



Application Note

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Doc No.: TN20-28
Version: 1.0
Date: 2 March 2000
Subject: HMI – Motion Coordinator serial link using Modbus RTU

Introduction

A growing number of programmable keypads and HMIs provide the user with a choice of serial interface protocols to enable communication with various PLCs and Industrial Computers. One such protocol is Modbus RTU. This document describes the implementation of a sub-set of Modbus commands as part of the system software in the Motion Coordinator.

Scope of Operation

This document applies to Motion Coordinator types MC202, MC204, MC216 and Euro205 with system software version 1.48 and above.

The Modbus RTU protocol provides single point to point communication between the Motion Coordinator and a programmable keypad/display. Implementation of the protocol is provided on serial port 1 for RS232 and port 2 for RS485. Port 0 is the main programming port and does not have the Modbus option. Baud rate and slave address can be set in the TRIO BASIC program during serial port initialisation.

Initialisation and Set-up

The Modbus protocol is initialised by setting the mode parameter of the SETCOM instruction to 4. The ADDRESS parameter must also be set before the Modbus protocol is activated.

e.g. `ADDRESS=1`
`SETCOM(9600,8,1,2,1,4) 'set up port 1 as MODBUS port at 9600 baud`

`ADDRESS=1`
`SETCOM(19200,8,1,2,2,4) 'set up the RS485 port at 19200 baud`

The protocol can be de-selected by setting the option to 0 in the SETCOM command.

`SETCOM(19200,8,1,2,2,0) 'set the RS485 port to normal mode`

Example

The following shows a typical set-up for a HMI panel running a Modbus Link. All references below are to the programming software supplied by the HMI manufacturer and are not specific to any individual programming environment. See your HMI programming instructions for the actual set-up sequence.

In the Controller Driver section choose "Modicon Modbus"

Choose any Modicon PLC type from the PLC setup section.

Program the panel to display a variable and open up a dialog box to **Define Field**.

Choose from: Input bits, Output bits, Holding Register.

Example : Holding Register

Choose data size/type = WORD (Binary).

Set the Address Offset.

Example : 12

Set the display format and field width to be displayed.

Example : Numeric 4 digits

The Motion Coordinator is the slave so it will always wait for the HMI to request the data required. With the set-up shown above, the display should poll the Motion Coordinator for the value of VR(12) and display the data as a 4 digit number.

Technical Reference

This section lists the Motion Coordinator's response to each supported Modbus Function.

Modbus Code Table

The following Modbus Function Codes are implemented:

Function Code	Function Name	Action
1	Read Coil Status	Returns input/output bit pattern
2	Read Input Status	Returns input/output bit pattern
3	Read Holding Registers	Returns data from VR() variables
5	Force Single Coil	Sets single output ON/OFF
6	Preset Single Register	Sets the value of a single VR() variable
16	Preset Multiple Registers	Sets the values of a group of VR() variables

(1 and 2) Read Coil Status / Read Input Status

Modbus Function Code	1 and 2
Mapped Trio Function	Read input word : IN(nn,mm)
Starting Address Range	0 to NIO-1 (NIO = Number of Input/Output Bits on Controller)
Number of Points Range	1 to (NIO-1) – Starting Address
Returned Data	Bytes containing "Number of Points" bits of data

(3) Read Holding Registers

Modbus Function Code	3
Mapped Trio Function	Read VR() Global Variable
Starting Address Range	0 to 250
Number of Points Range	1 to 127 (Number of VR() variables to be read)
Returned Data	2 to 254 bytes containing up to 127 16-bit Signed Integers.

(5) Force Single Coil

Modbus Function Code	5
Mapped Trio Function	Set Single Output : OP(n,ON/OFF)
Starting Address Range	8 to NIO-1
Data	00 = Output OFF, ffH = Output ON
Returned Data	None

(6) Preset Single Register

Modbus Function Code	6
Mapped Trio Function	Set VR() Global Variable : VR(addr)=data
Register Address Range	0 to 250
Data	-32768 to 32767 (16 bit signed)
Returned Data	None

(16) Preset Multiple Registers

Modbus Function Code	16
Mapped Trio Function	Set VR() Global Variables : VR(addr)=data ₁ VR(addr+n)=data _n
Starting Address Range	0 to 250
Number of Points Range	1 to 127
Data ₁ to Data _n	-32768 to 32767 (16 bit signed)
Returned Data	None

Notes

A. The following baud rate limitations should be observed when attaching a HMI panel to the Motion Coordinator using Modbus.

Motion Coordinator	Maximum Baud Rate
MC202	9600
MC204	19200
MC216	38400
Euro205	38400

B. Some HMI's use the standard MODICON addressing for registers and I/O. If this is the case, use the following mappings:

- 1) Holding Registers 40001 to 40251 are mapped to VR(0) to VR(250)
- 2) Inputs 10001 to 10272 are mapped to IN(0) to IN(271) when the appropriate I/O expansion is fitted.
- 3) Output Coils 9 to 272 are mapped to OP(8,s) to OP(271,s) where s is the state (ON or OFF)

C. Due to continual product development, the information contained in this application note is subject to change without notice.

Glossary

HMI	Human – Machine Interface
MODBUS	A communications protocol developed by Modicon, part of Groupe Schneider.
RTU	One of two serial transmission modes used by Modbus, the other being ASCII.
Holding Register	A read/write variable as defined for Modicon PLC.
Coil	A programmable output as defined for Modicon PLC.