

ANSI/ASHRAE Standard Building Automation and Control Networks BACnet/IP Driver

Supported version

TOP Design Studio

V1.4.3.0 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.

Please refer to this section and select the appropriate system.

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.

When changing external device settings, refer to this section and set identical TOP communication settings.

4. Supported addresses [Page 10](#)

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

1. System configuration

The system configuration of TOP and "BACnet/IP" is as follows.

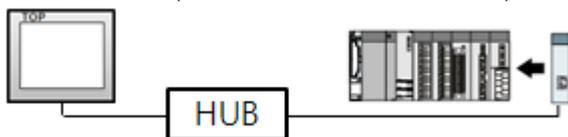
Series	Communication method	System setting	Cable
Building Automation and Control Networks BACnet-IP	Ethernet (UDP)	3. TOP communication setting	Twisted pair cable* Note 1)

*Note 1) Twisted pair cable

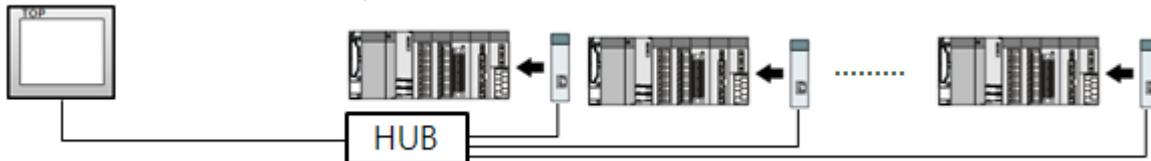
- Refer to STP (Shielded Twisted Pair Cable) or UTP (Unshielded Twisted Pair Cable) Category 3, 4, 5.
- Depending on the network configuration, you can connect to components such as the hub and transceiver, and in this case, use a direct cable.

■ Connectable configuration

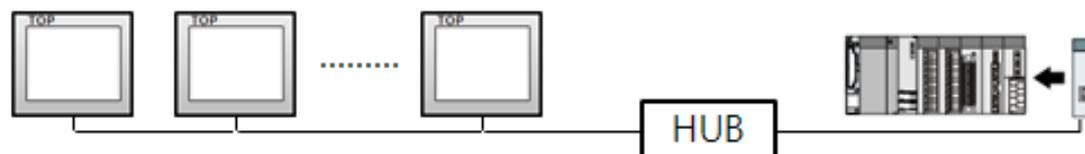
- 1:1 connection (one TOP and one external device) connection



- 1 : N connection (one TOP and multiple external devices) connection



- N : 1 connection (N TOPs and one external device) connection



2. External device selection

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

The first screenshot shows the 'Select Device' dialog box. It has a title bar 'Select Device' and a close button. The main area is titled 'PLC select [Ethernet]'. It includes a 'Filter' dropdown set to '[All]', a 'Search' input field, and radio buttons for 'Model' (selected) and 'Vendor'. A list of vendors is shown on the left, with 'BACnet' selected. A list of models is shown on the right, with 'BACnet' selected. At the bottom are 'Back', 'Next', and 'Cancel' buttons.

The second screenshot shows the 'PLC Setting [BACnet]' dialog box. It has a title bar 'Select Device' and a close button. The main area is titled 'PLC Setting [BACnet]'. It includes fields for 'Alias Name' (PLC1), 'Bind IP' (Auto), 'Interface' (Ethernet), 'Protocol' (BACnet/IP), and 'String Save Mode' (First HL HL). There is a 'Comm Manual' button. Below is a section for 'Use Redundancy' with 'Operate Condition' set to 'AND', 'Change Condition' set to 'TimeOut' (5 seconds), and a 'Condition' field. At the bottom are 'Back', 'OK', and 'Cancel' buttons.

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 "OTHERS Manufacture".					
	PLC	Select the external device to be connected to the TOP. <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="background-color: black; color: white;">Model</th> <th style="background-color: black; color: white;">Interface</th> <th style="background-color: black; color: white;">Protocol</th> </tr> </thead> <tbody> <tr> <td>BACnet/IP</td> <td>Ethernet</td> <td>BACnet/IP</td> </tr> </tbody> </table> <p>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.</p>	Model	Interface	Protocol	BACnet/IP	Ethernet
Model	Interface	Protocol					
BACnet/IP	Ethernet	BACnet/IP					

3. TOP communication setting

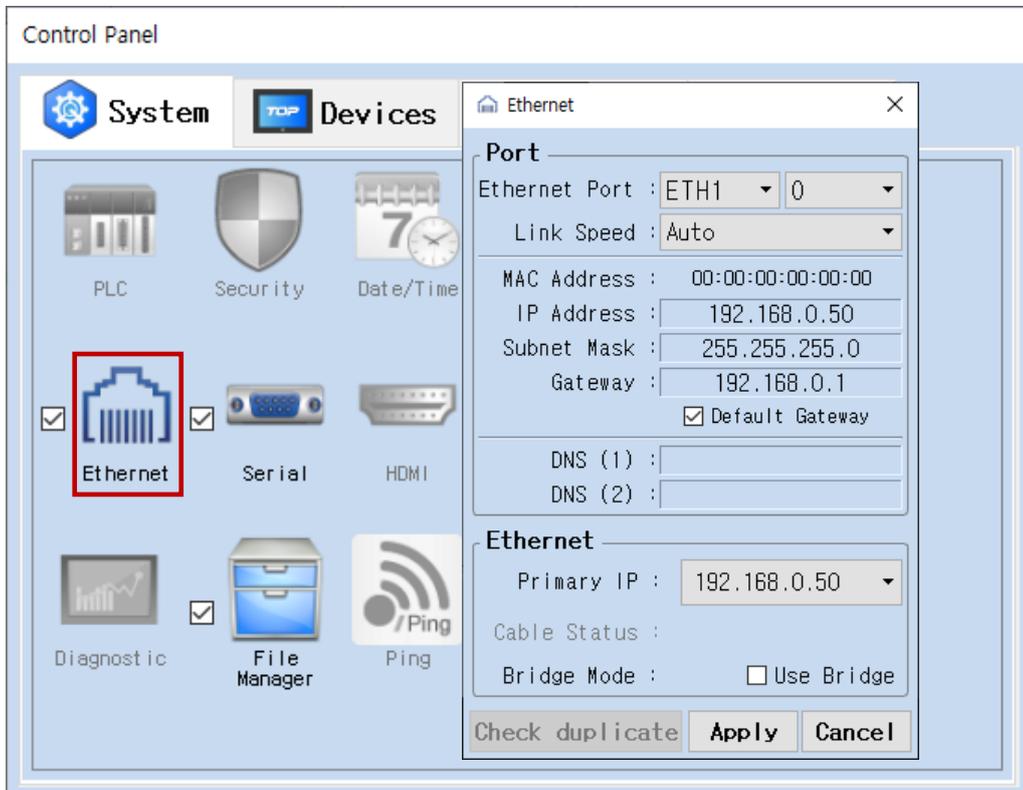
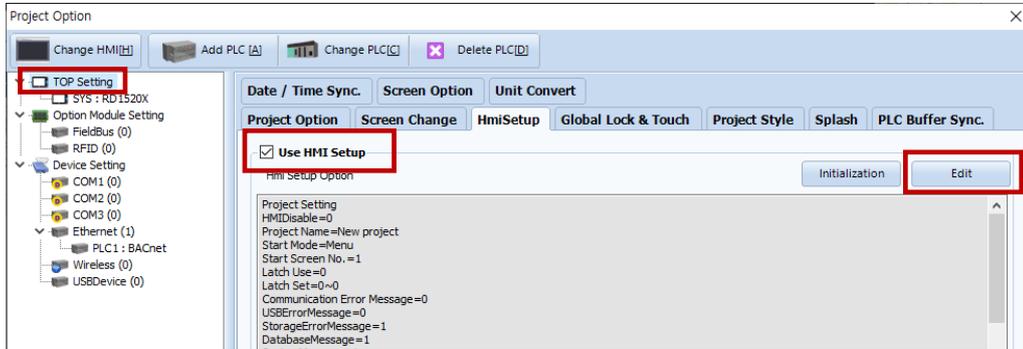
The communication can be set in TOP Design Studio or TOP main menu. The communication should be set in the same way as that of the external device.

3.1 Communication setting in TOP Design Studio

(1) Communication interface setting

■ [Project > Project properties > TOP settings] → [Project option > Check "Use HMI settings" > Edit > Ethernet]

– Set the TOP communication interface in TOP Design Studio.



Items	TOP	External device	Remarks
IP Address* Note 1 Note 2)	192.168.0.50	192.168.0.51	
Subnet Mask	255.255.255.0	255.255.255.0	
Gateway	192.168.0.1	192.168.0.1	

*[Note 1](#)) The network addresses of the TOP and the external device (the first three digits of the IP, 192 . 168 . 0 . 0) should match.

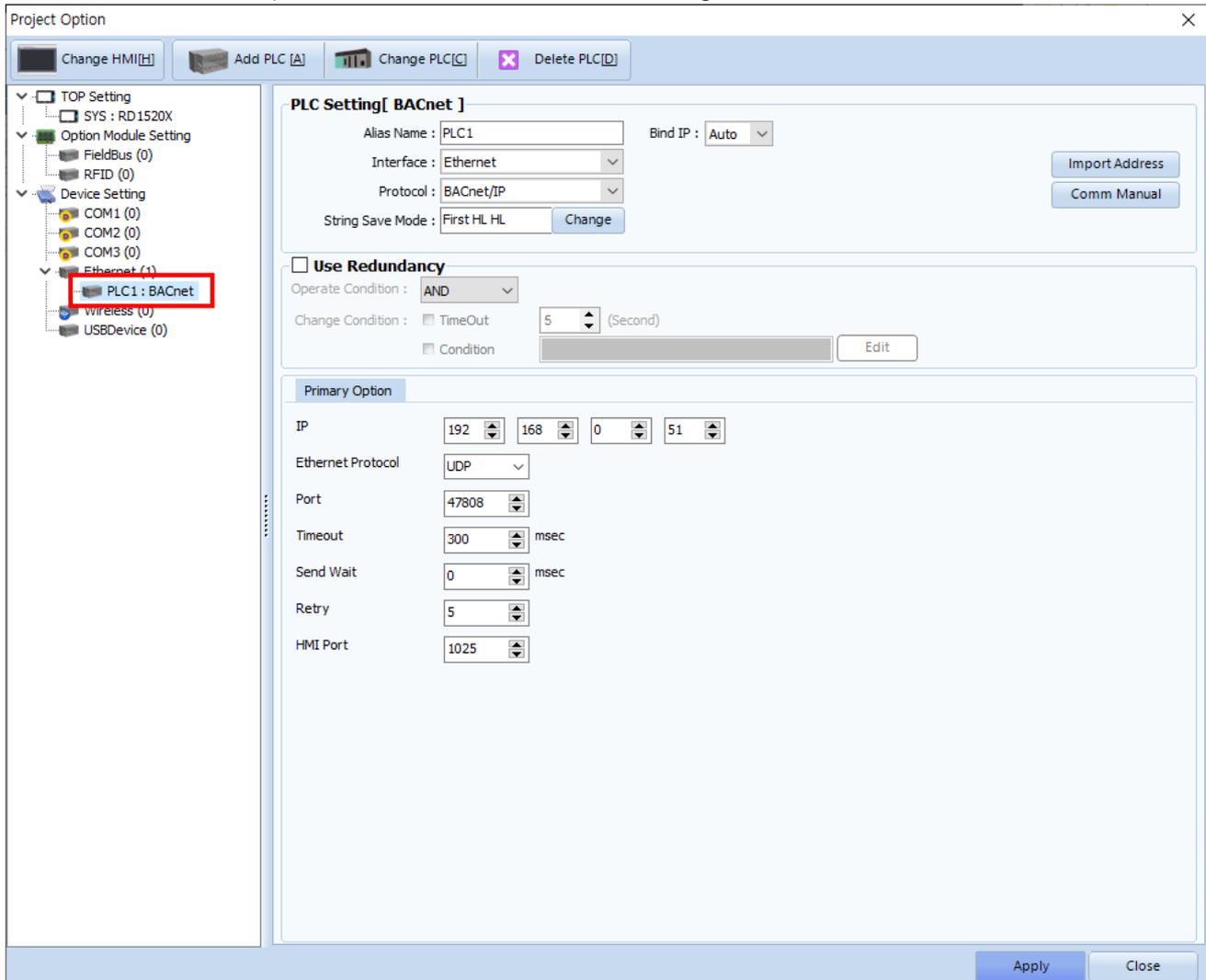
*[Note 2](#)) Do not use duplicate IP addresses over the same network.

* The above settings are examples recommended by the company.

Items	Description
IP Address	Set an IP address to be used by the TOP to use over the network.
Subnet Mask	Enter the subnet mask of the network.
Gateway	Enter the gateway of the network.

(2) Communication option setting

- [Project > Project properties > PLC settings > ETHERNET(1) > "PLC1: BACnet/IP"]
 – BACnet/IP. Set the options of the communication driver in TOP Design Studio



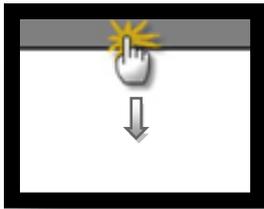
* The above settings are examples recommended by the company.

Items	Settings	Remarks
Interface	Select "Ethernet".	Refer to "2. External device selection".
Protocol	Select "BACnet/IP".	
IP	Enter the IP address of the external device.	
Ethernet Protocol	TOP – Select "UDP" Ethernet protocol between external devices.	Fixed
Port	Enter the Ethernet communication port number of the 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.	
Who-Is	Select whether to use Who-Is service of BACnet/IP protocol.	
Device ID	Enter the Device ID (Instance No.) of the external device. (Set when using Who-Is)	
HMI Port	Set the TOP Ethernet port number. (Set when using Who-Is)	
Import Address	Register the address to be used for drawing.	Refer to "4. Supported addresses"

3.2. Communication setting in TOP

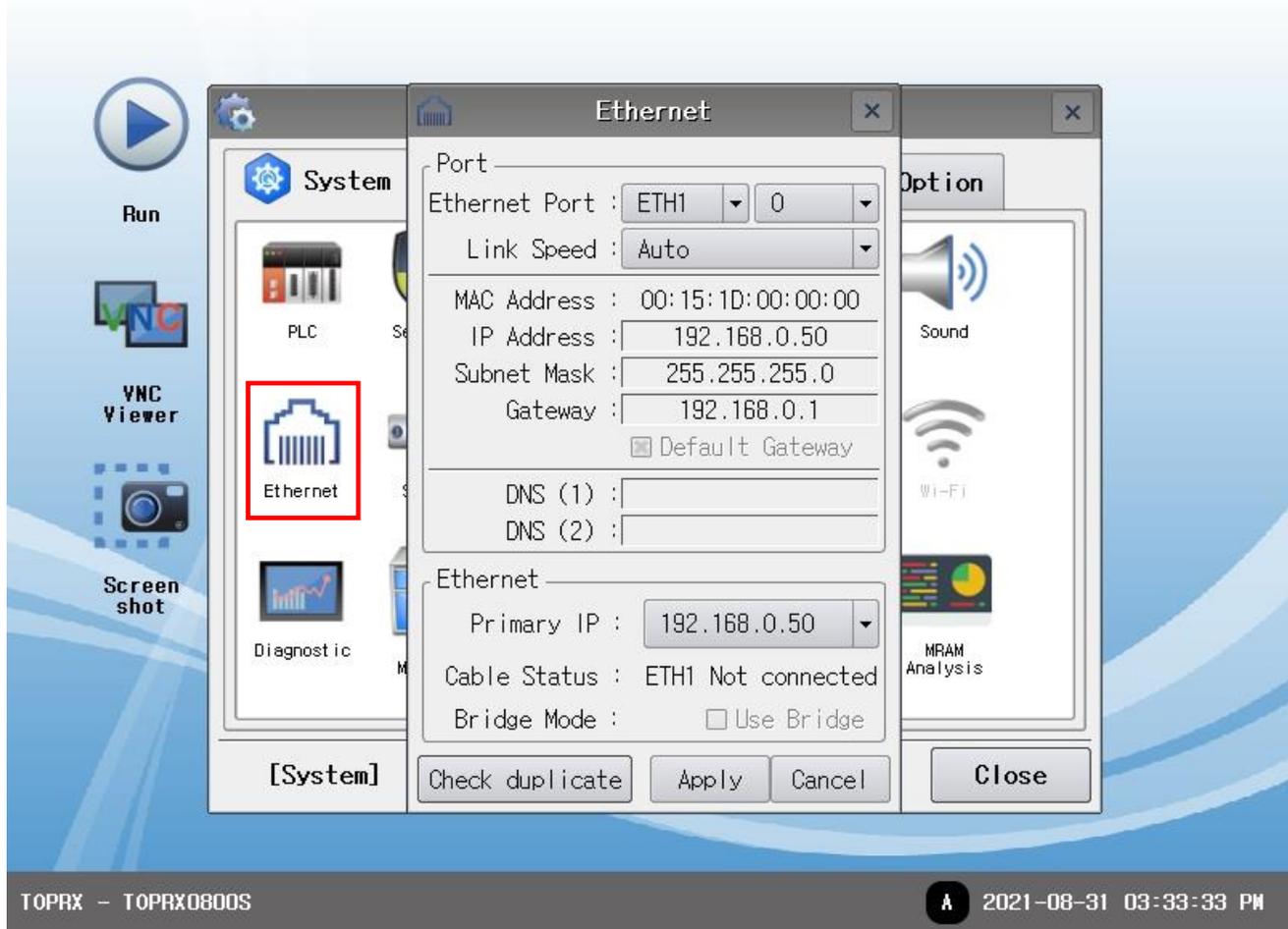
* This is a setting method when "Use HMI Setup" in the setting items in "3.1 TOP Design Studio" is not checked.

- 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 > Ethernet]



Items	TOP	External device	Remarks
IP Address*Note 1) Note 2)	192.168.0.50	192.168.0.51	
Subnet Mask	255.255.255.0	255.255.255.0	
Gateway	192.168.0.1	192.168.0.1	

*Note 1) The network addresses of the TOP and the external device (the first three digits of the IP, 192 . 168 . 0 . 0) should match.

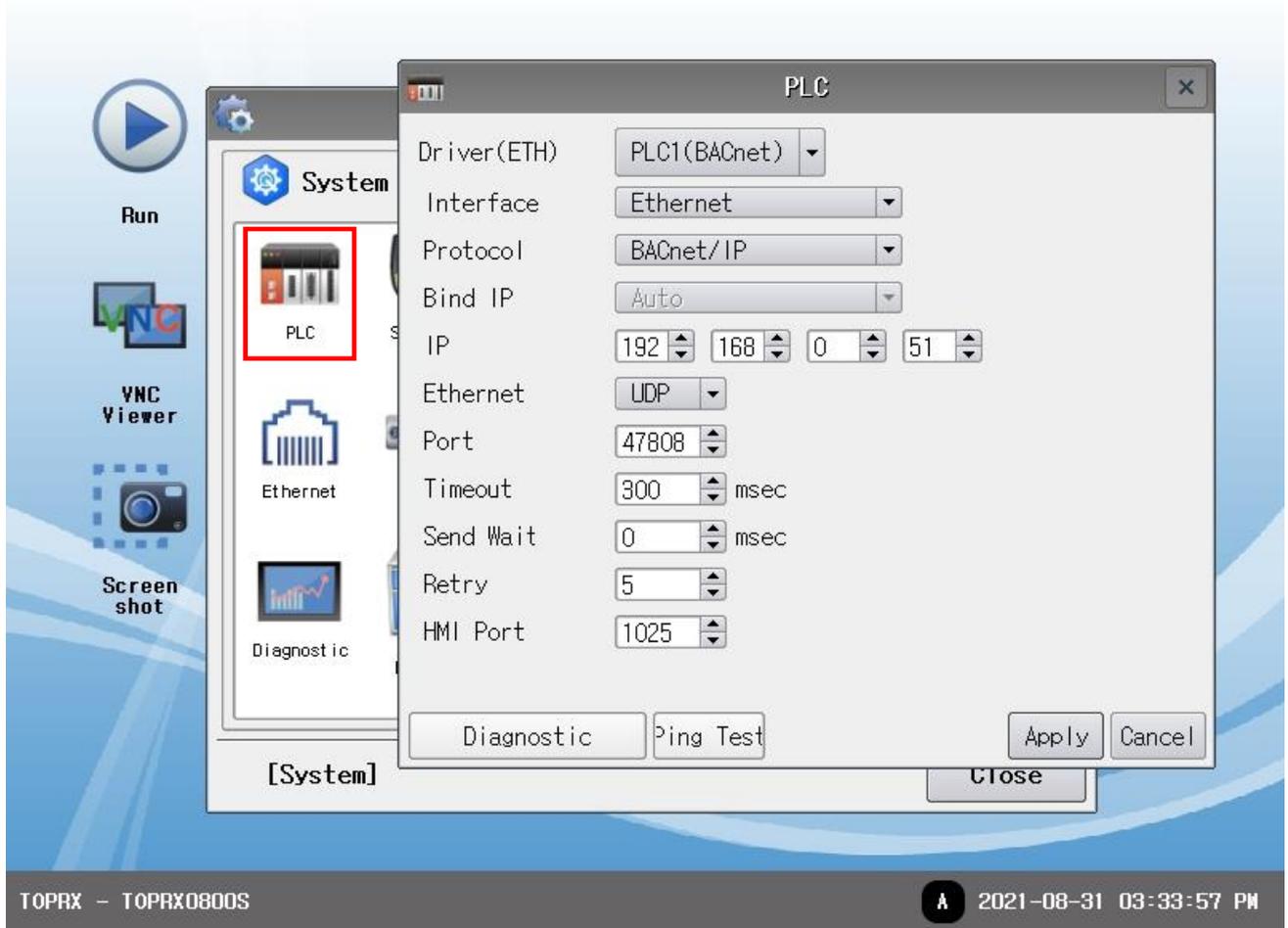
*Note 2) Do not use duplicate IP addresses over the same network.

* The above settings are examples recommended by the company.

Items	Description
IP Address	Set an IP address to be used by the TOP to use over the network.
Subnet Mask	Enter the subnet mask of the network.
Gateway	Enter the gateway of the network.

(2) Communication option setting

■ [Main screen > Control panel > PLC]



* The above settings are examples recommended by the company.

Items	Settings	Remarks
Interface	Select "Ethernet".	Refer to "2. External device selection".
Protocol	Select "BACnet/IP".	
IP	Enter the IP address of the external device.	
Ethernet Protocol	TOP – Select "UDP" Ethernet protocol between external devices.	Fixed
Port	Enter the Ethernet communication port number of the 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.	
Who-Is	Select whether to use Who-Is service of BACnet/IP protocol.	
Device ID	Enter the Device ID (Instance No.) of the external device. (Set when using Who-Is)	
HMI Port	Set the TOP Ethernet port number. (Set when using Who-Is)	

3.3 Communication diagnostics

- Check the interface setting status between the TOP and an 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 whether the port (ETH1/ETH2) settings you want to use are the same as those of the external devices in [Control panel > Ethernet].

- 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
	Ethernet port setting	IP Address	OK		NG
Subnet Mask		OK	NG		
Gateway		OK	NG		
External device	CPU name	OK	NG		
	Communication port name (module name)	OK	NG		
	Protocol (mode)	OK	NG		
	Setup Prefix	OK	NG		
	Other detailed settings	OK	NG		
	Ethernet port setting	IP Address	OK		NG
		Subnet Mask	OK		NG
		Gateway	OK	NG	
Check address range	OK	NG	4. Supported addresses (For details, please refer to the PLC vendor's manual.)		

4. Supported addresses

This chapter describes how to register objects of BACnet devices in TOP Design Studio.

※ Precautions when registering an address

This function is to register the object properties of the BACnet device as a variable address in TOP Design Studio.

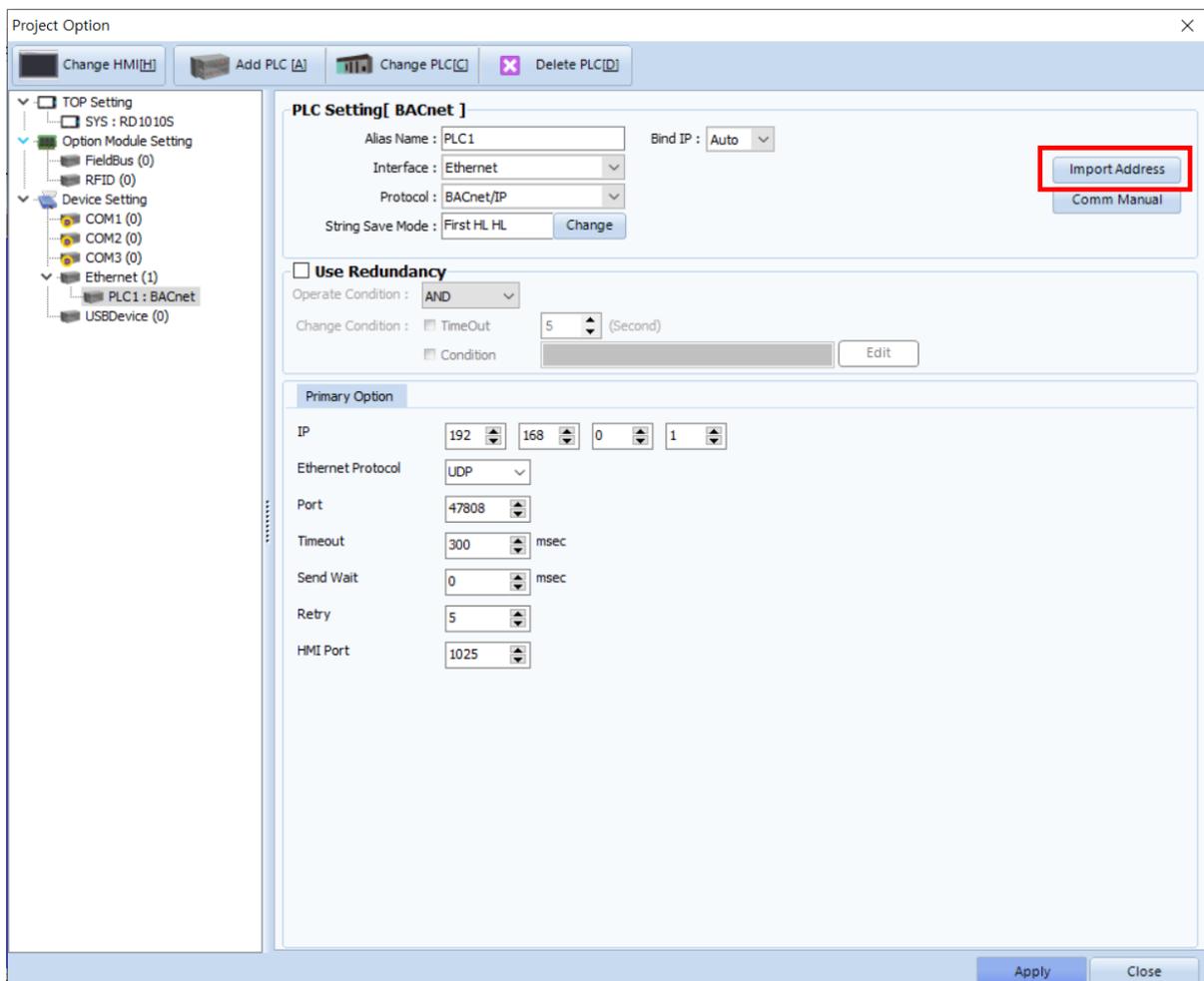
1. When importing by communication, the PC running TOP Design Studio and the BACnet device must be connected to the same network.
 2. When importing by communication, the name of the address is registered as the contents of Description among the properties of the object.
 3. You cannot use " ` " characters in the name of the address.
 4. The description field of the address shows [Object type, Instance number, Properties].
- Ex) If there is an Analog Input object whose instance number is 100 and Description is "AI_100", it is registered as follows.

Name	Data type	Description
AI_100	REAL	AI.00100.PresentValue

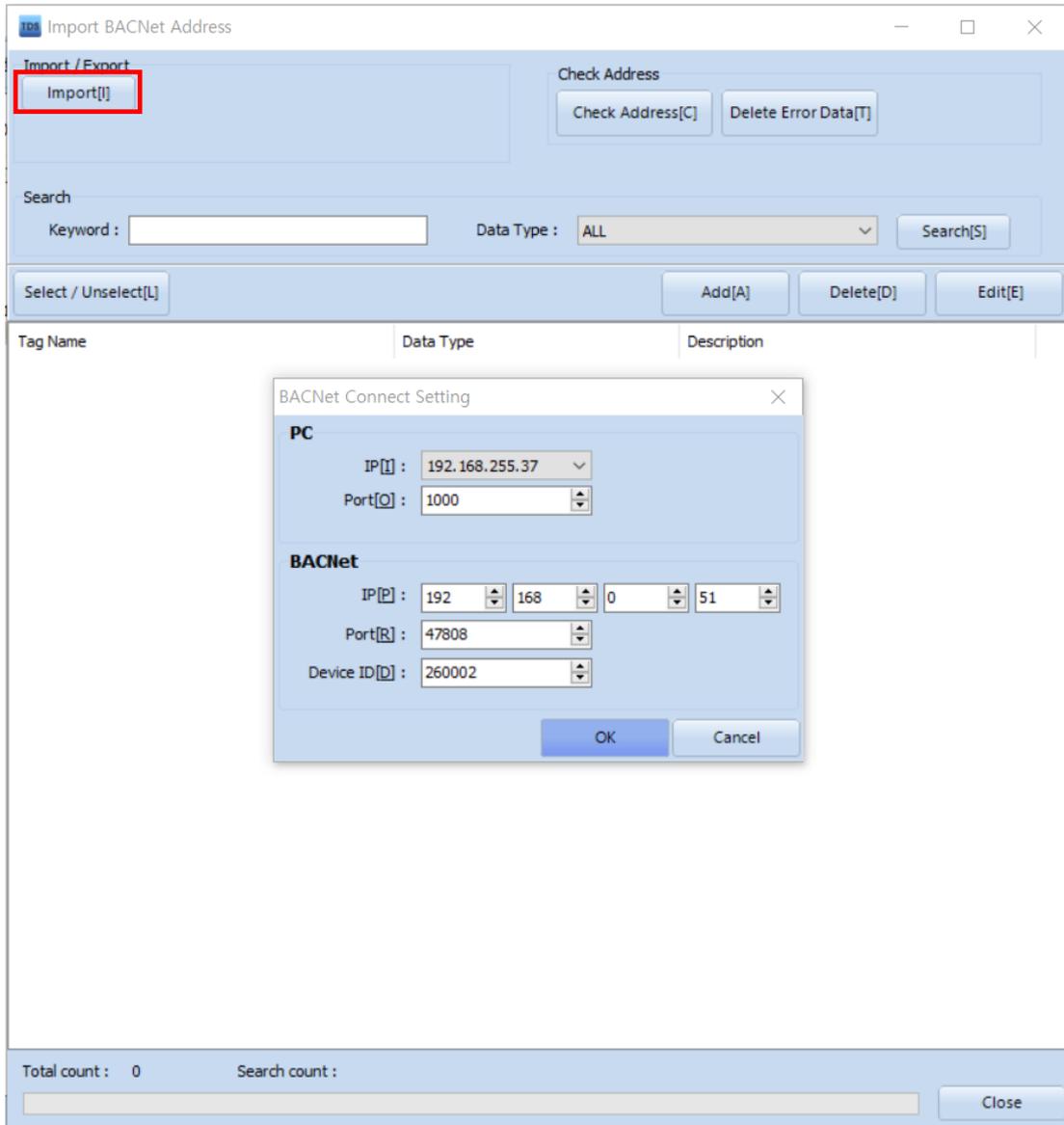
5. Import by communication function registers only Present Value as an address among object's properties. Other properties can be registered by entering the address name, object type, instance number and property with the "Add" button.

■ How to use Import Address

Step 1. Execute "Import Address" among PLC setting items in TOP Design Studio.



Step 2. Click the Import button to enter the IP and device ID (Instance No.) of the corresponding device, and then click the OK button.



■ Object and property supported by TOP Design Studio

※ Character String data type supports up to 80 characters.

Character String data type supports ANSI X3.4 encoding method.

OBJECT TYPE	PROPERTY	Remarks
Analog Input (AI)	ObjectIdentifier	
	ObjectName	
	ObjectType	
	PresentValue	
	Description	
	DeviceType	
	StatusFlags	
	EventState	
	Reliability	
	OutOfService	
	UpdateInterval	
	Units	
	MinPresValue	
	MaxPresValue	
	Resolution	
	COVIncrement	
	TimeDelay	
	NotificationClass	
	HighLimit	
	LowLimit	
	Deadband	
	LimitEnable	
	EventEnable	
AckedTransition		
NotifyType		
EventTimeStamps		
ProfileName		
Analog Output (AO)	ObjectIdentifier	
	ObjectName	
	ObjectType	
	PresentValue	
	Description	
	DeviceType	
	StatusFlags	
	EventState	
	Reliability	
	OutOfService	
	UpdateInterval	
	Units	
	MinPresValue	
	MaxPresValue	
	Resolution	
	PriorityArray	
	RelinquishDefault	
	COVIncrement	
	TimeDelay	
	NotificationClass	
	HighLimit	
	LowLimit	



OBJECT TYPE	PROPERTY	Remarks
	Deadband	
	LimitEnable	
	EventEnable	
	AckedTransition	
	NotifyType	
	EventTimeStamps	
	ProfileName	
Analog Value (AV)	ObjectIdentifier	
	ObjectName	
	ObjectType	
	PresentValue	
	Description	
	StatusFlags	
	EventState	
	Reliability	
	OutOfService	
	Units	
	PriorityArray	
	RelinquishDefault	
	COVIncrement	
	TimeDelay	
	NotificationClass	
	HighLimit	
	LowLimit	
	Deadband	
	LimitEnable	
	EventEnable	
	AckedTransition	
	NotifyType	
	EventTimeStamps	
	ProfileName	
	Binary Input (BI)	ObjectIdentifier
ObjectName		
ObjectType		
PresentValue		
Description		
DeviceType		
StatusFlags		
EventState		
Reliability		
OutOfService		
Polarity		
InactiveText		
ActiveText		
ChangeOfStateTime		
ChangeOfStateCount		
TimeOfStateCountReset		
ElapsedActiveTime		
TimeOfActiveTimeReset		
TimeDelay		
NotificationClass		
AlarmValue		
EventEnable		



OBJECT TYPE	PROPERTY	Remarks	
	AckedTransition		
	NotifyType		
	EventTimeStamps		
	ProfileName		
Binary Output (BO)	ObjectIdentifier		
	ObjectName		
	ObjectType		
	PresentValue		
	Description		
	DeviceType		
	StatusFlags		
	EventState		
	Reliability		
	OutOfService		
	Polarity		
	InactiveText		
	ActiveText		
	ChangeOfStateTime		
	ChangeOfStateCount		
	TimeOfStateCountReset		
	ElapsedActiveTime		
	TimeOfActiveTimeReset		
	MinimumOffTime		
	MinimumOnTime		
	PriorityArray		
	RelinquishDefault		
	TimeDelay		
	NotificationClass		
	FeedbackValue		
	EventEnable		
	AckedTransition		
	NotifyType		
	EventTimeStamps		
	ProfileName		
	Binary Value (BV)	ObjectIdentifier	
		ObjectName	
ObjectType			
PresentValue			
Description			
StatusFlags			
EventState			
Reliability			
OutOfService			
InactiveText			
ActiveText			
ChangeOfStateTime			
ChangeOfStateCount			
TimeOfStateCountReset			
ElapsedActiveTime			
TimeOfActiveTimeReset			
MinimumOffTime			
MinimumOnTime			
PriorityArray			



OBJECT TYPE	PROPERTY	Remarks
	RelinquishDefault	
	TimeDelay	
	NotificationClass	
	AlarmValue	
	EventEnable	
	AckedTransition	
	NotifyType	
	EventTimeStamps	
	ProfileName	
Calendar (CD)	ObjectIdentifier	
	ObjectName	
	ObjectType	
	PresentValue	
	DateList	
Command (CM)	ObjectIdentifier	
	ObjectName	
	ObjectType	
	PresentValue	
	InProcess	
	AllWritesSuccessful	
Device (DV)	ObjectIdentifier	
	ObjectName	
	ObjectType	
	SystemStatus	
	VendorName	
	VendorId	
	ModelName	
	FirmwareRevision	
	ApplicationSoftwareVersion	
	ProtocolVersion	
	ProtocolRevision	
	MaxAPDUlengthAccepted	
	SegmentationSupported	
	ApduTimeout	
	NumberOfAPDUretries	
	DataBaseRevision	
	MaxSegmentsAccepted	
	DaylightSavingsStatus	
	ApduSegmentTimeout	
	BackupFailureTimeout	
Event Enrollment (ER)	ObjectIdentifier	
	ObjectName	
	ObjectType	
	Description	
	EventType	
	NotifyType	
	EventParameter	
	ObjectPropertyReference	
	EventState	
	EventEnable	
	AckedTransitions	
	NotificationClass	
	Recipient	



OBJECT TYPE	PROPERTY	Remarks
	ProcessIdentifier	
	Priority	
	IssueConfirmedNotification	
File (FI)	ObjectIdentifier	
	ObjectName	
	ObjectType	
	FileType	
	FileSize	
	Archive	
	ReadOnly	
Group (GR)	ObjectIdentifier	
	ObjectName	
	ObjectType	
	Description	
	ListOfGoupMembers	
Loop (LP)	ObjectIdentifier	
	ObjectName	
	ObjectType	
	PresentValue	
	Description	
Life Safety Point (LSP)	ObjectIdentifier	
	ObjectName	
	ObjectType	
	PresentValue	
	TrackingValue	
	EventState	
	Reliability	
	OutOfService	
	Mode	
	Silenced	
Life Safety Zone (LSZ)	ObjectIdentifier	
	ObjectName	
	ObjectType	
	PresentValue	
	TrackingValue	
	EventState	
	Reliability	
	OutOfService	
	Mode	
	Silenced	
Multi State Input (MI)	ObjectIdentifier	
	ObjectName	
	ObjectType	
	PresentValue	
	EventState	
	OutOfService	
	Reliability	
	NumberofStates	
	TimeDelay	
	NotifyClass	
	NotifyType	
	ProfileName	



OBJECT TYPE	PROPERTY	Remarks
Multi State Output (MO)	ObjectIdentifier	
	ObjectName	
	ObjectType	
	PresentValue	
	EventState	
	OutOfService	
	Reliability	
	NumberOfStates	
	TimeDelay	
	NotifyClass	
	NotifyType	
	ProfileName	
	Multi State Value (MV)	ObjectIdentifier
ObjectName		
ObjectType		
PresentValue		
EventState		
OutOfService		
Reliability		
NumberOfStates		
TimeDelay		
NotifyClass		
NotifyType		
ProfileName		
Notification Class (NC)		ObjectIdentifier
	ObjectName	
	ObjectType	
	NotifyClass	
Program (PG)	ObjectIdentifier	
	ObjectName	
	ObjectType	
	Description	
	ProgramState	
	ProgramChange	
	ReasonForHalt	
	DescriptionOfHalt	
	ProgramLocation	
	InstanceOf	
	StatusFlags	
	Reliability	
	OutOfService	
Schedule (SC)	ObjectIdentifier	
	ObjectName	
	ObjectType	
	PriorityForWriting	
Trend Log (TL)	ObjectIdentifier	
	ObjectName	
	ObjectType	
	Enable	
	StopWhenFull	
	BufferSize	
	RecordCount	
TotalRecordCount		