B	0.1A	3	R
190	BEH	Ppv_A	input power A	1W	3	R
191	BFH	Ppv_B	input power B	1W	3	R
192	C0H	Vac_L1	Phase R output voltage	0.1V	3	R
193	C1H	Iac_L1	Phase R output current	0.1A	3	R
194	C2H	Pac_L1	Phase R output power	1W	3	R
195	C3H	Vac_L2	Phase S output voltage	0.1V	3	R
196	C4H	Iac_L2	Phase R output current	0.1A	3	R
197	C5H	Pac_L2	Phase R output power	1W	3	R
198	C6H	Vac_L3	Phase T output voltage	0.1V	3	R
199	C7H	Iac_L3	Phase R output current	0.1A	3	R
200	C8H	Pac_L3	Phase R output power	1W	3	R

Examples :

If the readings of the Eac_H = 12345 and Eac_L = 6789, then the cumulated energy generated by the inverter is (Eac_H * 10000 + Eac_L) which is (12345 * 10000) + 6789 = 123456789 kWHr.

READ COMMAND (3)

No.	Addr.	Variable	Description	Unit	RS485 Command	Read / Write
201	C9H	Fac	Output frequency	0.01Hz	3	R
202	CAH	Eac_H	Total output energy high word	1000KWHr	3	R
203	CBH	Eac_L	Total output energy low word	0.1KWHr	3	R
204	CCH	EpvA_H	Total input energy high word	1000KWHr	3	R
205	CDH	EpvA_L	Total input energy low word	0.1KWHr	3	R
206	CEH	EpvB_H	Total input energy high word	1000KWHr	3	R
207	CFH	EpvB_L	Total input energy low word	0.1KWHr	3	R
208	D0H	Ton_today	Output time today	1/1800 Hr	3	R
209	D1H	Riso_A	Insulation resistance	0.01MΩ	3	R
210	D2H	Riso_B	Insulation resistance	0.01MΩ	3	R
211	D3H	Ires	Leakage current	1mA	3	R
212	D4H	Heatsink_Temp_1	Heatsink temperature 1	0.1℃	3	R
213	D5H	Eac_TODAY	Total output energy today	0.1KWHr	3	R
214	D6H	Ton_total_Hr	Total output hours	Hr	3	R
215	D7H	Ton_total_Min	Total output minutes	Min	3	R
216	D8H	Ton_total_Sec	Total output seconds	Sec	3	R
217	D9H				3	R
218	DAH				3	R

READ COMMAND (3)

No.	Addr.	Variable	Description	Description	RS485 Command	Read / Write
265	109H	MODEL_NAME	model	1500,2000,2500	3	R
266	10AH	SN_HIGH	Serial number high word	0~9999(YYMM)	3	R
267	10BH	SN_LOW	Serial number low word	0~9999	3	R
268	10CH	DEVICE_VER	Hardware Version		3	R
269	10DH	Version_SEQU	DSP1 Version		3	R
270	10EH	Version_CURR	DSP2 Version		3	R

YY : Year MM : Month

EX: Command 3 Reading 10 datas from inverter. (Address 2 , parameters from address 181 to 190)
Master : 0AH 02H 03H 0H B5H 0H 0AH D4H 18H 0DH
Slave : 0AH 02H 03H 14H 0H 1H 0H 2H 0H 3H 0H 4H 0H 5H 0H 6H 0H 7H 0H 8H 0H 9H 0H 0AH CS(L) CS(H) 0DH

EX: Read inverter serial number (S/N 39006100001)
Master : 0AH 02H 03H 01H 09H 0H 03H D4H 06H 0DH
Slave : 0AH 02H 03H 06H 01H 86H 02H 62H 00H 01H CS(L) CS(H) 0DH

State_COD :

10 Program Initialize mode
11 LCD Initialize mode
30 Wait mode
31 Low Illumination mode
40 Monitoring mode
41 Count Down mode
42 Check Relay mode
50 Grid/MPP mode
60 Fault mode
61 Idle mode
80 Stop mode
90 Calibrate mode

Error_COD1 :

BIT0	GridNA	No AC voltage is detected on the grid side.
BIT1	VacH	The AC voltage of utility grid is over the upper limit.
BIT2	VacL	The AC voltage of utility grid is under the lower limit.
BIT3	FacH	The frequency of AC voltage of the utility is over the upper limit.
BIT4	FacL	The frequency of AC voltage of the utility is under the lower limit.
BIT5	Phase Loss	One/Two phase disconnection.
BIT6	L2, L3 Swap	L2, L3 reversed phase sequence.
BIT7	Drift Fac	Islanding is detected.
BIT8	FastEarthCurrent	The drastic change of the leakage current has been detected.
BIT9	SlowEarthCurrent	The leakage current has exceeded a safe operating limit.
BIT10	DCInjectCurH	Over DC current injected into the AC grid is detected.
BIT11	Imax_AC	Over current on the grid side.
BIT12	IacH	The AC current is over the upper limit.
BIT13	PLL Fault	PLL Error
BIT14		
BIT15		

Error_COD2

BIT0	Riso Low	The insulation resistance between PV array and the ground is below the safe operating limit.
BIT1	VpvH	The DC voltage of PV array is over the upper limit.
BIT2	IpvH	Over current on the DC side.
BIT3	PpvH	Over power on the DC side.
BIT4	VdcbusH	Internal DC bus voltage is over the upper limit.
BIT5	VdcbusL	Internal DC bus voltage is below the lower limit.
BIT6	Temp. High	The internal temperature of the inverter exceeded the safe operating limit.
BIT7	CPUs diff.High	Internal measurement comparison error or defective hardware.
BIT8	System Error	The system is failed.
BIT9	Auto test error	Auto test is failed
BIT10	Temp. Low	The internal temperature of the inverter below the safe operating limit.
BIT11	Bus unbalance	Vbus_high and Vbus_low unbalance
BIT12	Model Error	The mismatch of hardware MODEL setting and CPU setting.
BIT13		
BIT14		
BIT15		

Error_COD3

BIT0	Relay Open	The output relay is open.
BIT1	Relay Short	The output relay is short.
BIT2	RCMU Fault	The leakage current measurement device is failure.
BIT3	I/P HCT Fault	Input current sensor is failure.
BIT4	O/P HCT Fault	Output current sensor is failure.
BIT5	Idc-inj. Fault	The DC injection current monitoring function failure.
BIT6	SPI Error	Internal communication is failed.
BIT7	EEPROM Fault	EEPROM test failed. *waring message
BIT8	FanLock_A	The fan is lock. *waring message
BIT9	FanLock_B	The fan is lock. *waring message
BIT10	Comm. Error	External communication failed *waring message
BIT11	Offset Fault	Internal reference voltage failed, +1.5VA,+1.5VB.
BIT12	Driver Fault	Driver circuit is failed
BIT13		
BIT14		
BIT15		

Error_COD4

BIT0	Offset Fault	Internal reference voltage failed, +1.5VA,+1.5VB
BIT1	Vdcbus Fault	The DC/DC converter is failure.
BIT2	RCMU Fault	The leakage current measurement device is failure.
BIT3	HCT Fail	Hall sensor failed
BIT4	Idc-inj. Fault	The DC injection current monitoring function failure.
BIT5	Relay Fault	Relay test failed, continuously
BIT6	EEPROM Fault	EEPROM test failed
BIT7	Version Error	The firmware version is not correct
BIT8	CPUs diff.High	Internal measurement comparison error or defective hardware, continuously
BIT9	Model Error	The mismatch of hardware MODEL setting and CPU setting.
BIT10	SPI Error	Internal communication test failed
BIT11	CalDataLoss	Calibration data is lost
BIT12	System Error	The system is failed.
BIT13	Driver Fault	Driver circuit is failed
BIT14		
BIT15		

Your Notes :