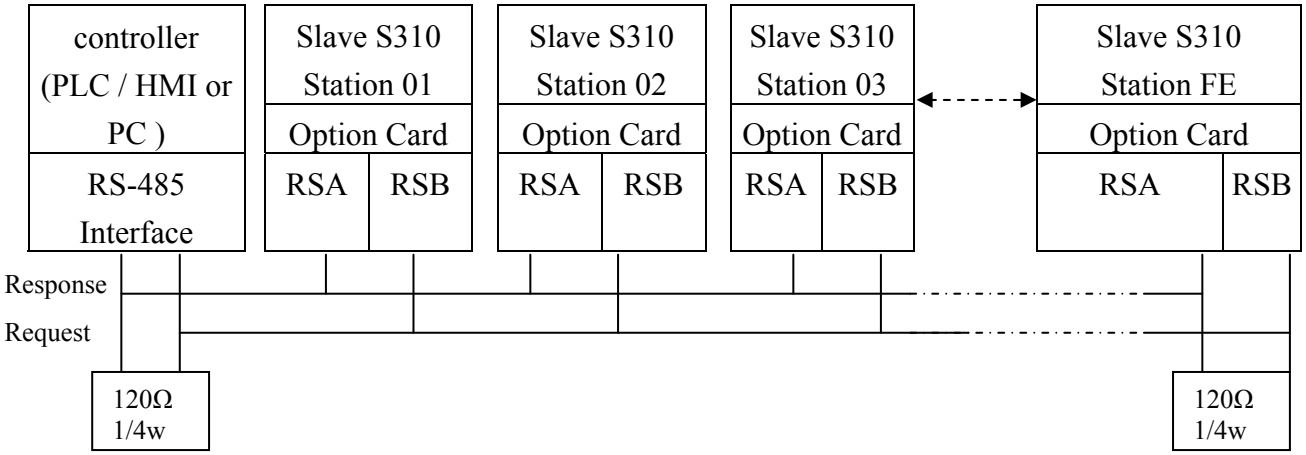
1. Communication Data Frame

S310 series inverter can be Communication controlled by the PC or other controller with the Communication protocol, Modbus ASCII Mode & Mode RTU, RS485 or RS232.

Frame length maximum 80 bytes.

1.1Hardware installation



The network is terminated at each end with an external terminating resistor (120Ω，1/4w)

1.2Data format frame

1.2.1 FOR ASCII MODE

STX(3AH)	Start bit = 3AH
Address Hi	Communication Address(Station):
Address Lo	2-digit ASCII Code
Function Hi	Function Code (command):
Function Lo	2-digit ASCII Code
Command Start Address	command Start byte: 4-digit ASCII Code
Command Start Address	
Command Start Address	
Command Start Address	
Data length	The length of the command: 4-digit ASCII Code
Data length	
Data length	
Data length	
LRC Check Hi	LRC Check Code:
LRC Check Lo	2-digit ASCII Code
END Hi	End Byte :
END Lo	END Hi=CR(0DH),END Li = LF(0AH)

1.2.2 FOR RTU MODE

MASTER(PLC etc.)send request to SLAVE, whereas SLAVE response to MASTER.The signal receiving is illustrated here.

The data length is varied with the command(Function).

SLAVE Address
Function Code
DATA
CRC CHECK
Signal Interval

**The interval should be maintained at 10ms between command signal and request.

1.3 SLAVE Address

00H : Broadcast to all the drivers

01H : to the No.01 Drivers

0FH : to the No.15 Drivers

10H : to the No.16 Drivers

and so on ……,Max to 32(20H)

1.4 Function Code

03H : Read the register contents

06H : write a WORD to register

08H : Loop test

10H : write several data to register(complex number register write)

2.CMS (Checksum and time-out definition)

2.1 LRC

ex. ADDRESS 01H
FUNCTION 03H
COMMAND 01H
00H
DATA LENGTH 0AH

0FH----------true complement
Checksum = F1H
CS(H) = 46H (ASCII)
CS(L) = 31H (ASCII)

2.2 CRC CHECK: CRC Check Code is from SLAVE Address to end of the data. The calculation method is illustrated as follow:

(1)Load a 16-bit register with FFFF hex (all's1).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 examines the LSB.

(4)(If the LSB was 0): Repeat Steps(3)(anther shift). (If the LSB was 1): Exclusive OR the CRC register with the polynomial value A001 hex (1010 0000 0000 0001).

(5) Repeat Steps (3) and (4) until 8 shifts been performed. When this is done, a complete 8-bit byte Will be processed .

(6) Repeat Steps (2) through (5) for next 8-bit byte of the message, Continue doing this until all bytes have been processed. The final content of the CRC register is the CRC value. Placing the CRC into the message: When the 16-bit CRC (2 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, the CRC-16 Upper put the 41h, the CRC-16 Lower put the 21h.

●CRC calculation application program

```
UWORD ch_sum ( UBYTE long , UBYTE *rxdbuff ) {
      BYTE i = 0;
      UWORD wkg = 0xFFFF;
      while ( long-- ) {
         wkg ^= rxdbuff++;
         for ( i = 0 ; i < 8; i++ ) {
            if ( wkg & 0x0001 ) wkg = ( wkg >> 1 ) ^ 0xa001;
            else wkg = wkg >> 1;
         }
      }
      return( wkg );
  }
```

3. Error code

ASCII Mode

STX	':'
Address	'0'
	'1'
Function	'8'
	'6'
Exception code	'5'
	'1'
LRC Check	'2'
	'8'
END	'CR'
	'LF'

RTU Mode

SLAVE Address		02H
Function		83H
Exception code		52H
CRC-16	High	C0H
	Low	CDH

Under communication linking, the driver responses the Exception Code and send Function Code AND 80H to main system if there is error happened.

Error Code	Description
51	Function Code Error
52	Address Error
53	Data Amount Error
54	DATA Over Range
55	Writing Mode Error

4. Inverter Control

4.1Command Data (Readable and Writable)

<table>
<tr><td>Register No.</td><td>Content</td></tr>
<tr><td>2500/A000H</td><td>Reserved</td></tr>
<tr><td>2501/A001H</td><td>Operation Signal
<table>
<tr><td>Bit</td><td>Description</td><td>1</td><td>0</td></tr>
<tr><td>0</td><td>Operation Command</td><td>Run</td><td>Stop</td></tr>
<tr><td>1</td><td>Reverse Command</td><td>Reverse</td><td>Forward</td></tr>
<tr><td>2</td><td>Reserved</td><td></td><td></td></tr>
<tr><td>3</td><td>Fault Reset</td><td>Reset</td><td></td></tr>
<tr><td>4</td><td>Jog Command</td><td>Jog</td><td></td></tr>
<tr><td>5</td><td>Reserved</td><td></td><td></td></tr>
<tr><td>6</td><td>Multi-function Command S1</td><td>ON</td><td>OFF</td></tr>
<tr><td>7</td><td>Multi-function Command S2</td><td>ON</td><td>OFF</td></tr>
<tr><td>8</td><td>Multi-function Command S3</td><td>ON</td><td>OFF</td></tr>
<tr><td>9</td><td>Multi-function Command S4</td><td>ON</td><td>OFF</td></tr>
<tr><td>A</td><td>Multi-function Command S5</td><td>ON</td><td>OFF</td></tr>
<tr><td>B</td><td>Reserved</td><td></td><td></td></tr>
<tr><td>C</td><td>Multi-function Command R1A</td><td>ON</td><td>OFF</td></tr>
<tr><td>D</td><td>Reserved</td><td></td><td></td></tr>
<tr><td>E</td><td>Reserved</td><td></td><td></td></tr>
<tr><td>F</td><td>Reserved</td><td></td><td></td></tr>
</table></td></tr>
<tr><td>2502/A002H</td><td>Frequency Command</td></tr>
<tr><td>2503/A003H</td><td>Reserved</td></tr>
<tr><td>2504/A004H</td><td>Reserved</td></tr>
<tr><td>2505/A005H</td><td>Reserved</td></tr>
<tr><td>2506/A006H</td><td>Reserved</td></tr>
<tr><td>2507/A007H</td><td>Reserved</td></tr>
<tr><td>2508/A008H</td><td>Reserved</td></tr>
<tr><td>2509/A009H</td><td>Reserved</td></tr>
</table>

Note: Write in zero for Not used BIT, do not write in data for the reserved register.

4.2Monitor Data(Only for reading)

<table>
<tr><th>Register No.</th><th>Content</th></tr>
<tr><td>2520/A020H</td><td>
<table>
<tr><th>Bit</th><th>Description</th><th>1</th><th>0</th></tr>
<tr><td>0</td><td>Operation state</td><td>Run</td><td>Stop</td></tr>
<tr><td>1</td><td>Direction state</td><td>Reverse</td><td>Forward</td></tr>
<tr><td>2</td><td>Inverter operation prepare state</td><td>ready</td><td>unready</td></tr>
<tr><td>3</td><td>Abnormal</td><td>Abnormal</td><td></td></tr>
<tr><td>4</td><td>DATA setting error</td><td>Error</td><td></td></tr>
<tr><td>5</td><td>Reserved</td><td></td><td></td></tr>
<tr><td>6</td><td>Reserved</td><td></td><td></td></tr>
<tr><td>7</td><td>Reserved</td><td></td><td></td></tr>
<tr><td>8</td><td>Reserved</td><td></td><td></td></tr>
<tr><td>9</td><td>Reserved</td><td></td><td></td></tr>
<tr><td>A</td><td>Reserved</td><td></td><td></td></tr>
<tr><td>B</td><td>Reserved</td><td></td><td></td></tr>
<tr><td>C</td><td>Reserved</td><td></td><td></td></tr>
<tr><td>D</td><td>Reserved</td><td></td><td></td></tr>
<tr><td>E</td><td>Reserved</td><td></td><td></td></tr>
<tr><td>F</td><td>Reserved</td><td></td><td></td></tr>
</table>
</td></tr>
<tr><td>2521/A021H</td><td>异常内容
<table>
<tr><th>Code</th><th>Description</th><th>Code</th><th>Description</th></tr>
<tr><td>00</td><td>Reserved</td><td>01</td><td>OH(Inverter over heat)</td></tr>
<tr><td>02</td><td>OC(Over current at stop)</td><td>03</td><td>LV(Under voltage)</td></tr>
<tr><td>04</td><td>OV(Over voltage)</td><td>05</td><td>B.B.(External bb)</td></tr>
<tr><td>06</td><td>CTER</td><td>07</td><td>Reserved</td></tr>
<tr><td>08</td><td>EPR(EEPROM error)</td><td>09</td><td>OL2(Inverter over load)</td></tr>
<tr><td>10</td><td>OL1(Motor over load)</td><td>11</td><td>E.S.(Emergency stop)</td></tr>
<tr><td>12</td><td>Reserved</td><td>13</td><td>OC-C(Over current at constant speed)</td></tr>
<tr><td>14</td><td>OC-A(Over current during accelerating)</td><td>15</td><td>OC-D(Over current during decelerating)</td></tr>
<tr><td>16</td><td>OC-S</td><td>17</td><td>LV-C(Under voltage during running)</td></tr>
<tr><td>18</td><td>OV-C(Over voltage at constant speed)</td><td>19</td><td>OH-C(Inverter over heat during running)</td></tr>
<tr><td>20</td><td>STP0(stop at 0 Hz)</td><td>21</td><td>STP1(Direct start disable)</td></tr>
<tr><td>22</td><td>STP2(Control panel emergency stop)</td><td>23</td><td>ERR1(Keypad operation error)</td></tr>
<tr><td>24</td><td>ERR2(Parameter setting error)</td><td>25</td><td>Reserved</td></tr>
<tr><td>26</td><td>ERR5(Communication failure)</td><td>27</td><td>ERR6 Communication failure</td></tr>
<tr><td>28</td><td>ERR7</td><td>29</td><td>ERR8</td></tr>
<tr><td>30</td><td>Reserved</td><td>31</td><td>Reserved</td></tr>
<tr><td>32</td><td>Reserved</td><td>33</td><td>Reserved</td></tr>
<tr><td>34</td><td>Reserved</td><td>35</td><td>Reserved</td></tr>
<tr><td>36</td><td>LOC(parameter Locked)</td><td>37</td><td>Reserved</td></tr>
<tr><td>38</td><td>Reserved</td><td>39</td><td>Reserved</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><th>Register No.</th><th>Content</th></tr>
<tr><td>2522/A022H</td><td>
<table>
<tr><th colspan="2">Bit</th><th>Description</th><th>1</th><th>0</th></tr>
<tr><td rowspan="10">Sequence input status</td><td>0</td><td>Terminal S1</td><td>Closed</td><td>Opened</td></tr>
<tr><td>1</td><td>Terminal S2</td><td>Closed</td><td>Closed</td></tr>
<tr><td>2</td><td>Terminal S3</td><td>Closed</td><td>Closed</td></tr>
<tr><td>3</td><td>Terminal S4</td><td>Closed</td><td>Closed</td></tr>
<tr><td>4</td><td>Terminal S5</td><td>Closed</td><td>Closed</td></tr>
<tr><td>5</td><td>reserved</td><td></td><td></td></tr>
<tr><td>6</td><td>Multi-function Output1 (RELAY1)</td><td>On</td><td>OFF</td></tr>
<tr><td>7</td><td>reserved</td><td></td><td></td></tr>
<tr><td>8</td><td>reserved</td><td></td><td></td></tr>
<tr><td>9</td><td>reserved</td><td></td><td></td></tr>
<tr><td rowspan="6">Contact output</td><td>A</td><td>reserved</td><td></td><td></td></tr>
<tr><td>B</td><td>reserved</td><td></td><td></td></tr>
<tr><td>C</td><td>reserved</td><td></td><td></td></tr>
<tr><td>D</td><td>reserved</td><td></td><td></td></tr>
<tr><td>E</td><td>reserved</td><td></td><td></td></tr>
<tr><td>F</td><td>reserved</td><td></td><td></td></tr>
</table>
</td></tr>
<tr><td>2523/A023H</td><td>frequency command (100/1Hz)</td></tr>
<tr><td>2524/A024H</td><td>Output frequency (100/1Hz)</td></tr>
<tr><td>2525/A025H</td><td>Output voltage command (10/1V)</td></tr>
<tr><td>2526/A026H</td><td>Output DC voltage command (10/1V)</td></tr>
<tr><td>2527/A027H</td><td>Output current (10/1A)</td></tr>
<tr><td>2528/A028H</td><td>reserved</td></tr>
<tr><td>2529/A029H</td><td>reserved</td></tr>
<tr><td>252A/A02AH</td><td>reserved</td></tr>
<tr><td>252B/A02BH</td><td>reserved</td></tr>
<tr><td>252C/A02CH</td><td>TM2 AIN input value (1024 / 10V) *1</td></tr>
<tr><td>252D/A02DH</td><td>Keypad AIN input value (1024 / 10V) *1</td></tr>
<tr><td>252E/A02EH</td><td>reserved</td></tr>
<tr><td>252F/A02FH</td><td>reserved</td></tr>
<tr><td>2530/A030H</td><td>reserved</td></tr>
</table>

(Note) 1、Do not write in data for the reserved register.

5.Function Code

5.1Read the data in the holding register [03H]

Master unit reads the contents of the holding register with the continuous number for the specified quantity.

Note：1、Limit the number of read data，RTU: 37，ASCII:17.

2、Can only Continuous read the address of the same Group

3、Read data Quantity≥1.

☒

☒

Only on the data in the same Group of continuous reading (Example) Read the SLAVE station No:01 ,S310 drive's frequency command.

ASCII Mode

Instruction Message

STX	3AH
SLAVE Address	30H
	31H
Function Code	30H
	33H
Start Address	32H
	35H
	32H
	33H
Quantity	30H
	30H
	30H
	31H
LRC CHECK	42H
	33H
END	0DH
	0AH

Response Message (Normal)

STX	3AH
SLAVE Address	30H
	31H
Function Code	30H
	33H
DATA number	30H
	32H
First holding register	31H
	37H
	37H
	30H
LRC CHECK	37H
	33H
END	0DH
	0AH

Response(Fault)

STX	3AH
SLAVE Address	30H
	31H
Function Code	38H
	33H
Error Code	35H
	32H
LRC CHECK	32H
	41H
END	0DH
	0AH

RTU Mode

Instruction Message

SLAVE Address		01H
Function Code		03H
Start Address	High	25H
	Low	23H
Quantity	High	00H
	Low	01H
CRC-16	High	7EH
	Low	CCH

Response Message (Normal)

SLAVE Address		01H
Function Code		03H
DATA number		02H
First holding register	High	07H
	Low	D0H
CRC-16	High	BBH
	Low	E8H

Response(Fault)

SLAVE Address		01H
Function Code		83H
Error Code		52H
CRC-16	High	C0H
	Low	CDH

5.2 LOOP BACK testing [08H]

The function code is check communication between MASTER and SLAVE, the Instruction message is returned as a response message without being change, Any values can be used for test coders or data.

ASCII Mode

Instruction Message

STX	3AH
SLAVE Address	30H
	31H
Function Code	30H
	38H
Test Code	30H
	30H
	30H
	30H
DATA	41H
	35H
	33H
	37H
LRC CHECK	31H
	42H
END	0DH
	0AH

Response Message (Normal)

STX	3AH
SLAVE Address	30H
	31H
Function Code	30H
	38H
Test Code	30H
	30H
	30H
	30H
DATA	41H
	35H
	33H
	37H
LRC CHECK	31H
	42H
END	0DH
	0AH

Response(Fault)

STX	3AH
SLAVE Address	30H
	31H
Function Code	38H
	38H
Error Code	32H
	30H
LRC CHEC	37H
	35H
END	0DH
	0AH

RTU Mode

Instruction Message

SLAVE Address		01H
Function Code		08H
Test Code	High	00H
	Low	00H
DATA	High	A5H
	Low	37H
CRC-16	High	DAH
	Low	8DH

Response Message (Normal)

SLAVE Address		01H
Function Code		08H
Test Code	High	00H
	Low	00H
DATA	High	A5H
	Low	37H
CRC-16	High	DAH
	Low	8DH

Response(Fault)

SLAVE Address		01H
Function Code		88H
Error Code		20H
CRC-16	High	47H
	Low	D8H

5.3 Write holding register [06H]

Specified data are written into the several specified holding registers from the Specified number, respectively.

(Example)Set SLAVE station No:01,S310 drive as forward run at frequency reference 60.0HZ.

ASCII Mode

Instruction Message	
STX	3AH
SLAVE Address	30H
	31H
Function Code	30H
	36H
Start Address	32H
	35H
	30H
	32H
DATA	31H
	37H
	37H
	30H
LRC CHECK	34H
	42H
END	0DH
	0AH

Response Message (Normal)	
STX	3AH
SLAVE Address	30H
	31H
Function Code	30H
	36H
Start Address	32H
	35H
	30H
	32H
DATA	31H
	37H
	37H
	30H
LRC CHECK	34H
	42H
END	0DH
	0AH

Response(Fault)	
STX	3AH
SLAVE Address	30H
	31H
Function Code	38H
	36H
Error Code	35H
	32H
LRC CHECK	32H
	37H
END	0DH
	0AH

RTU Mode

Instruction Message		
SLAVE Address		01H
Function Code		06H
Start Address	High	25H
	Low	02H
DATA	High	17H
	Low	70H
CRC-16	High	2DH
	Low	12H

Response Message (Normal)		
SLAVE Address		01H
Function Code		06H
Start Address	High	25H
	Low	02H
DATA	High	17H
	Low	70H
CRC-16	High	2DH
	Low	12H

Response(Fault)		
SLAVE Address		01H
Function Code		86H
Error Code		52H
CRC-16	High	C3H
	Low	9DH

5.4 Write in several holding registers [10H]

Specified data are written into the several specified holding registers from the Specified number, respectively.

Note：1、Limit the number of read data，RTU: 37，ASCII:17.

2、Can only Continuous read the address of the same Group

3、Read data Quantity≥1.

(Example)Set SLAVE station No:01, S310 drive as forward run at frequency reference 60.0HZ.

ASCII Mode

Instruction Message

STX	3AH
SLAVE Address	30H
	31H
Function Code	31H
	30H
Start Address	32H
	35H
	30H
	31H
Quantity	30H
	30H
	30H
	32H
DATA Number*	30H
	34H
First DATA	30H
	30H
	30H
	31H
Next DATA	31H
	37H
	37H
	30H
LRC CHECK	33H
	42H
END	0DH
	0AH

Response Message (Normal)

STX	3AH
SLAVE Address	30H
	31H
Function Code	31H
	30H
Start Address	32H
	35H
	30H
	31H
Quantity	30H
	30H
	30H
	32H
LRC CHECK	43H
	37H
END	0DH
	0AH

Response(Fault)

STX	3AH
SLAVE Address	30H
	31H
Function Code	39H
	30H
Error Code	35H
	32H
LRC CHECK	31H
	44H
END	0DH
	0AH

RTU Mode

Instruction Message

SLAVE Address		01H
Function Code		10H
Start Address	High	25H
	Low	01H
Quantity	High	00H
	Low	02H
DATA Number *		04H
First DATA	High	00H
	Low	01H
Next DATA	High	17H
	Low	70H
CRC-16	High	CBH
	Low	26H

Response Message (Normal)

SLAVE Address		01H
Function Code		10H
Start Address	High	25H
	Low	01H
Quantity	High	00H
	Low	02H
CRC-16	High	1BH
	Low	04H

Response(Fault)

SLAVE Address		01H
Function Code		90H
Error Code		52H
CRC-16	High	CDH
	Low	FDH

* DATA Numbers are the actual number timers 2

6Comparison list between parameter and register

Note：

Parameter register No.: GGnnH，“GG”means Group number ，“nn” means Parameter number for example: the address of Pr 08-03 is 0803H. the address of Pr 10-11 is 0A0BH

Register No.	Function	Register No.	Function	Register No.	Function
Group00		Group01		Group02	
0000H	Reserved	0100H	01-00	0200H	02-00
0001H	00-01	0101H	01-01	0201H	02-01
0002H	00-02	0102H	01-02	0202H	02-02
0003H	00-03	0103H	01-03	0203H	02-03
0004H	Reserved	0104H	01-04	0204H	02-04
0005H	00-05	0105H	01-05	0205H	02-05
0006H	Reserved	0106H	01-06	0206H	Reserved
0007H	00-07	0107H	Reserved	0207H	Reserved
0008H	00-08	0108H	Reserved	0208H	Reserved
0009H	00-09	0109H	01-09	0209H	Reserved
000AH	00-10	010AH	Reserved	020AH	Reserved
000BH	00-11	010BH	01-11	020BH	Reserved
000CH	00-12	010CH	01-12	020CH	02-12
000DH	00-13	010DH	01-13	020DH	02-13
000EH	00-14				

Register No.	Function	Register No.	Function	Register No.	Function
Group03		Group04		Group05	
0300H	Reserved	0400H	Reserved	0500H	05-00
0301H	03-01	0401H	04-01	0501H	Reserved
0302H	03-02	0402H	Reserved	0502H	05-02
0303H	03-03	0403H	04-03	0503H	05-03
0304H	03-04	0404H	Reserved	0504H	05-04
0305H	03-05	0405H	Reserved	0505H	05-05
0306H	03-06	0406H	Reserved	0506H	05-06
0307H	03-07	0407H	Reserved	0507H	05-07
0308H	03-08	0408H	04-08	0508H	05-08
0309H	Reserved	0409H	04-09	0509H	05-09
030AH	Reserved	040AH	Reserved	050AH	05-10
030BH	Reserved	040BH	Reserved	050BH	05-11
030CH	Reserved	040CH	Reserved		
030DH	Reserved	040DH	Reserved		
030EH	Reserved	040EH	Reserved		
030FH	Reserved	040FH	04-15		
0310H	Reserved	0410H	04-16		
0311H	03-17	0411H	04-17		
0312H	03-18	0412H	04-18		
0313H	03-19				
0314H	03-20				
0315H	03-21				
0316H	03-22				
0317H	03-23				
0318H	03-24				
0319H	03-25				
031AH	03-26				
031BH	03-27				
031CH	03-28				
031DH	03-29				
031EH	03-30				
031FH	03-31				
0320H	03-32				

Register No.	Function	Register No.	Function	Register No.	Function
Group06（Reserved）		Group07		Group08	
		0700H	07-00	0800H	08-00
		0701H	07-01	0801H	Reserved
		0702H	07-02	0802H	08-02
		0703H	07-03	0803H	08-03
		0704H	07-04	0804H	08-04
		0705H	07-05	0805H	08-05
		0706H	07-06	0806H	08-06
		…	…	0807H	08-07
		070CH	Reserved	0808H	08-08
		070DH	07-13		

Register No.	Function	Register No.	Function	Register No.	Function
Group09（Reserved）		Group10		Group11	
		0A00H	Reserved	0B00H	11-00
		0A01H	10-01	0B01H	11-01
		0A02H	Reserved	0B02H	11-02
		0A03H	10-03		
		0A04H	10-04		
		0A0FH	10-16		

Register No.	Function	Register No.	Function	Register No.	Function
Group12		Group13			
0C00H	12-00	0D00H	13-00		
0C01H	12-01	0D01H	13-01		
0C02H	12-02	0D02H	13-02		
0C03H	Reserved	0D03H	13-03		
0C04H	Reserved	0D04H	13-04		
0C05H	Reserved	0D05H	13-05		
0C06H	12-06	0D06H	13-06		
0C07H	12-07	0D07H	13-07		
		0D08H	Reserved		

		0D09H	Reserved		
		0D0AH	Reserved		
		0D0BH	Reserved		
		0D0CH	Reserved		
		0D0DH	Reserved		
		0D0EH	Reserved		
		0D0FH	Reserved		
		0D10H	13-16		
		0D11H	13-17		
		0D12H	13-18		
		0D13H	13-19		
		0D14H	13-20		
		0D15H	13-21		
		0D16H	13-22		
		0D17H	13-23		
		0D18H	Reserved		
		0D19H	Reserved		
		0D1AH	Reserved		
		0D1BH	Reserved		
		0D1CH	Reserved		
		0D1DH	Reserved		
		0D1EH	Reserved		
		0D1FH	Reserved		
		0D20H	13-32		
		0D21H	13-33		
		0D22H	13-34		
		0D23H	13-35		
		0D24H	13-36		
		0D25H	13-37		
		0D26H	13-38		
		0D27H	13-39		