YASKAWA Electric Corporation

Machine Controller MP2000 Series

Serial Driver

Supported version TOP Design Studio V1.0 or higher

CONTENTS

We would like to thank our customers for using M2I's "Touch Operation Panel (M2I TOP) Series". Read this manual and familiarize yourself with the connection method and procedures of the "TOP and external device".

1. System configuration

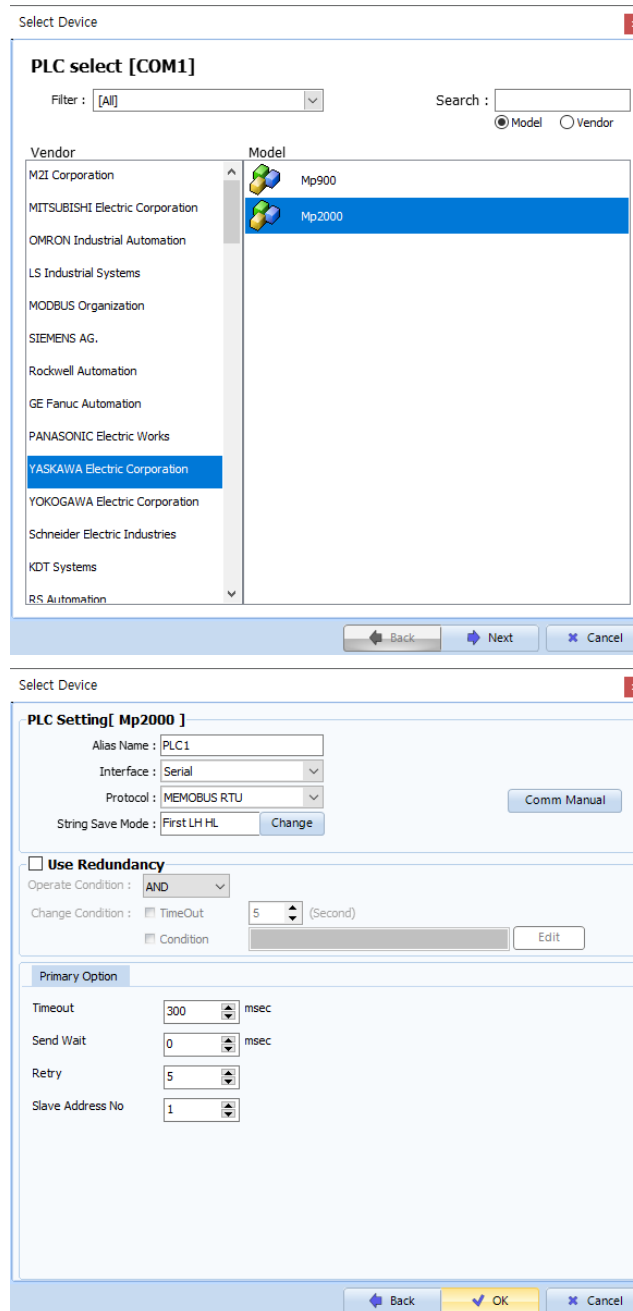The system configuration of TOP and "YASKAWA Electric Corporation – MP2000 Series Serial" is as follows.

■ MEMOBUS

Series	CPU	Link I/F	Communication method	System setting	Cable
MP2000	MP2300 MP2200 MP2310 MP2300S	Serial port on "218IF-01"	RS-232C	3. TOP communication setting 4. External device setting	5.1. Cable table 1
		Serial port on "218IF-02"	RS-232C		
		Serial port on "260IF-01"	RS-232C		
		Serial port on "261IF-01"	RS-232C		
		Port on "217IF-01"	RS-232C		
		RS422/485 on "217IF-01"	RS-422 (4 wire)	3. TOP communication setting 4. External device setting	5.2. Cable table 2
			RS-485 (2 wire)		

■ MP Extension

Series	CPU	Link I/F	Communication method	System setting	Cable
MP2000	MP2300 MP2200 MP2310 MP2300S	Serial port on 218IF-01	RS-232C	3. TOP communication setting 4. External device setting	5.1. Cable table 1
		Serial port on 218IF-02	RS-232C		
		Serial port on 260IF-01	RS-232C		
		Serial port on 261IF-01	RS-232C		
		Serial Port on 217IF-01	RS-232C		

2. External device selection

■ Select a TOP model and a port, and then select an external device.

Settings		Contents
TOP	Model	Check the TOP display and process to select the touch model.
External device	Vendor	Select the vendor of the external device to be connected to TOP. Please select "YASKAWA Electric Corporation".
	PLC	Select an external device to connect to TOP.

Model	Interface	Protocol
Mp2000	Serial	Set Users

Supported Protocol		
MEMOBUS ASCII	MEMOBUS RTU	MP Extension

Please check the system configuration in Chapter 1 to see if the external device you want to connect is a model whose system can be configured.
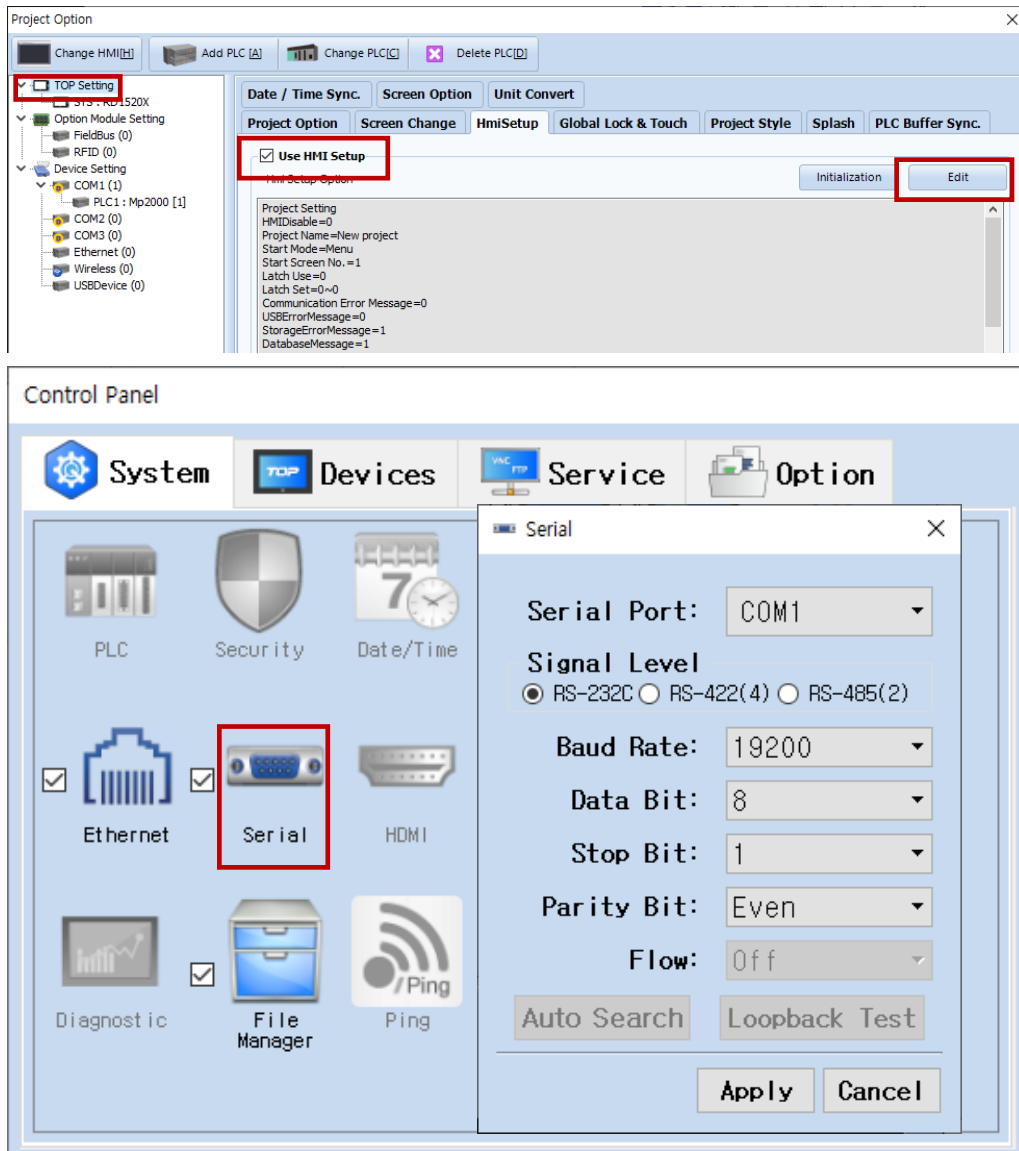
3. TOP communication setting

The communication can be set in TOP Design Studio or TOP main menu. The communication should be set in the same way as that of the external device.

3.1 Communication setting in TOP Design Studio

(1) Communication interface setting

■ [Project > Project properties > TOP settings] → [Project option > Check "Use HMI settings" > Edit > Serial]
  – Set the TOP communication interface in TOP Design Studio.

Items	TOP			External device	Remarks
Signal Level (port)	RS-232C	RS-422	RS-485	RS-232C RS-422/485	
Baud Rate	19200				
Data Bit	8				
Stop Bit	1				
Parity Bit	Even				

* The above settings are examples recommended by the company.

Items	Description
Signal Level	Select the serial communication method between the TOP and an external device.
Baud Rate	Select the serial communication speed between the TOP and an external device.
Data Bit	Select the serial communication data bit between the TOP and an external device.
Stop Bit	Select the serial communication stop bit between the TOP and an external device.
Parity Bit	Select the serial communication parity bit check method between the TOP and an external device.

(2) Communication option setting

■ [Project > Project properties > PLC settings > COM > "PLC1 : Mp2000"]

– Set the options of the communication driver of MP2000 Series Serial in TOP Design Studio.

Items	Settings	Remarks
Interface	Select "Serial".	Refer to "2. External device selection".
Protocol	Select the serial communication protocol between the TOP and an external device.	
Communication option items when selecting MEMOBUS		
TimeOut (ms)	Set the time for the TOP to wait for a response from an external device.	
SendWait (ms)	Set the waiting time between TOP's receiving a response from an external device and sending the next command request.	
Slave Address No	Enter the prefix number of an external device (Slave).	
Communication option items when selecting MP Extension		
TimeOut (ms)	Set the time for the TOP to wait for a response from an external device.	
SendWait (ms)	Set the waiting time between TOP's receiving a response from an external device and sending the next command request.	
Station No	Enter the prefix of an external device.	

3.2. Communication setting in TOP

* This is a setting method when "Use HMI Setup" in the setting items in "3.1 TOP Design Studio" is not checked.

■ Touch the top of the TOP screen and drag it down. Touch "EXIT" in the pop-up window to go to the main screen.

(1) Communication interface setting

■ [Main screen > Control panel > Serial]

Items	TOP			External device	Remarks
Signal Level (port)	RS-232C	RS-422	RS-485	RS-232C RS-422/485	
Baud Rate	19200				
Data Bit	8				
Stop Bit	1				
Parity Bit	Even				

* The above settings are setting examples recommended by the company.

Items	Description
Signal Level	Select the serial communication method between the TOP and an external device.
Baud Rate	Select the serial communication speed between the TOP and an external device.
Data Bit	Select the serial communication data bit between the TOP and an external device.
Stop Bit	Select the serial communication stop bit between the TOP and an external device.
Parity Bit	Select the serial communication parity bit check method between the TOP and an external device.

(2) Communication option setting

■ [Main screen > Control panel > PLC]

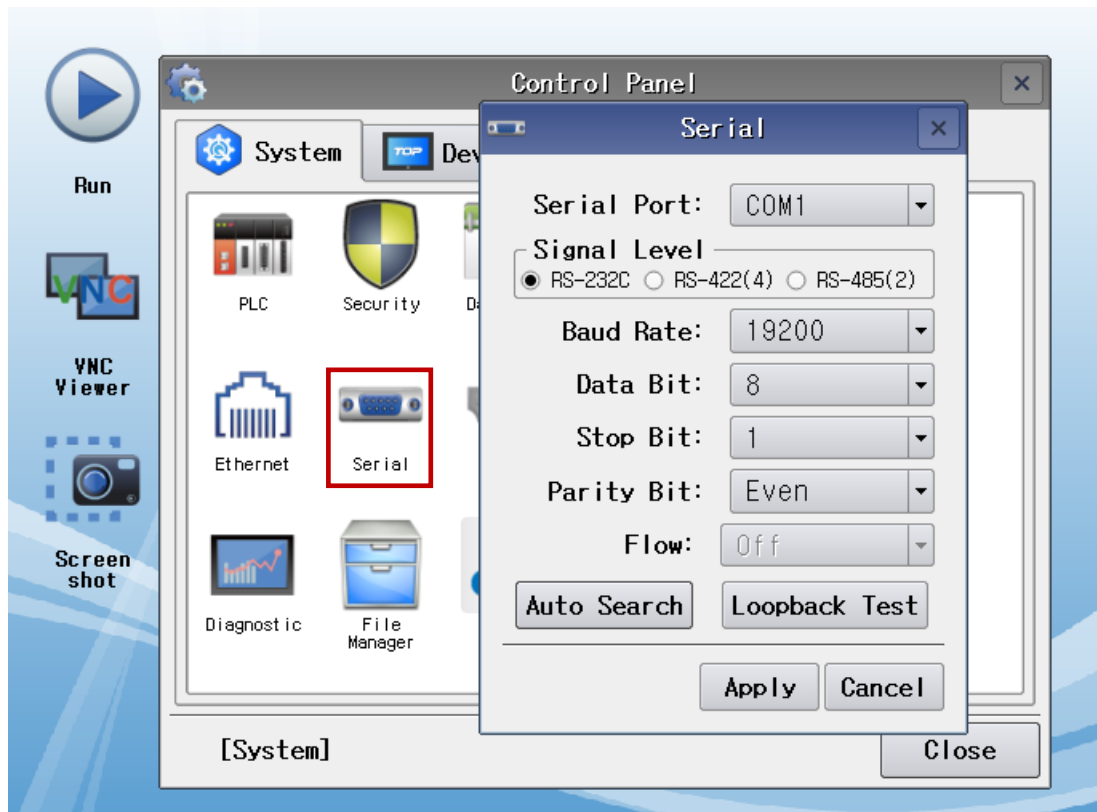| Items	Settings	Remarks
Interface	Select "Serial".	Refer to "2. External device selection".
Protocol	Select the serial communication protocol between the TOP and an external device.	
Communication option items when selecting MEMOBUS		
TimeOut (ms)	Set the time for the TOP to wait for a response from an external device.	
SendWait (ms)	Set the waiting time between TOP's receiving a response from an external device and sending the next command request.	
Slave Address No	Enter the prefix number of an external device (Slave).	
Communication option items when selecting MP Extension		
TimeOut (ms)	Set the time for the TOP to wait for a response from an external device.	
SendWait (ms)	Set the waiting time between TOP's receiving a response from an external device and sending the next command request.	
Station No	Enter the prefix of an external device.	

3.3 Communication diagnostics

■ Check the interface setting status between the TOP and an external device.

- Touch the top of the TOP screen and <u>drag</u> it down. Touch "EXIT" in the pop-up window to go to the main screen.

- Check if the COM port settings you want to use in [Control Panel > Serial] are the same as those of the external device.

■ Diagnosis of whether the port communication is normal or not

- Touch "Communication diagnostics" in [Control Panel > PLC].

- The Diagnostics dialog box pops up on the screen and determines the diagnostic status.

OK	Communication setting normal
Time Out Error	Communication setting abnormal
	- Check the cable, TOP, and external device setting status. **(Reference: Communication diagnostics sheet)**

■ Communication diagnostics sheet

- If there is a problem with the communication connection with an external terminal, please check the settings in the sheet below.

Items	Contents		Check		Remarks
System configuration	How to connect the system		OK	NG	1. System configuration
	Connection cable name		OK	NG	
TOP	Version information		OK	NG	2. External device selection 3. Communication setting
	Port in use		OK	NG	
	Driver name		OK	NG	
	Other detailed settings		OK	NG	
	Relative prefix	Project setting	OK	NG	
		Communication diagnostics	OK	NG	
	Serial Parameter	Transmission Speed	OK	NG	
		Data Bit	OK	NG	
		Stop Bit	OK	NG	
		Parity Bit	OK	NG	
External device	CPU name		OK	NG	4. External device setting
	Communication port name (module name)		OK	NG	
	Protocol (mode)		OK	NG	
	Setup Prefix		OK	NG	
	Other detailed settings		OK	NG	
	Serial Parameter	Transmission Speed	OK	NG	
		Data Bit	OK	NG	
		Stop Bit	OK	NG	
		Parity Bit	OK	NG	
	Check address range		OK	NG	6. Supported addresses (For details, please refer to the PLC vendor's manual.)

4. External device setting

Set as below using "MP Series" Ladder Software "MPE720". For more detailed setting method than that described in this example, refer to the PLC user manual.

⚠ – In case of setting "Automatically Reception" of "Procedure Ⅱ" to "Enable" in the setting procedure below, it is possible to connect without "Procedure Ⅲ".

– The example of "Procedure Ⅲ: Ladder Program" is an example of communication setting for one port on the external device side. In case of simultaneous communication of multiple ports, a separate ladder program is required. Please contact the manufactorer for details.

■ **Operation Ⅰ** : "**PC and PLC connection method**" : set communications as follows(Operation Ⅱ, Operation Ⅲ), but before connect PC and PLC.

1. Run "Communication Manager" program.
(Path : Start → Program → "YE_Applications" → "Communication Manager")
2. Run "Logical Port Setting" to set the port type and details.
(Path : File → Setting...)
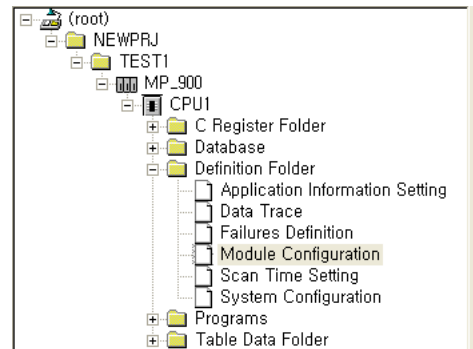**3.** After PC and PLC are connected, save, and follow below operation.

■ **Operation Ⅱ** : "**MPE720" Create Project** : (root) > [Group Folder] > [Order Folder] > [Controller Folder] Register

1. To register the device you want to use in "MPE720", follow "[Group Folder] > [Order Folder] > [Controller Folder]" path.

(Caution) In the "MPE720" left project window, Right–Click, and follow the parent path through the [New] entry.

2. Register the Controller Type for the device you wish to use in the Controller Configuration window, which appears when registering a new [Controller Folder]

3. Double-click the newly registered [Controller Folder] to bring up the [Log on to the controller] window and enter "User Name" and "Password" to form project folders as shown on the left.

```
(root)
  NEWPRJ
    TEST1
      MP_900
        CPU1
          C Register Folder
          Database
          Definition Folder
            Application Information Setting
            Data Trace
            Failures Definition
            Module Configuration
            Scan Time Setting
            System Configuration
          Programs
          Table Data Folder
```

■ **Operation Ⅲ** : "**Communication Setting**" : [Engineering Manager] – [Module Configuration] window

4. Double-click [Definition Folder] – [Module Configuration] to display the [Engineering Manager] – [Module Configuration] window.
5. Register the [Module Type] of the corresponding [Rack] – [Slot] position in the [Module Configuration] window.
6. Double-click the corresponding [Slot] area to display the setting window. Matters to be set are as follows.

Items	Settings	Remarks
Transmission Protocol	MEMOBUS	**Fixed**
Master/Slave	Slave	**Fixed**
Device Address	1	Set Users
Serial I/F	RS-232	User setting *Note 1)
Transmission Mode	RTU	User setting *Note 2)
Data Length	8Bit	Set Users
Parity	even	Set Users
Stop Bit	1Stop	Set Users
Baud Rate	19.2K	Set Users
Sending	Disable	Set Users
Automatically Reception	Disable	User setting *Note 3)
Slave I/F Register Settings	——	Set Users

CIR#01 | CIR#02 | CIR#03

Transmission Protocol MEMOBUS
Master/Slave Slave
Device Address 1 (Master=0,Slave=1-63)
Serial I/F RS-232
Transmission Mode RTU
Data Length 8Bit
Parity even
Stop Bit 1Stop
Baud Rate 19.2K
Sending ● Disable
         ○ Enable 0 (1 - 100ms)
Automatically Reception ● Disable ○ Enable

Slave I/F Register Settings   Head REG   WD Size
Readout of Input Relay   IW0000   5120
Readout of Input Register   IW0000   5120
Readout / Write-in of Coil   MW00000   32768
Readout / Write-in of Hold Register MW00000 32768
Write - in width of Coil/Hold Register LO: MW00000
                                        HI: MW32767

*Note 1) Select the communication method of the external device (RS-232C/RS-422/RS-485).
*Note 2) Select the communication mode (ASCII/RTU) you want to use.
*Note 3) When setting Disable, you must register a separate Ladder Software. If enabled, a separate Ladder Software is not required. However, the communication speed may be slow.
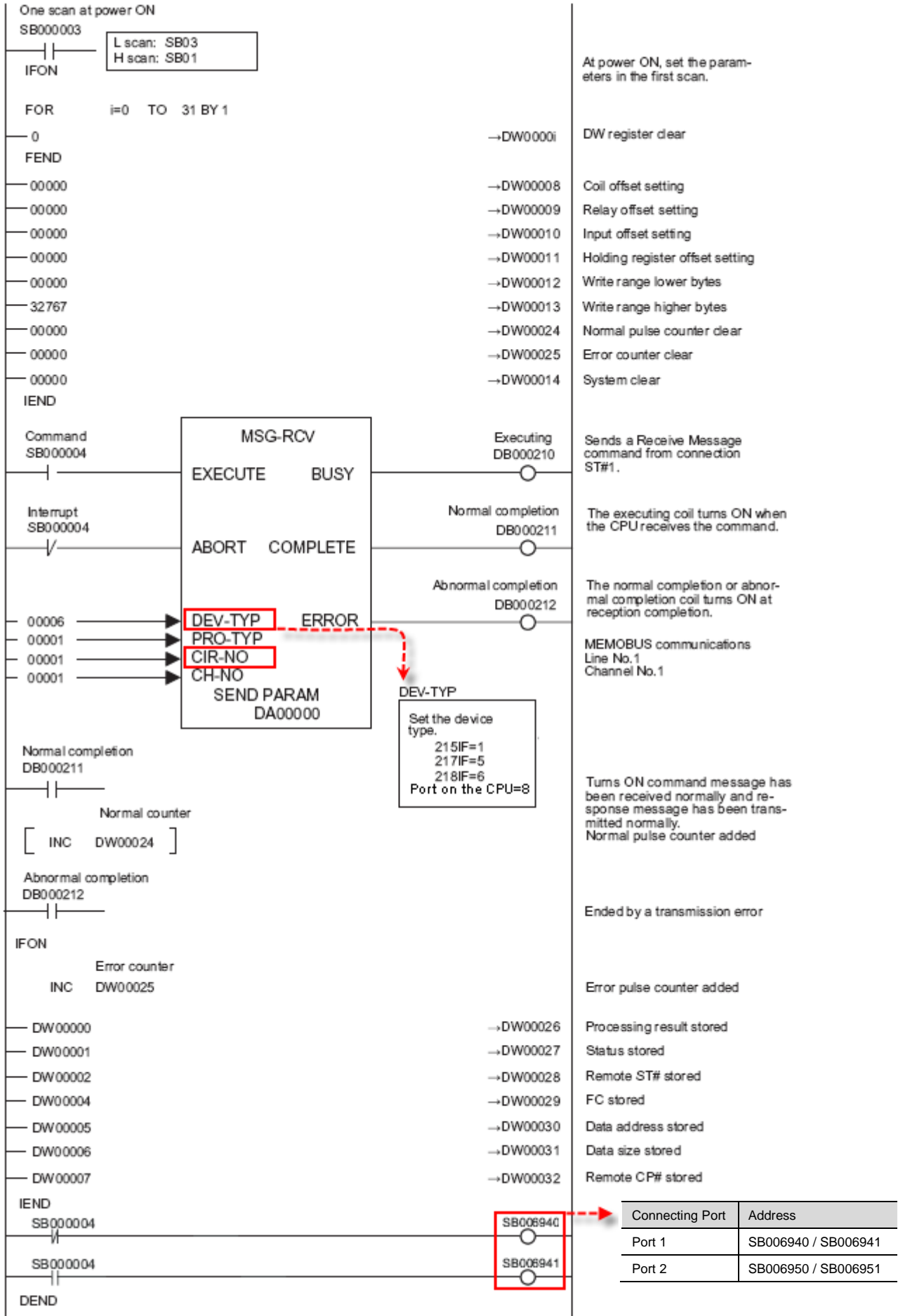
※ **Precautions for setting MP Extension**
Select [Serial I/F : RS-232C] [Transmission Protocol: RTU].
Select [Automatically Reception: Disable].
Procedure IV does not proceed.

7. Register the [MSG–RCV] function ([Instruction Pallete] menu – [System] tab) on the [Ladder Works] Software. Refer to the example below. For more detailed setting method, refer to the Ladder Software manual.

One scan at power ON	
SB000003	At power ON, set the param-
— ┤ ├ — [L scan: SB03 / H scan: SB01]	eters in the first scan.
IFON	
FOR i=0 TO 31 BY 1	
— 0 →DW0000i	DW register clear
FEND	
— 00000 →DW00008	Coil offset setting
— 00000 →DW00009	Relay offset setting
— 00000 →DW00010	Input offset setting
— 00000 →DW00011	Holding register offset setting
— 00000 →DW00012	Write range lower bytes
— 32767 →DW00013	Write range higher bytes
— 00000 →DW00024	Normal pulse counter clear
— 00000 →DW00025	Error counter clear
— 00000 →DW00014	System clear
IEND	
Command SB000004	MSG-RCV	Executing DB000210	Sends a Receive Message command from connection ST#1.
— ┤ ├ — EXECUTE BUSY ──○	
Interrupt SB000004		Normal completion DB000211	The executing coil turns ON when the CPU receives the command.
— ┤/├ — ABORT COMPLETE ──○	
	Abnormal completion DB000212	The normal completion or abnormal completion coil turns ON at reception completion.
— 00006 → DEV-TYP ERROR ──○	
— 00001 → PRO-TYP	MEMOBUS communications Line No.1 Channel No.1
— 00001 → CIR-NO	
— 00001 → CH-NO	
SEND PARAM DA00000	DEV-TYP [Set the device type. 215IF=1 217IF=5 218IF=6 Port on the CPU=8]	
Normal completion DB000211	
— ┤ ├ —	Turns ON command message has been received normally and response message has been transmitted normally. Normal pulse counter added
Normal counter [INC DW00024]	
Abnormal completion DB000212	
— ┤ ├ —	Ended by a transmission error
IFON	
Error counter INC DW00025	Error pulse counter added
— DW00000 →DW00026	Processing result stored
— DW00001 →DW00027	Status stored
— DW00002 →DW00028	Remote ST# stored
— DW00004 →DW00029	FC stored
— DW00005 →DW00030	Data address stored
— DW00006 →DW00031	Data size stored
— DW00007 →DW00032	Remote CP# stored
IEND	
SB000004 — ┤ ├ — SB006940 ──○	
SB000004 — ┤ ├ — SB006941 ──○	
DEND	

Connecting Port	Address
Port 1	SB006940 / SB006941
Port 2	SB006950 / SB006951

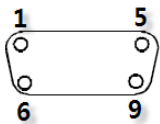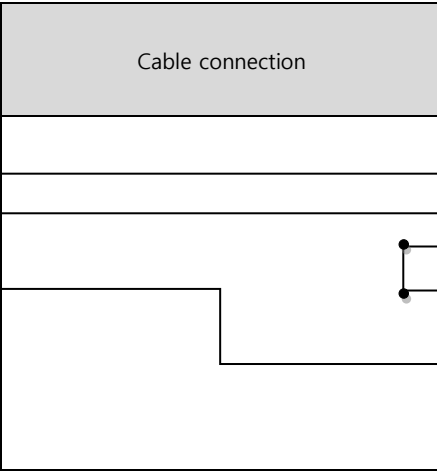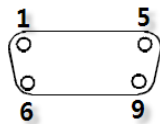**External device connection manual for TOP Design Studio**

5. Cable table

This chapter introduces a cable diagram for normal communication between the TOP and the corresponding device.

(The cable diagram described in this chapter may differ from the recommendations of "YASKAWA Electric Corporation".)
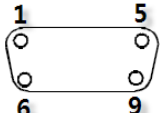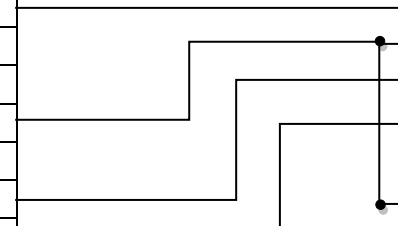
5.1. Cable table 1

■ RS-232C (1:1 connection)

COM			Cable connection	External device		
Pin arrangement*Note 1)	Signal name	Pin number		Pin number	Signal name	Pin arrangement*Note 1)
	CD	1		1	FG	
	RD	2		2	SD	
	SD	3		3	RD	
	DTR	4		4	RS	
1 5 6 9 Based on communication cable connector front, D-SUB 9 Pin male (male, convex)	SG	5		5	CS	1 5 6 9 Based on communication cable connector front, D-SUB 9 Pin male (male, convex)
	DSR	6		6	N/C	
	RTS	7		7	SG	
	CTS	8		8	N/C	
		9		9	N/C	

*Note 1) The pin arrangement is as seen from the connecting side of the cable connection connector.
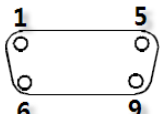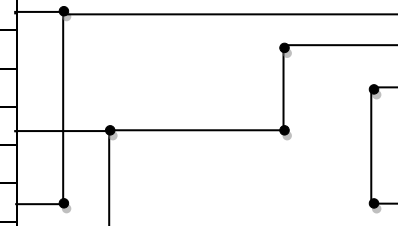
5.2. Cable table 2

■ RS-422 (1:1 connection)

COM			Cable connection	External device		
Pin arrangement*Note 1)	Signal name	Pin number		Pin number	Signal name	Pin arrangement*Note 1)
Based on communication cable connector front, D-SUB 9 Pin male (male, convex)	RDA	1		1	TX+	Based on communication cable connector front, MR–14 (Plug)
		2		2	TX–	
		3		3	RX+	
	RDB	4		4	RX–	
		5		7	RXR	
	SDA	6		11	TXR	
		7		14	GND	
		8				
	SDB	9				

*Note 1) The pin arrangement is as seen from the connecting side of the cable connection connector.

■ RS-485 (1:1 connection)

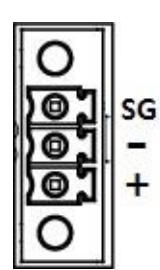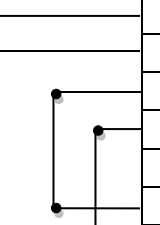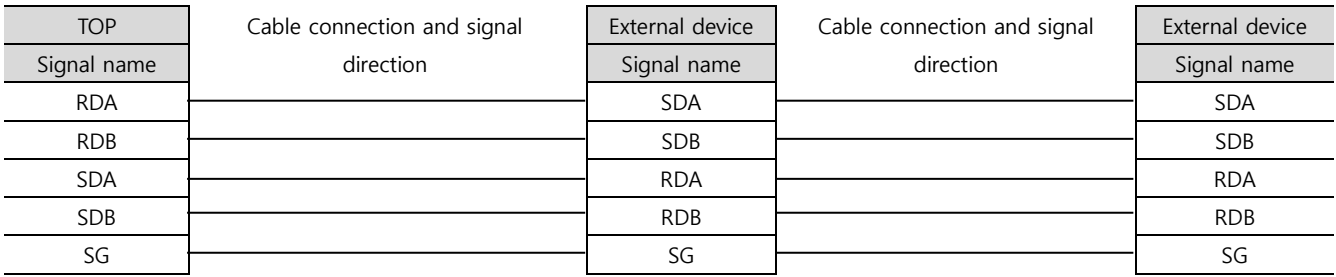| COM			Cable connection	External device		
Pin arrangement*Note 1)	Signal name	Pin number		Pin number	Signal name	Pin arrangement*Note 1)
Based on communication cable connector front, D-SUB 9 Pin male (male, convex)	RDA	1		1	TX+	Based on communication cable connector front, MR–14 (Plug)
		2		2	TX–	
		3		3	RX+	
	RDB	4		4	RX–	
		5		6	RX–	
	SDA	6		8	TX+	
		7		9	TX–	
		8		10	RX+	
	SDB	9		14	GND	

*Note 1) The pin arrangement is as seen from the connecting side of the cable connection connector.

■ RS-485 (1:1 connection)

COM		Cable connection	External device		
Pin arrangement	Signal name		Pin number	Signal name	Pin arrangement*Note 1)
SG – +	+		1	TX+	Based on communication cable connector front, MR–8 (Plug)
	-		2	TX–	
	SG		3	RX+	
			4	RX–	
			6	RX–	
			8	TX+	
			9	TX–	
			10	RX+	
			14	GND	

*Note 1) The pin arrangement is as seen from the connecting side of the cable connection connector.
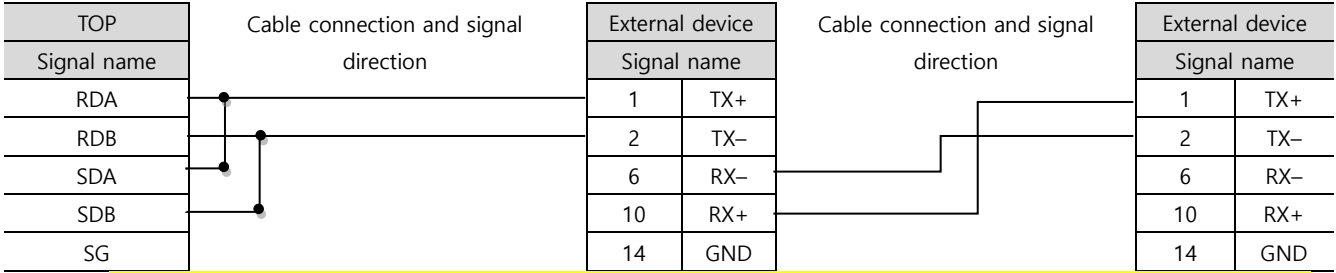
■ RS-422 1 : N connection - Refer to 1:1 connection to connect in the following method.

TOP	Cable connection and signal direction	External device	Cable connection and signal direction	External device
Signal name		Signal name		Signal name
RDA		SDA		SDA
RDB		SDB		SDB
SDA		RDA		RDA
SDB		RDB		RDB
SG		SG		SG

■ RS-485 1 : N connection - Refer to 1:1 connection to connect in the following method.

TOP	Cable connection and signal direction	External device		Cable connection and signal direction	External device	
Signal name		Signal name			Signal name	
RDA		1	TX+		1	TX+
RDB		2	TX−		2	TX−
SDA		6	RX−		6	RX−
SDB		10	RX+		10	RX+
SG		14	GND		14	GND

(**Caution**) In case of 1:N connection, short the pin arrangement of (1) and (2) items out of 14 pins for terminating devices.   (1) 4–7–9   (2) 3–8

6. Supported addresses

The devices available in TOP are as follows:

The device range (address) may differ depending on the CPU module series/type. The TOP series supports the maximum address range used by the external device series. Please refer to each CPU module user manual and be take caution to not deviate from the address range supported by the device you want to use.

■ Extended Memobus

Device		Bit Address	Word Address	32bit	Remarks
MB	Coil	MB000000 ~ MB65535F	MB00000 ~ MB65535	L/H	
IB	Discrete Input	IB00000 ~ IBFFFFF	IB0000 ~ IBFFFF		*Note 1)
IW	Input Register	-	IW0000 ~ IWFFFF		*Note 1)
MW	Holding Register	-	MW00000 ~ MW65535		

*Note 1) Cannot be written

■ MP Extension

Device		Bit Address	Word Address	32bit	Remarks
SB	System Register	SB00000 ~ SB8191F	SB0000 ~ SB8191	L/H	
SW		SW0000.0 ~ SW8191.F	SW0000 ~ SW8191		
IB	Input Register	IB00000 ~ IBFFFFF	IB0000 ~ IBFFFF		
IW		IW0000.0 ~ IWFFFF.F	IW0000 ~ IWFFFF		
OB	Output Register	OB00000 ~ OBFFFFF	OB0000 ~ OBFFFF		*Note 1)
OW		OW0000.0 ~ OWFFFF.F	OW0000 ~ OWFFFF		*Note 1)
MB	Data Register	MB000000 ~ MB65535F	MB00000 ~ MB65535		
MW		MW00000.0 ~ MW65535.F	MW00000 ~ MW65535		

*Note 1) Cannot be written