Instructor Led Training CP1H Serial Communications & Modbus communications with Omron Inverters

CONTINUOUS IMPROVEMENT

Engineered by



Easy Modbus Master

- This is a new function of **CP1H** exclusively!!!!
- This function allows the user to send Modbus commands from ladder without complex programming.
- The Easy Modbus Master uses the Serial Gateway function of the serial port.





Easy Modbus Master



- The Easy Modbus master function automatically:
 - Calculates the Modbus CRC-16 Checksum
 - Performs a timeout function on communications







Modbus Types

- Modbus ASCII is transmitted by RS232 in ASCII characters, uses LRC error checking and is usually a one-to-one protocol.
- Modbus RTU is preferred for serial transmission of binary (hex) characters, uses CRC-16 error checking and is usually implemented using RS422/485. This is the Modbus that Easy Modbus Master Supports.
- Modbus Plus is a peer-to-peer protocol using proprietary hardware similar to Controller Link.
- Modbus TCP/IP is Modbus RTU protocol enclosed in a TCP packet and intended for transmission on Ethernet.





	Function Codes				
				(decimal)	(hex)
		Physical Discrete Inputs	Read Input Discrete	02	02
	Bit access	Internal Bits Or Physical coils	Read Coils	01	01
			Write Single Coil	05	05
Data			Write Multiple Coils	15	0F
Access	Pagista	Physical Input Registers	Read Input Register	04	04
		Internal Registers Or Physical Output Registers	Read Multiple Registers	03	03
	16 bits		Write Single Register	06	00
	access		Write Multiple Registers	16	10

Omron Inverters only use Function Codes 03 and 10 (HEX).







Modbus Register Map in Inverters



NTINUOUS

Param- eter No.	Regis- ter No. (Hex)	Name	Description	Set- ting range	Unit of set- ting	Default setting	Changes during opera- tion
n024	0118	Frequency reference 1	Used to set internal frequency refer- ences.	0.0 to max.	0.01 Hz	6.00	Yes
n025	0119	Frequency reference 2	Note Frequency reference 1 is enabled in remote mode with	quency	(chan ge in	0.00	Yes
n026	011A	Frequency reference 3	n004 for frequency reference selection set to 1.		1035)	0.00	Yes
n027	011B	Frequency reference 4	Note These frequency references are selected with multi-step			0.00	Yes
n028	011C	Frequency reference 5	speed references (multi-func- tion input). See the reference			0.00	Yes

Extracted from 3G3MV Manual



Read Multiple Registers (Function Code 03)

Example: Read from node 1, 1 register starting at register 0118



Extracted from 3G3MV Manual



Write Multiple Registers (Function Code 10)

Example: Write to node 1, 1 register starting at register 0118



Extracted from 3G3MV Manual



Easy Modbus Master... Step 1



• 1 Assemble the Modbus command in PLC memory

Words		Bits	Contents		
Serial port 1	Serial port 2				
D32200	D32300	00 to 07	Command	Slave address (00 to F7 hex)	
		08 to 15		Reserved (Always 00.)	
D32201	D32301	00 to 07		Function code	
		08 to 15		Reserved (Always 00.)	
D32202	D32302	00 to 15		Number of communications data bytes (0000 to 005E hex)	
D32203 to D32249	D32303 to D32349	00 to 15		Communications data (94 bytes maximum)	

TINUOUS



Easy Modbus Master... Step 2

- 2 Turn on Execute Bit to send the Modbus command

Word	Bit	Port	Contents
A640	00	Port 2	Modbus-RTU Master Execution Bit
			Turned ON: Execution started
			ON: Execution in progress.
			OFF: Not executed or execution completed.
A641	00	Port 1	Modbus-RTU Master Execution Bit
			Turned ON: Execution started
			ON: Execution in progress.
			OFF: Not executed or execution completed.

Note: In the preliminary manual for CP1H, the port numbers are reversed. The above information is correct.



Easy Modbus Master... Step 3

• 3 Wait for the Executing bit to turn off, and then examine the result bits.

Word	Bit	Port	Contents	
A640	02	Port 2	Modbus-RTU Master Execution Error Flag	
			ON: Execution error.	
			OFF: Execution normal or still in progress.	
	01		Modbus-RTU Master Execution Normal Flag	
			ON: Execution normal.	
			OFF: Execution error or still in progress.	
A641	02	Port 1	Modbus-RTU Master Execution Error Flag	
			ON: Execution error.	
			OFF: Execution normal or still in progress.	
	01		Modbus-RTU Master Execution Normal Flag	
			ON: Execution normal.	
			OFF: Execution error or still in progress.	

Note: In the preliminary manual for CP1H, the port numbers are reversed. The above information is correct.







• 4 Examine the Modbus response

CONTINUOUS

Words		Bits	Contents	
Serial port 1	Serial port 2			
D32250	D32350	00 to 07	Response	Slave address (00 to F7 hex)
		08 to 15		Reserved (Always 00.)
D32251	D32351	00 to 07		Function code
		08 to 15		Reserved
D32252	D32352	00 to 07		Error code
		08 to 15		Reserved (Always 00.)
D32253	D32353	00 to 15		Number of response bytes (0000 to 03EA hex)
D32254 to D32299	D32354 to D32399	00 to 15		Response data (92 bytes maximum)



Filling in the Easy Modbus Registers



Memory Map for Function 03 (Read) Command





Examining the Response



Memory Map for Function 03 (Read) Response

				Example	_
D32350	Bits 8-15	Reserved (00)	00	00	
	Bits 0-7	Slave Address (00 to F7)	Modbus Slave Address	01	
D32351	Bits 8-15	Reserved (00)	00	00	
	Bits 0-7	Function Code	03	03	
D32352	Bits 8-15	Reserved (00)	00	00	
	Bits 0-7	Modbus Error Code	Modbus Error Code	00	- 1
D32353	Bits 8-15	Number of Comm Data	Number of Comm	00	1 < 1
	Bits 0-7	Bytes (0000 to 005E)	Data Bytes	03	$\sum \mathcal{N}$
D32354	Bits 8-15		Number of Modbus Data Bytes	02	3 Bytes
	Bits 0-7	2 Bytes of Data 🤾 🦵	Returned Data (High Byte)	17	
D32355	Bits 8-15]	Returned Data (Low Byte)	70	
	Bits 0-7]			
D32356	Bits 8-15] DATA			
	Bits 0-7				





Filling in the Easy Modbus Registers

	 Memory M 	lap for Function 10 (VVrite) C	Command		
	-			Example	
D32300	Bits 8-15	Reserved (00)	00	00	
	Bits 0-7	Slave Address (00 to F7)	Modbus Slave Address	01	
D32301	Bits 8-15	Reserved (00)	00	00	
	Bits 0-7	Function Code	10	10	
D32302	Bits 8-15	Number of Comm Data	Number of Comm	00	
	Bits 0-7	Bytes (0000 to 005E)	Data Bytes	07	$\int \langle \cdot \rangle$
D32303	Bits 8-15		Modbus Register	01] 🔿 🔨 7 Bytes
	Bits 0-7		Modbus Register	18	
D32304	Bits 8-15		Number of Registers to Write	00	
	Bits 0-7	DATA	Number of Registers to Write	01	
D32305	Bits 8-15		Number of Modbus Data Bytes	02	
	Bits 0-7	2 Bytes of Data 🤇 🖒	Data to Send (High Byte)	17	
D32306	Bits 8-15		Data to Send (Low Byte)	70	
	Bits 0-7				





Examining the Response



Memory Map for Function 10 (Write) Response Example D32300 Bits 8-15 Reserved (00) $\Omega \Omega$ 00 Bits 0-7 Modbus Slave Address 01 Slave Address (00 to F7) D32301 Bits 8-15 00 Reserved (00) 00 10 Bits 0-7 10 Function Code D32302 Bits 8-15 Reserved (00) Reserved (00) 00 Modbus Error Code Bits 0-7 Modbus Error Code 00 D32303 Bits 8-15 Number of Comm Data Number of Comm 00 Bits 0-7 04 Bytes (0000 to 005E) Data Bytes 4 Bytes D32304 Bits 8-15 Modbus Register 01 Bits 0-7 DATA 18 Modbus Register D32305 Bits 8-15 Number of Registers Written 00 Number of Registers Written Bits 0-7 01 D32306 Bits 8-15 Bits 0-7





Common Parameters for Applications

RUN Command (Register 0001 Hex)

Bit No.	Function
0	RUN command (1: RUN)
1	Forward/Reverse (1: Reverse)

Set Register 0001 as follows:

0 = Stop

- 1 = Forward
- 3 = Reverse







Register No. (Hex)	Function	Description
0002	Frequency reference	Set the frequency reference in the unit according to the set value in n152.

Set Register 0002 as follows:

0000 = 00.00 Hz

through

0258 (60.0 BCD) = 60.00 Hz





Common Parameters for Applications

Bit No.	Function		
0	During RUN (1: During RUN)		
1	Forward/reverse operation (1: Reverse operation)		
2	verter ready (1: Ready)		
3	Fault (1: Fault)		
4	Data setting error (1: Error)		
5	Multi-function output 1 (1: ON)		
6	Multi-function output 2 (1: ON)		
7	Multi-function output 3 (1: ON)		
8 to 15	Not used.		

Status Signal (Register 0020 Hex)





Configuring the 3G3MV Drive for Modbus

- Several parameters will need to be changed in the 3G3MV Inverter to allow Modbus communications to be used to start / stop the drive, as well as to change frequency.
- Please configure the following parameters:
 - N1 = 9 (This resets the Inverter to defaults)
 - N1 = 4 (Display all parameters)
 - N3 = 2 (Modbus used for Starting / Stopping)
 - N4 = 6 (Modbus Frequency Reference Used)
 - N151 = 4 (No Time Over Detection for Modbus)
 - N153 = 1 (Modbus Slave Unit Number)
 - N154 = 2 (9600 baud)
 - N153 = 2 (No Parity)





To Program the inverter, Press the Mode key until the PRGM LED lights up.

Use the Up / Down arrows to choose the parameter number (nxxx), then press the Enter Key.

Use the Up / Down arrows to change the value of the parameter, then press the Enter Key to accept the changes.

Press the Mode Key again to return to the FREF LED.





Modbus Wiring for 3G3MV

CP1H – CIF11



3G3MV



