OMRON Industrial Automation
Mobile Robot LD Series
Ethernet Driver

Supported version TOP Design Studio V1.4.10.22 or higher

CONTENTS

We want to thank our customers who use the Touch Operation Panel.

1. System configuration

The system configurations of TOP and "OMRON Industrial Automation – Mobile Robot LD Series" are as follows:

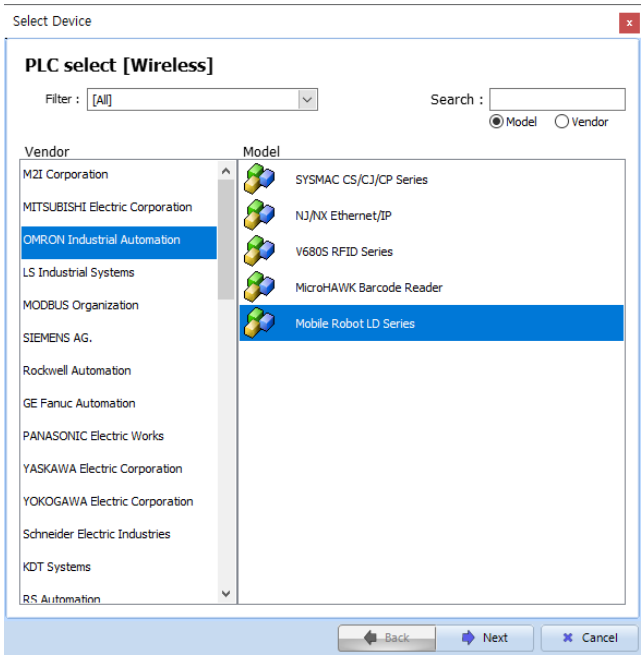
Series	Model	Communication method	System setting	Cable
LD	LD-60 LD-90	Ethernet	3. TOP communication setting 4. External device setting	Wireless

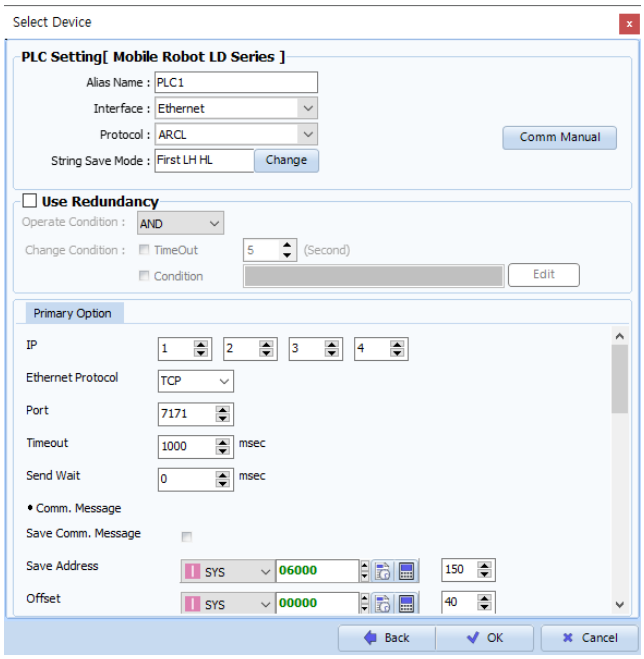
■ Connectable configuration

・N : N connection

2. External device selection

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





Settings		Contents
TOP	Model	Select the TOP model.
External device	Vendor	Select the vendor of the external device to be connected to TOP. Please select "OMRON Industrial Automation".
	PLC	Select the external device to be connected to the TOP. **Model** / **Interface** / **Protocol** Mobile Robot LD Series / Ethernet / ARCL 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

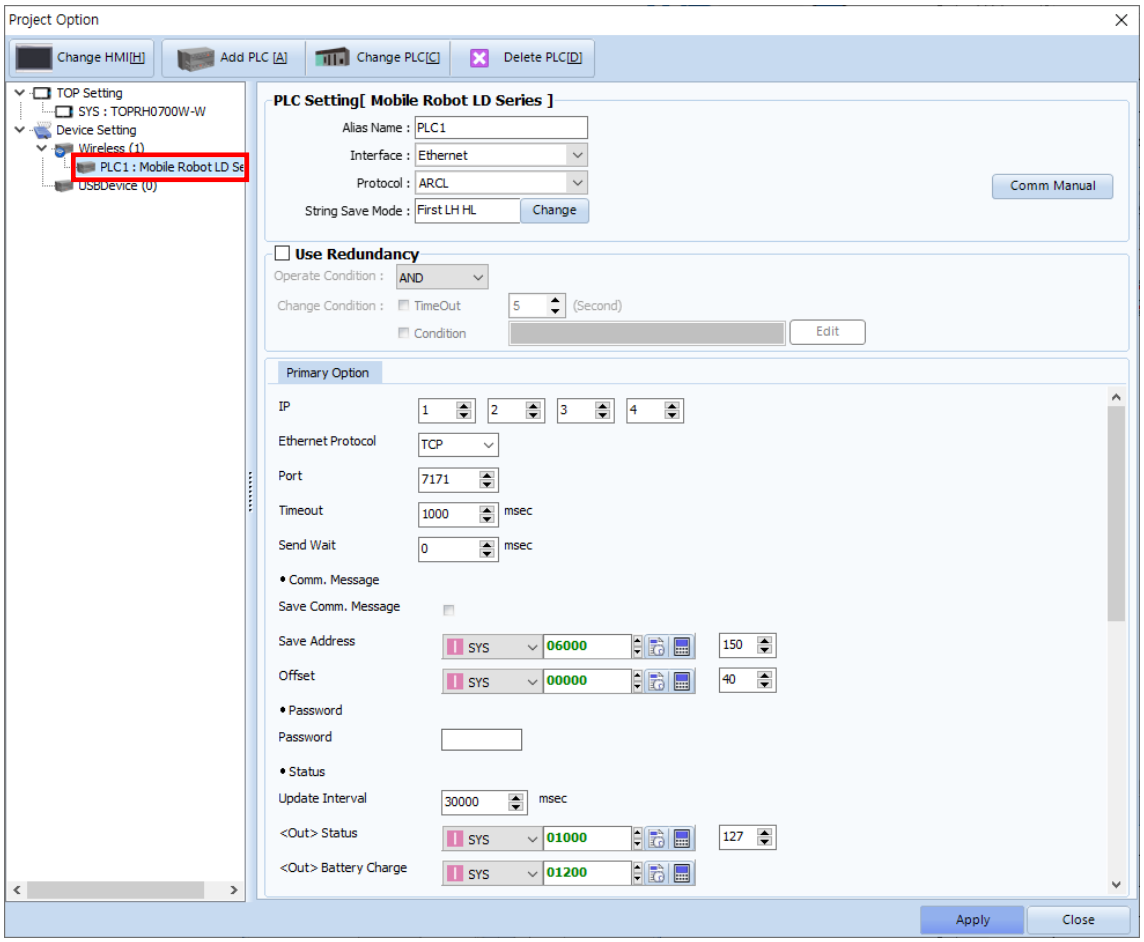
(1) Communication interface setting

The Wi-Fi connection setting of TOP-RH-W is possible only on the main unit.

(2) Communication option setting

■ [Project] → [Project Property] → [Device Setting > Wireless > PLC1 : Mobile Robot LD Series]

– Set the options of the Mobile Robot LD Series communication driver in TOP Design Studio.



Items	Settings	Remarks
Interface	Select “Ethernet”.	2. External device selection
Protocol	Select "ARCL".	
IP	Enter the IP address of the external device.	
Ethernet Protocol	Select the Ethernet protocol between the TOP and an external device.	
Port	Enter the Ethernet communication port number of an external device.	
TimeOut (ms)	Set the time to wait for a response from an external device.	
SendWait (ms)	Set the waiting time before sending a data request to an external device.	

● **Comm. Message**

Items	Settings	Remarks
Save Comm. Message	Set whether to use the message save function or not.	
Save Address	Set the starting address and length (bytes per line) of the TOP internal buffer where messages are saved.	
Offset	Set the starting address and number of lines in the TOP internal buffer where the offset value of a message is saved.	

● **Password**

Items	Settings	Remarks
Password	Enter the ARCL connection password of the Mobile Robot.	

● **Status command**

Items	Settings	Remarks
Update Interval	Set the Update Interval.	
Status	Set the starting address and length (bytes) of the TOP internal buffer where the current status is saved.	String
Battery Charge	Set the TOP internal buffer address in which the battery charging rate value is saved.	32-bit Float
Location X	Set the TOP internal buffer address in which an X coordinate value is saved.	32-bit Dec
Location Y	Set the TOP internal buffer address in which a Y coordinate value is saved.	32-bit Dec
Location Theta	Set the TOP internal buffer address in which a Theta value is saved.	32-bit Dec
Localization Score	Set the TOP internal buffer address in which a position accuracy value is saved.	32-bit Float
Temperature	Set the TOP internal buffer address in which a temperature value is saved.	32-bit Float

● **GoTo command**

Items	Settings	Remarks
Goal	Set the TOP internal buffer address and length (bytes) to enter a destination.	String
Arrived at	Set the TOP internal buffer address and length (bytes) in which a destination is saved when GoTo operation is completed.	String

● **DoTask command**

Items	Settings	Remarks
Task	Set the TOP internal buffer address and length (bytes) to enter a task.	String
Argument	Set the TOP internal buffer address and length (bytes) to enter the argument corresponding to the task.	String

● **Patrol command**

Items	Settings	Remarks
Route	Set the TOP internal buffer address and length (bytes) to enter a route.	String

● **Say command**

Items	Settings	Remarks
Text	Set the TOP internal buffer address and length (bytes) to enter a text string.	String

● **Play command**

Items	Settings	Remarks
File	Set the TOP internal buffer address and length (bytes) to enter a file path and name.	String

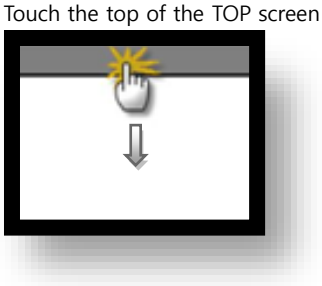
● **I/O**

Items	Settings	Remarks
Update Interval	Set the Update Interval.	

3.2. Communication setting in TOP

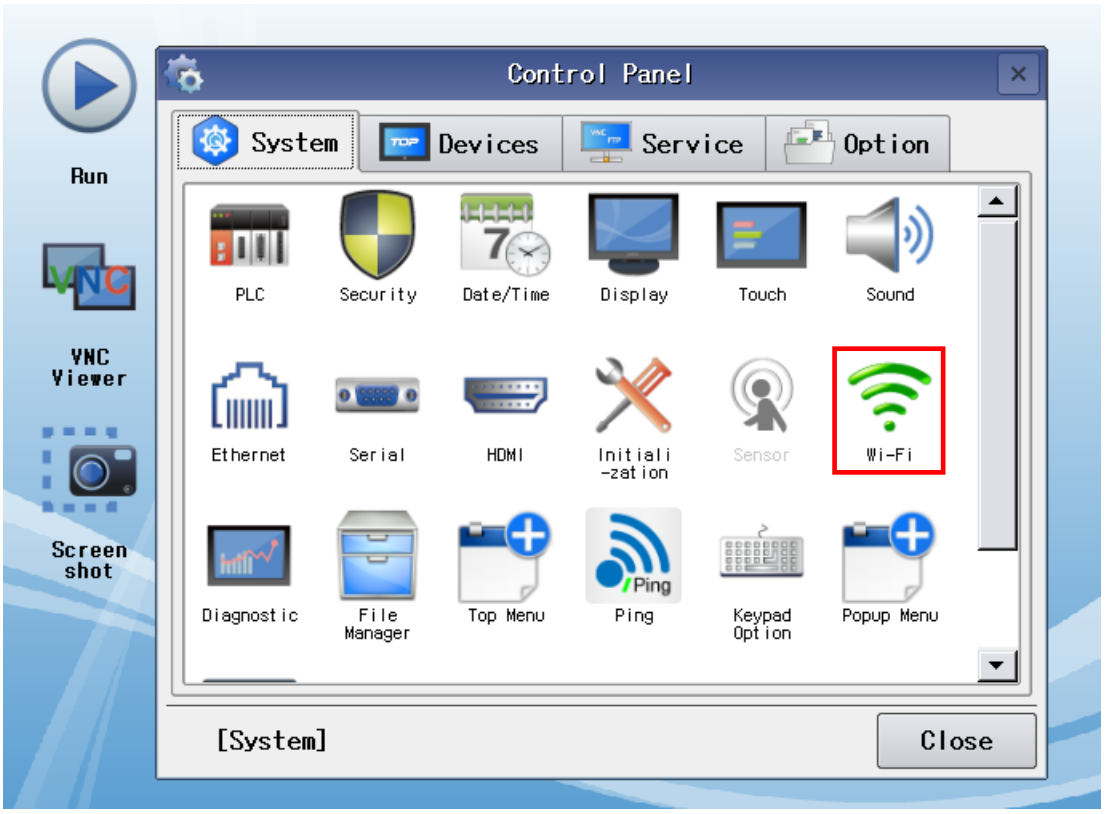
*** This is a setting method when "Use HMI Setup" in the setting items in "3.1 TOP Design Studio" is not checked.**

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



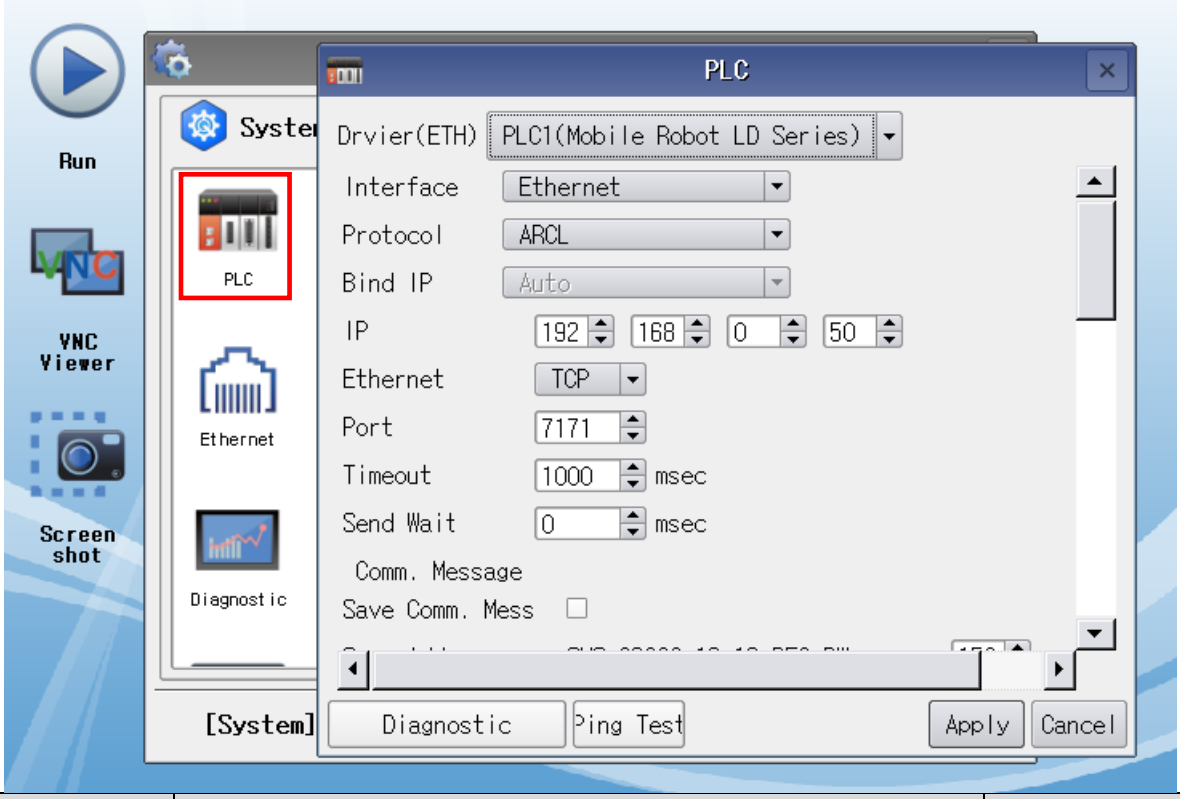
(1) Communication interface setting

■ [Control Panel] → [System] → [Wi-Fi]



(2) Communication option setting

■ [Control Panel] → [System] → [PLC]



Items	Settings	Remarks
Interface	Select “Ethernet”.	2. External device selection
Protocol	Select "ARCL".	
IP	Enter the IP address of the external device.	
Ethernet Protocol	Select the Ethernet protocol between the TOP and an external device.	
Port	Enter the Ethernet communication port number of 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 before TOP sends a data request to an external device.	

* Except for the above basic options and password, the rest of the options are interlocked with the drawing. Do not change the main unit.

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 that the settings in [Control Panel] → [Wi-Fi] are those which can be connected to an external device.

■ Diagnosis of whether the port communication is normal or not

- Touch "Communication Diagnostics" in [Control Panel] → [System] → [PLC].
- A communication diagnostics result window pops up on the screen to determine the diagnosis 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

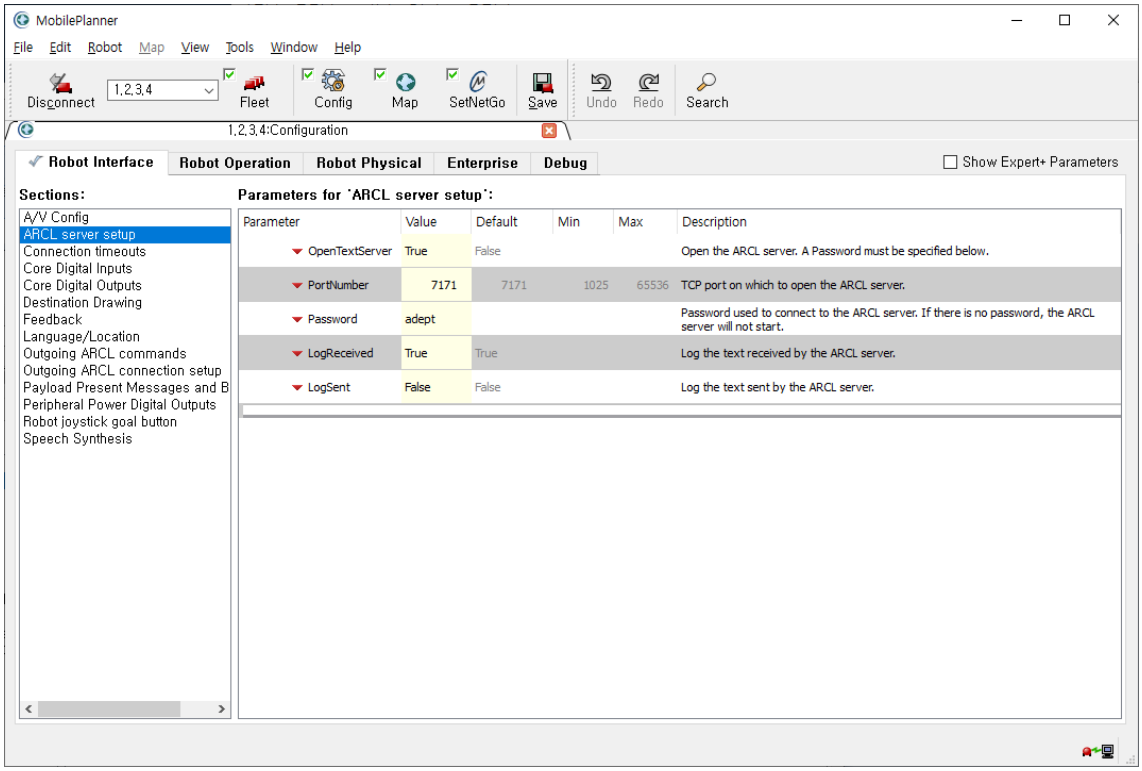
- If there is a problem with the communication connection with an external terminal, please check the settings in the sheet below.

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	4. External device setting
	Communication port name		OK	NG	
	Protocol		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	5. Supported addresses (For details, please refer to the PLC vendor's manual.)

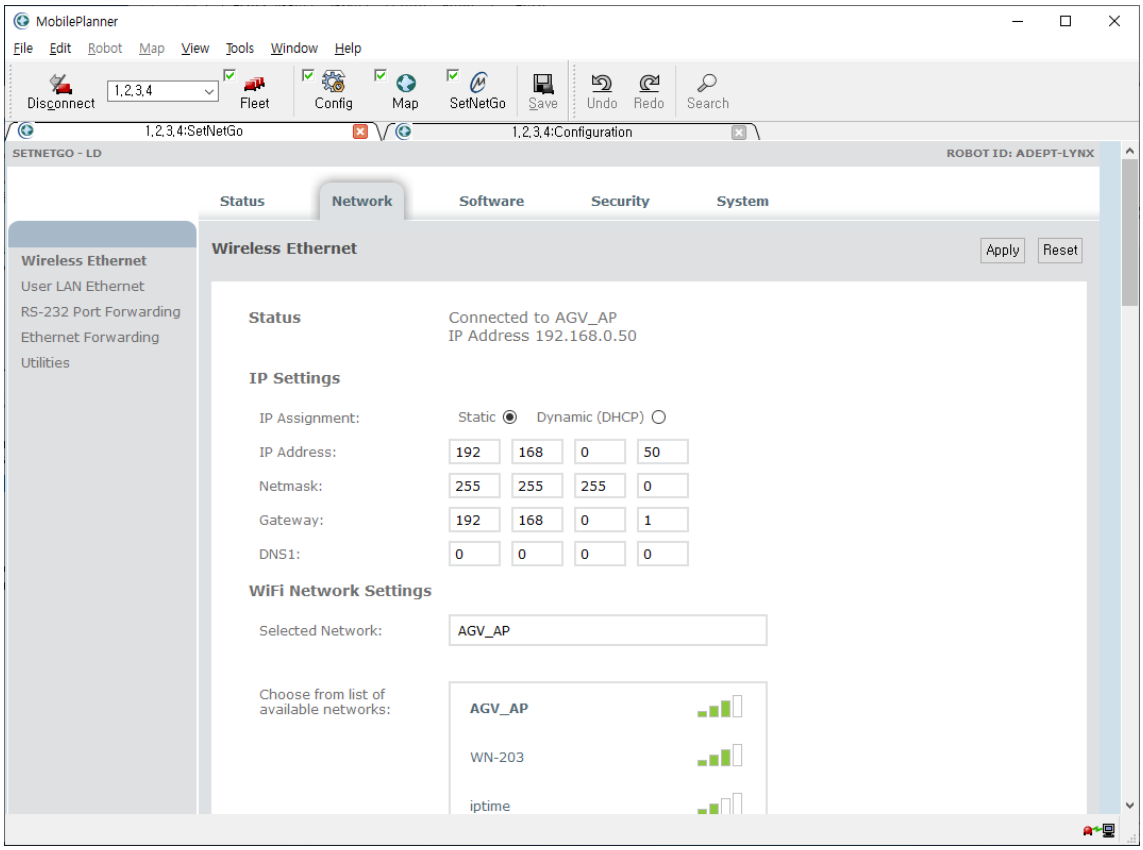
4. External device setting

Activate the ARCL of Mobile Robot and set IP, port and password.

Step 1. Activate ARCL server in [Config] → [ARCL server setup].



Step 2. Set the IP of the Mobile Robot and the router to be connected in [SetNetGo] → [Network] → [Wireless Ethernet].



5. Supported addresses and how to use them

Describes the supported address and drawing method of the Mobile Robot LD Series driver.

Address	Description	Remarks
CONNECTION	Information on the status of communication connection with the robot	
STATUS	Manual update of robot status	
GOTO	Go to destination	
ARRIVED	Moving to destination completed	
ERROR	An error occurs while executing a command	
STOP	Stop	
DOCK	Go to charging station	
DOCKED	Docked at the charging station	
DOTASK	Perform a specified task	
PATROL	Route patrol	
SAY	Output the entered string in voice	
PLAY	*.wav sound file playback	
I1–16	Core Digital Inputs	*Note 1)
O1–16	Core Digital Outputs	*Note 1)

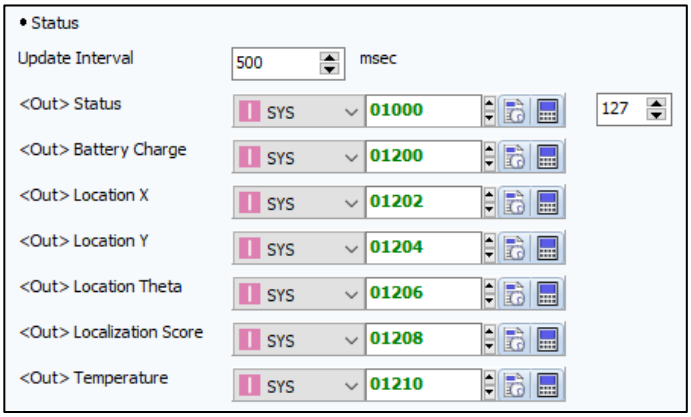
*Note 1) Check [Alias] of I/O. Reference) I/O settings

■ How to use the address

● STATUS

Updates the robot's status information manually.

The received status information is saved in the TOP internal address of the [Status] items of the communication option.



Current status (ASCII data)

Charging rate (32-bit Float data)

X coordinate (32-bit Dec data)

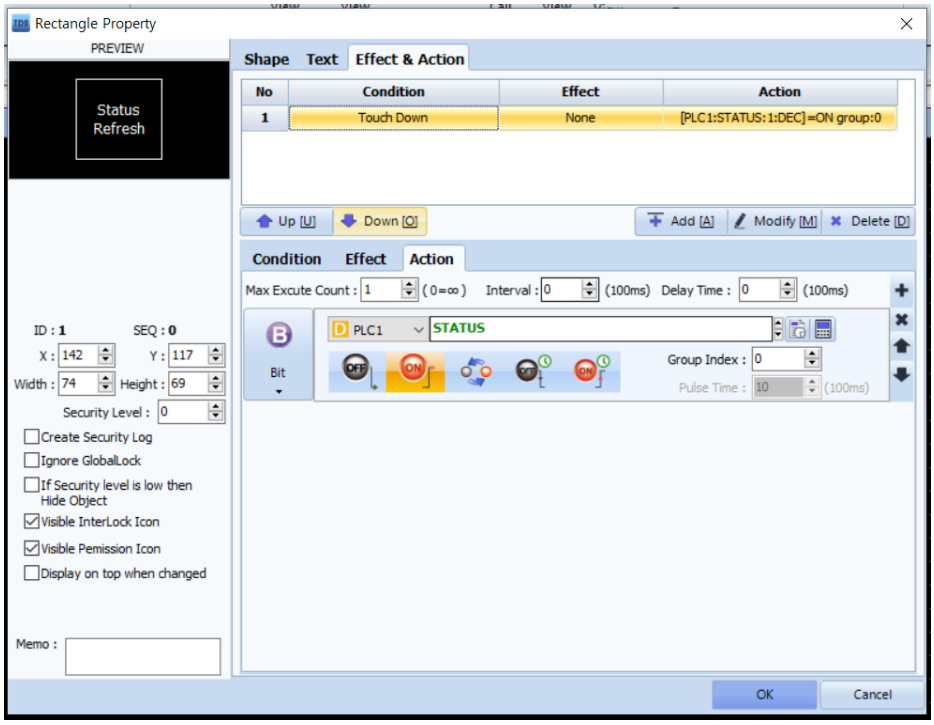
Y coordinate (32-bit Dec data)

Theta value (32-bit Dec data)

Position accuracy (32-bit Float data)

Temperature (32-bit Float data)

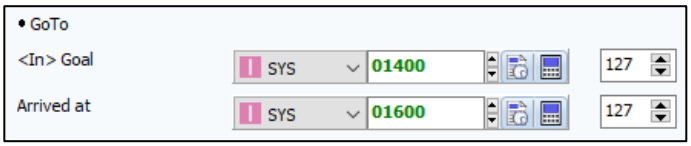
Example)



When pressed, enter ON in STATUS → update status information.

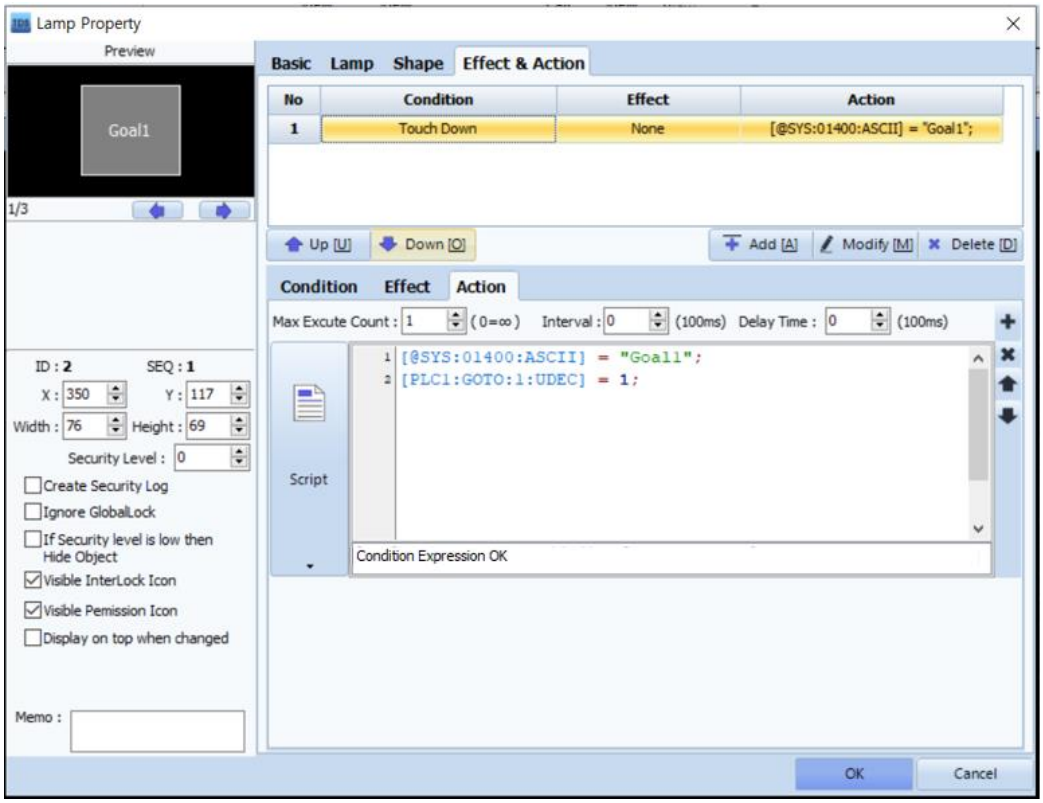
- **GOTO & ARRIVED**

When ON is entered in the GOTO address, the device goes to the destination entered in the [GoTo-Goal] address.
When OFF is entered in the GOTO address, a stop command is sent.
The GOTO address remains ON while moving by the goto command.
When arriving at the destination, the ARRIVED address becomes ON and the destination is saved in the [GoTo-Arrived at] address.

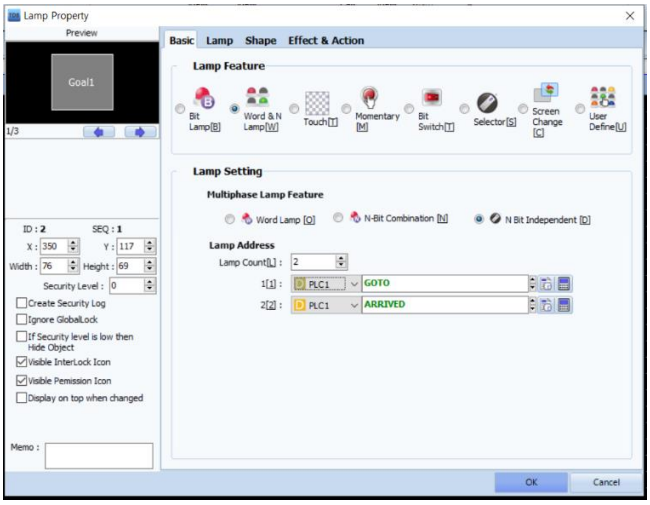


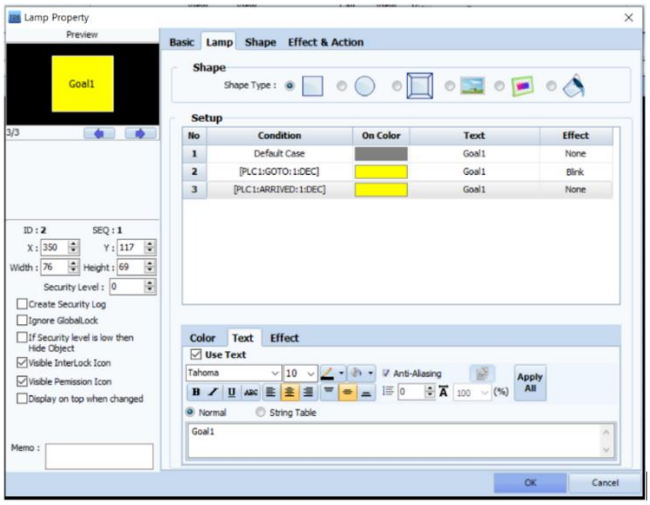
Goal entering address & length set in the map
Arrived Goal storage address & length

Example)



When pressed, enter a destination in Goal entering address + Enter GOTO address ON → Move to "Goal1".





Blink while executing goto command + keep ON lamp upon arrival

When there are several destinations, you can compare the strings in the Status address to find out what action is being performed.

If Goal1, Goal2, and Goal3 are set in the map, you can write the script as follows to distinguish the destination from the end.

```
// Status 주소: [@SYS:01000:127:ASCII]
if( [@SYS:01000:127:ASCII] == "Going to Goal1" )
{
    // Goal1로 이동중
}
else if( [@SYS:01000:127:ASCII] == "Going to Goal2" )
{
    // Goal2로 이동중
}
else if( [@SYS:01000:127:ASCII] == "Going to Goal3" )
{
    // Goal3으로 이동중
}
```

```
// Status 주소: [@SYS:01000:127:ASCII]
if( [@SYS:01000:127:ASCII] == "Arrived at Goal1" )
{
    // Goal1에 도착
}
else if( [@SYS:01000:127:ASCII] == "Arrived at Goal2" )
{
    // Goal2에 도착
}
else if( [@SYS:01000:127:ASCII] == "Arrived at Goal3" )
{
    // Goal3에 도착
}
```

- **DOCK & DOCKED**

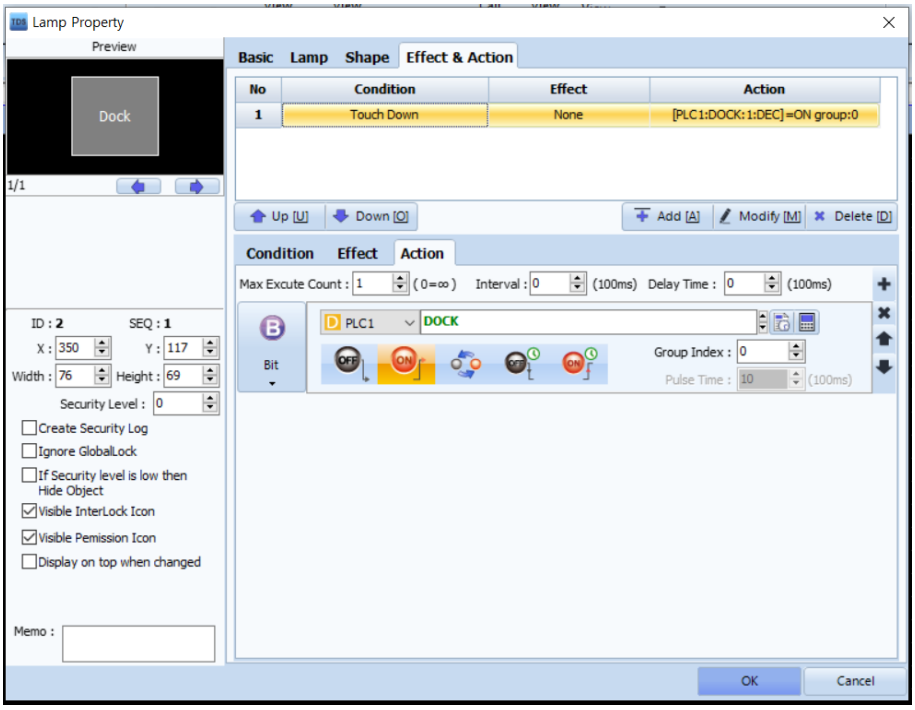
  When ON is entered in the DOCK address, the device goes to the charging station.

  When OFF is entered in the DOCK address, a stop command is sent.

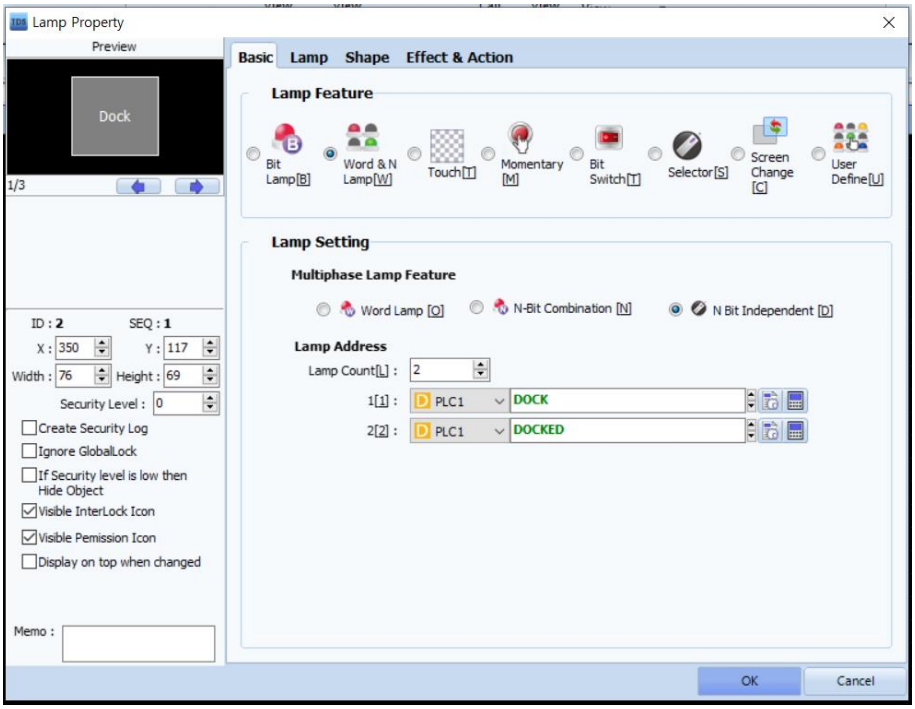
  The DOCK address remains ON while going to the charging station.

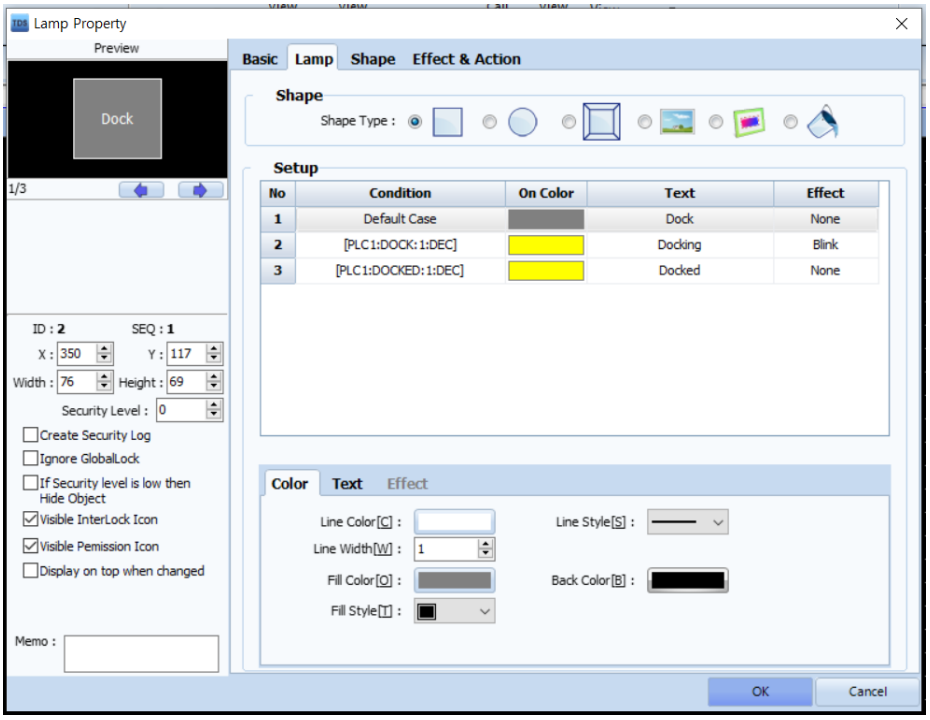
  When the robot is in the charging station, the DOCKED address remains ON.

Example)



When pressed, enter ON in DOCK address → Send goto command to charging station.



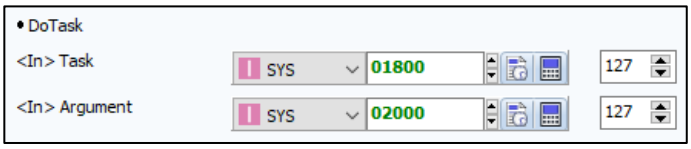


Blink while executing dock command + keep ON lamp upon arrival

- **DOTASK**

When a value is entered in DOTASK, the dotask command is sent as parameters for the task entered in the [DoTask-Task] address and the corresponding task entered in the [DoTask-Argument] address.

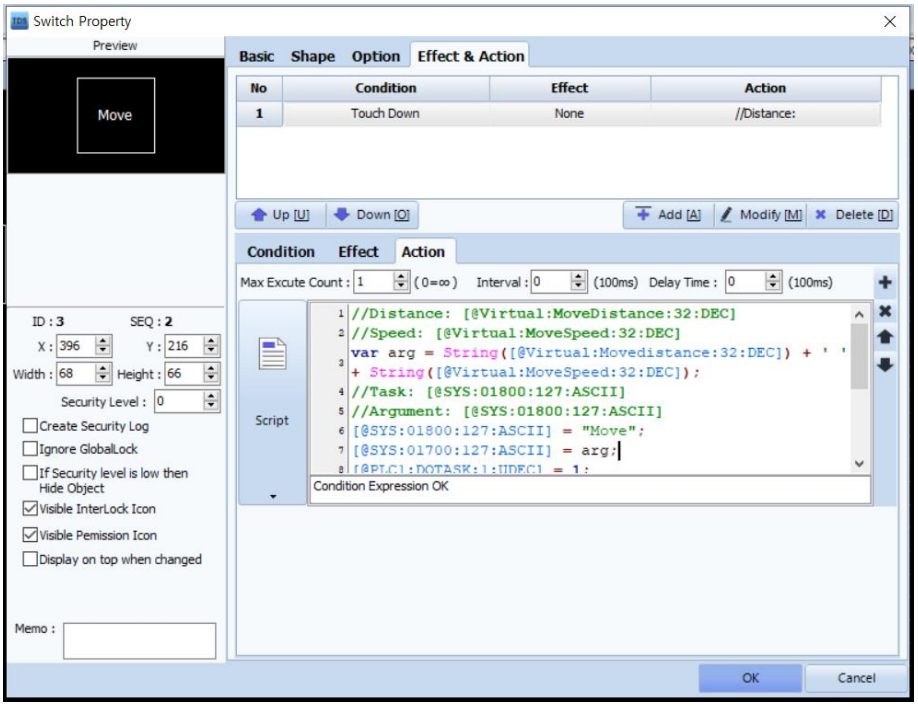
For information on Task and Argument, refer to the vendor's ARCL Command Manual.



Task entering address & length

Argument entering address & length

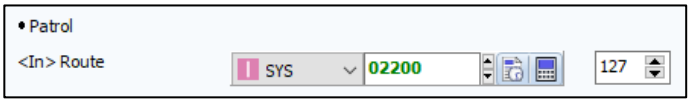
Example)



When pressed, enter "Move" in the task address + enter "[distance] [speed]" in the argument address + enter ON in the DOTASK address → Send dotask command ("dotask move xxxx yyyy")

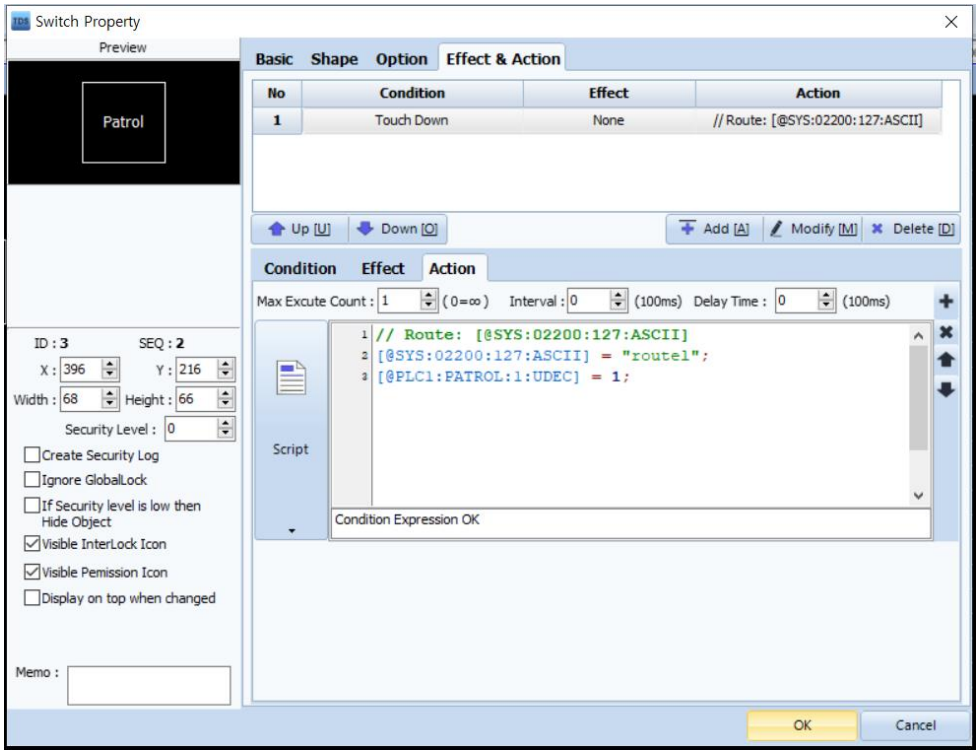
- **PATROL**

When ON is entered in the PATROL address, the route entered in the [Patrol-Route] address is patrolled.
When OFF is entered in the PATROL address, a stop command is sent.
The PATROL address remains ON during patrol.



Route entering address & length set in the map

Example)



When pressed, enter a route in Route address + enter ON in PATROL address → patrol route "Route1".

When there are several routes, you can compare the strings in the Status address to find out what action is being performed.
If Route1, Route2 are set in the map, you can write a script as follows to distinguish the destination from the end.

```
// Status 주소: [@SYS:01000:127:ASCII]
if( [@SYS:01000:127:ASCII] == "Patrolling route Route1" )
{
    // Route1 순찰중
}
else if( [@SYS:01000:127:ASCII] == "Patrolling route Route2" )
{
    // Route2 순찰중
}
```

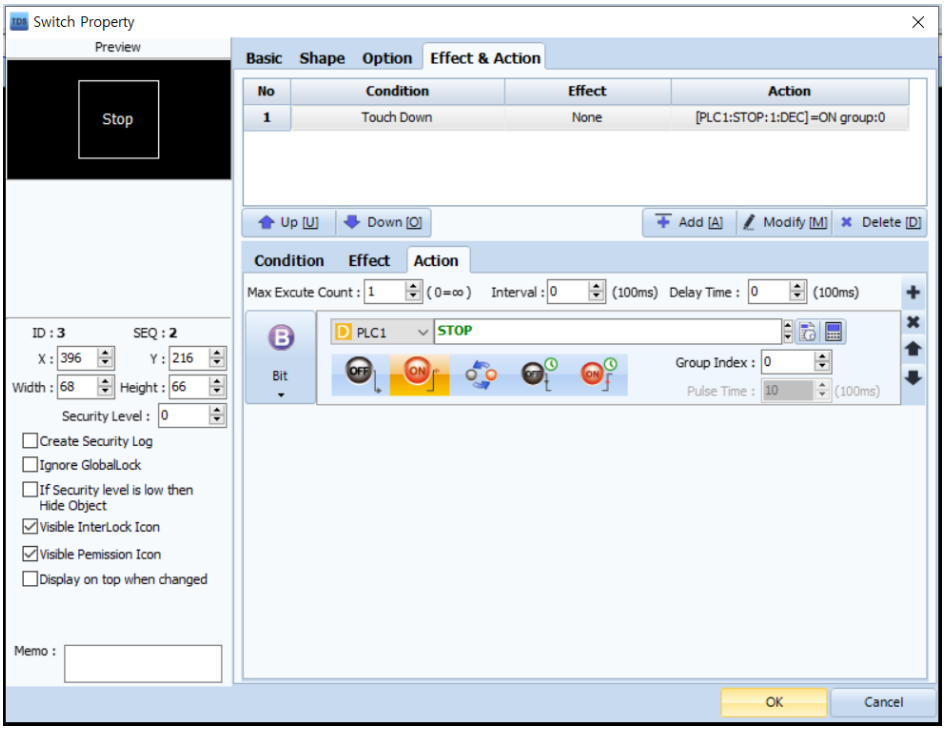
- **ERROR**

  When a problem occurs while the robot is executing a command, the ERROR address remains ON.

- **STOP**

  When a value is entered in STOP, a stop command is sent.

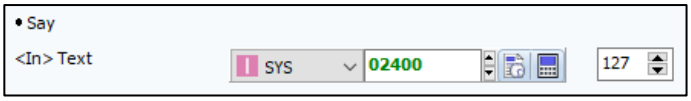
  Example)



  When pressed, enter ON in STOP address → send stop command.

- **SAY**

  When a value is entered in SAY, the character string entered in the [Say-Text] address is outputted as voice.

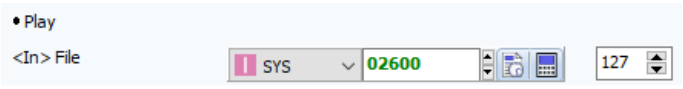


Text entering address & length

  * When using Korean, set [Project Settings > Language > Character Set] to EUC-KR.

- **PLAY**

  When a value is entered in PLAY, the *.wav file entered in the [Play-File] address is played.



File name entering address & length

  * Enter up to the extension name.
    /subfolder1/subfolder2/wavefile.wav

- **I/O**

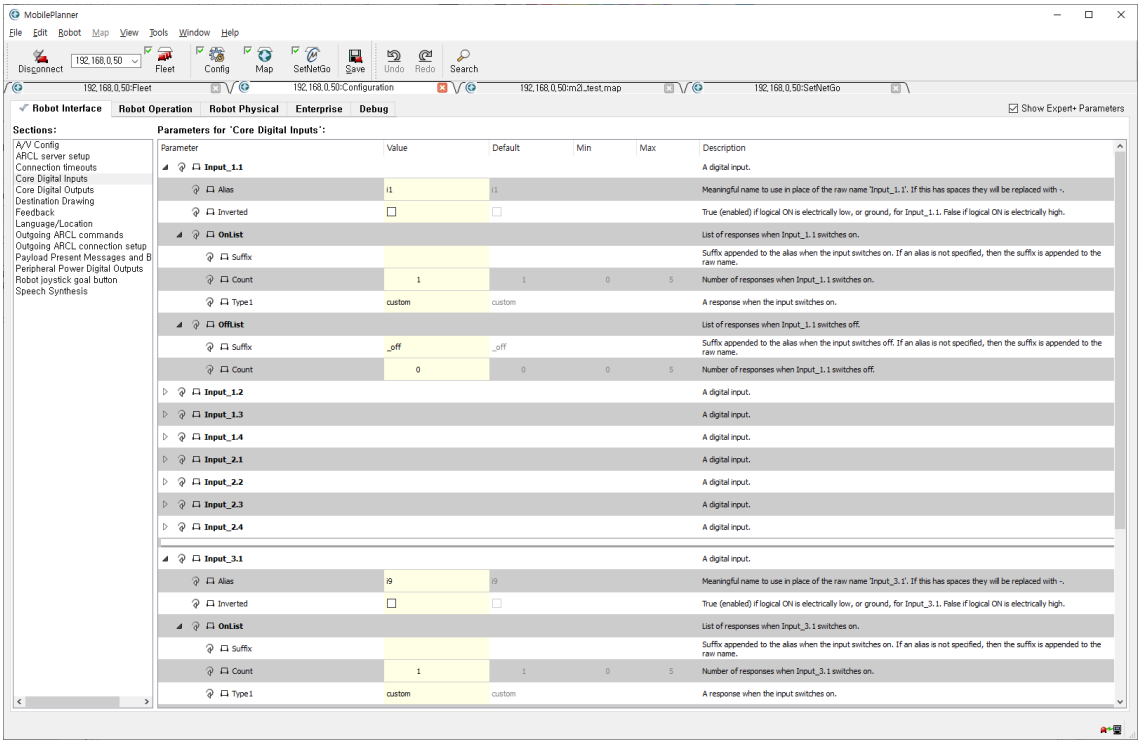
  Displays the Mobile Robot's built-in I/O.

  In order to read/write I/O data in TOP, set [Alias] of I/O as follows:

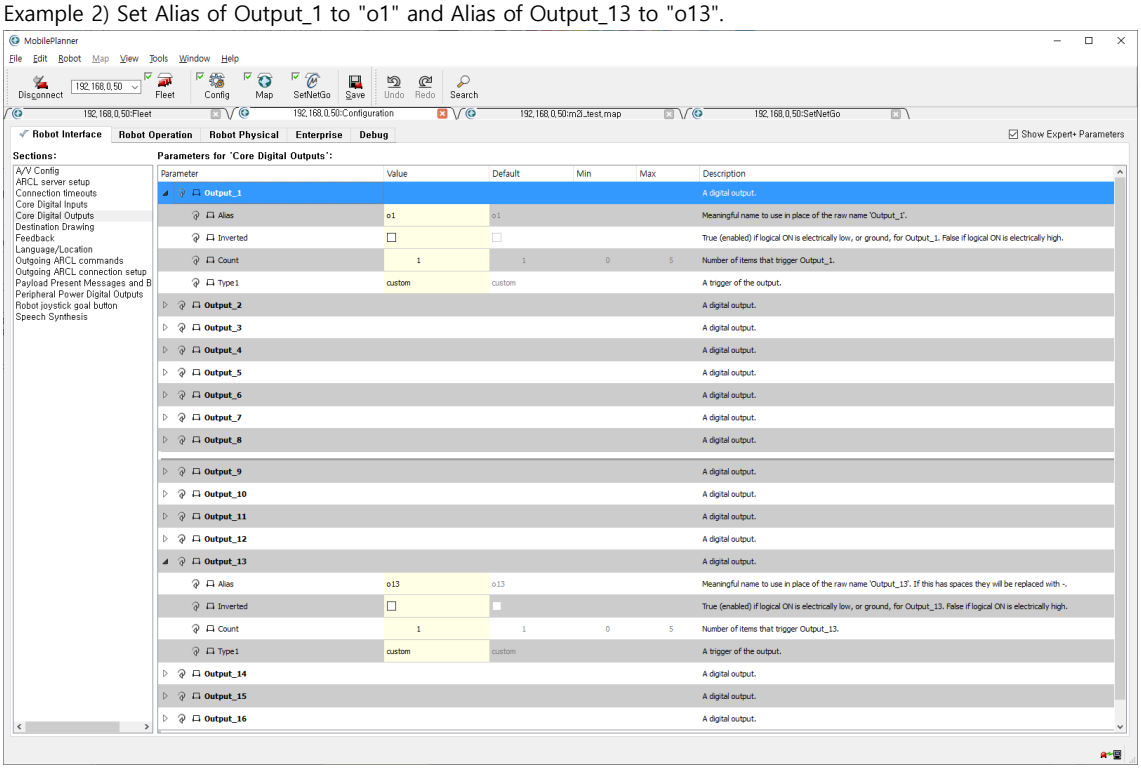
  Set Alias of Inputs to I1 – I16 in order from the top.

  Set Alias of Inputs to O1 – O16 in order from the top.

Example 1) Set Alias of Input_1.1 to "i1", and Alias of Input_3.1 to "i9".



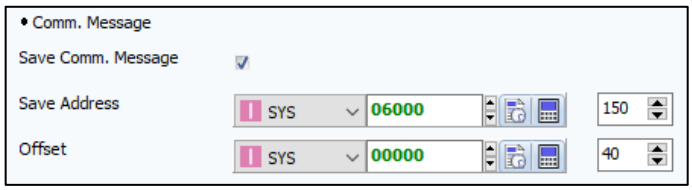
Example 2) Set Alias of Output_1 to "o1" and Alias of Output_13 to "o13".



※ It takes some time until receiving a response data from the robot after requesting 1 I/O data. (50–300ms) Set the I/O update cycle appropriately so that there is no problem with the update rate of other data.

■ Communication message saving function

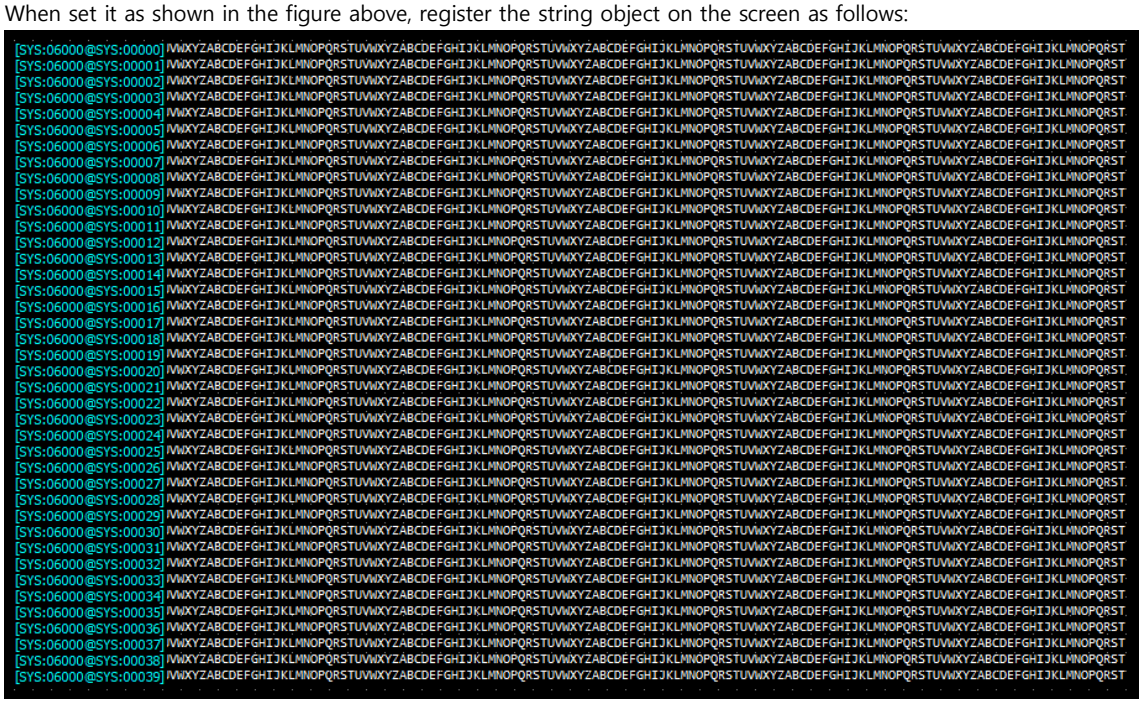
The communication message between the TOP and the robot can be saved in the TOP internal address to be displayed on the screen.

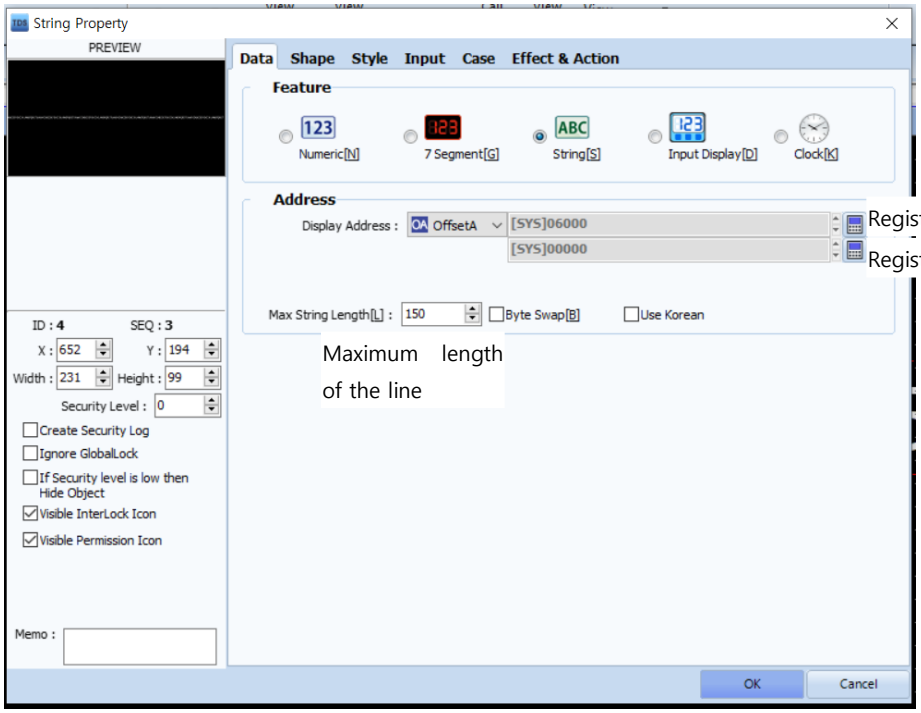


Message saving start address & maximum bytes

Offset saving address & number of lines

When set it as shown in the figure above, register the string object on the screen as follows:





Register all lines in the same way.

Register in increments of 1 per line.

Maximum length of the line

In the Mobile Robot LD Series communication driver, save the communication message in Save Address, and save the offset value, where the next line is saved, as many as the number of lines starting from the Offset address.

* Do not save status messages which are received/sent periodically.