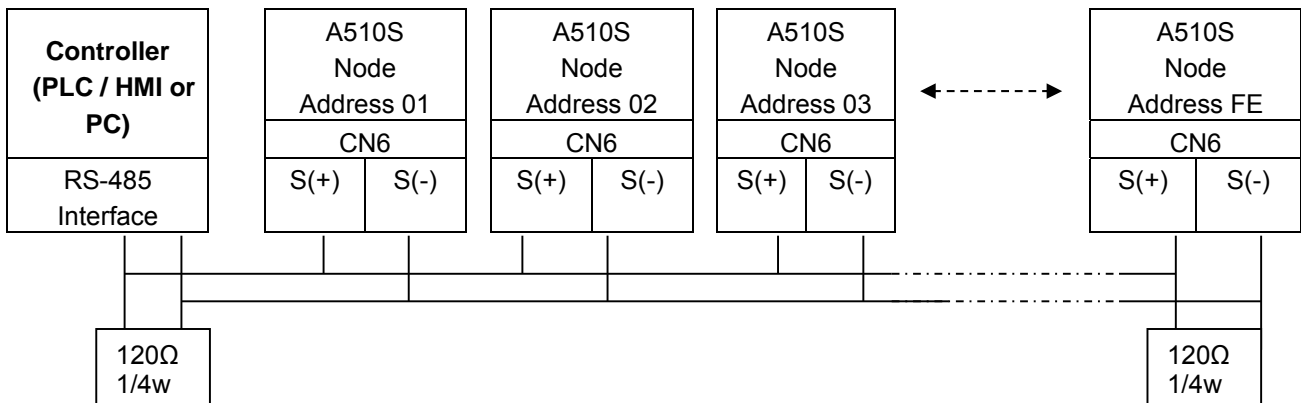


4.6 Modbus Protocol Descriptions

4.6.1 Communication Connection and Data Frame

The inverter can communicate with a PC or PLC via RS485 or RS232 using the Modbus RTU or Modbus ACSII protocol. The maximum frame length is 80 bytes.

Network Connection



**** Terminate the communications line with a (120 ohm, 1/4 watt) resistor at both ends.**

CN6 Pin out

PIN	Signal	PIN	Signal
1	RS-485 S+ signal	5	Tx signal
2	RS-485 S- signal	6	RS-485 S- signal
3	RS-485 S+ signal	7	VCC of isolated 5V power supply
4	Rx signal	8	GND of isolated 5V power supply

For RS-485 communication use pin 1 or pin 3 for S (+) and pin 2 or pin 6 for S (-)

Data Format Frame

Data Frame for ASCII Mode

STX(3AH)	Start Bit = 3AH
Node Address Hi	Communication Address(Station):
Node Address Lo	
Function Hi	Function Code (command):
Function Lo	
Command Start Address	Command Start byte:
Command Start Address	
Command Start Address	
Command Start Address	
Data length	The length of the command:
Data length	
Data length	
Data length	
LRC Check Hi	LRC Check Code:
LRC Check Lo	
END Hi	End Byte:
END Lo	

Data Frame for RTU Mode

Master (PLC etc.) sends request to follower (inverter), and the follower sends a response to the master (PC, PLC). The data received is illustrated here.

The data length varies depending on the command (Function).

Node Address
Function Code
DATA
CRC CHECK
Signal Interval

** The inverter response time is 10ms.

Node Address

00H: Broadcast to all the drivers

01H: to the No. 01 inverter

0FH: to the No.15 inverter

10H: to the No.16 inverter and so on....., max to No. 254 (FEH)

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)

Checksum Calculation

LRC

ex.	NODE ADDRESS	01H	
	FUNCTION	03H	
	COMMAND	01H	
		00H	
+	DATA LENGTH	0AH	
		0FH	----- 2's complement
	Checksum	F1H	
	CS (H)	46H	(ASCII)
	CS (L) =	31H	(ASCII)

CRC

CRC Check: CRC code covers the content from node address to DATA. Please calculate it according to the following methods.

- (1) Load a 16-bit register with FFFF hex (all 1's). Call this CRC register.
- (2) Exclusive OR the first 8-bit byte of the message, 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) (another shift)
 (If the LSB was 1): Exclusive OR the CRC register with the polynomial value A001 hex (1010 0000 0000 0001), putting the result in CRC register.
- (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 in the CRC register is the CRC value. When sending the CRC value, the Low-order byte should be sent firstly, then the High-order byte. For example, CRC value: 1241 Hex, the high-order byte should be set to 41hex and low-order byte 12hex.

CRC calculate program (C language):

```

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

```

ASCII Mode	
STX	‘:’
Address	‘0’
	‘1’
Function	‘8’
	‘6’
Exception code	‘5’
	‘1’
LRC Check	‘2’
	‘8’
END	‘CR’
	‘LF’

RTU Mode		
Node Address		02H
Function		83H
Exception code		52H
CRC-16	High	C0H
	Low	CDH

During a communication error the drive will response with an Exception Code and send a message back to the main system consisting of a Function Code that is “ANDED (and 80h)” with 80 Hex.

Exception code	Content
01	Function code error
02	Register number error
03	DATA setting error
04	Register number is over 32

4.6.2 Register and Data Format

Command Data (Read / Write)

Register No.	Bit	Content
2500H	Reserved	
2501H	0	Operation Command 1 : Run 0 : Stop
	1	Reverse Command 1 : Reverse 0 : Forward
	2	External Fault 1 : Fault
	3	Fault Reset 1 : Reset
	4	Reserved
	5	Reserved
	6	Multi-function Comm S1 1 : "ON"
	7	Multi-function Comm S2 1 : "ON"
	8	Multi-function Comm S3 1 : "ON"
	9	Multi-function Comm S4 1 : "ON"
	A	Multi-function Comm S5 1 : "ON"
	B	Multi-function Comm S6 1 : "ON"
	C	Multi-function Comm S7 1 : "ON"
	D	Multi-function Comm S8 1 : "ON"
E	Inverter mode 1 : "ON"	
F	Torque Command set by Communication 1 : "ON"	
2502H	*Frequency Command (Unit: 0.01Hz)	
2503H	Torque Command (+/-8192 corresponding to the rated torque +/-100%)	
2504H	Speed limit (+/- 120 corresponding +/-120%)	
2505H	AO1 (0.00V ~ 10.00V)	
2506H	AO2 (0 ~ 1000): Voltage (corresponding to 0.00~10.00V); Current (corresponding to 4mA~20mA)	
2507H	DO	
2508H	Reserved	
2509H	Reserved	
250AH	Reserved	
250BH	Reserved	
250CH	Reserved	
250DH	Reserved	
250EH	Reserved	
250FH	Reserved	
2510H	G12-00 H-WORD	
2511H	G12-00 L-WORD	

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

**** If the maximum output frequency of motor is over 300HZ,the frequency resolution is changed to 0.1Hz**

Monitor Data (Read-only)

Register No.	Bit	Content
2520H	0	Operation 1 : Run 0 : Stop
	1	Direction 1 : Reverse 0 : Forward
	2	Inverter ready 1 : ready 0 : unready
	3	Fault 1 : Abnormal
	4	Warning 1 : "ON"
	5	Zero Speed 1 : "ON"
	6	Is440V 1 : "ON"
	7	Frequency Agree 1 : "ON"
	8	Set Frequency Agree 1 : "ON"
	9	Frequency Detection 1 1 : "ON"
	A	Frequency Detection 2 1 : "ON"
	B	Under Voltage 1 : "ON"
	C	Baseblock 1 : "ON"
	D	Freq Ref. not from Comm. 1 : "ON"
	E	Seq. not from Comm. 1 : "ON"
	F	Over Torque 1 : "ON"
2521H	0	30
	1	UV 31
	2	OC 32
	3	OV 33
	4	OH1 34
	5	OL1 35
	6	OL2 36
	7	OT 37
	8	UT 38 CF07
	9	SC 39
	10	Ground OC 40
	11	Fuse broken 41 OLDOP
	12	Input Phase Loss 42
	13	Output Phase Loss 43
	14	PG Overspeed 44
	15	PG Open 45
	16	PG Speed Deviation 46
	17	External Fault 01 47 SS1
	18	External Fault 02 48 CF20
	19	External Fault 03 49 RUN
	20	External Fault 04 50
	21	External Fault 05 51
	22	External Fault 06 52
	23	External Fault 07 53
	24	External Fault 08 54
	25	FB 55
	26	OPR 56

		27		57					
		28	CE	58					
		29	STO	59					
		30	Over Torque 2	61					
2522H	DI State	0	Terminal S1						
		1	Terminal S2						
		2	Terminal S3						
		3	Terminal S4						
		4	Terminal S5						
		5	Terminal S6						
		6	Terminal S7						
		7	Terminal S8						
		8	Reserved						
		9	Reserved						
		A	Reserved						
		B	Reserved						
		C	Reserved						
		D	Reserved						
		E	Reserved						
		F	Reserved						
2523H		Frequency command (0.01Hz)							
2524H		Output frequency (0.01Hz)							
2525H		Reserved							
2526H		DC voltage command (0.1V)							
2527H		Output current (0.1A)							
2528H	Warning Description	0	No alarm	20	EF4	40	EF	60	Reserved
		1	OV	21	EF5	41	Reserved	61	RETRY
		2	UV	22	EF6	42	Reserved	62	SE07
		3	OL2	23	EF7	43	RDP	63	SE08
		4	OH2	24	EF8	44	Reserved	64	Reserved
		5	Reserved	25	Reserved	45	OL1	65	OH1
		6	OT	26	CLB	46	HP_ER	66	FIRE
		7	Reserved	27	Reserved	47	SE10	67	ES
		8	Reserved	28	CT	48	保留	68	STP1
		9	UT	29	USP	49	BB1	69	BDERR
		10	OS	30	RDE	50	BB2	70	EPERR
		11	PGO	31	WRE	51	BB3	71	ADCER
		12	DEV	32	FB	52	BB4	72	Reserved
		13	CE	33	VRYE	53	BB5	73	STP0
		14	CALL	34	SE01	54	BB6	74	ENC
		15	Reserved	35	SE02	55	BB7	75	STP2
		16	EF0	36	SE03	56	BB8		
		17	EF1	37	Reserved	57	Reserved		
		18	EF2	38	SE05	58	Reserved		
19	EF3	39	HPERR	59	Reserved				

2529H		Digital Output State
252AH		AO1 (0.00V ~ 10.00V)
252BH		AO2 (0 ~ 1000): Voltage (corresponding to 0.00~10.00V); Current (corresponding to 4mA~20mA)
252CH		Analog Input 1 (0.1%)
252DH		Analog Input 2 (0.1%)
252EH		Reserved
252FH		A510/L510/E510 Check

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

*** If the maximum output frequency of motor is over 300HZ,the frequency resolution is changed to 0.1Hz**

Read Holding Register [03H]

Read consecutive holding registers. The address of the first holding register is specified in the protocol
 Example: Read frequency command from the inverter with node address 1.

ASCII Mode

Command Message

3AH	STX
30H	Node Address
31H	
30H	Function
33H	
30H	Starting Register
31H	
32H	
33H	
30H	Number of Registers
30H	
30H	
31H	
?	LRC CHECK
?	
0DH	END
0AH	

Response Message (Normal)

3AH	STX
30H	Node Address
31H	
30H	Function
33H	
30H	Data Length
32H	
31H	Initial Save Register
37H	
37H	
30H	
?	LRC CHECK
?	
0DH	END
0AH	

Response Message (Error)

3AH	STX
30H	Node Address
31H	
38H	Function
33H	
30H	Exception code
34H	
34H	LRC CHECK
30H	
0DH	END
0AH	

RTU Mode

Command Message

Node Address	01 H	
Function	03H	
Starting Register	High	0CH
	Low	10H
Number of Registers	High	00H
	Low	01H
CRC-16	High	86H
	Low	9FH

Response Message (Normal)

Node Address	01H	
Function	03H	
Data Length	02H	
Initial Save Register	High	17H
	Low	70H
CRC-16	High	B6H
	Low	50H

Response Message (Error)

Node Address	01H	
Function	83H	
Exception code	04H	
CRC-16	High	40H
	Low	F3H

Loop back test [08H]

Check the communication between the master and the follower (inverter). The data used can be arbitrary.

ASCII Mode

Command Message

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

Response Message (Normal)

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

Response Message (Error)

3AH	STX
30H	Node Address
31H	
38H	Function
38H	
30H	Exception code
33H	
30H	LRC CHECK
36H	
0DH	END
0AH	

RTU Mode

Command Message

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

Response Message (Normal)

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

Response Message (Error)

Node Address	01H	
Function	88H	
Exception code	03H	
CRC-16	High	06H
	Low	01H

Write Single Holding Register [06H]

Write single holding register. The register address of the holding register is specified in the message.

Example: Write a 60.00Hz frequency command to node address 1.

ASCII Mode

Command Message

3AH	STX
30H	Node Address
31H	
30H	Function
36H	
32H	Starting Register
35H	
30H	
32H	
31H	DATA
37H	
37H	
30H	
34H	LRC CHECK
42H	
0DH	END
0AH	

Response Message (Normal)

3AH	STX
30H	Node Address
31H	
30H	Function
36H	
32H	Starting Register
35H	
30H	
32H	
31H	DATA
37H	
37H	
30H	
34H	LRC CHECK
42H	
0DH	END
0AH	

Response Message (Error)

3AH	STX
30H	Node Address
31H	
38H	Function
36H	
30H	Exception code
33H	
30H	LRC CHECK
32H	
0DH	END
0AH	

RTU Mode

Command Message

Node Address	01 H	
Function	06H	
Start No	High	25H
	Low	02H
DATA	High	17H
	Low	70H
CRC-16	High	2DH
	Low	12H

Response Message (Normal)

Node Address	01H	
Function	06H	
Start No	High	25H
	Low	02H
DATA	High	17H
	Low	70H
CRC-16	High	2DH
	Low	12H

Response Message (Error)

Node Address	01H	
Function	86H	
Exception code	03H	
CRC-16	High	02H
	Low	61H

Write Multiple Holding Register [10H]

Write multiple holding registers. The address of the first holding register is specified in the message.

Example: Write a 60.00Hz frequency command to node address 1 and enable FWD run command.

ASCII Mode

Command Message

3AH	STX
30H	Node Address
31H	
31H	Function
30H	
30H	Starting Register
31H	
30H	
31H	
30H	Number of Registers
30H	
30H	
32H	
30H	Number of Bytes*
34H	
30H	DATA 1
30H	
30H	
31H	
31H	DATA 2
37H	
37H	
30H	
33H	LRC CHECK
42H	
0DH	END
0AH	

Response Message (Normal)

3AH	STX
30H	Node Address
31H	
31H	Function
30H	
32H	Starting Register
35H	
30H	
31H	
30H	Number of Registers
30H	
30H	
32H	
43H	LRC CHECK
37H	
0DH	END
0AH	

Response Message (Error)

3AH	STX
30H	Node Address
31H	
39H	Function
30H	
30H	Exception code
33H	
30H	LRC CHECK
43H	
0DH	END
0AH	

* Number of bytes is register amount x 2

RTU Mode

Command Message

Node Address		01H
Function		10H
Starting Register	High	25H
	Low	01H
Number of Registers	High	00H
	Low	02H
Number of Bytes*		04H
DATA 1	High	00H
	Low	01H
DATA 2	High	17H
	Low	70H
CRC-16	High	60H
	Low	27H

Response Message (Normal)

Node Address		01H
Function		10H
Starting Register	High	25H
	Low	01H
Number of Registers	High	00H
	Low	02H
CRC-16	High	1BH
	Low	04H

Response Message (Error)

Node Address		01H
Function		90H
Exception code		03H
CRC-16	High	0CH
	Low	01H

* Data amount is register amount x 2

4.6.3 Parameter Data

Function	Register No	Function	Register No	Function	Register No
Group 0		Group 0		Group 1	
0 – 00	0000H	0 – 43	002BH	1 – 00	0100H
0 – 01	0001H	0 – 44	002CH	1 – 01	0101H
0 – 02	0002H	0 – 45	002DH	1 – 02	0102H
0 – 03	0003H	0 – 46	002EH	1 – 03	0103H
0 – 04	0004H	0 – 47	002FH	1 – 04	0104H
0 – 05	0005H	0 – 48	0030H	1 – 05	0105H
0 – 06	0006H	0 – 49	0031H	1 – 06	0106H
0 – 07	0007H	0 – 50	0032H	1 – 07	0107H
0 – 08	0008H	0 – 51	0033H	1 – 08	0108H
0 – 09	0009H	0 – 52	0034H	1 – 09	0109H
0 – 10	000AH	0 – 53	0035H	1 – 10	010AH
0 – 11	000BH	0 – 54	0036H	1 – 11	010BH
0 – 12	000CH	0 – 55	0037H	1 – 12	010CH
0 – 13	000DH	0 – 56	0038H	1 – 13	010DH
0 – 14	000EH	0 – 57	0039H	1 – 14	010EH
0 – 15	000FH			1 – 15	010FH
0 – 16	0010H			1 – 16	0110H
0 – 17	0011H			1 – 17	0111H
0 – 18	0012H			1 – 18	0112H
0 – 19	0013H			1 – 19	0113H
0 – 20	0014H			1 – 20	0114H
0 – 21	0015H			1 – 21	0115H
0 – 22	0016H			1 – 22	0116H
0 – 23	0017H			1 – 23	0117H
0 – 24	0018H			1 – 24	0118H
0 – 25	0019H			1 – 25	0119H
0 – 26	001AH				
0 – 27	001BH				
0 – 28	001CH				
0 – 29	001DH				
0 – 30	001EH				
0 – 31	001FH				
0 – 32	0020H				
0 – 33	0021H				
0 – 34	0022H				
0 – 35	0023H				
0 – 36	0024H				
0 – 37	0025H				
0 – 38	0026H				
0 – 39	0027H				
0 – 40	0028H				
0 – 41	0029H				
0 – 42	002AH				

Function	Register No	Function	Register No	Function	Register No	Function	Register No
Group 2		Group 3		Group 3		Group 4	
2 – 00	0200H	3 – 00	0300H	3 – 43	032BH	4 – 00	0400H
2 – 01	0201H	3 – 01	0301H	3 – 44	032CH	4 – 01	0401H
2 – 02	0202H	3 – 02	0302H	3 – 45	032DH	4 – 02	0402H
2 – 03	0203H	3 – 03	0303H	3 – 46	032EH	4 – 03	0403H
2 – 04	0204H	3 – 04	0304H	3 – 47	032FH	4 – 04	0404H
2 – 05	0205H	3 – 05	0305H			4 – 05	0405H
2 – 06	0206H	3 – 06	0306H			4 – 06	0406H
2 – 07	0207H	3 – 07	0307H			4 – 07	0407H
2 – 08	0208H	3 – 08	0308H			4 – 08	0408H
2 – 09	0209H	3 – 09	0309H			4 – 09	0409H
2 – 10	020AH	3 – 10	030AH			4 – 10	040AH
2 – 11	020BH	3 – 11	030BH			4 – 11	040BH
2 – 12	020CH	3 – 12	030CH			4 – 12	040CH
2 – 13	020DH	3 – 13	030DH			4 – 13	040DH
2 – 14	020EH	3 – 14	030EH			4 – 14	040EH
2 – 15	020FH	3 – 15	030FH			4 – 15	040FH
2 – 16	0210H	3 – 16	0310H			4 – 16	0410H
2 – 17	0211H	3 – 17	0311H			4 – 17	0411H
2 – 18	0212H	3 – 18	0312H			4 – 18	0412H
2 – 19	0213H	3 – 19	0313H			4 – 19	0413H
2 – 20	0214H	3 – 20	0314H			4 – 20	0414H
2 – 21	0215H	3 – 21	0315H				
2 – 22	0216H	3 – 22	0316H				
2 – 23	0217H	3 – 23	0317H				
2 – 24	0218H	3 – 24	0318H				
2 – 25	0219H	3 – 25	0319H				
2 – 26	021AH	3 – 26	031AH				
2 – 27	021BH	3 – 27	031BH				
2 – 28	021CH	3 – 28	031CH				
2 – 29	021DH	3 – 29	031DH				
2 – 30	021EH	3 – 30	031EH				
2 – 31	021FH	3 – 31	031FH				
2 – 32	0220H	3 – 32	0320H				
2 – 33	0221H	3 – 33	0321H				
2 – 34	0222H	3 – 34	0322H				
2 – 35	0223H	3 – 35	0323H				
2 – 36	0224H	3 – 36	0324H				
2 – 37	0225H	3 – 37	0325H				
		3 – 38	0326H				
		3 – 39	0327H				
		3 – 40	0328H				
		3 – 41	0329H				
		3 – 42	032AH				

Function	Register No	Function	Register No	Function	Register No
Group 5		Group 5		Group 6	
5 – 00	0500H	5 – 33	0521H	6 – 00	0600H
5 – 01	0501H	5 – 34	0522H	6 – 01	0601H
5 – 02	0502H	5 – 35	0523H	6 – 02	0602H
5 – 03	0503H	5 – 36	0524H	6 – 03	0603H
5 – 04	0504H	5 – 37	0525H	6 – 04	0604H
5 – 05	0505H	5 – 38	0526H	6 – 05	0605H
5 – 06	0506H	5 – 39	0527H	6 – 06	0606H
5 – 07	0507H	5 – 40	0528H	6 – 07	0607H
5 – 08	0508H	5 – 41	0529H	6 – 08	0608H
5 – 09	0509H	5 – 42	052AH	6 – 09	0609H
5 – 10	050AH	5 – 43	052BH	6 – 10	060AH
5 – 11	050BH	5 – 44	052CH	6 – 11	060BH
5 – 12	050CH	5 – 45	052DH	6 – 12	060CH
5 – 13	050DH	5 – 46	052EH	6 – 13	060DH
5 – 14	050EH	5 – 47	052FH	6 – 14	060EH
5 – 15	050FH	5 – 48	0530H	6 – 15	060FH
5 – 16	0510H			6 – 16	0610H
5 – 17	0511H			6 – 17	0611H
5 – 18	0512H			6 – 18	0612H
5 – 19	0513H			6 – 19	0613H
5 – 20	0514H			6 – 20	0614H
5 – 21	0515H			6 – 21	0615H
5 – 22	0516H			6 – 22	0616H
5 – 23	0517H			6 – 23	0617H
5 – 24	0518H			6 – 24	0618H
5 – 25	0519H			6 – 25	0619H
5 – 26	051AH			6 – 26	061AH
5 – 27	051BH			6 – 27	061BH
5 – 28	051CH			6 – 28	061CH
5 – 29	051DH			6 – 29	061DH
5 – 30	051EH			6 – 30	061EH
5 – 31	051FH			6 – 31	061FH
5 – 32	0520H			6 – 32	0620H

Function	Register No	Function	Register No	Function	Register No	Function	Register No
Group 6		Group 7		Group 8		Group 8	
6 – 33	0621H	7 – 00	0700H	8 – 00	0800H	8 – 41	0829H
6 – 34	0622H	7 – 01	0701H	8 – 01	0801H	8 – 42	082AH
6 – 35	0623H	7 – 02	0702H	8 – 02	0802H	8 – 43	082BH
6 – 36	0624H	7 – 03	0703H	8 – 03	0803H	8 – 44	082CH
6 – 37	0625H	7 – 04	0704H	8 – 04	0804H		
6 – 38	0626H	7 – 05	0705H	8 – 05	0805H		
6 – 39	0627H	7 – 06	0706H	8 – 06	0806H		
6 – 40	0628H	7 – 07	0707H	8 – 07	0807H		
6 – 41	0629H	7 – 08	0708H	8 – 08	0808H		
6 – 42	062AH	7 – 09	0709H	8 – 09	0809H		
6 – 43	062BH	7 – 10	070AH	8 – 10	080AH		
6 – 44	062CH	7 – 11	070BH	8 – 11	080BH		
6 – 45	062DH	7 – 12	070CH	8 – 12	080CH		
6 – 46	062EH	7 – 13	070DH	8 – 13	080DH		
6 – 47	062FH	7 – 14	070EH	8 – 14	080EH		
		7 – 15	070FH	8 – 15	080FH		
		7 – 16	0710H	8 – 16	0810H		
		7 – 17	0711H	8 – 17	0811H		
		7 – 18	0712H	8 – 18	0812H		
		7 – 19	0713H	8 – 19	0813H		
		7 – 20	0714H	8 – 20	0814H		
		7 – 21	0715H	8 – 21	0815H		
		7 – 22	0716H	8 – 22	0816H		
		7 – 23	0717H	8 – 23	0817H		
		7 – 24	0718H	8 – 24	0818H		
		7 – 25	0719H	8 – 25	0819H		
		7 – 26	071AH	8 – 26	081AH		
		7 – 27	071BH	8 – 27	081BH		
		7 – 28	071CH	8 – 28	081CH		
		7 – 29	071DH	8 – 29	081DH		
		7 – 30	071EH	8 – 30	081EH		
		7 – 31	071FH	8 – 31	081FH		
		7 – 32	0720H	8 – 32	0820H		
		7 – 33	0721H	8 – 33	0821H		
				8 – 34	0822H		
				8 – 35	0823H		
				8 – 36	0824H		
				8 – 37	0825H		
				8 – 38	0826H		
				8 – 39	0827H		
				8 – 40	0828H		

Function	Register No	Function	Register No	Function	Register No
Group 9		Group 10		Group 11	
9- 00	0900H	10- 00	0A00H	11- 00	0B00H
9 - 01	0901H	10 - 01	0A01H	11 - 01	0B01H
9 - 02	0902H	10 - 02	0A02H	11 - 02	0B02H
9 - 03	0903H	10 - 03	0A03H	11 - 03	0B03H
9 - 04	0904H	10 - 04	0A04H	11 - 04	0B04H
9 - 05	0905H	10 - 05	0A05H	11 - 05	0B05H
9 - 06	0906H	10 - 06	0A06H	11 - 06	0B06H
9 - 07	0907H	10 - 07	0A07H	11 - 07	0B07H
9 - 08	0908H	10 - 08	0A08H	11 - 08	0B08H
9 - 09	0909H	10 - 09	0A09H	11 - 09	0B09H
		10 - 10	0A0AH	11 - 10	0B0AH
		10 - 11	0A0BH	11 - 11	0B0BH
		10 - 12	0A0CH	11 - 12	0B0CH
		10 - 13	0A0DH	11 - 13	0B0DH
		10 - 14	0A0EH	11 - 14	0B0EH
		10 - 15	0A0FH	11 - 15	0B0FH
		10 - 16	0A10H	11 - 16	0B10H
		10 - 17	0A11H	11 - 17	0B11H
		10 - 18	0A12H	11 - 18	0B12H
		10 - 19	0A13H	11 - 19	0B13H
		10 - 20	0A14H	11 - 20	0B14H
		10 - 21	0A15H	11 - 21	0B15H
		10 - 22	0A16H	11 - 22	0B16H
		10 - 23	0A17H	11 - 23	0B17H
		10 - 24	0A18H	11 - 24	0B18H
		10 - 25	0A19H	11 - 25	0B19H
		10 - 26	0A1AH	11 - 26	0B1AH
		10 - 27	0A1BH	11 - 27	0B1BH
		10 - 28	0A1CH	11 - 28	0B1CH
		10 - 29	0A1DH	11 - 29	0B1DH
		10 - 30	0A1EH	11 - 30	0B1EH
		10 - 31	0A1FH	11 - 31	0B1FH
		10 - 32	0A20H	11 - 32	0B20H
		10 - 33	0A21H	11- 33	0B21H
		10 - 34	0A22H	11 - 34	0B22H
		10 - 35	0A23H	11 - 35	0B23H
		10 - 36	0A24H	11- 36	0B24H
		10 - 37	0A25H	11 - 37	0B25H
		10 - 38	0A26H	11 - 38	0B26H
		10 - 39	0A27H	11- 39	0B27H
		10 - 40	0A28H	11 - 40	0B28H
		10 - 41	0A29H	11 - 41	0B29H
				11- 42	0B2AH
				11 - 43	0B2BH

Function	Register No	Function	Register No	Function	Register No
Group 11		Group 12		Group 12	
11 – 44	0B2CH	12– 00	High WORD: 2510H Low WORD: 2511H	12 – 35	0C23H
11– 45	0B2DH	12 – 01	0C01H	12– 36	0C24H
11 – 46	0B2EH	12 – 02	0C02H	12 – 37	0C25H
11 – 47	0B2FH	12 – 03	0C03H	12 – 38	0C26H
11 – 48	0B30H	12 – 04	0C04H	12– 39	0C27H
11 – 49	0B31H	12 – 05	0C05H	12 – 40	0C28H
11 - 50	0B32H	12 – 06	0C06H	12 – 41	0C29H
11 - 51	0B33H	12 – 07	0C07H	12– 42	0C2AH
11 – 52	0B34H	12 – 08	0C08H	12 – 43	0C2BH
11 – 53	0B35H	12 – 09	0C09H	12 – 44	0C2CH
11 – 54	0B36H	12 – 10	0C0AH	12– 45	0C2DH
11 – 55	0B37H	12 – 11	0C0BH	12 – 46	0C2EH
11 – 56	0B38H	12 – 12	0C0CH	12 – 47	0C2FH
11 – 57	0B39H	12 – 13	0C0DH	12 – 48	0C30H
11 – 58	0B3AH	12 – 14	0C0EH	12 – 49	0C31H
11 – 59	0B3BH	12 – 15	0C0FH	12 - 50	0C32H
11 – 60	0B3CH	12 – 16	0C10H	12 - 51	0C33H
11 – 61	0B3DH	12 – 17	0C11H	12 – 52	0C34H
11 – 62	0B3EH	12 – 18	0C12H	12 – 53	0C35H
11 – 63	0B3FH	12 – 19	0C13H	12 – 54	0C36H
11 – 64	0B40H	12 – 20	0C14H	12 – 55	0C37H
11 – 65	0B41H	12 – 21	0C15H	12 – 56	0C38H
		12 – 22	0C16H	12 – 57	0C39H
		12 – 23	0C17H	12 – 58	0C3AH
		12 – 24	0C18H	12 – 59	0C3BH
		12 – 25	0C19H	12 – 60	0C3CH
		12 – 26	0C1AH	12 – 61	0C3DH
		12 – 27	0C1BH	12 – 62	0C3EH
		12 – 28	0C1CH	12 – 63	0C3FH
		12 – 29	0C1DH	12 – 64	0C40H
		12 – 30	0C1EH	12 – 65	0C41H
		12 – 31	0C1FH	12 – 66	0C42H
		12 - 32	0C20H	12 – 67	0C43H
		12– 33	0C21H	12 – 68	0C44H
		12 – 34	0C22H	12 – 69	0C45H

Function	Register No	Function	Register No	Function	Register No
Group 12		Group 13		Group 14	
12 – 70	0C46H	13– 00	0D00H	14– 00	0E00H
12 – 71	0C47H	13 – 01	0D01H	14 – 01	0E01H
12 – 72	0C48H	13 – 02	0D02H	14 – 02	0E02H
12 – 73	0C49H	13 – 03	0D03H	14 – 03	0E03H
12 – 74	0C4AH	13 – 04	0D04H	14 – 04	0E04H
12 – 75	0C4BH	13 – 05	0D05H	14 – 05	0E05H
12 – 76	0C4CH	13 – 06	0D06H	14 – 06	0E06H
12 – 77	0C4DH	13 – 07	0D07H	14 – 07	0E07H
12 – 78	0C4EH	13 – 08	0D08H	14 – 08	0E08H
12 – 79	0C4FH	13 – 09	0D09H	14 – 09	0E09H
		13 – 10	0D0AH	14 – 10	0E0AH
		13 – 11	0D0BH	14 – 11	0E0BH
		13 – 12	0D0CH	14 – 12	0E0CH
		13 – 13	0D0DH	14 – 13	0E0DH
		13 – 14	0D0EH	14 – 14	0E0EH
		13 – 15	0D0FH	14 – 15	0E0FH
				14 – 16	0E10H
				14 – 17	0E11H
				14 – 18	0E12H
				14 – 19	0E13H
				14 – 20	0E14H
				14 – 21	0E15H
				14 – 22	0E16H
				14 – 23	0E17H
				14 – 24	0E18H
				14 – 25	0E19H
				14 – 26	0E1AH
				14 – 27	0E1BH
				14 – 28	0E1CH
				14 – 29	0E1DH
				14 – 30	0E1EH
				14 – 31	0E1FH
				14 – 32	0E20H
				14 – 33	0E21H
				14 – 34	0E22H

Function	Register No	Function	Register No	Function	Register No
Group 14		Group 15		Group 16	
14 – 35	0E23H	15– 00	0F00H	16– 00	1000H
14 – 36	0E24H	15 – 01	0F01H	16 – 01	1001H
14 – 37	0E25H	15 – 02	0F02H	16 – 02	1002H
14 – 38	0E26H	15 – 03	0F03H	16 – 03	1003H
14 – 39	0E27H	15 – 04	0F04H	16 – 04	1004H
14 – 40	0E28H	15 – 05	0F05H	16 – 05	1005H
14 – 41	0E29H	15 – 06	0F06H	16 – 06	1006H
14 – 42	0E2AH	15 – 07	0F07H	16– 07	1007H
14 – 43	0E2BH	15 – 08	0F08H	16 – 08	1008H
14 – 44	0E2CH	15 – 09	0F09H	16 – 09	1009H
14 – 45	0E2DH	15 – 10	0F0AH		
14 – 46	0E2EH	15 – 11	0F0BH		
14 – 47	0E2FH	15 – 12	0F0CH		
		15 – 13	0F0DH		
		15 – 14	0F0EH		
		15 – 15	0F0FH		
		15 – 16	0F10H		
		15 – 17	0F11H		
		15 – 18	0F12H		
		15 – 19	0F13H		
		15 – 20	0F14H		
		15 – 21	0F15H		
		15 – 22	0F16H		
		15 – 23	0F17H		
		15 – 24	0F18H		
		15 – 25	0F19H		
		15 – 26	0F1AH		
		15 – 27	0F1BH		
		15 – 28	0F1CH		
		15 – 29	0F1DH		
		15 – 30	0F1EH		
		15 – 31	0F1FH		
		15 – 32	0F20H		

Function	Register No	Function	Register No	Function	Register No
Group 20		Group 21		Group 21	
20- 00	1400H	21- 00	1500H	21-33	1521H
20 - 01	1401H	21 - 01	1501H	21 - 34	1522H
20 - 02	1402H	21 - 02	1502H	21 - 35	1523H
20 - 03	1403H	21 - 03	1503H	21 - 36	1524H
20 - 04	1404H	21 - 04	1504H	21 - 37	1525H
20 - 05	1405H	21 - 05	1505H	21 - 38	1526H
20 - 06	1406H	21 - 06	1506H	21 - 39	1527H
20 - 07	1407H	21 - 07	1507H	21 - 40	1528H
20 - 08	1408H	21 - 08	1508H	21 - 41	1529H
20 - 09	1409H	21 - 09	1509H	21 - 42	152AH
20 - 10	140AH	21 - 10	150AH	21 - 43	152BH
20 - 11	140BH	21 - 11	150BH		
20 - 12	140CH	21 - 12	150CH		
20 - 13	140DH	21 - 13	150DH		
20 - 14	140EH	21 - 14	150EH		
20 - 15	140FH	21 - 15	150FH		
20 - 16	1410H	21 - 16	1510H		
20 - 17	1411H	21 - 17	1511H		
20 - 18	1412H	21 - 18	1512H		
20 - 19	1413H	21 - 19	1513H		
20 - 20	1414H	21 - 20	1514H		
20 - 21	1415H	21 - 21	1515H		
20 - 22	1416H	21 - 22	1516H		
20 - 23	1417H	21 - 23	1517H		
20 - 24	1418H	21 - 24	1518H		
20 - 25	1419H	21 - 25	1519H		
20 - 26	141AH	21 - 26	151AH		
20 - 27	141BH	21 - 27	151BH		
20 - 28	141CH	21 - 28	151CH		
20 - 29	141DH	21 - 29	151DH		
20 - 30	141EH	21 - 30	151EH		
20 - 31	141FH	21 - 31	151FH		
20 - 32	1420H	21 - 32	1520H		
20 - 33	1421H				
20 - 34	1422H				
20 - 35	1423H				

