Honeywell

Honeywell Process Solutions

Serial Communication I/F Module

2MLL-C22A, 2MLL-CH2A, 2MLL-C42A

User's Guide

ML 200 - Snet
R200
Mar 2010

Release 200

Honeywell

Notices and Trademarks

Release 200 **March, 2010**

Honeywell Process Solutions

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About This Document

This document describes the specifications, handling, and programming methods of Serial Communication I/F module used in association with CPU module of MasterLogic-200 PLC series (referred to as 2MLL-C22A, 2MLL-CH2A, 2MLL-C42A).

Release Information

Document Name	Document ID	Release Number	Publication Date
2MLL-C22A, 2MLL-CH2A, 2MLL-C42A User's Guide	ML 200 - Snet	200	Mar 2010

References

The following list identifies all documents that may be sources of reference for material discussed in this publication.

Document Title
SoftMaster User's Guide

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Symbol Definitions

The following table lists the symbols used in this document to denote certain conditions.

Symbol	Definition
	**ATTENTION:** Identifies information that requires special consideration.
	**TIP:** Identifies advice or hints for the user, often in terms of performing a task.
	**REFERENCE -EXTERNAL:** Identifies an additional source of information outside of the bookset.
	**REFERENCE - INTERNAL:** Identifies an additional source of information within the bookset.
CAUTION	Indicates a situation which, if not avoided, may result in equipment or work (data) on the system being damaged or lost, or may result in the inability to properly operate the process.
	**CAUTION**: Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices. **CAUTION** symbol on the equipment refers the user to the product manual for additional information. The symbol appears next to required information in the manual.
	**WARNING**: Indicates a potentially hazardous situation, which, if not avoided, could result in serious injury or death. **WARNING** symbol on the equipment refers the user to the product manual for additional information. The symbol appears next to required information in the manual.
	**WARNING, Risk of electrical shock**: Potential shock hazard where HAZARDOUS LIVE voltages greater than 30 Vrms, 42.4 Vpeak, or 60 VDC may be accessible.

Symbol	Definition
	**ESD HAZARD:** Danger of an electro-static discharge to which equipment may be sensitive. Observe precautions for handling electrostatic sensitive devices.
	**Protective Earth (PE) terminal**: Provided for connection of the protective earth (green or green/yellow) supply system conductor.
	**Functional earth terminal**: Used for non-safety purposes such as noise immunity improvement. NOTE: This connection shall be bonded to Protective Earth at the source of supply in accordance with national local electrical code requirements.
	**Earth Ground**: **Functional earth connection.** NOTE: This connection shall be bonded to Protective Earth at the source of supply in accordance with national and local electrical code requirements.
	**Chassis Ground**: Identifies a connection to the chassis or frame of the equipment shall be bonded to Protective Earth at the source of supply in accordance with national and local electrical code requirements.

Contents

1. INTRODUCTION 19

1.1 Overview of serial communication I/F module 19

1.2 Characteristics 19

1.3 Terminology 21

2. SPECIFICATIONS 25

2.1 Technical specifications 25

2.2 Part names and functions 27

2.3 Cable specifications 29

2.4 Terminal resistance 31

3. SYSTEM CONFIGURATION 33

3.1 Operation mode setting 33

Server mode 33

P2P (Client) mode 33

3.2 Channel operation during normal run 34

3.3 Channel operation in diagnosis mode (Loop-Back) 35

3.4 Method of serial interface 36

RS-232C interface 36

RS-422 interface 38

4. INSTALLATION AND TEST OPERATION 41

4.1 Installation environment 41

4.2 Precautions for handling 42

4.3 From setting to operation 43

5. SYSTEM CONFIGURATION 45

5.1 Introduction to system configuration 45

5.2 Supported system configurations 45
1:1 connection (no modem) to PC (HMI) 45
1:1 dedicated modem connection to PC (HMI) 45
Modem connection to PC and communication between interlinked Snet I/F modules 46
Dedicated communication with PC (HMI) and third-party RS-422 communication 47
Optical modem communication for mobile communication 48
Wireless modem communication between bodies in revolution 49
TM/TC (Telemetry/Telecommand) communication system 51

5.3 System configurations not supported 52
Dial-up modem communication between Snet I/F modules 52
SoftMaster connection using RS-422 channel of Snet I/F module 52

6. BASIC COMMUNICATION PARAMETERS SETTING 55

6.1 Communication module registration 55
Offline registration of Snet I/F module 55
Online registration of Snet I/F module 55

6.2 Transmission specification settings 58
Setting items 58
Setting method 61

7. COMMUNICATION FUNCTIONS 67

7.1 Communication functions classification 67

7.2 Dedicated service 68
Introduction 68
MLDP server 68
Modbus server (slave) 68

7.3 P2P service 72
Introduction 72
Configuration of P2P parameters 73
Channel information 74
Block information 76
User-defined frame information 86
P2P service operation 100

7.4 Remote connection 104
Introduction 104
SoftMaster remote connection 104
Remote connection between Snet I/F modules 112

8. MASTERLOGIC DEDICATED COMMUNICATION FUNCTION 115

8.1 Dedicated protocol communication 115
Introduction 115
Frame structure 115
Instructions list 118
Instruction details 120

9. PROGRAM EXAMPLES 143

9.1 Program examples 143
Example of dedicated service 143

9.2 P2P service 150
MLDP client (limited) 150
Modbus client 154
User-defined communication 164

10. DIAGNOSIS 185

10.1 Diagnosis function of SoftMaster-NM 185

10.2 Communication module information 188

10.3 Status information for respective services 190

10.4 Frame monitoring 193

10.5 Loop back test 195

11. APPENDIX 197

11.1 Definition of terms 197
Communication type 197
Transmission type 197
Asynchronous communication 198
Protocol 199
BPS (Bits Per Second) and CPS (Characters Per Second) 199
Node 199
Packet 199
Port 199
RS-232C 199
RS-422/RS-485 200
Half Duplex Communication 200
Full duplex communication 200
BCC (Block Check Character) 201

Frame 202
Reset 202

11.2 Flag list 203
Special relays list (F) 203
Communication relays list (L) 218
Link devices list (N) 222

Tables

Table 1 – Terminology definitions 21
Table 2 – Technical specifications 25
Table 3 – Parts and functions 28
Table 4 – Cable characteristics 29
Table 5 – RS-232C 9-pin connector standard 36
Table 6 – Cable connection between RS-232C and modem 37
Table 7 – 3-line type of connection (no handshake) 38
Table 8 – RS-422 5-pin connector standard 38
Table 9 – RS-422 connection 39
Table 10 – RS-485 connection 39
Table 11 – Module setting table for Snet stations 47
Table 12 – Module setting for Snet Stations 2 48
Table 13 – Setting details between communication modules 50
Table 14 – Basic setting parameters for Snet 58
Table 15 – Parity bit details 60
Table 16 – Driver details 60
Table 17 – Modbus instruction code 70
Table 18 – Details of Modbus area 71
Table 19 – Drivers 75
Table 20 – Codes of Modbus instructions and data 76
Table 21 – Tx frames 92
Table 22 – Rx ACK frame 97
Table 23 – Rx NAK frame 98
Table 24 – Request frame (basic structure) 115
Table 25 – ACK response frame (Basic Structure) 116
Table 26 – NAK response frame (Basic Structure) 116
Table 27 – Instructions in dedicated communication 118
Table 28 – Instructions in dedicated communication 2 119
Table 29 – Example of data type 119
Table 30 – Devices available 119
Table 31 – Request format 121
Table 32 – Instruction details 121
Table 33 – ACK response format 1 122
Table 34 – Data description 123
Table 35 – NAK response format 1 124
Table 36 – Error codes and details 124
Table 37 – Request format for external communication device 1 (example) 127
Table 38 – ACK response 1 (example) 128
Table 39 – NAK response 1 (example) 128
Table 40 – Request for external communication device 2 128
Table 41 – ACK response 2 129

Table 42 – NAK response 2 131
Table 43 – Request format of external communication device 2 (Example) 131
Table 44 – ACK response 2 (example) 131
Table 45 – NAK response 2 (example) 132
Table 46 – Request format of external communication device 3 132
Table 47 – ACK response Format 3 133
Table 48 – NAK response Format 3 134
Table 49 – Request format of external communication device 3 (Example) 134
Table 50 – ACK response Format 3 (Example), If 'HFF' is to be written on the M230 address of the station number 1 134
Table 51 – NAK response Format 3 (Example) 135
Table 52 – Request format of external communication device 4 135
Table 53 – ACK response Format 4 136
Table 54 – NAK response Format 4 136
Table 55 – Request format of external communication device 4 (Example) 136
Table 56 – ACK response Format 4 (Example) 137
Table 57 – NAK response Format 4 (Example) 137
Table 58 – Request format of external communication device 5 137
Table 59 – ACK response Format 5 138
Table 60 – ACK response Format 5 139
Table 61 – Request format of external communication device 5 (Example) 139
Table 62 – ACK response Format 5 (Example) 139
Table 63 – NAK response Format 5 (Example) 140
Table 64 – Request format of external communication device 6 140
Table 65 – ACK response Format 6 (1) 141
Table 66 – ACK response Format 6 (2) 141
Table 67 – NAK response Format 6 141
Table 68 – Request format of external communication device 6 (Example) 142
Table 69 – ACK response Format 6 (Example) 142
Table 70 – NAK response Format 6 (Example) 142
Table 71 – Structure of Write Request Frame 166
Table 72 – Structure of Data Read Frame 166
Table 73 – Structure of immediate Response Frame 167
Table 74 – Communication Module Information window description 188
Table 75 – Dedicated service window description 191
Table 76 – Frame monitoring window description 193
Table 77 – Special relays list (F) 203
Table 78 – List of communication flags based on HS link number 218
Table 79 – Relationship between HS link and L device area 220
Table 80 – P2P parameters 221
Table 81 – Link devices list 222

Figures

Figure 1 – Snet I/F module, front 27
Figure 2 – Structure 30
Figure 3 – Connection with terminal resistance (RS-422) 31
Figure 4 – Connection with terminal resistance (RS-485) 31
Figure 5 – Data flow of each channel 34
Figure 6 – Flowchart 43
Figure 7 – 1:1 communication system with PC 45
Figure 8 – 1:1 dedicated modem communication with PC 46
Figure 9 – Dedicated modem communication with PC 47
Figure 10 – 7-segment operation system for RS-422 48
Figure 11 – Optical modem communication system 49
Figure 12 – Wireless modem communication system 50
Figure 13 – TM/TC dedicated modem system 51
Figure 14 – Dial-up modem communication between Snet I/F modules 52
Figure 15 – SoftMaster connection via RS-422 channel 53
Figure 16 – Snet module registration window 55
Figure 17 – Snet IO information read window 56
Figure 18 – Message window of IO information change 57
Figure 19 – Communication module registration complete window 57
Figure 20 – Setting window of communication module 62
Figure 21 – Basic setting window of Snet communication for respective channels 63
Figure 22 – Parameter Download window 64
Figure 23 – Parameter Write setting 65
Figure 24 – Basic setting window of Modbus server 69
Figure 25 – Setting window of Modbus server memory 70
Figure 26 – P2P parameters setting window 72
Figure 27 – Configuration window of P2P parameters 73
Figure 28 – P2P Channel Setting window 74
Figure 29 – Setting window of channel driver with P2P used 75
Figure 30 – P2P block setting window 77
Figure 31 – Setting window of P2P Read instruction 1 78
Figure 32 – Setting window of P2P Read instruction 2 80
Figure 33 – Setting window of P2P Write instruction 81
Figure 34 – Setting window of P2P Write instruction 2 83
Figure 35 – Setting window of P2P Send instruction 84
Figure 36 – Setting window of P2P Receive instruction 85
Figure 37 – Setting window of frame HEAD segment 87
Figure 38 – Add segment numeric constant window 88
Figure 39 – Add segment text constant window 88
Figure 40 – Add segment size-fixed variable 89
Figure 41 – Segment size-changeable variable edits window 90

Figure 42 – Conversion setting window of segment size-changeable variable 91
Figure 43 – Add Tx frame group 93
Figure 44 – Setting window of Tx frame group 93
Figure 45 – Setting window of Tx frame Add 94
Figure 46 – Window of Tx frame edits 94
Figure 47 – Registration window of Tx frame Head 95
Figure 48 – Registration window of Tx frame Body 96
Figure 49 – Registration window of frame Tx.Tail 96
Figure 50 – Example frame 97
Figure 51 – Registration window of ACK, NAK group received 98
Figure 52 – Registration window of received ACK frame Head 98
Figure 53 – Registration window of ACK frame Body 99
Figure 54 – Registration window of ACK frame Tail 99
Figure 55 – Registration window of received NAK frame Head 99
Figure 56 – Registration window of NAK frame Body 99
Figure 57 – Registration window of NAK frame Tail 100
Figure 58 – ACK, NAK received frame registration complete window 100
Figure 59 – P2P parameters Write window 101
Figure 60 – Setting window of P2P Enable 102
Figure 61 – Example of SoftMaster remote connection via dial-up modem 105
Figure 62 – Setting window of modem connection 105
Figure 63 – Setting window of modem details 106
Figure 64 – Setting window of modem remote 2 stage 107
Figure 65 – Connection diagram via dedicated modem speed 109
Figure 66 – Setting window of dedicated modem 110
Figure 67 – Setting window of dedicated modem remote stage 2 111
Figure 68 – Remote connection between Snet I/F modules 112
Figure 69 – Setting window of remote connection between PLCs 113
Figure 70 – Setting window of remote 1 stage connection between PLCs 113
Figure 71 – Remote connection via wireless modem 114
Figure 72 – Sequence for instruction frame 118
Figure 73 – Communication between MasterLogic-200 Snet and external device 143
Figure 74 – Basic setting window of Snet I/F module with SoftMaster-NM 144
Figure 75 – Communication settings window 145
Figure 76 – Setting window of Modbus dedicated service 146
Figure 77 – Parameter Write window of dedicated service 146
Figure 78 – System diagnosis window of dedicated service 147
Figure 79 – Communication module information window of dedicated service 148
Figure 80 – Status window for respective services of dedicated service 149
Figure 81 – P2P basic setting window for MasterLogic-200 dedicated communication150
Figure 82 – P2P driver setting window for respective channels of MasterLogic-200 dedicated communication 151

Figure 83 – P2P block setting window (Read instruction) of MasterLogic-200 dedicated communication 152
Figure 84 – P2P block setting window (Write instruction) of MasterLogic-200 dedicated communication 153
Figure 85 – P2P block setting window of MasterLogic-200 dedicated communication 153
Figure 86 – P2P Modbus client communication 154
Figure 87 – Basic setting window of P2P Modbus client communication 155
Figure 88 – Parameter Write window of P2P Modbus client 156
Figure 89 – Communication module setting window of P2P Modbus client 156
Figure 90 – P2P parameter window of Modbus client 157
Figure 91 – P2P channel setting window of Modbus client 157
Figure 92 – P2P block setting window 1(Read instruction) of Modbus client 158
Figure 93 – P2P block setting window 1(Write instruction) of Modbus client 158
Figure 94 – P2P block setting window 2(Read instruction) of Modbus client 159
Figure 95 – P2P block setting window 3(Read instruction) of Modbus client 159
Figure 96 – P2P block setting window 2(Write instruction) of Modbus client 160
Figure 97 – P2P block setting window 3(Write instruction) of Modbus client 160
Figure 98 – P2P block setting of Modbus client 161
Figure 99 – Parameter Write window of Modbus client 161
Figure 100 – P2P Enable setting window of Modbus client 162
Figure 101 – Communication module information window of Modbus client 163
Figure 102 – Status window for respective services of Modbus client 164
Figure 103 – Example of communication system with other company's PLC (System Configuration) 165
Figure 104 – Tx/Rx frame structure 165
Figure 105 – Setting window of user-defined communication 168
Figure 106 – P2P channel setting window of user-defined communication 169
Figure 107 – Window of SoftMaster-NM frames registered 170
Figure 108 – Add - P2P user-defined group 171
Figure 109 – Group Edit window 171
Figure 110 – WR frame Add 172
Figure 111 – Setting window of 'WR. HEAD' frame 173
Figure 112 – Segment input window of WR. HEAD frame 173
Figure 113 – Setting window of WR. TAIL frame 173
Figure 114 – Setting window of WR. TAIL frame BCC 174
Figure 115 – WR. BODY frame Create 174
Figure 116 – Setting window of WR. BODY frame 175
Figure 117 – Whole setting of WR frames 175
Figure 118 – RD frame Add 176
Figure 119 – Setting of RD. HEAD and RD.TAIL frames 177
Figure 120 – Setting window of RD. BODY frame data received 178
Figure 121 – RD. BODY frame setting complete 178

Figure 122 – RD frame setting complete 179
Figure 123 – Immediate Response Frame setting complete 180
Figure 124 – P2P block setting of user-defined communication (Send instruction, WR frame used) 181
Figure 125 – P2P block setting of user-defined communication (Receive instruction, RD frame used) 182
Figure 126 – P2P block setting of user-defined communication 183
Figure 127 – Status for respective P2P communication services of user- defined communication 184
Figure 128 – System Diagnosis window 186
Figure 129 – System Diagnosis item window 187
Figure 130 – Communication Module Information window 188
Figure 131 – Dedicated service window of status for respective services 190
Figure 132 – Frame monitoring window 193
Figure 133 – Loop back test 195
Figure 134 – Execution window of LoopBack test 196
Figure 135 – Serial transmission 197
Figure 136 – Parallel transmission 198
Figure 137 – Asynchronous communication 198
Figure 138 – Half duplex communication 200
Figure 139 – Full duplex communication 201
Figure 140 – SoftMaster: Programming software of MasterLogic-200 PLC for Windows 201
Figure 141 – Structure of general Tx/Rx frame 202

1. Introduction

1.1 Overview of serial communication I/F module

This user's guide describes the serial communication I/F module (Snet I/F module) of MasterLogic-200 PLC system network.

Features of Snet I/F module are as follows:

1. It establishes communication with various devices such as PLCs of brands other than Honeywell, computers, and so on, which use different types of serial communication protocols. In addition, it is possible to integrate many different devices supporting ASCII communications in the MasterLogic- 200 PLC network.
2. It emulates a communication modem to control a remote PLC.

1.2 Characteristics

Snet I/F module has the following characteristics:

1. The user can specify the communication speed and communication mode (protocol) using SoftMaster-Network Manger (NM) application in Windows environment. This enables easy connection with other third-party products.
2. The Snet I/F modules are available in three types:
   a) RS-232C 2Port
   b) RS-422(485) 2Port
   c) RS-232C 1Port/ RS-422 1Port.
3. The communication is controlled based on each channel, which helps the CPU module to control the protocol data specified by the user. This enables the replacement of communication module without any additional setting or downloading.
4. For a protocol used, the Read/Write option is available.
5. If RS-422/485 channel is used, then multi-drop configuration up to 32 devices is possible.
6. The option of setting various communication speeds is supported such as: RS-232C: 300bps ~ 115, 200bps / RS-422: 300bps ~ 115, 200bps.
7. It supports 1:1/1:N/N:M communication (if RS-422 channel used).

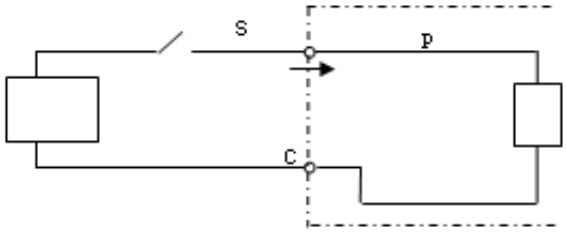
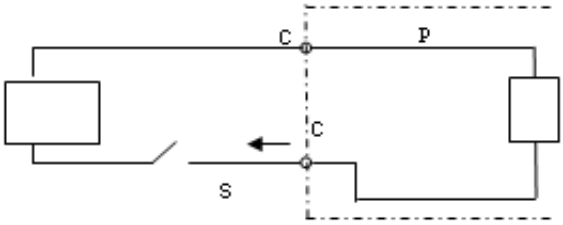
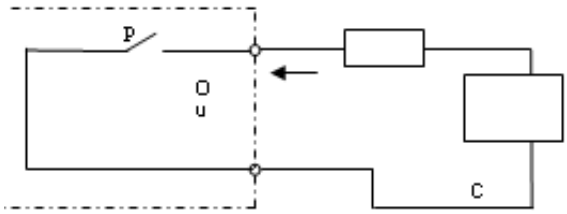
8. The module supports Full-duplex (RS-422/RS-232C) as well as Half-duplex (RS-485) communication.
9. Error diagnosis is made easy with the availability of following functions:
    a) Self-diagnosis function
    b) Loop-Back diagnosis function
10. The module also supports following functions:
    a) Dedicated communication
    b) Modbus Server (slave)/Client (master) function with open standard serial devices.
    c) User-defined protocol with proprietary serial devices.

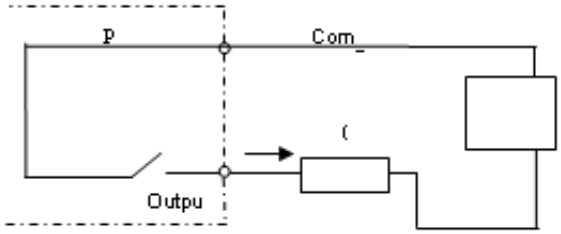
1.3 Terminology

The terminologies used in this document are as follows:

Table 1 – Terminology definitions

Terminology	Definition	Remarks
Module	A device like I/O board that is assembled and then inserted in the motherboard or base, to configure the system.	Example: CPU module, power module, I/O module, and so on.
Unit	A minimum unit in a PLC system operation is a single module or collection of modules. You can configure the PLC system by connecting to these modules.	Example: basic unit, expanded unit
PLC System	A system comprising of Programmable Logic Controller and its peripherals, which you can configure and control using a specific program written by the user.	
SoftMaster-200	Writing, editing, and debug function can be carried out by the graphic loader.	
I/O image area	The internal memory area of CPU module that is installed to maintain the input and output state.	
Rnet	Honeywell dedicated Network	
Snet	Serial Communication Network	
FEnet	Fast Ethernet Network	
Pnet	Profibus – DP Network	
Dnet	DeviceNet Network	
RTC	Real Time Clock. A general name of the universal IC having the clock function.	
Watchdog Timer	There is a timer used in monitoring the assigned running time of a program. The timer gives an alarm if the program fails to complete the processing within the assigned time.	

Terminology	Definition	Remarks
Sink input	The mode through which the current flows from the switch to a PLC input terminal, when input signal is ON. 	Z: Input resistance
Source input	The mode through which the current flows from a PLC input terminal to the switch, when input signal is ON. 	
Sink Output	The mode in which the current flows from load to output terminal, when PLC output contact is ON. 	

Terminology	Definition	Remarks
Source Output	The mode in which the current flows from output contact, when PLC output contact is ON. 	

2. Specifications

2.1 Technical specifications

The technical specifications are as follows:

Table 2 – Technical specifications

<table>
<tr><th colspan="2" rowspan="2">Item</th><th colspan="3">Specification</th></tr>
<tr><th>2MLL-C22A</th><th>2MLL-CH2A</th><th>2MLL-C42A</th></tr>
<tr><td rowspan="4">Serial communication channel</td><td rowspan="2">RS-232C</td><td>2 channels</td><td>1 channel</td><td rowspan="2">-</td></tr>
<tr><td colspan="2">Conforms to RS-232C standard</td></tr>
<tr><td rowspan="2">RS-422/485</td><td rowspan="2">-</td><td>1 channel</td><td>2 channels</td></tr>
<tr><td colspan="2">Conforms to RS-422/485 standards</td></tr>
<tr><td colspan="2">Modem connection function</td><td colspan="2">Remote communication with external devices is supported through public telephone line by connecting external modem to the module.</td><td>-</td></tr>
<tr><td rowspan="2">Operating mode (specified per port)</td><td>P2P</td><td colspan="3">Client communication protocols supported are:
• Proprietary MLDP Server – Limited client
• Modbus ASCII / RTU client (Modbus master)
• User-defined communication client</td></tr>
<tr><td>SERVER</td><td colspan="3">• Proprietary MLDP Server – Limited client
• Modbus ASCII / RTU server (Modbus slave)</td></tr>
<tr><td rowspan="3">Data type</td><td>Data Bits</td><td colspan="3">7 or 8</td></tr>
<tr><td>Stop Bits</td><td colspan="3">1 or 2</td></tr>
<tr><td>Parity</td><td colspan="3">Even/Odd/None</td></tr>
<tr><td colspan="2">Synchronization type</td><td colspan="3">Asynchronous type</td></tr>
</table>

2. Specifications

2.1. Technical specifications

Item	Specification		
	2MLL-C22A	2MLL-CH2A	2MLL-C42A
Transmission speed (bps)	300 / 600 / 1200 / 2400 / 4800 / 7200 / 9600 / 19200 / 38400 / 57600 / 64000 / 115200bps supported		
Station number setting	Setting range: 0 ~ 31 Max. station number supported: 32 stations		
Transmission distance	RS-232C: Max.15m (extendible if modem is used)		-
	-	RS-422: Max. 500m	
Diagnosis function	Checking availability through LED and SoftMaster-NM diagnosis service, Loop-Back diagnosis		
Current consumption	310mA	310mA	300 mA
Weight	121g	119g	116 g

2.2 Part names and functions

The front view of Snet I/F module is shown below.

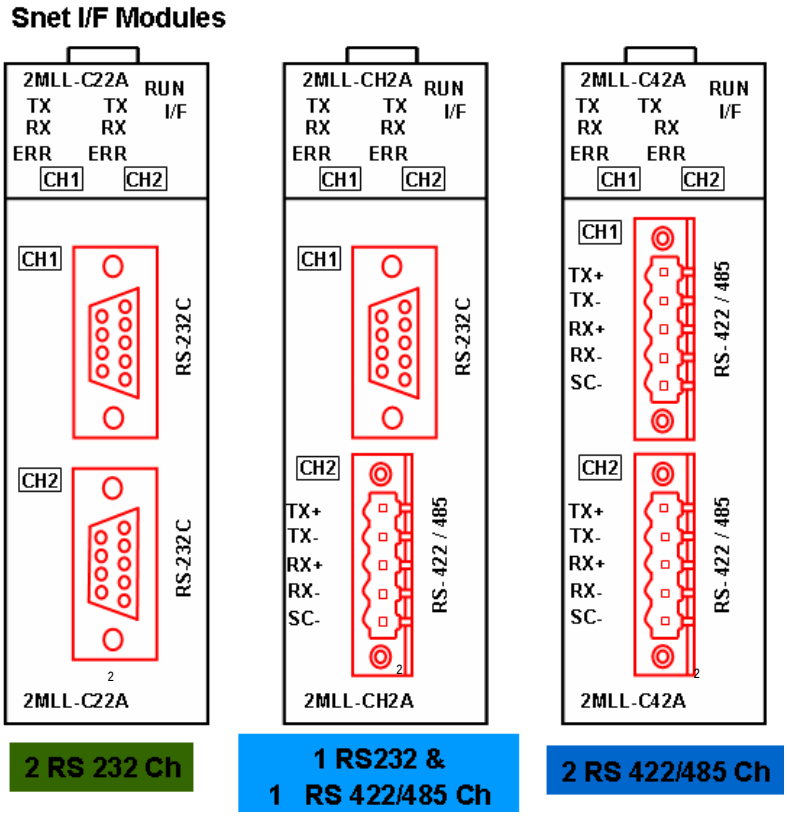


Figure 1 – Snet I/F module, front

Table 3 – Parts and functions

LED	LED Details	LED Status	Details of LED Status
RUN	Displays Snet operation status	ON	Operation normal
		OFF	Snet module operation abnormal
I/F	Displays interface status with CPU	ON	Operation abnormal during communication with CPU module
		OFF	Communication module initializing error
		Blinks	Operation normal
Tx	Displays frame being transmitted	ON	Frame being transmitted
		OFF	Frame transmitted completely
Rx	Displays frame being received	ON	Frame being received
		OFF	Frame received completely
ERR	Displays frame error	ON	Frame error
		OFF	Frame normal

2.3 Cable specifications

The cable specifications are based on the communication distance and speed. It is recommended to use twisted pair cable, when using communication channel RS-422 or RS-485. Recommended cable specifications are described in Table 4. It is important to use the cable that conforms to the characteristics as shown in Table 4.

Table 4 – Cable characteristics

	Test item	Unit	Characteristics	Test conditions
Electrical Characteristics	Conductor resistance	Ω/km	59 or less	Normal temp.
	Withstanding voltage (DC)	V/min	Withstands for 1 min. at 500V	In air
	Insulation resistance	MΩ-km	1000 or more	Normal temp.
	Static electricity capacity	Pf/M	45 or less	1kHz
	Characteristics impedance	Ω	120 ± 12	10MHz

	Item Unit			Single Cable
Characteristics of appearance	Conductor	Cores	Pair	2
		Size	AWG	22
		Composition	No./mm	1 / 0.643
		Outer diameter	mm	0.643
	Insulator	Thickness	mm	0.59
		Outer diameter	mm	1.94

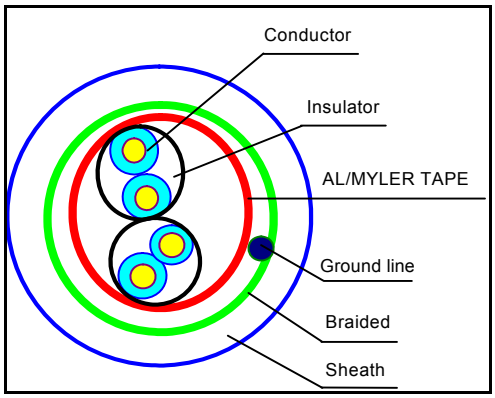


Figure 2 – Structure

2.4 Terminal resistance

To enable communication using RS-422 or RS-485 channel, you have to connect an external terminal resistance at both the ends of the line. Terminal resistance prevents distortion of signal due to reflected wave for long-distance communication. You have to connect the same resistance (120Ω) as characteristic impedance of cable to the ends of the network.

When using the cable as recommended in Cable specifications, connect terminal resistance of 120Ω to both ends of the cable. When using a cable other than the one recommended, connect the resistance which has characteristic impedance (1/2W) as of the cable to both ends of the cable.

Terminal resistance characteristics: 1/2W, 120Ω, tolerance of 5%

1. RS-422 connection with terminal resistance.

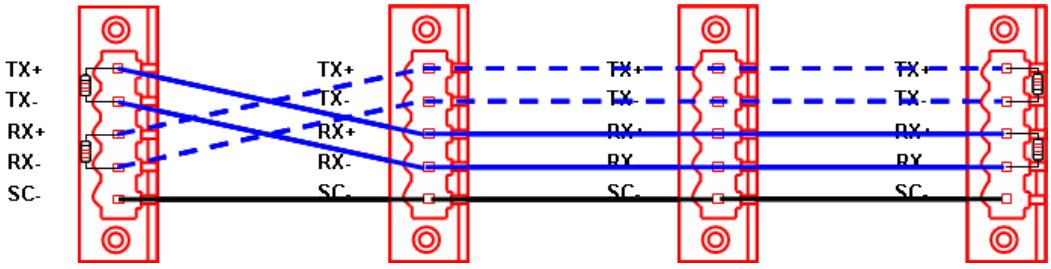


Figure 3 – Connection with terminal resistance (RS-422)

2. RS-485 connection with terminal resistance.

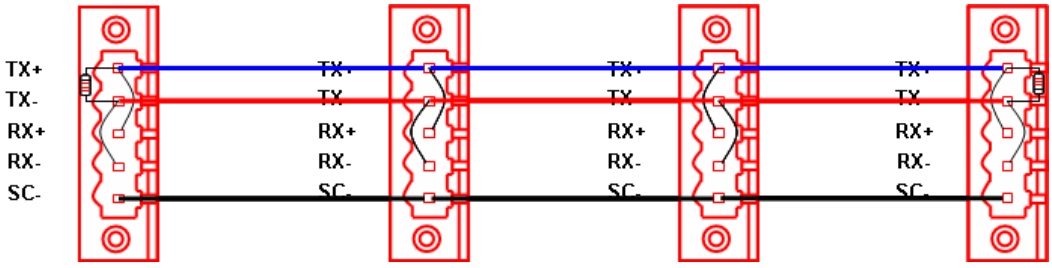


Figure 4 – Connection with terminal resistance (RS-485)

3. System Configuration

3.1 Operation mode setting

You can determine the operation mode of MasterLogic-200 Snet module by the basic communication parameters. The operational parameters are independent or separate for each communication port. The operation modes supported are described below.

Server mode

1. Operates as a server in the network with following configurable options.

   a) MLDP Server – Limited (MasterLogic Dedicated Protocol). This protocol supports dedicated peer-to-peer communication between MasterLogic PLCs on serial network. In addition, it supports Memory Read/Write function.

   b) Modbus server (Modbus slave protocol) with open standard serial devices

   - It supports Modbus RTU/ASCII type (optional).
   - Setting is necessary for conversion between Modbus protocol memory area and MasterLogic-200 memory area.

2. It supports SoftMaster service (remote 1/2 step connection) functions at a time.

P2P (Client) mode

1. Operates as a client in the network with following configurable options:

   a) MLDP Client – Limited (MasterLogic Dedicated Protocol). This protocol supports dedicated peer-to-peer communication between MasterLogic PLCs on serial network. In addition, it supports Memory Read/Write function.

   b) Modbus client (Modbus master protocol) with open standard serial devices

   - It supports Modbus protocol and RTU/ASCII type (optional).
   - Setting is necessary for conversion between Modbus protocol memory area and MasterLogic-200 memory area.

   c) User-defined protocol with proprietary serial devices.

2. You can specify up to 64 communication blocks for 1 Snet module to define the independent operation.

3.2 Channel operation during normal run

Each communication port operates independently to allow simultaneous Tx/Rx in separate transmission specifications. Therefore, transmission specifications can be set as per RS-232C and RS-422 channel. Run/Stop can be specified for each channel. Data flow of each channel is as shown below.

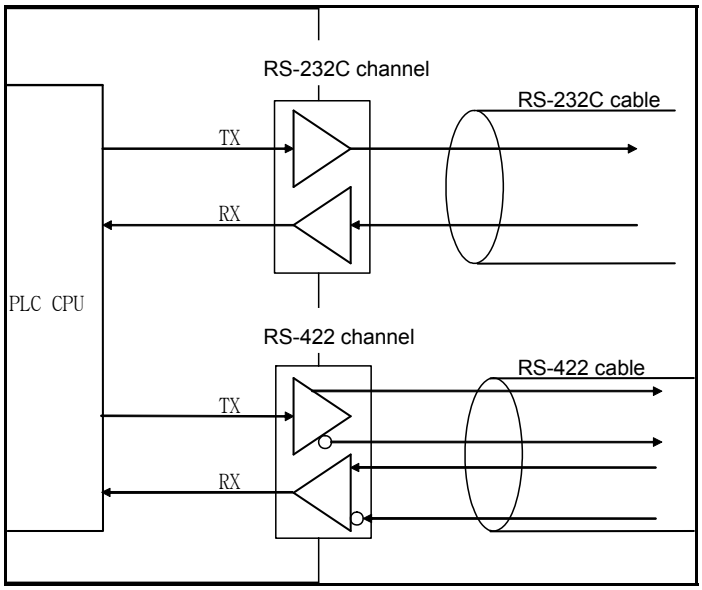


Figure 5 – Data flow of each channel

ATTENTION

You are not allowed to change Mode during operation. In order to change Mode, download the basic communication parameters and reset the communication module.

3.3 Channel operation in diagnosis mode (Loop-Back)

Loop-Back diagnosis is a function to check if the communication channel operates normally without being connected to any external device.

REFERENCE - INTERNAL

For more details on Loop-Back method, refer to Loop back test.

3.4 Method of serial interface

RS-232C interface

The channel RS-232C uses 9-pin connector (Female) for communication with external devices. The names and functions of pins and data directions are as shown in Table 5.

Table 5 – RS-232C 9-pin connector standard

Pin No.	Name	Contents	Signal Direction (Snet I/F module ↔ external device)	Description
1	CD	Carrier Detect	←	Reports carrier detection of DCE to DTE
2	RxD	Received Data	←	Received data signal
3	TxD	Transmitted Data	→	Transmitted data signal
4	DTR	Data Terminal Ready	→	Reports ready communication of DTE [TIP1] to DCE [TIP2]
5	SG	Signal Ground	↔	Ground line for signal
6	DSR	Data Set Ready	←	Reports ready communication of DCE to DTE
7	RTS	Request To Send	←	DTE communicates to DCE to send data
8	CTS	Clear To Send	→	DCE communicates to DTE to send data
9	RI	Ring	←	Reports ring tone received from DCE to DTE

The channel RS-232C can communicate with external devices directly and with remote communication devices through modem.

Communication type for RS-232C must be set to ‘modem’ in SoftMaster-NM if the modem is connected. Communication type for RS-232C must be set to null modem if the modem is not connected.

TIP

- **DTE**: Data Terminal Equipment (Snet I/F module)
- **DCE**: Data Communication Equipment (external modem)

Modem connection using RS-232C connector

1. Snet I/F module can communicate with long distance devices connected through modem.
2. The connection of modem and RS-232C is as shown in Table 6.

Table 6 – Cable connection between RS-232C and modem

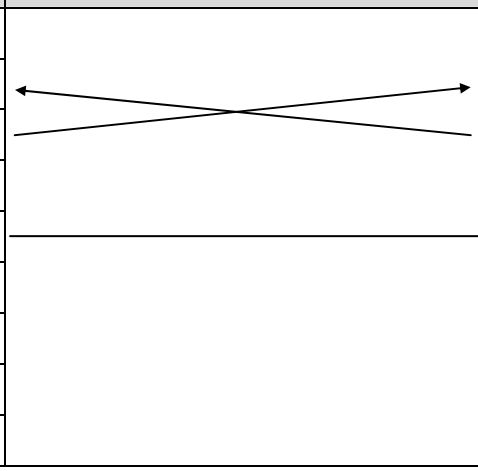
Snet (9-PIN)		Signal direction	Modem side (25-PIN)	
Pin No.	Name		Name	Pin No.
1	CD	←	CD	8
2	RXD	←	RXD	3
3	TXD	→	TXD	2
4	DTR	→	DTR	20
5	SG	—	SG	7
6	DSR	←	DSR	6
7	RTS	→	RTS	4
8	CTS	←	CTS	5
9	RI (Note)		RI	22

Note: Pin number 9, RI signal is not used in Snet I/F module.

Modem connection using RS-232C connector in null modem mode

In null modem mode, the connection is achieved by using three lines (pins) as shown in Table 7.

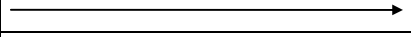
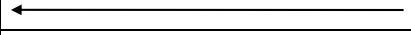
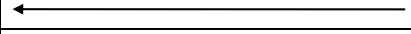
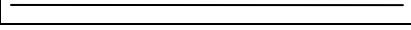
Table 7 – 3-line type of connection (no handshake)

Snet (9-PIN)		Signal Direction	Computer/Communication Devices
Pin No.	Name		Name
1	CD		CD
2	RXD		RXD
3	TXD		TXD
4	DTR		DTR
5	SG		SG
6	DSR		DSR
7	RTS		RTS
8	CTS		CTS
9	RI		RI

RS-422 interface

The channel RS-422 uses 5-pin connector (Terminal Block) for communication with external devices. The names and functions of pins and data directions are as shown Table 8.

Table 8 – RS-422 5-pin connector standard

Pin No.	Name	Signal Direction (Snet<-- > External Device)	Description
1	TX+		Transmitted data (+)
2	TX-		Transmitted data (-)
3	RX+		Received data (+)
4	RX-		Received data (-)
5	S.G (SG)		Ground line for signal

The channel RS-422 is designed to connect as RS-422 as well as RS-485 (multi-drop) interfaces with external devices. When using RS-422 channel as multi-drop,

- Set each channel's communication type to RS-485 on the Basic Setting menu in SoftMaster-NM
- Use the RS-422 interface with pin connections as shown in Table 9.

Table 9 shows an example of connecting communication cable for RS-422 communication.

Table 9 – RS-422 connection

Snet (5-Pin)		Signal Direction (Snet<--- > External Device)	External Communication Device
Pin No.	Name		
1	TX+	→	RX+
2	TX-	→	RX-
3	RX+	←	TX+
4	RX-	←	TX-
5	S.G (SG)	↔	S.G

Table 10 – RS-485 connection

Snet (5-Pin)		Signal Direction (Snet<--- > External Device)	External Communication Device
Pin No.	Name		
1	TX+		RX+
2	TX-		RX-
3	RX+		TX+
4	RX-		TX-
5	S.G (SG)		S.G

Table 10 shows the pin configuration and connections for RS-485 multi-drop communication.

In case of multi-drop communication, to connect with external devices, the pins TX+ and RX+, RX- and TX- of RS-422 channel should be shorted as shown in Table 9. At this time, half-duplex communication is run, Tx/Rx line is shared.

4. Installation and Test Operation

4.1 Installation environment

This product is highly reliable regardless of the installation environment. However, it is recommended to take the following precautions to ensure reliability and stability of the system.

1. Environmental conditions
    a) Install the system on a waterproof and dustproof control panel.
    b) Do not expose the system to continuous impact or vibration.
    c) Do not expose the system to direct sunlight.
    d) Prevent dew formation due to rapid temperature change.
    e) Maintain ambient temperature around 0-55°C.
2. Installation work
    a) Do not leave wire scraps inside the PLC while wiring or drilling screw holes.
    b) Install the system on a good location to work on.
    c) Do not install the system on the same panel as a high-voltage device.
    d) Keep it at least 50mm away from a duct or a near-by module.
    e) Ground the system to an appropriate place that is free from noise.

4.2 Precautions for handling

Ensure that thefollowing precautions are followed while installing the Snet I/F module.

1. Handle with care. Do not drop it and avoid strong and sudden shocks.
2. Do not remove PCB from the case. It might cause abnormal operation.
3. Do not let any external materials like wiring waste to be left over in the module casing during wiring.
4. Do not install or remove the module while the power is still ON.
5. Use standard cable only. Install within the maximum distance specified.
6. The communication cable should be free from the surge and inductive noises generated by the alternating current.
7. Do not let wiring get close to any hot device and material or in direct contact with oil for long, which might cause damage or abnormal operation due to short-circuit.

4.3 From setting to operation

The sequence right from the product installation to operation is explained below. After the product installation is complete, configure the system to be operated as specified in the following sequence.

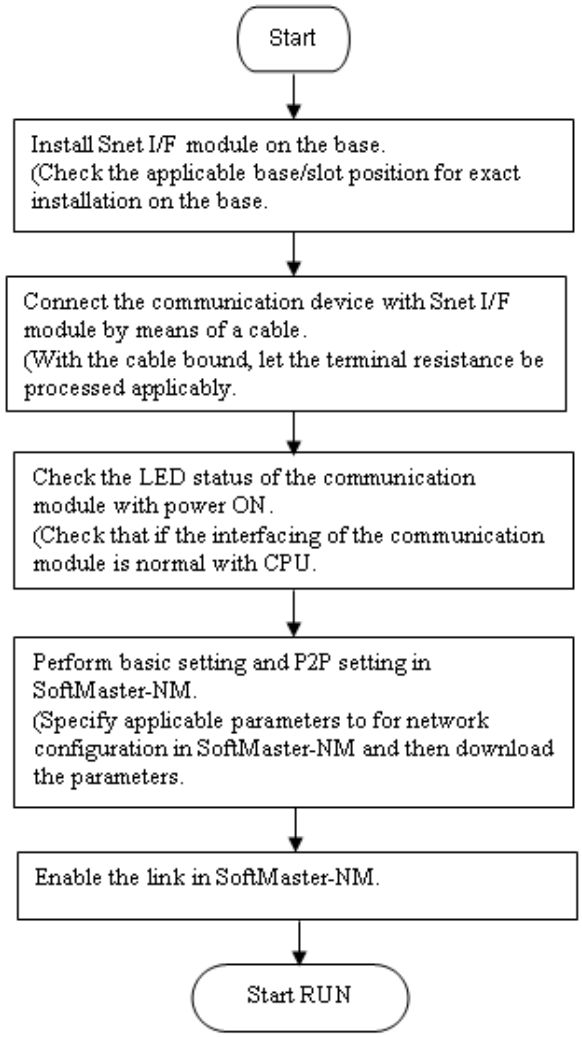


Figure 6 – Flowchart

TIP

Setting the Station number of Snet I/F module is not necessary due to hardware properties. Use SoftMaster-NM to specify basic settings necessary for station number and Snet communication.

5. System Configuration

5.1 Introduction to system configuration

Snet I/F module is used for both ML-200 and ML-200R modules. You can mount up to 24 modules on the main and expansion bases. All the 24 modules can be used by a dedicated server protocol. However, only eight modules are supported to be used for P2P service.

This module is used for configuring various communication systems in accordance with the application needs. This chapter describes examples of system configurations that are available or unavailable for various application needs.

5.2 Supported system configurations

1:1 connection (no modem) to PC (HMI)

In this configuration, PC (HMI) and Snet I/F modules are connected using RS-232C or RS-422 channel in 1:1 connection system without using any modem in between the two of them. Most PC (HMI)'s are operated as client stations and Snet I/F modules are operated as server stations that respond to the request of PC (HMI).

Since no modem is used, communication distance is a maximum of 15m via RS-232C channel and maximum of 500m via RS-422 channel. Operation mode of Snet I/F module is set according to the communication type of PC (HMI).

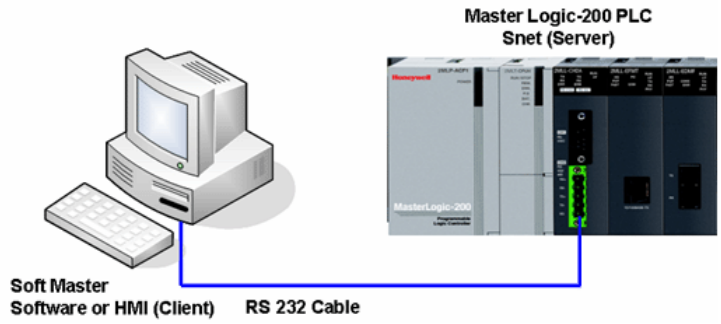


Figure 7 – 1:1 communication system with PC

1:1 dedicated modem connection to PC (HMI)

In this configuration, PC (HMI) and Snet I/F module are connected through dedicated modem via RS-232C channel in 1:1 connection system. Most PC (HMI)s are operated as

client stations and Snet I/F modules are operated as server stations that respond to the request of PC (HMI). Since modem is used, RS-232C channel should be set to dedicated modem for long-distance communication. Operation mode of Snet I/F module is set according to the communication type of PC (HMI).

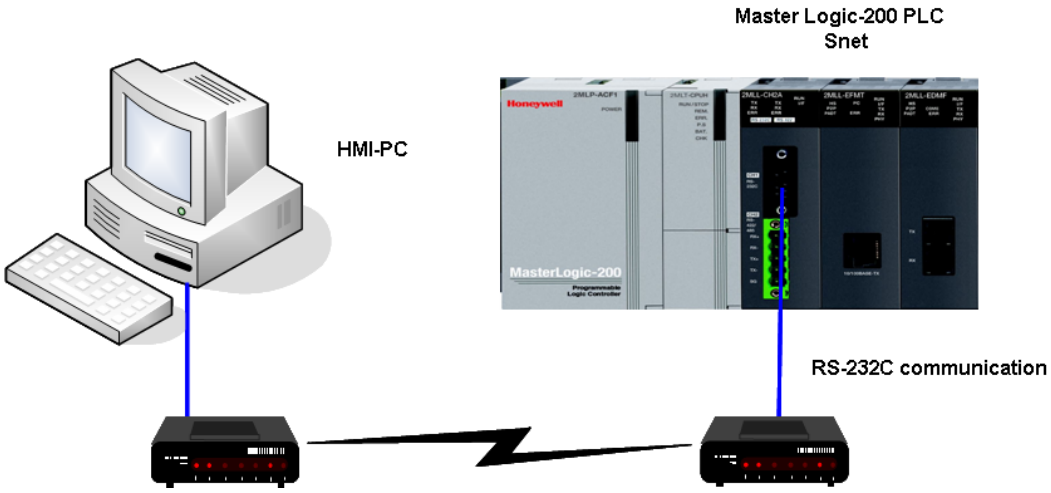


Figure 8 – 1:1 dedicated modem communication with PC

Modem connection to PC and communication between interlinked Snet I/F modules

1. PC and Snet #1 station are connected through modem via RS-232C channel.
2. Snet stations communicate with each other using RS-422 channel.
3. PC is operated as client station of Snet #1 station.
4. Snet I/F module can connect with a maximum of 32 stations (RS-422/485 communication).
5. RS-232C channel of Snet I/F module is set as server station and RS-422 channel of Snet I/F module is set as client station.
6. Dedicated modem or dial-up modem is available for use.

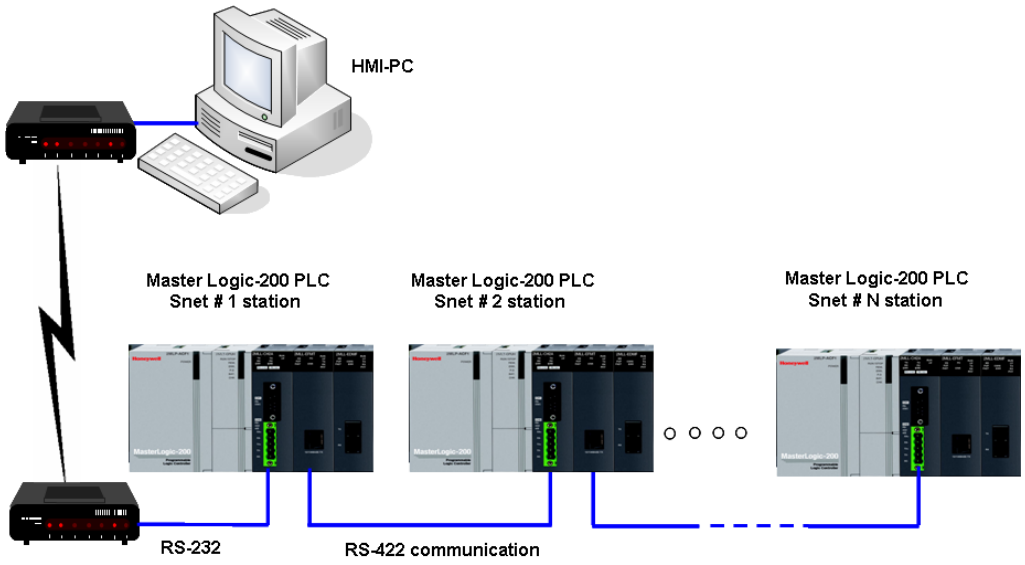


Figure 9 – Dedicated modem communication with PC

The following table shows the module setting for Snet stations.

Table 11 – Module setting table for Snet stations

Type	Module setting		
	RS-232C	RS-422	Station No.
PLC Snet #1 station	MLDP Server - Limited	P2P	1
		MLDP Client	
Snet #2~#31 station	Not used	MLDP Server - Limited	2~31

Dedicated communication with PC (HMI) and third-party RS-422 communication

1. Null-modem communication with PC (HMI) via RS-232C channel is available.
2. PC (HMI) is operated as client station and Snet I/F module via RS-232C channel is operated as MLDP server-Limited.
3. Snet I/F module's RS-422 channel is operated in P2P mode.

4. Display data is transmitted to display modules of mosaic panel via Snet RS-422 channel.

5. Display data transmission can be read from PC (HMI).

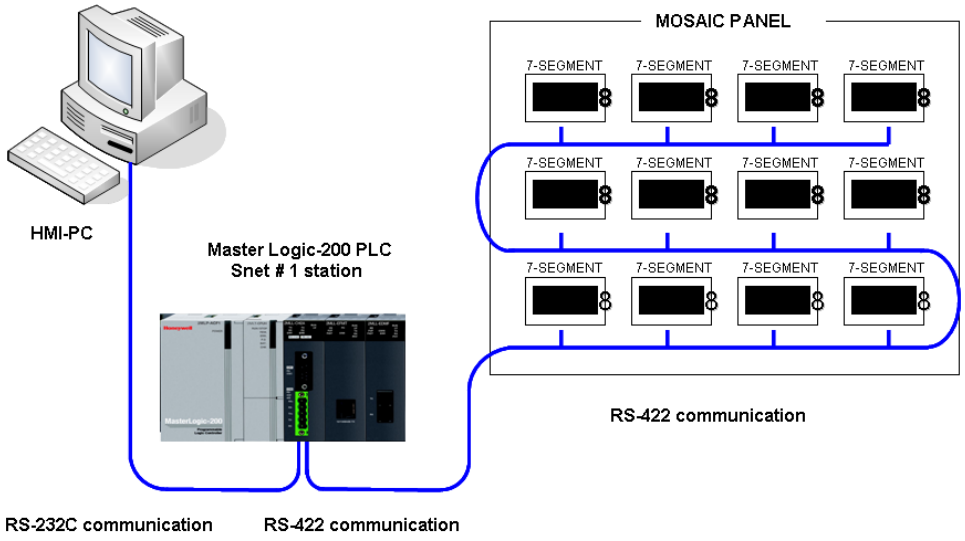


Figure 10 – 7-segment operation system for RS-422

The following table shows the module setting for Snet stations 2.

Table 12 – Module setting for Snet Stations 2

Type	Module Setting		
	RS-232C	RS-422	Station No.
PLC Snet #1 station	MLDP Server-Limited	P2P	1

Optical modem communication for mobile communication

1. Optical modem communication method is used for Snet communication when the PLC is mounted on a mobile body in linear motion.

2. Dedicated mode communication or P2P communication with monitoring device is available.

3. RS -232C/RS-422 communication with optical modem is available.
4. Dedicated client/server communication between Snet I/F modules is used.
5. Optical modem connected with Snet I/F module on the mobile body can communicate with the other optical modem only within communication range.
6. Main application: parking tower

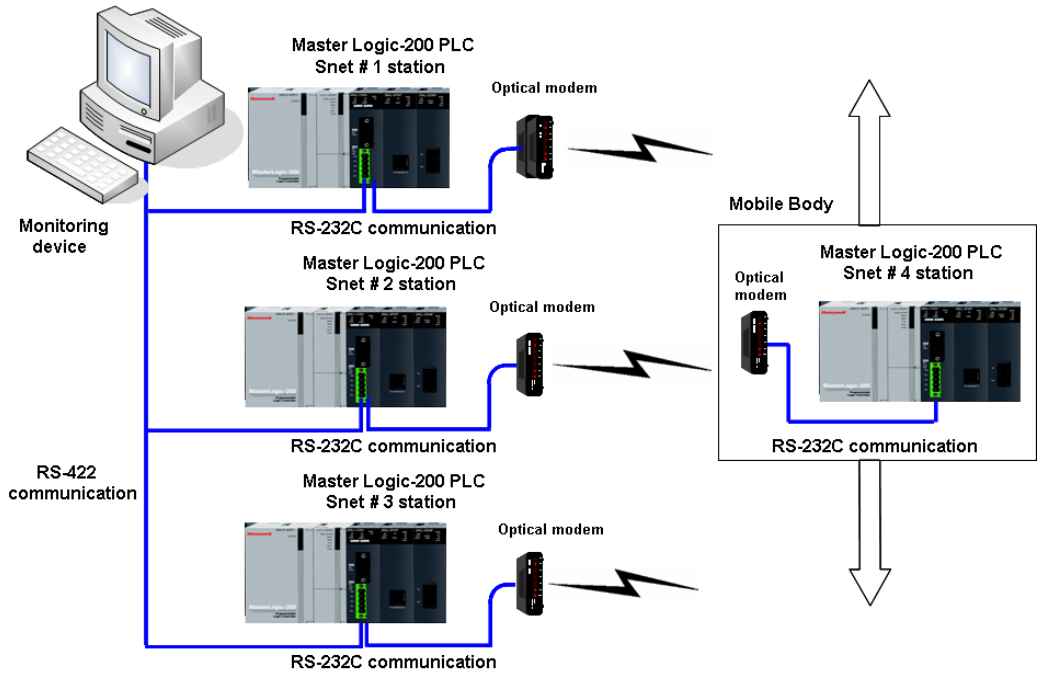


Figure 11 – Optical modem communication system

Wireless modem communication between bodies in revolution

1. Wireless modem communication method is used for Snet communication when the module is mounted on a mobile body which is revolving.
2. RS-232C communication with wireless modem is used.
3. Dedicated client/sever communication between Snet I/F modules is used.
4. RS-232C channel of Snet I/F module is configured in dedicated modem mode.

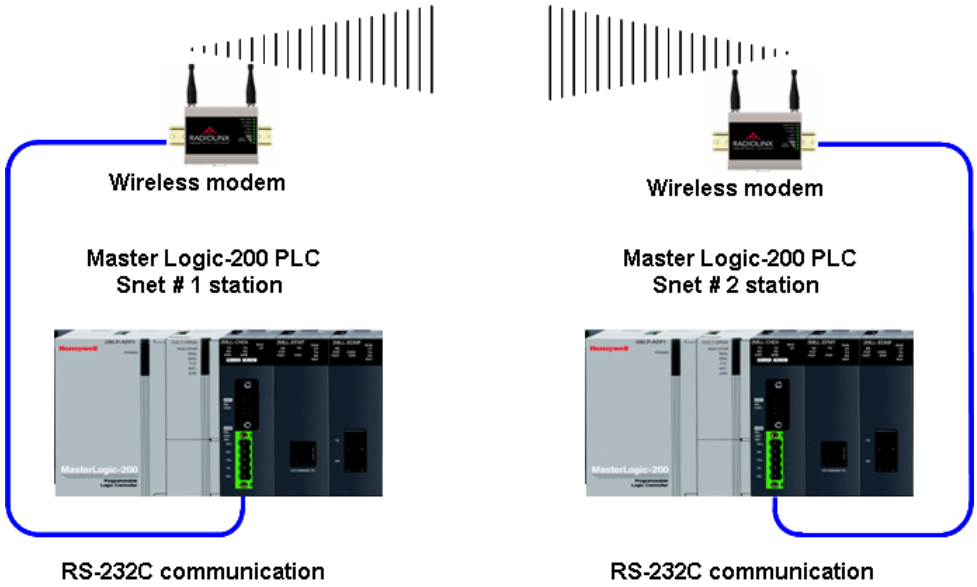


Figure 12 – Wireless modem communication system

The following table shows the setting details between communication modules.

Table 13 – Setting details between communication modules

Type	Module Setting		
	RS-232C	RS-422	Station No.
Snet#1 and Snet#2	Dedicated mode	Not used	1 and 2
	User mode		

TM/TC (Telemetry/Telecommand) communication system

1. Long-distance communication with remote server PLC via dedicated modem is possible.
2. Dedicated modem communication via RS-232C channel which is set to dedicated modem mode is possible in this system.
3. Dedicated client/server communication between Snet I/F modules is used.
4. You can mount eight Snet I/F modules on TM client PLC.

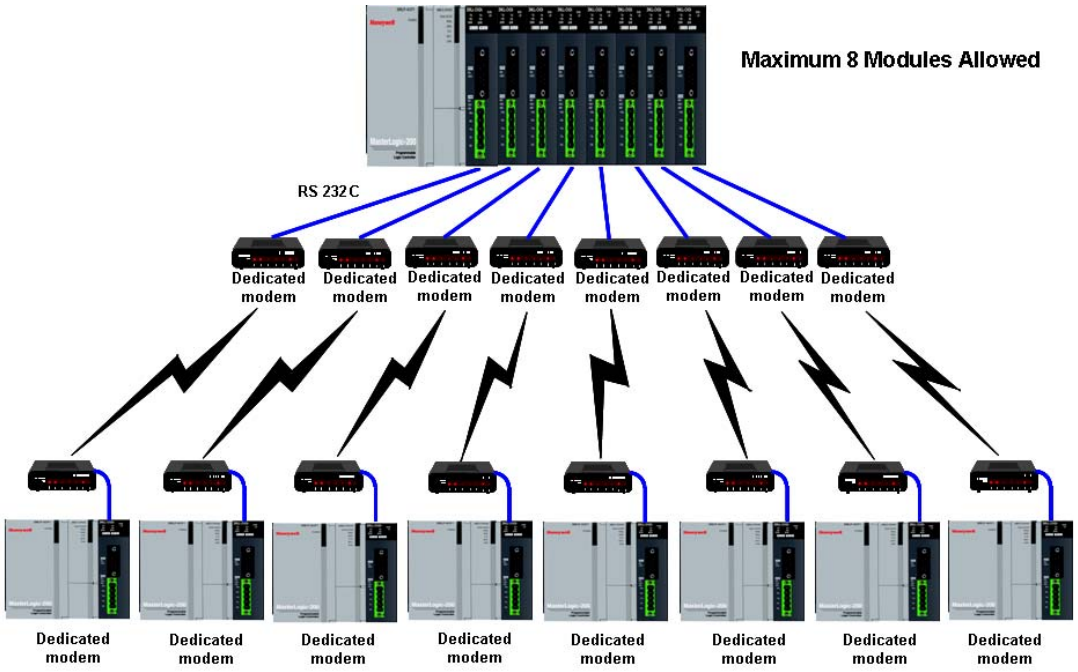


Figure 13 – TM/TC dedicated modem system

5.3 System configurations not supported

Dial-up modem communication between Snet I/F modules

1. Snet I/F module do not have dial-up function, to make telephone calls.
2. Snet I/F module only has a function to answer telephone calls.
3. Dial-up modem communication between Snet I/F modules via a PSTN network is unavailable.

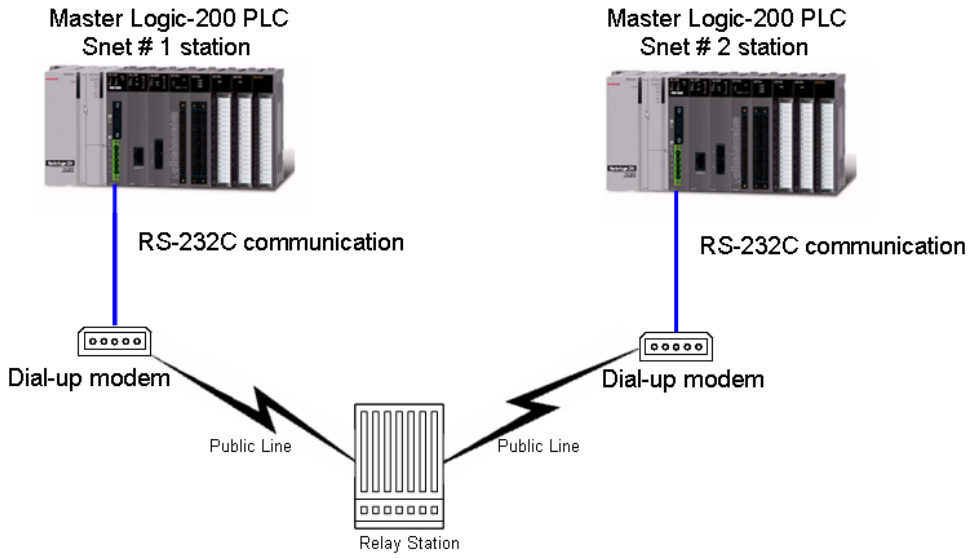


Figure 14 – Dial-up modem communication between Snet I/F modules

SoftMaster connection using RS-422 channel of Snet I/F module

1. SoftMaster service of Snet I/F module supports only RS-232C channel.
2. SoftMaster does not support the connection via RS-422 channel.
3. Setting Snet's station number in SoftMaster via a remote connection is not possible.
4. SoftMaster PC is connected to Snet #1 station as shown in the following figure.

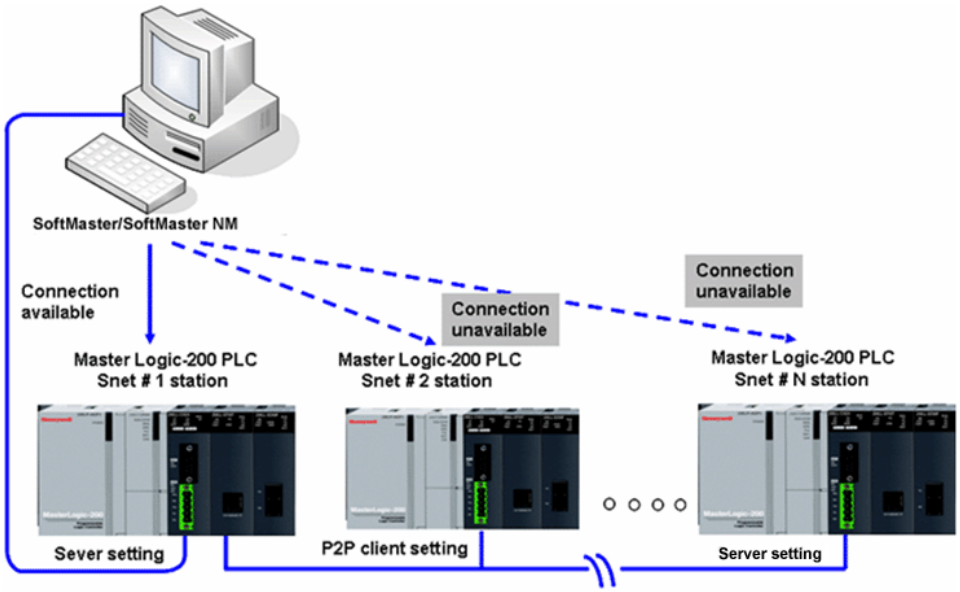


Figure 15 – SoftMaster connection via RS-422 channel

6. Basic Communication Parameters Setting

6.1 Communication module registration

In order to use Snet I/F module, communication parameters must be specified in SoftMaster-NM. The optional method to register the Snet I/F module depends on ON/OFF line status as described below.

Offline registration of Snet I/F module

When the PLC is disconnected from SoftMaster-NM, offline registration is used. To set the communication module and to specify communication related parameters, select the base and the slot position to register Snet I/F module on the **SoftMaster-NM Basic Setting** window. The **Communication Module Setting** window displays. Register the Snet I/F module on the desired base and slot position.

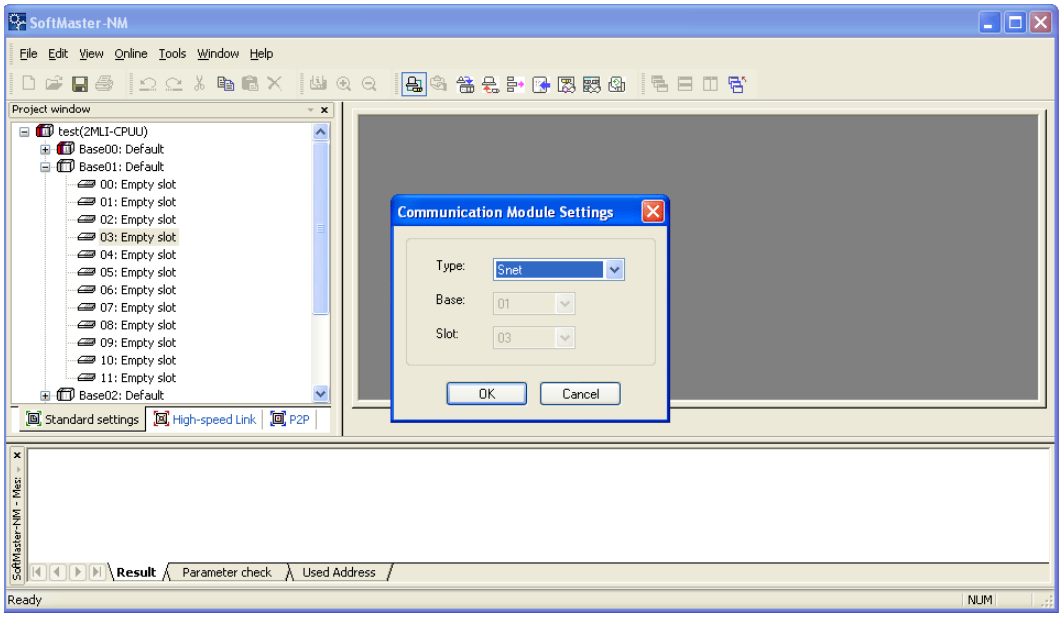


Figure 16 – Snet module registration window

Online registration of Snet I/F module

When SoftMaster-NM is online with the PLC CPU, online registration method is used.

Perform the following steps for online registration of Snet I/F module.

Step	Action
1	To register the communication module through SoftMaster-NM, connect the PLC CPU to the installed communication module.
2	From the **Online** menu, select **Connect Setting** for communication setting.
3	From the **Online** menu, select **Connect** to select Local Connect (or Remote 1/2 Stage Connect). If connected normally, submenus in **Online** menu will be enabled.
4	From the **Online** menu, select **Read IO Information** to automatically display all the communication modules in main base and extended base.

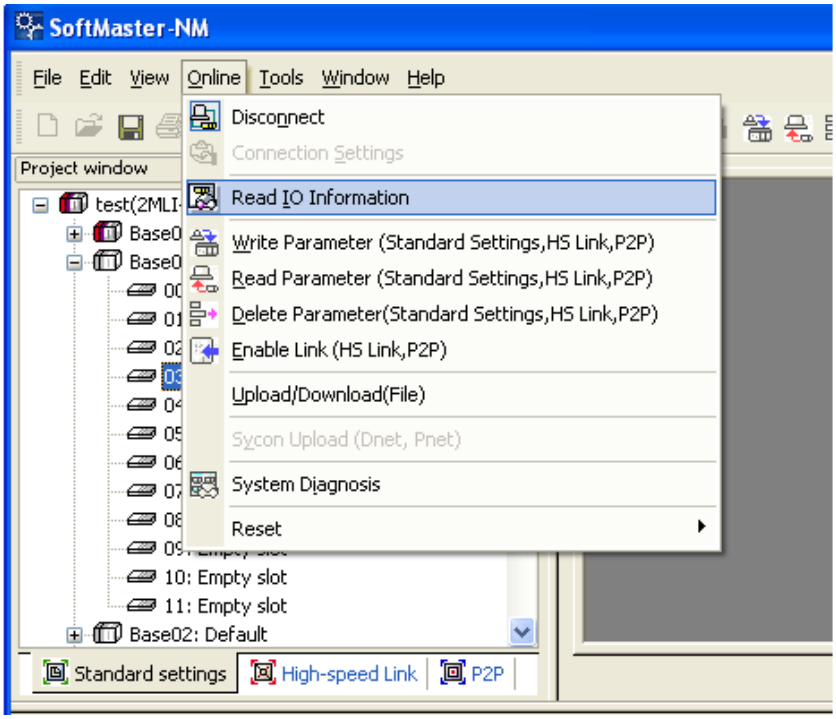


Figure 17 – Snet IO information read window

5	If the module registered in offline mode is different from the online mode of the presently connected PLC, or different from the type of the communication module configured in the previous project, the following message displays.

Step	Action

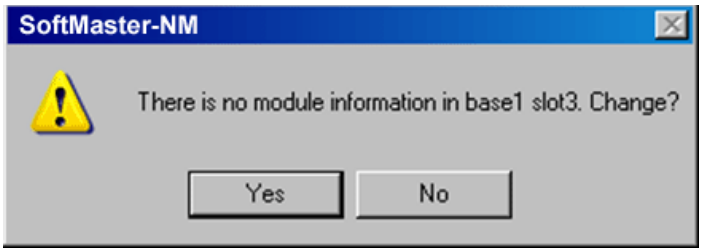


Figure 18 – Message window of IO information change

6 After the communication module is registered as described above, it displays in the list.

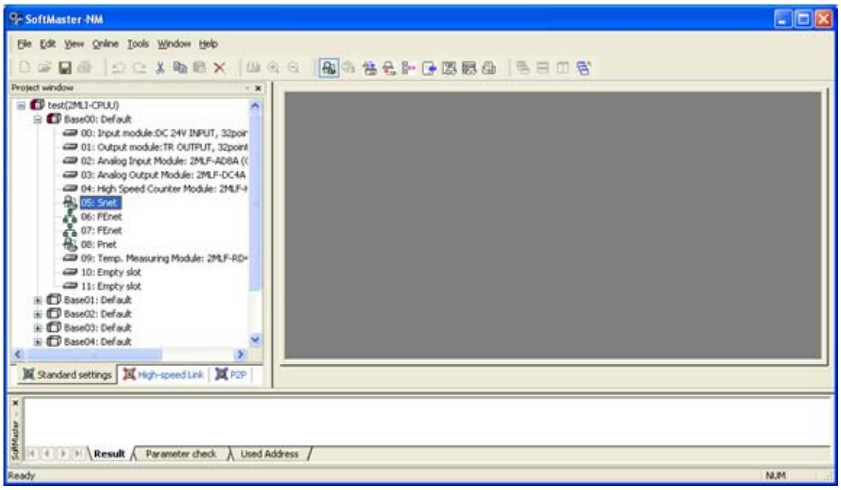


Figure 19 – Communication module registration complete window

6.2 Transmission specification settings

Transmission specifications such as transmission speed and data type such as data/stop bit should be specified in order to use Snet I/F module.

Specified basic setting values are saved in PLC CPU, and will not be changed until overwritten. In addition, even if Snet I/F module is replaced with a new module, the basic setting values previously specified and saved in CPU will be automatically applied to the new module as well.

The basic communication setting parameters even if downloaded is not directly applied to Snet. In order to apply the changed or newly specified basic settings, reset the communication module.

Setting items

When setting Snet communication parameters, you should specify the items as shown in Table 14.

Table 14 – Basic setting parameters for Snet

Items		Setting Value	Basic Value	Remarks
Communication type		RS-232C / RS-422 / RS-485	RS-232C	Register communication type of each channel
Communication speed		300 / 600 /1200 /1800 / 2400 / 3600 / 4800 / 7200 / 9600 / 19200 / 38400 / 57600 / 64000 / 115200	9600	
Data type	DATA BIT	7/8	8	
	STOP BIT	1/2	1	
	PARITY BIT	None/Even/Odd	NONE	Check detailed information
Modem type		Null modem/Dedicated modem/Dial-up modem	Null modem	

Items	Setting Value		Basic Value	Remarks
Dedicated service driver	MLDP communication	MLDP server - Limited	MLDP server – Limited (MLDP communication)	Check detailed information
	Modbus	RTU/ASCII server (slave)		
		DI/DO/AI/AO area		
Station No.	0 ~ 31		0	Commonly used for all services

Snet I/F module provides two communication channels which need Snet basic settings, respectively. The different configurations available are: RS-232 2Port, RS-232 1Port/RS-422 1Port, and RS-422 2Port based on the communication module chosen.

The additional information for some of the Basic Setting Parameters are described in Table 15.

Communication type

You can select the communication type (RS232C/ RS422/ RS485) of MasterLogic-200 Snet I/F module by changing the communication module. If the specified communication type is different from the communication module's actual channel, communication module's channel type is used. This disables normal communication.

Parity Bit

Three types of parity bit can be specified for Snet I/F module. Description of each parity bit is as follows.

Table 15 – Parity bit details

Parity Bit Type	Description	Remarks
None	Parity bit not used.	
Even	If the number of 1 bits in one byte is even, 0 is sent as the parity bit.	Maintain even number of 1's.
Odd	If the number of 1 bits in one byte is odd, 0 is sent as the parity bit.	Maintain odd number of 1's.

Dedicated service driver

Use driver selection item to select the operation mode of Snet I/F module for each channel. Each channel of Snet I/F module separately operates as a server or client. The details of operation modes available for each port are as follows.

Table 16 – Driver details

Driver Type	Description	Remarks
P2P	Applicable port operates as a client and executes communication using P2P parameters setting.	Refer to P2P setting
MLDP server-Limited	Operates as MLDP server (Limited), which supports MLDP communication with other ML-200 PLCs. This is not applicable for Experion integration.	For dedicated service
Modbus ASCII server	Operates as Modbus ASCII server (Modbus slave).	For dedicated service
Modbus RTU server	Operates as Modbus RTU server (Modbus slave).	For dedicated service

You can select the MLDP or Modbus server for the operation mode of Snet channel. It supports loader service along with dedicated service.

1. MLDP Server (Limited)

   Supports memory Read/Write only for dedicated service.

2. Modbus ASCII/RTU server

   a) You can select Snet I/F module, when it needs to operate as a server. It uses Modbus protocol.

b) Additional setting is necessary for mapping between Modbus defined memory area and MasterLogic-200 memory area.

REFERENCE - INTERNAL

For details on Memory Mapping, refer to Table 15.

Setting method

In order to operate Snet I/F module in the user-defined mode as per the user-defined communication specifications, follow the sequence below.

Example, for 2MLL-CH2A (RS232 1Port, RS422 1Port) installed on base 0 and slot 3, the setting should be done as shown below.

Communication specifications

1. Channel 1: RS-232C, 9600 Bps, 8/1/None, null modem, MLDP server, 1 station.
2. Channel 2: RS-422, 38400 Bps, 8/1/Odd, null modem, PTP, 2 stations.

Perform the following steps to set the method.

Step	Action
1	Open **SoftMaster-NM** and then register the communication module Snet on the applicable base and slot position as necessary for setting.

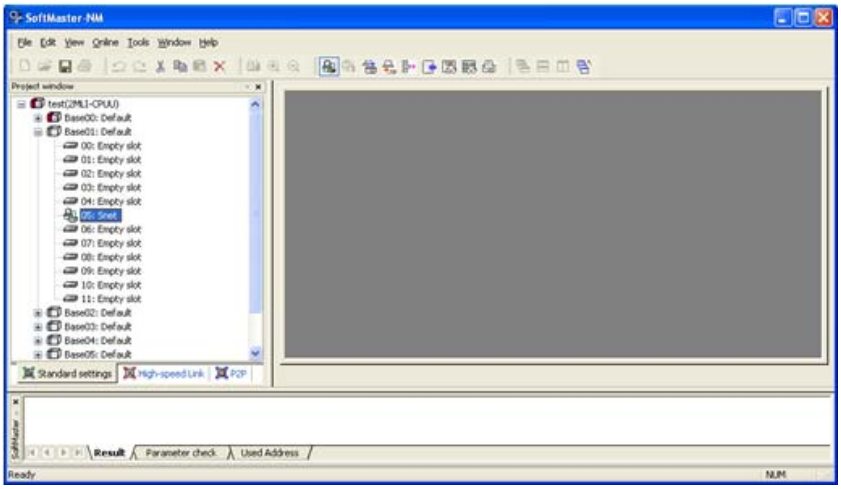


Figure 20 – Setting window of communication module

2	Select **Snet** on the basic setting window to display the serial communication setting window.
3	On the Snet module area of **Standard Settings** window, double-click Snet and the **Standard Settings Snet** displays; on this window specify the parameters for each channel.
4	Specify communication speed, communication type and station number for the applicable channels, respectively.

Step	Action

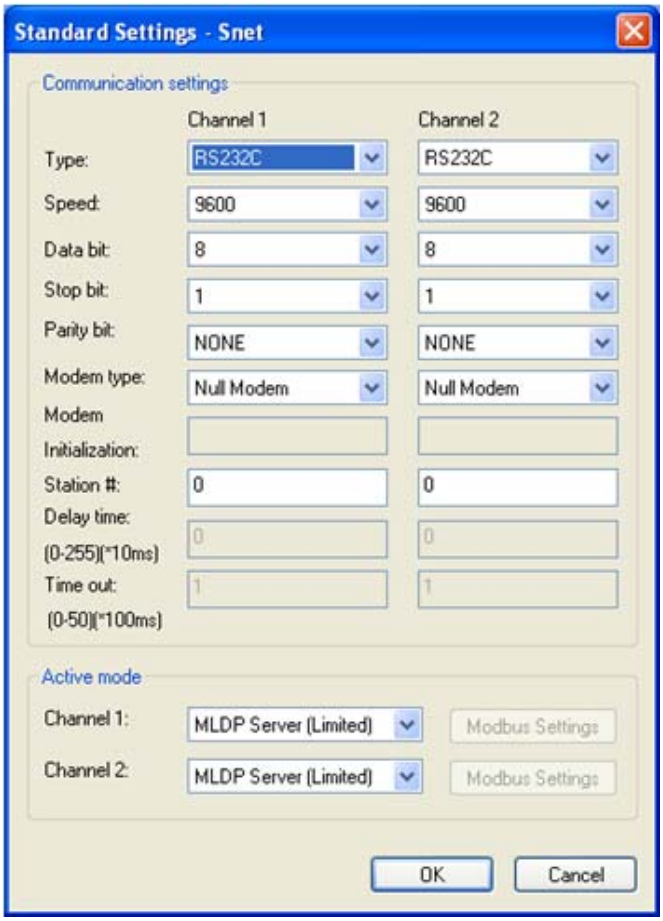


Figure 21 – Basic setting window of Snet communication for respective channels

5 Select the operation mode for each channel.

6 After basic communication parameters setting is complete, download it onto Snet module.

Step	Action
7	From the **Online menu, select Connect then select Write Parameter** to display **Parameter Download** window.

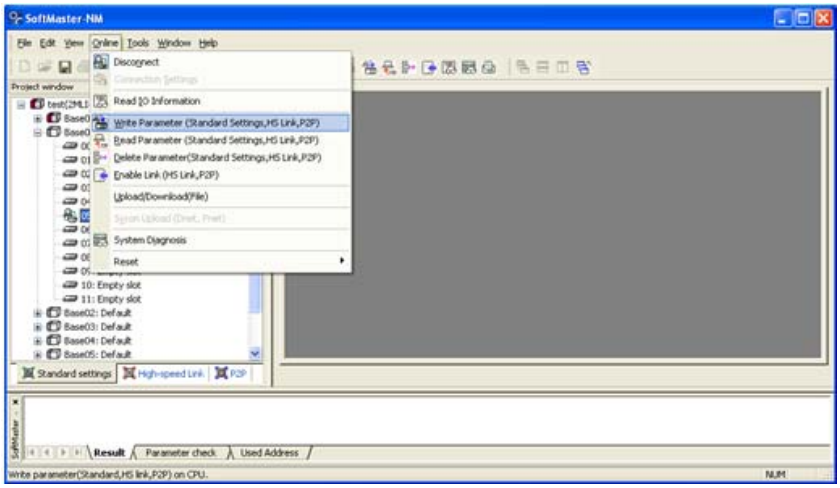


Figure 22 – Parameter Download window

8	Select basic setting for the desired communication card to execute Write.

Step	Action

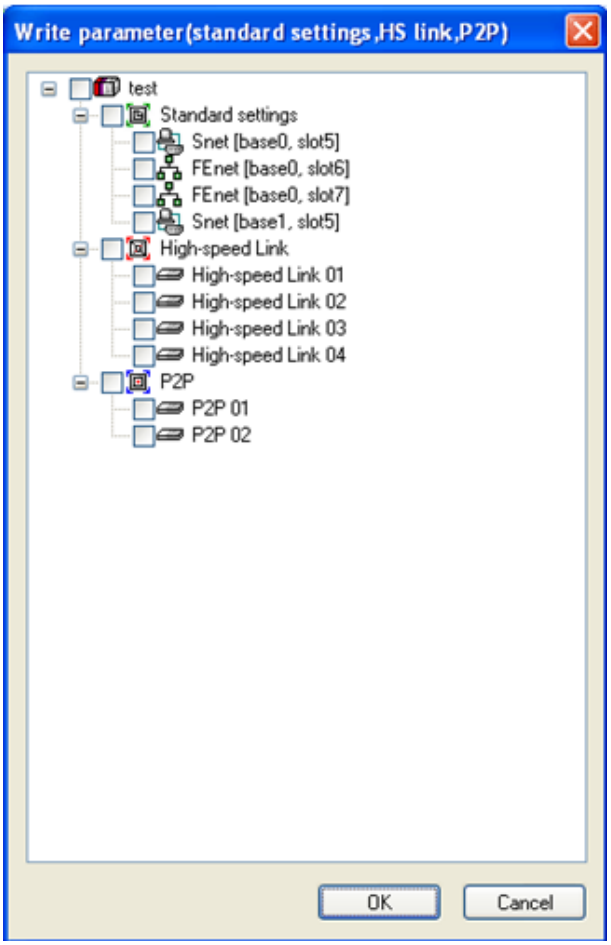


Figure 23 – Parameter Write setting

9 On **Basic setting**, specify Snet for each base and slot and then click Confirm to complete download.

The specified communication parameters are not applied to Snet module even after being downloaded. Reset the communication module for initialization and normal operation based on the specified communication parameters.

The following methods are used to reset.

1. Individual reset is a preferred option which does not disturb the operation.
2. In SoftMaster-NM, from the **Online** menu, select **Reset**.
3. Switch on the CPU reset switch. (Refer to the CPU user's manual.)
4. Restart the PLC power.

7. Communication Functions

7.1 Communication functions classification

Communication functions available in Snet I/F module can be classified into several services as follows:

1. Dedicated service

    a) Information and data of PLC can be read or written in PC and associated to devices without any additional programming in PLC.

    b) Snet I/F module can operate as MLDP (MasterLogic Dedicated Protocol) server supporting dedicated MLDP protocol and as Modbus server supporting Modbus RTU/ASCII protocol as well.

2. P2P service

    a) Snet I/F module can operate as a client on the network.

    b) If a specified event occurs, corresponding station's memory can be read or written.

    c) Snet I/F module can operate as MLDP Client and Modbus Client.

    d) P2P service is used for communication with third-party devices not supporting MLDP or Modbus protocol and used for Tx/Rx of the frame desired by user.

    e) You can define up to 64 P2P blocks that operate separately.

3. SoftMaster service

    With remote 1st stage/2nd stage connection used, monitoring/program download is available for remote PLC.

7.2 Dedicated service

Introduction

The dedicated service function built-in Snet I/F module enables information and data of PLC to be read or written in PC and associated devices without additional programming in PLC.

It operates as a server in communication network and responds to memory Read/Write request conforming to dedicated MLDP protocol in external devices or PC, or conforming to Modbus protocol.

In order to use the dedicated service, select the operation mode for the channel used for server, among Snet channels 1 and 2, when setting basic communication.

It supports MLDP server – Limited and Modbus server, which respond to both RTU and ASCII format.

Since each respective channel operates separately in Snet I/F module, it cannot be set to other type of server. Refer to dedicated service related sections in Diagnosis for details on diagnosis of normal operation of the dedicated service.

MLDP server

When using the dedicated service, the frame size of all the frames used in MLDP server should not exceed 256 Bytes. The characters used in all the frames are of ASCII code. If used as multi-drop, up to 32 stations can be connected with the server.

Two devices in the same network should not have the identical station number. Communication speed/stop bit/parity bit/data bit of all the Snet I/F modules should be identical on the network if used as multi-drop. MLDP server supports only the memory Read/Write function of the Dedicated MLDP protocol.

Modbus server (slave)

It is used when the device with which Snet module communicatation operates as Modbus Client (master). It supports both Modbus's ASCII Mode and RTU Mode, which can be specified in the operation mode of **Basic Setting** window.

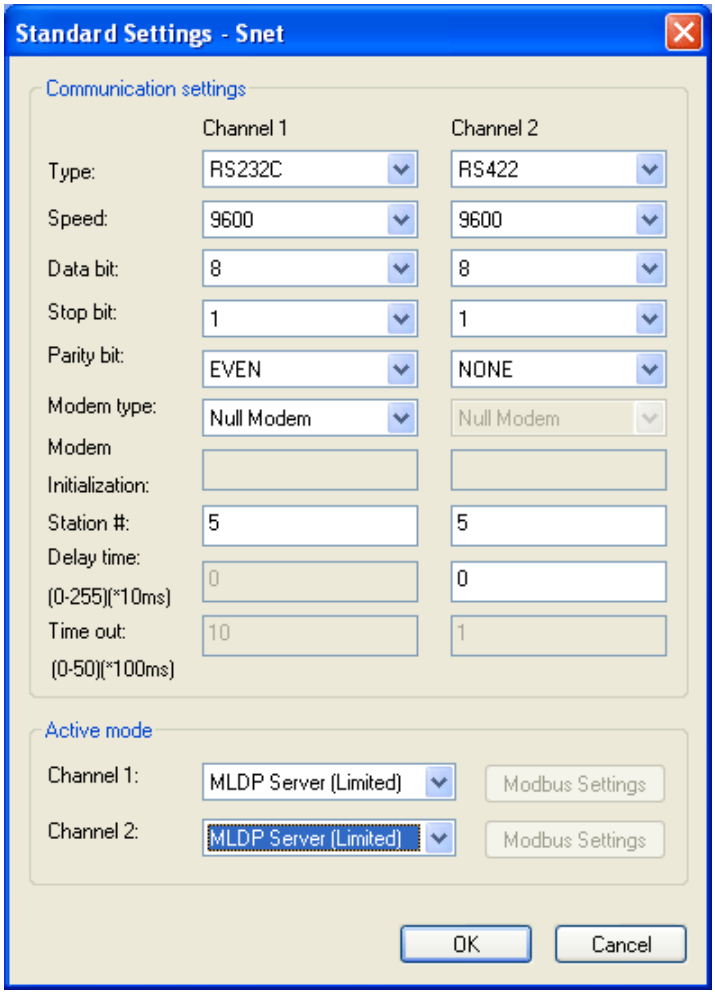


Figure 24 – Basic setting window of Modbus server

Modbus instructions and the maximum response data that is supported by the Modbus RTU/ASCII driver are described in Table 17.

The client device that communicates with Snet module in Modbus server mode should request data within the range described in Table 17.

For example, bit Read request: Read Coil Status is available up to 2000 bits and bit Write request (Force Multiple Coils) is available up to 1968 bits (using Modbus RTU).

Table 17 – Modbus instruction code

Code	Purpose	Address	Max. Response data
01	Read Coil Status	0XXXX	2000 Coils
02	Read Input Status	1XXXX	2000 Coils
03	Read Holding Registers	4XXXX	125 Registers
04	Read Input Registers	3XXXX	125 Registers
05	Force Single Coil	0XXXX	1 Coil
06	Preset Single Register	4XXXX	1 Register
15	Force Multiple Coils	0XXXX	1968 Coils
16	Preset Multiple Registers	4XXXX	120 Registers

For the request of each instruction code, corresponding area should be set in the MasterLogic-200 PLC memory.

This can be done through **Modbus Setting** window as shown in Figure 25, which is displayed if **Modbus Settings** button is clicked after selecting Modbus ASCII server/Modbus RTU server on the **Modbus setting of Snet operation mode** window.

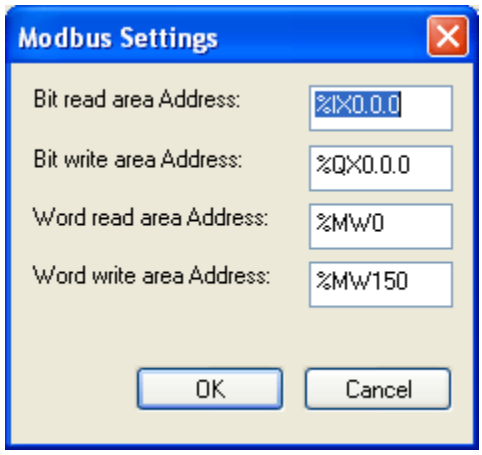


Figure 25 – Setting window of Modbus server memory

Details of respective setting items are as follows:

Table 18 – Details of Modbus area

Item	Description	Remarks
DI area address	MasterLogic-200 address applicable to digital input area	Bit address
DO area address	MasterLogic-200 address applicable to digital output area	Bit address
AI area address	MasterLogic-200 address applicable to analog input area	Word address
AO area address	MasterLogic-200 address applicable to analog output area	Word address

The address value set in the respective item is the base address of the applicable area. The window in Figure 25 above shows that DI area is assigned from MX1000, and AO area from PW200.

Input value of Base Address should be inside the effective area such as %M, P, and so on.

Since Modbus address is 1 ~ 9999 (decimal), bit I/O area's size will be 9999/8 = 1249.875 bytes.

Word I/O area's size will be 9999∗2 = 19998 bytes.

If the user sets the bit output (0XXXX) area's Base Address to 0, Modbus bit area 00001 will respond to 0th byte, 0th bit, and 00002 to 0th byte, 1st bit.

7.3 P2P service

Introduction

P2P service executes client operation of the communication module as realized with parameters set with instruction blocks. Four P2P instructions available in Snet I/F module are Read/Write/Send/Receive.

P2P service's registration and edit is executed in SoftMaster-NM where up to eight P2P parameters can be set. Each P2P parameter is composed of up to 64 P2P blocks.

The following figure shows an example of P2P parameters setting window in SoftMaster-NM.

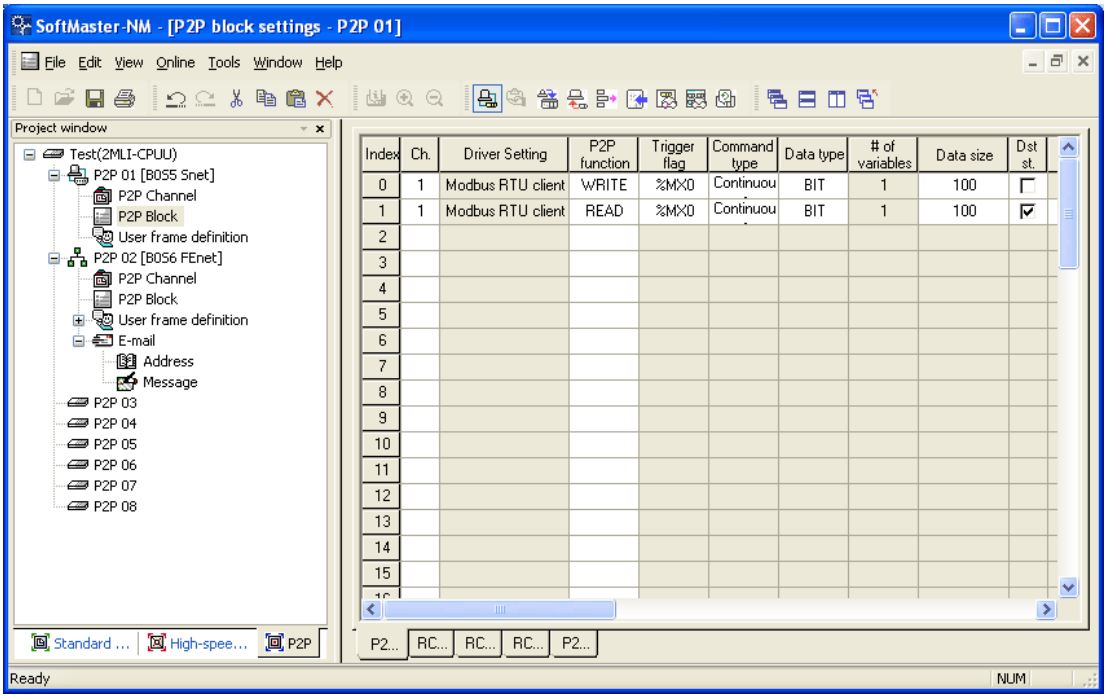


Figure 26 – P2P parameters setting window

1. P2P parameters registration window.

   a) You can set up to eight P2P parameters..

b) You can set multiple P2P parameters for an identical Snet I/F module. However, **Enable** option is available only for one parameter among the multiple P2P parameters for the identical Snet I/F module.

c) Each P2P parameter is composed of P2P channel, P2P block, and user-defined frame.

2. P2P edit window

a) You can register and edit up to 64 P2P blocks.

Configuration of P2P parameters

In order to use P2P service, the user needs to execute setting for the operation desired on the P2P parameters window. Each P2P parameter is composed of P2P channel, P2P block and user-defined frame.

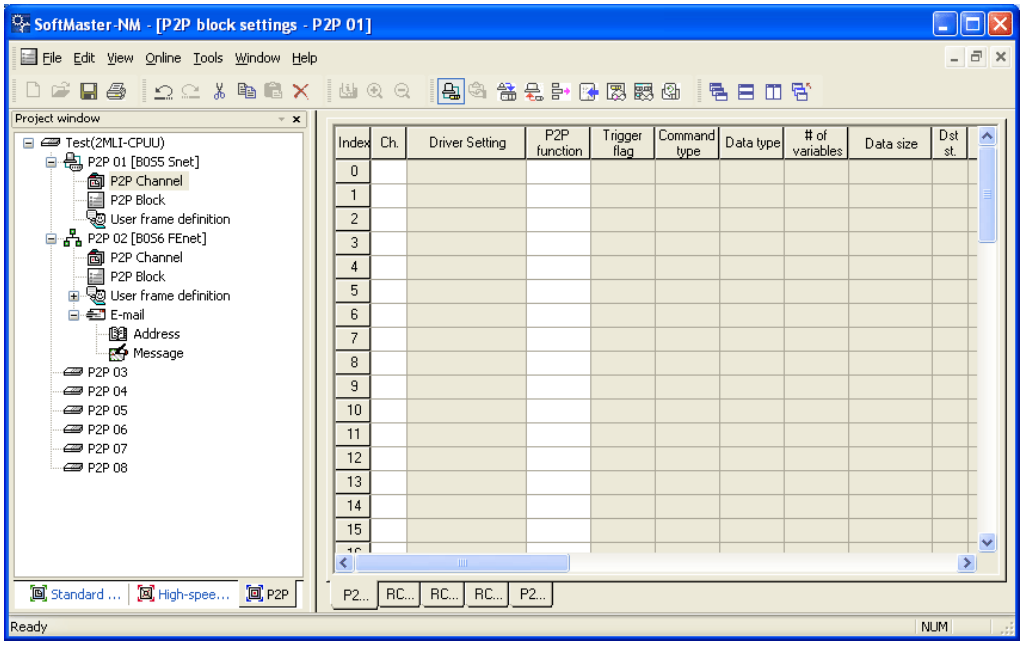


Figure 27 – Configuration window of P2P parameters

1. P2P channel
   a) P2P channel setting should define the communication protocol of the P2P service to be executed.
   b) MLDP/Modbus is available.
   c) You have to do separate setting for respective channels. This is applicable only if basic setting's '**P2P driver'** is None.
2. P2P block
   a) You have to set each of the 64 P2P blocks separately.
3. User-defined frame
   a) You have to register the user-defined frame.

Channel information

Snet I/F module provide two communication channels (channel 1, channel 2) that operate independently. You can define the respective driver type of each channel for P2P service.

Select P2P channel on **P2P Channel Setting** window, P2P Channel Setting window displays as shown in Figure 28.

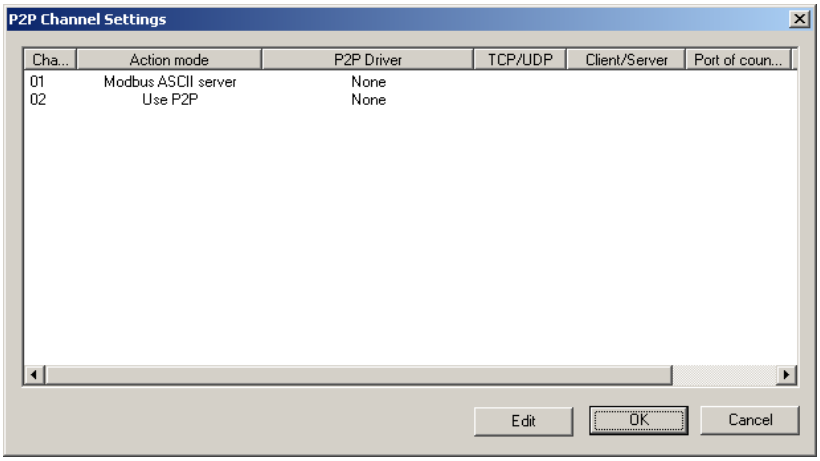


Figure 28 – P2P Channel Setting window

If you select the channel with P2P, 'P2P Channel Setting' window displays for the user to define P2P driver for the corresponding channel.

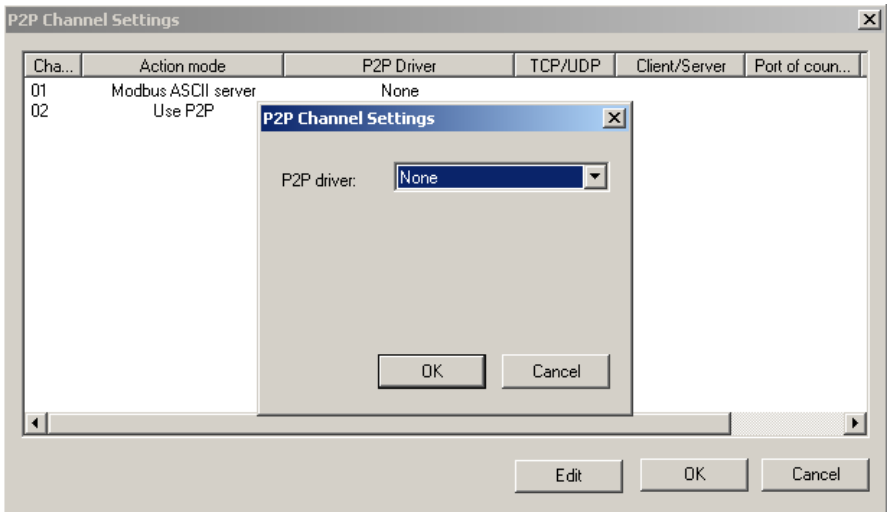


Figure 29 – Setting window of channel driver with P2P used

Drivers and details available in MasterLogic-200 Snet are as follows.

Table 19 – Drivers

Drivers	Details
None	P2P service not used
User-defined frame	Used for Tx / Rx of user-defined frame as desired
MLDP client	Select for Read/Write of MasterLogic-200 memory
Modbus ASCII client	Select if you operate as Modbus Client and use in ASCII Mode
Modbus RTU client	Select if you operate as Modbus Client and use in RTU Mode

If you select MLDP or Modbus as P2P driver for the communication channel, user-defined frame cannot be made available.

The following table describes how to use Modbus driver.

Table 20 – Codes of Modbus instructions and data

Code	Purpose	Modicon PLC Data Address	Remarks
01	Output Contact Status Read (Read Coil Status)	0XXXX (Bit-Output)	Bit Read
02	Input Contact Status Read (Read Input Status)	1XXXX (Bit-Input)	Bit Read
03	Output Register Read (Read Holding Registers)	4XXXX (Word-Output)	Word Read
04	Input Register Read (Read Input Registers)	3XXXX (Word-Input)	Word Read
05	Output Contact 1 Bit Write (Force Single Coil)	0XXXX (Bit-Output)	Bit Write
06	Output Register 1 Word Write (Preset Single Register)	4XXXX (Word-Output)	Word Write
15	Output Contact Continuous Write (Force Multiple Coils)	0XXXX (Bit-Output)	Bit Write
16	Output Register Continuous Write (Preset Multiple Register)	4XXXX (Word-Output)	Word Write

Block information

If you select P2P block of applicable parameter on P2P parameters setting window, P2P block setting window displays.

Index	Order word	Detailed information	Base address
0	Write	Ch:2, Flag:F00092, CmndType:Single, DataType:BIT, VarCnt:1, DestStNo:3	N00001
1	Write	Ch:2, Flag:F00092, CmndType:Single, DataType:WORD, VarCnt:1, DestStNo:4	N00042
2	Read	Ch:2, Flag:F00092, CmndType:Single, DataType:BIT, VarCnt:1, DestStNo:3	N00103
3	Read	Ch:2, Flag:F00093, CmndType:Single, DataType:WORD, VarCnt:1, DestStNo:4	N00144
4			
5			

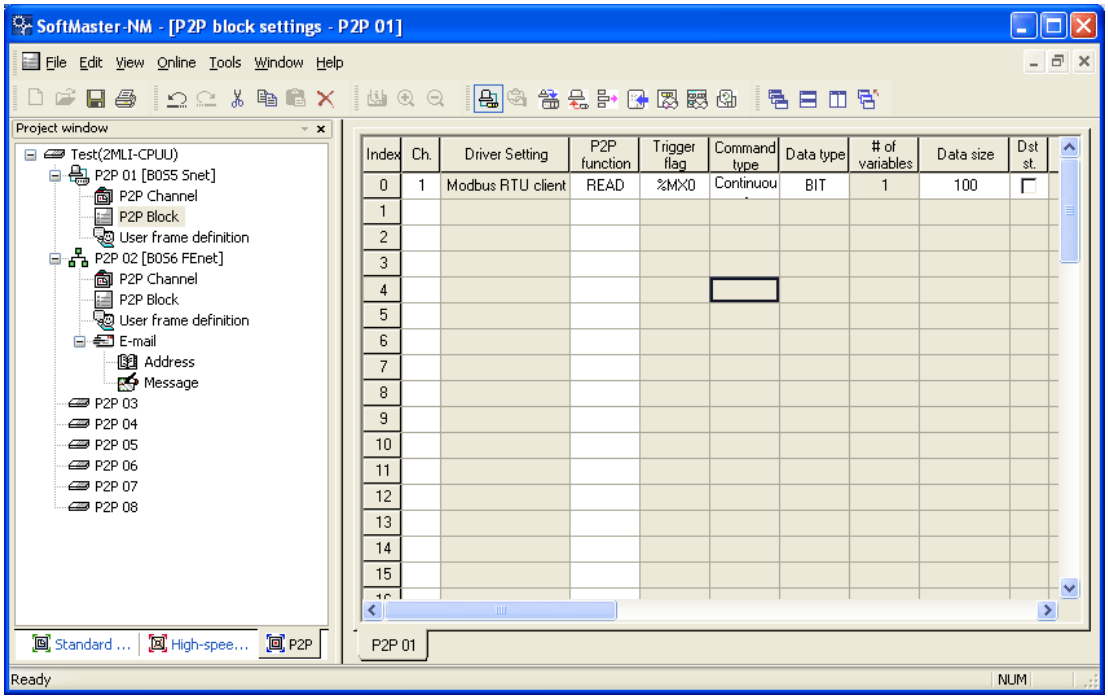


Figure 30 – P2P block setting window

You can set up to 64 separate blocks. Select an optional block to specify the applicable block operation by selecting an instruction as READ, WRITE, SEND, and RECEIVE.

Setting options and details of respective instructions are as follows.

Read instruction

You can use this instruction to read and save corresponding station's optional area, regardless of driver type. Its basic configuration is as shown below.

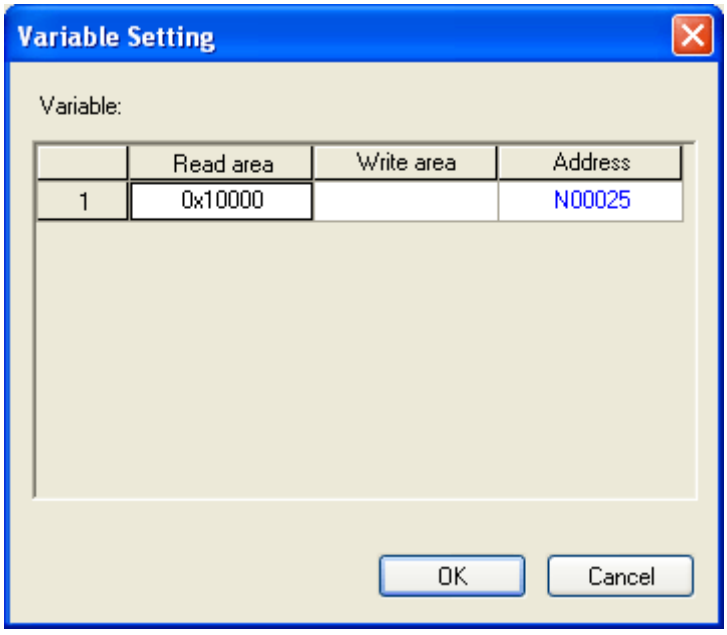


Figure 31 – Setting window of P2P Read instruction 1

It is composed of standard action settings and memory settings as described below.

1. Standard action settings

   a) Channel

   – Select a communication channel, which the applicable block will use. The communication channel for each block is decided while setting parameters. The parameters cannot be changed during Run mode.

   b) Condition Flag

   – Defines when P2P block should operate

   – Select Regular cycle and Memory Set Trigger condition

   c) Data Type

   – Define the format of the data, which the block will process. You can process the Bit, Byte, Word, Dword, and Lword in MLDP and you can only process Bit or Word in Modbus.

d) Command Type

- Choose between a detailed Read operation, Individual Read, and Continuous Read operation.
- Individual Read reads up to four memory areas.
- Continuous Read reads as many memory areas as defined on the specified position.

e) Number of Variables

- This parameter specifies the number of variables that you can select if you select Individual Read.
- Decide the number of memory areas to read from individually. Up to four memory areas are available.

f) Data Size

- Define the size of data to read, if you select Continuous Read.
- Data size has a different meaning based on the data type.
- When five is defined, it means five Words if Data Type is Word, and five Bits if Data Type is Bit.

g) Station of Counterpart

- Define the station number from which the data is to be read.
- If you select the check button, the counterpart station number will be fixed.
- If you clear the check button, the counterpart station number will be assigned to PLC memory, and the counterpart station number will be changeable by changing the applicable area's value.

2. Memory setting

a) Area to read

- Set the corresponding area to read.
- Set as many variables with input value that is different for different drivers.
- MLDP client
  - Input M100 to read data of corresponding %MW100.

- Modbus client
  - Input 30010 to read data of corresponding AI 10 address.

b) Area to save

- Set the area to save the read data.
- Set as many variables with input value that is different for different drivers.
- Input P100 to save the read data on %PW100.

In order to read and save %MW250 and %MW260's, 1 Word of the corresponding station number 7 on %PW100, and %PW130 when TW01's number 0 bit is set via the channel 2, its setting will be as follows.

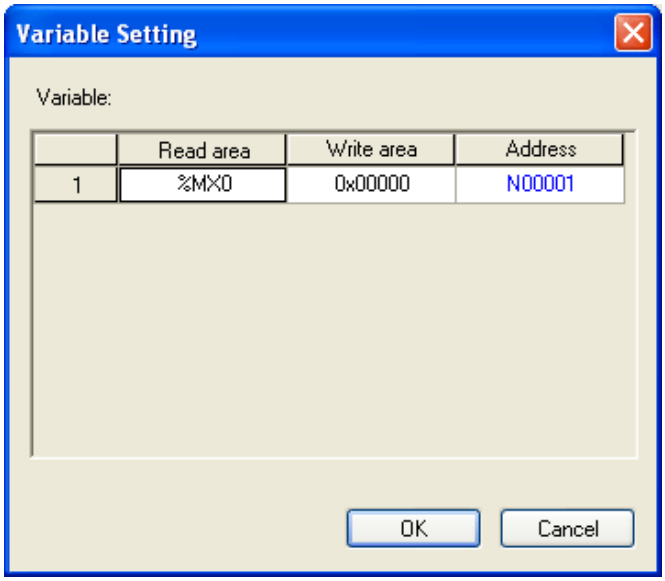


Figure 32 – Setting window of P2P Read instruction 2

Write instruction

You can use this instruction for writing data on optional area corresponding to station's desired area, regardless of driver type.

It supports Continuous Write and Individual Write, you can write data on up to four individual areas. Its basic configuration is as shown below.

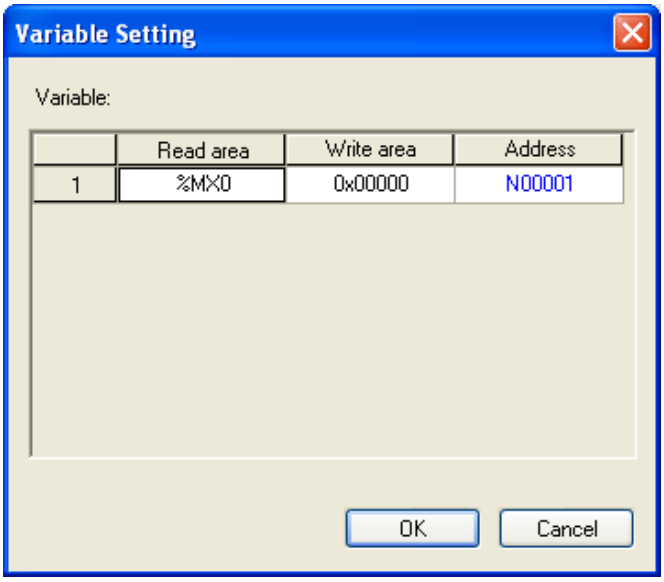


Figure 33 – Setting window of P2P Write instruction

Details of respective input options are as described below.

1. Standard action settings

   a) Channel

   – Select a communication channel that will be used by the applicable block. The communication channel for each block is decided when setting the parameters, which cannot be changed during Run mode.

   – For normal operation of P2P block, the applicable channel should be set to P2P with a driver selected.

   b) Condition Flag

   – Defines when P2P block should operate.

   – Select Regular cycle and Memory Set Trigger condition.

   c) Data Type

   – Define the format of the data that the block will process.

- You can process Bit, Byte, Word, Dword, and Lword in MLDP, and you can only process Bit/Word in Modbus.

d) Instruction Type

- Decide between detailed Write, Individual Write, and Continuous Write operation.
- Individual Write writes up to four memory areas.
- Continuous Write is able to write as many as defined on the specified position.

e) Number of Variables

- You can select number of Variables if you select Individual Write.
- Decide the number of memory areas to write on individually. Up to four memory areas are available.

f) Data Size

- Define the size of data to write if you select Continuous Write.
- Data size has a different meaning based on the data type.
  - When 5 is defined, it means 5 Words if Data Type is Word and 5 Bits if Data Type is Bit.

g) Counterpart Station Number

- Define the counterpart station number to write data.
- If you select check button, the counterpart station number will be fixed.
- If you clear check button, the counterpart station number will be assigned to PLC memory. Changing the value of the applicable area can change the counterpart station number.

2. Memory setting

a) Area to read

- Set the area of the value to write.
- Set as many variables with input value that will be different for different drivers.
- MLDP client

- Input P220 on the save area to write data on %PW220.

b) Area to save

- Set the corresponding area to write, which will be different based on drivers.
- Input M130 to save %MW130 in the case of MLDP client.
- Input 40054 to save AO 54 in the case of Modbus client.

In order to read and write 10 Words of the corresponding station number 2 in the memory starting from %MW125, on the corresponding %PW200 when MW10's number 2 bit is set via the channel 2, its setting is as follows.

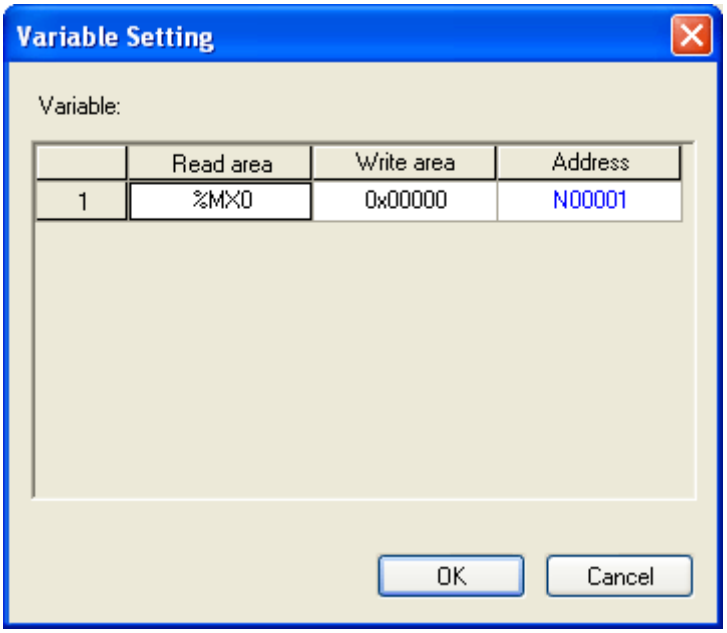


Figure 34 – Setting window of P2P Write instruction 2

Send instruction

You can use this instruction for sending the optional frame to an external device for which the communication method is not specified. The Send Instruction does not use MLDP/Modbus protocol.

Only one frame will be used for one Send instruction. Memory setting should be specified in this instruction for applicable frame's size-fixed/size-changeable variable. The frame to be sent must be specified before the instruction is used.

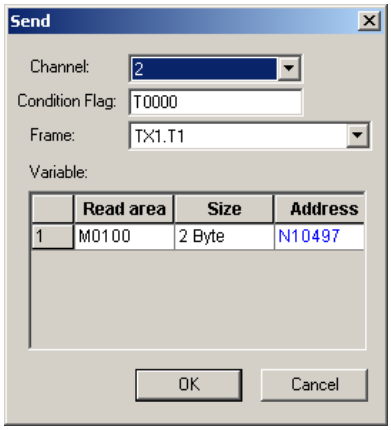


Figure 35 – Setting window of P2P Send instruction

Details of respective options are as described below.

1. Basic operation setting

   a) Channel

   – Select a communication channel to send the desired frame through.

   b) Condition Flag

   – Define when the frame is to be sent.

   c) Frame

   – Select the name of the user-defined frame to be used in applicable P2P block.

   – Frame should be defined before instruction registration. You can select the Frame to be sent from the list of registered frames.

2. Memory setting items

   a) Area to read

   – Define all the variables inside the frame.

- Specify the data position to configure the frame, as information for the variable area is inside Tx frame.
- Input Word address. If the variable area of the frame is configured by reading data from %MW200, then input M200.

b) Size

- Set the size of data to be in the variable area, inside Tx frame selected.
- It should be in Bytes and defined according to the size of all the variables.

Receive instruction

You can use this instruction for receiving some frames from the frames that have been sent by the counterpart station. You cannot select an identical frame for respective P2P Receive instruction blocks. You can decide only one Receive instruction block for the received frame.

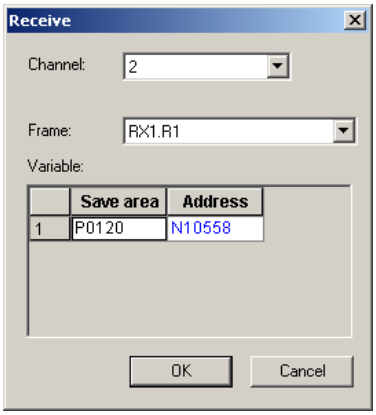


Figure 36 – Setting window of P2P Receive instruction

Details of respective options are as described below.

1. Basic operation setting

a) Channel

- Select a communication channel through which the frame is to be received.

b) Frame

- Select the name of the user-defined frame to be used in the applicable P2P block.
- Define a frame prior to instruction registration.
- You have to select a frame to be received from the list of registered frames.

2. Memory setting items

c) Area to save

- You can specify the position to save data through setting variables if you register the received frame.
- Define all the variables inside the received frames.
- Received data size is in Byte.

User-defined frame information

You have to define the applicable Tx/Rx frames if some frames are required to be sent by user or the frames among those on the network are to be received. This is available only in P2P service.

All the frames are composed of Head, Body, and Tail, which can be used as per requirement.

In MasterLogic-200, user-defined frames displays with group name and frame name, whose details are as follows.

1. Group

a) Frames with identical heads and tails form a group.

b) Group registration is necessary for the frame registration.

2. Frame

a) A frame is composed of Head, Body, and Tail.

b) You have to define the Tx/Rx frame.

c) You can add size-fixed and size-changeable variables to the Body of a frame.

d) Frame is composed of lot of segments, and up to four variable segments can be registered for a Body.

Type of segments

Head, Body and Tail of the frame are composed of lot of segments, which can be registered on the frame edit window as shown in Figure 37.

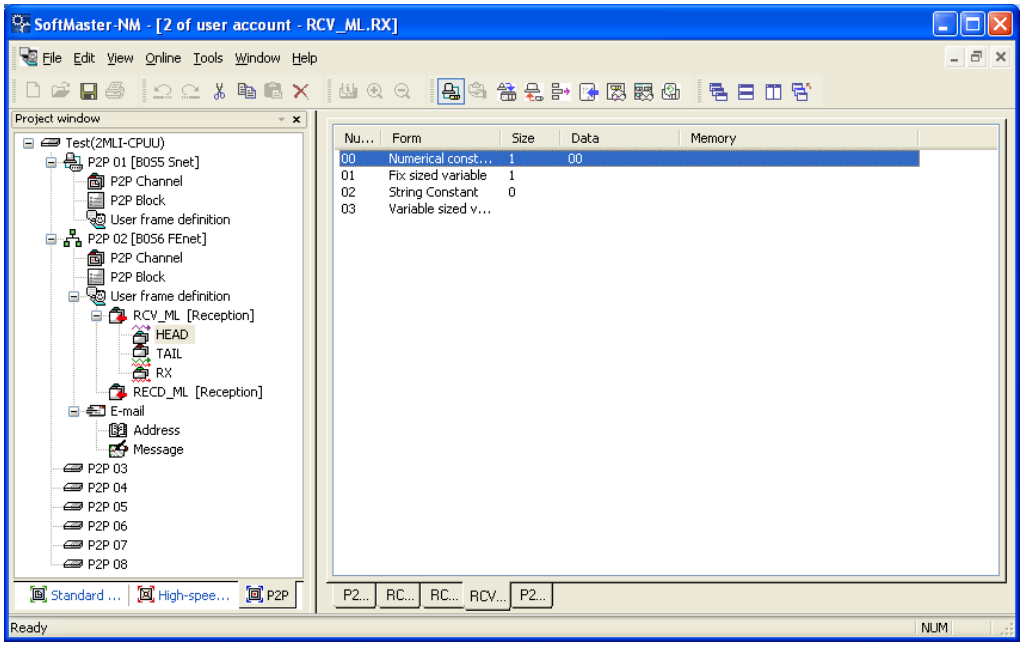


Figure 37 – Setting window of frame HEAD segment

Segments used for configuring the frame are:

1. Numeric Constant
   a) Defined as the part to be fixed as Constant among frames.
   b) Value of the data item is Hex.

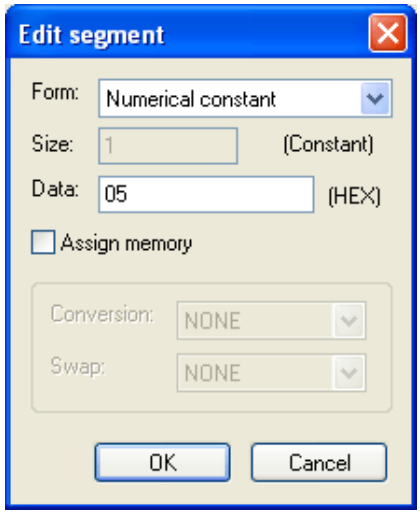


Figure 38 – Add segment numeric constant window

2. Text Constant

   a) Register Text Constant among frames.

   b) Value of the data item is in ASCII format

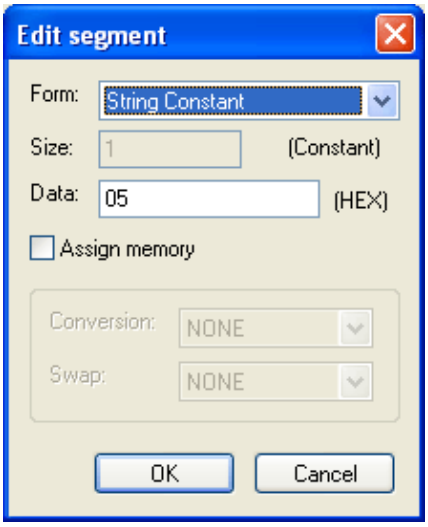


Figure 39 – Add segment text constant window

3. Size-fixed variable

   a) Available only in the Body area of Rx frame.

   b) Used for processing data as defined among received frames.

   – Size is in Bytes.

   c) Check **Specify Memory** to save on PLC Memory.

   – Conversion and swap are available.

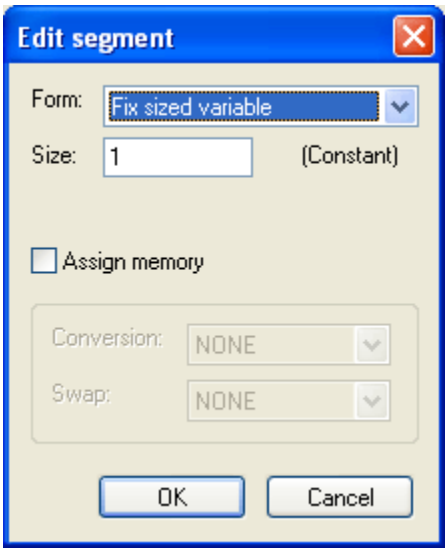


Figure 40 – Add segment size-fixed variable

4. Size-changeable variable

   a) Available in the Body area of Tx/Rx frames.

   b) Tx Frame

   – Used for changing the length of frame.

   – Check **Specify Memory** to configure Tx frame with the data read from PLC memory.

   c) Rx Frame

   – Used for processing the size-changeable data among the received frames.

- Registration available only in the last segment in the Body area.
- Check **Specify Memory** to save the data for the applicable segment among the received frames.
- Swap and conversion are available.
- Received data size is of Byte.

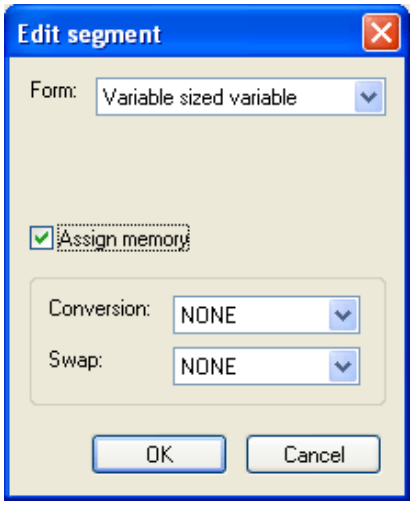


Figure 41 – Segment size-changeable variable edits window

Data conversion processing

In order to convert data from Hex to ASCII when frames are sent and received, or to execute Byte swap, the applicable setting should be specified on the frame edit window.

1. Conversion

   a) Hex To ASCII

   - Tx: converts read data from PLC memory to ASCII to configure the Tx frame.
   - Rx: converts received data to ASCII to save.

   b) ASCII To Hex

   - Tx: converts read data from PLC memory to Hex to configure the Tx frame.
   - Rx: converts received data to Hex to save.

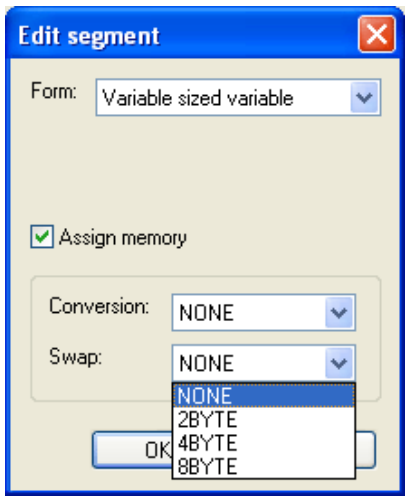


Figure 42 – Conversion setting window of segment size-changeable variable

If 2 Words of PLC memory %MW100 used for Tx frame configuration, is converted from Hex to ASCII, with 0x34353637 saved on %MW100, Tx frame's applicable segment will be specified to '4567'.

When some of the received frames are saved as converted to Hex. You can save 0x34353637 on PLC memory if the applicable area value is '4567'.

2. Swap

   a) 2 Bytes: 2 Bytes swap of applicable part among Tx/Rx frames

   b) 4 Bytes: 4 Bytes swap of applicable part among Tx/Rx frames

   c) 8 Bytes: 8 Bytes swap of applicable part among Tx/Rx frames

If 0x1234567811223344 is converted by respective methods above, its results are as follows:

   a) 2 Bytes swap: 0x3412785622114433

   b) 4 Bytes swap: 0x7856341244332211

   c) 8 Bytes swap: 0x4433221178563412

Tx frame

You have to register the desired Tx frame, in order to send a frame outside. If a user-defined frame is used instead of P2P MLDP client driver then a Tx frame setting example is as described below. In this case, 4-Word data is written starting on M100 address in the corresponding station number 0.

Table 21 – Tx frames

TX. Frame	Head	Body					Tail	
Frame	0x05	00	wSB	06%MW100	04	Size-Changeable Variable	0x04	BCC
Remarks	Numeric Constant	Text Constant	Text Constant	Text Constant	Text Constant	Hex To ASCII Conversion		Byte Checksum ASCII Conversion

Add the group of Tx frames as shown in Figure 43.

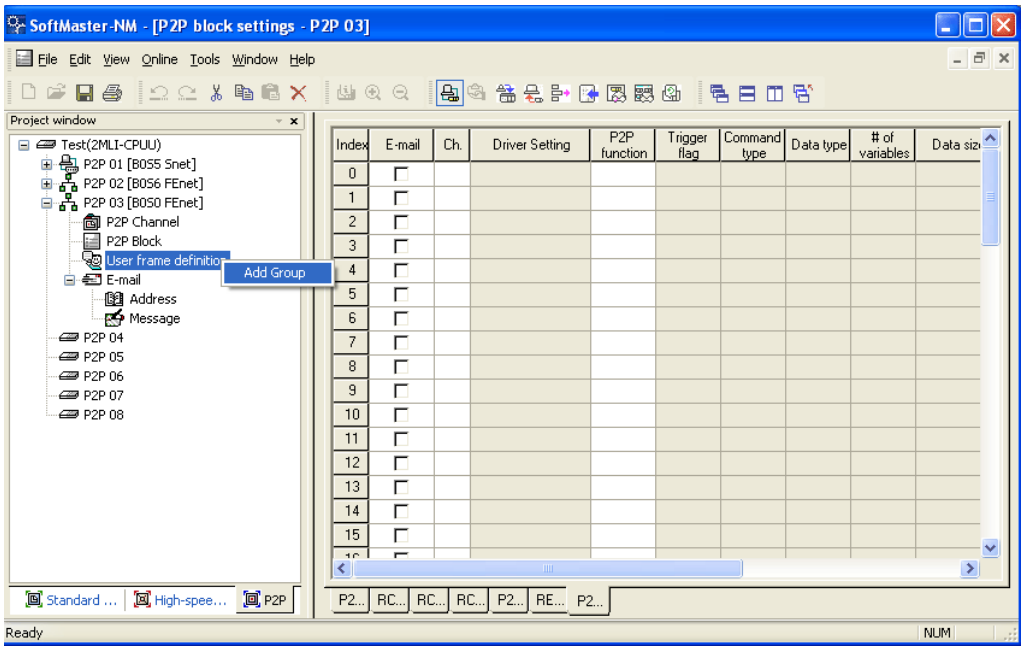


Figure 43 – Add Tx frame group

After the **Group Edit** window displays as shown in Figure 44, enter the group name of the Tx frames, and select the frame type as 'Tx' (Transmission).

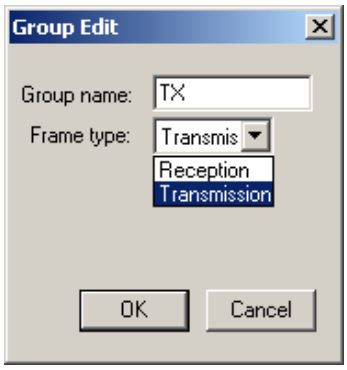


Figure 44 – Setting window of Tx frame group

A number of frames can be registered for the applicable group. To register, select the group in which Tx frame is to be registered and right-click to display the options as shown. Select **Add Frame** to add the frame as shown in Figure 45.

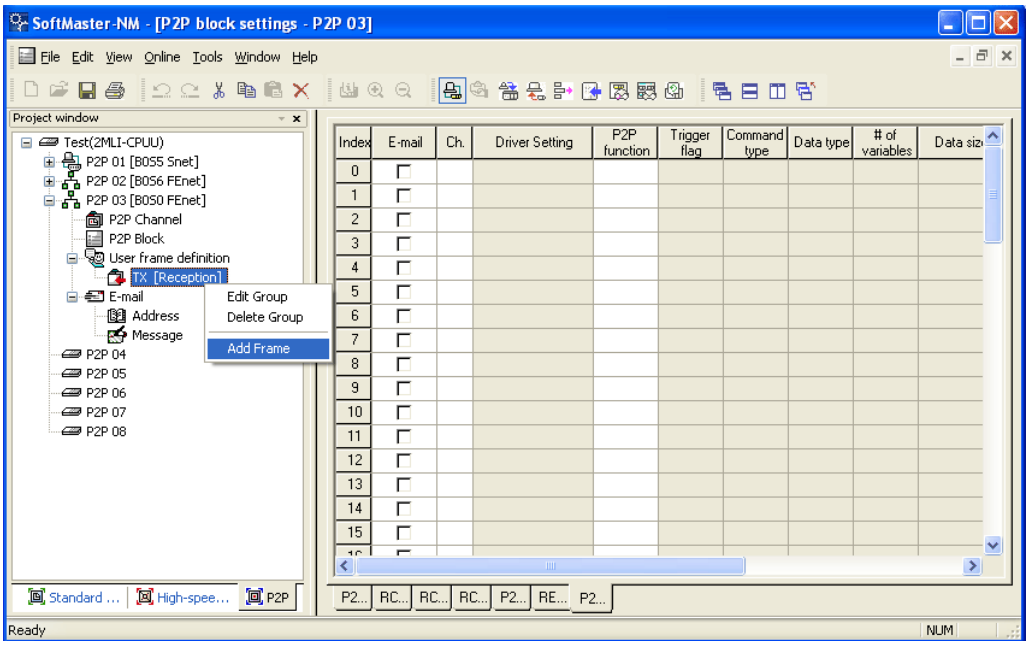


Figure 45 – Setting window of Tx frame Add

The Head, Body and Tail can be registered on the frame edit window.

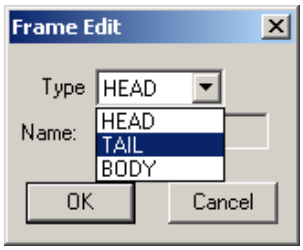


Figure 46 – Window of Tx frame edits

Just one Head and one Tail exist for a group. However, lot of bodies can be registered. In addition, while the Head and the Tail can be omitted, the frame should have a body.

1. Head registration

   Many segments can be added for Head; Numeric Constant or Text Constant is only available for respective segments.

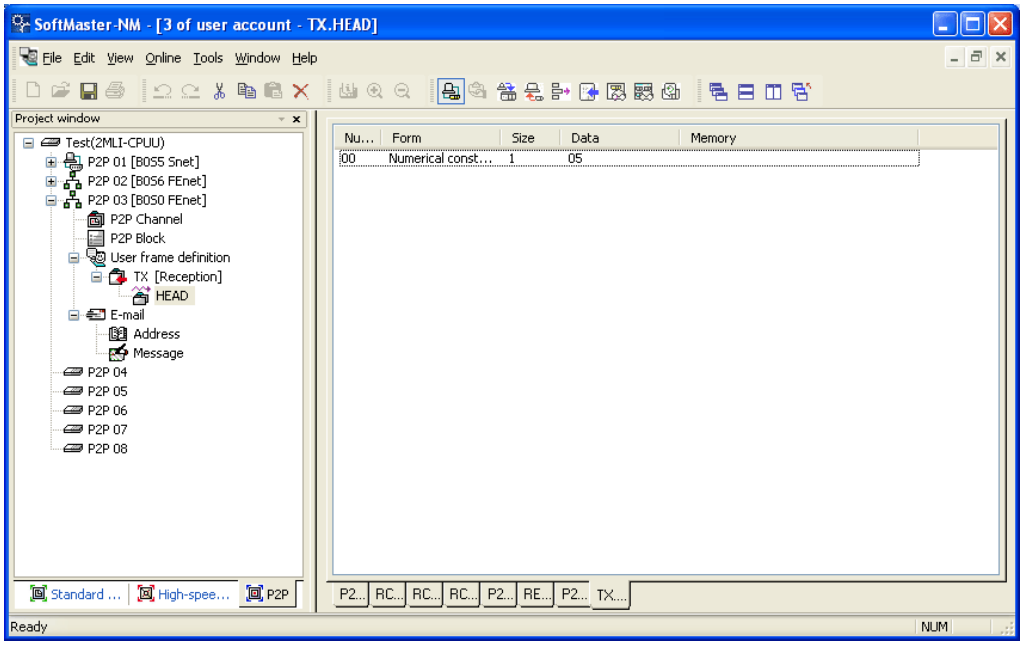


Figure 47 – Registration window of Tx frame Head

2. Body registration

   Body can be composed of many segments, with up to four size-changeable variables defined. Body setting for TX.FRM_A on the frame edit window is as follows.

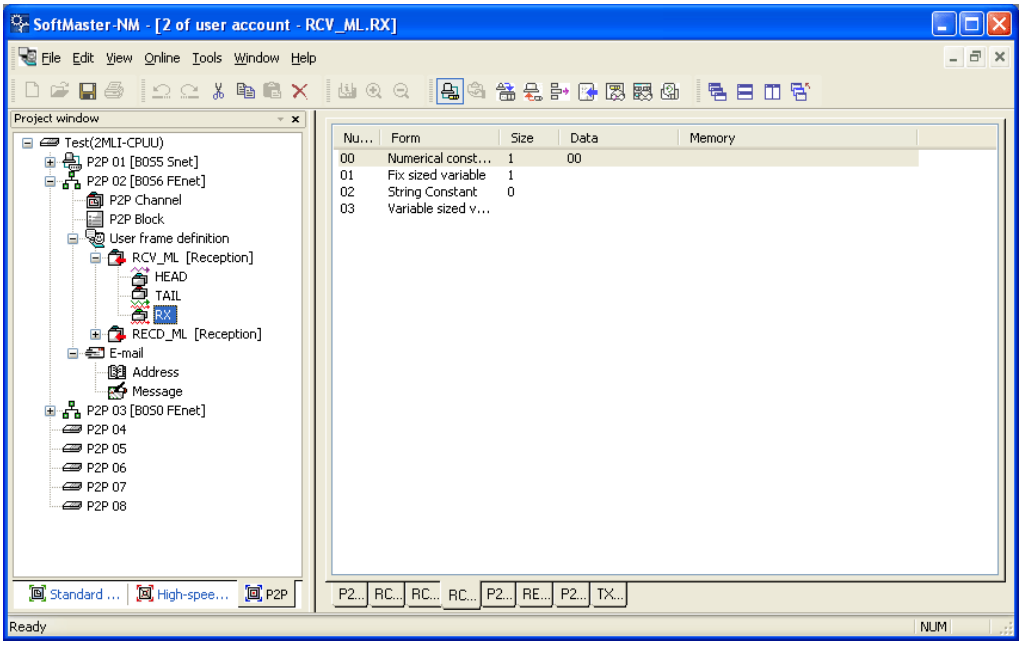


Figure 48 – Registration window of Tx frame Body

3. Tail registration

A BCC can be registered in tail. Available BCC is as shown in Figure 49.

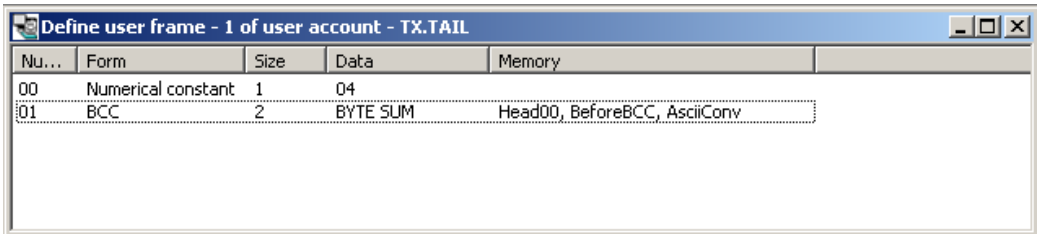


Figure 49 – Registration window of frame Tx.Tail

An example frame with complete registration is as shown in Figure 50.

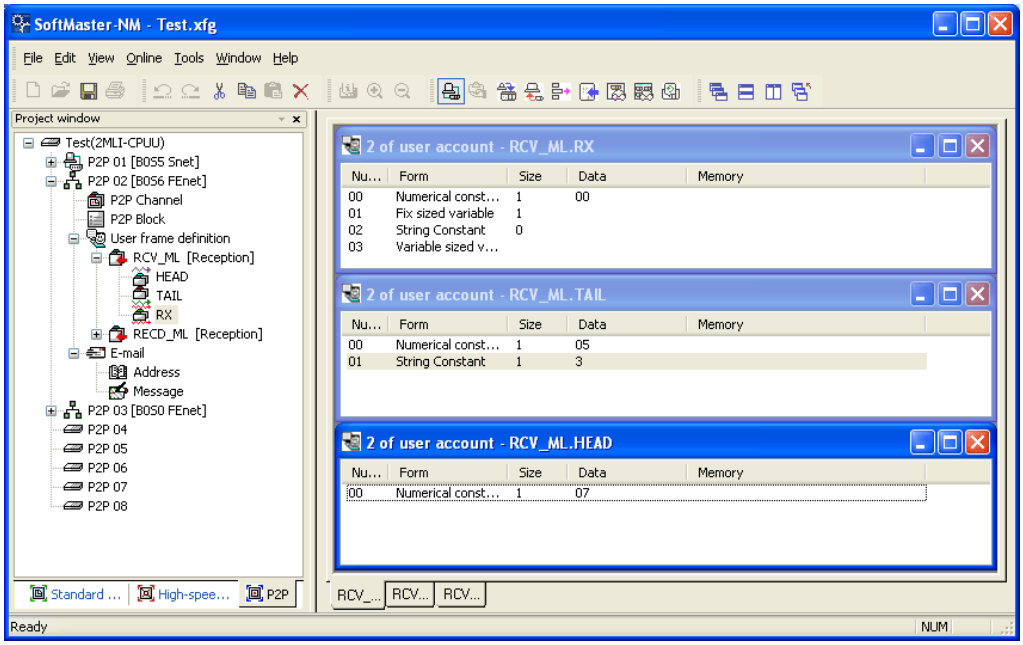


Figure 50 – Example frame

Rx frame

In order to receive an optional frame, you need to first define the Rx. In case the ACK and NAK response frames are received for the SB transmission frame, the registration method is as follows.

Register the Rx ACK frame received as described below.

Table 22 – Rx ACK frame

ACK.FRAME	Head	Body		Tail	
Frame	0x06	01	wSB	03	BCC
Remarks	Numeric Constant	Text Constant	Text Constant	Numeric Constant	Byte Check Sum ASCII

Register the Rx NAK frame as described below.

Table 23 – Rx NAK frame

NAK.FRAME	Head	Body			Tail	
Frame	0x15	01	wSB	Size-Fixed Variable	03	BCC
Size (BYTE)	1	2	3	2	1	2
Remarks	Numeric Constant	Text Constant	Text Constant	(Error code)	Numeric Constant	Byte Check Sum ASCII

Add the group with the name of 'ACK', 'NAK' for the frame registration.

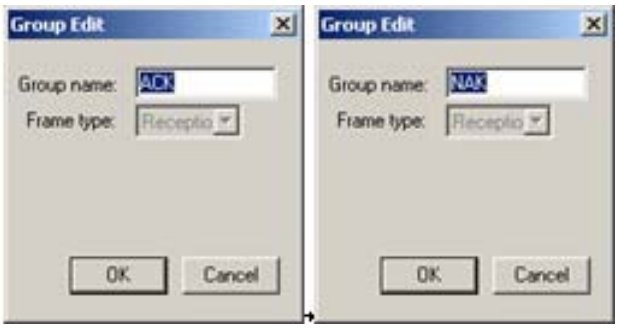


Figure 51 – Registration window of ACK, NAK group received

Add the frame to the registered received frame group 'ACK'.

1. Head registration

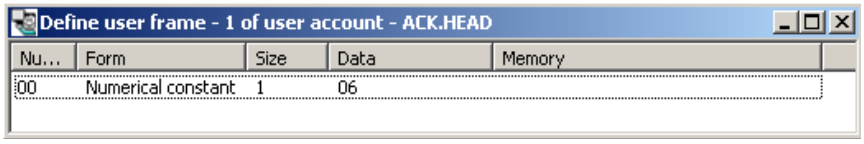


Figure 52 – Registration window of received ACK frame Head

2. Body registration

   Register the data to process in Body among received frames.

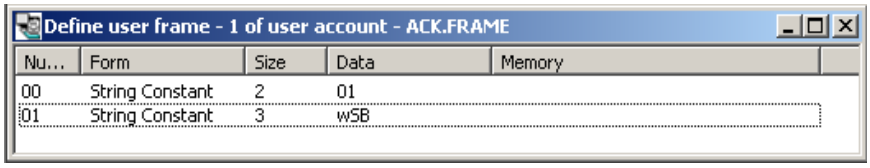


Figure 53 – Registration window of ACK frame Body

3. Tail registration

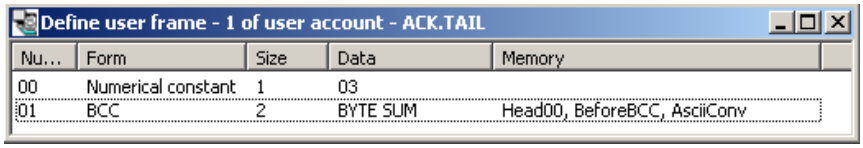


Figure 54 – Registration window of ACK frame Tail

Add the frame to the registered received frame group 'NAK'.

1. Head registration

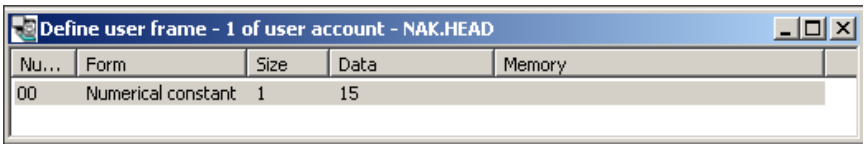


Figure 55 – Registration window of received NAK frame Head

2. Body registration

Register the data to process the Body among received frames.
Use fixed size variable if the data size is known, or use variable size variable if it is unknown.

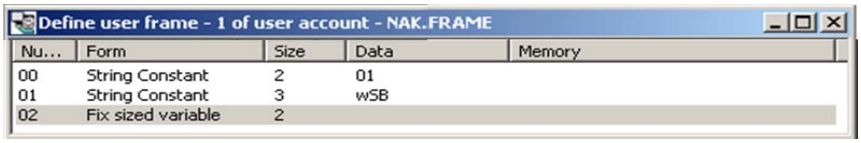


Figure 56 – Registration window of NAK frame Body

3. Tail registration

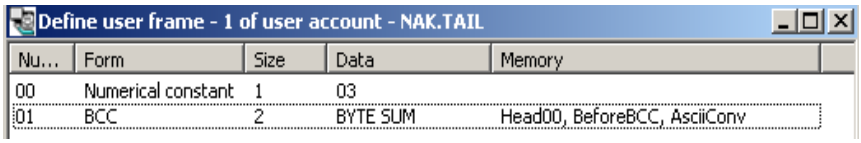


Figure 57 – Registration window of NAK frame Tail

An example frame with complete registration is as shown in Figure 58.

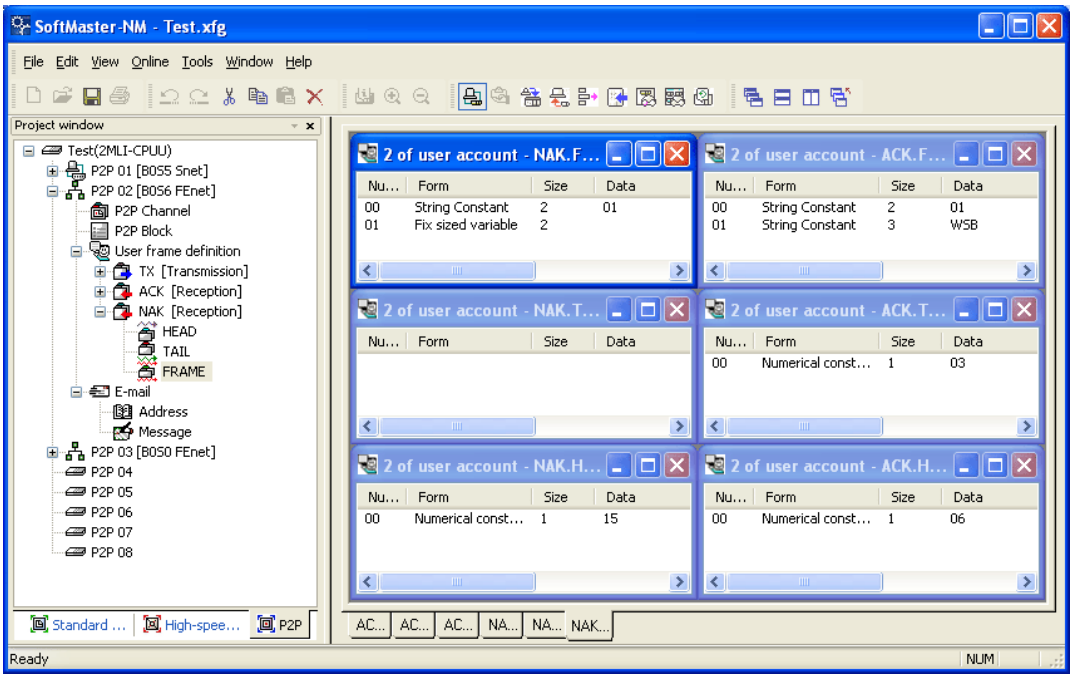


Figure 58 – ACK, NAK received frame registration complete window

P2P service operation

After P2P parameters are specified, download the parameters onto PLC CPU and start the P2P service. It is assumed that P2P parameters to be downloaded are already prepared and connection is available with the applicable PLC CPU.

P2P parameters downloading

In order to download the prepared P2P parameters, from the **Online** menu, select **Write Parameter** in SoftMaster-NM window to display the parameters download window. You can select the registered basic setting; P2P parameters and HS link parameters.

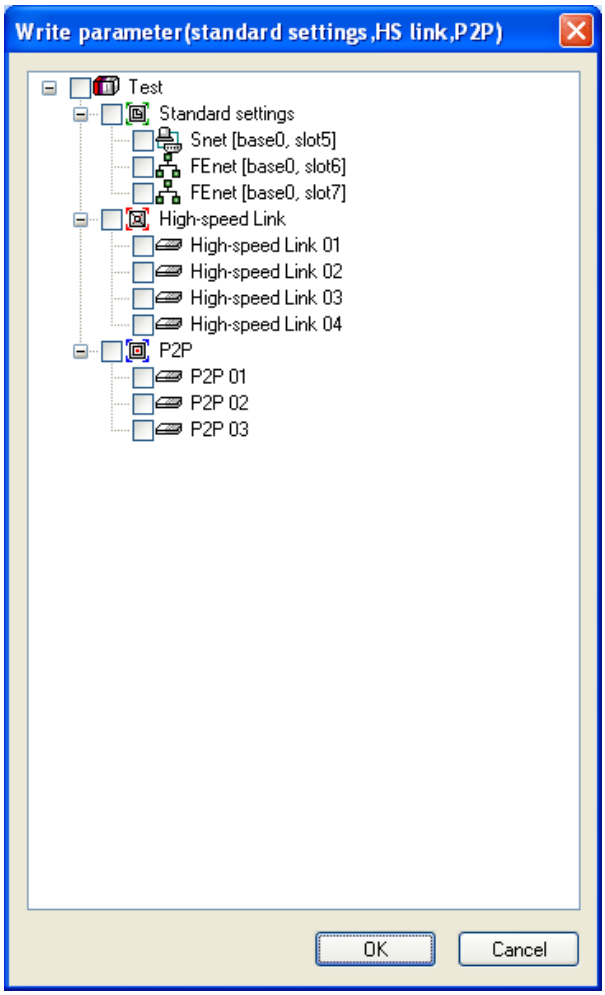


Figure 59 – P2P parameters Write window

From P2P 1 ~ 8, only the prepared P2P parameters displays after sorting, where P2P parameters to be downloaded is selected.

Click **Confirm** to download the P2P parameters onto CPU.

P2P service start

After P2P parameters are downloaded, the link should be enabled in order to start the P2P service. From the **Online** menu, select **Enable Link (HSLink, P2P)** on the menu.

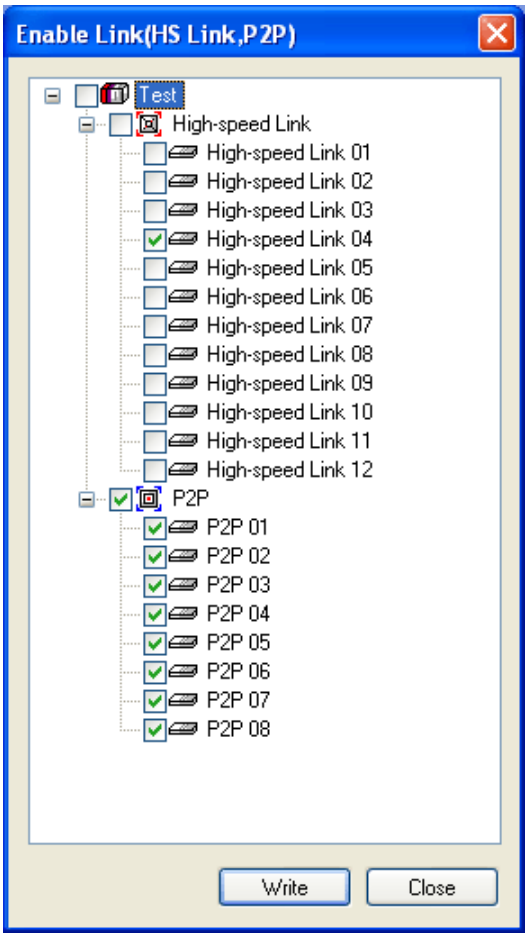


Figure 60 – Setting window of P2P Enable

Select P2P parameters to be started on the **HS Link/P2P Enable** window.

In order to confirm normal downloading and normal P2P service operation, from the **OnLine** menu, select **System Diagnosis**.

REFERENCE - INTERNAL

For more details, refer to Diagnosis.

7.4 Remote connection

Introduction

If you install the PC with SoftMaster/SoftMaster-NM, is located far from MasterLogic-200-PLC. Through remote connection function of Snet I/F module, remote PLC program can be controlled for download, upload, debugging, monitoring, and so on. Especially, in case if SoftMaster is located far away from PLC, you can conveniently access PLC CPU through telephone, remote connection, and computer linked modem connection functions in SoftMaster via public line. Remote connection, which is supported in FEnet and Snet of MasterLogic-200 PLC communication modules, allows connection between networks to control remote PLC program via multi-step connection. The remote connection via Snet module is available for both the cases of remote connection between Snet modules, where SoftMaster and PLC are directly connected via RS-232C and modem connection between SoftMaster and PLC.

SoftMaster remote connection

Figure 61 shows an example of remote connection between SoftMaster and PLC via modem. As shown in the figure, the structure requires for connection with PLC via phone line, dedicated line modem, or wireless modem, if SoftMaster operated PC is located far from PLC. In this case, SoftMaster is connected via direct modem with Snet I/F module and the connection type is set as modem in connection option. There are two types of modem connections:

1. Dial-up modem connection via public line.
2. Dedicated modem connection via dedicated line.

Dial-up modem connection

Figure 61 shows an example of dial-up modem connection. Dial-up modem connection connects dial-up modem with PC and Snet I/F module via telephone for remote connection through added function services to start/stop phone call. Firstly, make a phone call in SoftMaster to establish a remote connection after phone is connected, through PC linked modem of external or internal dial-up type, and via external modem for Snet I/F module side.

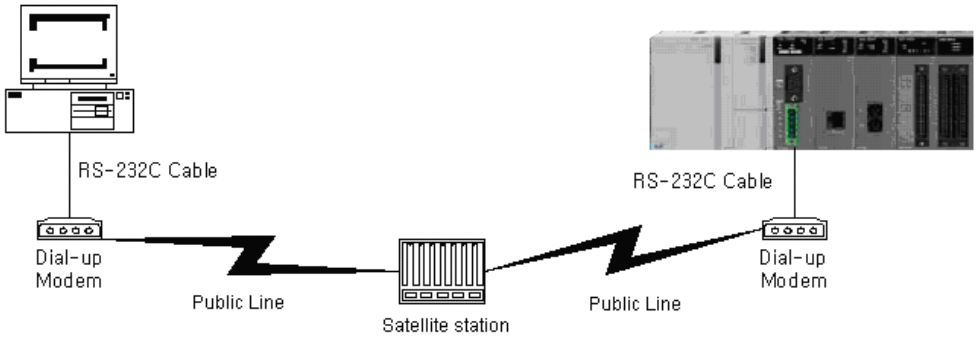


Figure 61 – Example of SoftMaster remote connection via dial-up modem

Remote connection sequence via dial-up modem is as follows:

1. Set operation mode of RS-232C channel in Snet I/F module to MLDP server.
2. Set RS-232C channel operation of Snet I/F module to dial-up modem and input modem initializing instruction.
3. Execute the SoftMaster program and from the **OnLine menu, select Connect Setting** to display the communication setting window. In communication setting window, in **Connection Setting**, set **Connect Type** to Modem.

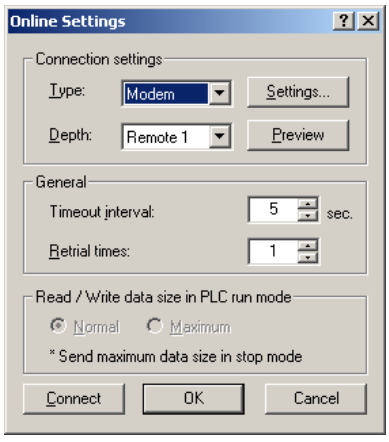


Figure 62 – Setting window of modem connection

4. Click **Setting** button in **Connection Setting** to specify modem related details.

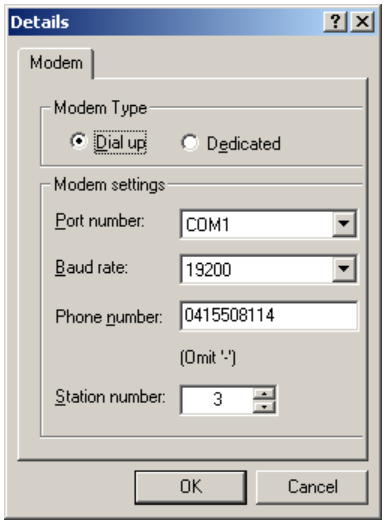


Figure 63 – Setting window of modem details

TIP

Communication speed set in connection option is not modem speed but connection speed between PC and modem. Communication speed of modem means the communication speed between modems that is automatically set as agreed with the telephone quality of public line and speed of the counterpart station modem.

The SoftMaster remote connection should use RS-232C channel with 'RS-232C Dial-up Modem' specified on SoftMaster-NM communication, set basic setting to write on MasterLogic Snet I/F module and then reset the module for its application. Connection types other than those set for Snet I/F module are identical to other units.

5. Phone number of the modem side linked to Snet should be used when setting the modem details as shown in Figure 65. If the modem is connected via an extension then the extension number and ',' can be used to specify the phone number. For example; if extension number is '9': Set the phone number to 9, 0343-398-xxxx.

TIP

If modem connected with Snet I/F module of the counterpart station is via central exchanger, normal communication is unavailable. For example, if a separate extension number is assigned to the receiving station, dial-up modem communication is not allowed.

6. If you select the connection stage of remote 2, select the base number and slot number of the remote stage 1's communication module on the details item and the station number of the remote stage 2's communication module. Enter the station number as specified in Snet module. Select remote stage 1's communication channel for Snet channel.

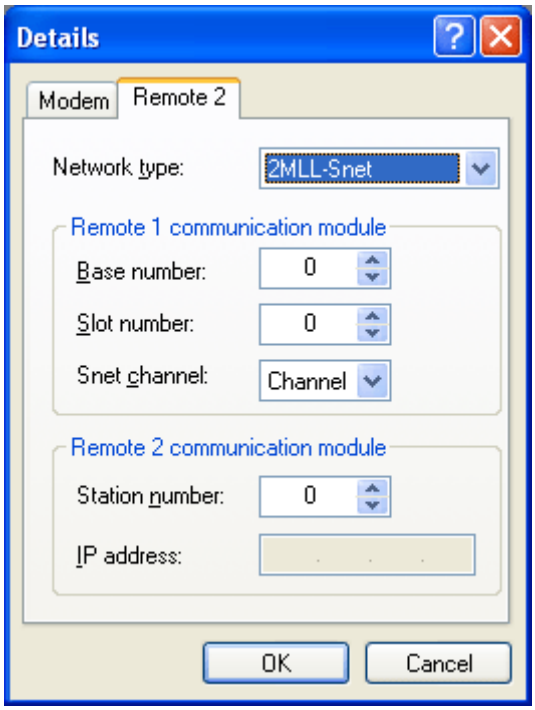


Figure 64 – Setting window of modem remote 2 stage

7. After **Connect** option setting for modem initializing; from the **Online** menu, select **Connect**.

8. If COM channel of the modem is incorrectly set or connection with modem is abnormal, an error message displays. In this case, inspect COM channel or modem connection.
9. If telephone line connection is established, SoftMaster tries remote connection automatically and if remote connection is complete, program Write and Run/Stop icon options will be active.
10. The remote 1 stage connection is complete and the connection status is same as that of RS-232C cable connection to the PLC. All **Online** menu options are enabled.

    Backing

TIP

- For application of SoftMaster, after remote connection, **Online** menu can be used in local connection. Functions for program download/upload/monitor are available.
- PLC control via modem depends mostly on modem performance and phone line status. If phone line traffic is high, connection may drop. In this case, try reconnecting not immediately but in approximately 30s.

11. From the **Online** menu, select **Disconnect** to release connection in remote connection status.
12. If connection is released, SoftMaster hangs up the phone automatically to disconnect it.
13. If the phone is hung up normally, local and remote modem is restored to initial status to allow remote connection again via telephone line.

Dedicated modem connection

Figure 65 shows dedicated modem connection between PC and Snet I/F module via dedicated line, where Snet I/F module can be set to a dedicated modem mode. This mode does not require a dial-up as in the case of a dial-up modem.

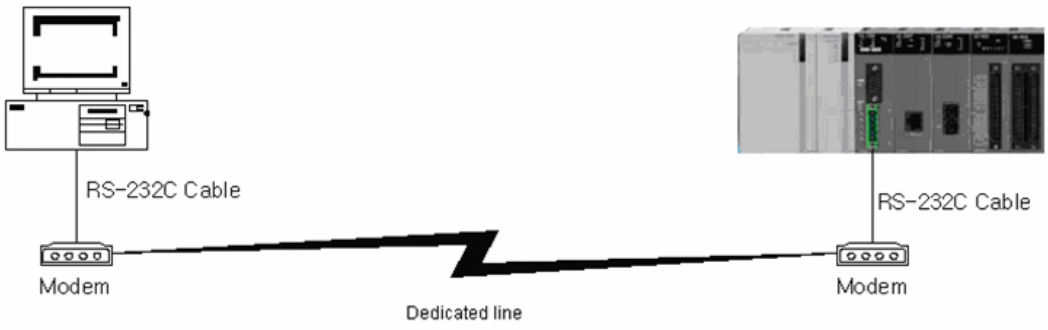


Figure 65 – Connection diagram via dedicated modem speed

Figure 65 shows an example of dedicated modem connection via dedicated line. In addition, you can use wireless modem or optical modems. Modem with no public line connection should be set as a dedicated modem. The procedure is as follows.

Remote connection sequence via dedicated modem is as follows:

1. Connect dedicated modem between PC and Snet I/F module.
2. Set RS-232C channel of Snet I/F module to MLDP server-Limited.
3. Set RS-232C channel operation of Snet I/F module to dedicated modem.
4. Execute the SoftMaster program on the PC, from the **Online** menu, select **Connect Setting** to display the communication setting window, and **Connect Type** to **Modem.** Click **Setting** button to specify communication channel and transmission speed as per the dedicated modem linked with PC. The communication speed should be set identical to that of the dedicated modem.

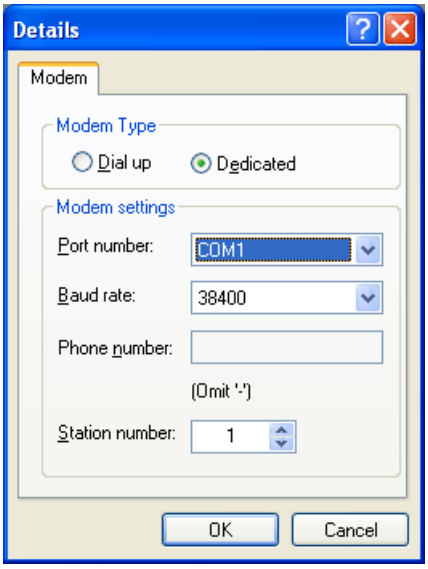


Figure 66 – Setting window of dedicated modem

5. If you select the connection stage Remote2, specify remote stage 1 and 2 related setting on **Details** window as shown below.

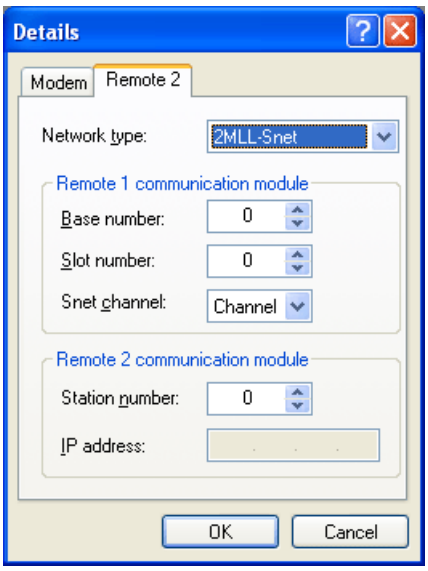


Figure 67 – Setting window of dedicated modem remote stage 2

6. SoftMaster tries remote connection and if remote connection is complete, it means Remote1 stage connection is complete, with the connection status identical to that of a local RS-232C cable connection, where all **Online** menu options are enabled.

TIP

- For application of SoftMaster after remote connection, Online menu can be used as in local connection. Functions for program download/upload/monitor are available.
- PLC control via modem depends much on modem performance and phone line status. If phone line is noisy, connection may drop. In this case, try reconnecting not immediately but in approximately 30s.

7. From the **Online** menu, select **Disconnect** to release connection in remote connection status.
8. If connection is released normally, Snet I/F module and SoftMaster are changed to initial mode to allow reconnection when tried again.
9. In addition to dedicated modem, optical modem and wireless modem can be used equally for connection between SoftMaster and Snet, though communication medium between modems differs from each other.

Remote connection between Snet I/F modules

Figure 68 shows an example of remote connection to PLC located far away when there is a local connection between SoftMaster and the local PLC CPU through RS-232C cable. RS-232C channel of Snet I/F module mounted on local PLC communicates with Snet I/F module of remote PLC via dedicated modem. As shown in the figure, SoftMaster can control remote PLC program via remote connection through modem communication function between Snet I/F modules.

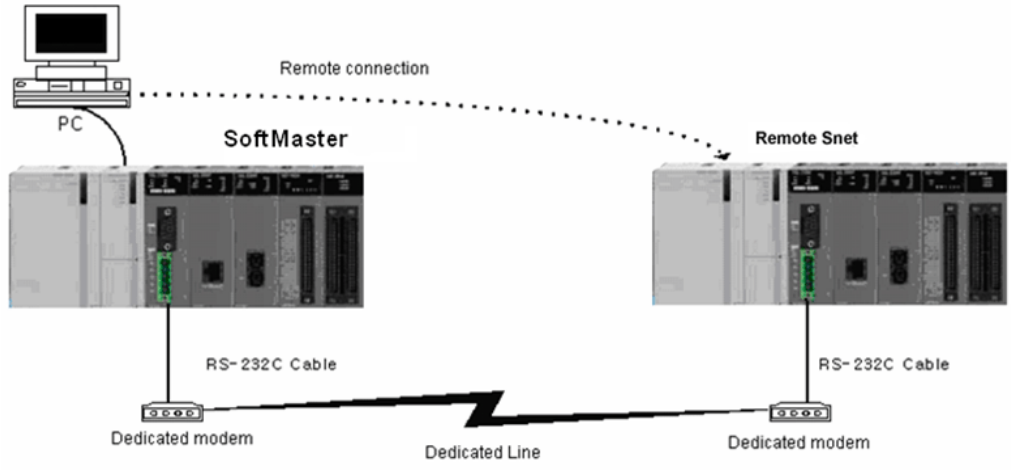


Figure 68 – Remote connection between Snet I/F modules

Remote connection sequence is as follows:

1. Set RS-232C channel operation of Snet I/F module to dedicated modem to operate as MLDP server.

2. Switch locally connected PLC to stop mode.

ATTENTION

If communication is overloaded, remote connection may fail. Recycle power to the PLC and retry remote connection.

3. Execute the SoftMaster program and from the **Online** menu, select **Connect Setting** to specify Connect Type of RS-232C and Communication Channel as in **local** connection.

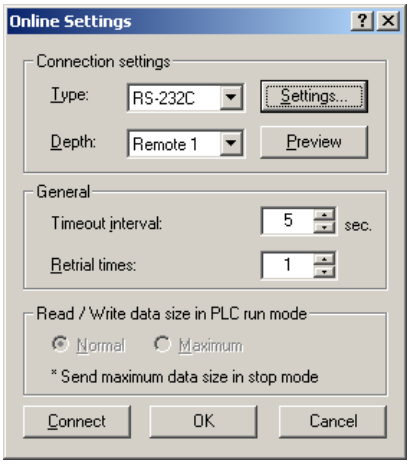


Figure 69 – Setting window of remote connection between PLCs

4. Select the connection stage of remote 1 and click **Setting** button to specify details. The station number can be set on **Details** window. The station number should be the same as specified in the remote Snet I/F module connected via modem. Snet channel should be set to local Snet module's communication channel. The figure below shows the remote Snet station number set to 22.

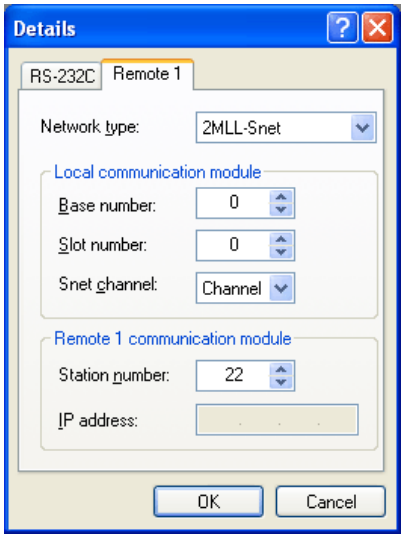


Figure 70 – Setting window of remote 1 stage connection between PLCs

5. SoftMaster tries remote connection and if remote connection is complete, all Online menu options will be enabled.

6. This means that if remote 1 stage connection is complete and the status is identical to the connection status of local RS-232C cable connection, where all Online menu options are enabled.

7. From the **Online** menu, select **Disconnect** to release connection in remote connection status.

8. If connection is released normally, Snet I/F module and SoftMaster revert back to initial mode to allow reconnection when tried again starting from the clause No. (3).

9. In addition to dedicated modem, optical modem and wireless modem can be used equally for remote connection, though communication medium between modems differ from each other.

Figure 71 shows an example of remote connection via wireless modem. Connection method is same as in the remote connection between Snet I/F modules. When wireless modem is applied with the remote connection in 1:N configuration, it is possible to connect to several remote Snet I/F module stations through the same link.

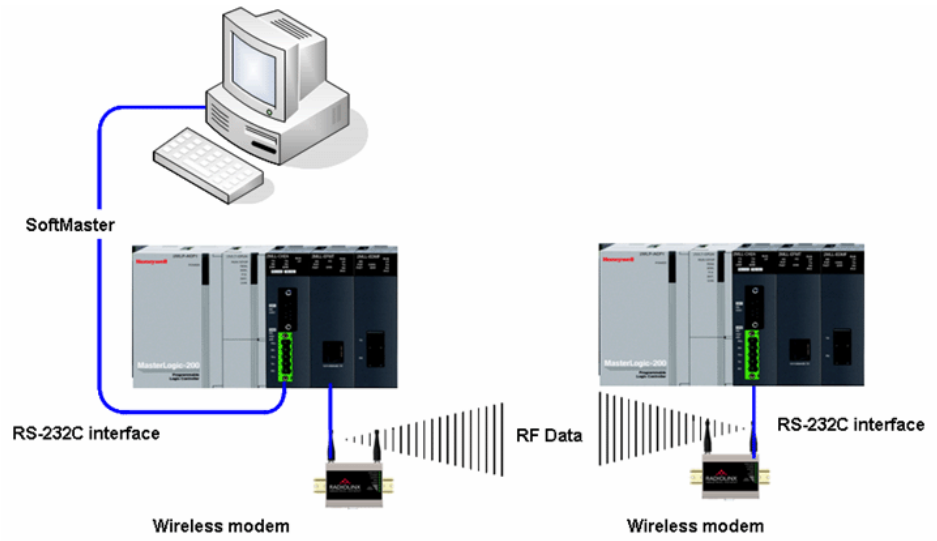


Figure 71 – Remote connection via wireless modem

8. MasterLogic Dedicated Communication Function

8.1 Dedicated protocol communication

Introduction

MasterLogic Snet dedicated communication function is used to establish dedicated communication with Snet I/F module. This allows you to configure the communication system easily by means of data Read/Write function and monitoring function of internal device area in CPU module.

In addition, it is handy for you to use the basic communication function only for internal device area Write/Read, monitor registration, and execution with Snet I/F module.

Snet I/F module provide the following functions:

1. Individual/Continuous Device Read
2. Individual/Continuous Device Write
3. Registration of Monitor Variable
4. Execution of Monitor
5. 1:1 connection (Honeywell link) system configuration (Snet I/F module: RS-232C)

Frame structure

Basic structure

1. Request frame (external communication device → Snet I/F module)

Table 24 – Request frame (basic structure)

Header (ENQ)	Sta. No.	Instruction	Instruction Type	Structured data area	Tail (EOT)	Frame Check (BCC)

a) Response frame

- ACK response frame
  (Snet I/F module → external communication device, if data is received normally)

Table 25 – ACK response frame (Basic Structure)

Header (ACK)	Sta. No.	Instruction	Instruction Type	Structured data area or Null code	Tail (ETX)	Frame Check (BCC)

- NAK response frame
  (Snet I/F module → external communication device, if data received is distorted)

Table 26 – NAK response frame (Basic Structure)

Header (NAK)	Sta. No.	Instruction	Instruction Type	Error code (ASCII 4 Bytes)	Tail (ETX)	Frame Check (BCC)

TIP

1. Unless specified, Datatype of all frames is displayed in ASCII code for hexadecimal numbers. The data displayed in hexadecimal numbers is as shown in the list below.
   a) Station number
   b) Instruction type as of figures (= data type) when main instruction is R(r) and W(w).
   c) All items indicating total data size in structured data area.
   d) Instruction registration number for monitor registration and execution Instruction.
   e) All contents of data.
2. If you select hexadecimal data, it is indicated with 'H' attached in front of number, inside frame like H01, H12345, H34, H12, and H89AB.
3. Available frame length is up to 256 Bytes.
4. Details of used control code are as follows:

Code	Hex Value	Designation	Control Detail
ENQ	H05	Enquire	Request frame's Start code
ACK	H06	Acknowledge	ACK response frame's Start code
NAK	H15	Not Acknowledge	NAK response frame's Start code
EOT	H04	End of Text	Frame End ASCII code used for Request
ETX	H03	End Text	Frame End ASCII code used for Response

5. If the instruction has small letter (r), BCC value is added to Frame Check and if it has capital letter (R), no BCC value is added.

Sequence of instruction frame

Request Instruction response frame is divided into ACK and NAK and sent in the following sequence.

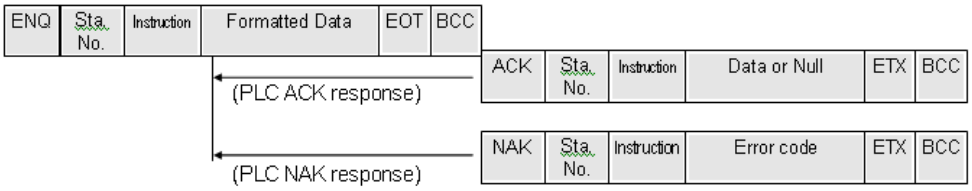


Figure 72 – Sequence for instruction frame

Instructions list

Instructions used in dedicated communication are as follows.

Table 27 – Instructions in dedicated communication

Classification	Item	Instruction				Description
		Main Instruction		Instruction Type		
		Sign	ASCII Code	Sign	ASCII Code	
Device Read	Individual Read	r(R)	H72(H52)	SS	5353	Reads direct variables in Bit, Byte
	Continuous Read	r(R)	H72(H52)	SB	5342	Reads direct variable in Word by block unit (Continuous Read of Bit is unavailable)
Device Write	Individual Write	w(W)	H77(H57)	SS	5353	Writes data on direct variable in Bit, Word.
	Continuous Write	w(W)	H77(H57)	SB	5342	Writes on direct variable in Word by block unit (Continuous Write of Bit is unavailable).

Table 28 – Instructions in dedicated communication 2

Classification / Item	Instruction				Description
	Main instruction		Registration No.		
	Sign	ASCII Code	Reg. No.	ASCII Code	
Monitor variable registration	x(X)	H78(H58)	H00 ~ H09	3030 ~ 3039	Registers the variable to monitor.
Monitor execution	y(Y)	H79(H59)	H00 ~ H09	3030 ~ 3039	Executes monitoring of registered variable.

The following table shows the example of data type.

Table 29 – Example of data type

Data Type	Display	Example
Bit	X(58H)	%PX000, %MX000, %LX000, %KX000, %CX000, %TX000, %FX000 and so on.
Byte	B(42H)	%PB000, %MB000, %LB000, %KB000, %CB000, %TB000, %FB000 and so on.
Word	W(57H)	%PW000, %MW000, %LW000, %KW000, %CW000, %TW000, %FW000, %DW000, %SW000 and so on.
Dword	D(44H)	%PD000, %MD000, %LD000, %KD000, %CD000, %TD000, %FD000, %DD000, %SD000 and so on.
Lword	L(4CH)	%PL000, %ML000, %LL000, %KL000, %CL000, %TL000, %FL000, %DL000, %SL000, and so on.

The following table shows the available devices.

Table 30 – Devices available

Area	Range	Size (Word)	Remarks
P	P0 – P2047	2048	Read/Write/Monitor available
M	M0 – M2047	2048	Read/Write/Monitor available
K	K0 – K2047	2048	Read/Write/Monitor available

Area	Range	Size (Word)	Remarks
F	F0 – F2047	2048	Read/Monitor available
T	T0 – T2047	2048	Read/Write/Monitor available
C	C0 – C2047	2048	Read/Write/Monitor available
L	L0 – L11263	11264	Read/Write/Monitor available
N	N0 – N21503	21504	Read/Write/Monitor available
D	D0 – D32767	32768	Read/Write/Monitor available, 2MLK–CPUH
	D0 – D19999	20000	Read/Write/Monitor available, 2MLK–CPUS
R	R0 – R32767	32768	Read/Write/Monitor available
ZR	ZR0 – ZR65535	65536	Read/Write/Monitor available only in 2MLK–CPUH

TIP

- ZR device is provided only in 2MLK–CPUH.
- ZR device should request with 'W' used.
- Example: If you request Word size from ZR0, it should be requested as '%WW000'.

Instruction details

Direct variable individual read(R(r)SS)

1. Purpose
   This function is used to directly specify and read the PLC device and its relevant data type. Up to 16 separate memory devices can be read at a time.

2. Request format of external communication device.

Table 31 – Request format

Format Name	Header	Sta.No.	Instruction	Instruction Type	No. of Blocks	Variable Length	Variable Name	----	Tail	Frame Check
Frame (Ex)	ENQ	H20	R(r)	SS	H01	H06	%MW100		EOT	BCC
ASCII value	H05	H3230	H52 (72)	H5353	H3031	H3036	H254D57 313030		H04	

Up to 16 blocks available repeatedly

Table 32 – Instruction details

Classification	Description
Number of blocks	Specify the number of blocks composed of '[Variable Length][Variable Name]' Max. setting range: 16 blocks Setting range: H01 (ASCII value: 3031) ~ H10 (ASCII value: 3130)
Variable length	Number of letters of Variable Name Max. setting range: 16 Setting range: H01 (ASCII value: 3031) ~ H10 (ASCII value: 3130) For example, If Variable Name is %MW0 whose letters are 4, its Variable Length is H04. If Variable Name is %MW000 whose letters are 6, its Variable Length is H06.
Variable name	Read device address Setting range: within eight letters available to input (ASCII value: within 16) Caution: Other than number, capital/small letter and % are not allowed.

Classification	Description
Frame check	If the instruction has small letter (r), BCC value is added and if it has capital letter (R), no BCC value is added. Since the instruction has small letter(r), ENQ ~ EOT have to be converted to ASCII value, to which 1 byte is added, respectively, where only the last one byte of the result should be added to BCC. An example for the above classification (BCC of the frame) is as follows: H05 + H32+H30 + H72 + H53+H53 + H30+H31 + H30+H36 + H25+H4D+H57+H31+H30+H30 + H04 = H03A4 Thus, BCC is A4.

3. Response format of Snet I/F module

   a) For ACK response

Table 33 – ACK response format 1

Format Name	Header	Sta. No.	Instruction	Instruction Type	No. of blocks	No. of data	Data	....	Tail	Frame Check
Frame (Ex)	ACK	H20	R(r)	SS	H01	H02	HA9F 3		ETX	BCC
ASCII value	H06	H32 30	H52 (72)	H5353	H3031	H3032	H413 94633		H04	

Up to 16 blocks available repeatedly

Table 34 – Data description

<table>
<tr><th>Classification</th><th>Description</th></tr>
<tr><td>Number of data</td><td>The number of Bytes in Hex converted to ASCII.

This number is decided based on the data type (X, B, W, D, L) included in direct variable name of the request format of the external communication device.

• The number of data based on variable type is as follows:

<table>
<tr><th>Data Type</th><th>Available Direct Variable</th><th>Number of Data</th></tr>
<tr><td>Bit (X)</td><td>%(P, M, L, K, F, T, C) X</td><td>1</td></tr>
<tr><td>Byte (B)</td><td>%(P, M, L, K, F, T, C, D, S) B</td><td>1</td></tr>
<tr><td>Word (W)</td><td>%(P, M, L, K, F, T, C, D, S) W</td><td>2</td></tr>
<tr><td>Dword (D)</td><td>%(P, M, L, K, …) D</td><td>4</td></tr>
<tr><td>Lword (L)</td><td>%(P, M, L, K, …) L</td><td>8</td></tr>
</table>
</td></tr>
<tr><td>Data</td><td>• The value of the area hex. data converted to ASCII code is saved.

Example 1

If the number of data is H04 (ASCII code value: H3034), it means that the data is of 4Byte Hex. The data is converted to 4-Byte Hex data’s ASCII code.

Example 2

If the number of data is H04 and the data is H12345678, its value converted to ASCII code is ‘31 32 33 34 35 36 37 38’ which are in the data area. In other words, the highest value comes first and the lowest value last.</td></tr>
</table>

TIP

- If the data type is Bit, the read data will be displayed in Byte.
- In other words, if the bit value is 0, it is displayed in H00 and if the value is 1, it will be in H01.

b) For NAK response

Table 35 – NAK response format 1

Format Name	Header	Sta. No.	Instruction	Instruction Type	Error code (Hex 2 Bytes)	Tail	Frame Check
Frame (Ex)	NAK	H20	R(r)	SS	H1132	ETX	BCC
ACSII value	H15	H32 30	H52(72)	H5353	H31313332	H03	

Error codes are as follows.

Details of error code, 2 Bytes hex code (4 Bytes in ASCII code) and error types are described below.

Table 36 – Error codes and details

Error Code	Error Type	Error Details and Causes	Example
0003	Number of blocks exceeded	Number of blocks exceeds 16 at Individual Read/Write Request	01rSS1105%MW10…
0004	Variable length error	Variable length exceeds the max. size of 16	01rSS0113%MW10000000000…
0007	Data type error	Other data type than X, B, W, D, L received	01rSS0105%MK10
0011	Data error	Data length area information incorrect	01rSB05%MW10%4
		In case % is unavailable to start with	01rSS0105$MW10
		Variable's area value is incorrect	01rSS0105%MW^&
		Other value is written for Bit Write than 00 or 01	01wSS0105%MX1011
0090	Monitor execution error	Unregistered monitor execution requested	
0190	Monitor execution error	Reg. No. range exceeded	

Error Code	Error Type	Error Details and Causes	Example
0290	Monitor reg. Error	Reg. No. range exceeded	
1132	Device memory error	Other letter than applicable device is input	
1232	Data size error	Request exceeds the max range of 60 Words to read or write at a time.	01wSB05%MW1040AA551
1234	Extra frame error	Unnecessary details exist as added.	01rSS0105%MW10000
1332	Conflicting data types	All the blocks should be requested of the identical data type in the case of Individual Read/Write	01rSS0205%MW1005%MB10
1432	Data value error	Data value unavailable to convert to Hex	01wSS0105%MW10AA%5
7132	Variable request area exceeded	Request exceeds the area each device supports.	01rSS0108%MWFFFFF

4. Example 2

If the number of data is H04 and the data is H12345678, its value converted to ASCII code is '31 32 33 34 35 36 37 38' which are in the data area. In other words, the highest value comes first and the lowest value last.

- If the data type is Bit, the read data will be displayed in Byte. In other words, if the bit value is 0, it will be displayed in H00 and if the value is 1, it will be in H01.

c) For NAK response Format 2

Format Name	Header	Sta. No.	Instruction	Instruction Type	Error code (Hex 2 Bytes)	Tail	Frame Check
Frame (Ex)	NAK	H20	R(r)	SS	H1132	ETX	BCC
ACSII value	H15	H3230	H52(72)	H5353	H31313332	H03	

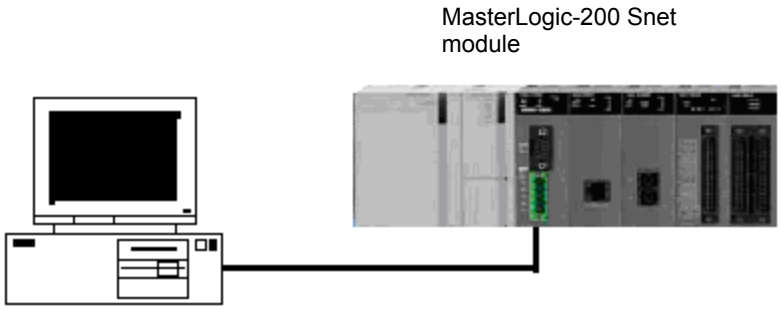
Error codes are as follows.

Details of error code hex 2 Bytes (4 Bytes in ASCII code) and error types are described below.

Error Code	Error Type	Error Details and Causes	Example
0003	Number of blocks exceeded	Number of blocks exceeds 16 at Individual Read/Write Request	01rSS1105%MW10…
0004	Variable length error	Variable Length exceeds the max. size of 16	01rSS0113%MW10000000000…
0007	Data type error	Other data type than X,B,W,D,L received	01rSS0105%MK10
0011	Data error	Data length area information incorrect	01rSB05%MW10%4
		In case % is unavailable to start with	01rSS0105$MW10
		Variable's area value wrong	01rSS0105%MW^&
		Other value is written for Bit Write than 00 or 01	01wSS0105%MX1011
0090	Monitor execution error	Unregistered monitor execution requested	
0190	Monitor execution error	Reg. No. range exceeded	
0290	Monitor reg. Error	Reg. No. range exceeded	
1132	Device memory error	Other letter than applicable device is input	
1232	Data size error	Request exceeds the max range of 60 Words to read or write at a time.	01wSB05%MW1040AA5512….
1234	Extra frame error	Unnecessary details exist as added.	01rSS0105%MW10000

Error Code	Error Type	Error Details and Causes	Example
1332	Data type discordant	All the blocks should be requested of the identical data type in the case of Individual Read/Write	01rSS0205%MW1005%MB10
1432	Data value error	Data value unavailable to convert to Hex	01wSS0105%MW10AA%5
7132	Variable request area exceeded	Request exceeds the area each device supports.	01rSS0108%MWFFFFF

5. Example



If M020's 1 word and P001's 1 word of station number 1 are read.

(At this time, it is assumed that H1234 is in M020 and H5678 is in P001.)

a) Request format of external communication device

Table 37 – Request format for external communication device 1 (example)

Format Name	Header	Sta. No.	Instruction	Instruction Type	No. of blocks	Variable Length	Variable Name	Variable Length	Variable Name	Tail	Frame Check
Frame (Ex)	ENQ	H01	R(r)	SS	H02	H06	%MW020	H06	%PW001	EOT	BCC
ACSII value	H05	H3031	H52(72)	H5353	H3032	H3036	H254D57303230	H3036	H2550573030303031	H04	

b) Response format of Snet I/F module

- For ACK response

Table 38 – ACK response 1 (example)

Format Name	Header	Sta. No.	Instruction	Instruction Type	No. of Blocks	Variable Length	Variable Name	Variable Length	Variable Name	Tail	Frame Check
Frame (Ex)	ACK	H01	R(r)	SS	H02	H02	H1234	H02	H5678	ETX	BCC
ACSII value	H06	H30 31	H52(72)	H5353	H3032	H3032	H31323 334	H3032	H3536 3738	H03	

- For NAK response

Table 39 – NAK response 1 (example)

Format Name	Header	Sta. No.	Instruction	Instruction Type	Error code	Tail	Frame Check
Frame (Ex)	NAK	H01	R(r)	SS	Error code (2 Bytes)	ETX	BCC
ACSII value	H15	H3031	H52(72)	H5353	Error code (4 Bytes)	H03	

Continuous read of direct variable (R(r)SB)

1. Purpose
   This function is used for reading the data of PLC device continuously as many as specified in the address.

2. Request format of external communication device.

Table 40 – Request for external communication device 2

Format Name	Header	Sta.No.	Instruction	Instruction Type	Variable Length	Variable Name	No. of data (up to 240 Bytes)	Tail	Frame Check
Frame (Ex)	ENQ	H10	R(r)	SB	H06	%MW100	H05	EOT	BCC
ASCII value	H05	H3130	H52(72)	H5342	H3036	H254D573 13030	H3035	H04	

TIP

Number of data means the number of devices to read. Namely, if device's data type is Word and the number of data is 5, then 5 Words are to be read.

For the number of data, up to 60 can be used.

Continuous Read function of direct variable has no number of blocks in the protocol.

Continuous Read of bit device is not available.

3. Response format of Snet I/F module

   a) For ACK response

Table 41 – ACK response 2

Format Name	Header	Sta. No.	Instruction	Instruction Type	Number of blocks	Number of data	Data	Tail	Frame Check
Frame (Ex)	ACK	H10	R(r)	SB	H01	H02	H1122	EOT	BCC
ASCII value	H06	H3130	H52 (72)	H5342	H3031	H3032	H31313232	H03	

b) For NAK response

<table>
<tr><th>Classification</th><th>Description</th></tr>
<tr><td>Number of data</td><td>It means the number of bytes in Hex, which is converted to ASCII.
It is the number of bytes.

<table>
<tr><th>Data Type</th><th>Available Direct Variable</th><th>Data Size (Byte)</th></tr>
<tr><td>BYTE (B)</td><td>% (P, M, L, K, F, T, C, D, S…) B</td><td>1</td></tr>
<tr><td>WORD (W)</td><td>% (P, M, L, K, F, T, C, D, S…)
Gone with the wind</td><td>2</td></tr>
<tr><td>Dword (D)</td><td>% (P, M, L, K, F, T, C, D, S…)
Diagram</td><td>4</td></tr>
<tr><td>Lword (L)</td><td>% (P, M, L, K, F, T, C, D, S…) L</td><td>8</td></tr>
</table></td></tr>
<tr><td>Data</td><td>In the data area, the value of hex. data converted to ASCII code is saved.
Example 1
If the memory type included in direct Variable Name of PC Request format is W(WORD) and PC Request format’s data is 03, PLC ACK response’s data after the instruction executed will be H06(2∗03 = 06 Bytes) Bytes, which will be converted to ASCII code value of 3036.
Example 2
In the example above, if 3 WORD data details are 1234, 5678, 9ABC in order, actual ASCII code value converted will be 31323334 35363738 39414243 which are in the data area.</td></tr>
</table>

Table 42 – NAK response 2

Format Name	Header	Sta.No.	Instruction	Instruction Type	Error code (Hex 2 Bytes)	Tail	Frame Check
Frame (Ex)	NAK	H10	R(r)	SB	H1132	ETX	BCC
ASCII value	H15	H3130	H52(72)	H5342	H31313332	H03	

4. Example

If 2 WORDs are read from M000 address of the station number 10. (It is supposed that the following data is saved in M000 and M001, respectively.)

M000 = H1234
M001 = H5678

a) Request format of external communication device (PC → MasterLogic-200 Snet module)

Table 43 – Request format of external communication device 2 (Example)

Format Name	Header	Sta.No.	Instruction	Instruction Type	Variable Length	Variable name	No. of data	Tail	Frame Check
Frame (Ex)	ENQ	H0A	R(r)	SB	H06	%MW000	H02	EOT	BCC
ASCII value	H05	H3041	H52(72)	H5342	H3036	H254D303030	H3032	H04	

b) Response format of Snet I/F module

– For ACK response

Table 44 – ACK response 2 (example)

Format Name	Header	Sta.No.	Instruction	Instruction Type	No. of data	Data	Tail	Frame Check
Frame (Ex)	ACK	H0A	R(r)	SB	H04	12345678	ETX	BCC
ASCII value	H06	H3041	H52(72)	H5342	H3034	H31323334 35363738	H03	

- For NAK response

Table 45 – NAK response 2 (example)

Format Name	Header	Sta.No.	Instruction	Instruction Type	Error code	Tail	BCC
Frame (Ex)	NAK	H0A	R(r)	SB	Error code (2 Bytes)	ETX	BCC
ASCII value	H15	H3041	H52(72)	H5342	Error code (4 Bytes)	H03	

Individual Write of direct variable (W(w)SS)

1. Purpose
   This function is used to directly specify and write the PLC device memory to use applicably to its memory data type.

2. Request format of external communication device.

Table 46 – Request format of external communication device 3

Format Name	Header	Sta.No.	Instruction	Instruction Type	No. of blocks	Variable Length	Variable Name	Data	Tail	Frame Check
Frame (Ex)	ENQ	H20	W(w)	SS	H01	H06	%MW100	H00E2	EOT	BCC
ASCII value	H05	H3230	H57(77)	H5353	H3031	H3036	H254D5731303 0	H3030453 2	H04	

1 block (Up to 16 blocks available repeatedly)

Classification	Description
Data	If the value to write on %MW100area is H A, data format should be H000A. Example: If the data type presently desired to write is Word and the data is H1234, its value converted to ASCII code is 31323334, which should be in the data area. In other words, the highest value should be sent first and the lowest value last.

TIP

- Device data type of each block should be identical.
- If the data type is Bit, the data to write will display as Hex (1Byte).
- In other words, if the bit value is 0, it will display as H00 (3030) and if the value is 1, it will display as H01(3031).

3. Response format of Snet I/F module

a) For ACK response

Table 47 – ACK response Format 3

Format Name	Header	Sta. No.	Instruction	Instruction Type	Tail	Frame Check
Frame (Ex)	ACK	H20	W(w)	SS	ETX	BCC
ASCII value	H06	H3230	H57(77)	H5353	H03	

b) For NAK response

Table 48 – NAK response Format 3

Format Name	Header	Sta. No.	Instruction	Instruction Type	Error code (Hex 2 Bytes)	Tail	Frame Check
Frame (Ex)	NAK	H20	W(w)	SS	H4252	ETX	BCC
ACSII value	H15	H3230	H57(77)	H5353	H34323532	H03	

4. Example

If 'HFF' is to be written on the M230 address of the station number 1. The following sequence will be there.

a) Request format of external communication device.

Table 49 – Request format of external communication device 3 (Example)

Format Name	Header	Sta. No.	Instruction	Instruction Type	Number of blocks	Variable Length	Variable Name	Data	Tail	Frame Check
Frame (Ex.)	ENQ	H01	W(w)	SS	H01	H06	%MW230	H00FF	EOT	BCC
ASCII value	H05	H3031	H57(77)	H5353	H3031	H3036	H254D57323330	H30304646	H04	

b) Snet I /F module response format

– For ACK response

Table 50 – ACK response Format 3 (Example), If 'HFF' is to be written on the M230 address of the station number 1

Format Name	Header	Sta. No.	Instruction	Instruction Type	Tail	Frame Check
Frame (Ex)	ACK	H01	W(w)	SS	ETX	BCC
ASCII value	H06	H3031	H57(77)	H5353	H03	

– For NAK response

Table 51 – NAK response Format 3 (Example)

Format Name	Header	Sta. No.	Instruction	Instruction Type	Error Code	Tail	Frame Check
Frame (Ex)	NAK	H01	W(w)	SS	Error code (2 Bytes)	ETX	BCC
ASCII value	H15	H3031	H57(77)	H5353	Error code (4 Bytes)	H03	

Continuous Write of direct variable (W(w)SB)

1. Purpose
   This function is used to write the data of the device continuously as long as specified from the specified address.

2. Request format of external communication device.

Table 52 – Request format of external communication device 4

Format Name	Header	Sta. No.	Instruction	Instruction Type	Variable Length	Variable Name	No. of data (up to 240 Bytes)	Data	Tail	Frame Check
Frame (Ex)	ENQ	H10	W(w)	SB	H06	%MW100	H02	H1111222 2	EOT	BCC
ASCII value	H05	H3130	H57(77)	H5342	H3036	H254D57313030	H3034	H3131313 1323232 32	H04	

TIP

- Number of data is the number based on the type of the direct variable. Namely, if device's data type is Word and the number of data is 5 then 5 Words are to be written.
- Maximum number of data is 120 Bytes (60 words).

3. Response format of Snet I/F module

   a) For ACK response

Table 53 – ACK response Format 4

Format Name	Header	Sta. No.	Instruction	Instruction Type	Tail	Frame Check
Frame (Ex)	ACK	H10	W(w)	SB	ETX	BCC
ASCII value	H06	H3130	H57(77)	H5342	H03	

b) For NAK response

Table 54 – NAK response Format 4

Format Name	Header	Sta. No.	Instruction	Instruction Type	Error Code (Hex 2 Bytes)	Tail	Frame Check
Frame (Ex)	ENQ	H10	W(w)	SB	H1132	EOT	BCC
ASCII value	H05	H3130	H57(77)	H5342	H31313332	H03	

4. Example
If 2 Bytes HAA15 are to be written on D000 of the station number 1, the request and response format for the instructions are given below.

a) Request format of external communication device

Table 55 – Request format of external communication device 4 (Example)

Format Name	Header	Sta. No.	Instruction	Instruction Type	Variable Length	Variable Name	No. of Data	Data	Tail	Frame Check
Frame (Ex)	ENQ	H01	W(w)	SB	H06	%DW000	H01	HAA15	EOT	BCC
ASCII value	H05	H3031	H57(77)	H5342	H3036	H254457303030	H3031	H4141413135	H04	

b) Response format of Snet I/F module

– For ACK response

Table 56 – ACK response Format 4 (Example)

Format Name	Header	Sta. No.	Instruction	Instruction Type	Tail	Frame Check
Frame (Ex)	ACK	H01	W(w)	SB	ETX	BCC
ASCII value	H06	H3031	H57(77)	H5342	H03	

– For NAK response

Table 57 – NAK response Format 4 (Example)

Format Name	Header	Sta. No.	Instruction	Instruction Type	Error code	Tail	Frame Check
Frame (Ex)	NAK	H01	W(w)	SB	Error code(2)	ETX	BCC
ASCII value	H15	H3031	H57(77)	H5342	Error code(4)	H03	

Registration of monitor variable (X##)

1. Purpose
   You can register up to 32 (0 to 31) Monitor variables separately with Read instruction of actual variables through this function, which executes the registered details by monitor instruction after the registration.

2. Request format of external communication device.

Table 58 – Request format of external communication device 5

Format Name	Header	Sta. No.	Instruction	Reg. No.	Reg. format	Tail	Frame Check
Frame (Ex)	ENQ	H1 0	X(x)	H09	Refer to registration format	EOT	BCC
ASCII value	H05	H3 130	H58(78)	H3039	[□]	H04	

Classification	Description
BCC	If the instruction is of small letter(x), 1 byte of ASCII value is added to ENQ ~ EOT, respectively, where only the lower 1 byte of the result will be converted to ASCII to add to BCC.
Reg. No.	You can register up to 32 (0~31, H00~H1F) variables. If the variable is registered again with an already registered number, the last executed one will be registered
Reg. format	Available until EOT of instructions during format of Device Individual Read and Continuous Read.

Note: Select only one option to use, between the two below, for registration format during Request format.

a) Device Individual Read

RSS	Number of Blocks (2 Bytes)	Variable Length (2 Bytes)	Variable Name (16 Bytes)	...

Up to 16 blocks available repeatedly

b) Device Continuous Read

RSB	Variable Length (2 Bytes)	Variable Name (16 Bytes)	Number of Data

3. Response format of Snet I/F module

a) For ACK response

Table 59 – ACK response Format 5

Format Name	Header	Sta. No.	Instruction	Reg. No.	Tail	Frame Check
Frame (Ex)	ACK	H10	X(x)	H09	ETX	BCC
ASCII value	H06	H3130	H58(78)	H3039	H03	

b) For NAK response

Table 60 – ACK response Format 5

Format Name	Header	Sta. No.	Instruction	Reg. No.	Error Code (Hex 2 Bytes)	Tail	Frame Check
Frame (Ex)	Format Name	Header	Sta. No.	Instruction	Reg. No.	Tail	Frame Check
ASCII value	Frame (Ex)	ACK	H10	X(x)	H09	ETX	BCC

4. Example

If the device M000 of the station number 1 is registered in number 01 to monitor.

a) Request format of external communication device

Table 61 – Request format of external communication device 5 (Example)

Format Name	Header	Sta.No.	Instruction	Reg.No.	Reg. format				Tail	Frame Check
					R##	No. of blocks	Variable Length	Variable Name		
Frame (Ex)	ENQ	H01	X(x)	H01	RSS	H01	H06	%MW000	EOT	BCC
ASCII value	H05	H3031	H58(78)	H3031	H525353	H3031	H3036	H2554573 03030	H04	

b) Snet I/F module response format

- For ACK response

Table 62 – ACK response Format 5 (Example)

Format Name	Header	Sta. No.	Instruction	Reg. No.	Tail	Frame Check
Frame (Ex)	ACK	H01	X(x)	H01	ETX	BCC
ASCII value	H06	H3031	H58(78)	H3031	H03	

– For NAK response

Table 63 – NAK response Format 5 (Example)

Format Name	Header	Sta. No.	Instruction	Reg. No.	Error code	Tail	Frame Check
Frame (Ex)	NAK	H01	X(x)	H01	Error code(2)	ETX	BCC
ASCII value	H15	H3031	H58(78)	H3031	Error code(4)	H03	

Monitor execution (Y##)

1. Purpose
   This function is used for reading the device registered by monitor registration. It specifies the registration number to read the device registered in that number.

2. Request format of external communication device.

Table 64 – Request format of external communication device 6

Format Name	Header	Sta. No.	Instruction	Reg. No.	Tail	Frame Check
Frame (Ex)	ENQ	H10	Y(y)	H09	EOT	BCC
ASCII value	H05	H3130	H59(79)	H3039	H03	

3. Snet I/F module response format

   a) For ACK response

   – If the registration format of the registration number is of Device Individual Read.

Table 65 – ACK response Format 6 (1)

Format Name	Header	Sta.No.	Instruction	Reg. No.	No. of Blocks	No. of Data	Data	Tail	Frame Check
Frame (Ex)	ACK	H10	Y(y)	H09	H01	H02	H9183	ETX	BCC
ASCII value	H06	H3130	H59(79)	H3039	H3031	H3032	H39313833	H03	

– If the registration format of the registration number is of Direct Variable Continuous Read.

Table 66 – ACK response Format 6 (2)

Format Name	Header	Sta.No.	Instruction	Reg. No.	No. of Data	Data	Tail	Frame Check
Frame (Ex)	ACK	H10	Y(y)	H09	H04	H9183 AABB	ETX	BCC
ASCII value	H06	H3130	H59(79)	H3039	H3034	H3931 383341 414242	H03	

b) For NAK response

Table 67 – NAK response Format 6

Format Name	Header	Sta. No.	Instruction	Reg. No.	Error code (Hex 2 Bytes)	Tail	Frame Check
Frame (Ex)	NAK	H10	Y(y)	H09	H1132	ETX	BCC
ASCII value	H15	H3130	H59(79)	H3039	H31313332	H03	

4. Example

If the device registered in number 01 of the station number 1 is to be read (It is supposed that the registered device is the device M000 with one block).

a) Request format of external communication device (PC → MasterLogic-200 Snet module)

Table 68 – Request format of external communication device 6 (Example)

Format Name	Header	Sta. No.	Instruction	Reg. No.	Tail	Frame Check
Frame (Ex)	ENQ	H01	Y(y)	H01	EOT	BCC
ASCII value	H05	H3031	H59(79)	H3031	H04	

b) Response format of Snet I/F module

- For ACK response

Table 69 – ACK response Format 6 (Example)

Format Name	Header	Sta. No.	Instruction	Reg. No.	No. of Blocks	No. of Data	Data	Tail	Frame Check
Frame (Ex)	ACK	H01	Y(y)	H01	H01	H02	H2342	ETX	BCC
ASCII value	H06	H3031	H59(79)	H3031	H3031	H3032	H32333432	H03	

- For NAK response

Table 70 – NAK response Format 6 (Example)

Format Name	Header	Sta. No.	Instruction	Reg. No.	Error Code	Tail	Frame Check
Frame (Ex)	NAK	H01	Y(y)	H01	Error code(2)	ETX	BCC
ASCII value	H15	H3031	H59(79)	H3031	Error code(4)	H03	

9. Program Examples

9.1 Program examples

Example of dedicated service

If MasterLogic-200 PLC is connected with an external device as shown in Figure 73, with its Snet I/F module configured as the server, the setting and diagnosis method of the Snet I/F module are as follows.

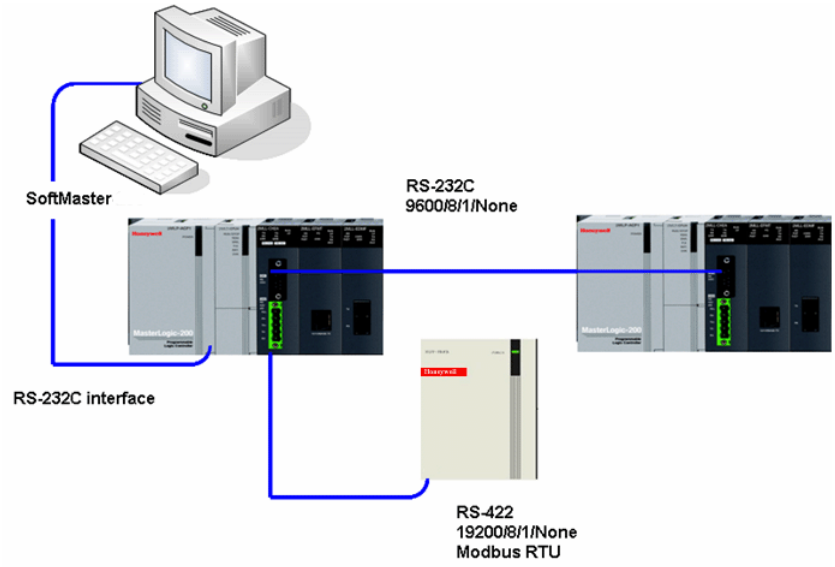


Figure 73 – Communication between MasterLogic-200 Snet and external device

Firstly, set the transmission specification for communication with the external device, by connecting SoftMaster-NM with CPU of MasterLogic-200 PLC. After the connection is complete, register the Snet communication module through **IO Information Read** in **Online** menu. If Snet I/F module is installed on Base 0, Slot 3, Snet is registered on the SoftMaster-NM's basic setting window as shown below.

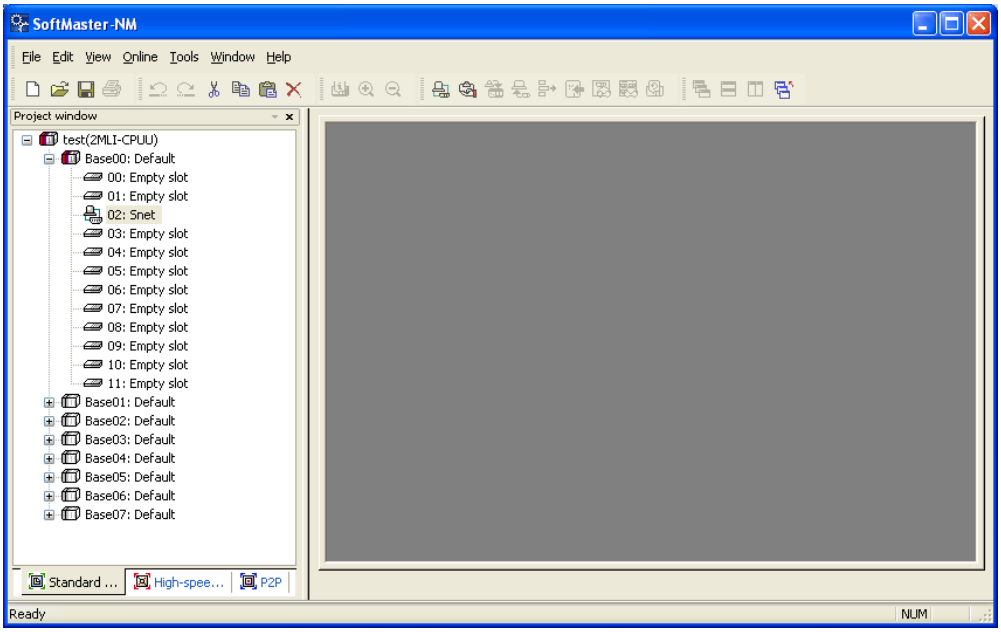


Figure 74 – Basic setting window of Snet I/F module with SoftMaster-NM

In order to communicate with the external device, select Snet on the **Basic Setting** window to display **Communication Settings** window for setting the transmission specification.

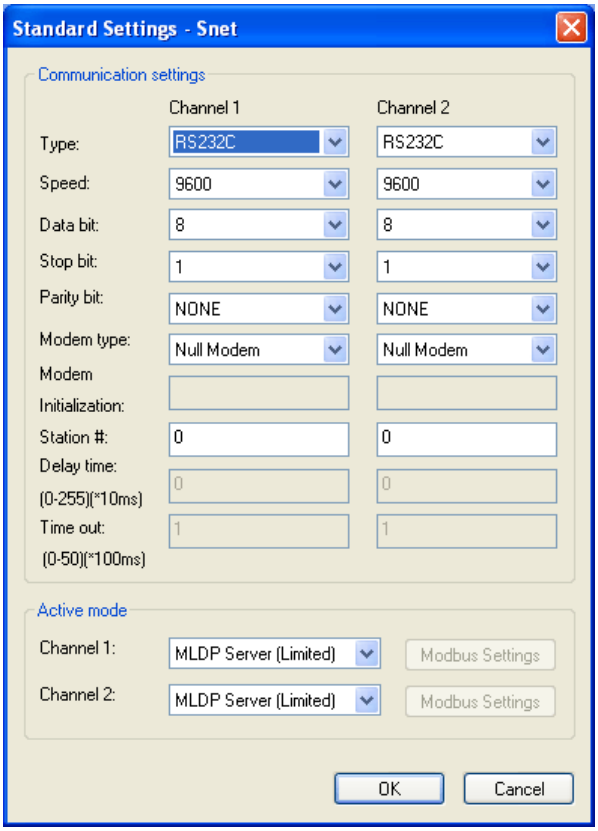


Figure 75 – Communication settings window

Since, channels 1 and 2 operate as server for the external device, where channel 1 uses MLDP protocol and channel 2 uses Modbus protocol, respectively, necessary configuration information should be specified on **Operation Mode** setting window.

Bit and Word's I/O information area for Modbus received via channel 2 should be specified on the **Modbus Setting** window.

For example, if Bit unit of digital input area is to be assigned to P20, Bit unit of digital output area to M300, Word unit of analog input area to M400 and Word unit of analog output area to M500, click **Setting** button on the **Standard Setting Snet** window to specify as shown in Figure 76.

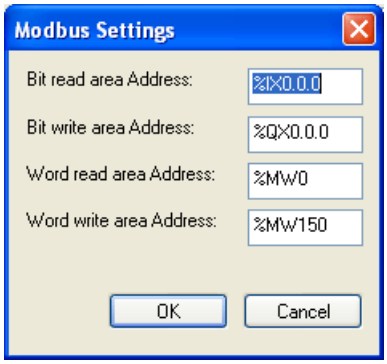


Figure 76 – Setting window of Modbus dedicated service

After setting is complete as shown in Figure 76, download basic communication parameters.

From the **OnLine** menu, select **Parameter Write** to display the parameter download window. And select specified Snet I/F module's basic setting items to download.

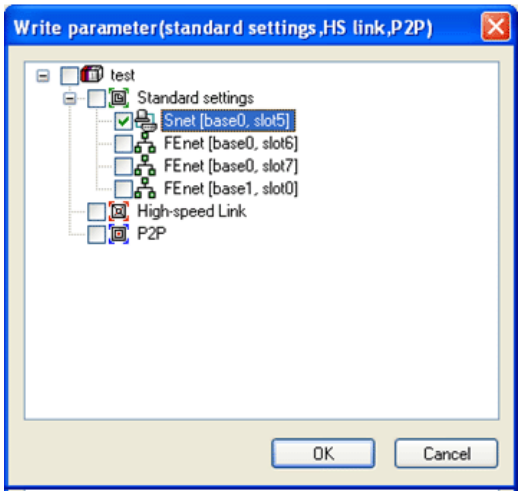


Figure 77 – Parameter Write window of dedicated service

After the download is complete, reset the communication module or recycle the PLC power to apply the specified communication parameters to the respective channel.

When Snet I/F module is in normal operation, System Diagnosis can be done as follows. From the Online menu, select the active menu **System Diagnosis** and System Diagnosis window displays as shown in Figure 78.

Select the slot on which the applicable module is installed on the system diagnosis window and then right-click and the system diagnosis menu displays for respective slot. Select the desired diagnosis service from the menu.

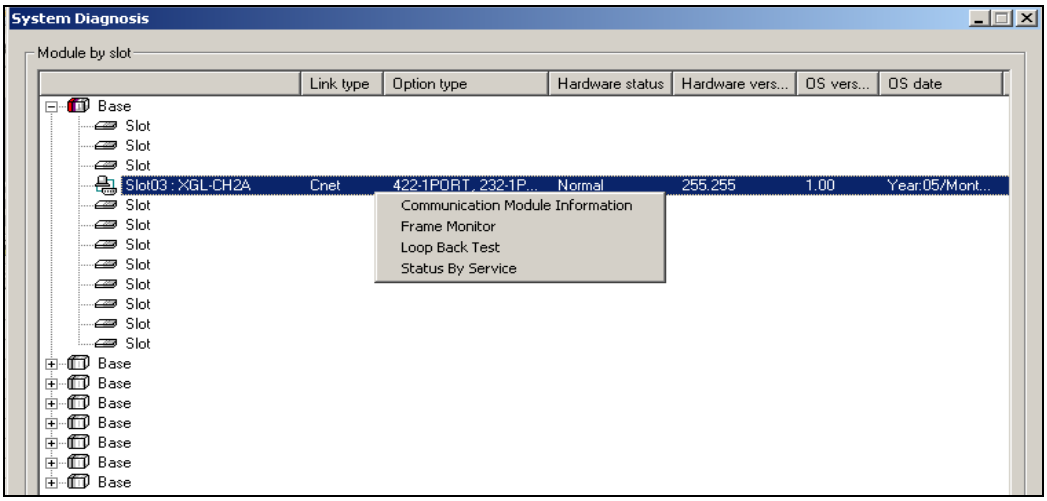


Figure 78 – System diagnosis window of dedicated service

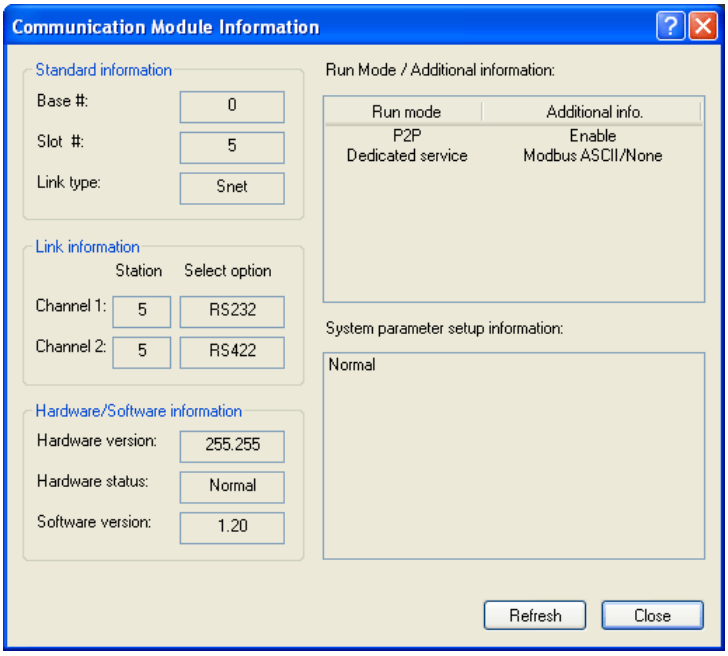


Figure 79 – Communication module information window of dedicated service

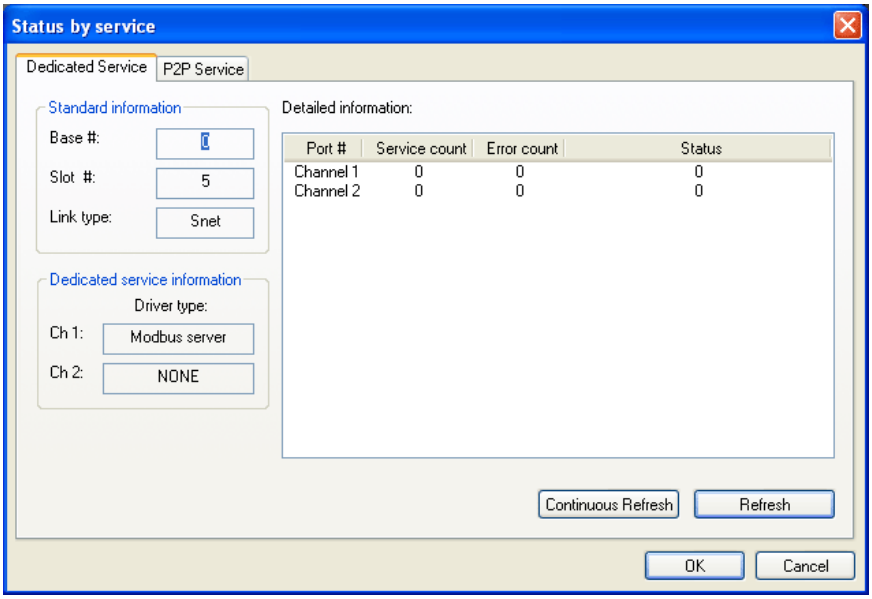


Figure 80 – Status window for respective services of dedicated service

9.2 P2P service

The following example is described for setting P2P service.

MLDP client (limited)

When the counterpart station operates as the server, while supporting MasterLogic-200 protocol with Snet I/F module operating as the client, MLDP client driver is used for communication.

If P2P is to be used for channel 1, select Operation Mode of P2P first on **Basic Setting** window as shown in Figure 81. On P2P setting window, set channel 1's P2P driver to MLDP client.

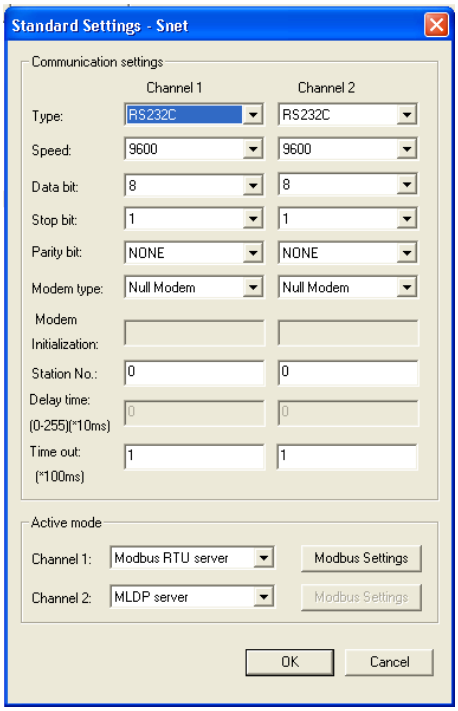


Figure 81 – P2P basic setting window for MasterLogic-200 dedicated communication

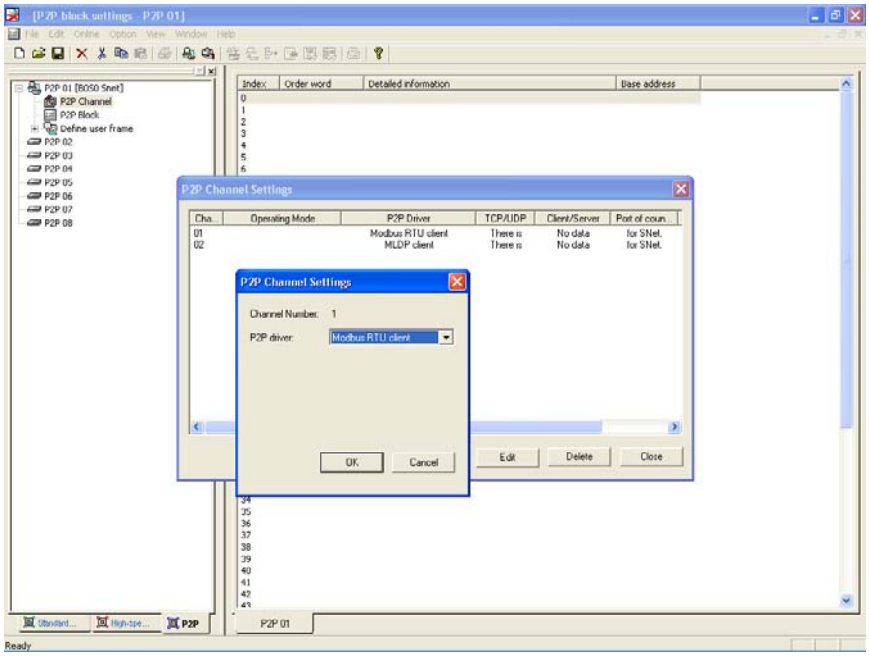


Figure 82 – P2P driver setting window for respective channels of MasterLogic-200 dedicated communication

Whenever M00000 Bit is set, P2P setting should be as shown in Figure 83, to read 1 Word (2Bytes) of corresponding station number 2's M0100, M0110, M0120, and M0130 to be saved on its own station's P0100, P0101, P0102, and P0103.

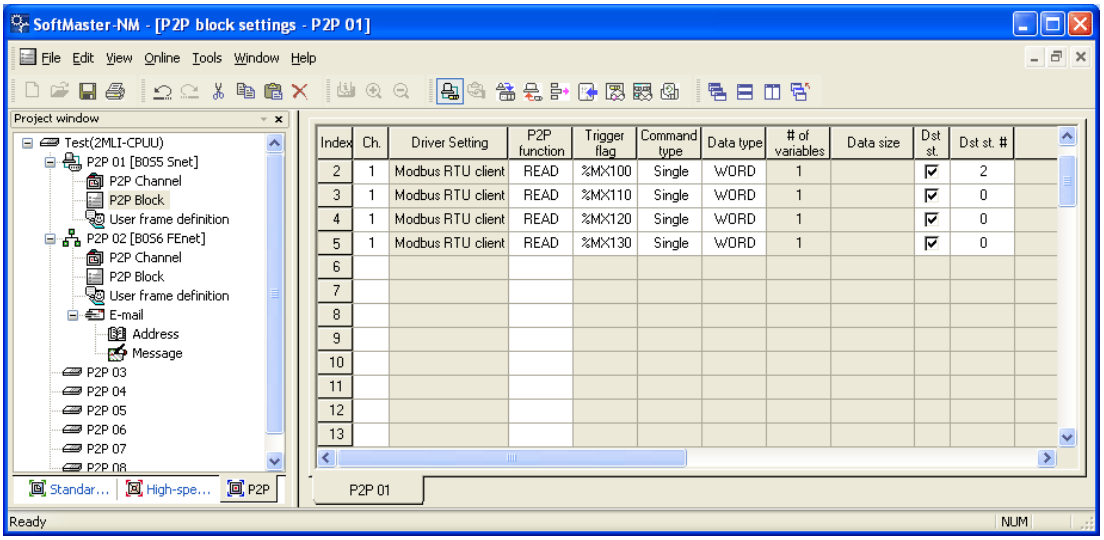


Figure 83 – P2P block setting window (Read instruction) of MasterLogic-200 dedicated communication

Whenever P00100 Bit is set, P2P setting should be as shown in Figure 84, in order to save Word data of M0200, M0210, and M0220 on P0101, P0102, and P0103 of corresponding station number 5.

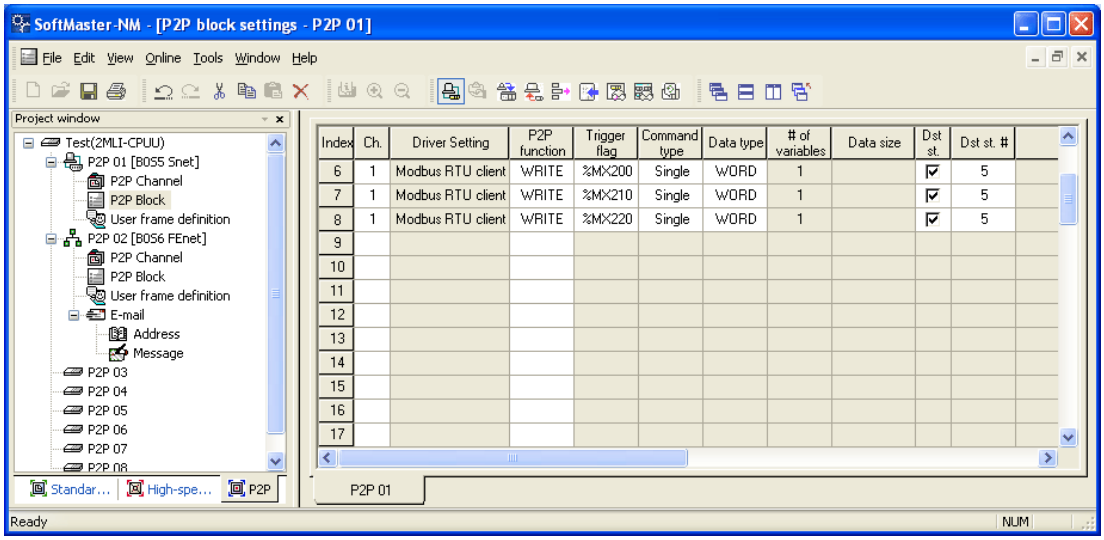


Figure 84 – P2P block setting window (Write instruction) of MasterLogic-200 dedicated communication

Registration of the two functions Read/Write as described above will be as follows.

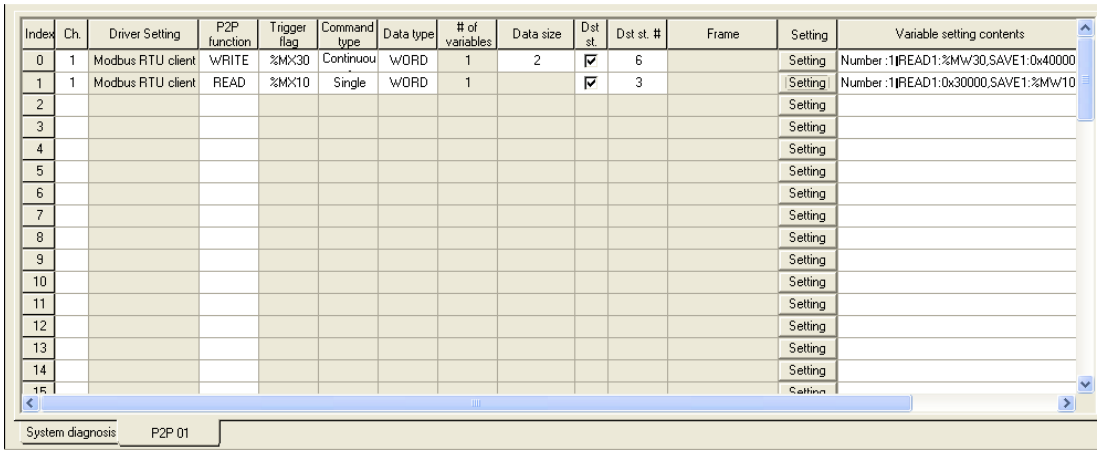


Figure 85 – P2P block setting window of MasterLogic-200 dedicated communication

By using identical method, up to 64 P2P blocks can be registered.

Modbus client

If Snet I/F module operates as Modbus Client as shown below, reading and writing Smart I/O Snet's data used for Modbus, connected through multi-drop P2P setting and checking of its normal operation is as described below.

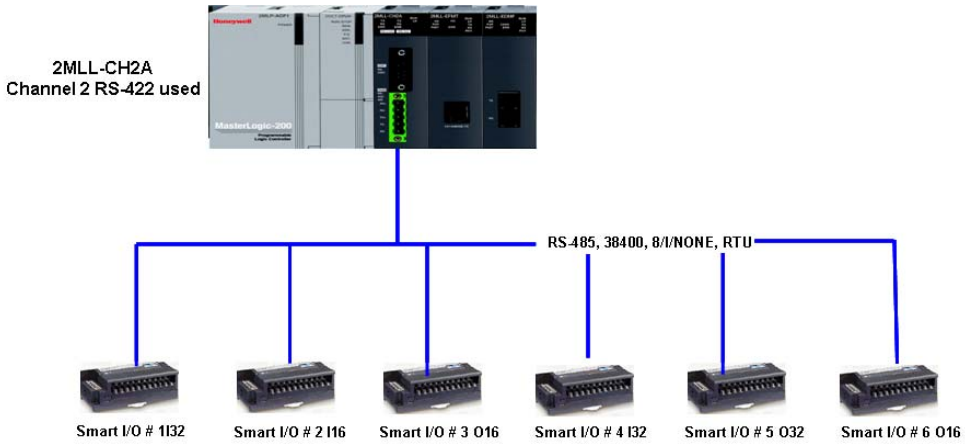


Figure 86 – P2P Modbus client communication

It is assumed that Snet I/F module runs as described below in the system configured as in Figure 86.

1. [Stage 1] Snet I/F module reads 32-point input value of Smart I/O station number 1 for every 200ms to save it at address MW10.
2. [Stage 2] Snet I/F module output address MW11's 1 Word to Smart I/O station number 3 when address MW10's number 2 Bit is set.
3. [Stage 3] Snet I/F module reads 16-point input value of Smart I/O station number 2 to save on address MW20 when PW4' number 1 bit is set.
4. [Stage 4] Snet I/F module reads 32-point input value of Smart I/O station number 4 to save on address MW30 when PW4' number 2 Bit is set.
5. [Stage 5] Snet I/F module outputs PW16's 2 Words to Smart I/O station number 5 when PW4' number 3 Bit is set.
6. [Stage 6] Snet I/F module outputs MW30's 1 Word to Smart I/O station number 6 when PW4' number 4 Bit is set.

Modbus client communication can be performed as below.

Step	Action
1	The basic parameters of Snet I/F module should be specified first and run SoftMaster-NM to connect with PLC.
2	After connecting normally, from the **Online** menu, select **IO Information Read** to register Snet module. Since Smart I/O's are connected to Snet channel 2, basic communication parameters should be specified for this port.

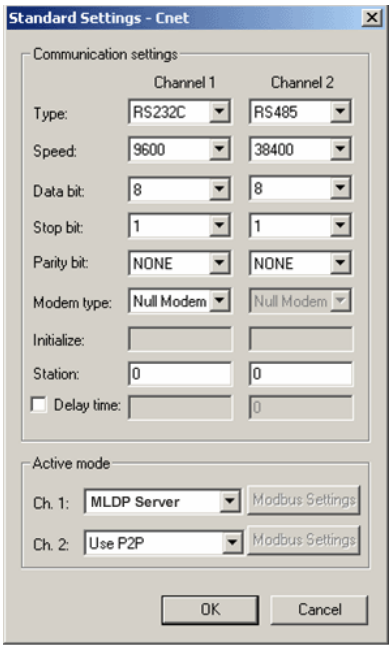


Figure 87 – Basic setting window of P2P Modbus client communication

3	Since P2P service is to be executed through channel 2, setting should be as shown above on the **Operation Mode setting** window. After setting is complete, from the **Online** menu, select **Parameter Write** menu to download the configuration.
4	Reset the communication module to apply the defined communication settings.

Step	Action

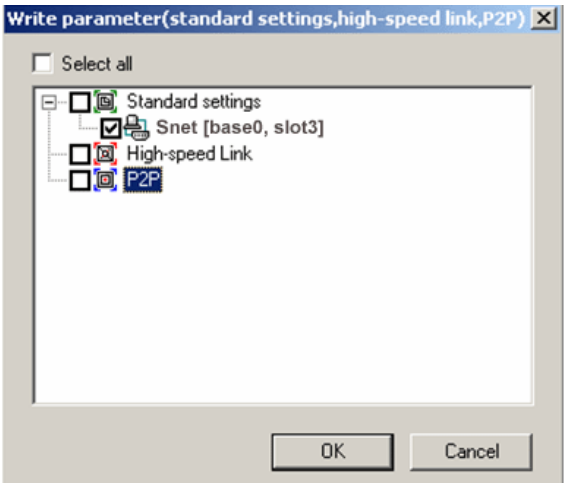


Figure 88 – Parameter Write window of P2P Modbus client

5 P2P parameters should be specified to execute P2P service. Firstly, register Snet I/F module on SoftMaster-NM's P2P parameter setting window.

Optional selection is available from P2P 1~8.

6 Select P2P 1 on the P2P parameter setting window to execute **Communication Module Setting**.

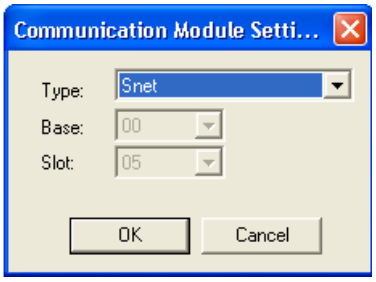


Figure 89 – Communication module setting window of P2P Modbus client

7 On the module setting window, select Snet and the exact positions of Base and Slot of Snet I/F module to execute P2P service. After Snet I/F module is registered, P2P parameter setting will be available as shown below.

Step	Action

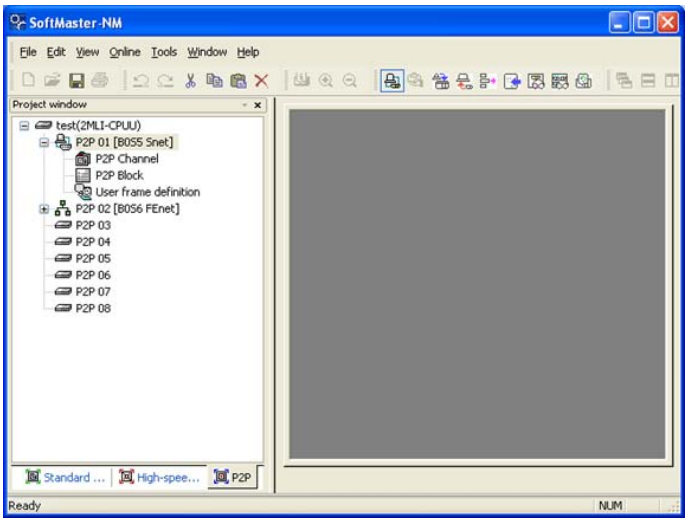


Figure 90 – P2P parameter window of Modbus client

8 Among P2P parameter items, select **P2P Channel** first to decide the device to be used for communication port. Since the network is composed of Modbus RTU for channel 2, setting should be as shown below.

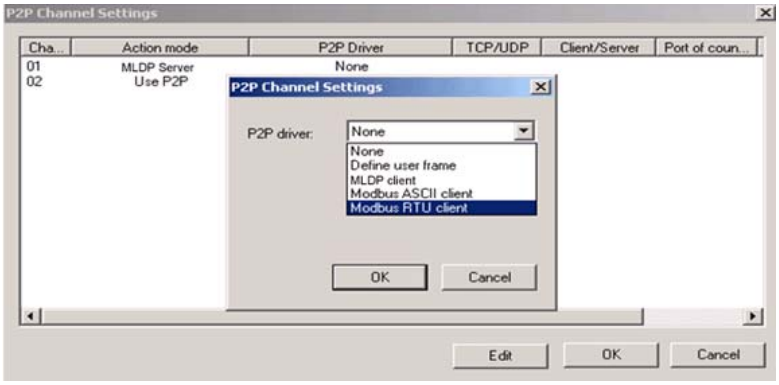


Figure 91 – P2P channel setting window of Modbus client

9 Since Snet I/F module needs to execute separate five stages of operations, register six instructions on the P2P block setting window.

Step	Action

Stage 1: Reads 32-point input value of Smart I/O station number 1 for every 200ms to save on MW10.

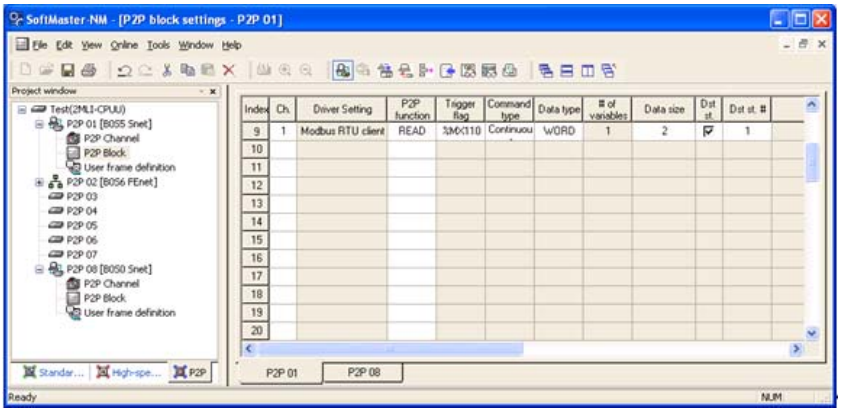


Figure 92 – P2P block setting window 1(Read instruction) of Modbus client

Stage 2: Outputs MW11's 1 Word to Smart I/O station number 3 when MW10' number 2 Bit is set.

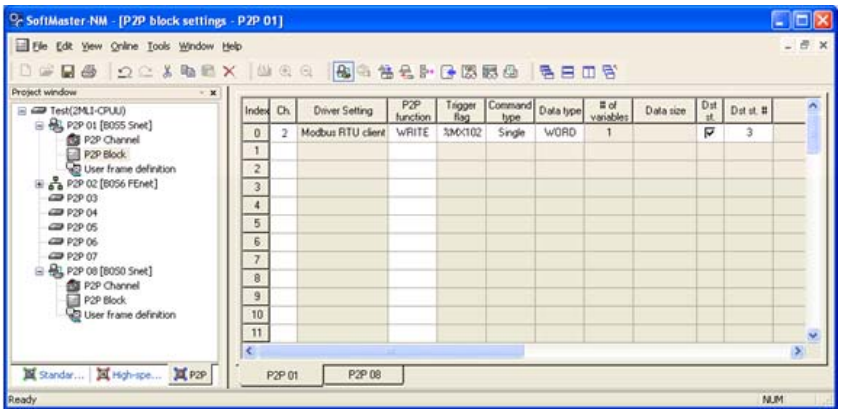


Figure 93 – P2P block setting window 1(Write instruction) of Modbus client

Stage 3: Reads 16-point input value of Smart I/O station number 2 to save on MW20 when PW4' number 1 Bit is set.

Step	Action

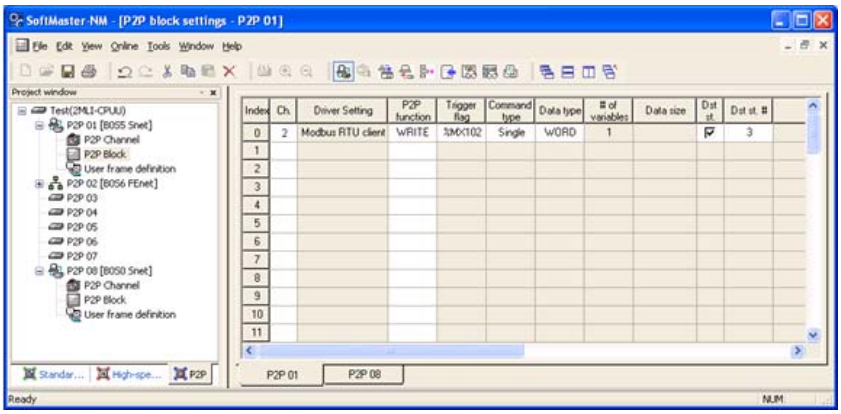


Figure 94 – P2P block setting window 2(Read instruction) of Modbus client

Stage 4: Reads 32-point input value of Smart I/O station number 4 to save on MW30 when PW4' number 2 Bit is set.

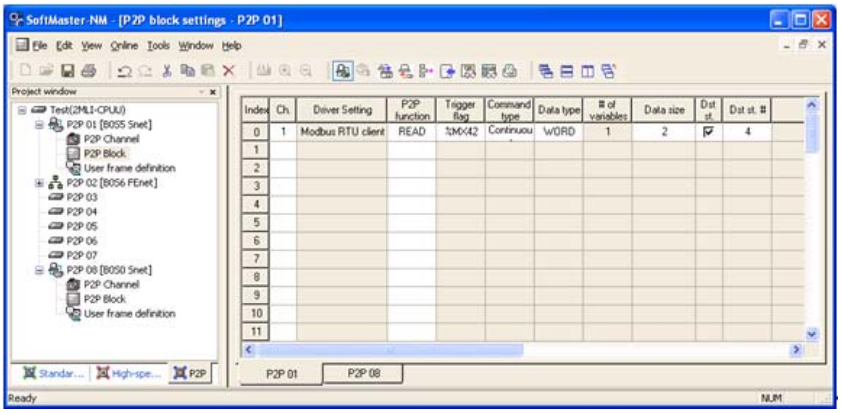


Figure 95 – P2P block setting window 3(Read instruction) of Modbus client

Stage 5: Outputs PW16's 2 Words to Smart I/O station number 5 when PW4' number 3 Bit is set.

Step	Action

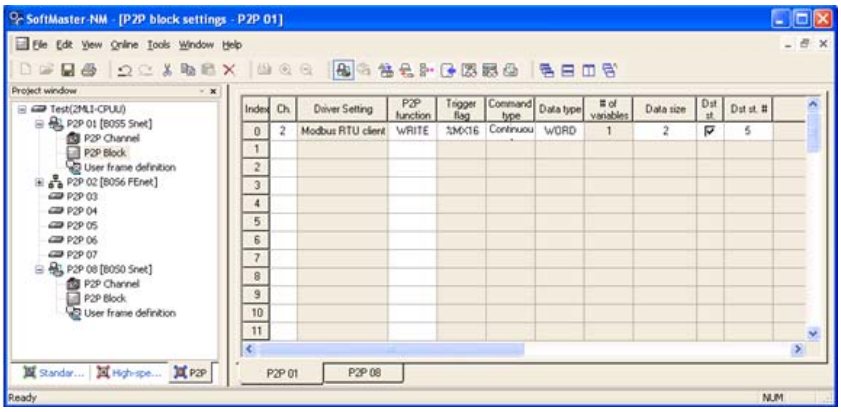


Figure 96 – P2P block setting window 2(Write instruction) of Modbus client

Stage 6: Outputs MW30's 1 Word to Smart I/O station number 6 when PW4' number 4 Bit is set.

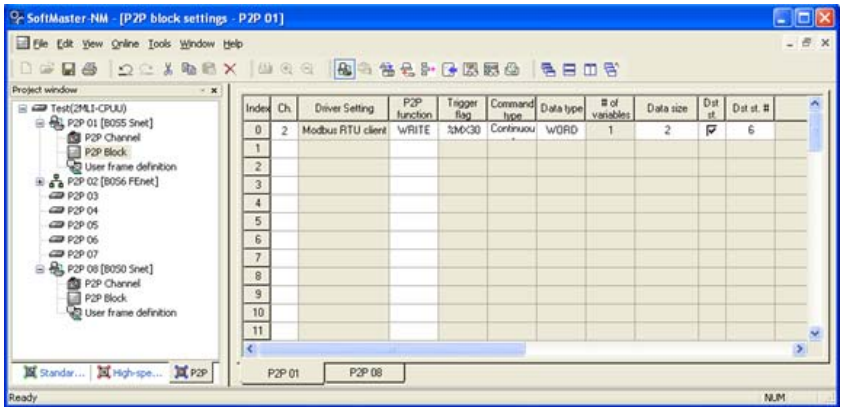


Figure 97 – P2P block setting window 3(Write instruction) of Modbus client

The result after all the above stages will be as follows.

Step	Action

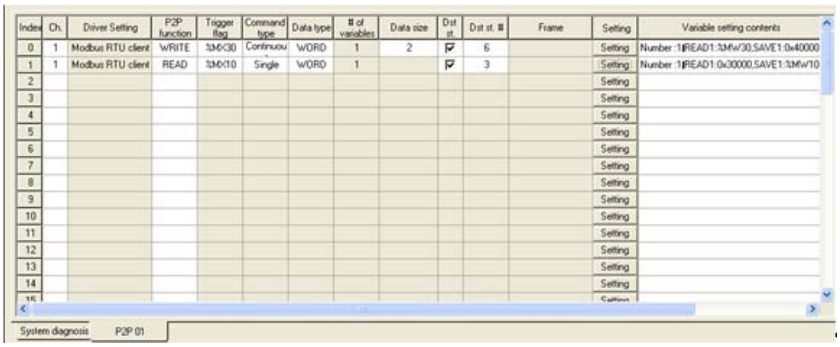


Figure 98 – P2P block setting of Modbus client

10 After P2P parameter setting is complete for Snet I/F module, from the **Online** menu, select **Parameter Write** on the Parameter Write window to select P2P parameters to download the parameters prepared.

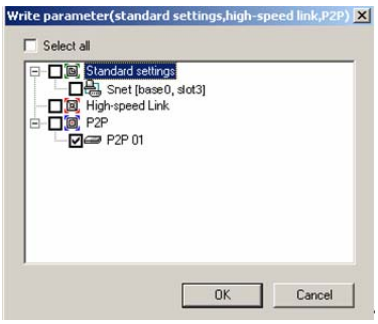


Figure 99 – Parameter Write window of Modbus client

11 P2P service is not enabled after the downloading is complete. The link should be enabled to start P2P service. To do so, from the **Online menu**, select **Link Enable** to start P2P service.

Step	Action

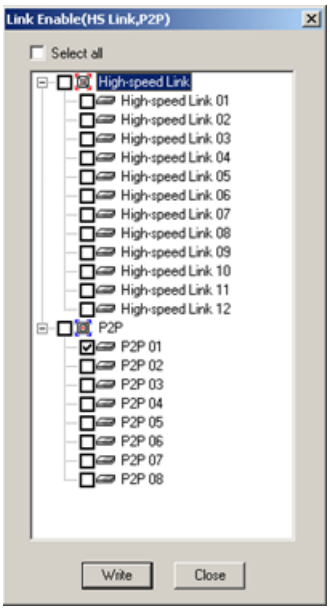


Figure 100 – P2P Enable setting window of Modbus client

12 From the **Online** menu, select **System Diagnosis** and the system diagnosis window displays, to check the normal operation of P2P service.

Step	Action

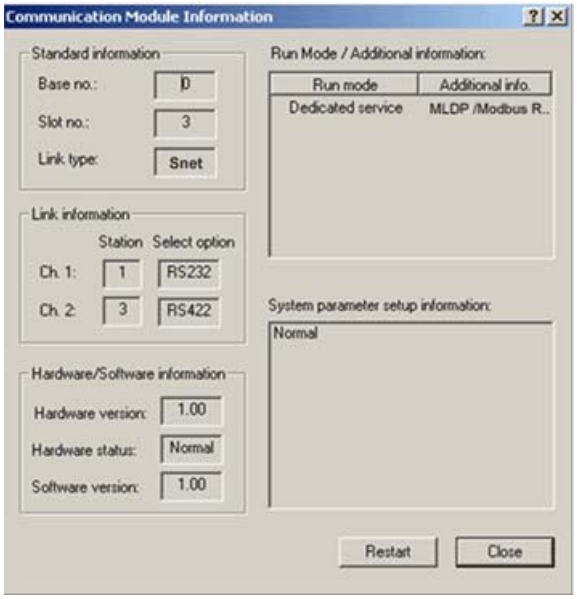


Figure 101 – Communication module information window of Modbus client

Step	Action

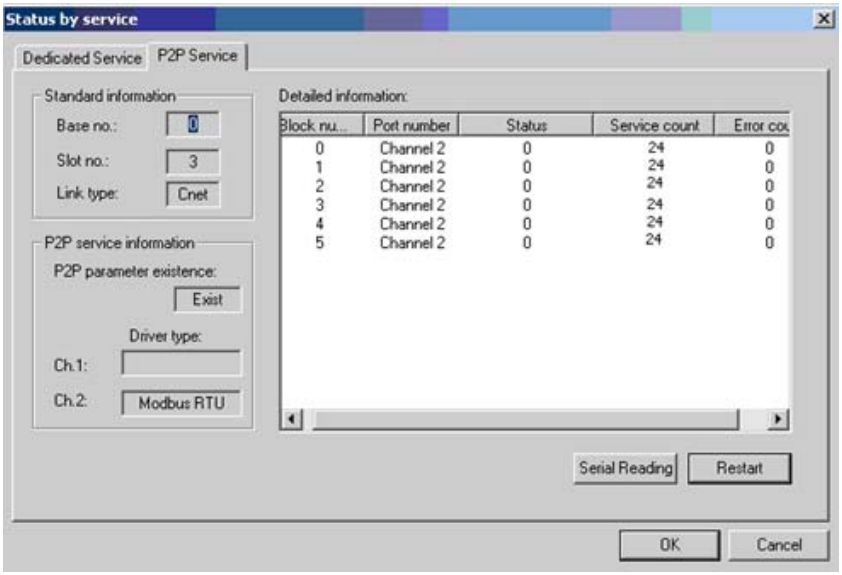


Figure 102 – Status window for respective services of Modbus client

REFERENCE - INTERNAL

For more information, refer to Diagnosis.

User-defined communication

Programming method of user-defined communication is described for communication system and frame configuration between Snet I/F module and other brand company's PLC.

The example shows the case where 22-Word data of MasterLogic-200's %MW0 area is written to other brand PLC, and 12-Word data from other brand PLC is read to save on %MW100 address area of MasterLogic-200.

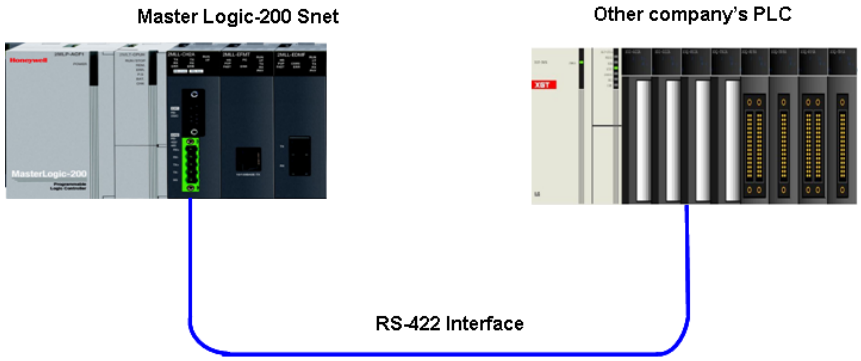


Figure 103 – Example of communication system with other company's PLC (System Configuration)

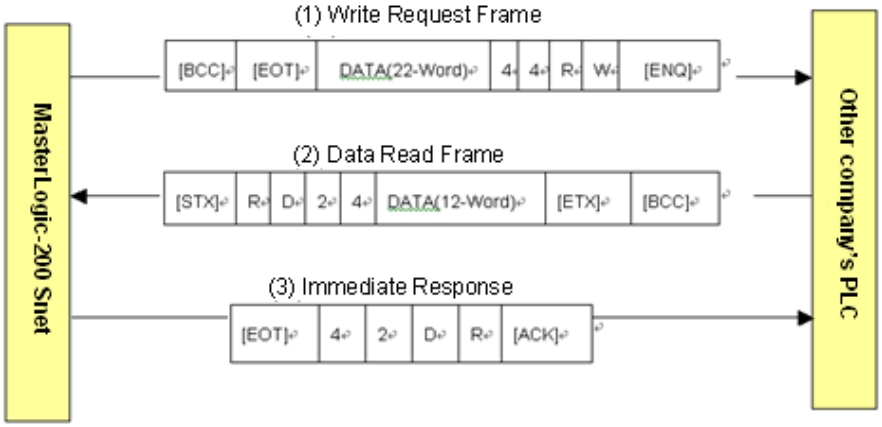


Figure 104 – Tx/Rx frame structure

In Figure 104, MasterLogic-200 sends 22-Word data to other company's PLC in format of '(1) Write Request Frame', and other company's PLC sends '(2) Data Read Frame' along with 12-Word data to MasterLogic-200.

The protocol is used for sending the Response frame in format of '(3) Immediate Response Frame' for the Data Read Frame if received.

Figure 104 shows the data flow according to the transmission sequence of frames.

At the end of Write/Read frame, BCC check data is attached and transmitted.

The following section describes frame setting and programming method to realize the protocol in the user-defined mode.

Description of protocol

1. Write Request Frame

Table 71 – Structure of Write Request Frame

Tx sequence	Header ←----------→ Tail								
Frame type	HEAD	BODY					TAIL	BCC	
		Instruction (CONSTANT)				Data (Array)			
Tx frame	**ENQ**	**W**	**R**	**4**	**4**	**Changeable data (22 words)**	**EOT**		
ASCII code value [Note]	H05	H57	H52	H34	H34		H04		

a) Use ASCII control characters of ENQ, EOT in header and tail.

b) Use ‘WR’ instruction for Write instruction.

c) Use ‘44’ for data length area to display 44 Bytes (22 Words) of Data Write.

d) Send 22-Word data to Tx data area.

e) Calculate BCC by adding ASCII code value from head to tail in hexadecimal.

Since this area is changeable, it will be changed for respective frames.

2. Data Read Frame

Table 72 – Structure of Data Read Frame

Tx sequence	Header ←----------→ Tail			
Frame type	HEAD	BODY	TAIL	BCC

		Instruction (CONSTANT)				Data (ARRAY)			
Tx frame	**STX**	**R**	**D**	**2**	**4**	**Changeable data**	**ETX**		
ASCII code value	H02	H52	H44	H32	H34	**(24 bytes)**	H03		

a) Use ASCII control characters of STX, ETX in header and tail.

b) Use 'RD' instruction for Read instruction.

c) Use '24' for data length area to display 24 Bytes (12 Words) of Data Read.

d) Send 24-Byte data to data area.

e) Calculate BCC by adding ASCII code value from head to tail in hexadecimal.

Since this area is changeable, it will be changed for respective frames.

3. Immediate Response Frame

As the Response Frame responds to Data Read Frame, Immediate Response Frame responds to the received instruction without data.

Table 73 – Structure of immediate Response Frame

Tx sequence	Header ←----------→ Tail					
Frame type	HEAD	BODY				TAIL
		Instruction (CONSTANT)				
Tx frame	**ACK**	**R**	**D**	**2**	**4**	**ETX**
ASCII code value	H10	H52	H44	H32	H34	H03

a) Use ASCII control characters of ACK, ETX in header and tail

b) Send the received instruction 'RD' again.

c) Send the received data length '24' again.

d) BCC is not used.

User-defined programming

Setting sequence of Snet I/F module for communication with other brand PLC protocol in user mode is as shown below.

1. Firstly, in order to use Snet I/F module, define the transmission specification on the SoftMaster-NM's basic setting window. Set Operation Mode of P2P for the channel to transmit and receive the user-defined frame.

2. Select optional P2P parameter among P2P 1~8 for P2P parameters setting, with Snet communication module registered with the requisite parameter.

At this time, the positions of Base and Slot should be exactly identical.

If user-defined Tx/Rx is to be executed through channel 1 of Snet I/F module installed on Base 0 and Slot 3, the registration will be as shown below.

In order to use the user-defined frame among P2P parameter items, specify all the channel/block/user-defined items.

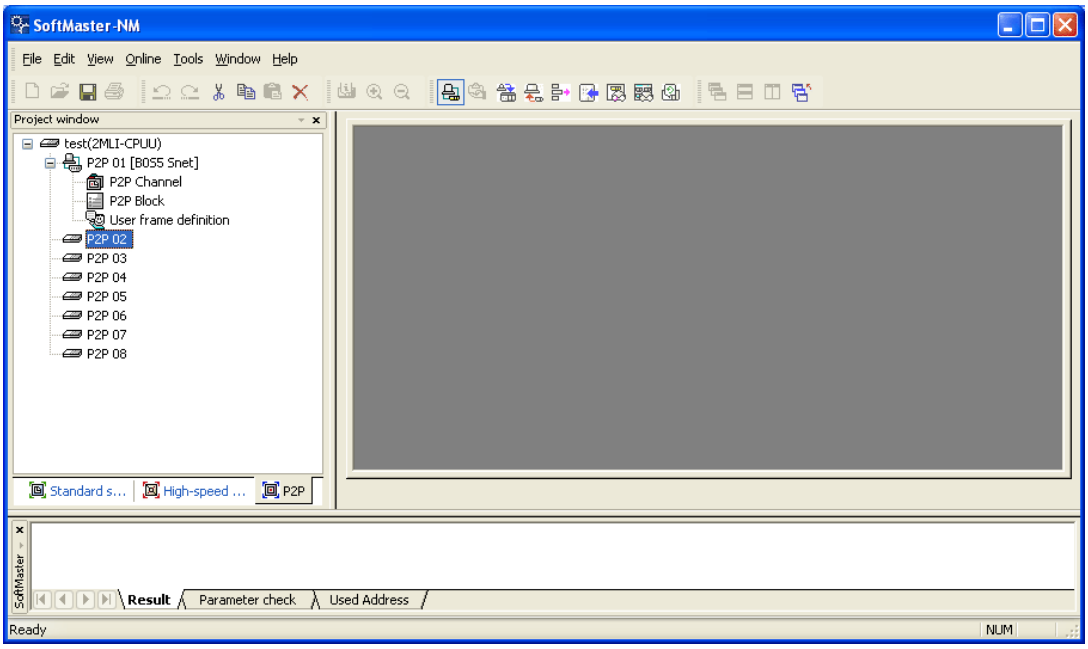


Figure 105 – Setting window of user-defined communication

Select P2P channel item to define the user-defined frame function for channel 1 as shown below.

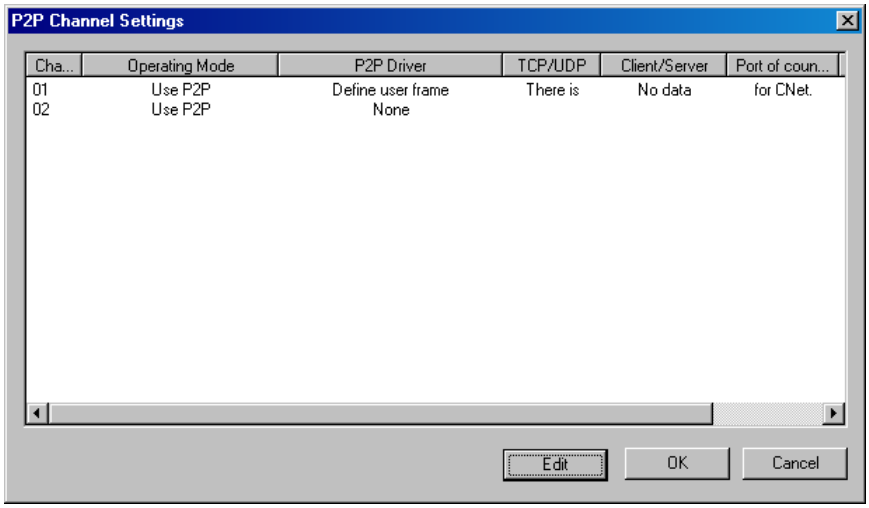


Figure 106 – P2P channel setting window of user-defined communication

If P2P Operation Mode of channel 1 is decided as defined by the user, Send/Receive instructions only are available for the applicable channel when setting blocks.

Frame setting

After basic communication setting and mode setting are complete, set and register the frame first among P2P parameter items. When setting frames, the frame name should be specified for three frames as shown below.

- Write Request Frame: WR.REQ
- Data Read Frame: RD.DATA
- Immediate Response Frame: IMM.RESPONSE

Figure 107 shows the basic window where three frames are registered.

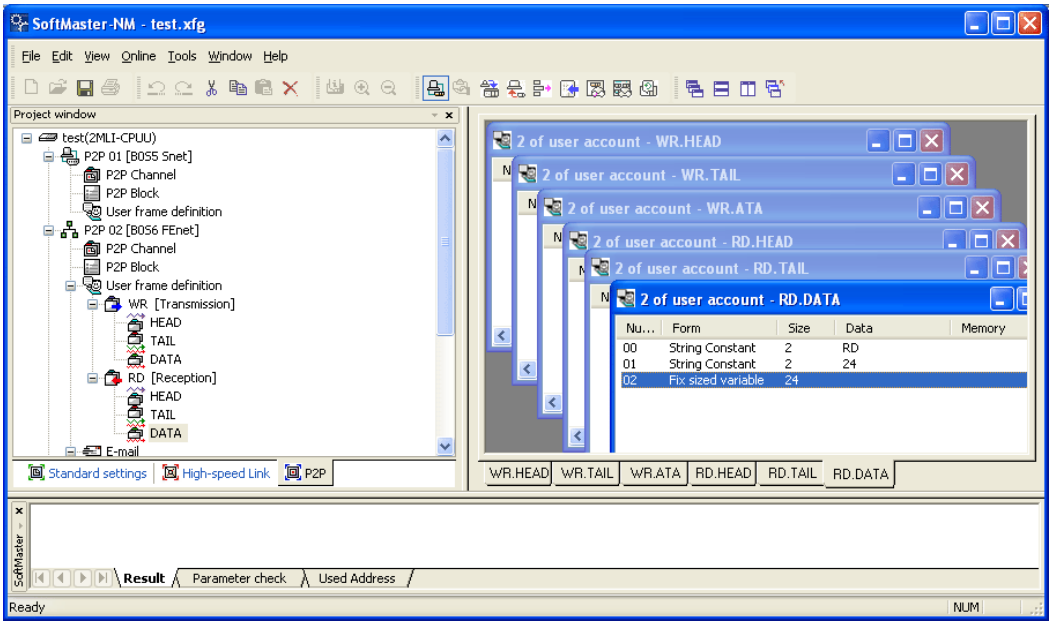


Figure 107 – Window of SoftMaster-NM frames registered

Perform the following steps to register the Write Request Frame: WR.REQ.

Step	Action
1	On the P2P parameter window, select **User Defined** item and right-click to select **Add Group**. All the frames of Snet I/F module are composed of group and frames. Thus, the group should be defined first when the user-defined frames are to be registered.

Step	Action

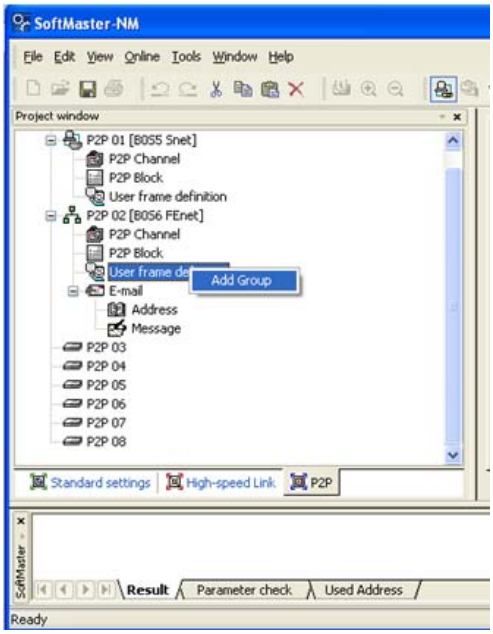


Figure 108 – Add - P2P user-defined group

2 On the **Group Edit** window, define the group name as **WR** and select the frame type of Tx (Transmission) as shown below.

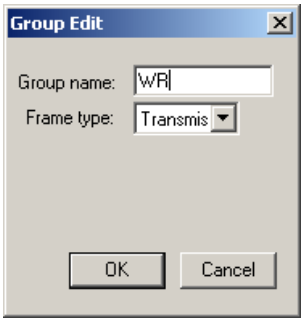


Figure 109 – Group Edit window

3 Actual frame should be registered for the registered group. Since WR.REQ frame, is composed of HEAD+BODY+TAIL as in Table 71, respectively,

Step	Action
	frames should be registered for those items. Select the registered group and right-click to add frames as shown below.

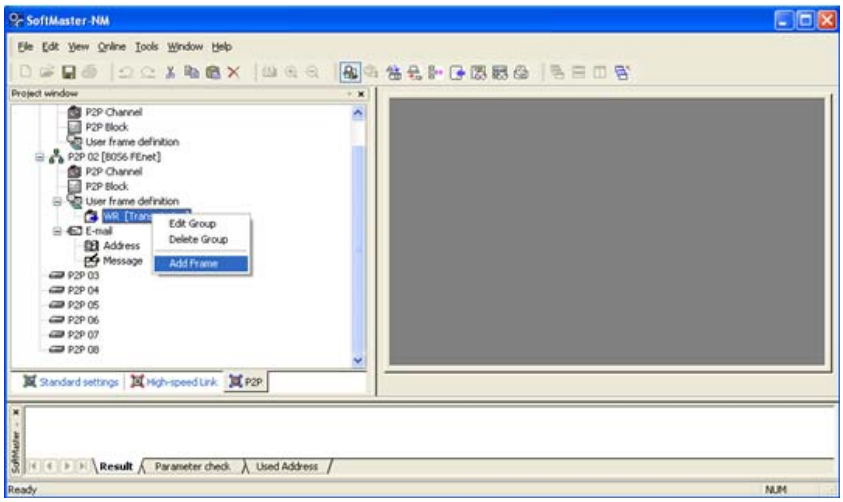
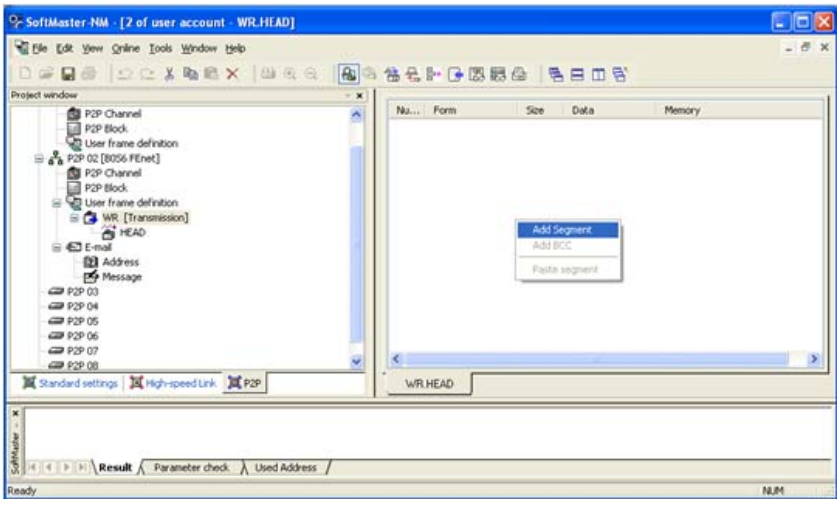


Figure 110 – WR frame Add

4	First register HEAD. If the registered HEAD is selected, frame register/edit is available. Right-click the frame edit window to add segments as shown below.



Step	Action

Figure 111 – Setting window of 'WR. HEAD' frame

5 Since WR.HEAD is composed of 'ENQ' only, specify the segment to be numeric constant with 05 specified.

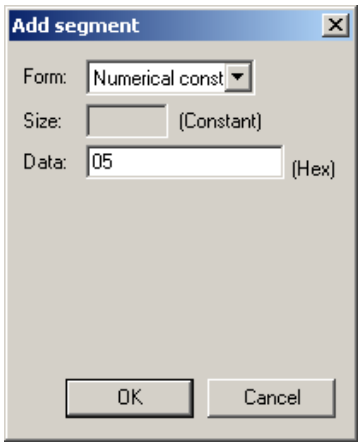


Figure 112 – Segment input window of WR. HEAD frame

6 TAIL is composed of [EOT] and BCC. Add the frame TAIL identical to HEAD registered, and register the segment as shown below.

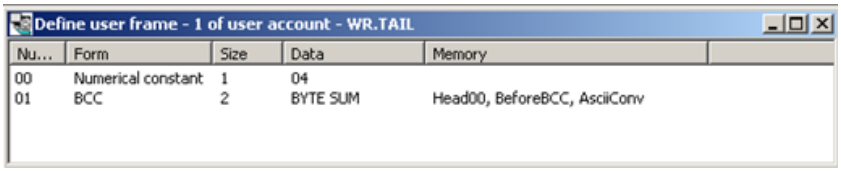


Figure 113 – Setting window of WR. TAIL frame

7 As BCC is Byte Checksum from HEAD to TAIL in ASCII format, setting should be as shown below.

Step	Action

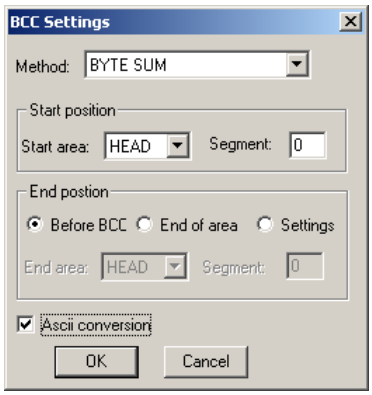


Figure 114 – Setting window of WR. TAIL frame BCC

8 Finally, since Body is registered with the name of 'REQ', when you add, the frame should be defined as shown below.

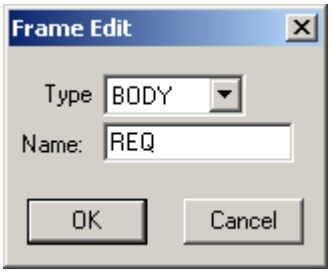


Figure 115 – WR. BODY frame Create

9 Add the segment to the registered REQ-Body.

Firstly, Body is composed of 'WR44' + 22 Words Data. Since 'WR44' is not changeable as text is constant, and 22 Words Data is 22 Words of PLC's MW0, the registration should be as shown below.

Step	Action

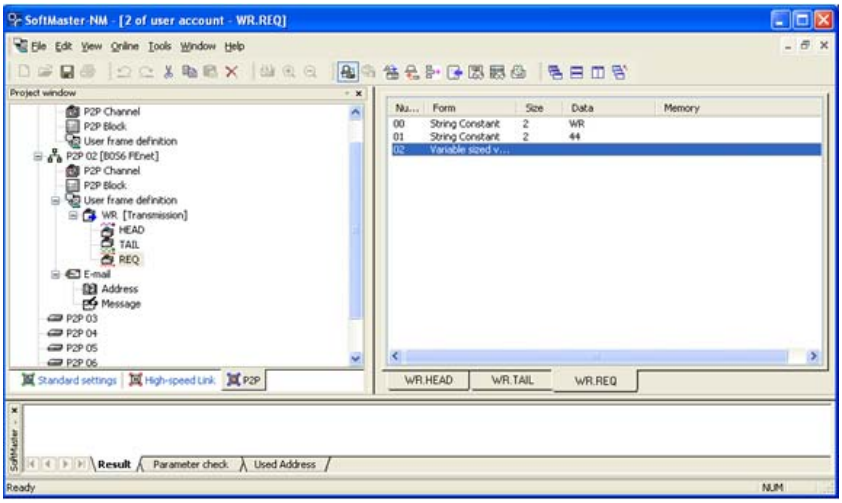


Figure 116 – Setting window of WR. BODY frame

10 Define the position of 22 Words Data when setting P2P blocks.

Through the steps described above ‘WR.REQ’ frame registration is complete.

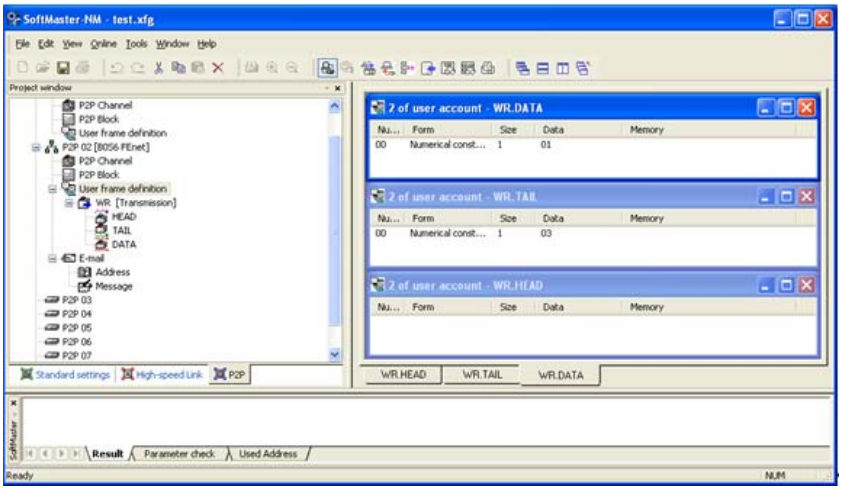


Figure 117 – Whole setting of WR frames

Perform the following steps to register the Data Read Frame: RD.DATA.

Step	Action
1	Register the group ‘RD’ as in the sequence identical to ‘WR.REQ’ register, for which the frames of HEAD, TAIL, and BODY [DATA] should be added.

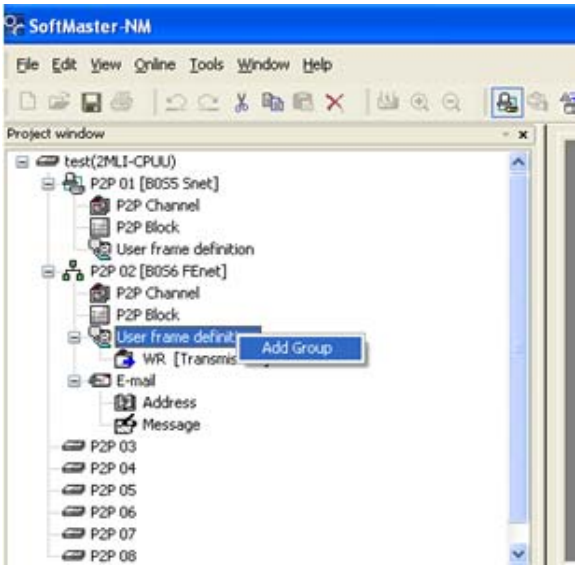


Figure 118 – RD frame Add

2	Refer to Table 72 to define HEAD, TAIL, and BODY. Since HEAD is composed of STX only and TAIL is of ETX, BCC, the registration should be as shown below.

Step	Action

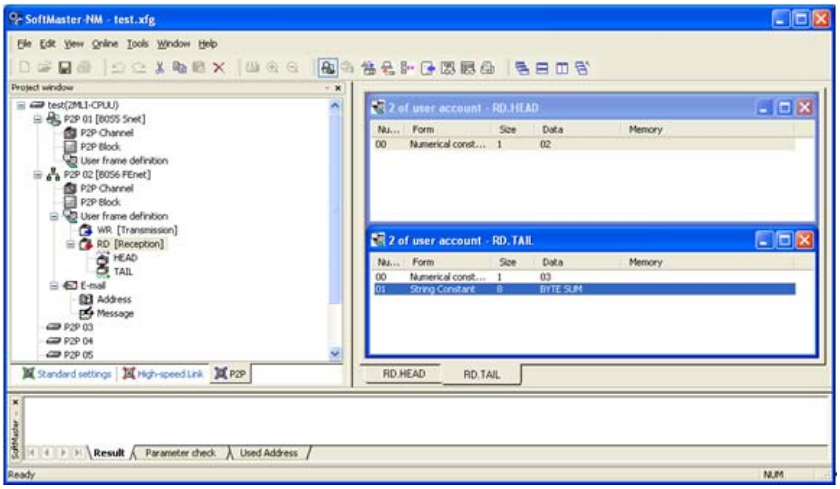


Figure 119 – Setting of RD. HEAD and RD.TAIL frames

3 Since BODY is composed of the received data of ‘RD24’ and 24 Bytes, and the received data are to be saved on MW100, add the text constant of ‘RD24’ segment.

Since the received data is fixed at 24 Bytes, add the variable segment of fixed size. At this time, since the received data is to be saved, select **Memory Setting** as shown below.

Step	Action

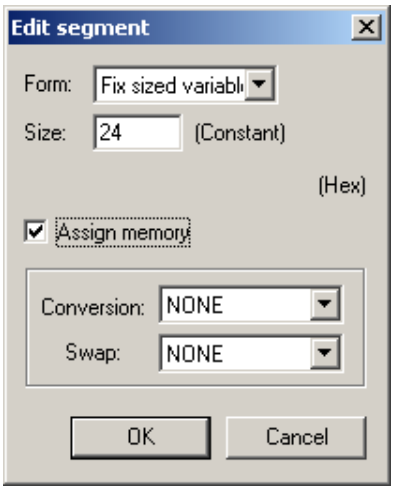


Figure 120 – Setting window of RD. BODY frame data received

4 After registering as shown above, Body is composed as shown below.

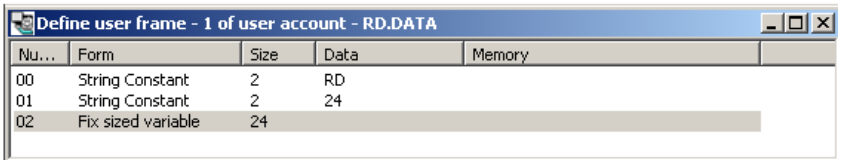


Figure 121 – RD. BODY frame setting complete

Step	Action

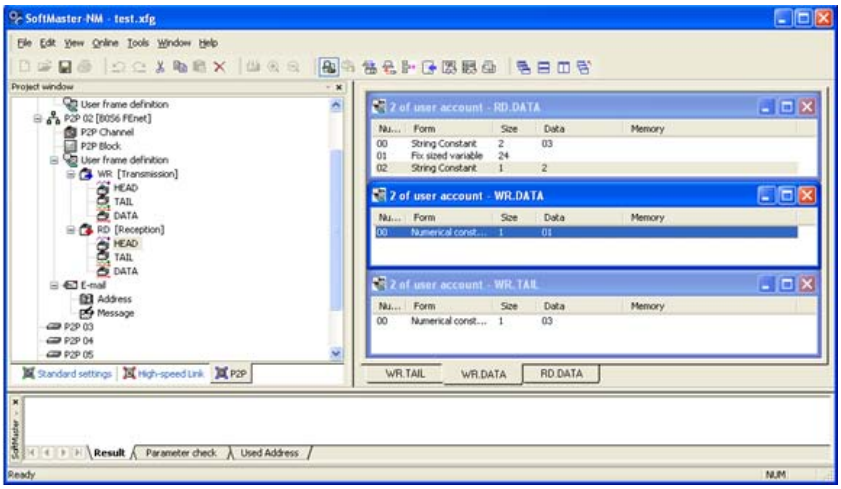


Figure 122 – RD frame setting complete

Perform the following steps to register the Immediate Response Frame: IMM.RESPONSE.

Step	Action
1	Immediate Response Frame is composed of constants only. Refer to Table 73 to define as below.

Step	Action

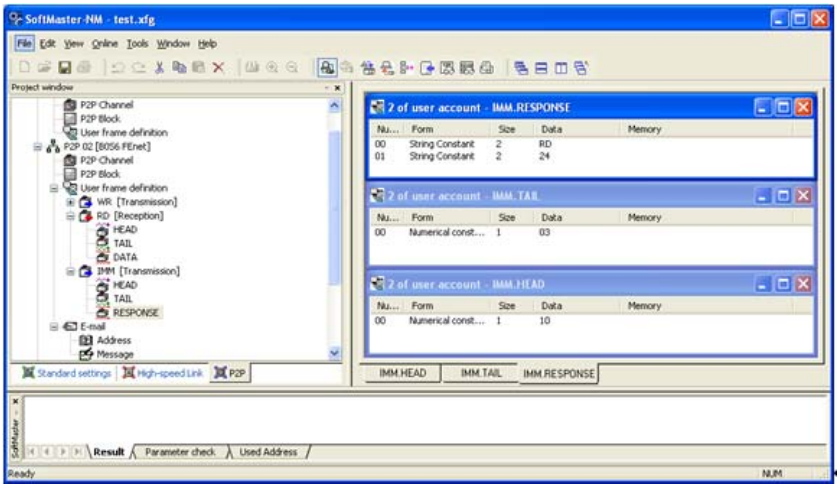


Figure 123 – Immediate Response Frame setting complete

P2P instruction setting

After user frames are defined, register P2P instructions to process the frame transmitted and received as specified.

In order to define the operation to send IMM.RESPONSE while sending WR.REQ for every 1s and receiving RD.DATA, the P2P instruction should be registered as shown below.

Select '**P2P Block**' to display the P2P instruction registration window, where 3 P2P blocks are to be added for the three operations.

1. WR.REQ to send for every 1s

   Add P2P instruction 'Send' so as to transmit WR.REQ for every 1s. Register it on **Send Instruction** edit window as shown below.

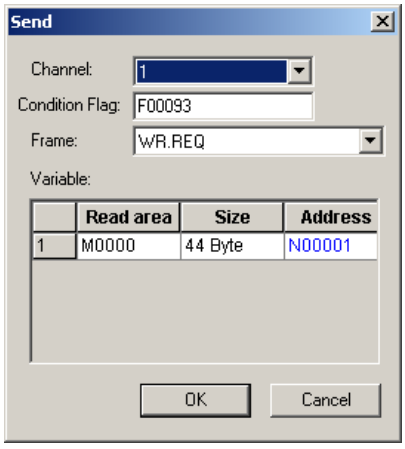


Figure 124 – P2P block setting of user-defined communication (Send instruction, WR frame used)

a) Channel: Port used to send WR.REQ frame → 1

b) Condition Flag: 1s Timer → F 93

c) Frame: Select the frame to send WR.REQ

d) Variable

- Create as many variables as WR.REQ's variable segments of changeable size.
- Up to four variables can be set (four changeable areas available for the frame).
- Area to read: data position of WR.REQ's variables of changeable size.
- Size: data size of WR.REQ's variables changeable (Byte size).

2. RD.DATA to receive

Define receive instruction to receive RD.DATA frame.

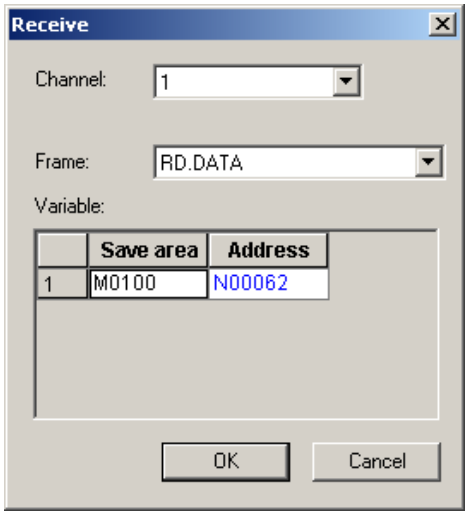


Figure 125 – P2P block setting of user-defined communication (Receive instruction, RD frame used)

a) Channel: Channel used to receive the frame

b) Frame: Frame name to receive. RD.DATA

c) Variable

- Create variable segments changeable and fixed registered in RD.DATA. However, it is only for the segment with memory setting specified.
- Area to save: the position to save data of the applicable location of the variable segments changeable and fixed among the received frames.

3. Immediate Response Frame to transmit

In order to transmit Immediate Response Frame when RD.DATA is received, the registration should be as shown below.

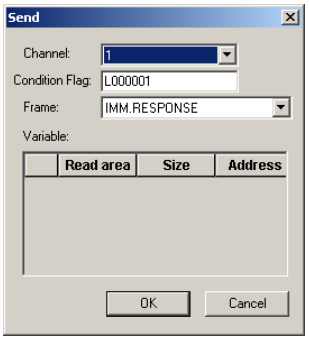


Figure 126 – P2P block setting of user-defined communication

(Send instruction, IMM frame used)

a) Channel: Port used to send the specified frame.

b) Condition Flag: Used to decide the time to be sent. Immediate Response Frame L001 will be set when RD.DATA is received normally.

c) Frame: Used to register the frame name to be sent.

After P2P registration is complete, download it to start P2P service.

From the **Online** menu, select **System Diagnosis** and use the frame monitoring and the status function for respective services in order to check for normal frame Tx/Rx.

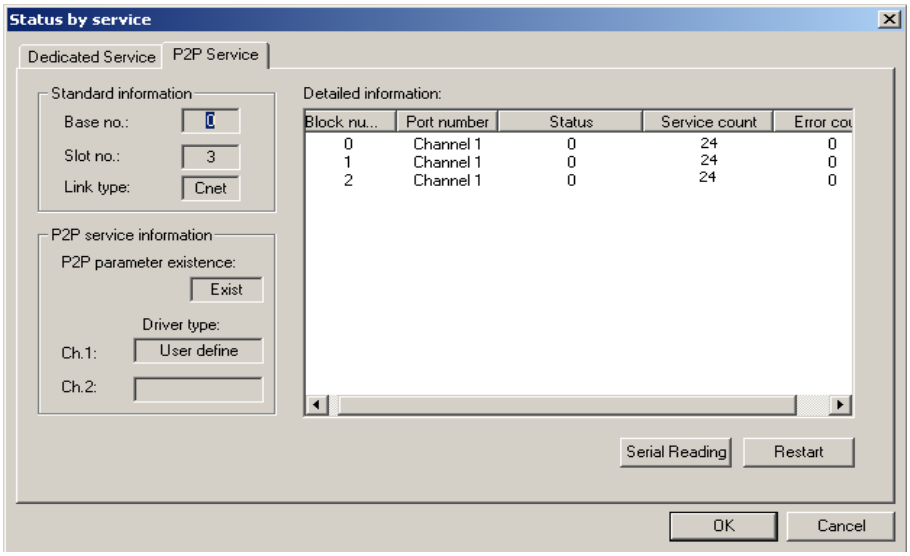


Figure 127 – Status for respective P2P communication services of user-defined communication

10. Diagnosis

10.1 Diagnosis function of SoftMaster-NM

SoftMaster-NM can check and diagnose the status of the system and the network. The Diagnosis function is composed of the following:

- CPU status
- Communication module information
- Status information for respective services
- Frame monitoring
- Log
- Loop Back test.

Following are the steps to perform diagnosis function of SoftMaster-NM.

Step	Action
1	Connect SoftMaster-NM to CPU module's loader port and from the **Online** menu, select **System Diagnosis** to display the window as shown below.

Step	Action

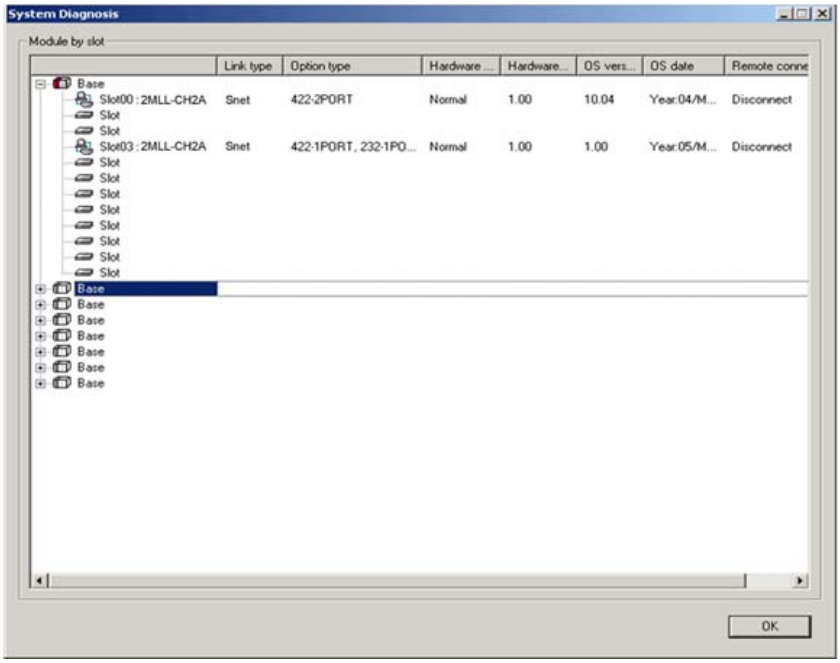


Figure 128 – System Diagnosis window

2 Select **IO Information Read** to display the slot numbers of all modules installed on the base.

3 Select the applicable module to use the diagnosis function for Snet I/F module installed on Base 0, Slot 3 and then right-click to make Diagnosis Function active on **System Diagnosis**, which is available for the applicable module as shown below.

Step	Action

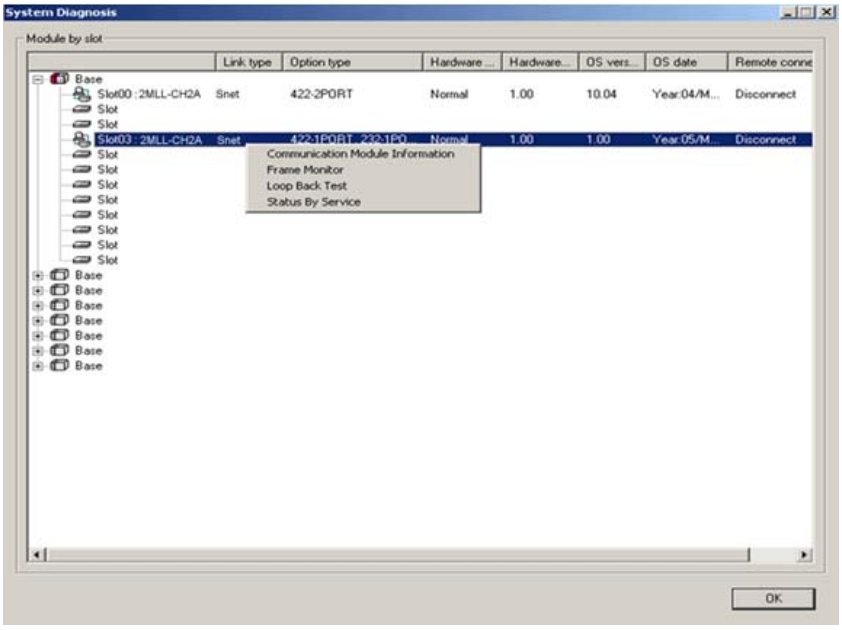


Figure 129 – System Diagnosis item window

10.2 Communication module information

In order to check the status information of the applicable communication module, from the **OnLine** menu, select **System Diagnosis** and then **Communication Module Information**.

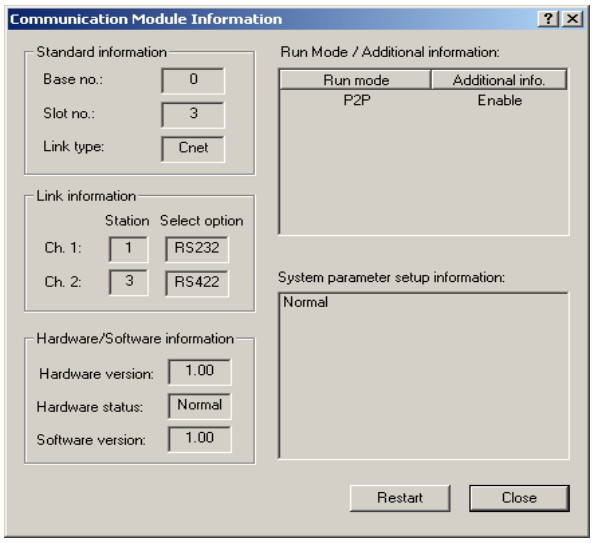


Figure 130 – Communication Module Information window

Table 74 – Communication Module Information window description

Item		Description
Basic information	Base number	Base position information of communication module being diagnosed.
	Slot number	Slot position information of communication module being diagnosed.
	Link type	Communication module type being diagnosed.
Link information	Station number	Applicable channel's station number used in dedicated service, P2P.
	Option mode	Checks if it is RS-232C or RS-422, then to display.

Item		Description
H/W & S/W information	H/W version	H/W version of communication module.
	H/W status	Checks if H/W status of communication module is normal.
	S/W version	Version of communication module OS.
Run mode /Additional information	Run mode	Displays service information being executed among dedicated service P2P.
	Additional information	Dedicated service: displays the driver type used. MLDP/Modbus available. P2P: displays Enable/Disenable. PADT: displays remote stage 1 or 2 connected with
Setting information of system parameters		Status of basic communication parameters displayed if downloaded. displays error information of basic communication parameters.

10.3 Status information for respective services

The following window shows the status information of respective services.

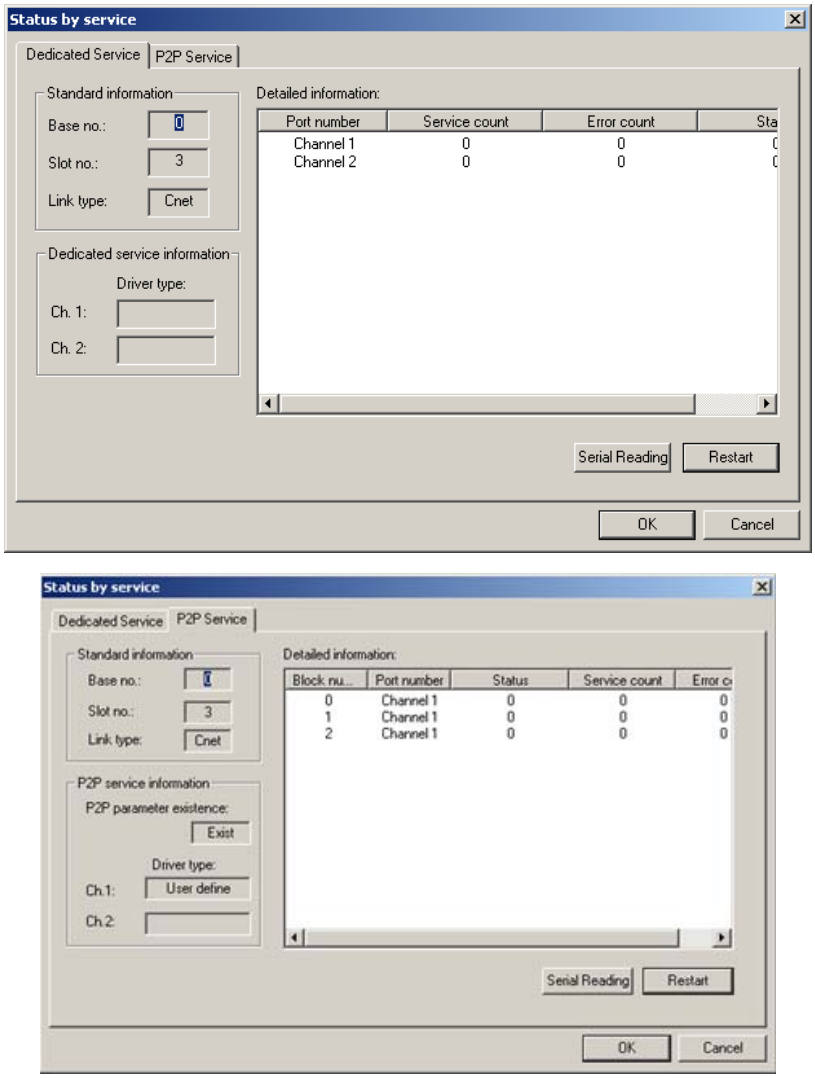


Figure 131 – Dedicated service window of status for respective services

The following table describes the dedicated service window.

Table 75 – Dedicated service window description

Classification	Item		Description
Dedicated service	Basic information	Base number	Base position of applicable module using dedicated service.
		Slot number	Slot position of applicable module using dedicated service.
		Link type	Communication module type being used.
	Dedicated service information		Displays driver type used for respective channels.
	Detailed information Window	Port number	Displays channel number
		Service count	Displays time of dedicated service communication.
		Error count	Displays time errors occured during dedicated service communication.
		Status	Displays status of dedicated service communication.
P2P service	Basic information	Base number	Base position of applicable module using dedicated service.
		Slot number	Slot position of applicable module using dedicated service.
		Link type	Communication module type being used.
	P2P service information	Existence of P2P parameters	Displays P2P parameters if downloaded.
		Driver type	P2P driver setting information for each port. MLDP/MODBUS/User-defined setting available.
	Detailed information	Block number	Up to 0~63 available. Blocks only if registered and operated will be displayed.
		Port number	Displays channel number

Classification	Item		Description
		Status	Displays service operation status information for each block.
		Service count	Displays each block's operation times since P2P service executed.
		Error count	Displays time errors occured during service.
Continuous Read/Restart	Continuous read		Checks P2P service status information for every 1s.
	Restart		Checks P2P service status information when selected.

10.4 Frame monitoring

This is used for checking the frames of Tx/Rx data between Snet I/F module and external communication device.

From the **Online** menu, select **System Diagnosis** and then **Frame Monitoring** to display the window as shown in Figure 132, on which frames for respective channels can be checked.

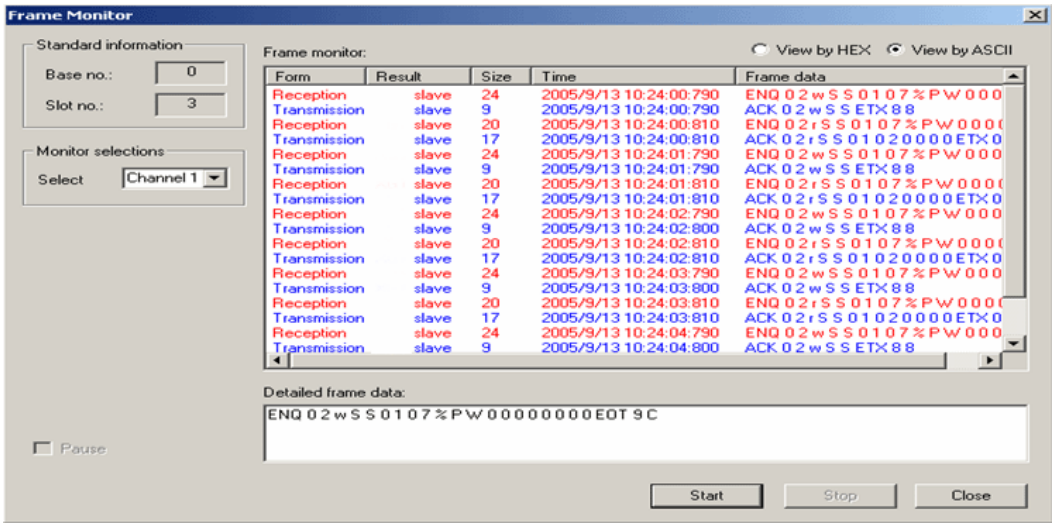


Figure 132 – Frame monitoring window

The following table describes the frame monitoring window.

Table 76 – Frame monitoring window description

Item		Description
Basic information	Base number	Base position information of communication module being diagnosed.
	Slot number	Slot position information of communication module being diagnosed.
Selection items for monitoring		Used for selecting the channel to monitor.

Item		Description
Frame monitor window	Type	Displays frames to transmit and receive.
	Processing result	Displays the processing result of frames • MLDP client • MLDP server • Modbus client • Modbus server • User defined • Unknown: frame unavailable to process
	Size	Length of the frame monitored
	Time	Displays the time when transmitted and received
	Frame data	Displays frame data transmitted and received
View in HEX		Displays frame data in HEX
View in ASCII		Displays frame data in ASCII
Start		Starts frame monitoring
Pause		Pause monitoring state
Stop		Stops monitoring state

10.5 Loop back test

This function is used for checking the normal operation of the self-communication port without connecting Snet I/F module to an external device.

Following are the steps to perform Loop Back Test operation.

Step	Action
1	From the **Online** menu, select **System Diagnosis** and then **LoopBack Test** to display the window as shown below.

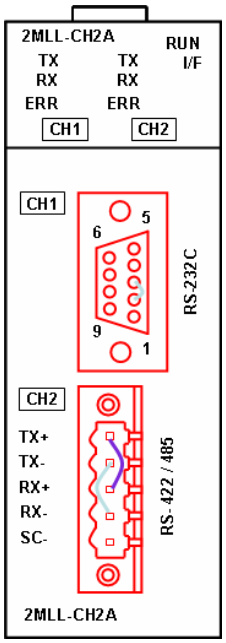


Figure 133 – Loop back test

2	You can test Channel 1 and Channel 2 of Snet, respectively.
3	Set the channel to be tested to the server. Download Snet basic setting to the applicable module and then reset it.
4	Remove P2P Link Enable.
5	Connect between communication ports Tx/Rx of respective channels.

Step	Action

Example: Connect pin number 2 with number 3 of the RS-232C communication port. Connect TX+ pin with RX+ pin, TX- pin with RX- pin of RS-422/485 communication port.

Execute LoopBack test of the system diagnosis.

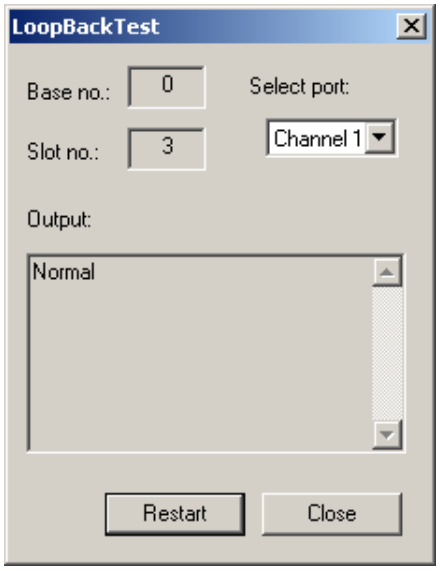


Figure 134 – Execution window of LoopBack test

11. Appendix

11.1 Definition of terms

Communication type

Simplex

In Simplex communication, the data or information is transferred in a single direction. Information cannot be transferred in the reverse direction.

Half-Duplex

In Half-Duplex communication, the data or information can be transferred in both the directions on a single cable but in different time intervals. The information cannot be transferred in both the directions simultaneously.

Full-Duplex

In Full-Duplex communication, the data or information can be simultaneously transferred and received in both directions with two cables.

Transmission type

Serial transmission

In Serial transmission, the data is transmitted bit by bit over a single cable. The speed of transmission is slow, but the cost of installation is low and the software implementation is simple.

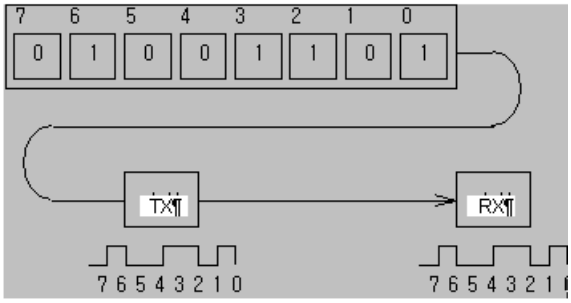


Figure 135 – Serial transmission

Some examples of the Serial communication interfaces are RS-232C, RS-422 and RS-485.

Parallel transmission

In Parallel transmission, data is transmitted in units of one byte (made up of eight bits), so that the speed of transmission is high and the accuracy of data is reliable. However, the longer the transmission distance, the higher is the cost of physical installation. Parallel transmission is used in printer and other devices.

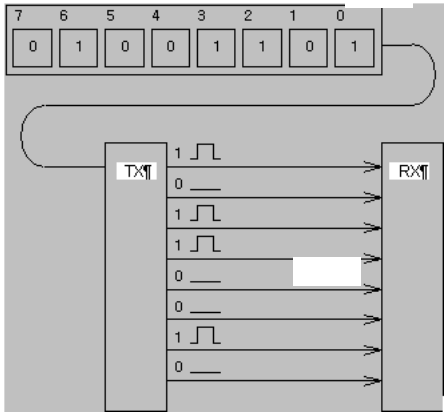


Figure 136 – Parallel transmission

Asynchronous communication

Asynchronous communication type transmits characters one by one asynchronously in serial transmission fashion. Here, synchronous signal (Clock, and so on) is not transmitted. Character code is transmitted with a start bit attached to the head of the first character, and it is finished with a stop bit attached to the tail.

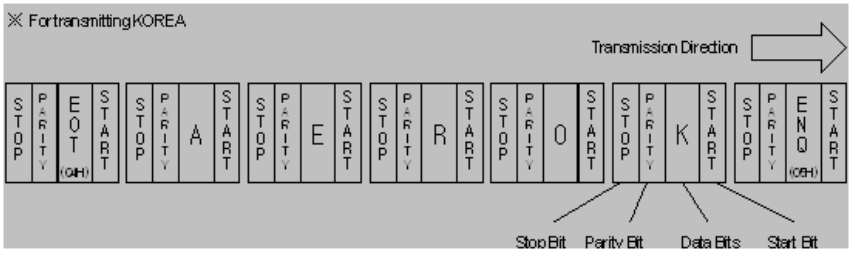


Figure 137 – Asynchronous communication

Protocol

Protocol is the set communication rules established in relation between the transmitting side and the receiving side, in order to send and accept information between two or more computers/terminals without error, effectively, and reliably. In general, this specifies call establishment, connection, structure of message exchange form, retransmission of error message, procedure of line inversion, and character synchronization between terminals, and so on.

BPS (Bits Per Second) and CPS (Characters Per Second)

BPS is a unit of transfer rate that represents how many bits are transferred per second. CPS is the number of the characters transferred per second. Generally, one character is 1Byte (8Bits), so CPS is the number of bytes that can be transferred per second.

Node

Node is a term that denotes the connected data nodes in the network tree structure. Generally, network is composed of a large number of nodes, and is also expressed as the station number.

Packet

Packet is a formatted block of information carried by a computer network. Most packets are split into Header, Data, Tail, and CRC bit. Different protocols use different conventions to identify the header, tail and formatting of the data. Networks that transmit data in the form of packets are called packet switched networks

Port

Port is part of the data processing device that sends or receives data to and from a remote control terminal in data communications, but in Snet serial communication is meant to be the RS-232C or RS-422 port

RS-232C

In telecommunications, **RS-232** is a standard for serial binary data interconnection between a Data terminal equipment (*DTE*) and a Data Circuit-terminating Equipment (*DCE*). This interface provides the link between a modem and a terminal (device), as well as the computer. In addition, it is used for achieving null modem configuration. It is the serial communication specification established by EIA according to the recommendations of the CCITT. The disadvantage is that the transfer length is short and that only 1:1 communication is available. The specifications that have overcome this disadvantage are RS-422 and RS-485.

RS-422/RS-485

RS-422/RS-485 are serial transmission specification, its transferring length is 1: N connection compared to RS-232C. The difference of these two specifications is that, RS-422 uses four signals of TX (+), TX (-), RX (+), and RX (-), while RS-485 has two signals of (+) and (-), where data is sent and received through the same signal line. Accordingly, RS-422 executes the full-duplex type of communication and RS-485 executes the half-duplex type of communication.

Half Duplex Communication

Two-way communication is available, however, simultaneous transmission and reception of data is not available in half duplex mode. This communication type is applied to RS-485. It is extensively used for multi-drop communication type, which communicates via one signal line with several stations. Typically, the stations transmit one by one not allowing simultaneous transmission. If there is simultaneous transmission then there can be data loss because of collision. The figure below shows an example of structure based on half duplex communication. Each station communicating with the terminal is linked with each other and can send or receive data via one line to execute communication with all stations.

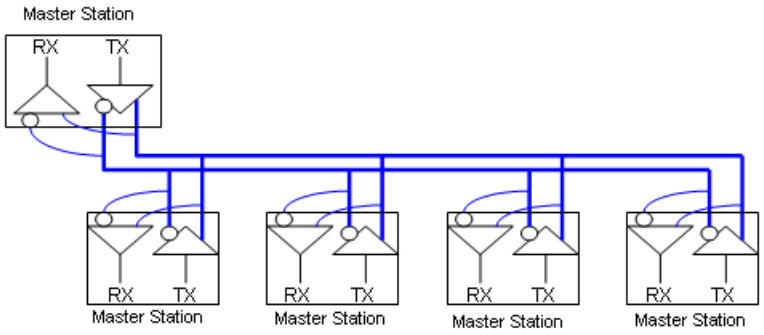


Figure 138 – Half duplex communication

Full duplex communication

A full duplex system allows communication in both directions and that too simultaneously. This communication type is applied to RS-232C and RS-422. Since, the transmission line is separated from the receiver line, simultaneous transmission and reception is available without data impact, which is called as full duplex communication. The figure shows an example of structure based on RS-422 for full duplex communication. Since, transmission terminal of the client station and reception terminals of the server stations are connected to one line, and transmission terminals of the server

stations are linked with reception terminal of the client station, the communication between server stations is unavailable with the restricted function of multi-server.

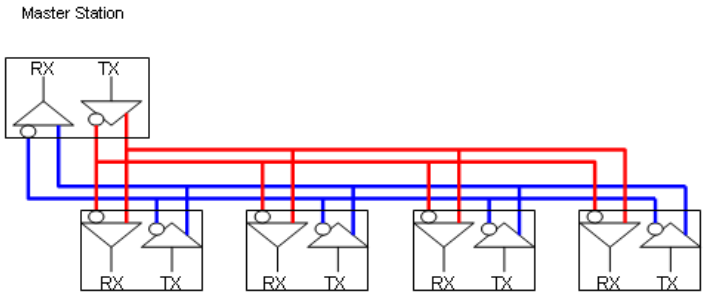


Figure 139 – Full duplex communication

BCC (Block Check Character)

As serial transmission may have signals distorted due to undesirable noise in transmission line, BCC is used for helping receiving side, verify if the received data is normal or distorted. To detect errors in signals, the received BCC is compared with the one calculated based on the received data.

SoftMaster function

This is the function to remotely perform programming, reading/writing user's program, debugging, and monitoring and so on without moving the physical connection of SoftMaster in the network system where PLC is connected to Snet I/F module. Especially, it is convenient to control a remote PLC through modem.

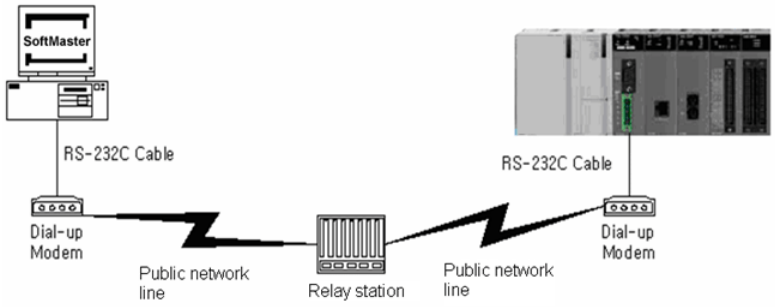


Figure 140 – SoftMaster: Programming software of MasterLogic-200 PLC for Windows

Frame

Frame is composed of transmitted and received data as in a specified form in data communication including additional information of segments [station number, instruction, and parameter by instruction], control characters [ENQ, ACK, EOT, ETX] for synchronization, parity for detecting error, and BCC. The structure of frame used for serial communication of Snet is as follows.

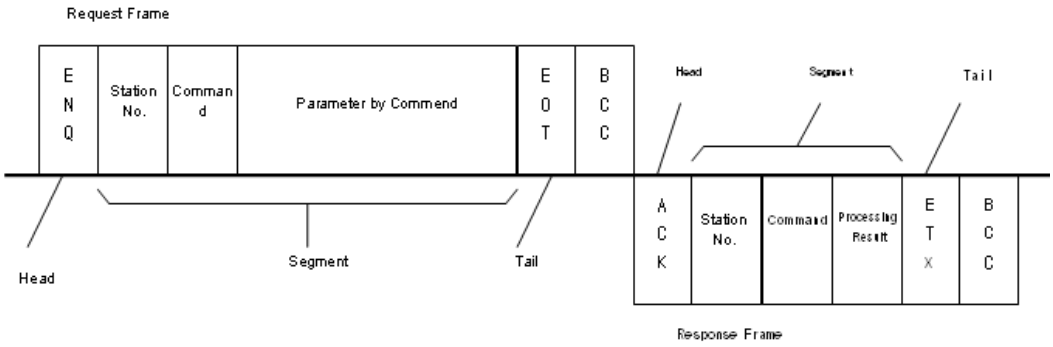


Figure 141 – Structure of general Tx/Rx frame

1. Head: ASCII value indicating frame start.
2. Tail: ASCII value indicating frame end.
3. BCC (Block Check Character)
   a) Check data for Tx/Rx frame
   b) Used for inspecting reliability of data with various methods as ADD, OR, Dedicated OR, MULTPLY, and so on.

Reset

This function is used for initializing the communication module with errors.

To execute Reset, from the **Online** menu, select **Reset** in **SoftMaster-NM,** which will restart PLC.

11.2 Flag list

Special relays list (F)

Table 77 – Special relays list (F)

Device 1	Device 2	Type	Variable	Function	Description
F0000		DWORD	_SYS_STATE	Mode and Status	PLC mode and run status displayed.
	F00000	BIT	_RUN	RUN	RUN status.
	F00001	BIT	_STOP	STOP	STOP status.
	F00002	BIT	_ERROR	ERROR	ERROR status.
	F00003	BIT	_DEBUG	DEBUG	DEBUG status.
	F00004	BIT	_LOCAL_CON	Local control	Local control mode.
	F00005	BIT	_MODBUS_CON	Modbus mode	Modbus control mode.
	F00006	BIT	_REMOTE_CON	Remote mode	Remote control mode.
	F00008	BIT	_RUN_EDIT_ST	Modification during run	Program being downloaded during run.
	F00009	BIT	_RUN_EDIT_CHK	Modification during run	Modification in progress during run.
	F0000A	BIT	_RUN_EDIT_DONE	Modification complete during run	Modification complete during run.
	F0000B	BIT	_RUN_EDIT_END	Modification complete during run	Modification complete during run.
	F0000C	BIT	_CMOD_KEY	Run Mode	Run Mode changed by key.
	F0000D	BIT	_CMOD_LPADT	Run Mode	Run Mode changed by local PADT.
	F0000E	BIT	_CMOD_RPADT	Run Mode	Run Mode changed by remote PADT.

Device 1	Device 2	Type	Variable	Function	Description
	F0000F	BIT	_CMOD_RLINK	Run Mode	Run Mode changed by remote communication module.
	F00010	BIT	_FORCE_IN	Compulsory input	Compulsory input status.
	F00011	BIT	_FORCE_OUT	Compulsory output	Compulsory output status.
	F00012	BIT	_SKIP_ON	I/O SKIP	I/O SKIP being executed.
	F00013	BIT	_EMASK_ON	Error mask	Error mask being executed.
	F00014	BIT	_MON_ON	Monitor	Monitor being executed.
	F00015	BIT	_USTOP_ON	STOP	Stopped by STOP function
	F00016	BIT	_ESTOP_ON	ESTOP	Stopped by ESTOP function.
	F00017	BIT	_CONPILE_MODE	compiling	Compile being performed.
	F00018	BIT	_INIT_RUN	Initializing	Initialization task being performed.
	F0001C	BIT	_PB1	Program code 1	Program code 1 selected.
	F0001D	BIT	_PB2	Program code 2	Program code 2 selected.
	F0001E	BIT	_CB1	Compile code 1	Compile code 1 selected.
	F0001F	BIT	_CB2	Compile code 2	Compile code 2 selected.

Device 1	Device 2	Type	Variable	Function	Description
F0002		DWORD	_CNF_ER	System error	Serious error in system reported.
	F00020	BIT	_CPU_ER	CPU error	CPU configuration error found.
	F00021	BIT	_IO_TYER	Module type error	Module type not identical.

Device 1	Device 2	Type	Variable	Function	Description
	F00022	BIT	_IO_DEER	Module installation error	Module displaced.
	F00023	BIT	_FUSE_ER	Fuse error	Fuse blown.
	F00024	BIT	_IO_RWER	Module I/O error	Module I/O error found.
	F00025	BIT	_IP_IFER	Module interface error	Error found in Special/ communication module interface.
	F00026	BIT	_ANNUM_ER	External equipment Error	Serious error detected in external equipment.
	F00028	BIT	_BPRM_ER	Basic parameter	Basic parameter abnormal.
	F00029	BIT	_IOPRM_ER	IO parameter	IO configuration parameter abnormal.
	F0002A	BIT	_SPPRM_ER	Special module parameter	Special module parameter abnormal.
	F0002B	BIT	_CPPRM_ER	Communication module parameter	Communication module parameter abnormal.
	F0002C	BIT	_PGM_ER	Program error	Program error found.
	F0002D	BIT	_CODE_ER	Code error	Program code error found.
	F0002E	BIT	_SWDT_ER	System watch-dog	System watch-dog active.
	F0002F	BIT	_BASE_POWER _ER	Power error	Base power abnormal.
	F00030	BIT	_WDT_ER	Scan watch-dog	Scan watch-dog active.
F0004		DWOR D	_CNF_WAR	System warning	Slight error in system reported.
	F00040	BIT	_RTC_ER	RTC error	RTC data abnormal.
	F00041	BIT	_DBCK_ER	Back-up error	Data back-up error found.
	F00042	BIT	_HBCK_ER	Restart error	Hot restart unavailable.
	F00043	BIT	_ABSD_ER	Run error stop	Stopped due to abnormal run.

Device 1	Device 2	Type	Variable	Function	Description
	F00044	BIT	_TASK_ER	Task impact	Task being impacted.
	F00045	BIT	_BAT_ER	Battery error	Battery status abnormal.
	F00046	BIT	_ANNUM_WAR	External equipment error	Slight error detected in external equipment.
	F00047	BIT	_LOG_FULL	Memory full	Log memory full
	F00048	BIT	_HS_WAR1	HS link 1	HS link – parameter 1 error
	F00049	BIT	_HS_WAR2	HS link 2	HS link – parameter 2 error
	F0004A	BIT	_HS_WAR3	HS link 3	HS link – parameter 3 error
	F0004B	BIT	_HS_WAR4	HS link 4	HS link – parameter 4 error
	F0004C	BIT	_HS_WAR5	HS link 5	HS link – parameter 5 error
	F0004D	BIT	_HS_WAR6	HS link 6	HS link – parameter 6 error
	F0004E	BIT	_HS_WAR7	HS link 7	HS link – parameter 7 error
	F0004F	BIT	_HS_WAR8	HS link 8	HS link – parameter 8 error
	F00050	BIT	_HS_WAR9	HS link 9	HS link – parameter 9 error
	F00051	BIT	_HS_WAR10	HS link 10	HS link – parameter 10 error
	F00052	BIT	_HS_WAR11	HS link 11	HS link – parameter11 error
	F00053	BIT	_HS_WAR12	HS link 12	HS link – parameter12 error
	F00054	BIT	_P2P_WAR1	P2P parameter 1	P2P – parameter1 error
	F00055	BIT	_P2P_WAR2	P2P parameter 2	P2P – parameter2 error
	F00056	BIT	_P2P_WAR3	P2P parameter 3	P2P – parameter3 error
	F00057	BIT	_P2P_WAR4	P2P parameter 4	P2P – parameter4 error
	F00058	BIT	_P2P_WAR5	P2P parameter 5	P2P – parameter5 error
	F00059	BIT	_P2P_WAR6	P2P parameter 6	P2P – parameter6 error

Device 1	Device 2	Type	Variable	Function	Description
	F0005A	BIT	_P2P_WAR7	P2P parameter 7	P2P – parameter7 error
	F0005B	BIT	_P2P_WAR8	P2P parameter 8	P2P – parameter8 error
	F0005C	BIT	_CONSTANT_ER	Fixed cycle error	Fixed cycle error
F0009		WORD	_USER_F	User contact point	Timer available for user.
	F00090	BIT	_T20MS	20ms	CLOCK of 20ms cycle.
	F00091	BIT	_T100MS	100ms	CLOCK of 100ms cycle.
	F00092	BIT	_T200MS	200ms	CLOCK of 200ms cycle.
	F00093	BIT	_T1S	1s	CLOCK of 1s cycle.
	F00094	BIT	_T2S	2s	CLOCK of 2s cycle.
	F00095	BIT	_T10S	10s	CLOCK of 10s cycle.
	F00096	BIT	_T20S	20s	CLOCK of 20s cycle.
	F00097	BIT	_T60S	60s	CLOCK of 60s cycle.
	F00099	BIT	_ON	Always ON	Bit always ON.
	F0009A	BIT	_OFF	Always OFF	Bit always OFF
	F0009B	BIT	_1ON	1 scan ON	Bit only ON for the first scan.
	F0009C	BIT	_1OFF	1 scan OFF	Bit only OFF for the first scan.
	F0009D	BIT	_STOG	Reverse	Every scan reversed.
F0010		WORD	_USER_CLK	User CLOCK	CLOCK available to set by user.
	F00100	BIT	_USR_CLK0	Repeat specific scan	ON/OFF CLOCK 0 for specific scan.
	F00101	BIT	_USR_CLK1	Repeat specific scan	ON/OFF CLOCK 1 for specific scan.
	F00102	BIT	_USR_CLK2	Repeat specific scan	ON/OFF CLOCK 2 for specific scan.

Device 1	Device 2	Type	Variable	Function	Description
	F00103	BIT	_USR_CLK3	Repeat specific scan	ON/OFF CLOCK 3 for specific scan.
	F00104	BIT	_USR_CLK4	Repeat specific scan	ON/OFF CLOCK 4 for specific scan.
	F00105	BIT	_USR_CLK5	Repeat specific scan	ON/OFF CLOCK 5 for specific scan.
	F00106	BIT	_USR_CLK6	Repeat specific scan	ON/OFF CLOCK 6 for specific scan.
	F00107	BIT	_USR_CLK7	Repeat specific scan	ON/OFF CLOCK 7 for specific scan.
F0011		WORD	_LOGIC_RESULT	Logic result	Logic result displayed.
	F00110	BIT	_LER	Calculation error	ON for 1 scan if calculation in error.
	F00111	BIT	_ZERO	Zero flag	ON if calculation result is 0.
	F00112	BIT	_CARRY	Carry flag	ON if Carry found during calculation.
	F00113	BIT	_ALL_OFF	Whole output OFF	ON if all output OFF
	F00115	BIT	_LER_LATCH	Calculation error latch	ON kept if calculation in error.
F0012		WORD	_CMP_RESULT	Compared result	Compared result displayed.
	F00120	BIT	_LT	LT flag	ON if ‘less than’.
	F00121	BIT	_LTE	LTE flag	ON if ‘less than or equal’.
	F00122	BIT	_EQU	EQU flag	ON if ‘equal’.
	F00123	BIT	_GT	GT flag	ON if ‘greater than’.
	F00124	BIT	_GTE	GTE flag	ON if ‘greater than or equal’.
	F00125	BIT	_NEQ	NEQ flag	ON if ‘not equal’
F0013		WORD	_AC_F_CNT	Inspected power cut	Number of inspected power-cuts displayed.

Device 1	Device 2	Type	Variable	Function	Description
F0014		WORD	_FALS_NUM	FALS No.	FALS No. displayed.
F0015		WORD	_PUTGET_ERR0	PUT/GET error 0	Main base PUT/GET error
F0016		WORD	_PUTGET_ERR1	PUT/GET error 1	Added base step 1 PUT/GET error
F0017		WORD	_PUTGET_ERR2	PUT/GET error 2	Added base step 2 PUT/GET error
F0018		WORD	_PUTGET_ERR3	PUT/GET error 3	Added base step 3 PUT/GET error
F0019		WORD	_PUTGET_ERR4	PUT/GET error 4	Added base step 4 PUT/GET error
F0020		WORD	_PUTGET_ERR5	PUT/GET error 5	Added base step 5 PUT/GET error
F0021		WORD	_PUTGET_ERR6	PUT/GET error 6	Added base step 6 PUT/GET error
F0022		WORD	_PUTGET_ERR7	PUT/GET error 7	Added base step 7 PUT/GET error
F0023		WORD	_PUTGET_NDR0	PUT/GET complete 0	Main base PUT / GET complete
F0024		WORD	_PUTGET_NDR1	PUT/GET complete 1	Added base step 1 PUT/GET complete
F0025		WORD	_PUTGET_NDR2	PUT/GET complete 2	Added base step 2 PUT/GET complete
F0026		WORD	_PUTGET_NDR3	PUT/GET complete 3	Added base step 3 PUT/GET complete
F0027		WORD	_PUTGET_NDR4	PUT/GET complete 4	Added base step 4 PUT/GET complete
F0028		WORD	_PUTGET_NDR5	PUT/GET complete 5	Added base step 5 PUT/GET complete
F0029		WORD	_PUTGET_NDR6	PUT/GET complete 6	Added base step 6 PUT/GET complete
F0030		WORD	_PUTGET_NDR7	PUT/GET	Added base step 7

Device 1	Device 2	Type	Variable	Function	Description
				complete 7	PUT/GET complete
F0044		WORD	_CPU_TYPE	CPU type	Information on CPU type displayed.
F0045		WORD	_CPU_VER	CPU version	CPU version displayed.
F0046		DWORD	_OS_VER	OS version	OS version displayed.
F0048		DWORD	_OS_DATE	OS date	OS released date displayed.
F0050		WORD	_SCAN_MAX	Max. scan time	Max. scan time displayed.
F0051		WORD	_SCAN_MIN	Min. scan time	Min. scan time displayed.
F0052		WORD	_SCAN_CUR	Present scan time	Present scan time displayed.
F0053		WORD	_MON_YEAR	Month/Year	PLC's time information (Month/Year)
F0054		WORD	_TIME_DAY	Hour/Date	PLC's time information (Hour/Date)
F0055		WORD	_SEC_MIN	Second/Minute	PLC's time information (Second/Minute)
F0056		WORD	_HUND_WK	100 years/Day	PLC's time information (100 years/Day)
F0057		WORD	_FPU_INFO	FPU calculation result	Floating decimal calculation result displayed.
	F00570	BIT	_FPU_LFLAG_I	Incorrect error latch	Latched if incorrect error.
	F00571	BIT	_FPU_LFLAG_U	Underflow latch	Latched if underflow found.
	F00572	BIT	_FPU_LFLAG_O	Overflow latch	Latched if overflow found.
	F00573	BIT	_FPU_LFLAG_Z	Latch divided by 0	Latched if divided by 0.
	F00574	BIT	_FPU_LFLAG_V	Invalid calculation latch	Latched if invalid calculation.
	F0057A	BIT	_FPU_FLAG_I	Incorrect error	Reported if incorrect error

Device 1	Device 2	Type	Variable	Function	Description
					found.
	F0057B	BIT	_FPU_FLAG_U	Underflow	Reported if underflow found.
	F0057C	BIT	_FPU_FLAG_O	Overflow	Reported if overflow found.
	F0057D	BIT	_FPU_FLAG_Z	Division by 0	Reported if divided by 0.
	F0057E	BIT	_FPU_FLAG_V	Invalid calculation	Reported if calculation invalid.
	F0057F	BIT	_FPU_FLAG_E	Irregular value input	Reported if irregular value input.
F0058		DWORD	_ERR_STEP	Error step	Error step saved.
F0060		DWORD	_REF_COUNT	Refresh	Increased when module refresh executed.
F0062		DWORD	_REF_OK_CNT	Refresh OK	Increased if module refresh normal.
F0064		DWORD	_REF_NG_CNT	Refresh NG	Increased if module refresh abnormal.
F0066		DWORD	_REF_LIM_CNT	Refresh LIMIT	Increased if module refreshes abnormal (TIME OUT).
F0068		DWORD	_REF_ERR_CNT	Refresh ERROR	Increased if module refresh abnormal.
F0070		DWORD	_MOD_RD_ERR_CNT	Module READ ERROR	Increased if module reads 1 word abnormally.
F0072		DWORD	_MOD_WR_ERR_CNT	Module WRITE ERROR	Increased if module writes 1 word abnormally.
F0074		DWORD	_CA_CNT	Block service	Increased if module's block data serviced.
F0076		DWORD	_CA_LIM_CNT	Block service LIMIT	Increased if module's block data service abnormal.
F0078		DWOR	_CA_ERR_CNT	Block service	Increased if module's block

Device 1	Device 2	Type	Variable	Function	Description
		D		ERROR	data service abnormal.
F0080		DWORD	_BUF_FULL_CNT	Buffer FULL	Increased if CPU's internal buffer is FULL.
F0082		DWORD	_PUT_CNT	PUT count	Increased if PUT executed.
F0084		DWORD	_GET_CNT	GET count	Increased if GET executed.
F0086		DWORD	_KEY	Present key	Local key's present status displayed.
F0088		DWORD	_KEY_PREV	Previous key	Local key's previous status displayed.
F0090		WORD	_IO_TYER_N	Discordant slot	Slot number with discordant module type displayed.
F0091		WORD	_IO_DEER_N	Displaced slot	Slot number with displaced module displayed.
F0092		WORD	_FUSE_ER_N	Fuse blown slot	Slot number with fuse blown displayed.
F0093		WORD	_IO_RWER_N	RW error slot	Slot number with module Read/Write error displayed.
F0094		WORD	_IP_IFER_N	IF error slot	Slot number with module interface error displayed.
F0096		WORD	_IO_TYER0	Module type 0 error	Main base module type error.
F0097		WORD	_IO_TYER1	Module type 1 error	Added base step 1 module type error.
F0098		WORD	_IO_TYER2	Module type 2 error	Added base step 2 module type errors.
F0099		WORD	_IO_TYER3	Module type 3 error	Added base step 3 module type errors.
F0100		WORD	_IO_TYER4	Module type 4 error	Added base step 4 module type errors.

Device 1	Device 2	Type	Variable	Function	Description
F0101		WORD	_IO_TYER5	Module type 5 error	Added base step 5 module type error.
F0102		WORD	_IO_TYER6	Module type 6 error	Added base step 6 module type error.
F0103		WORD	_IO_TYER7	Module type 7 error	Added base step 7 module type error.
F0104		WORD	_IO_DEER0	Module installation 0 error	Main base module installation error.
F0105		WORD	_IO_DEER1	Module installation 1 error	Added base step 1 module installation error.
F0106		WORD	_IO_DEER2	Module installation 2 error	Added base step 2 module installation error.
F0107		WORD	_IO_DEER3	Module installation 3 error	Added base step 3 module installation error.
F0108		WORD	_IO_DEER4	Module installation 4 error	Added base step 4 module installation error.
F0109		WORD	_IO_DEER5	Module installation 5 error	Added base step 5 module installation error.
F0110		WORD	_IO_DEER6	Module installation 6 error	Added base step 6 module installation error.
F0111		WORD	_IO_DEER7	Module installation 7 error	Added base step 7 module installation error.
F0112		WORD	_FUSE_ER0	Fuse blown 0 error	Main base Fuse blown error.
F0113		WORD	_FUSE_ER1	Fuse blown 1 error	Added base step 1 Fuse blown error.
F0114		WORD	_FUSE_ER2	Fuse blown 2 error	Added base step 2 Fuse blown error.
F0115		WORD	_FUSE_ER3	Fuse blown 3 error	Added base step 3 Fuse blown error.
F0116		WORD	_FUSE_ER4	Fuse blown 4 error	Added base step 4 Fuse blown error.

Device 1	Device 2	Type	Variable	Function	Description
F0117		WORD	_FUSE_ER5	Fuse blown 5 error	Added base step 5 Fuse blown error.
F0118		WORD	_FUSE_ER6	Fuse blown 6 error	Added base step 6 Fuse blown error.
F0119		WORD	_FUSE_ER7	Fuse blown 7 error	Added base step 7 Fuse blown error.
F0120		WORD	_IO_RWER0	Module RW 0 error	Main base module Read/Write error.
F0121		WORD	_IO_RWER1	Module RW 1 error	Added base step 1 module Read/Write error.
F0122		WORD	_IO_RWER2	Module RW 2 error	Added base step 2 module Read/Write error.
F0123		WORD	_IO_RWER3	Module RW 3 error	Added base step 3 module Read/Write error.
F0124		WORD	_IO_RWER4	Module RW 4 error	Added base step 4 module Read/Write error.
F0125		WORD	_IO_RWER5	Module RW 5 error	Added base step 5 module Read/Write error.
F0126		WORD	_IO_RWER6	Module RW 6 error	Added base step 6 module Read/Write error.
F0127		WORD	_IO_RWER7	Module RW 7 error	Added base step 7 module Read/Write error.
F0128		WORD	_IO_IFER_0	Module IF 0 error	Main base module interface error.
F0129		WORD	_IO_IFER_1	Module IF 1 error	Added base step 1 module interface error.
F0130		WORD	_IO_IFER_2	Module IF 2 error	Added base step 2 module interface error.
F0131		WORD	_IO_IFER_3	Module IF 3 error	Added base step 3 module interface error.
F0132		WORD	_IO_IFER_4	Module IF 4 error	Added base step 4 module interface error.

Device 1	Device 2	Type	Variable	Function	Description
F0133		WORD	_IO_IFER_5	Module IF 5 error	Added base step 5 module interface error.
F0134		WORD	_IO_IFER_6	Module IF 6 error	Added base step 6 module interface error.
F0135		WORD	_IO_IFER_7	Module IF 7 error	Added base step 7 module interface error.
F0136		WORD	_RTC_DATE	RTC date	RTC's present date.
F0137		WORD	_RTC_WEEK	RTC day	RTC's present day of the week.
F0138		DWORD	_RTC_TOD	RTC time	RTC's present time (ms unit).
F0140		DWORD	_AC_FAIL_CNT	Power-cut times	Power-cut times saved.
F0142		DWORD	_ERR_HIS_CNT	Errors found	Number of found errors saved.
F0144		DWORD	_MOD_HIS_CNT	Mode conversion times	Mode conversion times saved.
F0146		DWORD	_SYS_HIS_CNT	History updated times	System's history updated times saved.
F0148		DWORD	_LOG_ROTATE	Log rotate	Log rotate information saved.
F0150		WORD	_BASE_INFO0	Slot information 0	Main base slot information.
F0151		WORD	_BASE_INFO1	Slot information 1	Added base step 1 slot information.
F0152		WORD	_BASE_INFO2	Slot information 2	Added base step 2 slot information.
F0153		WORD	_BASE_INFO3	Slot information 3	Added base step 3 slot information.
F0154		WORD	_BASE_INFO4	Slot information 4	Added base step 4 slot information.
F0155		WORD	_BASE_INFO5	Slot information 5	Added base step 5 slot

Device 1	Device 2	Type	Variable	Function	Description
					information.
F0156		WORD	_BASE_INFO6	Slot information 6	Added base step 6 slot information.
F0157		WORD	_BASE_INFO7	Slot information 7	Added base step 7 slot information.
F0158		WORD	_RBANK_NUM	Used block number	Presently used block number.
F0159		WORD	_RBLOCK_STATE	Flash status	Flash block status.
F0160		DWORD	_RBLOCK_RD_FLAG	Flash Read	ON when reading Flash N block data.
F0162		DWORD	_RBLOCK_WR_FLAG	Flash Write	ON when writing Flash N block data.
F0164		DWORD	_RBLOCK_ER_FLAG	Flash error	Error found during Flash N block service.
F1024		WORD	_USER_WRITE_F	Available contact	Contact point available in program.
	F10240	BIT	_RTC_WR	RTC RW	Data Write and Read in RTC.
	F10241	BIT	_SCAN_WR	Scan WR	Scan value initialization.
	F10242	BIT	_CHK_ANC_ERR	Detect external serious error	Detection of serious error in external equipment requested.
	F10243	BIT	_CHK_ANC_WAR	Detect external slight error	Detection of slight error in external equipment requested.
F1025		WORD	_USER_STAUS_F	User contact point	User contact point.
	F10250	BIT	_INIT_DONE	Initialization complete	Initialization complete displayed.
F1026		WORD	_ANC_ERR	External serious error information	Serious error information in external equipment

Device 1	Device 2	Type	Variable	Function	Description
					displayed.
F1027		WORD	_ANC_WAR	External slight error information	Slight error information in external equipment displayed.
F1034		WORD	_MON_YEAR_DT	Month/Year	Time information data (Month/Year).
F1035		WORD	_TIME_DAY_DT	Hour/Date	Time information data (Hour/Date).
F1036		WORD	_SEC_MIN_DT	Second/Minute	Time information data (Second/Minute).
F1037		WORD	_HUND_WK_DT	100 years/Day	Time information data (100 years/Day).

Communication relays list (L)

- Special register for data link
- HS link number 1 ~ 12

Table 78 – List of communication flags based on HS link number

No.	Keyword	Type	Detail	Description
L000000	_HS1_RLINK	Bit	HS link parameter number 1's, all stations normally operate	Displays all stations normally operated as specified in HS link parameter, which will be ON if a) There is no RUN mode error in all stations specified in parameter. b) All data block is in normal communication as specified in parameter. c) The parameter specified in each station itself is in normal communication. Run_link will be kept ON. If once ON, until stopped by link disenable.
L000001	_HS1_LTRBL	Bit	After _HS1RLINK is ON, abnormal status displays	This flag will be ON if the station specified in parameter and the data block's communication status are as described below with _HSmRLINK flag ON, a) When the station specified in parameter is not in RUN mode. b) When the station specified in parameter is in error. c) When data block's communication status specified in parameter is unstable. The link trouble will be ON if one of the conditions 1, 2 and 3, above occurs. And if such a condition is back to normal, it will be OFF.

No.	Keyword	Type	Detail	Description
L000020 ~ L00009F	_HS1_STATE[k] (k=000~127)	Bit Array	HS link parameter number 1, block number k's general status displays	Displays the general status of the communication information for the specified parameter's respective data blocks. HS1STATE[k]=HS1MOD[k]&_HS1TRX[k]&(~_HSmERR[k])
L000100 ~ L00017F	_HS1_MOD[k] (k=000~127)	Bit Array	HS link parameter number 1, block number k station's run operation mode	Displays the operation mode of the station specified in parameter's data block k.
L000180 ~ L00025F	_HS1_TRX[k] (k=000~127)	Bit Array	Normal communication displays with HS link parameter number 1, block number k station	Displays the communication status of parameter's data block k to check if normal is as specified.
L000260 ~ L00033F	_HS1_ERR[k] (k=000~127)	Bit Array	HS link parameter number 1, Block number k station's run error mode	Displays the communication status of parameter's data block k to check for any error.
L000340 ~ L00041F	_HS1_SETBLOCK [k=000~127]	Bit Array	HS link parameter number 1, Block number k setting displays	Displays the setting status of parameter's data block k.

K as a block number is displayed through eight words by 16 for 1 word for the information of 128 blocks from 000 to 127. For example, block information of 16~31, 32~47, 48~63, 64~79, 80~95, 96~111, 112~127 will be displayed in L00011, L00012,

L00013, L00014, L00015, L00016, L00017 from block 0 to block 15 for mode information (_HS1MOD).

Table 79 – Relationship between HS link and L device area

HS link number	L area address	Remarks
2	L000500~L0009 9F	Compare with HS link of 1, other HS link station number's flag address will be simply calculated as follows: ∗Calculation formula: L area address = L000000 + 500 x (HS link number – 1) In order to use HS link flag for program and monitoring, use the flag map registered in SoftMaster for convenient application.
3	L001000~L0014 9F	
4	L001500~L0019 9F	
5	L002000~L0024 9F	
6	L002500~L0029 9F	
7	L003000~L0034 9F	
8	L003500~L0039 9F	
9	L004000~L0044 9F	
10	L004500~L0049 9F	
11	L005000~L0054 9F	

P2P parameters: 1~8, P2P block: 0~63.

Table 80 – P2P parameters

Number	Keyword	Type	Detail	Description
L006250	_P2P1_NDR00	Bit	P2P parameter number 1, block number 00 service completes normally	P2P parameter number 1, block number 0 service completes normally
L006251	_P2P1_ERR00	Bit	P2P parameter number 1, block number 00 service completes abnormally	P2P parameter number 1, block number 0 service completes abnormally
L00626	_P2P1_STATUS00	Word	Error code if P2P parameter number 1, block number 00 service completes abnormally	Error code displayed if P2P parameter number 1, block number 0 service completes abnormally
L00627	_P2P1_SVCCNT00	DWord	P2P parameter number 1, block number 00 service, normal execution time	P2P parameter number 1, block number 0 service normal execution time displays
L00629	_P2P1_ERRCNT00	DWord	P2P parameter number 1, block number 00 service abnormal execution time	P2P parameter number 1, block number 0 service abnormal execution time displays
L006310	_P2P1_NDR01	Bit	P2P parameter number 1, block number 01 service completes normally	P2P parameter number 1, block number 1 service completes normally
L006311	_P2P1_ERR01	Bit	P2P parameter number 1, block number 01 service completes abnormally	P2P parameter number 1, block number 1 service completes abnormally
L00632	_P2P1_STATUS01	Word	Error code if P2P parameter number 1, block number 01 service completes abnormally	Error code displayed if P2P parameter number 1, block number 1 service completes abnormally

Number	Keyword	Type	Detail	Description
L00633	_P2P1_SVCCNT01	DWord	P2P parameter number 1, block number 01 service normal execution time	P2P parameter number 1, block number 1 service normal execution time displays
L00635	_P2P1_ERRCNT01	DWord	P2P parameter number 1, block number 01 service abnormal execution time	P2P parameter number 1, block number 1 service abnormal execution time displays

Link devices list (N)

- These devices are used for saving the size and the details of P2P number and block number.
- P2P number : 1 ~ 8, P2P block: 0 ~ 63

Table 81 – Link devices list

No.	Keyword	Type	Detail	Description
N00000	_P1B00SN	Word	P2P parameter number 1, block number 00's corresponding station number	P2P parameter number 1, block number 00's corresponding station number saved. Use P2PSN instruction to modify during Run if corresponding station number is used in SoftMaster-NM.
N00001 ~ N00004	_P1B00RD1	Device structure	P2P parameter number 1, block number 00 area device 1 to read	P2P parameter number 1, block number 00 area device 1 to read saved
N00005	_P1B00RS1	Word	P2P parameter number 1, block number 00 area size 1 to read	P2P parameter number 1, block number 00 area size 1 to read saved
N00006 ~ N00009	_P1B00RD2	Device structure	P2P parameter number 1, block number 00 area device 2 to read	P2P parameter number 1, block number 00 area device 2 to read saved
N00010	_P1B00RS2	Word	P2P parameter number 1, block number 00 area size 2 to read	P2P parameter number 1, block number 00 area size 2 to read saved

No.	Keyword	Type	Detail	Description
N00011 ~ N00014	_P1B00RD3	Device structure	P2P parameter number 1, block number 00 area device 3 to read	P2P parameter number 1, block number 00 area device 3 to read saved
N00015	_P1B00RS3	Word	P2P parameter number 1, block number 00 area size 3 to read	P2P parameter number 1, block number 00 area size 3 to read saved
N00016 ~ N00019	_P1B00RD4	Device structure	P2P parameter number 1, block number 00 area device 4 to read	P2P parameter number 1, block number 00 area device 4 to read saved
N00020	_P1B00RS4	Word	P2P parameter number 1, block number 00 area size 4 to read	P2P parameter number 1, block number 00 area size 4 to read saved
N00021 ~ N00024	_P1B00WD1	Device structure	P2P parameter number 1, block number 00 saved area device 1	P2P parameter number 1, block number 00 area device 1 saved
N00025	_P1B00WS1	Word	P2P parameter number 1, block number 00 saved area size 1	P2P parameter number 1, block number 00 area size 1 saved
N00026 ~ N00029	_P1B00WD2	Device structure	P2P parameter number 1, block number 00 saved area device 2	P2P parameter number 1, block number 00 area device 2 saved
N00030	_P1B00WS2	Word	P2P parameter number 1, block number 00 saved area size 2	P2P parameter number 1, block number 00 area size 2 saved
N00031 ~ N00034	_P1B00WD3	Device structure	P2P parameter number 1, block number 00 saved area device 3	P2P parameter number 1, block number 00 area device 3 saved
N00035	_P1B00WS3	Word	P2P parameter number 1, block number 00 saved area size 3	P2P parameter number 1, block number 00 area size 3 saved
N00036 ~ N00039	_P1B00WD4	Device structure	P2P parameter number 1, block number 00 saved area device 4	P2P parameter number 1, block number 00 area device 4 saved

No.	Keyword	Type	Detail	Description
N00040	_P1B00WS4	Word	P2P parameter number 1, block number 00 saved area size 4	P2P parameter number 1, block number 00 area size 4 saved
N00041	_P1B01SN	Word	P2P parameter number 1, block number 01 corresponding station number	P2P parameter number 1, block number 01's corresponding station number saved. Use P2PSN instruction to modify during Run if corresponding station number is used in SoftMaster-NM.
N00042 ~ N00045	_P1B01RD1	Device structure	P2P parameter number 1, block number 01 area device 1 to read	P2P parameter number 1, block number 01 device area 1 to read saved
N00046	_P1B01RS1	Word	P2P parameter number 1, block number 01 area size 1 to read	P2P parameter number 1, block number 01 area size 1 to read saved
N00047 ~ N00050	_P1B01RD2	Device structure	P2P parameter number 1, block number 01 area device 2 to read	P2P parameter number 1, block number 01 area device 1 to read saved
N00051	_P1B01RS2	Word	P2P parameter number 1, block number 01 area size 2 to read	P2P parameter number 1, block number 01 area size 2 to read saved
N00052 ~ N00055	_P1B01RD3	Device structure	P2P parameter number 1, block number 01 area device 3 to read	P2P parameter number 1, block number 01 area device 3 to read saved
N00056	_P1B01RS3	Word	P2P parameter number 1, block number 01 area size 3 to read	P2P parameter number 1, block number 01 area size 3 to read saved
N00057 ~ N00060	_P1B01RD4	Device structure	P2P parameter number 1, block number 01 area device 4 to read	P2P parameter number 1, block number 01 area device 4 to read saved
N00061	_P1B01RS4	Word	P2P parameter number 1, block number 01 area size 4 to read	P2P parameter number 1, block number 01 area size 4 to read saved
N00062 ~ N00065	_P1B01WD1	Device structure	P2P parameter number 1, block number 01 saved area device 1	P2P parameter number 1, block number 01 area device 1 saved

No.	Keyword	Type	Detail	Description
N00066	_P1B01 WS1	Word	P2P parameter number 1, block number 01 saved area size 1	P2P parameter number 1, block number 01 area size 1 saved
N00067 ~ N00070	_P1B01 WD2	Device structure	P2P parameter number 1, block number 01 saved area device 2	P2P parameter number 1, block number 01 area device 2 saved
N00071	_P1B01 WS2	Word	P2P parameter number 1, block number 01 saved area size 2	P2P parameter number 1, block number 01 area size 2 saved
N00072 ~ N00075	_P1B01 WD3	Device structure	P2P parameter number 1, block number 01 saved area device 3	P2P parameter number 1, block number 01 area device 3 saved
N00076	_P1B01 WS3	Word	P2P parameter number 1, block number 01 saved area size 3	P2P parameter number 1, block number 01 area size 3 saved
N00077 ~ N00080	_P1B01 WD4	Device structure	P2P parameter number 1, block number 01 saved area device 4	P2P parameter number 1, block number 01 area device 4 saved
N00081	_P1B01 WS4	Word	P2P parameter number 1, block number 01 saved area size4	P2P parameter number 1, block number 01 area size 4 saved

TIP

If P2P parameters are to be specified with SoftMaster-NM that are used for N area, the setting will be carried out automatically. The modification during Run is also available by P2P dedicated instruction.

Since the addresses of N area available and are classified according to

- P2P parameter setting number
- Block index number, the area that is not used for P2P service can be used as an internal device.

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