

# ModbusTCP & EtherNet/IP Protocol Description

## 1. Function

### 1.1 ModbusTCP Protocol

Support Modbus function codes 04 (read input registers) and 16 (write multiple registers);

Support querying device information, port information, alarm information, DT-Ring information, DRP Ring information, and RSTP information;

Support setting whether a port is enabled.

### 1.2 EtherNet/IP Protocol

Support EtherNet/IP explicit message communication (querying device information, port information, DT-Ring information, DRP Ring information, RSTP information; setting port enablement)

Get attribute single            service: 14 class: 4 instance: 103 attribute: 3

Set attribute single            service: 16 class: 4 instance: 104 attribute: 3

Support IO message communication (setting port enablement; querying port status, alarm information)

Connection point:

Input 101 (0x65)            size 156 bytes

Output 102 (0x66)            size 20 bytes

Support querying device information, port information, alarm information, DT-Ring information, DRP Ring information, RSTP information;

Support setting whether a port is enabled.

## 2. Protocol Description

### 2.1 ModbusTCP

Using a Modbus simulator (modbus poll) on the PC as the master.

#### 2.1.1 Function Code

Using a ModbusTCP master to send ModbusTCP messages (function code 04) to the device, reads the device's registers to obtain corresponding device information.

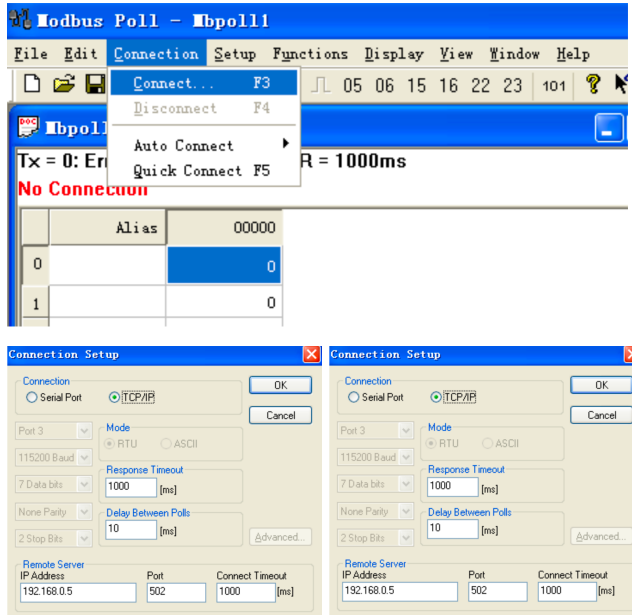
Sending ModbusTCP messages (function code 16) to the device can set whether the device's ports are enabled.

The register address and number of registers are explained in Appendix 1.

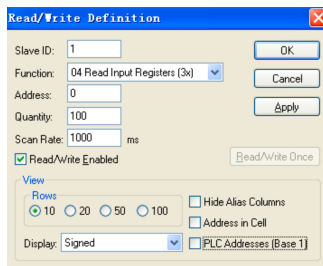
### 2.1.2 Modbus Poll Usage

Modbus poll settings:

In connection→connect, configure the TCP connection"



"Then in setup→read/write definition, set the function code, register address, quantity, and whether to auto-read, etc.



Modbus poll tool will display the received information (it can also be checked using a packet capture tool). If not set to auto-send, requests need to be sent manually.

	Alias	00000	Alias	00010
0		0x010		0x009
1		0x021		0x765
2		0x034		0x600
3		0x054		0x000
4		0x053		0x000
5		0x09E		0x000
6		0x09C		0x000
7		0x097		0x000
8		0x780		0x000
9		0x0C9		0x000

## 2.2 EtherNet/IP Protocol

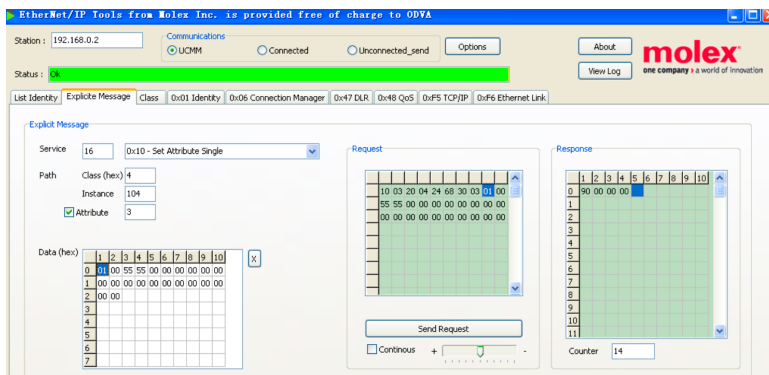
Here, Molex's test tool is used. In actual scenarios, PLCs or other EtherNet/IP devices can be used to send messages. If there is a need to send a get attribute single message to query the device status, it is necessary to first send a set attribute single message to configure the type of device to be queried.

### 2.2.1 Explicit Messages

Set attribute single message content:

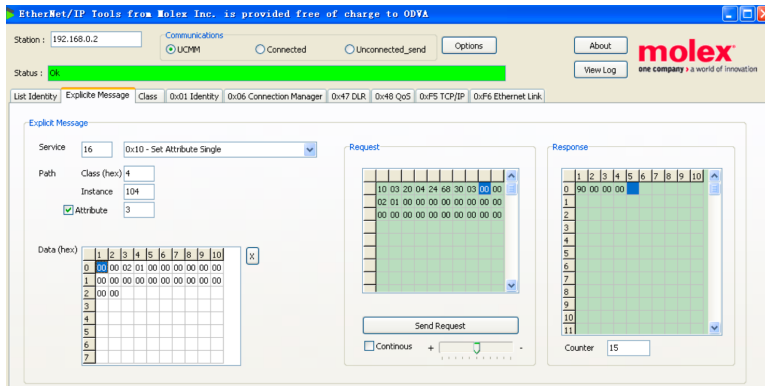
Set attribute single message can be used to set port enablement status or to set the type of data to be queried.

If it is necessary to set the port enablement status, the first two bytes of the message data segment should be filled with 0x0100. The format of the rest of the message is the same as the output message in the I/O message. The device sends back a response message to this message, indicating whether the setting is successful or failed, and relevant prompts will be returned in the message. (See Appendix 2 for data format)



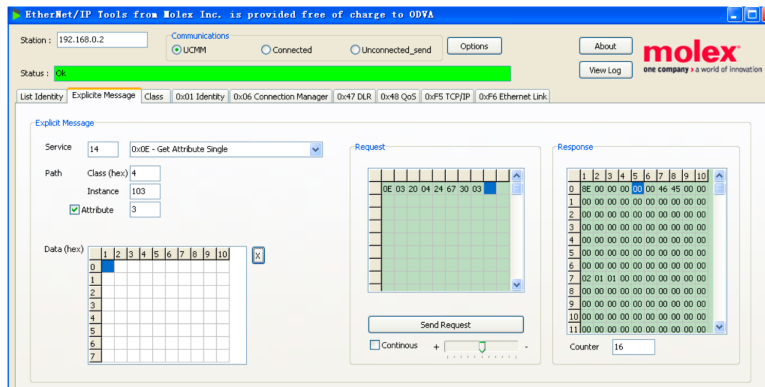
If you want to query the status of the device, fill the first two bytes with 0x0000, and the next two bytes represent the data you want to query. The corresponding relationship is as follows: for example, if you want to query the information of the first port, the message content is as follows:"

	00	01	02	03	04	05	...	n
							...	
00	Port status and alarms (same as I/O)							
01 Device Information		Manufacturer Name	Device Type	Manufacturer Address	Contact Phone	Other Information		
02 Port Information		1 <sup>st</sup> Port	2 <sup>nd</sup> Port	3 <sup>rd</sup> Port	4 <sup>th</sup> Port	5 <sup>th</sup> Port		Nth Port
03 DT-Ring Information	Ring Operating Mode	1 <sup>st</sup> Ring	2 <sup>nd</sup> Ring	3 <sup>rd</sup> Ring	4 <sup>th</sup> Ring	5 <sup>th</sup> Ring		Nth Ring
04 DRP Information	Ring Operating Mode	1 <sup>st</sup> Ring	2 <sup>nd</sup> Ring	3 <sup>rd</sup> Ring	4 <sup>th</sup> Ring	5 <sup>th</sup> Ring		Nth Ring
05 RSTP Information	Root Bridge State	1 <sup>st</sup> Port	2 <sup>nd</sup> Port	3 <sup>rd</sup> Port	4 <sup>th</sup> Port	5 <sup>th</sup> Port		Nth Port



### Get Attribute Single Message Content:

After setting the desired data type to query, send the get attribute single message. The device sends back the corresponding status in the response message. (The response message is on the right side, with the data segment starting from position 05). See Appendix 2 for the data format



### 2.2.2 IO Message

IO communication requires establishing a CIP connection first, using the following connection points:

Input 101 (0x65)      size 156 bytes

Output 102 (0x66)    size 20 bytes

Once a CIP connection is established with the device, IO communication can begin. The Output message contains the statuses of various ports that are to be set; the Input message includes the current status and alarm information of each port. See Appendix 2 for the message data format.

## 3. Appendix 1 Explanation of Register Information

If there is a reading error within the module or a reserved register address is read, it returns all F's; reading from an unsupported module returns an error.

### 3.1 Device Information

No	Register Address	Number Of Register	Data Type	Data Name	Register Example
1	0x0000	255	ASCII	Manufacturer Name	Word 0 HI byte = 'K' Word 0 LO byte = 'y' Word 1 HI byte = '1' Word 1 LO byte = 'a' Word 2 HI byte = 'n' Word 2 LO byte = 'd' Word 3 HI byte = '\0' Word 3 LO byte = '\0'
2	0x0100	255	ASCII	Device Type	SICOM3216-16T-L2-L2
3	0x0200	255	ASCII	Manufacturer Address	No.901 Floor 8 to 12, Building No.2, Shixing Avenue 30#, Shijingshan District, Beijing, P.R. China 100144
4	0x0300	255	ASCII	Contact Phone	86-10-88798888
5	0x0400	20	ASCII	Product Model	SICOM3000
6	0x0420	15	ASCII	Serial Number	S3A00A140600002
7	0x0440	11	ASCII	Bootrom Version	1.0.6
8	0x0460	9	ASCII	Current Running Software Version	T0002
9	0x0480	4	ASCII	Hardware Version	Not supported, returns 0 (empty string)
10	0x0500	20	ASCII	Logical Version	Not supported, returns 0 (empty string)

11	0x0600	2	INT16	Device IP Address	192.168.0.1 - Word 0 HI byte = 192 (0xC0) - Word 0 LO byte = 168 (0xA8) - Word 1 HI byte = 0 (0x00) - Word 1 LO byte = 1 (0x01)
12	0x0602	3	INT16	Device start Mac Address	00-1E-CD-00-00-01 - Word 0 HI byte = 0x00 - Word 0 LO byte = 0x1E - Word 1 HI byte = 0xCD - Word 1 LO byte = 0x00 - Word 2 HI byte = 0x00 - Word 2 LO byte = 0x01
13	0x0605	1	INT16	Mac Quantity	
14	0x0606	1	INT16	Power Supply 1 Status Information	Power ON/Power OFF/None - 0x0000 = Power OFF - 0x0001 = Power ON - 0x0002 = None
15	0x0607	1	INT16	Power Supply 2 Status Information	Power ON/Power OFF/None - 0x0000 = Power OFF - 0x0001 = Power ON - 0x0002 = None
16	0x0608	1		Long-term CPU Usage Percentage	
17	0x0609	1	INT32	Short-term CPU Usage Percentage	
18	0x060A	2	INT32	Total Memory (Bytes)	

19	0x060C	2	INT32	Remaining Memory (Bytes)	
20	0x060E	2	INT32	Device RunningTime (Minutes)	
21	0x0610	2	INT32	Cumulative Device Running Time (Minutes)	Not supported, returns all F's
22	0x0612	2	INT32	Temperature	Not supported, returns all F's

### 3.2 Port Information

"Port Configuration Register Addresses are the same as the starting address for each port when obtaining port information. For example, to configure Port 1, the address is 0x1000, and for Port 2, it is 0x1080, and so on.

No	Register Address	Number of Registers	Data Type	Data Name	Register Example
1	0x1000	32	ASCII	Port Description	FE/GE
2	0x1020	1	INT16	Port Status	up/down/disable   - 0x0000 = disable   - 0x0001 = up   - 0x0002 = down
3	0x1021	1	INT16	Port Speed	10/100/1000/10000M - 0x0000 = 10 - 0x0001 = 100 - 0x0002 = 1000 - 0x0003 = 10000
4	0x1022	1	INT16	Port Duplex	half/full - 0x0000 = half - 0x0001 = full



5	0x1023	1	INT1 6	Port Flow Control Status	on/off - 0x0000 = off - 0x0001 = on
6	0x1024	4	INT6 4	Port Received Packets Count	
7	0x1028	4	INT6 4	Port Received Bytes Count	
8	0x102C	4	INT6 4	Port Sent Packets Count	
9	0x1030	4	INT6 4	Port Sent Bytes Count	
10	0x1034	4	INT6 4	Port Received Unicast Packets Count	
19	0x1080- 0x10FF	128		Second Port Information, each port reserves 0x80 register addresses	
...					
N	0x2F800x2F FF	128		64 Port Information, each port reserves 0x80 register addresses	

### 3.3 Alarm Information

No	Register Address	Number of Registers	Data Type	Data Name	Register Example
1	0x3000	1	INT1 6	Port Alarm Status	disable/normal/alarm 0x0000 = disable 0x0001 = normal 0x0002 = alarm
2	0x3001	1	INT1 6	Inbound Traffic Anomaly Alarm Status	Not supported, returns all Fs

3	0x3002	1	INT1 6	Outbound Traffic Anomaly Alarm Status	Not supported, returns all Fs
4	0x3003	1	INT1 6	Port CRC Alarm Status	Not supported, returns all Fs
5	0x3010~0x301 F	16		Second Port Information, each port reserves 0x10 register addresses	
6	0x3020~0x302 F	16		Third Port Information, each port reserves 0x10 register addresses	
7	0x33F0~0x33FF	16		Sixty-fourth Port Information, each port reserves 0x10 register addresses	
8	0x3400	1	INT1 6	dt-ring Ring Alarm Status	disable/normal/alarm 0x0000 = disable 0x0001 = normal 0x0002 = alarm
9	0x3401	1	INT1 6	DRP Ring Alarm Status	disable/normal/alarm/none 0x0000 = disable 0x0001 = normal 0x0002 = alarm 0x0003 = none
10	0x3402~0x340 3	2		Ring ID 2 Alarm Status Information, each ring reserves 0x2 register addresses	
...					
12	0x343E~0x343F	2		Ring ID 32 Alarm Status Information, each ring reserves 0x2 register addresses	

13	0x3500	1	INT1 6	Temperature Alarm Status	Not supported, returns all Fs
14	0x3501	1	INT1 6	IP Address Conflict Alarm Status	0x0000 = disable 0x0001 = normal 0x0002 = alarm
15	0x3502	1	INT1 6	MAC Address Conflict Alarm Status	0x0000 = disable 0x0001 = normal 0x0002 = alarm
16	0x3503	1	INT1 6	CPU Utilization Alarm Status	Not supported, returns all Fs
17	0x3504	1	INT1 6	Memory Utilization Alarm Status	Not supported, returns all Fs
18	0x3505	1	INT1 6	Power Supply Alarm Status	0x0000 = disable 0x0001 = normal 0x0002 = alarm

### 3.4 DT-Ring Information

<b>N o.</b>	<b>Register Address</b>	<b>Numb er of Regist ers</b>	<b>Dat a Typ e</b>	<b>Data Name</b>	<b>Register Example</b>
1	0x4000	1	INT1 6	Ring Work Mode	0x0000 = port 0x0001 = vlan
2	0x4001	1	INT1 6	Ring ID	
3	0x4002	1	INT1 6	Site Role	0x0000 = master 0x0001 = normal
4	0x4003	1	INT1 6	Ring Protocol Enable Status	0x0000 = disable 0x0001 = enable

5	0x4004	1	INT1 6	Ring Status	0x0000 = open 0x0001 = close 0x0002 = alarm 0x0003 = none
6	0x4005	1	INT1 6	Ring Port 1 Status	0x0001 = forward 0x0002 = block
7	0x4006	1	INT1 6	Ring Port 2 Status	0x0001 = forward 0x0002 = block
8	0x4007	1	INT1 6	Ring Switchin g Number	
9	0x4008	1	INT1 6	DT-Ring+ Status	0x0000 = disable 0x0001 = enable
10	0x4009	1	INT1 6	Backup Port Status	0x0000 = none 0x0001 = forward 0x0002 = block
11	0x400A	2	INT1 6	Backup Port 1 IP Status List	192.168.0.1 Word 0 HI byte = 192(0xC0) Word 0 LO byte = 168(0xA8) Word 1 HI byte = 0(0x00) Word 1 LO byte = 1(0x01)
12	0x400C	3	INT1 6	Backup Port 1 MAC Status List	00-1E-CD-00-00-01 Word 0 HI byte = 0x00 Word 0 LO byte = 0x1E Word 1 HI byte = 0xCD Word 1 LO byte = 0x00 Word 2 HI byte = 0x00 Word 2 LO byte = 0x01
13	0x400F	1	INT1 6	Backup Port 1 Status List	None/forward/block 0x0000 = none 0x0001 = forward 0x0002 = block
14	0x4010	2	INT1 6	Backup Port 2 IP	192.168.0.1 Word 0 HI byte = 192(0xC0) Word 0 LO byte = 168(0xA8) Word 1 HI byte = 0(0x00) Word 1 LO byte = 1(0x01)

				Status List	
15	0x4012	3	INT1 6	Backup Port 2 MAC Status List	00-1E-CD-00-00-01 Word 0 HI byte = 0x00 Word 0 LO byte = 0x1E Word 1 HI byte = 0xCD Word 1 LO byte = 0x00 Word 2 HI byte = 0x00 Word 2 LO byte = 0x01
16	0x4015	1	INT1 6	Backup Port 2 Status List	None/forward/block 0x0000 = none 0x0001 = forward 0x0002 = block
17	0x4016	4	ASCI I	Ring Port 1 Information	Currently only the port number
18	0x401A	4	ASCI I	Ring Port 2 Information	Currently only the port number
19	0x401E	4	ASCI I	Backup Port Information	Currently only the port number
20	0x4022	1	INT1 6	Main Port	0 = Not enabled Port number
21	0x4023	16	INT1 6	Vlan List	Starting from this register, 16 registers are for 16 Vlans, if not available or insufficient, return all Fs
...					
23	0x4041~0x4080	64	INT1 6	Ring ID 2 Information	Ring ID 2 Information, each ring reserves 0x40 register addresses

24	0x4081~0x40C0	64	INT16	Ring ID 3 Information	Ring ID 3 Information, each ring reserves 0x40 register addresses
...					
N	0x47C1~0x4800	64	INT16	Ring ID 32 Information	Ring ID 32 Information, each ring reserves 0x40 register addresses

### 3.5 DRP Information

No.	Register Address	Number of Registers	Data Type	Data Name	Register Example
1	0x5000	1	INT16	Ring Operating Mode	0x0000 = port, 0x0001 = vlan
2	0x5001	1	INT16	Ring ID	
3	0x5002	1	INT16	Site Role	0x0000 = init, 0x0001 = root, 0x0002 = b-root, 0x0003 = normal
4	0x5003	1	INT16	Site Priority	
5	0x5004	1	INT16	Ring Protocol Enable Status	0x0000 = disable, 0x0001 = enable
6	0x5005	1	INT16	Ring Status	0x0000 = init, 0x0001 = open, 0x0002 = close, 0x0003 = none
7	0x5006	1	INT16	Ring Port 1 Block Status	0x0000 = forwarding, 0x0001 = blocked

8	0x5007	1	INT16	Ring Port 1 Link Status	0x0000 = down, 0x0001 = up
9	0x5008	1	INT16	Ring Port 2 Block Status	0x0000 = forwarding, 0x0001 = blocked
10	0x5009	1	INT16	Ring Port 2 Link Status	0x0000 = down, 0x0001 = up
11	0x500A	1	INT16	Backup Port Block Status	0x0000 = forwarding, 0x0001 = blocked
12	0x500B	1	INT16	Backup Port Link Status	0x0000 = down, 0x0001 = up
13	0x500C	4	ASCII	Ring Port 1 Informatio n	Currently only port number
14	0x5010	4	ASCII	Ring Port 2 Informatio n	Currently only port number
15	0x5014	4	ASCII	Backup Port Informatio n	Currently only port number
16	0x5018	1	INT16	Preferred Port	none = 0x0000, RingPort1 = 0x0001, RingPort2 = 0x0002
17	0x5019	1	INT16	CRC Threshold	
18	0x501A	1	INT16	DHP Mode	disable = 0x0000, normal node = 0x0001, home node = 0x0002
19	0x501B	1	INT16	Home Port	none = 0x0000, RingPort1 = 0x0001, RingPort2 = 0x0002, RingPort1-2 = 0x0003

20	0x501C	2	INT16	Root IP	Root is 0, otherwise root IP, e.g., 192.168.0.1
22	0x501F	16	INT16	Protected Vlans	Starting from this register, 16 registers for 16 Vlans, if not available or insufficient, return all Fs
...					
	0x5041~0x5080	64	INT16	Ring ID 2 Information	
	0x5081~0x50C0	64	INT16	Ring ID 3 Information	Ring ID 32 Information, each ring reserves 0x40 register addresses
...					
N	0x57C1~0x5800	64	INT16	Ring ID 32 Information	Each ring reserves 0x40 register addresses for Ring ID 32 Information

### 3.6 RSTP Information

No.	Register Address	Number of Registers	Data Type	Data Name	Register Example
1	0x6000	1	INT16	Protocol Enable Status	0x0000 = disable, 0x0001 = enable
2	0x6001	4	INT16	Root Bridge ID	Priority 0x8000 mac 00-1E-CD-00-00-01, Result: 0x8000001ecd000001
3	0x6005	4	INT16	Bridge ID	Priority 0x8000 mac 00-1E-CD-00-00-01, Result: 0x8000001ecd000001
4	0x6009	1	INT16	Spanning Tree Priority	



5	0x600A	1	INT1 6	Hello Time	
6	0x600B	1	INT1 6	Max Age Time	
7	0x600C	1	INT1 6	Forward Delay Time	
8	0x600D	1	INT1 6	Message-age Increment	Not supported, returns all Fs
9	0x600E	1	INT1 6	Port Protocol Enable Status	0x0000 = disable, 0x0001 = enable
10	0x600F	1	INT1 6	Port Priority	
11	0x6010	2	INT1 6	Path Cost	
12	0x6012	1	INT1 6	Cost Auto Calculation Status	0x0000 = disable, 0x0001 = enable
13	0x6013	1	INT1 6	Ring Port Role	0x0000 = MasterPort, 0x0001 = AltBackupPort, 0x0002 = RootPort, 0x0003 = DesignatedPort, 0x0004 = AlternatePort, 0x0005 = BackupPort, 0x0006 = UnknownPort, 0x0007 = DisabledPort
14	0x6014	1	INT1 6	Ring Port Status	0x0001 = forwarding, 0x0002 = blocked
...					
4	0x6016~0x601D	8	Second Port Information, each port reserves 0x08 register addresses		
5	0x601E~0x6025	8			

			Third Port Information, each port reserves 0x08 register addresses		
...					
N	0x6206~0x620D	8	64th Port Information, each port reserves 0x08 register addresses		