RS485
MODBUS-RTU
General Problem

Version：V1.02

目錄(Catalog)

1. Modbus-RTU Introduction

1.1 Modbus-RTU Communication Rule

Characteristics of RTU mode transmission	
Coding System	Binary
Start bits	1
Data bits (least significant first)	8
Parity	No parity
Error checking	CRC (Cyclical Redundancy Check)

2. Modbus-RTU Function

2.1 Function Code — 01 Read DO Bits(Read DO Bits Status)

Read Output Status Query message from master

Slave Unit ID	Function	Start Address (High)	Start Address (Low)	No. of Coils (High)	No. of Coils (Low)	CRC (Low)	CRC (High)
01 **	01	00 *2	00 *2	00 *3	10 *3	-- *1	-- *1

Read Output Status Response message from slave

Slave Unit ID	Function	Byte Count	Coil Status 0-7	Coil Status 8-15	CRC (Low)	CRC (High)
01 **	01	02 *4	D3 *5	86 *5	-- *1	-- *1

**：For each drive unit, the "Unit-ID" (in parameter Pr.071) must be assigned uniquely (range=1~63).
In this case, drive unit no.1 is requested.

*1: "--" CRC value must be evaluated

*2: 16 bits hex value, means start address 0x0000

*3: 16 bits hex value, means a total of 0x0010 (16D) coils data are requested

*4: two bytes in total will sent to master

*5: Coil status (assumed value)

2.2 Function Code — 02 Read DI Bits(Read DI Bits Status)

Read Input Status Query message from master

Slave Unit ID	Function	Start Address (High)	Start Address (Low)	No. of Inputs (High)	No. of Inputs (Low)	CRC (Low)	CRC (High)
05 **	02	00 *2	00 *2	00 *3	20 *3	-- *1	-- *1

Read Input Status Response message from slave

Slave Unit ID	Function	Byte Count	Input Status (0-7)	Input Status 8-15	Input Status 16-23	Input Status 24-31	CRC (Low)	CRC (High)
05 **	02	04 *4	36 *5	79 *5	21 *5	AF *5	-- *1	-- *1

**： Assume drive unit no.5 is requested.

*1："--" CRC value must be evaluated

*2： 16 bits hex value, means start address 0x0000

*3： 16 bits hex value, means a total of 0x0020 (32D) inputs data are requested

*4： Four bytes in total will sent to master

*5： Input status (assumed value)

- Original Function Code - 1 & - 2 are used for checking the DO & DI status of an Modicon-PLC. For servo-drive, they serves exactly the same function, because,both functions can be used to Read the DI/DO status of servo drive.
- This example is equivalent to "Read 32 Bit-Status of Drive no.5"

2.3 Function Code — 04 Read Input Registers(Read Parameters)

Read Input Register Query Message

Slave ID	Function	Start Address (High)	Start Address (Low)	Input Registers (High)	Input Registers (Low)	CRC (Low)	CRC (High)
12 **	04	01 *2	08 *2	00 *3	01 *3	-- *1	-- *1

Read Input Register Response Message

Slave ID	Function	Byte Count	Data of Address 0x0108 (High)	Data of Address 0x0108 (Low)	CRC (Low)	CRC (High)
12 **	04	02 *4	00 *5	00 *5	-- *1	-- *1

**：Assume drive unit no.18 is requested.

*1： "--" CRC value must be evaluated

*2： 16 bits hex value, means the value of Input registers from start address 0x0008 is desired

*3:：16 bits hex value, means a total of 0x0001 1 Words Input register is requested

*4:：two bytes in total will sent to master

*5： value in input register 0x0108 is 0x0000 (assumed value)

- Originally, Modbus Function Code - 3 & - 4 are used for reading the Output & Input Registers of an Modicon-PLC.
- For Servo-drive, they serves exactly the same function, because,both functions can be used to Read the Parameters of servo drive.
- The above example is equivalent to "Read Pr.264 of Drive no.18" by Modbus.

2.4 Function Code — 05: Force Single Coil(Control Bit On/OFF)

Force Single Coil Query Message

Slave ID	Function	Bit-Address (High)	Bit-Address (Low)	DATA ON/OFF	DATA	CRC (Low)	CRC (High)
02 **	05	00 *2	07 *2	FF *3	00 *4	-- *1	-- *1

Force Single Coil Response Message

Slave ID	Function	Bit-Address (High)	Bit-Address (Low)	DATA ON/OFF	DATA	CRC (Low)	CRC (High)
02 **	05	00 *2	07 *2	FF *3	00 *4	-- *1	-- *1

**: Assume drive unit no.2 is requested.

*1: "--" CRC value must be evaluated

*2: Bit-7 (DI-7) is selected to modify

*3: if this value = FF, set the bit ON, if this value =00, cleat the bit OFF.

*4: always =00

2.5 Function Code — 06 Preset Single Registers(Write Parameter with 1 word)

Preset Single Register Query Message

Slave ID	Function	Register-Address (High)	Register-Address (Low)	New DATA (High)	New DATA (Low)	CRC (Low)	CRC (High)
01 **	06	01 *2	00 *2	00 *3	64 *3	-- *1	-- *1

Preset Single Register Response Message

Slave ID	Function	Register-Address (High)	Register-Address (Low)	New DATA (High)	New DATA (Low)	CRC (Low)	CRC (High)
01 **	06	01 *2	00 *2	00 *3	64 *3	-- *1	-- *1

**：Assume drive unit no.1 is requested.

*1： "--" CRC value must be evaluated

*2： Address 0x0100 ==> Pr.256 is selected to change value

*3:：Set New Data = 0x0064

- The above example is equivalent to "Write 100 to Pr.256 of Drive no.1".

2.6 Function Code — 16 Preset Multiple Registers(Write Parameter with 2 words)

Preset Multiple Register Query Message

Slave ID	Function	Register-Address		QUANTITY		Byte Count	New DATA1		New DATA2		CRC	
		(High)	(Low)	(High)	(Low)		(High)	(Low)	(High)	(Low)	(Low)	(High)
01 **	10	01 *2	00 *2	00 *3	02 *3	04 *4	56 *5	78 *5	12 *6	34 *6	-- *1	-- *1

Preset Multiple Register Response Message

Slave ID	Function	Register-Address		QUANTITY		CRC	
		(High)	(Low)	(High)	(Low)	(Low)	(High)
01 **	10	01 *2	00 *2	00 *3	02 *3	-- *1	-- *1

**:：Assume drive unit no.1 is requested.

*1： "--" CRC value must be evaluated

*2:：Long 1 Word Address 0x0101/0x0100 ==> Pr.257/256 is selected to change value

*3： Only Long 1 Word is accepted. The quantity value other than 0x0002 is not allowed.

*4:：Total byte counts=4

*5： New data for Pr.256 (Low 1 Word)

*6： New data for Pr.257 (High 1 Word)

- The above example is equivalent to "Write long 1 Word data 0x12345678 to Pr.257/256 of Drive no.1".

2.7 Function Code — 08: Loop back Diagnostic test

Query message from master

Slave Unit ID	Function	DIAG Code (High)	DIAG Code (Low)	DATA*2 (High)	DATA*2 (Low)	CRC (Low)	CRC (High)
3F**	08	00	00	A5	37	--*1	--*1

Response message from slave

Slave Unit ID	Function	DIAG Code (High)	DIAG Code (Low)	DATA (High)	DATA (Low)	CRC (Low)	CRC (High)
3F	08	00	00	A5	37	--*1	--*1

**: Assume drive unit no.63 is requested to respond.

*1: "--" CRC value must be evaluated

*2: These are considered to be the information fields for diagnostic mode.

3. Modbus-RTU Q & A

- Q：Modbus 屬於哪一種格式?
  A：Modbus RTU 格式

- Q：CRC 為何種模式，因 CRC 有 CRC-12、CRC-16、CRC-32、CRC-CCITT 模式，不知 JPS 為何種?
  A：CRC-16

- Q：通訊格式中是否有起始、結束碼，如 CR、LF..,
  A：沒有 起始、結束碼

- Q：資料格式 ASCII、HEX…
  A：HEX

101. Modbus-RTU Introduction

101.1 Modbus-RTU Communication Rule

Characteristics of RTU mode transmission	
Coding System	Binary
Start bits	1
Data bits (least significant first)	8
Parity	No parity
Error checking	CRC (Cyclical Redundancy Check)

102. Modbus-RTU Function

102.1 Function Code — 01 Read DO Bits(Read DO Bits Status)

Read Output Status Query message from master

Slave Unit ID	Function	Start Address (High)	Start Address (Low)	No. of Coils (High)	No. of Coils (Low)	CRC (Low)	CRC (High)
01 **	01	00 *2	00 *2	00 *3	10 *3	-- *1	-- *1

Read Output Status Response message from slave

Slave Unit ID	Function	Byte Count	Coil Status 0-7	Coil Status 8-15	CRC (Low)	CRC (High)
01 **	01	02 *4	D3 *5	86 *5	-- *1	-- *1

**：For each drive unit, the "Unit-ID" (in parameter Pr.071) must be assigned uniquely (range=1~63).
In this case, drive unit no.1 is requested.

*1: "--" CRC value must be evaluated

*2: 16 bits hex value, means start address 0x0000

*3: 16 bits hex value, means a total of 0x0010 (16D) coils data are requested

*4: two bytes in total will sent to master

*5: Coil status (assumed value)

102.2 Function Code — 02 Read DI Bits(Read DI Bits Status)

Read Input Status Query message from master

Slave Unit ID	Function	Start Address (High)	Start Address (Low)	No. of Inputs (High)	No. of Inputs (Low)	CRC (Low)	CRC (High)
05 **	02	00 *2	00 *2	00 *3	20 *3	-- *1	-- *1

Read Input Status Response message from slave

Slave Unit ID	Function	Byte Count	Input Status (0-7)	Input Status 8-15	Input Status 16-23	Input Status 24-31	CRC (Low)	CRC (High)
05 **	02	04 *4	36 *5	79 *5	21 *5	AF *5	-- *1	-- *1

**： Assume drive unit no.5 is requested.

*1："--" CRC value must be evaluated

*2： 16 bits hex value, means start address 0x0000

*3： 16 bits hex value, means a total of 0x0020 (32D) inputs data are requested

*4： Four bytes in total will sent to master

*5： Input status (assumed value)

- Original Function Code - 1 & - 2 are used for checking the DO & DI status of an Modicon-PLC. For servo-drive, they serves exactly the same function, because,both functions can be used to Read the DI/DO status of servo drive.
- This example is equivalent to "Read 32 Bit-Status of Drive no.5"

102.3 Function Code — 04 Read Input Registers(Read Parameters)

Read Input Register Query Message

Slave ID	Function	Start Address (High)	Start Address (Low)	Input Registers (High)	Input Registers (Low)	CRC (Low)	CRC (High)
12 **	04	01 *2	08 *2	00 *3	01 *3	-- *1	-- *1

Read Input Register Response Message

Slave ID	Function	Byte Count	Data of Address 0x0108 (High)	Data of Address 0x0108 (Low)	CRC (Low)	CRC (High)
12 **	04	02 *4	00 *5	00 *5	-- *1	-- *1

**：Assume drive unit no.18 is requested.

*1： "--" CRC value must be evaluated

*2： 16 bits hex value, means the value of Input registers from start address 0x0008 is desired

*3:：16 bits hex value, means a total of 0x0001 1 Words Input register is requested

*4:：two bytes in total will sent to master

*5： value in input register 0x0108 is 0x0000 (assumed value)

- Originally, Modbus Function Code - 3 & - 4 are used for reading the Output & Input Registers of an Modicon-PLC.
- For Servo-drive, they serves exactly the same function, because,both functions can be used to Read the Parameters of servo drive.
- The above example is equivalent to "Read Pr.264 of Drive no.18" by Modbus.

102.4 Function Code — 05: Force Single Coil(Control Bit On/OFF)

Force Single Coil Query Message

Slave ID	Function	Bit-Address (High)	Bit-Address (Low)	DATA ON/OFF	DATA	CRC (Low)	CRC (High)
02 **	05	00 *2	07 *2	FF *3	00 *4	-- *1	-- *1

Force Single Coil Response Message

Slave ID	Function	Bit-Address (High)	Bit-Address (Low)	DATA ON/OFF	DATA	CRC (Low)	CRC (High)
02 **	05	00 *2	07 *2	FF *3	00 *4	-- *1	-- *1

**: Assume drive unit no.2 is requested.

*1: "--" CRC value must be evaluated

*2: Bit-7 (DI-7) is selected to modify

*3: if this value = FF, set the bit ON, if this value =00, cleat the bit OFF.

*4: always =00

102.5 Function Code — 06 Preset Single Registers(Write Parameter With 1 word)

Preset Single Register Query Message

Slave ID	Function	Register-Address (High)	Register-Address (Low)	New DATA (High)	New DATA (Low)	CRC (Low)	CRC (High)
01 **	06	01 *2	00 *2	00 *3	64 *3	-- *1	-- *1

Preset Single Register Response Message

Slave ID	Function	Register-Address (High)	Register-Address (Low)	New DATA (High)	New DATA (Low)	CRC (Low)	CRC (High)
01 **	06	01 *2	00 *2	00 *3	64 *3	-- *1	-- *1

**：Assume drive unit no.1 is requested.

*1： "--" CRC value must be evaluated

*2： Address 0x0100 ==> Pr.256 is selected to change value

*3:：Set New Data = 0x0064

- The above example is equivalent to "Write 100 to Pr.256 of Drive no.1".

102.6 Function Code — 16 Preset Multiple Registers(Write Parameter With 2 words)

Preset Multiple Register Query Message

Slave ID	Function	Register-Address		QUANTITY		Byte Count	New DATA1		New DATA2		CRC	
		(High)	(Low)	(High)	(Low)		(High)	(Low)	(High)	(Low)	(Low)	(High)
01 **	10	01 *2	00 *2	00 *3	02 *3	04 *4	56 *5	78 *5	12 *6	34 *6	-- *1	-- *1

Preset Multiple Register Response Message

Slave ID	Function	Register-Address		QUANTITY		CRC	
		(High)	(Low)	(High)	(Low)	(Low)	(High)
01 **	10	01 *2	00 *2	00 *3	02 *3	-- *1	-- *1

**:：Assume drive unit no.1 is requested.

*1： "--" CRC value must be evaluated

*2:：Long 1 Word Address 0x0101/0x0100 ==> Pr.257/256 is selected to change value

*3： Only Long 1 Word is accepted. The quantity value other than 0x0002 is not allowed.

*4:：Total byte counts=4

*5： New data for Pr.256 (Low 1 Word)

*6： New data for Pr.257 (High 1 Word)

- The above example is equivalent to "Write long 1 Word data 0x12345678 to Pr.257/256 of Drive no.1".

102.7 Function Code — 08: Loop back Diagnostic test

Query message from master

Slave Unit ID	Function	DIAG Code (High)	DIAG Code (Low)	DATA*2 (High)	DATA*2 (Low)	CRC (Low)	CRC (High)
3F**	08	00	00	A5	37	--*1	--*1

Response message from slave

Slave Unit ID	Function	DIAG Code (High)	DIAG Code (Low)	DATA (High)	DATA (Low)	CRC (Low)	CRC (High)
3F	08	00	00	A5	37	--*1	--*1

**: Assume drive unit no.63 is requested to respond.

*1: "--" CRC value must be evaluated

*2: These are considered to be the information fields for diagnostic mode.

103. Modbus-RTU Q & A

- Q：What protocol does Modbus belong to ?
  A：Modbus RTU protocol。

- Q：What type does CRC belong to，CRC-12、CRC-16、CRC-32、CRC-CCITT ?
  A：belong to CRC-16

- Q：Does RTU-communication has start、end ，like CR、LF..,
  A：No。

- Q：What format with Modbus-RTU，ASCII、HEX…
  A：belong to HEX

正頻企業股份有限公司
JOINT PEER SYSTEC CORP.
台北縣深坑鄉北深路 3 段 266 號 6 樓
TEL:886-2-26646866 FAX:886-2-26644889
http://www.jps.com.tw
E-mail:jps.service@jps.com.tw