

FnIO M - Series:

M9222

M9222 (PROFIBUS Network Adapter(Single Type))

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History

REV.	PAGES	REMARKS	DATE	Editor
1.00		Preliminary	Nov 25, 2019	JY BAE
1.03	34	Modify Firmware Revision	2020/10/29	CW SEO
1.04		Remove Description pages of Hot Swap Function, Use in Hazardous Environments and Caution(Before using the unit)	2020/12/7	SJ LIM
1.05	5	Environment Specification Update	2021/11/16	EC KIM
1.06	5	Certificate Update	2023/06/01	CW SEO
1.07	9	Document Number Added Exception Indication Added	2024/09/19	SH PARK

1. ENVIRONMENT SPECIFICATION

Environmental specification	
Operating Temperature	-25℃~60℃
UL Temperature	-25℃~60℃
Storage Temperature	-40℃~85℃
Relative Humidity	5% ~ 90% non-condensing
Mounting	DIN rail
General specification	
Shock Operating	IEC 60068-2-27
Vibration Resistance	IEC 60068-2-6, 4g
Industrial Emissions	EN 61000-6-4/A11 : 2011
Industrial Immunity	EN 61000-6-2 : 2019
Installation Position	Vertical and horizontal installation is available.
Product Certifications	UL, ATEX, CE, UKCA

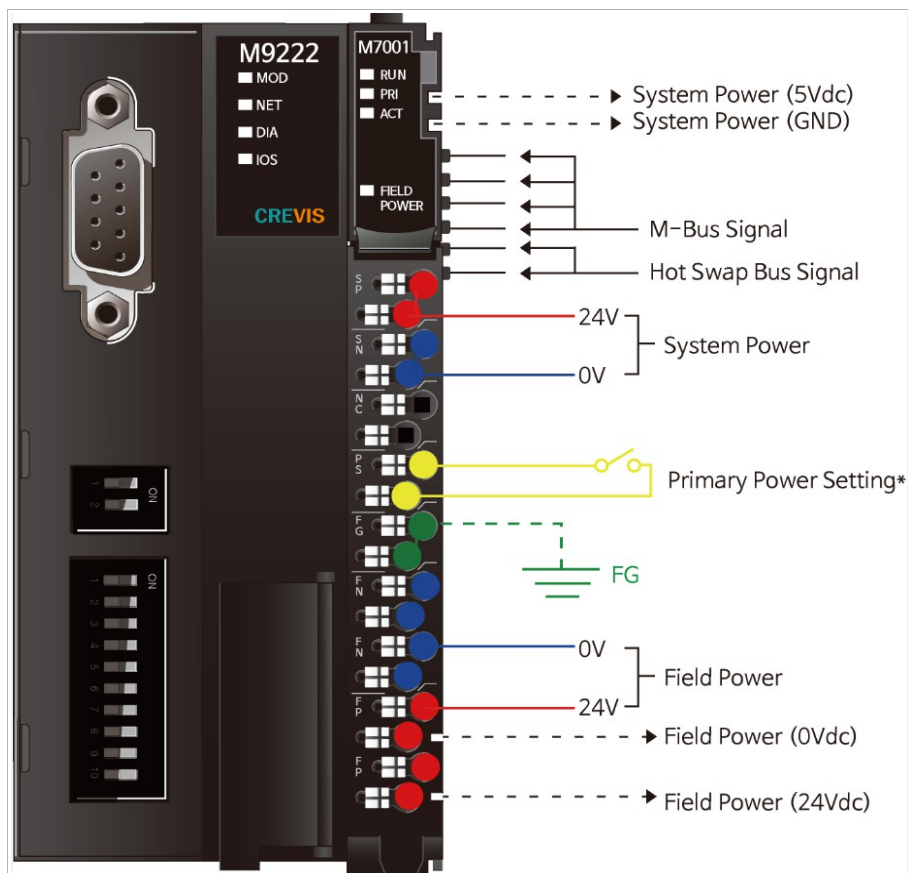
2. M9222 (Profibus NETWORK ADAPTER)

2.1. M9222 Specification

Items	Specification
Communication Interface Specification	
Repeater Control Signal	RS-485 Signal
Freeze mode	Support
Sync mode	Support
Auto baudrate	Support
Station type	Slave
FMS support	Not supported
Max. Network Node	125 Nodes
Max. Expansion Slot	63 Slots
I/O Data Size	Input : 244bytes / Output : 244bytes
Indicator	4 LEDs 1 Green/Red, Module Status (MOD) 1 Green, Receive Data (NET) 1 Green, Transmit Data (DIA) 1 Green/Red, Expansion I/O Module Status (IOS)
Communication Rate	9.6K ~ 12M (1.2Km~100m)
Communication Speed	9.6 ~ 12000 Kbps (Auto baudrate selection)
Bus Connection	9 Pin D-Sub Connector
Serial Port	RS232 for MODBUS/RTU, Touch Pannel or IOGuidePro
Serial Configuration (RS232)	Node : 1 (Fixed) Baud Rate : 115200 (Fixed) Data bit : 8 (Fixed) Parity bit : No parity (Fixed) Stop bit : 1 (Fixed)
Module Location	Starter module left side of M-Series system
General specification (Supplied by M7001)	
UL System Power	Supply voltage : 24Vdc nominal, Class 2
[[[[System Power	Supply voltage : 24Vdc nominal Supply voltage range : 15~28.8Vdc Protection : Output current limit, Reverse polarity protection
Power Dissipation	80mA typical @ 24Vdc
Current for I/O Module	2.0A @ 5Vdc (If except for NA, current for I/O module is about 1.5A)
Isolation	System power to internal logic : Non-isolation System power I/O driver : Isolation
UL Field Power	Supply voltage : 24Vdc nominal, Class 2
Field Power	Supply voltage : 24Vdc typical (Max. 28.8Vdc) * Field Power Range is different depending on IO Module series. Refer to IO Module's Specification.
Max. Current Field Power Contact	DC 10A Max
Single Wire	0.205mm ² - 1.3mm ² (24-16 AWG)
Torque	0.8Nm(7 lb-in)
Weight	179g
Module Size	54mm x 110mm x 75mm
Environment Condition	Refer to '1. Environment Specification'

* Class 2, adjacent to voltage rating (30Vmax)

2.2. M9222 Wiring Diagram



* Primary Power Setting (P.S pin)

- Short the P.S pin to set one of the two M7001 as the primary power.

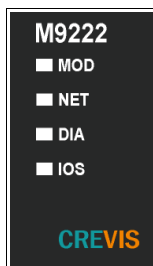
Pin No.	Signal Description
0	SP System Power, 24V
1	SP System Power, 24V
2	SN System Power, 0V(GND)
3	SN System Power, 0V(GND)
4	NC -----
5	NC -----
6	PS Primary Power Setting
7	PS Primary Power Setting
8	FG F.G
9	FG F.G
10	FN Field Power 0V (GND)
11	FN Field Power 0V (GND)
12	FN Field Power 0V (GND)
13	FN Field Power 0V (GND)
14	FP Field Power 24V
15	FP Field Power 24V
16	FP Field Power 24V
17	FP Field Power 24V

Series No	Through Air	Over Surface	CTI
RTB18C	1.5mm	1.5mm	175≤CTI≤400

Spacings : The following minimum spacing in inches (millimeters) shall be maintained between uninsulated live parts of opposite polarity; and between an uninsulated live part and a grounded part including any mounting surface or exposed metal part.

2.3. M9222 LED Indicator

2.3.1. LED Indicator



LED No.	LED Function / Description	LED Color
RUN	M-Bus Status	Green/Red
NET	Network Status	Green/Red
DIA	Diagnostic Status	Red
IOS	Expansion Module Status	Green/Red

2.3.2. MOD (Module Status LED)

Status	LED	To indicate
Not Powered	OFF	Power is not supplied to the unit.
Device Operational	Green	The unit is operating in normal condition.
Device in Standby	Flashing Green	The EEPROM parameter is not initialized yet. Serial Number is zero value (0x00000000)
Minor Fault	Flashing Red	The unit has occurred recoverable fault in self-testing. - EEPROM checksum fault.
Unrecoverable Fault	Red	The device has an unrecoverable fault. - Memory error or CPU watchdog error.

2.3.3. NET (Network Status LED)

Status	LED	To indicate
Not Powered, Not On-line	OFF	Device is not on-line or may not be powered
On-line, Not connected	Flashing Green	Device is on-line but has no connections in the established state. - Not allocated to a master
On-line, Connected	Green	Device is on-line and allocated to a master
Connection Time-out	Flashing Red	One or more I/O connections are in the time-out state.
Critical Communication Failure	Red	Failed communication

2.3.4. DIA(Diagnostic Status LED)

Status	LED	To indicate
Hardware Error	Flashing Red	Device has hardware checking error. (with MOD led is red.)
Expansion Module Error	Flashing Red	Device has expansion module error. (with IOS led is red.)
IO Configuration Error	Flashing Red	Failed to initialize expansion module - Overflow Input/Output size. (244bytes / 244bytes) - Overflow Configuration data size. (244bytes / 244bytes) - Too many expansion module. (Max 63 slot) - Mismatch vendor code between adapter and expansion module.

2.3.5. IOS LED (Extension Module Status LED)

Status	LED	To indicate
Not Powered	OFF	Device may not be powered.
On-line, Do not Exchanging I/O	Flashing Green	I/O Communication is normal but does not exchanging I/O data. (Passed the expansion module configuration)
Connection, Run Exchanging I/O	Green	Exchanging I/O data.
Connection Fault during Exchanging I/O	Red	One or more expansion module occurred in fault state. - Changed expansion module configuration.

		- Communication failure. - Mismatch vendor code between adapter and expansion module.
Expansion Configuration Failed	Flashing Red	Failed to initialize expansion module. - Detect invalid expansion module ID. - Overflow Input/Output size. (244bytes / 244bytes) - Too many expansion module. - Initial protocol failure. - If Hotswap function is enable, configured module is incorrect.

2.3.6. Exception Indication

To indicate	LED			
	MOD	NET	DIA	IOS
Overcurrent Consumption	Flashing Red	OFF	OFF	Red

2.4. M7001 LED Indicator

2.4.1. LED Indicator



ED No.	LED Function / Description	LED Color
RUN	M-Bus Status	Green
PRI	Primary Status	Green
ACT	Active	Green
Field Power	Field Power Enable	Green

2.4.2. RUN(RUN Status LED)

Status	LED	To indicate
Main Power Module	Green On	When the Power Module is operating in main operation.
Substitution Power Module	Green Off	Standby with Substitution Power Module.

2.4.3. PRI(Primary Status LED)

Status	LED	To indicate
Main Power Module	Green On	When the Power Module is operating in main operation.
Substitution Power Module	Green Off	Standby with Substitution Power Module.

2.4.4. ACT(Active Status LED)

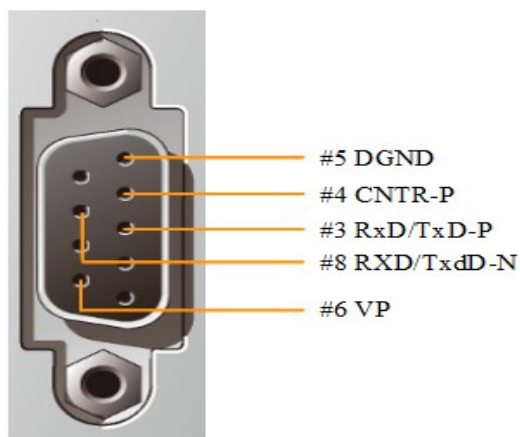
Status	LED	To indicate
Main Power Module	Green On	When the Power Module is operating in main operation.
Substitution Power Module	Green Off	Standby with Substitution Power Module.

2.4.5. Field Power LED (Field Power Status LED)

Status	LED	To indicate
No field power	OFF	Not supplied 24Vdc field power.
Supplied field power	Green	Supplied 24Vdc field power

2.5. M9222 Electrical Interface

2.5.1. PROFIBUS Connector

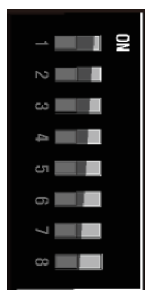


Pin No.	Description
3	RxD / TxD-P
4	CNTR-P
5	DGND
6	VP
8	RxD / TxD-N

2.5.2. Dip Switch



Terminating Resistance	1	2
Applied	On	On
Not applied	Off	Off

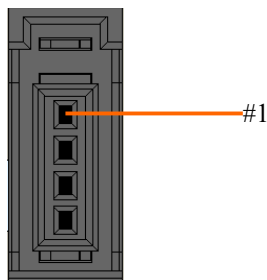


Node ID	1	2	3	4	5	6	7	8
1	On	Off	Off	Off	Off	Off	Off	Off
2	Off	On	Off	Off	Off	Off	Off	Off
~								
125	On	Off	On	On	On	On	On	Off

1) If switch value is 0, change the node ID is 1.

2.5.3. RS232 Port for MODBUS/RTU

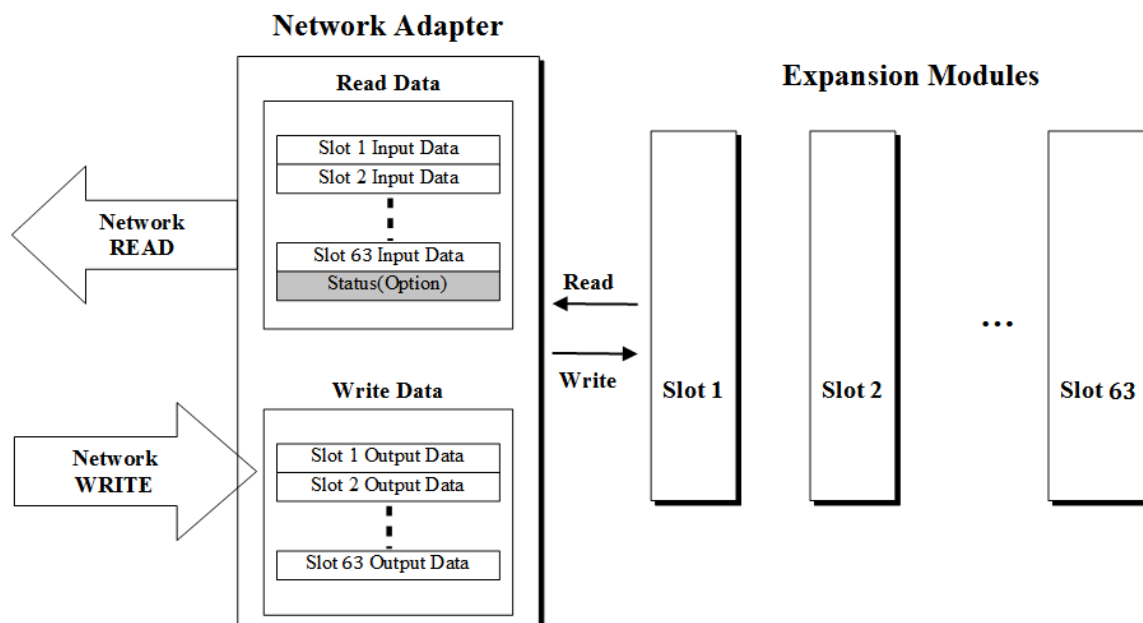
The configuration interface used for the communication with IO Guide Pro or for firmware download.



Pin#	Signal Name	Description
1	Reserved	----
2	TXD	RS232 TXD
3	RXD	RS232 RXD
4	GND	RS232 GND

2.6. Process Image Map

An expansion module may have 3 types of data as I/O data, configuration parameter and memory register. The data exchange between network adapter and expansion modules is done via an I/O process image data by M-Series protocol. The following figure shows the data flow of process image between network adapter and expansion modules.



Specification

2.6.1. Example of Input and Output Process Image Map

Input image data depends on slot position and expansion slot data type. Input process image data is only ordered by expansion slot position

- For example slot configuration



Slot No.	Module Description
#0	MODBUS/TCP Adapter
#1	Power Input
#2	Power Input
#3	16-discrete input
#4	16-discrete output
#5	16-analog input
#6	8-analog output
#7	8-discrete output
#8	8-discrete output

- Input Process Image

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Power module (Slot#1)							
1	Power module (Slot#2)							
2	Analog Input Ch0 low byte (Slot#5)							
3	Analog Input Ch0 high byte (Slot#5)							
4	Analog Input Ch1 low byte (Slot#5)							
5	Analog Input Ch1 high byte (Slot#5)							
...	...							
...	...							
30	Analog Input Ch14 low byte (Slot#5)							
31	Analog Input Ch14 high byte (Slot#5)							
32	Analog Input Ch15 low byte (Slot#5)							
33	Analog Input Ch15 high byte (Slot#5)							

- Output Process Image

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Discrete Output 8 pts (Slot#1)							
1	Discrete Output 8 pts (Slot#2)							
2	Analog Output Ch0 low byte (Slot#6)							
3	Analog Output Ch0 high byte (Slot#6)							
4	Analog Output Ch1 low byte (Slot#6)							
5	Analog Output Ch2 high byte (Slot#6)							
...	...							
...	...							
14	Analog Output Ch6 low byte (Slot#6)							
15	Analog Output Ch6 high byte (Slot#6)							
16	Analog Output Ch7 low byte (Slot#6)							
17	Analog Output Ch7 high byte (Slot#6)							

3. Parameter

3.1. M9222

- ☐ Parameter length: 3 bytes
- ☐ Parameter Data:

Offset	Access	Decimal Bit	Description	Default Value
3	R/W	00-01	Word Data Format 0: Little-Endian(INTEL) 1: Big-Endian (MOTOROLA)	1 (Motorola)
		02-07	Reserved	0
4	R/W	00-01	Hot swap 0: Hotswap enable 0: Hotswap disable	0
		02-07	Reserved	0
5	R/W	00-01	PROFIBUS Disconnection 0: Fault values are switched 1: Hold Last states	0
		02-07	Reserved	0

4. DPV1 Service

4.1. MSAC1 Read(PROFIBUS-DP Extensions to EN50170)

■ MSAC1 Read request

Parameter	Description
Remote Address	Slave Address(0~99)
Slot Number	Slot Number : 0(M9222)
Index	253 : FW revision (Data size : 4 bytes) 254 : Vendor code (Data size : 1 byte)
Length	1~128

■ MSAC1 Read Confirm(+)

Parameter	Description
Remote Address	Slave Address(0~99)
Length	1~128
Data	User Data

■ MSAC1 Read Confirm (-)

Parameter	Description
Remote Address	Slave Address(0~99)
Error Decode	-
Error code 1	-
Error code 2	Reserved

4.2. MSAC1 Write(PROFIBUS-DP Extensions to EN50170)

■ MSAC1 Write request

Parameter	Description
Remote Address	Slave Address(0~99)
Slot Number	Slot Number : 0(M9222)
Index	254 : Vendor code (Data size : 5 bytes)
Length	1~128
Data	Vendor(Don't mention this in the User manual) - Data[0] : 0xAE - Data[1] : 0xBE - Data[2] : 0xCE - Data[3] : 0xDE - Vendor code

■ MSAC1 Write Confirm(+)

Parameter	Description
Remote Address	Slave Address(0~99)
Length	1~128

■ MSAC1 Write Confirm (-)

Parameter	Description
Remote Address	Slave Address(0~99)
Error Decode	-
Error_code 1	-
Error_code 2	Reserved

Parameter	Description
C Ref	Communication-Reference
Error Decode	-
Error_code 1	-
Error_code 2	Reserved

4.3. Error Decode (PROFIBUS-DP Extensions to EN50170)

- ▶ 0~127 : Reserved
- ▶ 128 : DPV1
- ▶ 129 ~253 : Reserved
- ▶ 254 : FMS
- ▶ 255 : HART

4.4. Error Code 1 (PROFIBUS-DP Extensions to EN50170)

Bit	7	6	5	4	3	2	1	0
1	- Error Class ✓ 0xA : Application class				- Error code 0 : Read Error 1 : Write Error 2 : Module Failure 3 ~7 : Reserved 8 : Version conflict 9 : Feature not supported 10~15 : User specific			
2	- Error Class ✓ 0xB : Access class				- Error code 0 : Invalid index 1 : Write length error 2 : Invalid slot 3 : Type conflict 4 : Invalid area 5 : state conflict 6 : access denied 7 : invalid range 8 : invalid parameter 9 : invalid type 10~15 : User specific			
3	- Error Class ✓ 0xC : Resource class				- Error code 0 : read constrain conflict 1 : Write constrain conflict 2 : Resource busy 3 : Resource unavailable 4 ~7 : Reserved 8~15 : User specific			
4	- Error Class ✓ 0xD : M9222 Specific Class				- Error code 1 : Slot Parameter write error 2 : Read memory error 3 : Write memory error			

5. Diagnostics

Byte	Item	Description
0	Station status 1	PROFIBUS Standard Diagnostic
1	Station status 2	
2	Station status 3	
3	Master Address	
4	PNO Ident Number High	
5	PNO Ident Number Low	

- Station Status 1~3

Station status			
1	Bit 7	Master_Lock	Slave is parameterized by another master
	Bit 6	Prm_Fault	Last parameter telegram faulty
	Bit 5	Inv._Sl_Res.	Implausible response of the slave
	Bit 4	Not_Supp.	Unknown command detected by the slave
	Bit 3	Ext_Diag	The area Ext_Diag is used for extended diagnostic
	Bit 2	Cfg_Fault	Slave is wrong parameterized
	Bit 1	Sta._Not_Rdy	Slave not ready
	Bit 0	Sta._Non_Exist.	Slave not responding
2	Bit 7	Deactivated	Slave not projected
	Bit 6	Reserved	Reserved
	Bit 5	Sync_Mode	Sync-command active
	Bit 4	Freeze_Mode	Freeze-command active
	Bit 3	WD_On	Watchdog activated
	Bit 2	1	Always 1
	Bit 1	Stat_Diag	Get diagnostic from slave, till bit is released
	Bit 0	Prm_	Slave must be parameterized
3	Bit 7	Ext_Diag_Ovfl.	The slave has more diagnostic data available than it can send
-	Bit 6~0	Reserved	Reserved

6. MODBUS INTERFACE

6.1. MODBUS Interface Register/Bit Map

- Register Map

Start Address	Read/Write	Description	Func. Code
0x0000 ~	Read	Process input image registers (Real Input Register)	3,4,23
0x0800 ~	Read/Write	Process output image registers (Real Output Register)	3,16,23
0x1000 *	Read	Adapter Identification special registers.	3,4,23
0x1020 *	Read/Write	Adapter Watchdog, other time special register.	3,4,6,16,23
0x1100 *	Read/Write	Adapter Information special registers.	3,4,6,16,23
0x2000 *	Read/Write	Expansion Slot Information special registers.	3,4,6,16,23

* The special register map must be accessed by read/write of each address (one address).

- Register Map

Start Address	Read/Write	Description	Func. Code
0x0000~	Read	Process input image bits All input register areas are addressable by bit address. Size of input image bit is size of input image register * 16.	2
0x1000~	Read/Write	Process output image bits All output register areas are addressable by bit address. Size of output image bit is size of output image register * 16.	1,5,15

6.2. Supported MODBUS Function Codes

Function Code	Function	Description
1(0x01)	Read Coils	Read output bit
2(0x02)	Read Discrete Inputs	Read input bit
3(0x03)	Read Holding Registers	Read output word
4(0x04)	Read Input Registers	Read input word
5(0x05)	Write Single Coil	Write one bit output
6(0x06)	Write Single Register	Write one word output
8(0x08)	Diagnostics	Read diagnostic register
15(0x0F)	Write Multiple Coils	Write a number of output bits
16(0x10)	Write Multiple registers	Write a number of output words
23(0x17)	Read/Write Multiple registers	Read a number of input words /Write a number of output words

- Refer to MODBUS APPLICATION PROTOCOL SPECIFICATION V1.1a

6.3. MODBUS Transmission Mode

Two different serial transmission modes are defined : The RTU mode and the ASCII mode. It defines the bit contents of message fields transmitted serially on the line. It determines how information is packed into the message fields and decoded.

6.3.1. RTU Transmission Mode

When devices communicate on a MODBUS serial line using the RTU (Remote Terminal Unit) mode, each 8-bit byte in a message contains two 4-bit hexadecimal characters. The main advantage of this mode is that its greater character density allows better data throughput than ASCII mode for the same baud rate. Each message must be transmitted in a continuous stream of characters.

Start	Address	Function	Data	CRC Check	End
≥ 3.5 char	1 char	1 char	Up to 252 chars(s)	2 chars	≥ 3.5 char

6.3.2. ASCII Transmission Mode

When devices are setup to communicate on a MODBUS serial line using ASCII (American Standard Code for Information Interchange) mode, each 8-bit byte in a message is sent as two ASCII characters. This mode is used when the physical communication link or the capabilities of the device does not allow the conformance with RTU mode requirements regarding timers management.

Start	Address	Function	Data	LRC Check	End
1 char “.”	2 chars	2 chars	Up to 2x252 char(s)	2 chars	2 chars CR,LF

6.3.3. 1 (0x01) Read Coils

This function code is used to read from 1 to 2000 contiguous status of coils in a remote device. The Request PDU specifies the starting address, i.e. the address of the first coil specified, and the number of coils. In the PDU Coils are addressed starting at zero. Therefore coils numbered 1-16 are addressed as 0-15. The coils in the response message are packed as one coil per bit of the data field. Status is indicated as 1= ON and 0= OFF.

• Request

Field name	Example	RTU	ASCII	ASCII (bus line)
Start of Frame	-	t1-t2-t3	“.”	0x3A
Slave Address	0x63	0x63	“63”	0x36, 0x33
Function Code	0x01	0x01	“01”	0x30, 0x31
Starting Address Hi	0x10	0x10	“10”	0x31, 0x30
Starting Address Lo	0x00	0x00	“00”	0x30, 0x30
Quantity of Outputs Hi	0x00	0x00	“00”	0x30, 0x30
Quantity of Outputs Lo	0x10	0x10	“10”	0x31, 0x30
Error Check (CRC/LRC)	-	0x31, 0x44	“7C”	0x37, 0x43
End of Frame	-	t1-t2-t3	CR, LF	0x0D, 0x0A

• Response

Field name	Example	RTU	ASCII	ASCII (bus line)
Start of Frame	---	t1-t2-t3	“.”	0x3A
Slave Address	0x63	0x63	“63”	0x36, 0x33
Function Code	0x01	0x01	“01”	0x30, 0x31
Byte Count	0x02	0x02	“02”	0x30, 0x32
Output Status	0x00	0x00	“00”	0x30, 0x30
Output Status	0x00	0x00	“00”	0x30, 0x30
Error Check (CRC/LRC)	---	0x40, 0x34	“9A”	0x39, 0x41
End of Frame	---	t1-t2-t3	CR, LF	0x0D, 0x0A

6.3.4. 2 (0x02) Read Discrete Inputs

This function code is used to read from 1 to 2000 contiguous status of discrete inputs in a remote device. The Request PDU specifies the starting address, i.e. the address of the first input specified, and the number of inputs. In the PDU Discrete Inputs are addressed starting at zero. Therefore Discrete inputs numbered 1-16 are addressed as 0-15.

The discrete inputs in the response message are packed as one input per bit of the data field.

Status is indicated as 1= ON; 0= OFF.

• Request

Field name	Example	RTU	ASCII	ASCII (bus line)
Start of Frame	---	t1-t2-t3	“,”	0x3A
Slave Address	0x63	0x63	“07”	0x36, 0x33
Function Code	0x02	0x02	“02”	0x30, 0x32
Starting Address Hi	0x00	0x00	“00”	0x30, 0x30
Starting Address Lo	0x00	0x00	“00”	0x30, 0x30
Quantity of Inputs Hi	0x00	0x00	“00”	0x30, 0x30
Quantity of Inputs Lo	0x10	0x10	“0A”	0x31, 0x30
Error Check (CRC/LRC)	---	0x71, 0x84	“ED”	0x38, 0x42
End of Frame	---	t1-t2-t3	CR, LF	0x0D, 0xA

• Response

Field name	Example	RTU	ASCII	ASCII (bus line)
Start of Frame	---	t1-t2-t3	“,”	0x3A
Slave Address	0x63	0x63	“63”	0x36, 0x33
Function Code	0x02	0x02	“02”	0x30, 0x32
Byte Count	0x02	0x02	“02”	0x30, 0x32
Input Status	0x00	0x00	“00”	0x30, 0x30
Input Status	0x00	0x00	“00”	0x30, 0x30
Error Check (CRC/LRC)	---	0x40, 0x70	“99”	0x39, 0x39
End of Frame	---	t1-t2-t3	CR, LF	0x0D, 0xA

6.3.5. 3 (0x03) Read Holding Registers

This function code is used to read the contents of a contiguous block of holding registers in a remote device. The Request PDU specifies the starting register address and the number of registers.

The register data in the response message are packed as two bytes per register, with the binary contents right justified within each byte. For each register, the first byte contains the high order bits and the second contains the low order bits.

• Request

Field name	Example	RTU	ASCII	ASCII (bus line)
Start of Frame	---	t1-t2-t3	“,”	0x3A
Slave Address	0x63	0x63	“63”	0x36, 0x33
Function Code	0x03	0x03	“03”	0x30, 0x33
Starting Address Hi	0x10	0x10	“10”	0x31, 0x30
Starting Address Lo	0x00	0x00	“00”	0x30, 0x30
Quantity of Register Hi	0x00	0x00	“00”	0x30, 0x30
Quantity of Register Lo	0x01	0x01	“01”	0x30, 0x31
Error Check (CRC/LRC)	---	0x88, 0x88	“89”	0x38, 0x39
End of Frame	---	t1-t2-t3	CR, LF	0x0D, 0x0A

• Response

Field name	Example	RTU	ASCII	ASCII (bus line)
Start of Frame	---	t1-t2-t3	“,”	0x3A
Slave Address	0x63	0x63	“63”	0x36, 0x33
Function Code	0x03	0x03	“03”	0x30, 0x33
Byte Count	0x02	0x02	“02”	0x30, 0x32
Output Register#0 Hi	0x02	0x02	“02”	0x30, 0x32
Output Register#0 Lo	0xE5	0xE5	“E5”	0x45, 0x35
Error Check (CRC/LRC)	---	0x81, 0x67	“B1”	0x42, 0x31
End of Frame	---	t1-t2-t3	CR, LF	0x0D, 0x0A

- In case of address 0x0800, 0x0801 output register value: 0x1122, 0x3344.

6.3.6. 4 (0x04) Read Input Registers

This function code is used to read from 1 to approx. 125 contiguous input registers in a remote device. The Request PDU specifies the starting register address and the number of registers. The register data in the response message are packed as two bytes per register, with the binary contents right justified within each byte. For each register, the first byte contains the high order bits and the second contains the low order bits.

• Request

Field name	Example	RTU	ASCII	ASCII (bus line)
Start of Frame	---	t1-t2-t3	“,”	0x3A
Slave Address	0x63	0x63	“63”	0x36, 0x33
Function Code	0x04	0x04	“04”	0x30, 0x34
Starting Address Hi	0x10	0x10	“10”	0x31, 0x30
Starting Address Lo	0x00	0x00	“00”	0x30, 0x30
Quantity of Register Hi	0x00	0x00	“00”	0x30, 0x30
Quantity of Register Lo	0x01	0x01	“01”	0x30, 0x31
Error Check (CRC/LRC)	---	0x3D, 0x48	“88”	0x38, 0x38
End of Frame	---	t1-t2-t3	CR, LF	0x0D, 0x0A

• Response

Field name	Example	RTU	ASCII	ASCII (bus line)
Start of Frame	---	t1-t2-t3	“,”	0x3A
Slave Address	0x63	0x63	“63”	0x36, 0x33
Function Code	0x04	0x04	“04”	0x30, 0x34
Byte Count	0x02	0x02	“02”	0x30, 0x32
Input Register#0 Hi	0x02	0x02	“02”	0x30, 0x32
Input Register#0 Lo	0xE5	0xE5	“E5”	0x45, 0x35
Error Check (CRC/LRC)	---	0x80, 0x13	“B0”	0x42, 0x30
End of Frame	---	t1-t2-t3	CR, LF	0x0D, 0x0A

- In case of address 0x0000, 0x0001 input register value: 0x0080, 0x0000.

6.3.7. 5 (0x05) Write Single Coil

This function code is used to write a single output to either ON or OFF in a remote device. The requested ON/OFF state is specified by a constant in the request data field. A value of FF 00 hex requests the output to be ON. A value of 00 00 requests it to be OFF. All other values are illegal and will not affect the output.

• Request

Field name	Example	RTU	ASCII	ASCII (bus line)
Start of Frame	---	t1-t2-t3	“,”	0x3A
Slave Address	0x63	0x63	“36”	0x36, 0x33
Function Code	0x05	0x05	“05”	0x30, 0x35
Output Address Hi	0x10	0x10	“10”	0x31, 0x30
Output Address Lo	0x00	0x00	“00”	0x30, 0x30
Output Value Hi	0xFF	0xFF	“FF”	0x46, 0x46
Output Value Lo	0x00	0x00	“00”	0x30, 0x30
Error Check (CRC/LRC)	---	0x80, 0xB8	“8Y”	0x38, 0x59
End of Frame	---	t1-t2-t3	CR, LF	0x0D, 0x0A

• Response

Field name	Example	RTU	ASCII	ASCII (bus line)
Start of Frame	---	t1-t2-t3	“,”	0x3A
Slave Address	0x63	0x63	“36”	0x36, 0x33
Function Code	0x05	0x05	“05”	0x30, 0x35
Output Address Hi	0x10	0x10	“10”	0x31, 0x30
Output Address Lo	0x00	0x00	“00”	0x30, 0x30
Output Value Hi	0xFF	0xFF	“FF”	0x46, 0x46
Output Value Lo	0x00	0x00	“00”	0x30, 0x30
Error Check (CRC/LRC)	---	0x80, 0xB8	“8Y”	0x38, 0x59
End of Frame	---	t1-t2-t3	CR, LF	0x0D, 0x0A

- Output bit of address 0x1001 turns ON.

6.3.8. 6 (0x06) Write Single Register

This function code is used to write a single holding register in a remote device. Therefore register numbered 1 is addressed as 0. The normal response is an echo of the request, returned after the register contents have been written.

• Request

Field name	Example	RTU	ASCII	ASCII (bus line)
Start of Frame	---	t1-t2-t3	“,”	0x3A
Slave Address	0x63	0x63	“63”	0x36, 0x33
Function Code	0x06	0x06	“06”	0x30, 0x36
Register Address Hi	0x08	0x08	“08”	0x30, 0x38
Register Address Lo	0x00	0x00	“00”	0x30, 0x30
Register Value Hi	0x00	0x00	“00”	0x30, 0x30
Register Value Lo	0xFF	0xFF	“FF”	0x46, 0x46
Error Check (CRC/LRC)	---	0xC3, 0xA8	“90”	0x39, 0x30
End of Frame	---	t1-t2-t3	CR, LF	0x0D, 0xA

• Response

Field name	Example	RTU	ASCII	ASCII (bus line)
Start of Frame	---	t1-t2-t3	“,”	0x3A
Slave Address	0x63	0x63	“63”	0x36, 0x33
Function Code	0x06	0x06	“06”	0x30, 0x36
Register Address Hi	0x08	0x08	“08”	0x30, 0x38
Register Address Lo	0x00	0x00	“00”	0x30, 0x30
Register Value Hi	0x00	0x00	“00”	0x30, 0x30
Register Value Lo	0xFF	0xFF	“FF”	0x46, 0x46
Error Check (CRC/LRC)	---	0xC3, 0xA8	“90”	0x39, 0x30
End of Frame	---	t1-t2-t3	CR, LF	0x0D, 0xA

- In case of address 0x0800 output register value: 0x0000 changes to 0x1122.

6.3.9. 8 (0x08) Diagnostics

MODBUS function code 08 provides a series of tests for checking the communication system between a client (Master) device and a server (Slave), or for checking various internal error conditions within a server.

The function uses a two-byte sub-function code field in the query to define the type of test to be performed. The server echoes both the function code and sub-function code in a normal response. Some of the diagnostics cause data to be returned from the remote device in the data field of a normal response.

• Request

Field name	Example	RTU	ASCII	ASCII (bus line)
Start of Frame	---	t1-t2-t3	“,”	0x3A
Slave Address	0x07	0x07	“07”	0x30, 0x37
Function Code	0x08	0x08	“08”	0x30, 0x38
Sub-Function Hi	0x00	0x00	“00”	0x30, 0x30
Sub-Function Lo	0x00	0x00	“00”	0x30, 0x30
Data Hi	0x11	0x11	“11”	0x31, 0x31
Data Lo	0x22	0x22	“22”	0x32, 0x32
Error Check (CRC/LRC)	---	0x6C, 0x24	“BE”	0x42, 0x45
End of Frame	---	t1-t2-t3	CR, LF	0x0D, 0xA

• Response

Field name	Example	RTU	ASCII	ASCII (bus line)
Start of Frame	---	t1-t2-t3	“,”	0x3A
Slave Address	0x07	0x07	“07”	0x30, 0x37
Function Code	0x08	0x08	“08”	0x30, 0x38
Sub-Function Hi	0x00	0x00	“00”	0x30, 0x30
Sub-Function Lo	0x00	0x00	“00”	0x30, 0x30
Data Hi	0x11	0x11	“11”	0x31, 0x31
Data Lo	0x22	0x22	“22”	0x32, 0x32
Error Check (CRC/LRC)	---	0x6C, 0x24	“BE”	0x42, 0x45
End of Frame	---	t1-t2-t3	CR, LF	0x0D, 0xA

Sub-function 0x0000(0) Return Query Data

The data passed in the request data field is to be returned (looped back) in the response.
The entire response message should be identical to the request.

Sub-function	Data Field (Request)	Data Field (Response)	Description
0x0000(0)	Any	Echo Request Data	

Sub-function 0x0001(1) Restart Communications Option

The remote device could be initialized and restarted, and all of its communications event counters are cleared.
Especially, data field 0x55AA make the remote device to restart with factory default setup of EEPROM.

Sub-function	Data Field (Request)	Data Field (Response)	Description
0x0001(1)	0x0000 or 0xFF00	Echo Request Data	Reset
0x0001(1)	0x55AA+0xAB7B+Sumcheck	Echo Request Data	Reset with Factory default ¹⁾
0x0001(1)	0x55AA+0xAA55+Sumcheck	Echo Request Data	Reset with Factory default ²⁾

1),2) Watchdog time value, auto recovery will be the factory defaults value.

2) Mac Address will be the factory default value. This module is not using Mac address.

Sub-function 0x000A(10) Clear Counters and Diagnostic Register

The goal is to clear all counters and the diagnostic register. Counters are also cleared upon power-up.

Sub-function	Data Field (Request)	Data Field (Response)	Description
0x000A(10)	0x0000	Echo Request Data	

Sub-function 0x000B(11) Return Bus Message Count

The response data field returns the quantity of messages that the remote device has detected on the communications system since its last restart, clear counters operation, or power-up.

Sub-function	Data Field (Request)	Data Field (Response)	Description
0x000B(11)	0x0000	Total Message Count	

Sub-function 0x000C(12) Return Bus Communication Error Count

The response data field returns the quantity of CRC errors encountered by the remote device since its last restart, clear counters operation, or power-up.

Sub-function	Data Field (Request)	Data Field (Response)	Description
0x000C(12)	0x0000	CRC Error Count	

Sub-function 0x000D(13) Return Bus Exception Error Count

The response data field returns the quantity of MODBUS exception responses returned by the remote device since its last restart, clear counters operation, or power-up.

Exception responses are described and listed in section 3.2.11.

Sub-function	Data Field (Request)	Data Field (Response)	Description
0x000D(13)	0x0000	Exception Error Count	

Sub-function 0x000E(14) Return Slave Message Count

The response data field returns the quantity of messages addressed to the remote device, or broadcast, that the remote device has processed since its last restart, clear counters operation, or power-up.

Sub-function	Data Field (Request)	Data Field (Response)	Description
0x000E(14)	0x0000	Slave Message Count	

Sub-function 0x000F(15) Return Slave No Response Count

The response data field returns the quantity of messages addressed to the remote device for which it has returned no response (neither a normal response nor an exception response), since its last restart, clear counters operation, or power-up.

Sub-function	Data Field (Request)	Data Field (Response)	Description
0x000F(15)	0x0000	Slave No Response Count	

Sub-function 0x0064(100) Return Slave ModBus, Internal Bus Status

The response data field returns the status of ModBus and Internal Bus addressed to the remote device.
This status values are identical with status 1 word of input process image.

Sub-function	Data Field (Request)	Data Field (Response)	Description
0x0064(100)	0x0000	ModBus, Internal Bus Status	Same as status 1 word

Sub-function 0x0065(101) Return Slave Watchdog Error Count

The response data field returns the quantity of watchdog error addressed to the remote device since its last restart, clear counters operation, or power-up.

Sub-function	Data Field (Request)	Data Field (Response)	Description
0x0065(101)	0x0000	Watchdog Error Count	

6.3.10. 15 (0x0F) Write Multiple Coils

This function code is used to force each coil in a sequence of coils to either ON or OFF in a remote device. The Request PDU specifies the coil references to be forced. Coils are addressed starting at zero. A logical '1' in a bit position of the field requests the corresponding output to be ON. A logical '0' requests it to be OFF.

The normal response returns the function code, starting address, and quantity of coils forced.

• Request

Field name	Example	RTU	ASCII	ASCII (bus line)
Start of Frame	---	t1-t2-t3	“,”	0x3A
Slave Address	0x63	0x63	“63”	0x36, 0x33
Function Code	0x0F	0x0F	“0F”	0x30, 0x46
Starting Address Hi	0x10	0x10	“10”	0x31, 0x30
Starting Address Lo	0x00	0x00	“00”	0x30, 0x30
Quantity of Outputs Hi	0x00	0x00	“00”	0x30, 0x30
Quantity of Outputs Lo	0x10	0x10	“10”	0x31, 0x30
Byte Count	0x02	0x02	“02”	0x30, 0x32
Output Value#0	0x0F	0x0F	“0F”	0x30, 0x46
Output Value#1	0x00	0x00	“00”	0x30, 0x30
Error Check (CRC/LRC)	---	0x47, 0x73	“5D”	0x35, 0x44
End of Frame	---	t1-t2-t3	CR, LF	0x0D, 0xA

• Response

Field name	Example	RTU	ASCII	ASCII (bus line)
Start of Frame	---	t1-t2-t3	“,”	0x3A
Slave Address	0x63	0x63	“63”	0x36, 0x33
Function Code	0x0F	0x0F	“0F”	0x30, 0x46
Starting Address Hi	0x10	0x10	“10”	0x31, 0x30
Starting Address Lo	0x00	0x00	“00”	0x30, 0x30
Quantity of Outputs Hi	0x00	0x00	“00”	0x30, 0x30
Quantity of Outputs Lo	0x10	0x10	“10”	0x31, 0x30
Error Check (CRC/LRC)	---	0x58, 0x85	“6E”	0x36, 0x45
End of Frame	---	t1-t2-t3	CR, LF	0x0D, 0xA

- In case of address 0x1015~0x1000 output bit value: 00000000_00000000 changes to 00000001_01010101.

6.3.11. 16 (0x10) Write Multiple Registers

This function code is used to write a block of contiguous registers (1 to approx. 120 registers) in a remote device. The requested written values are specified in the request data field. Data is packed as two bytes per register. The normal response returns the function code, starting address, and quantity of registers written.

• Request

Field name	Example	RTU	ASCII	ASCII (bus line)
Start of Frame	---	t1-t2-t3	“,”	0x3A
Slave Address	0x63	0x63	“63”	0x36, 0x33
Function Code	0x10	0x10	“10”	0x31, 0x30
Starting Address Hi	0x08	0x08	“08”	0x30, 0x38
Starting Address Lo	0x00	0x00	“00”	0x30, 0x30
Quantity of Registers Hi	0x00	0x00	“00”	0x30, 0x30
Quantity of Registers Lo	0x01	0x01	“01”	0x30, 0x31
Byte Count	0x02	0x02	“02”	0x30, 0x32
Register Value#0 Hi	0x00	0x00	“00”	0x30, 0x30
Register Value#0 Lo	0xFF	0xFF	“FF”	0x46, 0x46
Error Check (CRC/LRC)	---	0xDE, 0xB2	“83”	0x38, 0x33
End of Frame	---	t1-t2-t3	CR, LF	0x0D, 0xA

• Response

Field name	Example	RTU	ASCII	ASCII (bus line)
Start of Frame	---	t1-t2-t3	“,”	0x3A
Slave Address	0x63	0x63	“63”	0x36, 0x33
Function Code	0x10	0x10	“10”	0x31, 0x30
Starting Address Hi	0x08	0x08	“08”	0x30, 0x38
Starting Address Lo	0x00	0x00	“00”	0x30, 0x30
Quantity of Registers Hi	0x00	0x00	“00”	0x30, 0x30
Quantity of Registers Lo	0x01	0x01	“01”	0x30, 0x31
Error Check (CRC/LRC)	---	0x0B, 0xEB	“84”	0x38, 0x34
End of Frame	---	t1-t2-t3	CR, LF	0x0D, 0xA

- In case of address 0x0800, 0x0801 output register value: 0x0000, 0x0000 changes to 0x1122, 0x3344.

6.3.12. 23 (0x17) Read/Write Multiple Registers

This function code performs a combination of one read operation and one write operation in a single MODBUS transaction. The write operation is performed before the read. The request specifies the starting address and number of holding registers to be read as well as the starting address, number of holding registers, and the data to be written. The byte count specifies the number of bytes to follow in the write data field.

The normal response contains the data from the group of registers that were read. The byte count field specifies the quantity of bytes to follow in the read data field.

• Request

Field name	Example	RTU	ASCII	ASCII (bus line)
Start of Frame	---	t1-t2-t3	“;”	0x3A
Slave Address	0x63	0x63	“63”	0x36, 0x33
Function Code	0x17	0x17	“17”	0x31, 0x37
Read Starting Address Hi	0x00	0x00	“00”	0x30, 0x30
Read Starting Address Lo	0x00	0x00	“00”	0x30, 0x30
Quantity of Read Hi	0x00	0x00	“00”	0x30, 0x30
Quantity of Read Lo	0x01	0x01	“01”	0x30, 0x31
Write Starting Address Hi	0x08	0x08	“08”	0x30, 0x38
Write Starting Address Lo	0x00	0x00	“00”	0x30, 0x30
Quantity of Write Hi	0x00	0x00	“00”	0x30, 0x30
Quantity of Write Lo	0x01	0x01	“01”	0x30, 0x31
Byte Count	0x02	0x02	“02”	0x30, 0x32
Write Reg. Value#0 Hi	0x00	0x00	“00”	0x30, 0x30
Write Reg. Value#0 Lo	0xFF	0xFF	“FF”	0x46, 0x46
Error Check (CRC/LRC)	---	0x1B, 0xCC	“7B”	0x37, 0x42
End of Frame	---	t1-t2-t3	CR, LF	0x0D, 0x0A

• Response

Field name	Example	RTU	ASCII	ASCII (bus line)
Start of Frame	---	t1-t2-t3	“;”	0x3A
Slave Address	0x63	0x63	“63”	0x36, 0x33
Function Code	0x17	0x17	“17”	0x31, 0x37
Byte Count	0x02	0x02	“02”	0x30, 0x32
Read Reg. Value#0 Hi	0x00	0x00	“00”	0x30, 0x30
Read Reg. Value#0 Lo	0xFF	0xFF	“FF”	0x46, 0x46
Error Check (CRC/LRC)	---	0x04, 0x3C	“85”	0x38, 0x35
End of Frame	---	t1-t2-t3	CR, LF	0x0D, 0x0A

- In case of address 0x0800, 0x0801 output register value: 0x0000, 0x0000 changes to 0x1122, 0x3344.

6.3.13. Error Response

In an exception response, the server sets the MSB of the function code to 1. This makes the function code value in an exception response exactly 80 hexadecimal higher than the value would be for a normal response.

- **Exception Response Example**

Field name	Example	RTU	ASCII	ASCII (bus line)
Start of Frame	---	t1-t2-t3	“,”	0x3A
Slave Address	0x07	0x07	“07”	0x30, 0x37
Function Code	0x81	0x81	“81”	0x38, 0x31
Exception Code	0x02	0x02	“02”	0x30, 0x32
Error Check (CRC/LRC)	---	0x22, 0xC0	“76”	0x37, 0x36
End of Frame	---	t1-t2-t3	CR, LF	0x0D, 0xA

- **Exception Codes**

Exception Code	Name	Description
01	Illegal Function	The function code received in the query is not an allowable action for the server (or slave).
02	Illegal Data Address	The data address received in the query is not an allowable address for the server (or slave).
03	Illegal Data Value	A value contained in the query data field is not an allowable value for server (or slave).
04	Slave Device Failure	An unrecoverable error occurred while the server (or slave) was attempting to perform the requested action.
05	Acknowledge	The server (or slave) has accepted the request and is processing it, but a long duration of time will be required to do so.
06	Slave Device Busy	Specialized use in conjunction with programming commands. The server (or slave) is engaged in processing a long-duration program command. The client (or master) should retransmit the message later when the server (or slave) is free.
08	Memory Parity Error	The server (or slave) attempted to read record file, but detected a parity error in the memory. The client (or master) can retry the request, but service may be required on the server (or slave) device.
0A	Gateway Path Unavailable	Specialized use in conjunction with gateways, indicates that the gateway was unable to allocate an internal communication path from the input port to the output port for processing the request.

6.4. MODBUS Special Register Map

The special register map can be accessed by function code 3, 4, 6 and 16. Also the special register map must be accessed by read/write of each address (one address).

6.4.1. Adapter Identification Special Register (0x1000, 4096)

Address	Access	Type, Size	Description
0x1000(4096)	Read	1word	Vendor ID = 0x029D, Crevis. Co., Ltd.
0x1001(4097)	Read	1word	Device type = 0x000C, Network Adapter
0x1002(4098)	Read	1word	Product Code = 0xA040
0x1003(4099)	Read	1word	Firmware revision, if 0x0101, revision 1.01
0x1004(4100)	Read	2word	Product unique serial number
0x1005(4101)	Read	String upto 36byte	Product name string (ASCII) "M9222,Profibus Adapter, MBUS"
0x1006(4102)	Read	1word	Sum check of EEPROM
0x1010(4112)	Read	2word	Firmware release date
0x1011(4113)	Read	2word	Product manufacturing inspection date
0x101E(4126)	Read	7word - 1word - 1word - 1word - 1word - 1word - 2word	Composite Id of following address * RTU mode 0x1100(4352), Modbus RS232 Node. (Fixed 0x0001) 0x1000(4096), Vendor ID 0x1001(4097), Device type 0x1002(4098), Product code 0x1003(4099), Firmware revision 0x1004(4100), Product serial number

- String Type consists of valid string length (first 1word) and array of characters

6.4.2. Adapter Hotswap Register (0x1060, 4192)

Address	Access	Type, Size	Description
0x1060(4192)	Read/ Write	1word	Hot swap status 0 : Enable 1 : Disable
0x1062(4194)*	Read	1word	Error slot detection 0 : No error slot 1 : Error slot detection
0x1063(4195)*	Read	4word	Error slot location, 8x8 bit

* 0x1062 and 0x1063 functions are only available if hot swap(0x1060) is enabled.

6.4.3. Adapter Information Special Register (0x1100, 4352)

Address	Access	Type, Size	Description				
0x1102(4354)	Read	1word	Start address of input image word register. =0x0000				
0x1103(4355)	Read	1word	Start address of output image word register. =0x0800				
0x1104(4356)	Read	1word	Size of input image word register.				
0x1105(4357)	Read	1word	Size of output image word register.				
0x1106(4358)	Read	1word	Start address of input image bit. = 0x0000				
0x1107(4359)	Read	1word	Start address of output image bit. =0x1000				
0x1108(4360)	Read	1word	Size of input image bit.				
0x1109(4361)	Read	1word	Size of output image bit.				
0x110A(4362)	Read	1word	Update time for cyclic data change (same as 0x1028)				
0x110D(4365)	Read	1word	Dip switch value(MSB) Dip switch value : 0 ~ 7 bit (xxxxxxx 00000000)				
0x110E(4366)	Read	upto 33word	Expansion slot's M-number including M First 1word is adapter's number, if M9222, then 0x9222				
0x1110(4368)	Read	1word	Number of expansion slot				
0x1113(4371)	Read	upto 33word	Expansion slot Module Id. First 1word is adapter's module id.				
0x1119(4377)	Read	1word	Hi byte is ModBus status, low byte is internal status. <table><tr><th>ModBus Status</th><th>Internal bus status(M-Bus)</th></tr><tr><td>0x00 : No Error 0x01 : Error Dip Switch 0x40 : Error CRC LRC 0x80 : Error Watchdog</td><td>0x01 : Init State 0x02 : Idle State 0x03 : Run State 0x04 : Stop State 0x05 : Fault State 0x06 : Reset State 0x07 : CRC Error State 0x08 : Pause State 0x09 : Master Fault State 0x80* : At Hot swap mode expansion module error</td></tr></table>	ModBus Status	Internal bus status(M-Bus)	0x00 : No Error 0x01 : Error Dip Switch 0x40 : Error CRC LRC 0x80 : Error Watchdog	0x01 : Init State 0x02 : Idle State 0x03 : Run State 0x04 : Stop State 0x05 : Fault State 0x06 : Reset State 0x07 : CRC Error State 0x08 : Pause State 0x09 : Master Fault State 0x80* : At Hot swap mode expansion module error
ModBus Status	Internal bus status(M-Bus)						
0x00 : No Error 0x01 : Error Dip Switch 0x40 : Error CRC LRC 0x80 : Error Watchdog	0x01 : Init State 0x02 : Idle State 0x03 : Run State 0x04 : Stop State 0x05 : Fault State 0x06 : Reset State 0x07 : CRC Error State 0x08 : Pause State 0x09 : Master Fault State 0x80* : At Hot swap mode expansion module error						
0x111D(4381)	Read	1word	Adapter M-Series Revision.				

* After the system is reset, the new "Set Value" action is applied.

** If the slot location is changed, set default value automatically (all expansion slot are live).

6.4.4. Expansion Slot Information Special Resister (0x2000, 8192)

Each expansion slot has 0x20(32) address offset and same information structure.

Slot#1	0x2000(8192)~0x201F(8223)	Slot#2	0x2020(8224)~0x203F(8255)
Slot#3	0x2040(8256)~0x205F(8287)	Slot#4	0x2060(8288)~0x207F(8319)
Slot#5	0x2080(8320)~0x209F(8351)	Slot#6	0x20A0(8352)~0x20BF(8383)
Slot#7	0x20C0(8384)~0x20DF(8415)	Slot#8	0x20E0(8416)~0x20FF(8447)
Slot#9	0x2100(8448)~0x211F(8479)	Slot#10	0x2120(8480)~0x213F(8511)
Slot#11	0x2140(8512)~0x215F(8543)	Slot#12	0x2160(8544)~0x217F(8575)
Slot#13	0x2180(8576)~0x219F(8607)	Slot#14	0x21A0(8608)~0x21BF(8639)
Slot#15	0x21C0(8640)~0x21DF(8671)	Slot#16	0x21E0(8672)~0x21FF(8703)
Slot#17	0x2200(8704)~0x221F(8735)	Slot#18	0x2220(8736)~0x223F(8767)
Slot#19	0x2240(8768)~0x225F(8799)	Slot#20	0x2260(8800)~0x227F(8831)
Slot#21	0x2280(8832)~0x229F(8863)	Slot#22	0x22A0(8864)~0x22BF(8895)
Slot#23	0x22C0(8896)~0x22DF(8927)	Slot#24	0x22E0(8928)~0x22FF(8959)
Slot#25	0x2300(8960)~0x231F(8991)	Slot#26	0x2320(8992)~0x233F(9023)
Slot#27	0x2340(9024)~0x235F(9055)	Slot#28	0x2360(9056)~0x237F(9087)
Slot#29	0x2380(9088)~0x239F(9119)	Slot#30	0x23A0(9120)~0x23BF(9151)
Slot#31	0x23C0(9152)~0x23DF(9183)	Slot#32	0x23E0(9184)~0x23FF(9215)
Slot#33	0x2400(9216)~0x241F(9247)	Slot#34	0x2420(9248)~0x243F(9279)

.....
Slot#63 0x27C0(10176)~0x27DF(10207)

Address Offset	Expansion Slot#1	Expansion Slot#2	Expansion Slot#3	Expansion Slot#4	.....	Expansion Slot#63
+ 0x00(+0)	0x2000(8192)	0x2020(8224)	0x2040(8256)	0x2060(8288)	.....	0x27C0(10176)
+ 0x01(+1)	0x2001(8193)	0x2021(8225)	0x2041(8257)	0x2061(8289)	.....	0x27C1(10177)
+ 0x02(+2)	0x2002(8194)	0x2022(8226)	0x2042(8258)	0x2062(8290)	.....	0x27C2(10178)
+ 0x03(+3)	0x2003(8195)	0x2023(8227)	0x2043(8259)	0x2063(8291)	.....	0x27C3(10179)
+ 0x04(+4)	0x2004(8196)	0x2024(8228)	0x2044(8260)	0x2064(8292)	.....	0x27C4(10180)
+ 0x05(+5)	0x2005(8197)	0x2025(8229)	0x2045(8261)	0x2065(8293)	.....	0x27C5(10181)
+ 0x06(+6)	0x2006(8198)	0x2026(8230)	0x2046(8262)	0x2066(8294)	.....	0x27C6(10182)
+ 0x07(+7)	0x2007(8199)	0x2027(8231)	0x2047(8263)	0x2067(8295)	.....	0x27C7(10183)
+ 0x08(+8)	0x2008(8200)	0x2028(8232)	0x2048(8264)	0x2068(8296)	.....	0x27C8(10184)
+ 0x09(+9)	0x2009(8201)	0x2029(8233)	0x2049(8265)	0x2069(8297)	.....	0x27C9(10185)
+ 0x0A(+10)	0x200A(8202)	0x202A(8234)	0x204A(8266)	0x206A(8298)	.....	0x27CA(10186)
+ 0x0B(+11)	0x200B(8203)	0x202B(8235)	0x204B(8267)	0x206B(8299)	.....	0x27CB(10187)
+ 0x0C(+12)	0x200C(8204)	0x202C(8236)	0x204C(8268)	0x206C(8300)	.....	0x27CC(10188)
+ 0x0D(+13)	0x200D(8205)	0x202D(8237)	0x204D(8269)	0x206D(8301)	.....	0x27CD(10189)
+ 0x0E(+14)	0x200E(8206)	0x202E(8238)	0x204E(8270)	0x206E(8302)	.....	0x27CE(10190)
+ 0x0F(+15)	0x200F(8207)	0x202F(8239)	0x204F(8271)	0x206F(8303)	.....	0x27CF(10191)
+ 0x10(+16)	0x2010(8208)	0x2030(8240)	0x2050(8272)	0x2070(8304)	.....	0x27D0(10192)
+ 0x11(+17)	0x2011(8209)	0x2031(8241)	0x2051(8273)	0x2071(8305)	.....	0x27D1(10193)
+ 0x12(+18)	0x2012(8210)	0x2032(8242)	0x2052(8274)	0x2072(8306)	.....	0x27D2(10194)
+ 0x13(+19)	0x2013(8211)	0x2033(8243)	0x2053(8275)	0x2073(8307)	.....	0x27D3(10195)
+ 0x14(+20)	0x2014(8212)	0x2034(8244)	0x2054(8276)	0x2074(8308)	.....	0x27D4(10196)
+ 0x15(+21)	0x2015(8213)	0x2035(8245)	0x2055(8277)	0x2075(8309)	.....	0x27D5(10197)
+ 0x16(+22)	0x2016(8214)	0x2036(8246)	0x2056(8278)	0x2076(8310)	.....	0x27D6(10198)
+ 0x17(+23)	0x2017(8215)	0x2037(8247)	0x2057(8279)	0x2077(8311)	.....	0x27D7(10199)
+ 0x18(+24)	0x2018(8216)	0x2038(8248)	0x2058(8280)	0x2078(8312)	.....	0x27D8(10200)
+ 0x19(+25)	0x2018(8217)	0x2038(8249)	0x2058(8281)	0x2078(8313)	.....	0x27D9(10201)
+ 0x1A(+26)	0x201A(8218)	0x203A(8250)	0x205A(8282)	0x207A(8314)	.....	0x27DA(10202)
+ 0x1B(+27)	0x201B(8219)	0x203B(8251)	0x205B(8283)	0x207B(8315)	.....	0x27DB(10203)
+ 0x1C(+28)	0x201C(8220)	0x203C(8252)	0x205C(8284)	0x207C(8316)	.....	0x27DC(10204)
+ 0x1D(+29)	0x201D(8221)	0x203D(8253)	0x205D(8285)	0x207D(8317)	.....	0x27DD(10205)
+ 0x1E(+30)	0x201E(8222)	0x203E(8254)	0x205E(8286)	0x207E(8318)	.....	0x27DE(10206)
+ 0x1F(+31)	0x201F(8223)	0x203F(8255)	0x205F(8287)	0x207F(8319)	.....	0x27DF(10207)

Address Offset	Access	Type, Size	Description
+ 0x02(+2) **	Read	1 word	Input start register address of input image word this slot.
+ 0x03(+3) **	Read	1 word	Input word's bit offset of input image word this slot.
+ 0x04(+4) **	Read	1 word	Output start register address of output image word this slot.
+ 0x05(+5) **	Read	1 word	Output word's bit offset of output image word this slot.
+ 0x06(+6) **	Read	1 word	Input bit start address of input image bit this slot.
+ 0x07(+7) **	Read	1 word	Output bit start address of output image bit this slot.
+ 0x08(+8) **	Read	1 word	Size of input bit this slot
+ 0x09(+9) **	Read	1 word	Size of output bit this slot
+ 0x0A(+10) **	Read	n word	Read input data this slot
+ 0x0B(+11) **	Read/Write	n word	Read/write output data this slot
+ 0x0E(+14)	Read	1 word	M-number, if M-1238, returns 0x1238
+ 0x0F(+15)	Read	String upto 72byte	First 1 word is length of valid character string. If M1238, returns "00 1E 52 54 2D 31 32 33 38 2C 20 38 44 49 2C 20 32 34 56 64 63 2C 20 55 6E 69 76 65 72 73 61 6C 00 00" Valid character size = 0x001E =30 characters, "M-1238, 8DI, 24Vdc, Universal"
+ 0x10(+16)	Read	1 word	Size of configuration parameter byte
+ 0x11(+17) **	Read/Write	n word	Read/write Configuration parameter data, up to 8byte. Refer to A.2 ***
+ 0x17(+23)	Read	2 word	Firmware Revision ex) 0x00010010 (Major revision 1 /Minor revision 16, Rev 1.016)
+ 0x19(+25)	Read	2 word	Firmware release date.

* After the system is reset, the new "Set Value" action is applied.

** Nothing of output, input, memory or configuration parameter corresponding slot returns Exception 02.

6.5. Supported MODBUS Function Codes

MODBUS Reference Documents

<http://www.modbus.org>

MODBUS Tools

<http://www.modbustools.com>, modbus poll

<http://www.win-tech.com>, modscan32