IEC 60870-5-101

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 Page 2

Describes the devices required for connection, the setting of each device, cables, and configurable systems.

2. External device selection Page 3

Select a TOP model and an external device.

3. TOP communication setting Page 4

Describes how to set the TOP communication.

4. Cable table Page 9

Describes the cable specifications required for connection.

5. Communication setting Page 10

Refer to this section to check the addresses which can communicate with an external device.

6. Device Page 12

Refer to this section to check the addresses which can communicate with an external device.

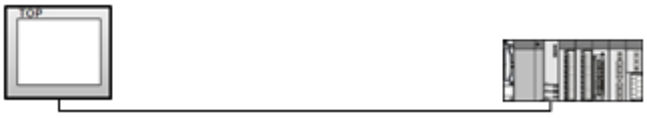
1. System configuration

The system configuration of TOP and "IEC 60870-5-101" is as follows:

Series	Link I/F	Communication method	Communication setting	Cable
IEC 60870-5-101	-	RS–232C	3. TOP communication setting	5.1. Cable table 1

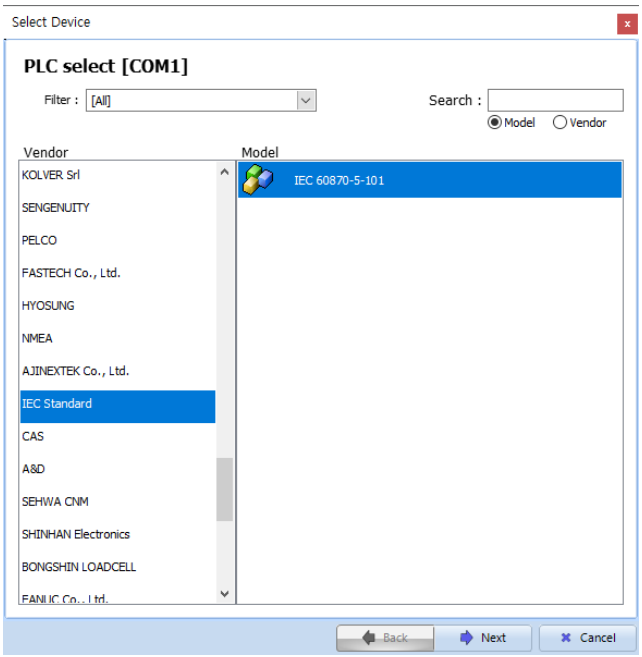
■ Connection configuration

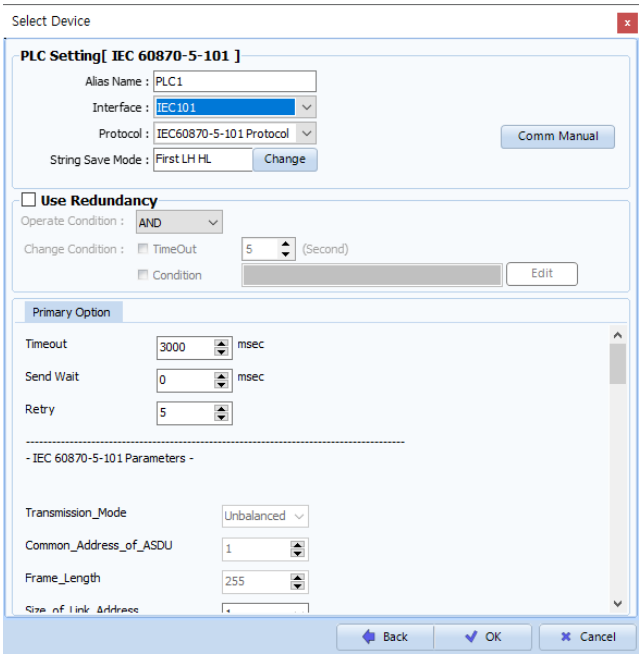
• 1:1 (one TOP and one external device) connection



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. Select "IEC Standard".
	PLC	Select an external device to connect to TOP. **Model** / **Interface** / **Protocol** IEC 60870-5-101 / IEC101 / IEC60870-5-101 prtocotol 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

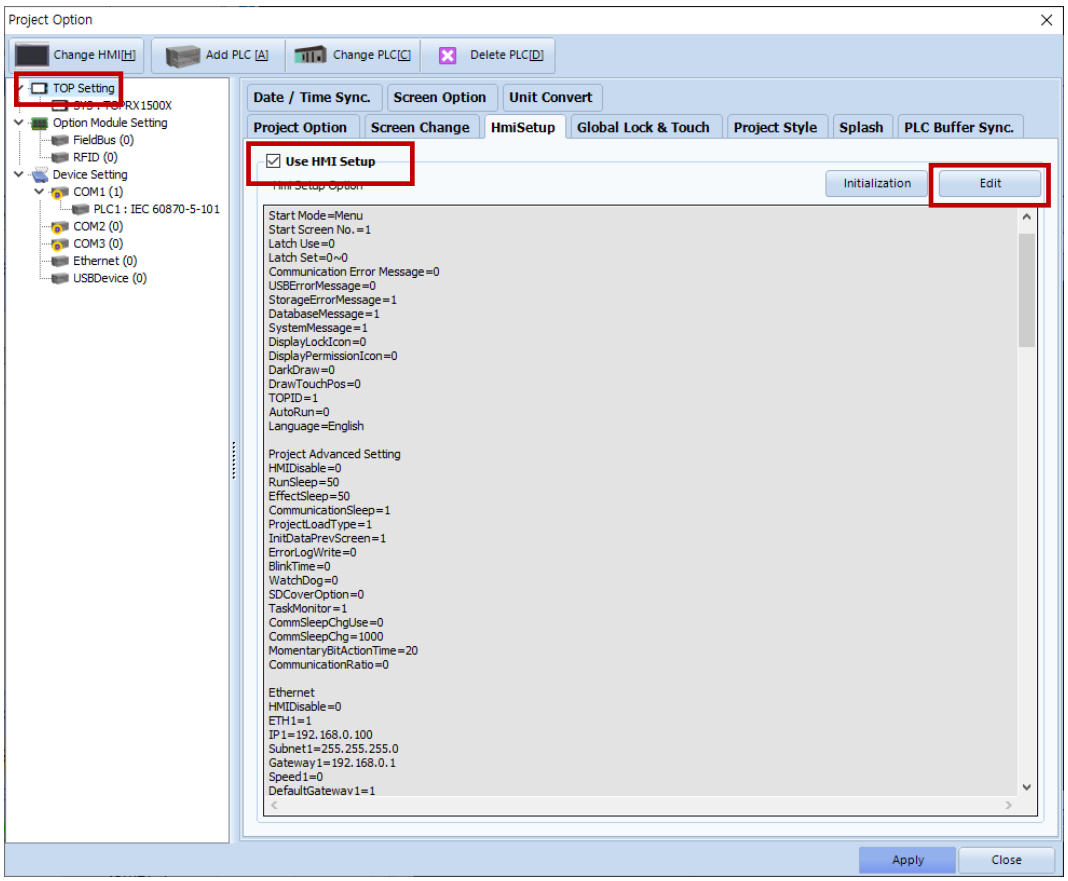
The communication can be set in TOP Design Studio or TOP main menu. The communication should be set in the same way as that of the external device.

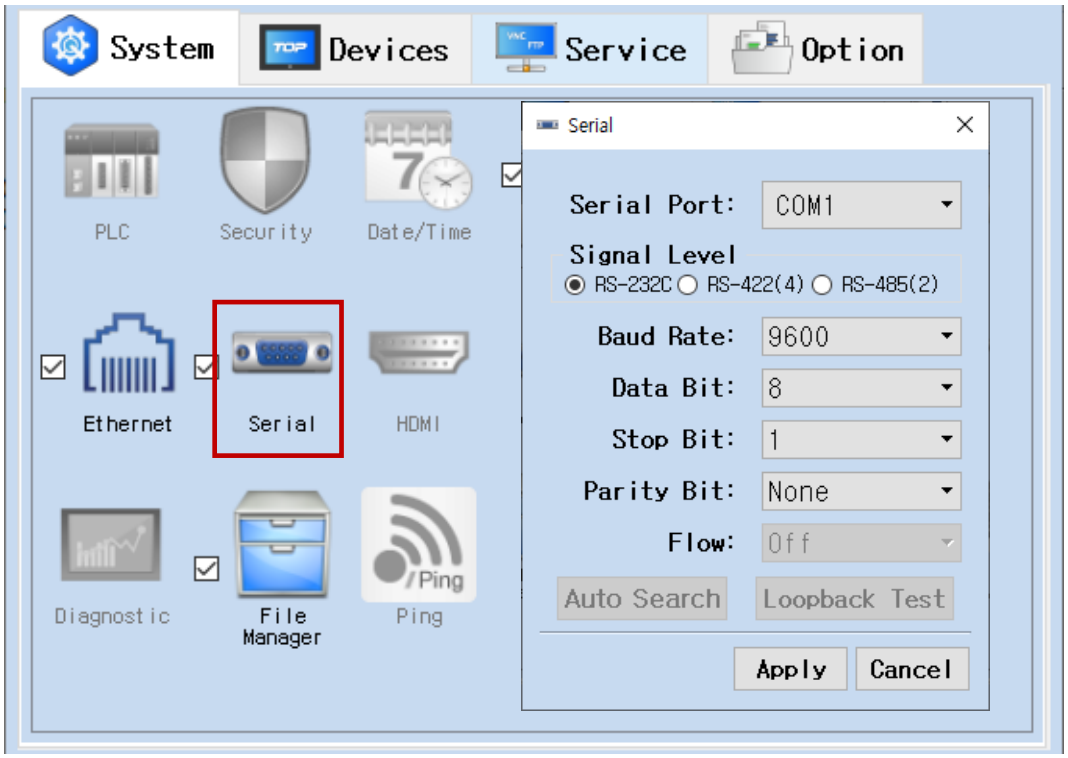
3.1 Communication setting in TOP Design Studio

(1) Communication interface setting

■ [Project > Project Property > TOP Setting] → [Project Option > "Use HMI Setup" Check > Edit > Serial]

– Set the TOP communication interface in TOP Design Studio.





Items	TOP	External device	Remarks
Signal Level (port)	RS-232C	RS-232C	Fixed
Baud Rate	9600		
Data Bit	8		
Stop Bit	1		
Parity Bit	NONE		

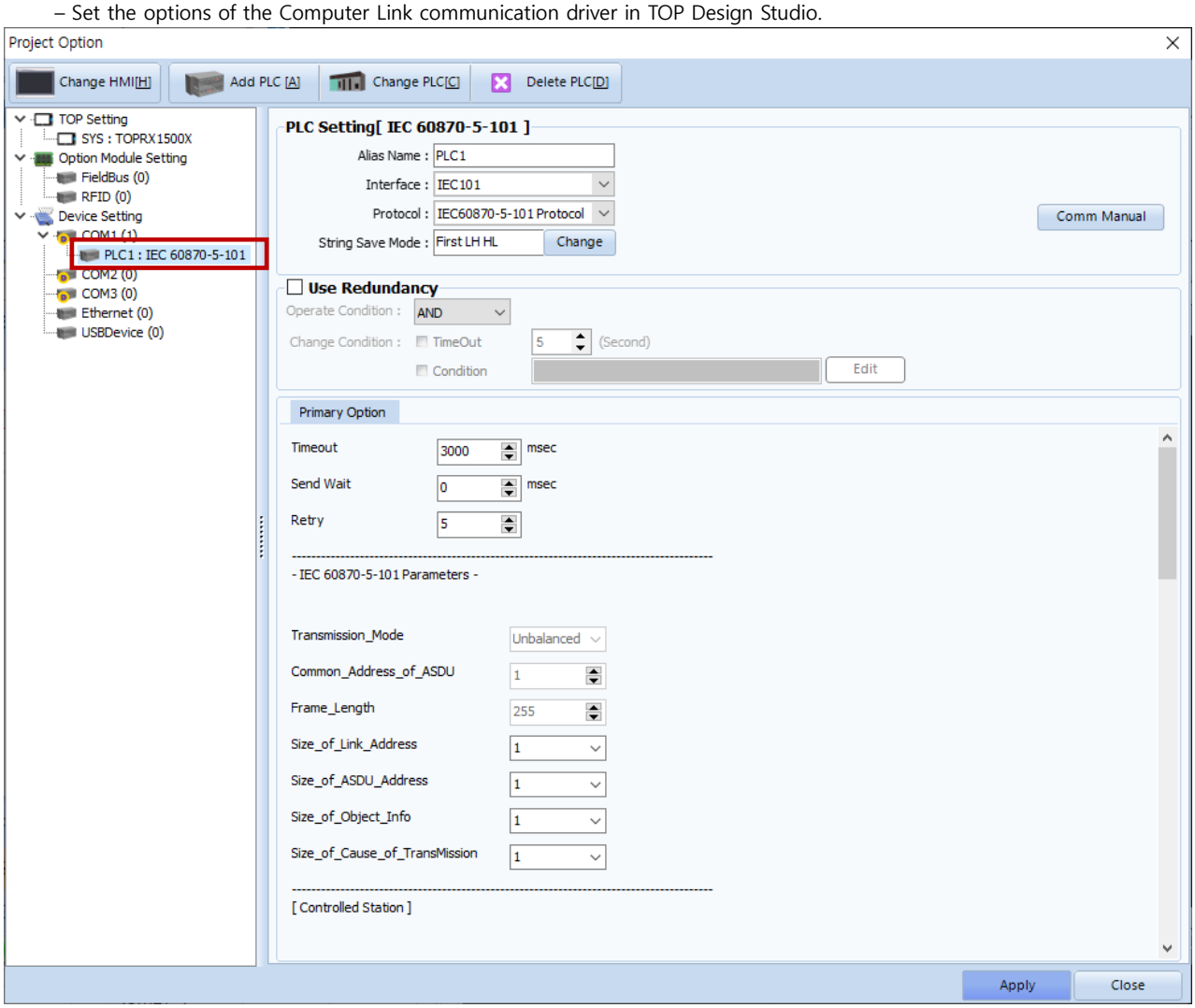
* The above settings are examples recommended by the company.

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 Property > Device Setting > COM1 > "IEC 60870-5-101"]

– Set the options of the Computer Link communication driver in TOP Design Studio.

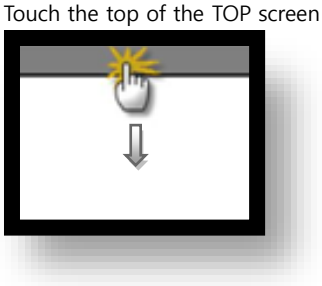


Items	Settings	Remarks
Interface	Configure the communication interface between the TOP and an external device.	Refer to "2. External device selection".
Protocol	Configure the communication protocol between the TOP and an external device.	
TimeOut (ms)	Set the time for the TOP to wait for a response from 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.	

3.2. Communication setting in TOP

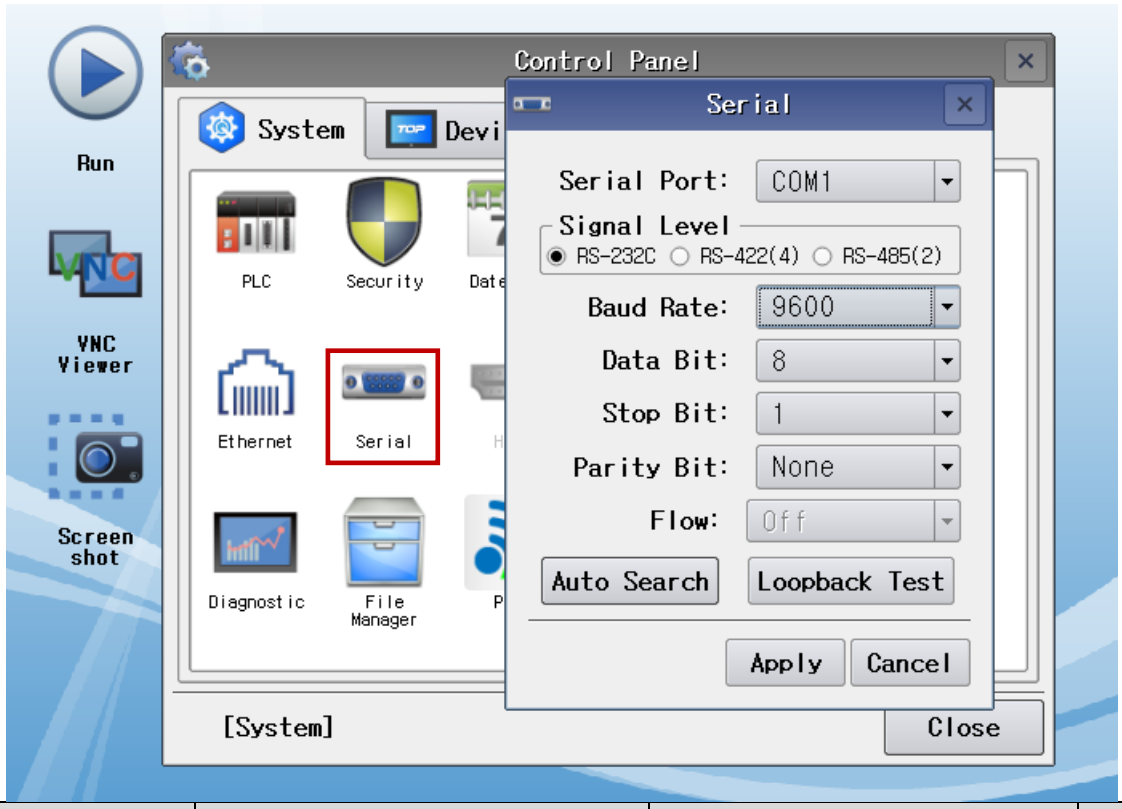
*** This is a setting method when "Use HMI Setup" in the setting items in "3.1 TOP Design Studio" is not checked.**

■ 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]



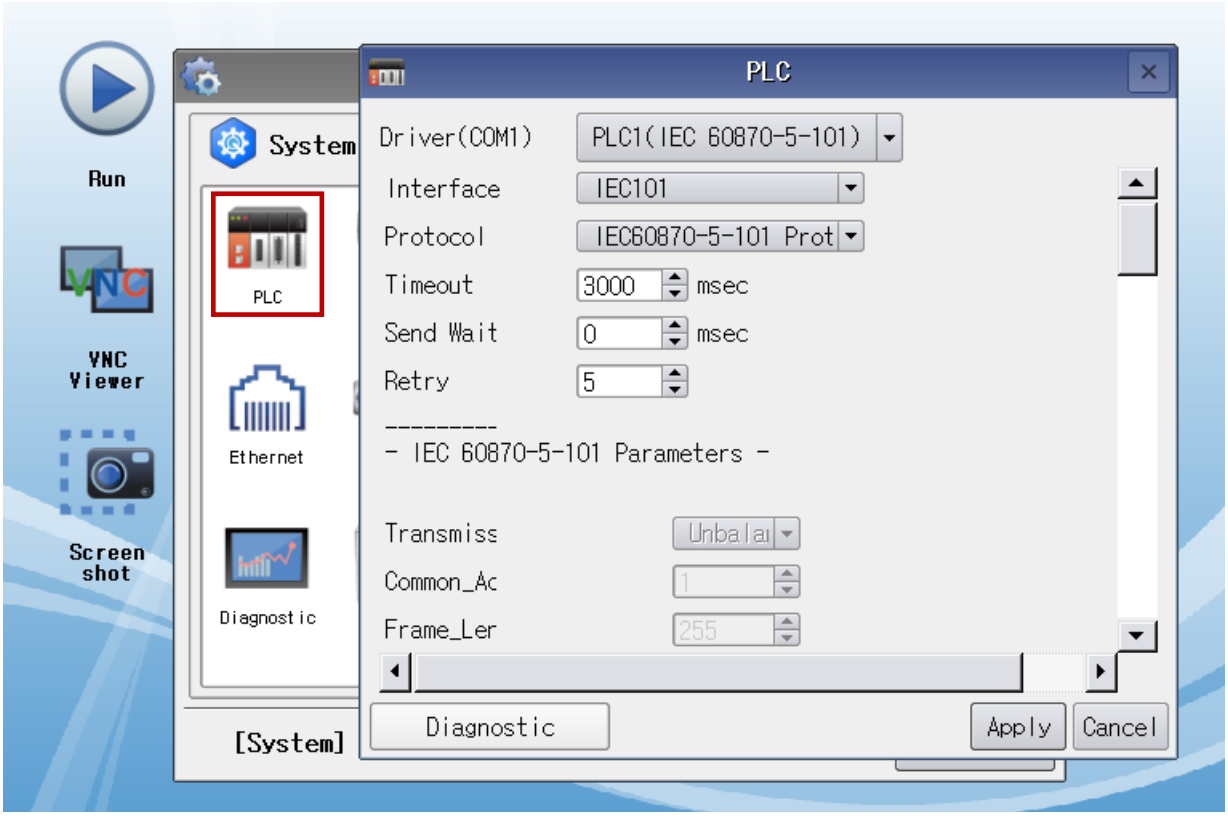
Items	TOP	External device	Remarks
Signal Level (port)	RS-232C	RS-232C	Fixed
Baud Rate	9600		
Data Bit	8		
Stop Bit	1		
Parity Bit	NONE		

* 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	Configure the communication interface between the TOP and an external device.	Refer to "2. External device selection".
Protocol	Configure the communication protocol between the TOP and an external device.	
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.	

Items	Description
Common Address of ASDU	Common Address of ASDU.
Size of Link Address	Select the Link Address Size. [1 or 2 Bytes]
Size of ASDU Address	Select the size of ASDU Address [1 or 2 Bytes]
Size of Object Information	Select the Size of Object Information address[1 or 2 or 3 Bytes]
Size of Cause of Transmission	Select the Size of Cause of Transmission [1 or 2 Bytes]
Link Address	Select the Link Address of the External Device/PLC
Common Address of ASDU	Address Select the Common ASDU Address of the External Device/PLC
Name	Address Object Information Name
Start Address	Address Object Information Start Address
Range	Address Object Information Range.
Clock Sync.Interval	Select the Time Interval (in minutes) to send Clock Synchronization command.

3.3 Communication diagnostics

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

- Touch the top of the TOP screen and drag 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.)

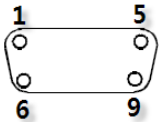
4. Cable table

This chapter introduces a cable diagram for normal communication between the TOP and the corresponding device.
(The cable diagram described in this section may differ from the recommendations of "IEC60870-5-101")

4.1. Cable table 1

■ 1:1 connection

COM Port (9 pin)

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

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

(5) Communication interface setting

Network configuration

- Multi-point-party line

Physical layer

Transmission speed

-2400 bit/s

-4800 bit/s

-9600 bit/s

-19200 bit/s (**NOT Defined in 870-5-101**)

Linked layer

Link transmission

- Unbalanced

Address field of the link

- One octet
- Two octets

Frame length

- 255 Maximum length L (number of octets)

Application layer

Common address of ASDU

- One octet
- Two octets

Information object address

- One octet
- Two octets
- Three octets

Cause of transmission

- One octet
- Two octets

ASDUs

Process information in monitor direction		Name
<1>	Single-point information	M_SP_NA_1
<3>	Double-point information	M_DP_NA_1
<5>	Step position information	M_ST_NA_1
<11>	Measured value, scaled value	M_ME_NB_1
<15>	Integrated totals	M_IT_NA_1
<30>	Single-point information with time tag CP56Time2a	M_SP_TB_1
<31>	Double-point information with time tag CP56Time2a	M_DP_TB_1
<32>	Step position information with time tag CP56Time2a	M_ST_TB_1
<35>	Measured value, scaled value with time tag CP56Time2a	M_ME_TE_1
<37>	Integrated totals with time tag CP56Time2a	M_IT_TB_1
Process information in control direction		Name
<45>	Single command	C_SC_NA_1
<46>	Double command	C_DC_NA_1
<47>	Regulating step command	C_RC_NA_1
<48>	Set point command, normalized value	C_SE_NA_1

6. Device

Device Name	Description	Range	R/W
SP	Single Point Information	0–1999	Read only
DP	Double-Point Information	2000–3999	Read only
ME	Measured Value	4000–5999	Read only
SC	Single Command	6000–7999	Write only
IT	Integrated Totals	8000–9999	Read only
ST	Step Position Information	10000–11999	Read only
SE	Set Point Command	12000–13999	Write only
DC	Double Command	14000–15999	Write only
RC	Regulating Step Command	16000–17999	Write only

("Address range can be edited at PLC option. (User setting)[0–16777215](3 Byte) range settings should not overlap.)

Device Name	Sub Category / Element		Description	Data Type
	Category	Element		
SP	SIQ	SPI	Single Point Information 0: OFF 1: ON	*1
		BL	0: Not Blocked 1: Blocked	*1
		SB	0: Not Substituted 1: Substituted	*1
		NT	0: Topical 1: Not Topical	*1
		IV	0: Valid 1: Invalid	*1
	TIME	IV	Valid	*1
		SU	Summer Time	*1
		MSEC	Milliseconds	*2
		MIN	Minute	*2
		HOUR	Hour	*2
		DAY	Day	*2
		MONTH	Month	*2
		YEAR	Year	*2
DP	DIQ	BL	Blocked / Not Blocked	*1
		SB	Substituted / Not Substituted	*1
		NT	Topical / Not Topical	*1
		IV	Valid / Invalid	*1
		DPI	Double Point Information	*2
	TIME	IV	Valid	*1
		SU	Summer Time	*1
		MSEC	Milliseconds	*2
		MIN	Minute	*2
		HOUR	Hour	*2
		DAY	Day	*2
		MONTH	Month	*2
		YEAR	Year	*2
ST	VTI	T	Transient	*1
		VAL	Value	*2
	QDS	OV	Overflow / No Overflow	*1
		BL	Blocked / Not Blocked	*1
		SB	Substituted / Not Substituted	*1
		NT	Topical / Not Topical	*1
		IV	Valid / Invalid	*1
	TIME	IV	Valid	*1
		SU	Summer Time	*1
		MSEC	Milliseconds	*2
		MIN	Minute	*2
		HOUR	Hour	*2
		DAY	Day	*2
		MONTH	Month	*2
		YEAR	Year	*2

Device Name	Sub Category / Element		Description	Data Type
	Category	Element		
ME	QDS	OV	Overflow / No Overflow	*1
		BL	Blocked / Not Blocked	*1
		SB	Substituted / Not Substituted	*1
		NT	Topical / Not Topical	*1
		IV	Valid / Invalid	*1
	VA	VAL	Measured Value	*2
	TIME	IV	Valid	*1
		SU	Summer Time	*1
		MSEC	Milliseconds	*2
		MIN	Minute	*2
		HOUR	Hour	*2
		DAY	Day	*2
		MONTH	Month	*2
		YEAR	Year	*2
IT	BCR	VAL	Counter value	*2
		SQ	Sequence	*2
		CY	(Carry) Counter Overflow / No Overflow	*1
		CA	Counter Adjusted / Not Adjusted	*1
		IV	Counter value Valid / Invalid	*1
	TIME	IV	Valid	*1
		SU	Summer Time	*1
		MSEC	Milliseconds	*2
		MIN	Minute	*2
		HOUR	Hour	*2
		DAY	Day	*2
		MONTH	Month	*2
		YEAR	Year	*2
SC	SCO	SCS	Single command state	*1
DC	DCO	DCS	Double command state	*2
RC	RCO	RCS	Regulating step command state	*2
SE	VA	VAL	Value (Normalized / Scaled /short floating point)	*2

***1 Bit Address Only**
***2 Word Address Only**