

7200MA
RS-485 MODBUS Communication
Application Manual

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This manual describes the communication methods between TECO frequency inverter 7200MA and host controllers(PC,PLC...).

① Using RS-485 Interface

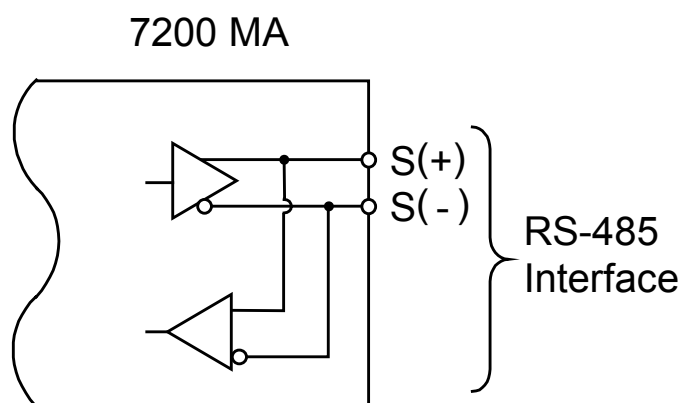
② MODBUS RTU mode protocol

③ Communication Format : (Setting by Inverter's parameter)

Transfer Speed : 1200/2400/4800/9600 bps (Setting by parameter Sn-37)

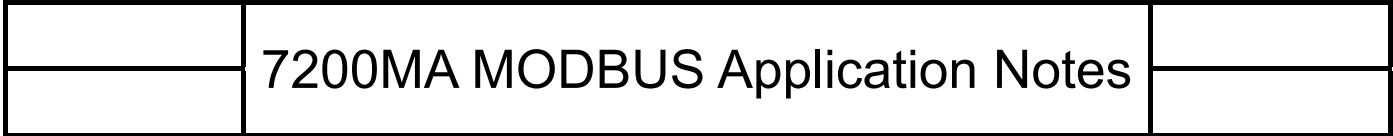
Parity : no parity/even parity/odd parity (Setting by parameter Sn-38)

3. Wiring Terminal :





Cn-27 = 00.0 s ----- Don't care
 = 01.0 s ----- Checked error (Default = 01.0 s)



(1) Operation procedure

- ① Inverter power turn on , Set the related parameters
- ② Connect inverter and host controller
- ③ Host controller sends communication message

(2) Communication status indication of inverter

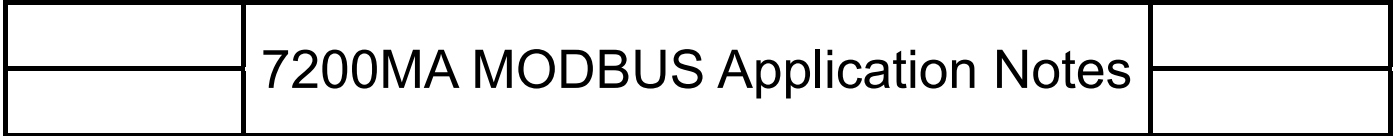
We can set the Run/Stop command (Sn-04) or Frequency Reference (Sn-05) by RS485. Inverter will display “Alarm RS-485” if it does not receive any message from host controller after power on 5 seconds. This display will disappear while inverter had received messages from host controller.

We can set Time-out Check. Inverter will display “Alarm RS-485” if it does not receive any message in Time-out (Cn-27).

Parameter Sn-39 will decide the “Alarm RS-485” display format.

Sn-39 = 0 , Decelerate to stop by Bn-02 (“Alarm RS-485” light up)
 = 1 , Coasting to stop (“Alarm RS-485” light up)
 = 2 , Decelerate to stop by Bn-04 (“Alarm RS-485” light up)
 = 3 , Continuous operation (“Alarm RS-485” flash)

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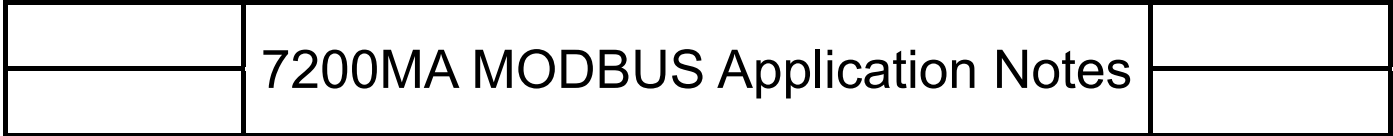
(1) In MODBUS RTU mode protocol , one message has 4 parts :
include Slave Address 、 Function Code 、 Data and CRC-16 Character.

T1 T2 T3 T4	Slave Address	Function Code	Data Character	CRC-16 Character	T1 T2 T3 T4
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Even/Odd Parity	start	1	2	3	4	5	6	7	8	parity	stop
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No Parity	start	1	2	3	4	5	6	7	8	stop	stop
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This message can only use for Run/Stop, Fault Reset (Address 0000H) and Frequency Reference (Address 0001H).

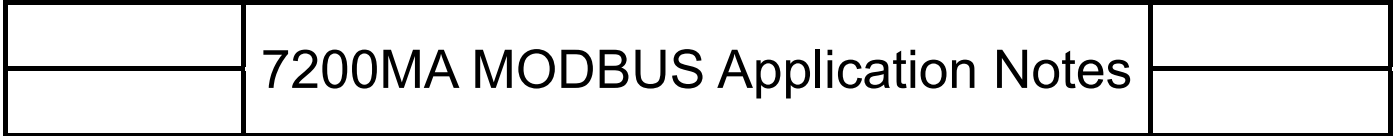


Code	Function	Remark
03H	Read Data from Holding Register	_____
08H	Loop Test	_____
10H	Write Data to Holding Register	slave address can be 0

Detail descriptions will be discuss later because it depends on different Function Code.

CRC-16 Generation Procedure :

- [illegible]



- ① Please refer to the “Message Format” in next page about inverter returning messages for more detail descriptions.
- ② It needs 5ms to return messages after inverter had received normal message from host controller.
- ③ In next two cases, inverter does not return any message :
 - There are any error detection in received data message (parity error, framing error, overrun error or CRC-16 error).
 - Slave Address character is different to parameter Sn-36 (Inverter Slave No.).

[illegible]



7200MA supports 3 MODBUS Function Codes only.

Table1 Message Length

Function	Code	Description	Host Query		Inverter Return	
			Byte (Min.)	Byte (Max.)	Byte (Min.)	Byte (Max.)
Data Read	03H	Read Data from Holding Register	8	8	7	37
Loop Test	08H	Loop Test	8	8	8	8
Data Write	10H	Write Data to Holding Register	11	41	8	8

Host Query

Slave Address		01H
Function Code		03H
Head Address	High Byte	00H
	Low Byte	00H
Access Count	High Byte	00H
	Low Byte	01H
CRC-16	Low Byte	84H
	High Byte	0AH

(*1)

Slave Address		01H
Function Code		03H
Data Byte Count		02H
Data Value	High Byte	00H
	Low Byte	00H
CRC-16	Low Byte	B8H
	High Byte	44H

Inverter Return(Error Detected)

Slave Address		01H
80H+Function Code		83H
Error Code		03H
CRC-16	Low Byte	01H
	High Byte	31H

*1 Host controller can read 16 registers at most in each transferring message.

Host Query

(*1)

Slave Address		01H
Function Code		08H
Test Code	High Byte	00H
	Low Byte	00H
Test Data	High Byte	AAH
	Low Byte	55H
CRC-16	Low Byte	5EH
	High Byte	94H

Slave Address		01H
80H+Function Code		88H
Error Code		01H
CRC-16	Low Byte	87H
	High Byte	C0H

*1 Test Data can be any random value.

Host Query

(*1)

Slave Address	01H
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Slave Address		01H
Function Code		10H
Head Address	High Byte	00H
	Low Byte	00H
Access Count	High Byte	00H
	Low Byte	01H
CRC-16	Low Byte	01H
	High Byte	C9H

Slave Address	01H
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Slave Address		01H
80H+Function Code		90H
Error Code		03H
CRC-16	Low Byte	0CH
	High Byte	01H

- *1. Host controller can write 16 registers at most in each transferring message.
- *2. $\text{Data Byte Count} = 2 * \text{Access Count}$
- *3. If Slave Address of Host Query message is 0, all slave stands will execute this command but do not return the message to master.

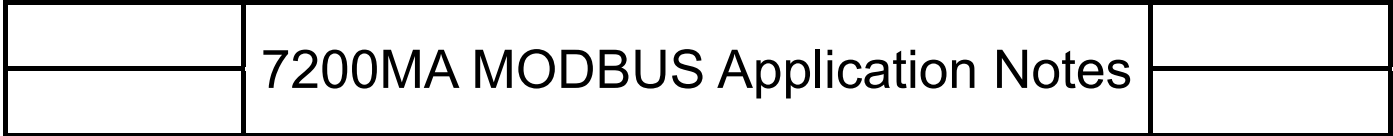
Run/Stop, Fault Reset (0000H) and Frequency Reference (0001H).

- *4. Change 7200MA to PRG Mode, write data to address 0900H, we can save parameter value to E²PROM.



(1) Control Data Register(Read/Write)

*1. Control Data Register can be used for Slave Address '0' write-in message.

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Address	Bits	Function Description
0020H	0	1 : Running
	1	1 : Zero Speed
	2	1 : Reverse
	3	1 : Inverter Ready
	4	1 : DRV Mode ; 0 : PRG Mode
	5	1 : 440V Series ; 0 : 220V Series
	6	1 : Inverter Alarm
	7	1 : Inverter Fault
	8	1 : Reserved
	9	1 : Reserved
	10	1 : Reserved
	11	1 : LCD Digital Operator
	12	0001 : Parameter Setting Invalid 0010 : Multi-Function Digital Input Parameter Setting Invalid 0011 : Auto-Run Mode Parameter Setting Invalid 0100 : V/F Pattern Parameter Setting Invalid
	13	0101 : Frequency Limit Parameter Setting Invalid 0110 : Jump Frequency Parameter Setting Invalid 0111 : PG Parameter Setting Invalid
	14	1000 : Reserved 1001 : Reserved 1010 : Reserved 1011 : Reserved
	15	1100 : Reserved 1101 : Reserved 1110 : Reserved 1111 : Reserved

[illegible]

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Address	Parameter	Unit
0101H	Sn-01 (Inverter capacity selection)	—
0102H	Sn-02 (V/F curve selection)	—
0103H	Sn-03 (Operator display)	—
0104H	Sn-04 (Run Source selection)	—
0105H	Sn-05 (Frequency Command selection)	—
0106H	Sn-06 (Stopping method selection)	—
0107H	Sn-07 (Priority of stopping)	—
0108H	Sn-08 (Prohibition of REV run)	—
0109H	Sn-09 (Output frequency Up/Down function)	—
010AH	Sn-10 (Frequency command characteristics Selection)	—
010BH	Sn-11 (Scanning times at input terminal)	—
010CH	Sn-12 (Over torque detection selection)	—
010DH	Sn-13 (Output voltage limit selection)	—
010EH	Sn-14 (Stall prevention during Accel. function selection)	—
010FH	Sn-15 (Stall prevention during Decel. function selection)	—
0110H	Sn-16 (Stall prevention during running function selection)	—
0111H	Sn-17 (Fault retry setting)	—
0112H	Sn-18 (Operation selection at power loss)	—
0113H	Sn-19 (Zero speed braking operation selection)	—
0114H	Sn-20 (External fault ③ contact selection)	—
0115H	Sn-21 (External fault ③ detection selection)	—
0116H	Sn-22 (External fault operation selection)	—
0117H	Sn-23 (Motor overload protection selection)	—
0118H	Sn-24 (Vin, Ain function selection)	—
0119H	Sn-25 (DI ⑤ function Selection)	—
011AH	Sn-26 (DI ⑥ function Selection)	—
011BH	Sn-27 (DI ⑦ function Selection)	—
011CH	Sn-28 (DI ⑧ function Selection)	—
011DH	Sn-29 (Aux function selection)	—
011EH	Sn-30 (RA-RB-RC function selection)	—
011FH	Sn-31 (DO1 function selection)	—
0120H	Sn-32 (DO2 function selection)	—
0121H	Sn-33 (AO1 function selection)	—
0122H	Sn-34 (AO2 function selection)	—
0123H	Sn-35 (Pulse output multiplier selection)	—

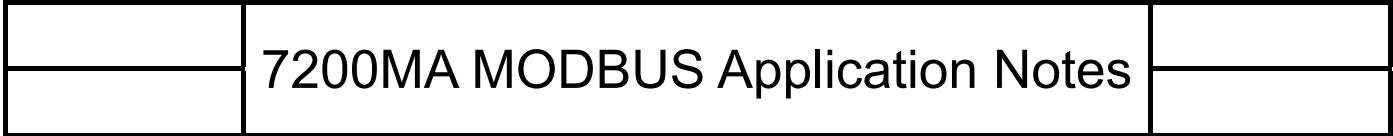
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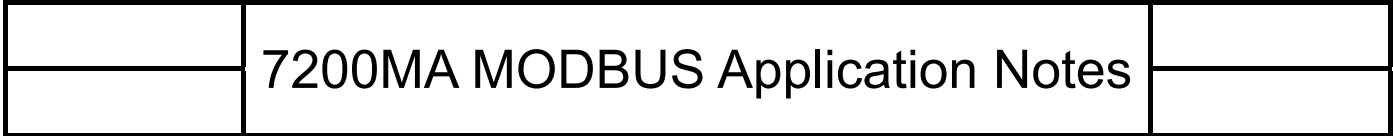
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*1. These parameters can be written in DRV mode or PRG mode.

*2. Writing data 0000H to this address in PRG mode can save parameter to E²PROM.

All parameters can be read in PRG mode or DRV mode, but some parameters can be written in PRG mode only.



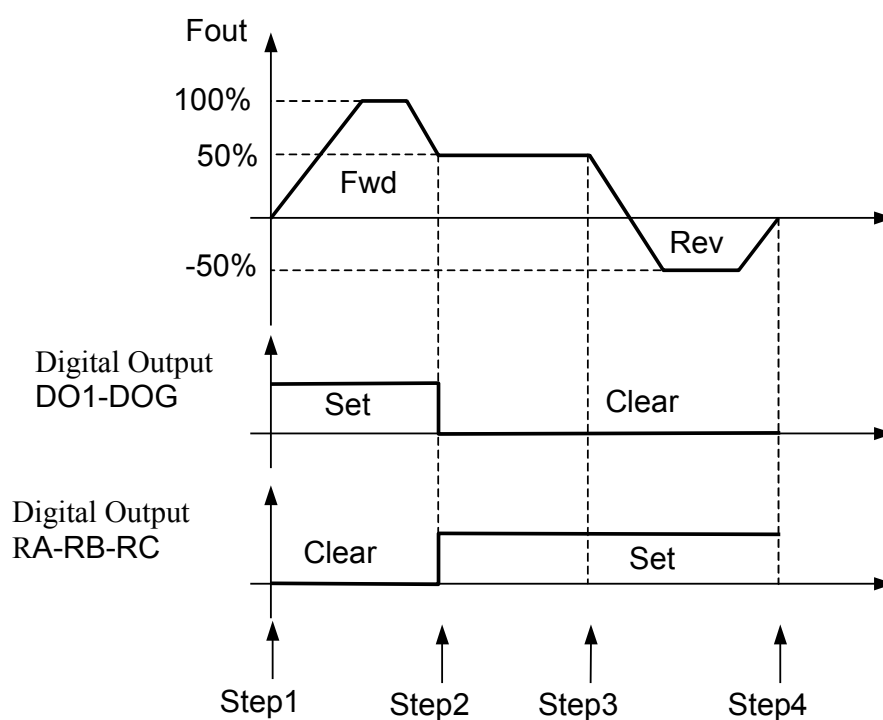
Code	Description	Possible Cause
00H	CRC Code Error	CRC Word (High or Low Byte) Error
01H	Function Code Error	Function Code is not equal to 03H, 08H or 10H.
02H	Register Address Error	Register Address is not in the range that can be accessed.
03H	Data Value Error	Data Value is over range in writing message.
04H	Parameter Save Failure	Can not save into EEPROM.
06H	Parameter Save Busy	Saving into EEPROM is doing.
Not Response	UART Error	Parity, Overrun, Frame Error
Not Response	Data Format Error	Data String is not correct.

Firstly, Set Inverter parameters

Sn-04 = 2 (Run/Stop by RS-485)

Sn-30 = 22 (RA Output by RS-485), Sn-31 = 22 (DO1Output by RS-485)

Secondly, Host Controller can control the inverter 7200MA via RS-485 serial communication by executing the following procedures:



- (1) Run 7200MA forward with 100% Speed. Set DO1-DOG.
- (2) Run 7200MA forward with 50% Speed. Clear DO1-DOG. Set RA-RB-RC.
- (3) Run 7200MA reverse with 50% Speed. Set RA-RB-RC.
- (4) Stop 7200MA. Set RA-RB-RC.

Host Query

Inverter Return

Slave Address		01H
Function Code		10H
Head Address	High Byte	00H
	Low Byte	00H
Access Count	High Byte	00H
	Low Byte	08H
CRC-16	Low Byte	C1H
	High Byte	CFH

Data Value8 of Address 0007H = 0002H:Set DO1-DOG.

※ When inverter received this message, it will start and accelerate to 100% speed in forward direction, digital output terminal DO1-DOG Set.

Host Query

Inverter Return

Slave Address		01H
Function Code		10H
Head Address	High Byte	00H
	Low Byte	00H
Access Count	High Byte	00H
	Low Byte	08H
CRC-16	Low Byte	C1H
	High Byte	CFH

Data Value8 of Address 0007H = 0001H: Set RA-RB-RC.

- ✖ When inverter received this message, it will start and decelerate to 50% speed in forward direction, digital output terminal DO1-DOG clear, digital output RA-RB-RC set.

Host Query

Inverter Return

Slave Address		01H
Function Code		10H
Head Address	High Byte	00H
	Low Byte	00H
Access Count	High Byte	00H
	Low Byte	08H
CRC-16	Low Byte	C1H
	High Byte	CFH

Data Value8 of Address 0007H = 0001H: Set RA-RB-RC.

- ✖ When inverter received this message, it will start and decelerate to 50% speed in reverse direction, digital output terminal DO1-DOG clear, digital output RA-RB-RC set.

Slave Address		01H
Function Code		10H
Head Address	High Byte	00H
	Low Byte	00H
Access Count	High Byte	00H
	Low Byte	01H
CRC-16	Low Byte	C1H
	High Byte	CFH