ZLAC8015D SERVO DRIVER (SPECIAL FOR HUB SERVO MOTOR)

RS485 COMMUNICATION INSTRUCTION

Version	Description	Date
V1.0	First edition	

CATALOG

1. RS485 SERIAL PORT SETTINGS

RS485 communication of ZLAC8015D supports Modbus RTU protocol.

The driver address can be set to 0-127, the default address is 1.

For RS485 communication, ZLAC8015D has 7 optional baud rates: 9600, 19200, 38400, 57600, 115200, 128000, 256000. Baud rate could be set through software, its default value is 115200.

Serial port configuration：

Data bits: 8

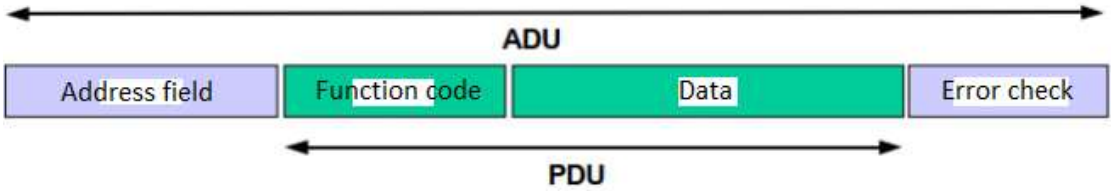
Stop bits: 1

Parity: None

Flow control: None

2. PROTOCOL FORMAT

The MODBUS protocol defines a protocol data unit (PDU), which has nothing to do with the basic communication layer. The MODBUS protocol mapping of specific bus or network, can introduce some add-on domain on the application data unit (ADU).



The MODBUS protocol defines three PDUs:

MODBUS requests PDU = {function code + request data field}

MODBUS responses PDU = {function code + response data field}

MODBUS abnormal responses PDU = {abnormal function code + error code}

The function codes supported by ZLAC8015D are as below:

Function description	Function code	Error function code
Read multiple registers	0x03	0x83
Write single register	0x06	0x86
Writer multiple registers	0x10	0x90

Error function code shows as below:

Error code	Name	Meaning
0x01	Illegal function code	Function error
0x02	Illegal data address	Data address error
0x03	Illegal data value	Data error

2.1 Read Register Function Code 0x03

Eg: Send command “Read the actual speed of motor”, return “The actual speed of motor is 10RPM”

Send:

Command	Content Description
01	Driver Address
03	Function Code
20	High 8 bits of register start address
AB	Low 8 bits of register start address
00	High 8 bits of register number
02	Low 8 bits of register number
BE	High 8 bits of CRC check
2B	Low 8 bits of CRC check

Return data:

Command	Content Description
01	Driver Address
03	Function Code
04	Number of bytes read
00	High 8 bits of data 0
64	Low 8 bits of data 0
00	High 8 bits of data 1
64	Low 8 bits of data 1
BA	High 8 bits of CRC check
07	Low 8 bits of CRC check

2.2 Write Single Register (16-bit data) Function Code 0x06

Eg: Write Left motor target speed 100RPM

Send:

Command	Content Description
01	Driver Address
06	Function Code
20	High 8 bits of register start address
88	Low 8 bits of register start address
00	High 8 bits of register number
64	Low 8 bits of register number
03	High 8 bits of CRC check
CB	Low 8 bits of CRC check

Return data:

Command	Content Description
01	Driver Address
06	Function Code
20	High 8 bits of register start address
88	Low 8 bits of register start address
00	High 8 bits of register number
64	Low 8 bits of register number
03	High 8 bits of CRC check
CB	Low 8 bits of CRC check

2.3 Write Multiple Register Function Code 0x10

Eg: Write Left motor encoder wire 1024, hall offset angle 0

Send:

Command	Content Description
01	Driver Address
10	Function Code
20	High 8 bits of register start address
30	Low 8 bits of register start address
00	High 8 bits of register number
02	Low 8 bits of register number
04	Number of bytes
04	High 8 bits of data 0
00	Low 8 bits of data 0
00	High 8 bits of data 1
00	Low 8 bits of data 1
68	High 8 bits of CRC check
4A	Low 8 bits of CRC check

Return data:

Command	Content Description
01	Driver Address
10	Function Code
20	High 8 bits of register start address
30	Low 8 bits of register start address
02	Number of registers
4A	High 8 bits of CRC check
07	Low 8 bits of CRC check

3. CONTROL ROUTINE

3.1 Velocity Mode

The relevant parameter addresses are shown in the table below：

Index	Name	Description	Type	Access	Default
200Eh	Control word	Control word 0x05：quick stop 0x06：clear fault 0x07：stop 0x08：enable	U16	RW	0
200Dh	Control mode	3：velocity mode	U16	RW	0
2080h	Acceleration time(Left)	Acceleration time Range：0-32767ms；	U16	RW	500ms
2081h	Acceleration time(Right)	Acceleration time Range：0-32767ms；	U16	RW	500ms
2082h	Deceleration time(Left)	Deceleration time； Range：0-32767ms；	U16	RW	500ms
2083h	Deceleration time(Right)	Deceleration time； Range：0-32767ms；	U16	RW	500ms
2088h	Target velocity(Left)	Target velocity in velocity mode Range：-3000-3000r/min；	I16	RW	0
2089h	Target velocity(Right)	Target velocity in velocity mode Range：-3000-3000r/min；	I16	RW	0
20ABh	Actual velocity(Left)	Actual velocity，unit: 0.1r/min	I16	RO	0
20ACh	Actual velocity(Right)	Actual velocity，unit: 0.1r/min	I16	RO	0

Velocity mode initialization

Description	Transmit	Receive
Velocity mode	01 06 20 0D 00 03 53 C8	01 06 20 0D 00 03 53 C8
Acceleration time(Left) to 500ms	01 06 20 80 01 F4 83 F5	01 06 20 80 01 F4 83 F5
Acceleration time(Right) to 500ms	01 06 20 81 01 F4 D2 35	01 06 20 81 01 F4 D2 35
Deceleration time(Left) to 500ms	01 06 20 82 01 F4 22 35	01 06 20 82 01 F4 22 35
Deceleration time(Right) to 500ms	01 06 20 83 01 F4 73 F5	01 06 20 83 01 F4 73 F5
Enable	01 06 20 0E 00 08 E2 0F	01 06 20 0E 00 08 E2 0F

Left motor velocity control

Description	Transmit	Receive
Target velocity(Left) to 100RPM	01 06 20 88 00 64 03 CB	01 06 20 88 00 64 03 CB
Target velocity(Left) to -100RPM	01 06 20 88 FF 9C 43 B9	01 06 20 88 FF 9C 43 B9
Stop	01 06 20 31 00 07 92 07	01 06 20 31 00 07 92 07

Right motor velocity control

Description	Transmit	Receive
Target velocity(Right) to 100RPM	01 06 20 89 00 64 52 0B	01 06 20 89 00 64 52 0B
Target velocity(Right) to -100RPM	01 06 20 89 FF 9C 12 79	01 06 20 89 FF 9C 12 79
Stop	01 06 20 31 00 07 92 07	01 06 20 31 00 07 92 07

Synchronous velocity control

Description	Transmit	Receive
Target velocity to 100RPM	01 10 20 88 00 02 04 00 64 00 64 23 9C	01 10 20 88 00 02 CA 22
Target velocity to -100RPM	01 10 20 88 00 02 04 FF 9C FF 9C D2 0B	01 10 20 88 00 02 CA 22
Stop	01 06 20 31 00 07 92 07	01 06 20 31 00 07 92 07

3.2 Position Mode

The relevant parameter addresses are shown in the table below：

Index	Name	Description	Type	Access	Default
200Eh	Control word	Control word 0x05： quick stop 0x06： clear fault 0x07： stop 0x08： enable 0x10：start(Synchronous)（needed in position control） 0x11: start(Left) 0x12: start(Right)	U16	RW	0
200Fh	Synchronous/asynchronous control status	0： Synchronous 1： asynchronous	U16	RW	0
200Dh	Control mode	1： Position mode(Relative) 2： Position mode(Absolute)	U16	RW	0
2080h	Acceleration time(Left)	Acceleration time Range：0-32767ms；	U16	RW	500ms

2081h	Acceleration time(Right)	Acceleration time Range：0-32767ms；	U16	RW	500ms
2082h	Deceleration time(Left)	Deceleration time； Range：0-32767ms；	U16	RW	500ms
2083h	Deceleration time(Right)	Deceleration time； Range：0-32767ms；	U16	RW	500ms
208Ah	Target position high 16 bits(Left)	Range Relative：-0x7FFFFFFF~0x7FFFFFFF Absolute：-0x3FFFFFFF~0x3FFFFFFF	I16	RW	0
208Bh	Target position low 16 bits(Left)		I16	RW	0
208Ch	Target position high 16 bits(Right)	Range Relative：-0x7FFFFFFF~0x7FFFFFFF Absolute：-0x3FFFFFFF~0x3FFFFFFF	I16	RW	0
208Dh	Target position low 16 bits(Right)		I16	RW	0
208Eh	Target speed(Left)	Target speed in position mode Range：1-1000r/min；	U16	RW	120r/min
208Fh	Target speed(Right)	Target speed in position mode Range：1-1000r/min；	U16	RW	120r/min
20A7h	Actual motor position high 16 bits(Left)	Actual motor position, unit: counts Range:-0x7FFFFFFF~0x7FFFFFFF	I16	RO	0
20A8h	Actual motor position low 16 bits(Left)		I16	RO	0
20A9h	Actual motor position high 16 bits(Right)	Actual motor position, unit: counts Range:-0x7FFFFFFF~0x7FFFFFFF	I16	RO	0
20AAh	Actual motor position low 16 bits(Right)		I16	RO	0

Position mode asynchronous control initialization

Description	Transmit	Receive
Asynchronous control	01 06 20 0F 00 00 B2 09	01 06 20 0F 00 00 B2 09
Position mode(Relative)	01 06 20 0D 00 01 D2 09	01 06 20 0D 00 01 D2 09
Acceleration time(Left) to 500ms	01 06 20 80 01 F4 83 F5	01 06 20 80 01 F4 83 F5
Acceleration time(Right) to 500ms	01 06 20 81 01 F4 D2 35	01 06 20 81 01 F4 D2 35
Deceleration time(Left) to 500ms	01 06 20 82 01 F4 22 35	01 06 20 82 01 F4 22 35
Deceleration time(Right) to 500ms	01 06 20 83 01 F4 73 F5	01 06 20 83 01 F4 73 F5
Target speed(Left) to 50RPM	01 06 20 8E 00 32 63 F4	01 06 20 8E 00 32 63 F4
Target speed(Right) to 50RPM	01 06 20 8F 00 32 32 34	01 06 20 8F 00 32 32 34
Enable	01 06 20 0E 00 08 E2 0F	01 06 20 0E 00 08 E2 0F

Left motor relative position control

Description	Transmit	Receive
Target position(Left) to 20480 pulses	01 10 20 8A 00 02 04 00 00 50 00 DE 71	01 10 20 8A 00 02 6B E2
Start(Left)	01 06 20 0E 00 11 23 C5	01 06 20 0E 00 11 23 C5
Target position(Left) to -20480 pulses	01 10 20 8A 00 02 04 FF FF B0 00 97 95	01 10 20 8A 00 02 6B E2
Start(Left)	01 06 20 0E 00 11 23 C5	01 06 20 0E 00 11 23 C5
Stop	01 06 20 0E 00 07 A2 0B	01 06 20 0E 00 07 A2 0B

Right motor relative position control

Description	Transmit	Receive
Target position(Right) to 20480 pulses	01 10 20 8C 00 02 04 00 00 50 00 5E 5B	01 10 20 8C 00 02 8B E3
Start(Right)	01 06 20 0E 00 12 63 C4	01 06 20 0E 00 12 63 C4
Target position(Right) to -20480 pulses	01 10 20 8C 00 02 04 FF FF B0 00 17 BF	01 10 20 8C 00 02 8B E3
Start(Right)	01 06 20 0E 00 12 63 C4	01 06 20 0E 00 12 63 C4
Stop	01 06 20 0E 00 07 A2 0B	01 06 20 0E 00 07 A2 0B

Position mode synchronization control initialization

Description	Transmit	Receive
Synchronous control	01 06 20 0F 00 01 73 C9	01 06 20 0F 00 01 73 C9
Position mode(Relative)	01 06 20 0D 00 01 D2 09	01 06 20 0D 00 01 D2 09
Acceleration time(Left) to 500ms	01 06 20 80 01 F4 83 F5	01 06 20 80 01 F4 83 F5
Acceleration time(Right) to 500ms	01 06 20 81 01 F4 D2 35	01 06 20 81 01 F4 D2 35
Deceleration time(Left) to 500ms	01 06 20 82 01 F4 22 35	01 06 20 82 01 F4 22 35
Deceleration time(Right) to 500ms	01 06 20 83 01 F4 73 F5	01 06 20 83 01 F4 73 F5
Target speed(Left) to 50RPM	01 06 20 8E 00 32 63 F4	01 06 20 8E 00 32 63 F4
Target speed(Right) to 50RPM	01 06 20 8F 00 32 32 34	01 06 20 8F 00 32 32 34
Enable	01 06 20 0E 00 08 E2 0F	01 06 20 0E 00 08 E2 0F

Synchronous relative position control

Description	Transmit	Receive
Target positon to 20480pulses	01 10 20 8A 00 04 08 00 00 50 00 00 00 50 00 E3 2C	01 10 20 8A 00 04 EB E0
Start(Synchronous)	01 06 20 0E 00 10 E2 05	01 06 20 0E 00 10 E2 05
Target positon to	01 10 20 8A 00 04 08 FF FF B0 00	01 10 20 8A 00 04 EB E0

-20480pulses	FF FF B0 00 FC A3	
Start(Synchronous)	01 06 20 0E 00 10 E2 05	01 06 20 0E 00 10 E2 05
Stop	01 06 20 0E 00 07 A2 0B	01 06 20 0E 00 07 A2 0B

3.4 Torque Mode

The relevant parameter addresses are shown in the table below：

Index	Name	Description	Type	Access	Default
200Eh	Control word	Control word 0x05： quick stop 0x06： clear fault 0x07： stop 0x08： enable	U16	RW	0
200Dh	Control mode	4： torque mode	U16	RW	0
2086h	Torque rate(Left)	Unit: mA/S;	U16	RW	300ms
2087h	Torque rate(Right)	Unit: mA/S;	U16	RW	300ms
2090h	Target torque(Left)	Unit: mA Range: -30000~30000；	I16	RW	0
2091h	Target torque(Right)	Unit: mA Range: -30000~30000；	I16	RW	0
20ADh	Actual torque(Left)	Unit: 0.1A Range: -300~300；	I16	RO	0
20AEh	Actual torque(Right)	Unit: 0.1A Range: -300~300；	I16	RO	0

Torque mode initialization

Description	Transmit	Receive
Torque mode	01 06 20 0D 00 04 12 0A	01 06 20 0D 00 04 12 0A
Torque rate(Left) to 500mA/s	01 06 20 86 01 F4 63 F4	01 06 20 86 01 F4 63 F4
Torque rate(Right) to 500mA/s	01 06 20 87 01 F4 32 34	01 06 20 87 01 F4 32 34
Enable	01 06 20 31 00 08 D2 03	01 06 20 31 00 08 D2 03

Left motor torque control

Description	Transmit	Receive
Target torque(Left) to 2000mA	01 06 20 90 07 D0 81 8B	01 06 20 90 07 D0 81 8B
Target torque(Left) to -2000mA	01 06 20 90 F8 30 C1 F3	01 06 20 90 F8 30 C1 F3
Stop	01 06 20 0E 00 07 A2 0B	01 06 20 0E 00 07 A2 0B

Right motor torque control

Description	Transmit	Receive
Target torque(Right) to 2000mA	01 06 20 91 07 D0 D0 4B	01 06 20 91 07 D0 D0 4B
Target torque(Right) to -2000mA	01 06 20 91 F8 30 90 33	01 06 20 91 F8 30 90 33
Stop	01 06 20 0E 00 07 A2 0B	01 06 20 0E 00 07 A2 0B

Synchronous torque control

Description	Transmit	Receive
Target torque to 2000mA	01 10 20 90 00 02 04 07 D0 07 D0 60 23	01 10 20 90 00 02 4A 25
Target torque to -2000mA	01 10 20 90 00 02 04 F8 30 F8 30 11 B9	01 10 20 90 00 02 4A 25
Stop	01 06 20 0E 00 07 A2 0B	01 06 20 0E 00 07 A2 0B

3.5 Quick stop

The relevant parameter addresses are shown in the table below：

Index	Name	Description	Type	Access	Default
200Eh	Control word	Control word 0x05： quick stop 0x06： clear fault 0x07： stop 0x08： enable	U16	RW	0
2016h	Input effective level	Bit0： Input(X0) Bit1： Input(X0) 0： Default(High level) 1： Reverse(Low level)	U16	RW	0
2017h	X0 function choice	0： None 1-8： NC 9： Quick stop	U16	RW	9
2018h	X1 function choice		U16	RW	0

※Note： Wiring refer to 《ZLAC8015D Manual》

Command to qucik stop：

Description	Transmit	Receive
Quick stop	01 06 20 0E 00 05 23 CA	01 06 20 0E 00 05 23 CA

3.6. Error and clear

ZLAC8015D supports overvoltage, overcurrent and other protection. All fault information can be obtained by reading address 0x20A5/0x20A6 (Left/Right drive).

故障码如下表：

0x20A5/0x20A6	Description
0x0000	None
0x0001	Over voltage
0x0002	Under voltage
0x0004	Over current
0x0008	Over load
0x0010	Current following error
0x0020	Position following error
0x0040	Velocity following error
0x0080	Reference voltage error
0x0100	EEPROM error
0x0200	Hall error
0x0400	Motor temperature over temperature

Fault clear:

Description	Transmit	Receive
Clear faults	01 06 20 0E 00 06 63 CB	01 06 20 0E 00 06 63 CB

4. ADDRESS DIRECTIONARY

Index	Name	Description	Type	Access	Default
Common constant for Left and Right motors					
2000h	Communication offline time	Driver and **host** communication offline time setting. Unit: ms Range: 0-32767;	U16	RW	1000
2001h	RS485 Node ID	Raange: 1~127	U16	RW	4
2002h	RS485 Baud Rate	0：256000bps 1：128000bps 2：115200bps 3：57600bps 4：38400bps 5：19200bps 6：9600bps	U16	RW	2
2003h	Input signal status	2 input signal level status Bit0-Bit1: X0-X1 input level status	U16	RO	0
2004h	Out signal status	2 output signal level status Bit0-Bit1: Y0-Y1 output status;	U16	RO	0
2005h	Clear feedback position	Used to clear feedback position in Profile Position Mode. 0: Invalid; 1: Clear the feedback position; Not saved.	U16	RW	0
2006h	In absolute position control, reset the zero point	reset the zero point 0: Invalid. 1: Reset the zero point(Left) 2: Reset the zero point(Right) 3: Reset the zero point(Right) Not saved.	U16	RW	0
2007h	Driver state	Whether the driver is enabled when powered on 0: Stop 1: Enable	U16	RW	0
2008h	Maximum motor speed	Motor maximum speed Unit: r/min. Range: 1-1000 r/min.	U16	RW	1000
2009h	Register parameter settings	0: Invalid. 1: Restore factory settings.	U16	RW	0
200Ah	CAN Node ID	Range: 1-127	U16	RW	1
200Bh	CAN Baud rate	0：1000 Kbit/s 1：500 Kbit/s	U16	RW	1

		2：250 Kbit/s 3：125 Kbit/s 4：100 Kbit/s 5：50 Kbit/s 6：25 Kbit/s			
200Ch					
200Dh	Control mode	0: Undefined 1: Position mode(Relative) 2: Position mode(Absolute) 3: Velocity mode 4: Torque mode	U16	RW	3
200Eh	Control word	0x05: Quick stop 0x06: Clear faults 0x07: Stop 0x08: Enable 0x10:Start(Synchronous)(Position mode) 0x11: Start(Left) 0x12: Start(Right)	U16	RW	0
200Fh	Synchronous/asynchronous control status	0: Synchronous 1: Asynchronous	U16	RW	0
2010h	Whether store RW register to EEPROM	0: Invalid 1: Store RW register to EEPROM	U16	RW	0
2011h	Quick stop control	How driver process when receive quick stop command 5: Stop 6: Quick stop(with deceleration time) 7: Quick stop(without deceleration time)	U16	RW	5
2012h	Stop control	How driver process when receive stop command 0: Invalid 1: Stop(switch to ready to switch on)	U16	RW	0
2013h	Disable control	How driver process when receive disable command 0: Invalid 1: Stop(Switch to switch on)	U16	RW	800
2014h	Halt control	How driver process when receive Halt command 1: Stop(operation enabled) 2: Quick stop with deceleration time (operation enable) 3: Quick stop without deceleration time(operation enable)	U16	RW	150

2015h					
2016h	Input effective level	Bit0：Input(X0) Bit1：Input(X0) 0：Default(High level) 1：Reverse(Low level)	U16	RW	0
2017h	X0 function choice	0：None 1-8：NC 9：Quick stop	U16	RW	9
2018h	X1 function choice		U16	RW	0
2019h	Output effective level	Bit0：Input(X0) Bit1：Input(X0) 0：Default(High level) 1：Reverse(Low level)	U16	RW	0
201Ah	Y0 function choice	Brake 0：Open brake 1：Close brake	U16	RW	0
201Bh	Y1 function choice		U16	RW	0
Left motor parameter					
2030h	Encoder line	Range: 0-4096	U16	RW	1024
2031h	Hall offset angle	Unit: 1° Range: -360-+360	I16	RW	0
2032h	Overload factor	Unit: % Range: 0-300	U16	RW	200
2033h	Rated current	Unit: 0.1A Range: 0-150	U16	RW	150
2034h	Maximum current	Unit: 0.1A Range: 0-300	U16	RW	300
2035h	Overload protection time	Unit: 10ms Range: 0-6553	U16	RW	300
2036h	Position following error threshold	Unit: 10counts Range: 1-6553	U16	RW	409
2037h	Velocity smoothing factor	Range: 0-30000	U16	RW	1000
2038h	Cl Kp	Range: 0-30000	U16	RW	600
2039h	Cl Ki	Range: 0-30000	U16	RW	300
203Ah	Feedforward output smoothing factor	Range: 0-30000	U16	RW	100
203Bh	Torque output smoothing factor	Range: 0-30000	U16	RW	100
203Ch	Vl Kp	Range: 0-30000	U16	RW	500
203Dh	Vl Ki	Range: 0-30000	U16	RW	100
203Eh	Vl Kf	Range: 0-30000	U16	RW	500
203Fh	Pl Kp	Range: 0-30000	U16	RW	100
2040h	Pl Kf	Range: 0-30000	U16	RW	50
2043h	Initial velocity(Velocity	Initial velocity in velocity mode	U16	RW	1r/min

	mode)	Unit: r/min； Range: 1-250/min；			
2044h	Initial velocity(Position mode)	Initial velocity in position mode Range: 1-250/min；	U16	RW	1r/min
2045h	Poles of motor	Range: 4-64	U16	RW	15
2046h	Over temperature threshold	Unit: 0.1° C； Range: 0-1200	U16	RW	800
2047h	Velocity observer coefficient 1	0-30000	U16	RW	1000
2048h	Velocity observer coefficient 2	0-30000	U16	RW	750
2049h	Velocity observer coefficient 3	0-30000	U16	RW	350
204Ah	Velocity observer coefficient 4	0-30000	U16	RW	1000
Right motor parameter					
2060h	Encoder line	Range: 0-4096	U16	RW	1024
2061h	Hall offset angle	Unit: 1° Range: -360-+360	I16	RW	0
2062h	Overload factor	Unit: % Range: 0-300	U16	RW	200
2063h	Rated current	Unit: 0.1A Range: 0-150	U16	RW	150
2064h	Maximum current	Unit: 0.1A Range: 0-300	U16	RW	300
2065h	Overload protection time	Unit: 10ms Range: 0-6553	U16	RW	300
2066h	Position following error threshold	Unit: 10counts Range: 1-6553	U16	RW	409
2067h	Velocity smoothing factor	Range: 0-30000	U16	RW	1000
2068h	Cl Kp	Range: 0-30000	U16	RW	600
2069h	Cl Ki	Range: 0-30000	U16	RW	300
206Ah	Feedforward output smoothing factor	Range: 0-30000	U16	RW	100
206Bh	Torque output smoothing factor	Range: 0-30000	U16	RW	100
206Ch	Vl Kp	Range: 0-30000	U16	RW	500
206Dh	Vl Ki	Range: 0-30000	U16	RW	100
206Eh	Vl Kf	Range: 0-30000	U16	RW	500
206Fh	Pl Kp	Range: 0-30000	U16	RW	100
2070h	Pl Kf	Range: 0-30000	U16	RW	50
2073h	Initial velocity(Velocity	Initial velocity in velocity mode	U16	RW	1r/min

	mode)	Unit: r/min； Range: 1-250/min；			
2074h	Initial velocity(Position mode)	Initial velocity in position mode Range: 1-250/min；	U16	RW	1r/min
2075h	Poles of motor	Range: 4-64	U16	RW	15
2076h	Over temperature threshold	Unit: 0.1° C； Range: 0-1200	U16	RW	800
2077h	Velocity observer coefficient 1	0-30000	U16	RW	1000
2078h	Velocity observer coefficient 2	0-30000	U16	RW	750
2079h	Velocity observer coefficient 3	0-30000	U16	RW	350
207Ah	Velocity observer coefficient 4	0-30000	U16	RW	1000
Control parameter					
2080h	Acceleration time(Left)	Acceleration time Range：0-32767ms	U16	RW	500ms
2081h	Acceleration time(Right)	Acceleration time Range：0-32767ms	U16	RW	500ms
2082h	Deceleration time(Left)	Deceleration time Range：0-32767ms	U16	RW	500ms
2083h	Deceleration time(Right)	Deceleration time Range：0-32767ms	U16	RW	500ms
2084h	Deceleration time of quick stop(Left)	Range: 0-32767ms	U16	RW	10ms
2085h	Deceleration time of quick stop(Right)	Range: 0-32767ms	U16	RW	10ms
2086h	Torque rate(Left)	Unit: mA/S	U16	RW	300ms
2087h	Torque rate(Right)	Unit: mA/S	U16	RW	300ms
2088h	Target velocity(Left)	Target velocity in velocity mode Range: -3000-3000r/min	I16	RW	0
2089h	Target velocity(Right)	Target velocity in velocity mode Range: -3000-3000r/min	I16	RW	0
208Ah	Target position high 16 bits(Left)	Range: Relativ： -0x7FFFFFFF~0x7FFFFFFF Absolute： -0x3FFFFFFF~0x3FFFFFFF	I16	RW	0
208Bh	Target position low 16 bits(Left)		I16	RW	0
208Ch	Target position high 16 bits(Right)	Range: Relative： -0x7FFFFFFF~0x7FFFFFFF Absolute： -0x3FFFFFFF~0x3FFFFFFF	I16	RW	0
208Dh	Target position low 16 bits(Right)		I16	RW	0

208Eh	Target speed(Left)	Target speed in position mode Range：1-1000r/min；	U16	RW	120r/min
208Fh	Target speed(Right)	Target speed in position mode Range：1-1000r/min；	U16	RW	120r/min
2090h	Target torque(Left)	Unit: mA Range: -30000~30000；	I16	RW	0
2091h	Target torque(Right)	Unit: mA Range: -30000~30000；	I16	RW	0
Read only parameter					
20A0h	Sofeware version	Default	U16	RO	-
20A1h	DC voltage	Unit: 0.01V	U16	RO	0
20A2h	Motor state	0: Stopped 1: Running High 8 bits(Left) Low 8 bits(Right)	U16	RO	0
20A3h	Hall state	Range: 0-7 High 8 bits(Left) Low 8 bits(Right)	U16	RO	0
20A4h	Motor temperature	Unit: 1° C; Range: 0-120 High 8 bits(Left) Low 8 bits(Right)	U16	RO	-
20A5h	Error code(Left)	0000h: None 0001h : Over voltage 0002h : Under voltage 0004h: Over current 0008h: Over load 0010h: Current following error 0020h: Position following error 0040h: Velocity following error 0080h : Reference voltage error 0100h: EEPROM error 0200h: Hall error 0400h: Motor temperature over temperature	U16	RO	0
20A6h	Error code(Right)	0000h: None 0001h : Over voltage 0002h : Under voltage 0004h: Over current 0008h: Over load 0010h: Current following error 0020h: Position following error 0040h: Velocity following error 0080h : Reference voltage error	U16	RO	0

		0100h: EEPROM error 0200h: Hall error 0400h: Motor temperature over temperature			
20A7h	Actual motor position high 16 bits(Left)	Actual motor position, unit: counts Range:-0x7FFFFFFF~0x7FFFFFFF	I16	RO	0
20A8h	Actual motor position low 16 bits(Left)		I16	RO	0
20A9h	Actual motor position high 16 bits(Right)	Actual motor position, unit: counts Range:-0x7FFFFFFF~0x7FFFFFFF	I16	RO	0
20AAh	Actual motor position low 16 bits(Right)		I16	RO	0
20ABh	Actual velocity(Left)	Actual velocity，unit: 0.1r/min	I16	RO	0
20ACh	Actual velocity(Right)	Actual velocity，unit: 0.1r/min	I16	RO	0
20ADh	Actual torque(Left)	Unit: 0.1A Range: -300~300；	I16	RO	0
20AEh	Actual torque(Right)	Unit: 0.1A Range: -300~300；	I16	RO	0
20AFh	Software connected status	01			
Note: U16 means unsigned 16 bits; I16 means signed 16 bits; U32 means unsigned 32 bits; I32 means signed 32 bits.					