

Modbus User Manual



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What is Modbus?

Modbus, originally created by Modicon, is a fieldbus that allows a master and one or more slave devices to share data. These data are organized into 16-bit registers, which can also be used to share information single-bit I/O points.

It is a popular protocol with PLC vendors due to its simplicity and the inherent ease of sending PLC register data (often 16-bits in width) over a fieldbus protocol optimized for 16-bit data.

The master may initiate read and write operations on single registers or blocks of registers. While there is no rule to this effect, it is common for the master to read and write on a periodic time base (polling), rather than sending and requesting data only when it is needed. In this manner, PLC register data is ensured to be valid and consistent as a representation of the slave device's status.

The Modbus products of MOONS' are based on serial communication bus with Modbus/RTU.

Since Modbus is a master/slave protocol, that means only one node is a master and the others is slave node. Each device intended to communicate using Modbus is given a unique address. In serial networks, only the node assigned as the Master may initiate a command.

A Modbus command contains the Modbus address of the device it is intended for. Only the intended device will act on the command, even though other devices might receive it (an exception is specific broadcast able commands sent to node 0 which are acted on but not acknowledged). All Modbus commands contain checksum information, to allow the recipient to detect transmission errors. The basic Modbus commands can instruct an RTU to change the value in one of its registers, control or read an I/O port, and command the device to send back one or more values contained in its registers.

Wiring

Modbus/RTU:

Modbus/RTU uses the standard RS-232 or RS-485 physical layer.

RS-232 is a point-to-point communications scheme, and as such the largest possible network would consist of a single slave drive. Please note that even though it will be the only device on the "network", it will still require an address. This address may be an integer value from 1-32, and is set through the configuration software (ST Configurator, STB Configurator, Step-Servo Quick Tuner or M Servo Suite) during initial configuration.

For drives with RS-485 communications, there are a few things to consider.

It is possible to use 2-wire RS-485 for operational communication over Modbus, however 4-wire RS-485 is required for use with all MOONS' configuration and programming software. As such, we recommend that all RS-485 networks be constructed using the 4-wire method.

Be sure to consult your drive's hardware manual for specific wiring details.

Data Encode

Big-endian: The most significant byte (MSB) value is stored at the memory location with the lowest address; the next byte value in significance is stored at the following memory location and so on.

For example: To store a 32bit data 0x12345678 into register address 40031 and 40032. 0x1234 will be defined as MSB, and 0x5678 as LSB. With big-endian system

Register 40031 = 0x1234

Register 40032 = 0x5678

When transfer 0x12345678, the first word will be 0x1234, and the second word will be 0x5678

Little-endian: The most significant byte (MSB) value is stored at the memory location with the highest address; the next byte value in significance is stored at the following memory location and so on.

For example: To store a 32bit data 0x12345678 into register address 40031 and 40032. 0x5678 will be defined as MSB, and 0x1234 as LSB. With little-endian system

Register 40031 = 0x5678

Register 40032 = 0x1234

When transfer 0x12345678, the first words will be 0x5678, and the second words will be 0x1234

Big-endian or **Little-endian** can be configured in the configuration software (ST Configurator, STB Configurator, Step-Servo Quick Tuner or M Servo Suite).

Communication Baud Rate and Framing

MOONS' drive has a fixed communication data framing: 8,N,1.

Date bits:8, parity checking: none, stop bit: 1.

In serial communication, the change of baudrate will NOT effect immediately, it will ONLY effects at next power up of the drive. Five different baud rate settings are available:

9600bps

19200bps

38400bps

57600bps

115200bps

Modbus/RTU Data Frame

The standard data framing are as follows:

Address	Function Code	Data	CRC
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The CRC checking code includes from drive's address bits to data bits.

Based on data transfer status, there can be two types of response code:

Normal Modbus response:

Response function code = request function code

Modbus error response:

Response function code = request function code + 0x80

Providing an error code to indicate the error reasoning.

Drive Behavior

An extensive list of registers has been made available, allowing the user to monitor or change every detail of the drive's status. It is also possible to send commands to a specific register, mimicking the behavior of our proprietary SCL command set. The capability allows a PLC to have unparalleled control over the drive's behavior at runtime.

The drive will respond to the following Modbus function codes:

DEC	HEX	Function
3	3	Read Holding Registers
4	4	Read Input Registers
6	6	Write Single Register
16	10	Write Multiple Registers

Function Code 0X03, Reading Multiple Holding Registers

If we want to read encoder's actual position command to drive Node ID 1, the data address for encoder's actual position is register 40005 and 40006. If the register value is 2500000 in decimal, and the transfer is big-endian transfer.

Communication details are as follows:

Command Message (Master)			Response Message (slave)		
Function	Data	Number of Bytes	Function	Data	Number of Bytes
Slave Address	01H	1	Slave Address	01H	1
Function Code	03H	1	Function Code	03H	1
Starting Data Address (Register 40005)	00H(High) 04H(Low)	2	Number of Data (In Byte)	04	1
Number of Data (In word)	00(High) 02(Low)	2	Content of Starting Data Address 40005	00H(High) 26H(Low)	2
CRC Check Low	85	1	Content of second Data Address 40006	25H(High) A0H(Low)	2
CRC Check High	CA	1	CRC Check Low	01H	1
			CRC Check High	10H	1

Host Sending: 01 03 00 04 00 02 85 CA

Drive Reply: 01 03 04 00 26 25 A0 01 10

If error is occurred, drive reply format: 01 83 XX CRC_L CRC_H

Where

XX = 01 : Function code 03 unsupported

XX = 02 : Incorrect reading on driving address or numbers

XX = 03 : Reading register address out of range

XX = 04 : Reading failure

Function Code 0x06, Writing Single Register

If we want to set motor rotary velocity 1.25 rps to drive node ID 11, the corresponding address is register 40030. The write in data value for the register will be $1.25 \times 240 = 300$. In hexadecimal number, it is 12C.

Communication Details are as follows:

Command Message (Master)			Response Message (slave)		
Function	Data	Number of Bytes	Function	Data	Number of Bytes
Slave Address	0BH	1	Slave Address	0BH	1
Function Code	06H	1	Function Code	06H	1
Starting Data Address (Register 40030)	00H(High) 1DH(Low)	2	Starting Data Address (Register 40030)	00H(High) 1DH(Low)	2
Content of Data	01(High) 2C(Low)	2	Content of Data	01(High) 2C(Low)	2
CRC Check Low	19	1	CRC Check Low	19	1
CRC Check High	2B	1	CRC Check High	2B	1

Host Sending: 0B 06 00 1D 01 2C 19 2B

Drive Reply: 0B 06 00 1D 01 2C 19 2B

If error is occurred, drive reply format: 01 86 XX CRC_L CRC_H

Where

XX = 01 : Function code 06 unsupported

XX = 02 : Incorrect writing on driving address or number

XX = 03 : Writing register address out of range

XX = 04 : Writing failure

Function Code 0X10, Writing Multiple Registers

If we writing target distance 30000 into drive NODE-ID 10, the correspondent register address will be 40031 and 40032. Transfer into hexadecimal, it is 7530h.

Communication Details are as follows:

Command Message (Master)			Response Message (slave)		
Function	Data	Number of Bytes	Function	Data	Number of Bytes
Slave Address	0AH	1	Slave Address	0AH	1
Function Code	10H	1	Function Code	10H	1
Starting Data Address (Register 40031)	00H(High) 1EH(Low)	2	Starting Data Address (Register 40031)	00H(High) 1EH(Low)	2
Number of Data (In word)	00H(High) 02H(Low)	2	Number of Data (In word)	00H(High) 02H(Low)	2
Number of Data (In byte)	04H	1	CRC Check Low	20	1
Content of first Data address	00(High) 00(Low)	2	CRC Check High	B5	1
Content of second Data address	75H(High) 30H(Low)	2			
CRC Check Low	70	1			
CRC Check High	8F	1			

Host Sending: 0A 10 00 1E 00 02 04 00 00 75 30 70 8F

Drive Reply: 0A 10 00 1E 00 02 20 B5

If error is occurred, drive reply format: 01 90 XX CRC_L CRC_H

Where

XX = 01 : Function code 10 unsupported

XX = 02 : Incorrect reading on driving address or number

XX = 03 : Reading register address out of range

XX = 04 : Reading failure

Monitoring

See the Register Map table for details on specific data that can be monitored and written in this manner.

Sending Commands

The Command Opcode register, 40125, is designated to receive encoded SCL commands via Modbus. Many SCL commands have been made available in this manner, and will allow the user full control over the motion capabilities of the drive.

SCL command encoding details can be found in the Modbus Register Table.

Please refer to the Host Command Reference for details of the functionality of these registers and commands.

Modbus Register Table

ST&STM Series Modbus Register Table				
Register	Access	Data Type	Description	SCL Register
40001	Read Only	SHORT	Alarm Code (AL)报警代码 (AL)	f
40002	Read Only	SHORT	Status Code (SC)状态代码 (SC)	s
40003	Read Only	SHORT	Immediate Expanded Inputs (IS) 数字输入状态	y
40004	Read Only	SHORT	Driver Board Inputs (ISX)	i
40005..6	Read Only	LONG	Encoder Position (IE, EP)	e
40007..8	Read Only	LONG	Immediate Absolute Position(IP) 即时位置	l
40009..10	Read Only	LONG	Absolute Position Command(SP) 绝对位置	P(大写) (Capital)
40011	Read Only	SHORT	Immediate Actual Velocity (IV0) 瞬时实际速度	v
40012	Read Only	SHORT	Immediate Target Velocity (IV1) 瞬时给定速度	w
40013	Read Only	SHORT	Immediate Drive Temperature (IT) 瞬时驱动器温度	t
40014	Read Only	SHORT	Immediate Bus Voltage (IU) 瞬时母线电压	u
40015..16	Read Only	LONG	Immediate Position Error (IX) 瞬时位置误差	x
40017	Read Only	SHORT	Immediate Analog Input Value (IA)	a
40018	Read Only	SHORT	Q Program Line Number Q 程序行号	b
40019	Read Only	SHORT	Immediate Current Command (IC) 瞬时电流	c
40020..21	Read Only	LONG	Relative Distance (ID) 相对位置	d
40022..23	Read Only	LONG	Sensor Position 传感器位置	g
40024	Read Only	SHORT	Condition Code 比较状态代码	h
40025	Read Only	SHORT	Analog Input 1 (IA1) 模拟量 1	j
40026	Read Only	SHORT	Analog Input 2 (IA2) 模拟量 2	k
40027	Read Only	SHORT	Command Mode (CM) 控制方式	
40028	R/W	SHORT	Point-to-Point Acceleration (AC) 点到点定位加速度	A
40029	R/W	SHORT	Point-to-Point Deceleration (DE) 点到点定位减速度	B

40030	R/W	SHORT	Velocity (VE) 点到点定位速度		V
40031..32	R/W	LONG	Point-to-Point Distance (DI) 点到点定位距离		D
40033..34	R/W	LONG	Change Distance (DC)		C
40035	R/W	SHORT	Change Velocity (VC)		U
40036	Read Only	SHORT	Velocity Move State		n
40037	Read Only	SHORT	Point-to-Point Move State		o
40038	Read Only	SHORT	Q Program Segment Number		p
40039	Read Only	SHORT	Reserved		
40040	Read Only	SHORT	Reserved		
40041..42	R/W	LONG	Position Offset		E
40043	R/W	SHORT	Miscellaneous Flags		F
40044	R/W	SHORT	Reserved		
40045..46	R/W	LONG	Input Counter		I
40047	R/W	SHORT	Jog Accel (JA)		
40048	R/W	SHORT	Jog Decel (JL)		
40049	R/W	SHORT	Jog Velocity (JS)		J
40050	R/W	SHORT	Accel/Decel Current	STM Series(CA)	
				ST Series(VM)	
40051	R/W	SHORT	Running Current (CC)		N
40052	R/W	SHORT	Idle Current (CI)		
40053	R/W	SHORT	Steps per Revolution		R
40054..55	R/W	LONG	Pulse Counter		S
40056	R/W	SHORT	Analog Position Gain (AP)		X
40057	R/W	SHORT	Analog Threshold (AT)		Y
40058	R/W	SHORT	Analog Offset (AV)		Z
40059..60	R/W	LONG	Accumulator		0
40061..62	R/W	LONG	User Defined		1
40063..64	R/W	LONG	User Defined		2
40065..66	R/W	LONG	User Defined		3
40067..68	R/W	LONG	User Defined		4
40069..70	R/W	LONG	User Defined		5

40071..72	R/W	LONG	User Defined	6
40073..74	R/W	LONG	User Defined	7
40075..76	R/W	LONG	User Defined	8
40077..78	R/W	LONG	User Defined	9
40079..80	R/W	LONG	User Defined	:
40081..82	R/W	LONG	User Defined	;
40083..84	R/W	LONG	User Defined	<
40085..86	R/W	LONG	User Defined	=
40087..88	R/W	LONG	User Defined	>
40089..90	R/W	LONG	User Defined	?
40091..92	R/W	LONG	User Defined	@
40093..94	R/W	LONG	User Defined	[
40095..96	R/W	LONG	User Defined	\
40097..98	R/W	LONG	User Defined]
40099..100	R/W	LONG	User Defined	^
40101..102	R/W	LONG	User Defined	_
40103..104	R/W	LONG	User Defined	`
40105	R/W	SHORT	Brake Release Delay	
40106	R/W	SHORT	Brake Engage Delay	
40107	R/W	SHORT	Idle Current Delay	
40108	R/W	SHORT	Reserved	
40109	R/W	SHORT	Reserved	
40110	R/W	SHORT	Analog Filter Gain	
40111..124			Reserved	
40125	R/W	SHORT	Command Opcode	
40126	R/W	SHORT	Parameter 1	
40127	R/W	SHORT	Parameter 2	
40128	R/W	SHORT	Parameter 3	
40129	R/W	SHORT	Parameter 4	
40130	R/W	SHORT	Parameter 5	

STB Series Modbus Register Table

Register	Access	Data Type	Description	SCL Register
40001	Read Only	SHORT	Alarm Code (AL)	f
40002	Read Only	SHORT	Status Code (SC)	s
40003	Read Only	SHORT	Immediate Expanded Inputs (IS)	y
40004	Read Only	SHORT	Driver Board Inputs (ISX)	i
40005..6	Read Only	LONG	Encoder Position (IE, EP)	e
40007..8	Read Only	LONG	Immediate Absolute Position(IP)	l
40009..10	Read Only	LONG	Absolute Position Command(SP)	P
40011	Read Only	SHORT	Immediate Actual Velocity (IV0)	v
40012	Read Only	SHORT	Immediate Target Velocity (IV1)	w
40013	Read Only	SHORT	Immediate Drive Temperature (IT)	t
40014	Read Only	SHORT	Immediate Bus Voltage (IU)	u
40015..16	Read Only	LONG	Immediate Position Error (IX)	x
40017	Read Only	SHORT	Immediate Analog Input Value (IA)	a
40018	Read Only	SHORT	Q Program Line Number	b
40019	Read Only	SHORT	Immediate Current Command (IC)	c
40020..21	Read Only	LONG	Relative Distance (ID)	d
40022..23	Read Only	LONG	Sensor Position	g
40024	Read Only	SHORT	Condition Code	h
40025	Read Only	SHORT	Analog Input 1 (IA1)	j
40026	Read Only	SHORT	Analog Input 2 (IA2)	k
40027	Read Only	SHORT	Command Mode (CM)	m
40028	R/W	SHORT	Point-to-Point Acceleration (AC)	A
40029	R/W	SHORT	Point-to-Point Deceleration (DE)	B
40030	R/W	SHORT	Velocity (VE)	V
40031..32	R/W	LONG	Point-to-Point Distance (DI)	D
40033..34	R/W	LONG	Change Distance (DC)	C
40035	R/W	SHORT	Change Velocity (VC)	U
40036	Read Only	SHORT	Velocity Move State	n
40037	Read Only	SHORT	Point-to-Point Move State	o

40038	Read Only	SHORT	Q Program Segment Number	p
40039			Reserved	
40040	Read Only	SHORT	Reserved	z
40041..42	R/W	LONG	Position Offset	E
40043	R/W	SHORT	Miscellaneous Flags	F
40044			Reserved	
40045..46	R/W	LONG	Input Counter	I
40047	R/W	SHORT	Jog Accel (JA)	
40048	R/W	SHORT	Jog Decel (JL)	
40049	R/W	SHORT	Jog Velocity (JS)	J
40050	R/W	SHORT	Accel/Decel Current (CA)	
40051	R/W	SHORT	Running Current (CC)	N
40052	R/W	SHORT	Idle Current (CI)	
40053	R/W	SHORT	Steps per Revolution	R
40054..55	R/W	SHORT	Pulse Counter	S
40056	R/W	SHORT	Analog Position Gain (AP)	X
40057	R/W	SHORT	Analog Threshold (AT)	Y
40058	R/W	SHORT	Analog Offset (AV)	Z
40059..60	R/W	LONG	Accumulator	0
40061..62	R/W	LONG	User Defined	1
40063..64	R/W	LONG	User Defined	2
40065..66	R/W	LONG	User Defined	3
40067..68	R/W	LONG	User Defined	4
40069..70	R/W	LONG	User Defined	5
40071..72	R/W	LONG	User Defined	6
40073..74	R/W	LONG	User Defined	7
40075..76	R/W	LONG	User Defined	8
40077..78	R/W	LONG	User Defined	9
40079..80	R/W	LONG	User Defined	:
40081..82	R/W	LONG	User Defined	;
40083..84	R/W	LONG	User Defined	<

40085..86	R/W	LONG	User Defined	=
40087..88	R/W	LONG	User Defined	>
40089..90	R/W	LONG	User Defined	?
40091..92	R/W	LONG	User Defined	@
40093..94	R/W	LONG	User Defined	[
40095..96	R/W	LONG	User Defined	\
40097..98	R/W	LONG	User Defined]
40099..100	R/W	LONG	User Defined	^
40101..102	R/W	LONG	User Defined	_
40103..104	R/W	LONG	User Defined	`
40105	R/W	SHORT	Brake Release Delay(BD)	
40106	R/W	SHORT	Brake Engage Delay(BE)	
40107	R/W	SHORT	Idle Current Delay(CD)	
40108			Reserved	
40109			Reserved	
40110	R/W	SHORT	Analog Filter Gain(AF)	
40111..124			Reserved	
40125	R/W	SHORT	Command Opcode	
40126	R/W	SHORT	Parameter 1	
40127	R/W	SHORT	Parameter 2	
40128	R/W	SHORT	Parameter 3	
40129	R/W	SHORT	Parameter 4	
40130	R/W	SHORT	Parameter 5	
40131	R/W	SHORT	Hyperbolic Smoothing Gain(HG)	
40132	R/W	SHORT	Hyperbolic Smoothing Phase(HP)	
40133	R/W	SHORT	Smoothing filter frequency(SF)	
40134	R/W	SHORT	Node High Byte Address	
40135	R/W	SHORT	Motor Detail	
40136			Reserved	
40137			Reserved	
40138	R/W	SHORT	Control Mode set(CM)	

40139	R/W	SHORT	Operation Mode(PM)	
40140	R/W	SHORT	Enable Input(SI)	
40141	R/W	SHORT	Alarm Reset Input(AI)	
40142	R/W	SHORT	Limit Sensor Input(DL)	
40143	R/W	SHORT	Alarm Output(AO)	
40144	R/W	SHORT	Brake Output(BO)	
40145	R/W	SHORT	Move Output(MO)	
40146			Reserved	
40147			Reserved	
40148	R/W	SHORT	Low Voltage(LV)	
40149	R/W	SHORT	Baud Rate(BR)	
40150	R/W	SHORT	Protocol(PR)	
40151	R/W	SHORT	Transmit Delay(TD)	
40152..40200			Reserved	

Step-Servo Series Modbus Register Table

Register	Access	Data Type	Description	SCL Register
40001	Read Only	SHORT	Alarm Code (AL)	f
40002	Read Only	SHORT	Status Code (SC)	s
40003	Read Only	SHORT	Immediate Expanded Inputs (IS)	y
40004	Read Only	SHORT	Driver Board Inputs (ISX)	i
40005..6	Read Only	LONG	Encoder Position (IE, EP)	e
40007..8	Read Only	LONG	Immediate Absolute Position(IP)	l
40009..10	Read Only	LONG	Absolute Position Command(SP)	P
40011	Read Only	SHORT	Immediate Actual Velocity (IV0)	v
40012	Read Only	SHORT	Immediate Target Velocity (IV1)	w
40013	Read Only	SHORT	Immediate Drive Temperature (IT)	t
40014	Read Only	SHORT	Immediate Bus Voltage (IU)	u
40015..16	Read Only	LONG	Immediate Position Error (IX)	x
40017	Read Only	SHORT	Immediate Analog Input Value (IA)	a
40018	Read Only	SHORT	Q Program Line Number	b
40019	Read Only	SHORT	Immediate Current Command (IC)	c
40020..21	Read Only	LONG	Relative Distance (ID)	d
40022..23	Read Only	LONG	Sensor Position	g
40024	Read Only	SHORT	Condition Code	h
40025	Read Only	SHORT	Analog Input 1 (IA1)	j
40026	Read Only	SHORT	Analog Input 2 (IA2)	k
40027	Read Only	SHORT	Command Mode (CM)	m
40028	R/W	SHORT	Point-to-Point Acceleration (AC)	A
40029	R/W	SHORT	Point-to-Point Deceleration (DE)	B
40030	R/W	SHORT	Velocity (VE)	V
40031..32	R/W	LONG	Point-to-Point Distance (DI)	D
40033..34	R/W	LONG	Change Distance (DC)	C
40035	R/W	SHORT	Change Velocity (VC)	U
40036	Read Only	SHORT	Velocity Move State	n
40037	Read Only	SHORT	Point-to-Point Move State	o

40038	Read Only	SHORT	Q Program Segment Number	p
40039			Reserved	
40040	Read Only	SHORT	Phase Error	z
40041..42	R/W	LONG	Position Offset	E
40043	R/W	SHORT	Miscellaneous Flags	F
40044	R/W	SHORT	Current Command (GC)	G
40045..46	R/W	LONG	Input Counter	I
40047	R/W	SHORT	Jog Accel (JA)	
40048	R/W	SHORT	Jog Decel (JL)	
40049	R/W	SHORT	Jog Velocity (JS)	J
40050	R/W	SHORT	Max Velocity (VM)	
40051	R/W	SHORT	Running Current (CC)	N
40052	R/W	SHORT	Peak Current (CP)	
40053	R/W	SHORT	Steps per Revolution (EG)	R
40054..55	R/W	SHORT	Pulse Counter	S
40056	R/W	SHORT	Analog Position Gain (AP)	X
40057	R/W	SHORT	Analog Threshold (AT)	Y
40058	R/W	SHORT	Analog Offset (AV)	Z
40059..60	R/W	LONG	Accumulator	0
40061..62	R/W	LONG	User Defined	1
40063..64	R/W	LONG	User Defined	2
40065..66	R/W	LONG	User Defined	3
40067..68	R/W	LONG	User Defined	4
40069..70	R/W	LONG	User Defined	5
40071..72	R/W	LONG	User Defined	6
40073..74	R/W	LONG	User Defined	7
40075..76	R/W	LONG	User Defined	8
40077..78	R/W	LONG	User Defined	9
40079..80	R/W	LONG	User Defined	:
40081..82	R/W	LONG	User Defined	;
40083..84	R/W	LONG	User Defined	<

40085..86	R/W	LONG	User Defined	=
40087..88	R/W	LONG	User Defined	>
40089..90	R/W	LONG	User Defined	?
40091..92	R/W	LONG	User Defined	@
40093..94	R/W	LONG	User Defined	[
40095..96	R/W	LONG	User Defined	\
40097..98	R/W	LONG	User Defined]
40099..100	R/W	LONG	User Defined	^
40101..102	R/W	LONG	User Defined	_
40103..104	R/W	LONG	User Defined	`
40105	R/W	SHORT	Brake Release Delay(BD)	
40106	R/W	SHORT	Brake Engage Delay(BE)	
40107	Read Only	SHORT	Reserved	
40108	R/W	SHORT	Reserved	
40109	R/W	SHORT	Firmware Version	
40110	R/W	SHORT	Analog Filter Gain(AF)	
40111			Reserved	
40112	Read Only	SHORT	Alarm Code Upper	
40113..120			Reserved	
40121	R/W	SHORT	Filter Input 1#	
40122	R/W	SHORT	Filter Input 2#	
40123	R/W	SHORT	Filter Input 3#	
40124	R/W	SHORT	Filter Input 4# (not SSM)	
40125	R/W	SHORT	Command Opcode	
40126	R/W	SHORT	Parameter 1	
40127	R/W	SHORT	Parameter 2	
40128	R/W	SHORT	Parameter 3	
40129	R/W	SHORT	Parameter 4	
40130	R/W	SHORT	Parameter 5	
40131	Read Only	SHORT	Reserved	
40132	Read Only	SHORT	Reserved	

40133	R/W	SHORT	Smoothing filter frequency(SF)	
40134	R/W	SHORT	Address Upper(AU)(SS only)	
40135	R/W	SHORT	Motor Detail	
40136	R/W	SHORT	Step Mode/Input noise filter(SZ)	
40137	Read Only	SHORT	Reserved	
40138	R/W	SHORT	Control Mode set(CM)	
40139	R/W	SHORT	Operation Mode(OM)	
40140	R/W	SHORT	Servo Enable Input(SI)	
40141	R/W	SHORT	Alarm Reset Input(AI)	
40142	R/W	SHORT	Limit Sensor Input(DL)	
40143	R/W	SHORT	Alarm Output(AO)	
40144	R/W	SHORT	Brake Output(BO)	
40145	R/W	SHORT	Move Output(MO)	
40146	R/W	SHORT	Reserved	
40147	R/W	SHORT	Reserved	
40148	R/W	SHORT	Low Voltage(LV)	
40149	R/W	SHORT	Baud Rate(BR)	
40150	R/W	SHORT	Protocol(PR)	
40151	R/W	SHORT	Transmit Delay(TD)	
40152	R/W	SHORT	Reserved	
40153	R/W	SHORT	Position Proportional Gain(KP)	
40154	R/W	SHORT	Position Derivative Gain(KD)	
40155	R/W	SHORT	Derivative Filter factor(KE)	
40156	R/W	SHORT	Velocity Proportional Gain(VP)	
40157	R/W	SHORT	Velocity Integral Gain(VI)	
40158	R/W	SHORT	Acceleration Feed-forward(KK)	
40159	R/W	SHORT	Torque Command Filter(KC)	
40160	R/W	SHORT	Max Acceleration(AM)	
40161	R/W	SHORT	Position Fault Window(PF)	
40162	R/W	SHORT	Address(DA)	
40163	R/W	SHORT	Analog Velocity Gain(AG)	

40164	R/W	SHORT	Jog Change Velocity(JC)		
40165	R/W	SHORT	Jog Mode(JM)		
40166	R/W	SHORT	Analog Current Gain(AN)		
40167	R/W	SHORT	Homing Acceleration 1		
40168	R/W	SHORT	Homing Acceleration 2		
40169	R/W	SHORT	Homing Acceleration 3		
40170	R/W	SHORT	Homing Deceleration 1		
40171	R/W	SHORT	Homing Deceleration 2		
40172	R/W	SHORT	Homing Deceleration 3		
40173	R/W	SHORT	Homing Velocity 1		
40174	R/W	SHORT	Homing Velocity 2		
40175	R/W	SHORT	Homing Velocity 3		
40176	R/W	SHORT	HardStop Current Limit(HC)		
40177	R/W	SHORT	Pulse Complete Timing(TT)		
40178	R/W	SHORT	TSM, SSM	Tach Output(TO)	
			SS Series	Dumping	
40179	R/W	SHORT	In Position Limit(PL)		
40180	R/W	SHORT	In Position Timing(PE)		
40181	R/W	SHORT	In Position Counts(PD)		
40182	R/W	SHORT	Alarm Mask(MA)		
40183..40200	R/W	SHORT	Reserved		

M2 Modbus Register Table

Register	Access	Data Type	Description	SCL Register
40001	Read Only	SHORT	Alarm Code (AL)报警代码 (AL) 低 16 位	f
40002	Read Only	SHORT	Status Code (SC)状态代码(SC)	s
40003	Read Only	SHORT	Drive Digital output 驱动器输出状态	
40004	Read Only	SHORT	Drive Digital output 驱动器输入状态	i
40005..6	Read Only	LONG	Encoder Position (IE, EP) 编码器位置	e
40007..8	Read Only	LONG	Immediate Absolute Position(IP) 参考位置	l
40009..10	Write	LONG	Absolute Position Command(SP) 绝对位置	P(大写) (Capital)
40011	Read Only	SHORT	Immediate Actual Velocity (IV0) 瞬时实际速度	v
40012	Read Only	SHORT	Immediate Target Velocity (IV1) 瞬时给定速度	w
40013	Read Only	SHORT	Immediate Drive Temperature (IT) 瞬时驱动器温度	t
40014	Read Only	SHORT	Immediate Bus Voltage (IU) 瞬时母线电压	u
40015..16	Read Only	LONG	Immediate Position Error (IX) 瞬时位置误差	x
40017	Read Only	SHORT	Immediate Analog Input Value (IA) 瞬时模拟量输入值	a
40018	Read Only	SHORT	Q Program Line Number Q 程序行号	b
40019	Read Only	SHORT	Immediate Current Command (IC) 瞬时电流	c
40020..21	Read Only	LONG	Relative Distance (ID) 相对位置	d
40022..23	Read Only	LONG	Sensor Position 传感器位置	g
40024	Read Only	SHORT	Condition Code 比较状态代码	h
40025	Read Only	SHORT	Analog Input 1 (IA1) 模拟量 1	j
40026	Read Only	SHORT	Analog Input 2 (IA2) 模拟量 2	k
40027	Read Only	SHORT	Command Mode (CM) 控制方式	m
40028	R/W	SHORT	Point-to-Point Acceleration (AC) 点到点定位加速度	A
40029	R/W	SHORT	Point-to-Point Deceleration (DE) 点到点定位减速度	B

40030	R/W	SHORT	Velocity (VE) 点到点定位速度	V
40031..32	R/W	LONG	Point-to-Point Distance (DI) 点到点定位距离	D
40033..34	R/W	LONG	Change Distance (DC) 改变距离	C
40035	R/W	SHORT	Change Velocity (VC) 改变速度	U
40036	Read Only	SHORT	Velocity Move State 速度模式当前运动状态	n
40037	Read Only	SHORT	Point-to-Point Move State 点到点位置模式当前运动状态	o
40038	Read Only	SHORT	Q Program Segment Number Q 程序当前执行的段号	p
40039	Read Only	SHORT	Reserved	
40040	Read Only	SHORT	Phase Error	z
40041..42	R/W	LONG	Position Offset	E
40043	R/W	SHORT	Miscellaneous Flags 其他标记寄存器	F
40044	R/W	SHORT	Current Command (GC) 转矩指令	G
40045..46	R/W	LONG	Input Counter 输入计数	I
40047	R/W	SHORT	Jog Accel (JA) 点动加速度	
40048	R/W	SHORT	Jog Decel (JL) 点动减速度	
40049	R/W	SHORT	Jog Velocity (JS) 点动速度	J
40050	R/W	SHORT	Max Velocity 最大速度	
40051	R/W	SHORT	Continuous Current(CC) 额定电流	N
40052	R/W	SHORT	Peak Current (CP) 峰值电流	O(大写) (Capital)
40053	Read Only	SHORT	Reserved	
40054..55	R/W	LONG	Pulse Counter 脉冲输入计数	S
40056	R/W	SHORT	Analog Position Gain (AP) 模拟量位置定标	X
40057	R/W	SHORT	Analog Threshold (AT) 模拟量触发阈值	Y
40058	R/W	SHORT	Analog Offset (AV) 模拟量偏移量	Z
40059..60	R/W	LONG	Accumulator	0

40061..62	R/W	LONG	User Defined Register 用户自定义寄存器	1
40063..64	R/W	LONG	User Defined Register 用户自定义寄存器	2
40065..66	R/W	LONG	User Defined Register 用户自定义寄存器	3
40067..68	R/W	LONG	User Defined Register 用户自定义寄存器	4
40069..70	R/W	LONG	User Defined Register 用户自定义寄存器	5
40071..72	R/W	LONG	User Defined Register 用户自定义寄存器	6
40073..74	R/W	LONG	User Defined Register 用户自定义寄存器	7
40075..76	R/W	LONG	User Defined Register 用户自定义寄存器	8
40077..78	R/W	LONG	User Defined Register 用户自定义寄存器	9
40079..80	R/W	LONG	User Defined Register 用户自定义寄存器	:
40081..82	R/W	LONG	User Defined Register 用户自定义寄存器	;
40083..84	R/W	LONG	User Defined Register 用户自定义寄存器	<
40085..86	R/W	LONG	User Defined Register 用户自定义寄存器	=
40087..88	R/W	LONG	User Defined Register 用户自定义寄存器	>
40089..90	R/W	LONG	User Defined Register 用户自定义寄存器	?
40091..92	R/W	LONG	User Defined Register 用户自定义寄存器	@
40093..94	R/W	LONG	User Defined Register 用户自定义寄存器	[
40095..96	R/W	LONG	User Defined Register 用户自定义寄存器	\
40097..98	R/W	LONG	User Defined Register 用户自定义寄存器]
40099..100	R/W	LONG	User Defined Register 用户自定义寄存器	^
40101..102	R/W	LONG	User Defined Register 用户自定义寄存器	-
40103..104	R/W	LONG	User Defined Register 用户自定义寄存器	,
40105	R/W	SHORT	Brake Release Delay(BD) 释放刹车后运动等待延时	
40106	R/W	SHORT	Brake Engage Delay(BE) 释放刹车后运动等待延时	
40107	Read Only	SHORT	Reserved	

40108	Read Only	SHORT	Reserved	
40109	Read Only	SHORT	Firmware version 固件版本	
40110	R/W	SHORT	Analog Filter Gain(AF) 模拟量滤波器	
40111	Read Only	SHORT	Reserved	
40112	Read Only	SHORT	Alarm Code High bit 报警代码（高 16 位）	
40113	R/W	SHORT	Jog Change(JC) 固定速度模式：第 1 档速度	
40114	R/W	SHORT	Jog Change(JC) 固定速度模式：第 2 档速度	
40115	R/W	SHORT	Jog Change(JC) 固定速度模式：第 3 档速度	
40116	R/W	SHORT	Jog Change(JC) 固定速度模式：第 4 档速度	
40117	R/W	SHORT	Jog Change(JC) 固定速度模式：第 5 档速度	
40118	R/W	SHORT	Jog Change(JC) 固定速度模式：第 6 档速度	
40119	R/W	SHORT	Jog Change(JC) 固定速度模式：第 7 档速度	
40120	R/W	SHORT	Jog Change(JC) 固定速度模式：第 8 档速度	
40121	R/W	SHORT	X9 Input Filter 输入 X9 防抖滤波器	
40122	R/W	SHORT	X10 Input Filter 输入 X10 防抖滤波器	
40123	R/W	SHORT	X11 Input Filter 输入 X11 防抖滤波器	
40124	R/W	SHORT	X12 Input Filter 输入 X12 防抖滤波器	
40125	R/W	SHORT	Command Opcode	
40126	R/W	SHORT	Parameter 1	
40127	R/W	SHORT	Parameter 2	
40128	R/W	SHORT	Parameter 3	
40129	R/W	SHORT	Parameter 4	
40130	R/W	SHORT	Parameter 5	
40131	R/W	SHORT	Global Gain(KP) 全局增益	
40132	R/W	SHORT	Global Gain1(KG) 全局增益 1	
40133	R/W	SHORT	Proportional Gain(KF) 位置环比例增益	

40134	R/W	SHORT	Damping Gain(KD) 微分增益	
40135	R/W	SHORT	Velocity Gain(KV) 阻尼增益	
40136	R/W	SHORT	Integral Gain(KI) 积分增益	
40137	R/W	SHORT	Inertia Feed forward Gain(KK) 前馈增益	
40138	R/W	SHORT	Jerk Filter(KJ) 平滑滤波	
40139	R/W	SHORT	Velocity Mode Proportional Gain(VP) 速度环比例增益	
40140	R/W	SHORT	Velocity Mode Integral Gain(VI) 速度环积分增益	
40141	R/W	SHORT	Damping Filter Gain(KE) 阻尼滤波因子	
40142	R/W	SHORT	Current Filter Gain(KC) PID 滤波因 子	
40143	R/W	SHORT	Control Mode(CM) 控制模式	
40144	R/W	SHORT	Control Mode 1(CN) 控制模式 1	
40145	R/W	SHORT	Operation Mode(PM) 操作模式	
40146	R/W	SHORT	Jog Mode(JM) 速度模式	
40147	R/W	SHORT	Hard-Stop Current Limit(HC) 无传感器回原点电流限定	
40148	R/W	SHORT	Max Acceleration(AM) 最大加速度	
40149	Read Only	SHORT	Encoder Resolution(ER) 编码器分辨率	
40150	Read Only	SHORT	Reserved	
40151	Read Only	SHORT	Steps-Rev(EG)	
40152	R/W	SHORT	Electronic Ration Numerator(EN) 电子齿轮比分子	
40153	R/W	SHORT	Electronic Ration Denominator(ED) 电子齿轮比分母	
40154	Read Only	SHORT	Step Mode (SZ) 脉冲模式	
40155	R/W	SHORT	Position Fault(PF) 位置误差报警阈值	
40156	R/W	SHORT	Dynamic Position Error Count(PL) 动态位置误差阈值	
40157	R/W	SHORT	In-Position Counts(PD) 静态位置误差范围	
40158	R/W	SHORT	In-Position Timing(PE) 静态位置误差持续时间	

40159	R/W	SHORT	Pulse Complete Timing(TT) 脉冲结束判断等待时间	
40160	R/W	SHORT	Analog Velocity Gain(AG) 模拟量速度定标	
40161	R/W	SHORT	Analog Torque Gain(AN) 模拟量力矩定标	
40162	R/W	SHORT	Analog Offset 1(AV1) 模拟量输入口偏移量 1	
40163	R/W	SHORT	Analog Offset 2(AV2) 模拟量输入口偏移量 2	
40164	R/W	SHORT	Analog Type(AS) 模拟量输入类型	
40165	R/W	SHORT	Analog Deadband 1(AD1) 模拟量输入端 1 死区	
40166	R/W	SHORT	Analog Deadband 2(AD2) 模拟量输入端 2 死区	
40167	R/W	SHORT	Analog Deadband (AD) 差分模拟量输入死区	
40168	R/W	SHORT	Analog Function(FA) 模拟量功能	
40169	R/W	SHORT	Servo Enable(SI) 使能输入引脚功能	
40170	R/W	SHORT	Alarm Reset(AI) 报警清除输入引脚功能	
40171	R/W	SHORT	Define Limits Input(DL) 定义限位传感器输入功能	
40172	R/W	SHORT	Motion Input X7, X8, X9, X10 输入引脚功能定	
40173	R/W	SHORT	Alarm Output(AO) 报警输出引脚功能定义	
40174	R/W	SHORT	Brake Output(BO) 电机刹车器输出引脚	
40175	R/W	SHORT	Motion Output(MO) Y3, Y4, Y5, Y6 输出引脚功能设定	
40176	R/W	SHORT	Reserved	
40177	R/W	SHORT	Communication Protocol(PR) 通讯协议	
40178	R/W	SHORT	Transmit Delay(TD) 应答延时	
40179	R/W	SHORT	Baud Rate(BR) 波特率	
40180	R/W	SHORT	Communication Address(DA) 通讯地址	
40181	R/W	SHORT	Velocity value(VR)	
40182	R/W	SHORT	Tach-out Count(TO) Tach-out 设定	
40183	R/W	SHORT	Torque Value(TV)	

40184	R/W	SHORT	Parameters Lock(PK) 操作面板锁	
40185	R/W	SHORT	Default Display(DD) LED 面板默认显示设置	
40186	R/W	SHORT	Mask Alarm(MA) 报警屏蔽	
40187	R/W	SHORT	Homing Acceleration 1 回零找行程开关加速度	
40188	R/W	SHORT	Homing Acceleration 2 回零寻原点开关加速度	
40189	R/W	SHORT	Homing Acceleration 3 回零回原点开关加速度	
40190	R/W	SHORT	Homing Deceleration 1 回零找行程开关减速度	
40191	R/W	SHORT	Homing Deceleration 2 回零寻原点开关减速度	
40192	R/W	SHORT	Homing Deceleration 3 回零回原点开关减速度	
40193	R/W	SHORT	Homing Velocity 1 回零找行程开关速度	
40194	R/W	SHORT	Homing Velocity 2 回零寻原点开关速度	
40195	R/W	SHORT	Homing Velocity 3 回零回原点开关速度	
40196	R/W	SHORT	Clamp Resistance(ZR) 反电势吸收电阻阻值	
40197	R/W	SHORT	Clamp Count (ZC) 反电势吸收电阻功率	
40198	R/W	SHORT	Clamp time(ZT) 反电势最大泄放时间	
40199	Read Only	SHORT	Reserved	
40200	Read Only	SHORT	Reserved	

SCL Command Encoding Table

Function	SCL	Opcode	Parameter 1	Parameter 2	Parameter 3	Parameter 4	Parameter 5
Alarm Reset	AX	0xBA	×	×	×	×	×
Start Jogging	CJ	0x96	×	×	×	×	×
Stop Jogging	SJ	0xD8	×	×	×	×	×
Encoder Function	EF	0xD6	0,1,2 or 6	×	×	×	×
Encoder Position	EP	0x98	Position	×	×	×	×
Feed to Double Sensor	FD	0x69	I/O Point 1	Condition 1	I/O Point 2	Condition 2	×
Follow Encoder	FE	0xCC	I/O Point	Condition	×	×	×
Feed to Length	FL	0x66	×	×	×	×	×
Feed to Sensor with Mask Distance	FM	0x6A	I/O Point	Condition	×	×	×
Feed and Set Output	FO	0x68	I/O Point	Condition	×	×	×
Feed to Position	FP	0x67	×	×	×	×	×
Feed to Sensor	FS	0x6B	I/O Point	Condition	×	×	×
Feed to Sensor with Safety Distance	FY	0x6C	I/O Point	Condition	×	×	×
Jog Disable	JD	0xA3	×	×	×	×	×
Jog Enable	JE	0xA2	×	×	×	×	×
Motor Disable	MD	0x9E	×	×	×	×	×
Motor Enable	ME	0x9F	×	×	×	×	×
Seek Home	SH	0x6E	I/O Point	Condition	×	×	×
Set Position	SP	0xA5	Position	×	×	×	×
Filter Input	FI	0xC0	I/O Point	Filter Time	×	×	×
Filter Select Inputs	FX	0xD3	×	×	×	×	×
Step Filter Freq	SF	0x06	Freq	×	×	×	×
Analog Deadband	AD	0xD2	0.001 V	×	×	×	×
Alarm Reset Input	AI	0x46	Function ('1' .. '3')	I/O Point	×	×	×

Alarm Output	AO	0x47	Function ('1' .. '3')	I/O Point	×	×	×
Analog Scaling	AS	0xD1	×	×	×	×	×
Define Limits	DL	0x42	1..3	×	×	×	×
Set Output	SO	0x8B	I/O Point	Condition	×	×	×
Wait for Input	WI	0x70	×	×	×	×	×
Queue Load & Execute	QX	0x78	1..12	×	×	×	×
Wait Time	WT	0x6F	0.01 sec	×	×	×	×
Stop Move, Kill Buffer	SK	0xE1	×	×	×	×	×
Stop Move, Kill Buffer, Normal Decel	SKD	0xE2	×	×	×	×	×

IO Encoding Table

Character	hex code	
'0'	0x30	Index of encoder
'1'	0x31	input 1 or output 1
'2'	0x32	input 2 or output 2
'3'	0x33	input 3 or output 3
'4'	0x34	input 4 or output 4
'L'	0x4C	low state (closed)
'H'	0x48	high state (open)
'R'	0x52	rising edge
'F'	0x46	falling edge

Examples

Position Control

Target Profile Planning

SCL command	Target Value	Unit	Dec	Dec (Hex)	Description
AC	100	rps/s	40028	600 (258h)	The unit for register 40028 is $\frac{1}{6} \text{rps}^2$, when target acceleration is 100rps/s, the value will be 600
DE	200	rps/s	40029	1200 (258h)	The unit for register 40029 is $\frac{1}{6} \text{rps}^2$. When target deceleration is 200rps/s, the value will be 1200
VE	10	rps	40030	2400 (960)	The unit for register 40030 is $\frac{1}{240} \text{rps}$. When target velocity is 200rps/s, the value will be 1200
DI	20000	counts	40031~40032	20000 (4E20h)	The target distance will be 20000 counts

Sending Command

First Step :

Set acceleration register 40028 = 258h, deceleration register 40029 = 4B0h, velocity register 40030 = 960h, and target position 40031~40032 = 4E20h.

Host Sending: 01 10 00 1B 00 05 0A 02 58 04 B0 09 60 00 00 4E 20 24 3B

Drive Respond: 01 10 00 1B 00 05 70 0D

Command Message (Master)			Command Message (Slave)		
Function	Data	Number Of Bytes	Function	Data	Number Of Bytes
Slave Address	01H	1	Slave Address	01H	1
Function Code	10H	1	Function Code	10H	1
Starting Data Address	00H (High) 1BH (Low)	2	Starting Data Address	00H (High) 1BH (Low)	2
Number of Data (In word)	00H (High) 05H (Low)	2	Number of Data (In word)	00H (High) 05H (Low)	2
Number of Data (In word)	0AH	1	CRC Check Low	70	1
Content of first Data address 40028	02 (High) 58 (Low)	2	CRC Check High	0D	1
Content of second Data address 40029	04H (High) B0H (Low)	2			
Content of third Data address 40030	09H (High) 60H (Low)	2			
Content of fourth Data address 40031	00H (High) 00H (Low)	2			
Content of fifth Data address 40032	4EH (High) 20H (Low)	2			
CRC Check Low	24	1			
CRC Check High	3B	1			

Second Step: Point To Point Motion Command

From the SCL code list shows that for point to point position motion, it requires to write data 0x66 to register 40125.

SCL Command Encoding Table							
Function	SCL	Opcode	Parameter 1	Parameter 2	Parameter 3	Parameter 4	Parameter 5
Feed to Length	FL	0x66	x	x	x	x	x

Host Sending: 01 06 00 7C 00 66 C8 38

Drive Reply: 01 06 00 7C 00 66 C8 38

Listed As Below:

Command Message (Master)			Command Message (Slave)		
Function	Data	Number Of Bytes	Function	Data	Number Of Bytes
Slave Address	01H	1	Slave Address	01H	1
Function Code	06H	1	Function Code	06H	1
Starting Data Address	00H (High) 7CH (Low)	2	Starting Data Address	00H (High) 7CH (Low)	2
Content of Data	00 (High) 66 (Low)	2	Content of Data	00 (High) 66 (Low)	2
CRC Check Low	C8	1	CRC Check Low	C8	1
CRC Check High	38	1	CRC Check High	38	1