

Function Block



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Référence	MTCP_CP1L Client
Révision	2.7
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Date	11/01/2018
+ Support	http://support-omron.fr/

N° Indigo 0 825 825 679
 0.15€ TTC/mm

Function Block Modbus TCP Client dedicated to CP1L-Ex (Ethernet built-in)

Function	Modbus TCP client for CP1L series					
Connexion	<div style="text-align: center;"> </div>					
Read/Write Fn	<div style="text-align: center;"> </div>	<div style="text-align: center;"> </div>	<div style="text-align: center;"> </div>	<div style="text-align: center;"> </div>	<div style="text-align: center;"> </div>	<div style="text-align: center;"> </div>

File	MTCP_CP1L_Client.zip
PLC	- CP1L-EL, CP1L-EM (Built-in Ethernet)
Restriction of use	The FB use socket n° 1 and TCP port 502 Execution time is 30ms minimum

Conditions of use	<p>The FB Modbus TCP client provides some read/write features in accordance with the specifications defined by the Modbus organization.</p> <p>The Modbus TCP Client function block is offered 'as is' and may serve as a basis for development.</p> <p>Users should previously test its adequacy to the final application.</p> <p>Omron could not be held responsible in case of malfunction.</p>																																													
Principe	<p>The function block MTCP_CP1L_Connect establish the connection to a remote Modbus TCP server when Connect input is activated.</p> <p>When Connect is released, the FB disconnect the socket.</p> <p>ENO output should be used to allow execution of read/write FB via the EN input.</p> <p>The FB MTCP_CP1L_Connect manage re-connection when accidental disconnection occurs.</p> <p>If the disconnection is longer than 2mn, the FB will force close the socket.</p> <p>Output LinkOFF signal that the Ethernet Link is disconnected</p> <p>List of read/write function provided :</p> <table border="1"> <thead> <tr> <th>Code</th> <th>Modbus Function</th> <th>Function Block</th> </tr> </thead> <tbody> <tr> <td>0x01</td> <td>Read coils</td> <td>MTCP_CP1L_Fn01</td> </tr> <tr> <td>0x03</td> <td>Read Holding Registers</td> <td>MTCP_CP1L_Fn03</td> </tr> <tr> <td>0x04</td> <td>Read Input Registers</td> <td>MTCP_CP1L_Fn04</td> </tr> <tr> <td>0x05</td> <td>Write Single Coil</td> <td>MTCP_CP1L_Fn05</td> </tr> <tr> <td>0x06</td> <td>Write Single Register</td> <td>MTCP_CP1L_Fn06</td> </tr> <tr> <td>0x0F</td> <td>Write Multiple Coils</td> <td>MTCP_CP1L_Fn0F</td> </tr> <tr> <td>0x10</td> <td>Write Multiple Registers</td> <td>MTCP_CP1L_Fn10</td> </tr> <tr> <td>0x17</td> <td>Read Write Multiple Registers</td> <td>MTCP_Client_Fn17</td> </tr> </tbody> </table> <p>Memory Area used by the FB</p> <table border="1"> <thead> <tr> <th>Type</th> <th>address</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>send</td> <td>D32500-D32506</td> <td>Modbus request area</td> </tr> <tr> <td>receive</td> <td>D32510-D32642</td> <td>Receive response area</td> </tr> </tbody> </table> <p>Flags and commands related to CP1L socket n°1</p> <table border="1"> <thead> <tr> <th>Type</th> <th>address</th> <th>Descriptions</th> </tr> </thead> <tbody> <tr> <td>Flags/command</td> <td>A567 & A571</td> <td>More details :</td> </tr> <tr> <td>Parameters</td> <td>D 32400 - D32417</td> <td>Socket Service de W421</td> </tr> </tbody> </table>	Code	Modbus Function	Function Block	0x01	Read coils	MTCP_CP1L_Fn01	0x03	Read Holding Registers	MTCP_CP1L_Fn03	0x04	Read Input Registers	MTCP_CP1L_Fn04	0x05	Write Single Coil	MTCP_CP1L_Fn05	0x06	Write Single Register	MTCP_CP1L_Fn06	0x0F	Write Multiple Coils	MTCP_CP1L_Fn0F	0x10	Write Multiple Registers	MTCP_CP1L_Fn10	0x17	Read Write Multiple Registers	MTCP_Client_Fn17	Type	address	Description	send	D32500-D32506	Modbus request area	receive	D32510-D32642	Receive response area	Type	address	Descriptions	Flags/command	A567 & A571	More details :	Parameters	D 32400 - D32417	Socket Service de W421
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1- I/O variable of MTCP_CP1L_Connect

Input Variables

Name	type	range	Description
EN	Bool	OFF, ON	FB Activation
IP_Address1	UINT	00 - FF	IP Address of the server (byte 1,2,3,4)
IP_Address2			
IP_Address3			
IP_Address4			
Connect	Bool	OFF, ON	Request to connect to the server

Output Variables

Name	type	Range	Description
ENO	Bool	OFF, ON	ON : Connected to the server
Error_Modbus	Bool	OFF, ON	FINS Error flag
Error_FINS	Bool	OFF, ON	MODBUS Error flag
Error_Code	UINT	0 - FFFF	Error Code returned by the socket switch or Modbus TCP server (see error code list below).
Waiting_Server	Bool	OFF-ON	ON : waiting for a SYNC acknowledge of the server
LinkOFF	Bool	OFF-ON	ON : Ethernet link disconnected
Cpt_LinkOff	UINT	0 - FFFF	Counter of Ethernet link disconnection

2- Input Variables of FB MTCP_CP1L_Fn01, Fn03, Fn04, Fn05, Fn06, Fn0F, Fn10 and Fn17

MTCP_CP1L_Fn01	type	range	Description
EN	Bool	OFF, ON	FB Activation (use ENO of FB Connect)
UNIT_ID	UINT	00 - FF	Unit Identifier (0 = default value -> &255)
Timeout	UINT	0 - FFFF	Timeout in 0.1s (0 : default value = 100ms)
Coil_Address	UINT	0 - FFFF	Address of 1rst coil
Coil_Qty	UINT	0 - 00FF	Number of coils
Cmd_Read	Bool	OFF, ON	Read Commande

MTCP_CP1L_Fn03 MTCP_CP1L_Fn04	type	range	Description
EN	Bool	OFF, ON	FB Activation (use ENO of FB Connect)
UNIT_ID	UINT	00 - FF	Unit Identifier (0 = default value -> &255)
Timeout	UINT	0 - FFFF	Timeout in 0.1s (0 : default value = 100ms)
Register_Address	UINT	0 - FFFF	Address of 1rst register
Register_Qty	UINT	0 - 00FF	Number of registers
RespData_DM	UINT	0 - FFFF	Destination of data (DM area)
Cmd_Read	Bool	OFF, ON	Read Commande

MTCP_CP1L_Fn05	type	range	Description
EN	Bool	OFF, ON	FB Activation (use ENO of FB Connect)
UNIT_ID	UINT	00 - FF	Unit Identifier (0 = default value -> &255)
Timeout	UINT	0 - FFFF	Timeout in 0.1s (0 : default value = 100ms)
Coil_Address	UINT	0 - FFFF	Address of the coil
Value	Bool	OFF, ON	ON/OFF value of the coil
Cmd_Write	Bool	OFF, ON	Write command

MTCP_CP1L_Fn06	type	range	Description
EN	Bool	OFF, ON	FB Activation (use ENO of FB Connect)
UNIT_ID	UINT	00 - FF	Unit Identifier (0 = default value -> &255)
Timeout	UINT	0 - FFFF	Timeout in 0.1s (0 : default value = 100ms)
Register_Address	UINT	0 - FFFF	Address of the register
Value	UINT	0 - FFFF	Value to write
Cmd_Write	Bool	OFF, ON	Write command

MTCP_CP1L_Fn0F	type	range	Description
EN	Bool	OFF, ON	FB Activation (use ENO of FB Connect)
UNIT_ID	UINT	00 - FF	Unit Identifier (0 = default value -> &255)
Timeout	UINT	0 - FFFF	Timeout in 0.1s (0 : default value = 100ms)
Coil_Address	UINT	0 - FFFF	Address of 1rst coil
Coil_Qty	UINT	0 - 00FF	Number of coil to write
DataAddress_DM	UINT	0 - FFFF	Source of data (DM area)
Cmd_Write	Bool	OFF, ON	Read Command

MTCP_CP1L_Fn10	type	range	Description
EN	Bool	OFF, ON	FB Activation (use ENO of FB Connect)
UNIT_ID	UINT	00 - FF	Unit Identifier (0 = default value -> &255)
Timeout	UINT	0 - FFFF	Timeout in 0.1s (0 : default value = 100ms)
Register_Address	UINT	0 - FFFF	Address of 1rst register
Register_Qty	UINT	0 - 00FF	Number of registers
DataAddress_DM	UINT	0 - FFFF	Source of data (DM area)
Cmd_Write	Bool	OFF, ON	Write command

MTCP_CP1L_Fn17	type	range	Description
EN	Bool	OFF, ON	FB Activation (use ENO of FB Connect)
UNIT_ID	UINT	00 - FF	Unit Identifier (0 = default value -> &255)
Timeout	UINT	0 - FFFF	Timeout in 0.1s (0 : default value = 100ms)
Reg_Address_Read	UINT	0 - FFFF	Address of 1rst register
Reg_Qty_Read	UINT	0 - 00FF	Number of registers
RespData_DM	UINT	0 - FFFF	Destination of data (DM area)
Reg_Address_Write	UINT	0 - FFFF	Address of 1rst register
Reg_Qty_Write	UINT	0 - 00FF	Number of registers
Data_Adress_DM	UINT	0 - FFFF	Source of data (DM area)
Cmd_Send	Bool	OFF, ON	Send the ReadWrite Command

3- Output Variables of FB MTCP_CP1L_Fn01, Fn03, Fn05, Fn06, Fn0F et Fn10

Name	type	Range	Description
ENO	Bool	OFF, ON	ON when read/write succeed
Busy	Bool	OFF, ON	ON during execution of the FB. Use this flag to avoid simultaneous execution of several FB MTCP_CP1L_Fnxx
Rcv_Counter	UINT	0 - FFFF	Reception counter
Error_Modbus	Bool	OFF, ON	FINS Error flag
Error_FINS	Bool	OFF, ON	MODBUS Error flag
Error_Code	UINT	0 - FFFF	Error Code returned by the socket switch or Modbus TCP server (see error code list below).
Timeout	Bool	OFF, ON	Timeout

Error Code returned by the Modbus TCP server (Modbus exception response)

Code	Description
0001	ILLEGAL FUNCTION
0002	ILLEGAL DATA ADDRESS
0003	ILLEGAL DATA VALUE

Error Code returned by the TCP Socket switch OpenActive, Send and Receive

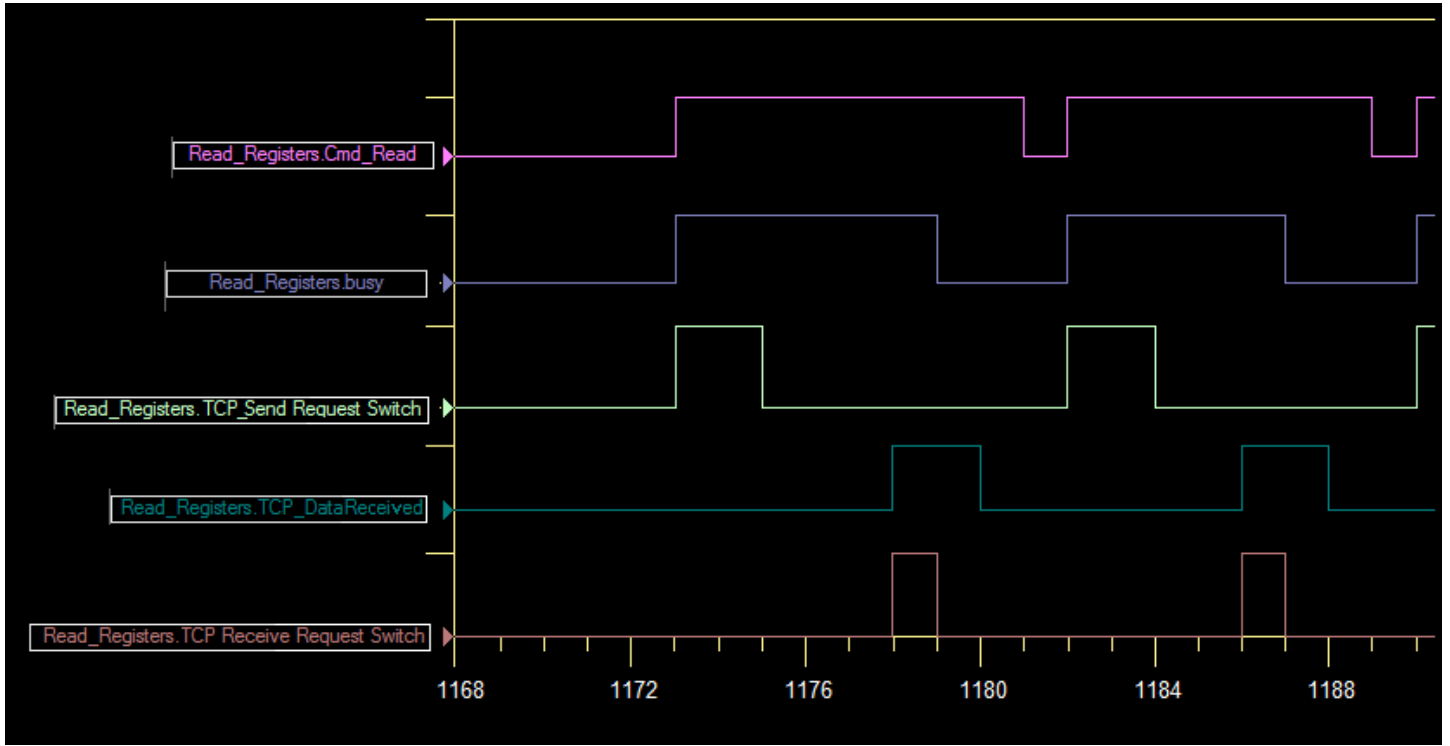
2607	Socket already in use
0302	CPU Unit error: cannot execute
1100	Number bytes to send/receive not in allowed range
1101	The area designation of the Send/Receive Data address is not in allowable range
1103	The bit number in the Send/Receive data address is not in allowable range
110C	Request switch turned ON during other processing
220F	Specified socket is already processing a SEND request
2210	The specified socket is not connected
2211	Unit is busy: cannot execute
2606	Specified socket is already open as UDP socket
2607	Specified socket service parameter area is already being used by another socket
0020	Connection with remote socket broken during Send (EPIPE)
003E	Internal buffer cannot be obtained due to high reception traffic
0045	Error in communication with remote node
004B	Error communication with remote node (again)
004E	Remote IP address parameter error (ET unreach)
0051	Remote IP address parameter error (Host unreach)
0053	Error communication with remote HOST
0080	Receive request Timed out
0081	Specified socket was closed during receive processing

See more details:

http://support-omron.fr/pdf/ErrCode_CP1L_Socket.pdf

Timing charts

The minimum time to execute the function block is 40ms when the PLC scan time is around 1ms. When scan time is about 5ms (all 7 FB MTCP_CP1L activated), time to execute the FB is 50ms. See below the status of related command bit and flags.



ANNEXE

Modbus protocol

I/O memory area (CIO) Read Multiple Coils

Example: read 19 bits (CIO 0001.04 to 0002.06)

Request		Response	
	Data		Data
Function Code	0x01	Function Code	0x01
Starting Address(H)	0x00	Byte Count	0x03
Starting Address(L)	0x14	Coil Status 27-20	0xCD
Quantity of Coils(H)	0x00	Coil Status 35-28	0x6B
Quantity of Coils(L)	0x13	Coil Status 38-36	0x05

	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0CH	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
1CH	<i>31₁</i>	<i>30₀</i>	<i>29₁</i>	<i>28₁</i>	<i>27₁</i>	<i>26₁</i>	<i>25₀</i>	<i>24₀</i>	<i>23₁</i>	<i>22₁</i>	<i>21₀</i>	<i>20₁</i>	19	18	17	16
2CH	47	46	45	44	43	42	41	40	39	<i>38₁</i>	<i>37₀</i>	<i>36₁</i>	<i>35₀</i>	<i>34₁</i>	<i>33₁</i>	<i>32₀</i>
3CH	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48

Italic characters show the ON/OFF(1/0) status of its bit condition.

Reads registers in I/O memory area

Example: read 3 words (DM 1000 to DM 1002)

Request		Response	
	Data		Data
Function Code	0x03	Function Code	0x03
Starting Address(H)	0x03	Byte Count	0x06
Starting Address(L)	0xE8	Register Value(H)DM1000	0xAB
Quantity of Registers(H)	0x00	Register Value(L) DM1000	0x12
Quantity of Registers(L)	0x03	Register Value(H)DM1001	0x56
		Register Value(L) DM1001	0x78
		Register Value(H)DM1002	0x97
		Register Value(L) DM1002	0x13

DM	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
1000	A				B				1				2			
1001	5				6				7				8			
1002	9				7				1				3			

Writes single coil.

Example: write 1 coil. (CIO 0002.02 ON)

Request		Response	
	Data		Data
Function Code	0x05	Function Code	0x05
Output Address(H)	0x00	Output Address(H)	0x00
Output Address(L)	0x22	Output Address(L)	0x22
Output Value(H)	0xFF	Output Value(H)	0xFF
Output Value(L)	0x00	Output Value(L)	0x00

	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0CH	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
1CH	31 ₁	30 ₀	29 ₁	28 ₁	27 ₁	26 ₁	25 ₀	24 ₀	23 ₁	22 ₁	21 ₀	20 ₁	19	18	17	16
2CH	47	46	45	44	43	42	41	40	39	38 ₁	37 ₀	36 ₁	35 ₀	34 ₁	33 ₁	32 ₀
3CH	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48

Italic characters show the ON/OFF(1/0) status of its bit condition.

Writes single register.

Example: write &h3AC5 to DM 2000.

Request		Response	
	Data		Data
Function Code	0x06	Function Code	0x06
Register Address(H)	0x07	Register Address(H)	0x07
Register Address(L)	0xD0	Register Address(L)	0xD0
Register Value(H)	0x3A	Register Value(H)	0x3A
Register Value(L)	0xC5	Register Value(L)	0xC5

DM	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
2000	3				A				C				5			
2001																
2002																

Writes registers.

Example: write 2 words into DM1000-1001.

Request		Response	
	Data		Data
Function Code	0x10	Function Code	0x10
Starting Address(H)	0x03	Starting Address(H)	0x03
Starting Address(L)	0xE8	Starting Address(L)	0xE8
Quantity of Registers(H)	0x00	Quantity of Registers(H)	0x00
Quantity of Registers(L)	0x02	Quantity of Registers(L)	0x02
Byte Count	0x04		
Registers Value(H)	0x3A		
Registers Value(L)	0xC5		
Registers Value(H)	0x97		
Registers Value(L)	0x13		

DM	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
1000			3				A				C				5	
1001			9				7				1				3	

Writes Multiple coils.

Example: In the case of writing 10 bits (xxxx xx11 1100 1101) to CIO 0001.04.

(X = ignored.)

Request		Response	
	Data		Data
Function Code	0x0F	Function Code	0x0F
Starting Address(H)	0x00	Starting Address(H)	0x00
Starting Address(L)	0x13	Starting Address(L)	0x13
Quantity of Outputs(H)	0x00	Quantity of Outputs(H)	0x00
Quantity of Outputs(L)	0x0A	Quantity of Outputs(L)	0x0A
Byte Count	0x02		
Output Value(H)	0x3A		
Output Value(L)	0x01		

	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0CH	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
1CH	31 ₀	30 ₀	29 ₀	28 ₁	27 ₀	26 ₀	25 ₁	24 ₁	23 ₁	22 ₀	21 ₁	20 ₀	19 ₀	18 ₀	17 ₀	16 ₀

Italic characters show the ON/OFF(1/0) status of its bit condition.

Read and Write multiple registers Fn17

Example: read registers 1 & 2 (1001-2002) and write CAFE into register 0003.

Requête		Réponse	
	Donnée		Donnée
Function Code	0x17	Function Code	0x17
Starting Address(H) to read	0x00	Nbre of byte	0x04
Starting Address(L) to read	0x01	Valeur du registre 1 (poids faible)	0x10
Quantity of Registers(H) to read	0x00	Valeur du registre 1 (poids fort)	0x01
Quantity of Registers(L) to read	0x02	Valeur du registre 2 (poids faible)	0x20
Starting Address(H) to write	0x00	Valeur du registre 2 (poids fort)	0x02
Starting Address(L) to write	0x03		
Nbre of registers (H) to write	0x00		
Nbre of registers (L) to write	0x01		
Nbre of bytes/octets à écrire	0x02		
1ère valeur (poids fort)	0xCA		
1ère valeur (poids faible)	0xFE		

	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0000			3				A				C				5	
0001			1				0				0				1	
0002			2				0				0				2	
0003			C				A				F				E	