MODBUS TCP

APPENDIX E

In this Appendix...

MODBUS TCP Definition

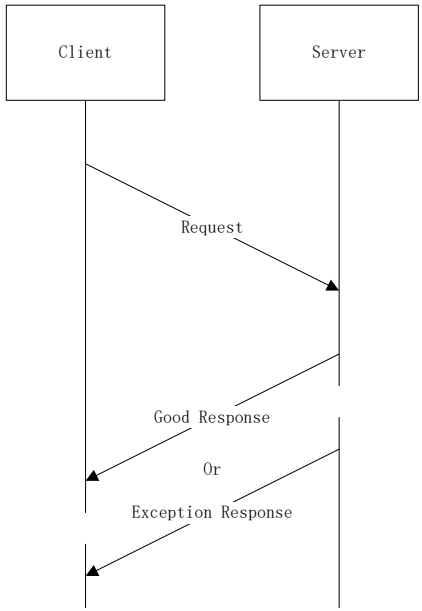
Port Definition

The MODBUS TCP server listening port is the standard value of 502.

Communication Process

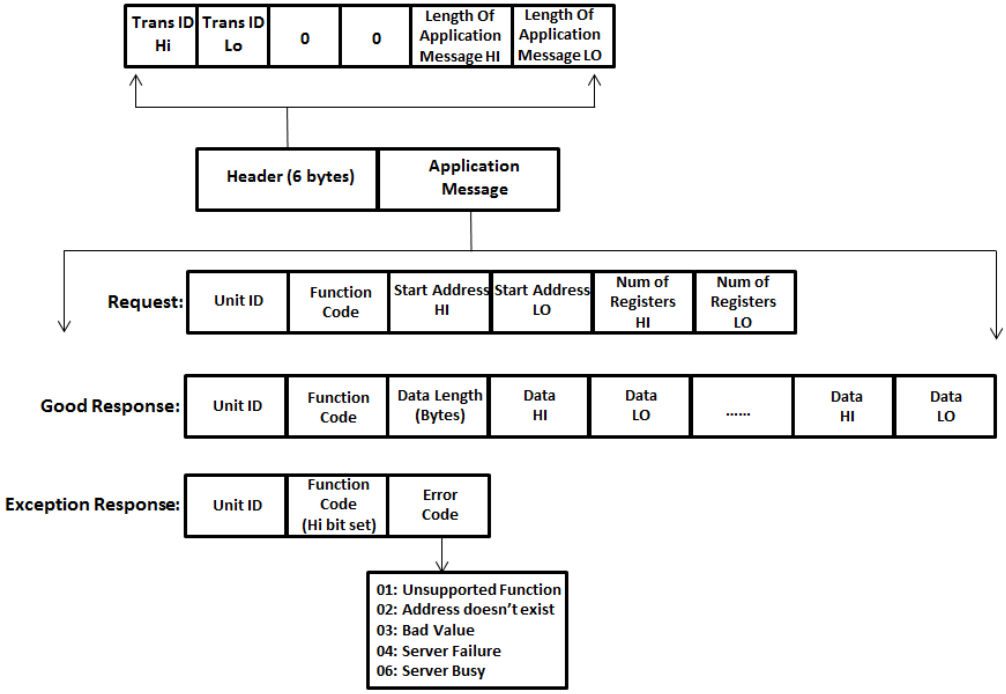
MODBUS information communication process is described below:

1. Client sends request to the switch;
2. The Switch (Server) receives the request and responds with a good response followed by the data requested or an exception response (high bit of Function Code set on) followed by the error code.



Information Frame Definition

MODBUS Frame definition is described below:



The Header is 6 bytes. Typically, the Transaction ID is incremented by 1 on every transaction by the Client device. The Server responds with the same value back.

The Unit ID is 1 byte.

The Function code is 1 byte and only Function Codes 3 and 4 are supported by the switch.

Maximum read size is 124 registers.

Function Code Definition

Function Code			
Item	**Function Code**	**Detail**	**Comments**
1	0x03	Holding Register	Read Register
2	0x04	Input Register	Read Register

Addresses are READ ONLY except where identified R/W in the tables that follow.

Example

Read the 4th register on server with Unit ID 01.

00 00 00 00 00 06 01 03 00 04 00 01– reads the value from 4th register address

00 00 00 00 00 05 01 03 02 00 05 – the response is 1 register (2 bytes) with a value of 5.

Read the value of the 4th and 5th register address from server with Unit ID 01.

00 00 00 00 00 06 01 03 00 04 00 02– Reads starting register 04 with a size of 2
00 00 00 00 00 07 01 03 04 00 05 00 04–The response to these 2 registers are 5 and 4.
00 00 00 00 00 03 01 83 0 – An example Exception Response. Unsupported Function Code error.

Switch MODBUS MAP

Addressing is described in 2 different ways

- Protocol Address
- Modbus Address

Protocol Addressing is more clear when writing the protocol itself or working with a Modbus master device that presents the data in a manner very closely tied to the protocol fields. As shown in the information of the previous section, the Modbus protocol request contains the Function code and the offset address from 0 in hexadecimal numbering.

Modbus Addressing makes more sense for devices that present the Modbus registers in a Modicon PLC style addressing where the high digit indicates the data type (4 for Holding Registers and 3 for Input Registers) followed by the offset from 1 in decimal numbering.

The tables below show only the Holding Register format (4xxxxx) for use with Function Code 3 but you could also substitute the upper 4 for 3 when doing Function Code 4 (reading Input Registers).

Register Address Allocation			
Item	**Description**	**Protocol Address**	**Modbus Address**
1	Device Information	0x0000 – 0x0fff	400001 – 404096
2	Port Information	0x1000 – 0x2fff	404097 – 412288
3	Alarm Information	0x3000 – 0x3fff	412289 – 416384
4	AD-Ring Information	0x4000 – 0x4fff	416385 – 420480
5	AD-RP Ring Information	0x5000 – 0x5fff	420481 – 424576
6	RSTP Ring Information	0x6000 – 0x6fff	424577 – 428672

Addresses are READ ONLY except where identified R/W in the tables that follow.

Register Information

Device Information

Modbus Address	Protocol Address	Size	Data Type	Data Name	Register Sample
400001–400255	0x0000–0x00ff	255	ASCII	Manufacturer Name	Word 0 HI byte = 'A Word 0 LO byte = 'u Word 1 HI byte = 't' Word 1 LO byte = 'o' Word 2 HI byte = 'm' Word 2 LO byte = 'a'…
400257–400512	0x0100–0x01ff	255	ASCII	Device type	Industrial Ethernet Switch
400513–400768	0x0200–0x02ff	255	ASCII	Manufacturer address	3505 Hutchinson Road, Cumming, GA 30040
400769–401024	0x0300–0x03ff	255	ASCII	Contact phone number	
401025–401044	0x0400–0x0413	20	ASCII	Product type	
401057–401071	0x0420–0x042e	15	ASCII	Serial number	
401089–401099	0x0440–0x044a	11	ASCII	Bootrom version	
401121–401129	0x0460–0x0468	9	ASCI	FW version	
401153–401156	0x0480–0x0483	4	ASCII	Reserved for future use	
401281–401300	0x0500–0x0513	20	ASCII	Reserved for future use	
401537–401538	0x0600–0x0601	2	INT16	Switch management interface IP information	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)
401539–401541	0x0602–0x0604	3	INT16	Device 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
401542	0x0605	1	INT16	Reserved for future use	
401543	0x0606	1	INT16	Power 1 status	0x0000 = None 0x0001 = Power ON 0x0002 = Power OFF
401544	0x0607	1	INT16	Power 2 status	
401545	0x0608	1	INT16	CPU usage (long term)	
401546	0x0609	1	INT16	CPU usage (short term)	
401547–401548	0x060a–0x060b	2	INT32	Total memory (in bytes)	
401549–401550	0x060c–0c060d	2	INT32	Available memory (in bytes)	
401551–401552	0x060e–0x060f	2	INT32	Device operating time (minutes)	

Addresses are READ ONLY except where noted.

Information - Port 1 details

Modbus Address	Register Address	Offset from Beginning of Block	Size (in words)	Data Type	Data Name	Register Sample
404097–404128	0x1000	0	32	ASCII	Port 1 Port Type	Either “FE” (fast Ethernet) or “GE” (Gigabet Ethernet)
404129	0x1020	32	1	INT16	Port 1 Status READ/WRITE *	up/down/disable 0x0000 = disable 0x0001 = up 0x0002 = down
404130	0x1021	33	1	INT16	Port 1 Speed	10/100/1000/10000M 0x0000 = 10 0x0001 = 100 0x0002 = 1000 0x0003 = 10000
404131	0x1022	34	1	INT16	Port 1 Duplex	half/full 0x0000 = half 0x0001 = full
404132	0x1023	35	1	INT16	Port 1 Flow Control	on/off 0x0000 = off 0x0001 = on
404133–404136	0x1024	36	4	INT64	Port 1 Received Packets	–
404137–404140	0x1028	40	4	INT64	Port 1 Received Bytes	–
404141–404144	0x102C	44	4	INT64	Port 1 Sent Packets	–
404145–404148	0x1030	48	4	INT64	Port 1 Sent Bytes	–
404149–404152	0x1034	52	4	INT64	Port 1 Received Unicast Packets	–
404153–404156	0x1038	56	4	IINT64	Port 1 Received Multicast Packets	–
404157–404160	0x103C	60	4	INT64	Port 1 Received Broadcast Packets	–
404161–404164	0x1040	64	4	INT64	Port 1 Sent Unicast Packets	–
404165–404168	0x1044	68	4	INT64	Port 1 Sent Multicast Packets	–
404169–404172	0x1048	72	4	INT64	Port 1 Sent Broadcast Packets	–
404173–404176	0x104C	76	4	INT64	Port 1 Received Pause Frame	–
404177–404180	0x1050	80	4	INT64	Port 1 Sent Pause Frame	–
404181–404184	0x1054	84	4	INT64	Port 1 Received CRC Error Packets	–

Addresses are READ ONLY except Port Status.
*** Note that the only values to write to Port Status are:**
0x0000 to Disable the port,
0x0001 to Enable the port.

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Starting Modbus Address	Starting Protocol Address	Port Number
404255–404352	0x1080	Port 2 information. Use Starting Address from this table and add "Offset from Beginning of Block" from the Port Details table on the previous page to identify the address for each Port Information element.
404353	0x1100	3
404481	0x1180	4
404609	0x1200	5
404737	0x1280	6
404865	0x1300	7
404993	0x1380	8
405121	0x1400	9
405249	0x1480	10
405377	0x1500	11
405505	0x1580	12
405633	0x1600	13
405761	0x1680	14
405889	0x1700	15
406017	0x1780	16
406145	0x1800	17
406273	0x1880	18
406401	0x1900	19
406528	0x1980	20
406657	0x1a00	21
406785	0x1a80	22
406913	0x1b00	23
407041	0x1b80	24
407169	0x1c00	25
407297	0x1c80	26
407425	0x1d00	27
407553	0x1d80	28
407681	0x1e00	29
407809	0x1e80	30
407937	0x1f00	31
408065	0x1f80	32
|	|	|
V	V	V
412161	0xdf80	64

Port Status

Addresses are READ ONLY except where noted.
The value in the register is INT 16:
Port Disabled = 0x0000
Port activity normal = 0x0001
Port alarm condition = 0x0002

Protocol Address	Modbus Address	Port Number
0x3000	412289	1
0x3010	412305	2
0x3020	402321	3
0x3030	412337	4
0x3040	412353	5
0x3050	412369	6
0x3060	412385	7
0x3070	412401	8
0x380	412417	9
0x390	412433	10
0x30a0	412449	11
0x30b0	412465	12
0x30c0	412481	13
0x30d0	412497	14
0x30e0	412513	15
0x30f0	412529	16
0x3100	412545	17
0x3110	412561	18
0x3120	412577	19
0x3130	412593	20
0x3140	412609	21
0x3150	412625	22
0x3160	412641	23
0x3170	412657	24
0x3180	412673	25
0x3190	412689	26
0x31a0	412705	27
0x31b0	412721	28
0x31c0	412737	29
0x31d0	412753	30
0x31e0	412769	31
0x31f0	412785	32
|	|	|
V	V	V
0x33f0	413297	64

AD-Ring Status

Each ring status includes two words. The first word is the AD-Ring number status and the second word is the AD-RP Ring number status.

Addresses are READ ONLY except where noted.
The value in the register is INT 16:
Ring Disabled - 0x000
Ring activity Normal = 0x0001
Ring alarm condition = 0x0002

AD-RP is not configured = 0x0003
(Applies to second word, AD-RP ring status only)

Protocol Address	Modbus Address	Ring Number
0x3400	413313	AD-Ring 1
0x3401	413314	AD-RP Ring 1
0x3402–0x3403	413315–413316	2
0x3404–0x3405	413317–413318	3
0x3406–0x3407	413319–413320	4
0x3408–0x3409	413321–413322	5
0x340a–0x340b	413323–413324	6
0x340c–0x340d	413325–413326	7
0x340e–0x340f	413327–413328	8
0x3410–0x3411	413329–413330	9
0x3412–0x3413	413331–413332	10
0x3414–0x3415	413333–413334	11
0x3416–0x3417	413335–413336	12
0x3418–0x3419	413337–413338	13
0x341a–0x341b	413339–413340	14
0x341c–0x341d	413341–413342	15
0x341e–0x341f	413343–4133344	17
|	|	|
V	V	V
0x343e–0x343f	413375–413376	32

Alarm Information

Addresses are READ ONLY except where noted.

Protocol Address	Modbus Address	Alarm	Values
0x3501	413570	IP address conflict	Disabled = 0x0000 Normal = 0x0001 Alarm = 0x0002
0x3502	413571	MAC address conflict	Disabled = 0x0000 Normal = 0x0001 Alarm = 0x0002
0x3505	413574	Power Alarm	Disabled = 0x0000 Normal = 0x0001 Power 1 Alarm = 0x0002 Power 2 Alarm = 0x0003

AD-Ring - Ring 1 details

Addresses are READ ONLY except where noted.

Protocol Address	Modbus Address	Offset from Beginning of Block	Size (in Words)	Data Type	Name	Details
0x4008	416393	8	1	INT16	AD-RING + STATUS	Down/Forward/Block Down = 0x0000 Forward = 0x0001 Block=0x0002
0x4009	416394	9	1	INT16	Backup Port Status	None = 0x0000 Forward = 0x0001 Block = 0x0002
0x400a – 0x400b	416395–416396	10	2	INT16	Backup Port Status: Backup Port 1 IP	Ex: 192.168.0.1 (0x00 1e cd 00 00 01)
0x400c – 0x400e	416397–416399	12	3	INT16	Backup Port Status: Backup Port 1 MAC	Ex: 00-1e-cd-00-00-01 (0x00 1e cd 00 00 01)
0x400f	416400	15	1	INT16	Backup Port Status: Backup Port 1 Status	None = 0x0000 Forward = 0x0001 Block = 0x0002
0x4010 – 0x4011	416401–416402	16	2	INT16	Backup Port Status: Backup Port 2 IP	Ex: 192.168.0.1 (0x00 1e cd 00 00 01)
0x4012 – 0x4014	416403–416405	18	3	INT16	Backup Port Status: Backup Port 2 MAC	Ex: 00-1e-cd-00-00-01 (0x00 1e cd 00 00 01)
0x4015	416406	21	1	INT16	Backup Port Status: Backup Port 2 Status	None = 0x0000 Forward = 0x0001 Block = 0x0002
0x4016 – 0x4019	416407–146410	22	4	ASCII	Ring Port 1 Status	Returns Port number in ASCII format
0x401a – 0x401d	416411–416414	26	4	ASCII	Ring Port 2 Status	
0x401e – 0x4021	416415–416418	30	4	ASCII	Backup Port	
0x4022	416419	34	1	INT16	Master Port	Returns 0 if port is disabled, Returns Port number if enabled
0x4023 – 0x4032	416420–416435	35	16	INT16	VLAN list	If VLAN is disabled, returns all 0xff, returns VLAN numbers if enabled

AD-Ring (cont'd)

Starting Protocol Address	Starting Modbus Address	Ring Number
0x4041	416450	Ring 2 information. Use Starting Address from this table and add "Offset from Beginning of Block" from the Ring Details table on the previous page to identify the address for each Ring Information element.
0x4081	416514	Ring 3
0x40c1	416578	Ring 4
0x4101	416642	Ring 5
0x4141	416706	Ring 6
0x4181	416770	Ring 7
0x41c1	416834	Ring 8
0x4201	416898	Ring 9
0x4241	416962	Ring 10
0x4281	417026	Ring 11
0x42c1	417090	Ring 12
0x4301	417154	Ring 13
0x4341	417218	Ring 14
0x4381	417282	Ring 15
0x43c1	417346	Ring 16
|	|	|
V	V	V
0x47c1	418370	Ring 32

AD-RP Ring - Ring 1 details

Addresses are READ ONLY except where noted.

Protocol Address	Modbus Address	Offset from Beginning of Block	Size (in Words)	Data Type	Name	Details
0x5000	420481	0	1	INT16	Ring Working Mode	Port/VLAN Port = 0x000 VLAN = 0x0001
0x5001	420482	1	1	INT16	Ring ID	–
0x5002	420483	2	1	INT16	Node Status	Init = 0x0000 Root = 0x0001 B-Root = 0x0002 Normal = 0x0003
0x5003	420484	3	1	INT16	Node Priority	–
0x5004	420485	4	1	INT16	Ring Protocol Enable Status	Enable/Disable Disable = 0x0000 Enable = 0x0001
0x5005	420486	5	1	INT16	Ring Status	Init = 0x0000 Open = 0x0001 Close = 0x0002 None = 0x0003
0x5006	420487	6	1	INT16	Ring Port 1 Blocking Status	Forwarding = 0x0000 Blocking = 0x0001
0x5007	420488	7	1	INT16	Ring Port 1 Link Status	Down = 0x0000 Up = 0x0001
0x5008	420489	8	1	INT16	Ring Port 2 Blocking Status	Forwarding = 0x0000 Blocking = 0x0001
0x5009	420490	9	1	INT16	Ring Port 2 Link Status	Down = 0x0000 Up = 0x0001
0x500a	420491	10	1	INT16	Backup Port Blocking Status	Forwarding = 0x0000 Blocking = 0x0001
0x500b	420492	11	1	INT16	Backup Port Link Status	Down = 0x0000 Up = 0x0001
0x500c - 0x500f	420493–420496	12	4	ASCII	Ring Port 1 Information	Returns Port number in ASCII format
0x5010 - 0x5013	420497–420500	16	4	ASCII	Ring Port 2 Information	
0x5014 - 0x5017	420501–420504	20	4	ASCII	Backup Port	
0x5018	420505	24	1	INT16	Port Priority	None = 0x0000 Ring Port 1 = 0x0001 Ring Port 2 = 0x0002
0x5019	420506	25	1	INT16	CRC Gap	–
0x501a	420507	26	1	INT16	DHP Mode	None = 0x0000 Normal mode = 0x0001 Home node = 0x0002
0x501b	420508	27	1	INT16	Home Port	None = 0x0000 Ring Port 1 = 0x0001 Ring Port 2 = 0x0002 Ring Port 1-2 = 0x0003
0x501c - 0x501d	420509–420510	28	2	INT32	Root IP	Returns 0 if switch is Root, otherwise returns IP in 32 bit format
0x501e	420511	30	1	INT16	Reserved for future use	Reserved
0x501f - 0x502e	420512–420527	31	16	INT16	Protected VLAN	If VLAN isn't enabled, returns 0xff. Otherwise returns VLAN numbers.

AD-RP Ring (cont'd)

Starting Protocol Address	Starting Modbus Address	Ring Number
0x5041	420546	Ring 2 information. Use Starting Address from this table and add "Offset from Beginning of Block" from the Ring Details table on the previous page to identify the address for each Ring Information element.
0x5081	420610	Ring 3
0x50c1	420674	Ring 4
0x5101	420738	Ring 5
0x5141	420802	Ring 6
0x5181	420866	Ring 7
0x51c1	420930	Ring 8
0x5201	420994	Ring 9
0x5241	421058	Ring 10
0x5281	421122	Ring 11
0x52c1	421186	Ring 12
0x5301	421250	Ring 13
0x5341	421314	Ring 14
0x5381	421378	Ring 15
0x53c1	421442	Ring 16
|	|	|
V	V	V
0x57c1	422466	Ring 32

RSTP Settings

Addresses are READ ONLY except where noted.

Protocol Address	Modbus Address	Offset from Beginning of Block	Size (in Words)	Data Type	Name	Details
0x6000	424577	N/A	1	INT16	RSTP Ring Enable Status	Disable= 0x000 Enable= 0x0001
0x6001–0x6004	424578–424581	N/A	4	INT16	Root ID	Priority combined with MAC Ex: Priority = 0x8000 MAC = 00-1e-cd-00-00-01 Result = 0x800000ecd000001
0x6005–0x6008	424582–424585	N/A	4	INT16	Bridge ID	
0x6009	424586	N/A	1	INT16	Spanning-tree Priority	–
0x600a	424587	N/A	1	INT16	Hello Time	–
0x600b	424588	N/A	1	INT16	Max Age Time	–
0x600c	424589	N/A	1	INT16	Forward Delay Time	–
0x600d	424590	N/A	1	INT16	Message-age Increment	Compulsion = 0x0000 Default = 0x0001

RSTP - Port 1 details

Addresses are READ ONLY except where noted.

Protocol Address	Modbus Address	Offset from Beginning of Block	Size (in Words)	Data Type	Name	Details
0x600e	424591	0	1	INT16	Port Enable Status	Disable= 0x000 Enable= 0x0001
0x600f	424592	1	1	INT16	Port Priority	–
0x6010–0x6011	424593–424594	2	2	INT32	Path Cost	–
0x6012	424595	4	1	INT16	Automatic Cost Status	Disable= 0x000 Enable= 0x0001
0x6013	424596	5	1	INT16	Ring Port Pole	Disabled Port = 0x000 Alternate Port = 0x0001 Backup Port = 0x0002 Root Port = 0x0003 Designated Port = 0x0004 Master Port = 0x0005 Non Stp Port = 0x0006
0x6014	424597	6	1	INT16	Ring Port Status	Forwarding = 0x0001 Blocked = 0x0002

RSTP Settings (cont'd)

Starting Protocol Address	Starting Modbus Address	Ring Number
0x6016	424599	Port 2 information. Use Starting Address from this table and add "Offset from Beginning of Block" from the Port Details table on the previous page to identify the address for each Port Information element.
0x601e	424607	Port 3
0x6026	424615	Port 4
0x602e	424623	Port 5
0x6036	424631	Port 6
0x603e	424639	Port 7
0x6046	424647	Port 8
0x604e	424655	Port 9
0x6056	424663	Port 10
0x605e	424671	Port 11
0x6066	424679	Port 12
0x606e	424687	Port 13
0x6076	424695	Port 14
0x607e	424703	Port 15
0x6086	424711	Port 16
0x608e	424719	Port 17
0x6096	424727	Port 18
0x609e	424735	Port 19
0x60a6	424743	Port 20
0x60ae	424751	Port 21
0x60b6	424759	Port 22
0x60be	424767	Port 23
0x60c6	424775	Port 24
0x60ce	424783	Port 25
0x60d6	424791	Port 26
0x60de	424799	Port 27
0x60e6	424807	Port 28
0x60ee	424815	Port 29
0x60f6	424823	Port 30
0x60fe	424831	Port 31
0x6106	424839	Port 32
|	|	|
V	V	V
0x6206	425095	Port 64