

**M2I Corporation**

# **TOPRHWS**

## **Hardware Manual**

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Thank you for purchasing M2I TOPRHWS.

Please read this user manual carefully for safe installation, wiring, and operation of this equipment before use.

## Chapter 1. Safety Precautions

### ■ Before Use

For safe operation of the equipment, the user is required to read the contents of this manual thoroughly before use. The safety precautions are for the safe and right use of the product. Therefore, please follow the safety precaution so as to prevent accidents and potential dangers.

They are classified into 'warning', 'caution' and each defined as follows.

 <b>Warning</b>	Violating the instruction may result in serious personal injury or death.
 <b>Caution</b>	Violating the instruction may result in slight personal injury or product damage.
	Be cautious, there is a potential danger.
	Be cautious, there is a possibility of an electric shock.

### ■ General Precautions Caution

-  Do not press the screen with a hard or sharp object (awl, screwdriver, pen, etc.) or apply excessive force to it.
-  Do not use or store the product where high vibration can occur.
-  Do not allow foreign objects (e.g. water, liquids, metal powders) into the product.  
This may cause breakage or electric shock.
-  Do not use a radio or mobile phone within a 30-cm radius from the main body.  
A high-frequency radioactive device such as a mobile phone may cause a malfunction to the installation.
-  Do not store or operate in an environment exposed to sunlight.

### ■ Design Precautions Warning

In case that external power supply failure or a product error is suspected, please install a protection circuit outside of the product.

-  As malfunction or/and an output failure of the product may pose a serious threat to the stability of the entire system and a user, the product must be installed with the system physical damage protection units including emergency stop switch, lower/higher limit switch, and interlock circuit for forward/backward motion.
-  When a computer or other external controllers exchange data with the product or control the operation (driving) mode of the main body of the product through communication, it is necessary to set up interlock in the sequence program to protect system communication error.
-  Install output signal or communication lines at least 100mm (3.94 inches) away from a power line  
or  
a high-tension wire.

### ■ Installation Precautions Caution

Do not install the product in temperature ranges out of allowable level. Otherwise, it can damage the product or shorten its service life.

Especially avoid the installation environments below.

-  Ambient temperatures lower than 0°C or higher than 50°C and/or on the surface of the control board where a high-pressure device is installed.
-  Where it is continually exposed to an excessive impact or vibration
-  The space between the rear of the main body and the console box should be at least 100mm for maintenance and ventilation. Do not install a cooling fan in case of installation in a confined space.
-  Use it only indoors.

### ■ Wiring Precautions

-  Before wiring work, check the rated voltage for each component and its terminal layout and make

correct writing. Otherwise, it may cause a fire, electric shock, or/and malfunction.

- ❗ Tighten the terminal screw with the specified torque. The loose screws of the terminal can be the cause of short circuit, a fire, or/and malfunction.

Use a standard earthing for FG terminal. When not earthed, it can cause malfunction.

- ❗ a. It should be triple earth and earthing point, as below, gets as close to the main body as possible and the earth line should be as short as possible.
- ❗ b. Earthing point, as below, gets as close to the main body as possible and the earth line should be as short as possible.

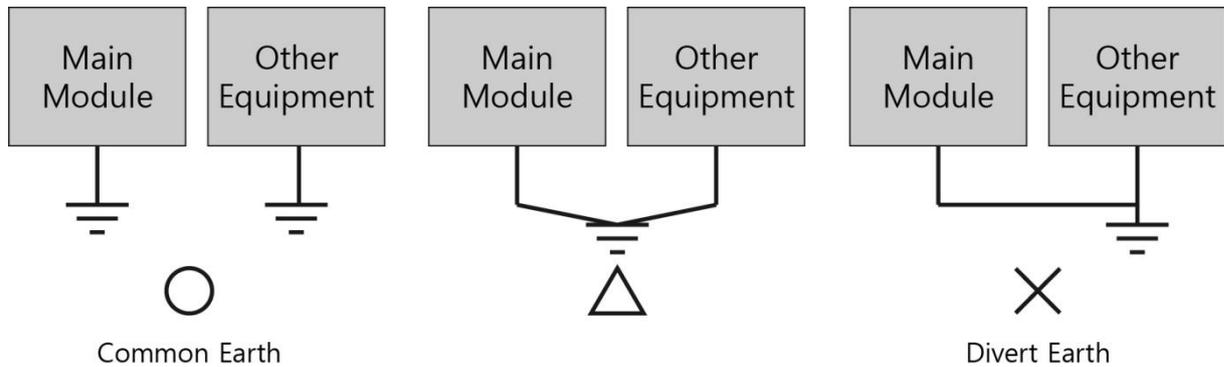


Fig. Grounding Example Diagram

#### ■ Operational Precautions Caution

-  An excessive impact or force may deter the operation of the main body of the product.
-  After challenging work, it is necessary to check the parts related to the main body to know whether they work properly.

It is not recommended at all to operate the facility system at once in which multiple main bodies are installed.

Please avoid a simultaneous operation through a proper configuration.

- ❗ A high-frequency radioactive device such as a mobile phone may cause a malfunction to the installation.

#### ■ Disposal Precautions Caution

When the product needs to be disposed, handle it according to the regulation or standard for industrial waste.

It can generate poisonous substances or has the risk of explosion.

- The wiring work to this product should be done with the insulation source (<23Vdc) with limited voltage and current, and a fuse or Class 2 circuit.

## Chapter 2. Overview

### 2.1 Product

This product is an industrial equipment required for power supply and communication for TOPRH0700WD. Based on RS-232C, RS-422/485, Ethernet, it is aimed primarily to control the power line communication (PLC) of other devices connected to this product.

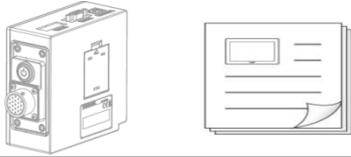
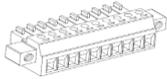
This product and other devices (PLC) are connected, communicated, and controlled through a cable.

This equipment works under DC24V and its ergonomic design ensures an optimal environment that ensures safe work and consistent work for a user when he/she operates and monitors an installation system.

### 2.2 Components

The components of the product are as follows.

Before use, please check that all of the following components are included.

Item	Picture	Quantity
Product and Manual		1
Power Connector		1
EXT. Function Connector		2

- The connection cables to TOPRH0700WD are custom-made (3, 5, and 10 meters in length).

## Chapter 3. General Specifications

### 3.1 Power Specifications

Power	Input Voltage	DC 24V
	Input Voltage Range	DC 20~28V
	Consumption	20W or less

### 3.2 Environment Specifications

Operation Temperature (°C)	-10 ~ +50
Storage Temperature (°C)	-20 ~ +60
Operation Humidity (%RH)	0 ~ 90 (No dew)
Atmosphere	No corrosive gas
Vibration Endurance	Amplitude: 10≤F < 25 Hz(2G) X, Y, Z each direction(for 30 minutes)
Noise Immunity	1000Vp-p(Pulse width 1 μs)
Static Electricity Discharge	Connective discharge from EN61000-4-2: ±4 kV
Shock Endurance	10G X, Y, Z each direction (for 3 times)
Surge Voltage	500V(Line-Line)
Ground Connection	Class 3(100Ω under)

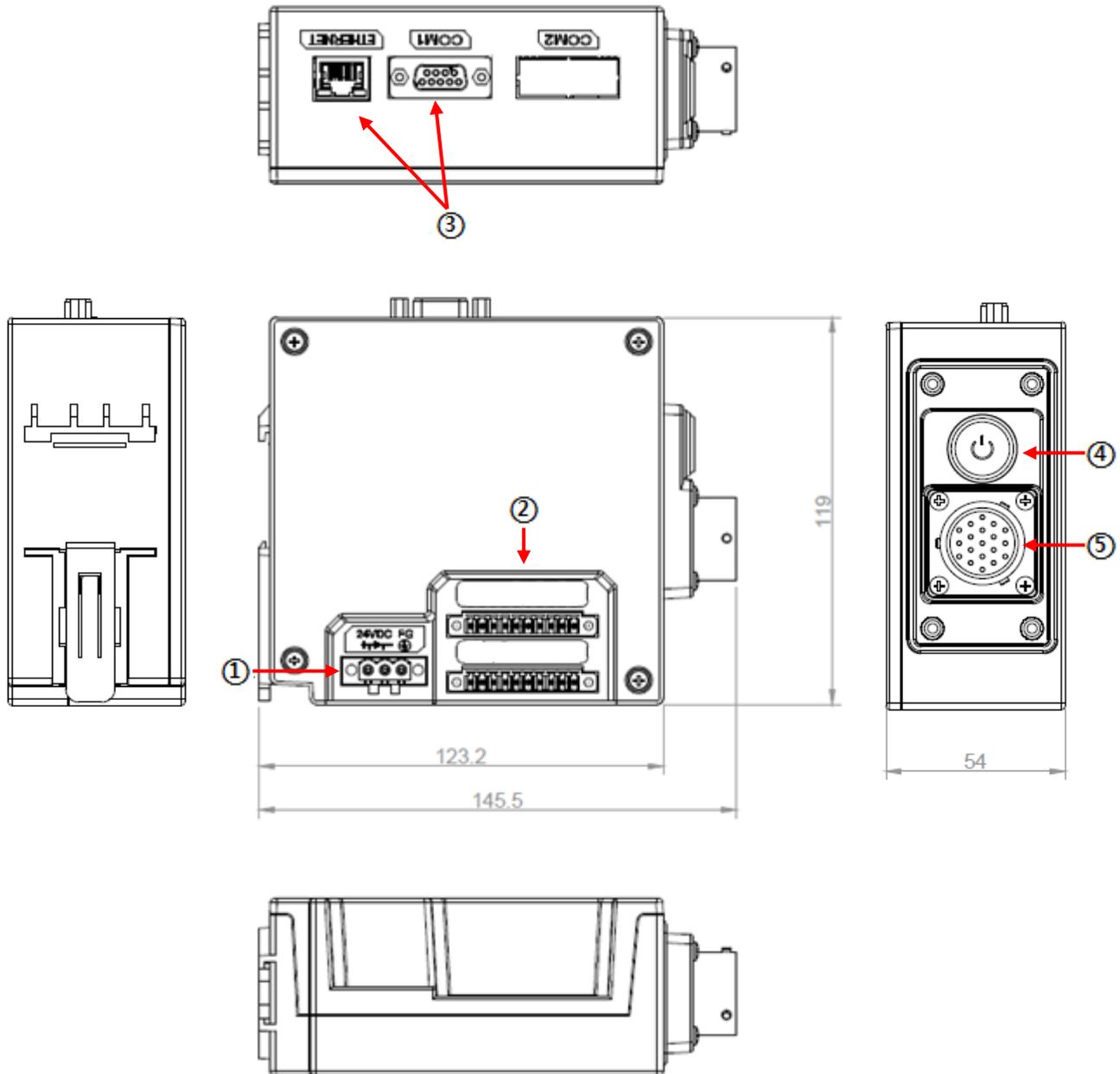
### 3.3 Structure Specifications

Weight (Kg)	0.3Kg (*Except Cable Pack)
Cooling System	Natural air circulation
Case Material	PC (Resistance to flame)

## Chapter 4. Parts and Detail Specifications

### 4.1 External Appearance

#### 4.1.1 External Dimensions



#### 4.1.2 Part Names and General Specifications

NO.	Name	Description	Note
①	Power Input	24V DC Power Input	
②	Ext. Function Connector	EMG S/W, 3-POS S/W, KEY-Lock, Function1~6	
③	Communication	ETHERNET, RS232C/422/485	Cannot be used simultaneously
④	Power S/W	TOPRHWS Operating Switch	
⑤	26P Connector	Connector to TOPRH0700WD	Produced separately

## Chapter 5. The interface of External Devices

The communication between the main body and external devices requires a connection that meets the following conditions.

### 5.1 Serial Communication Specifications

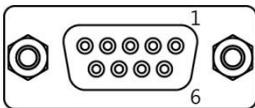
#### 5.1.1 RS-232C

Items		Contents
Protocol		Full Duplex
Synch.		Asynchronous
Communication distance		About 15m
Type of connection		1:1
Control code		ASCII Code or HEXA Code
Baud rate		2400,4800,9600,19200,38400,57600,76800, 115200 bps
Data type	Data Bit	7, 8 bit
	Parity Bit	NONE, ODD, EVEN Parity
	Stop Bit	1, 2 bit

#### 5.1.2 RS-422/485

Items		Contents
Protocol		Full Duplex, Half Duplex
Synch.		Asynchronous
Communication distance		About 500m
Type of connection		1:N (N≤31)
Control code		ASCII Code or HEXA Code
Baud rate		2400,4800,9600,19200,38400,57600,76800, 115200 bps
Data type	Data Bit	7, 8 bit
	Parity Bit	NONE, ODD, EVEN Parity
	Stop Bit	1, 2 bit

#### 5.1.3 COM1 Connector pin number and Signal names

TYPE	PIN No.	Signal	Direction	Contents
9Pin Female 	1	RDA(RD+)	Input	RS-422/485 Receive Data(RX+)
	2	RD(RxD)	Input	RS-232C Receive Data
	3	SD(TxD)	Output	RS-232C Send Data
	4	RDB(RD-)	Input	RS-422/485 Receive Data(RX-)
	5	SG	-	Signal Ground
	6	SDA(SD+)	Output	RS-422/485 Send Data(TX+)
	7	NC		NC
	8	NC		NC
	9	SDB(SD-)	Output	RS-422/485 Send Data(TX-)

- Make sure that for RS-232C communication line, RD and SD cross each other with a twisted pair cable.  
SG should be directly connected.
- For RS-422 and 485 communication line, RDA and RDB, and SDA and SDB should be a twisted pair cable, respectively.
- Connect the signal ground with that of an external device. It can improve noise immunity.
- Do not run RS-232C, 422, and 485 at the same time.
- Do not use the shield wire of the communication line for the signal ground. It can lead to communication failure.

## 5.2 Ethernet Communication Specifications

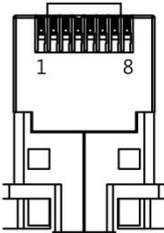
### 5.2.1 Ethernet

Item	Specification
Ethernet Method	IEEE802.3i/IEEE802.3u, 10BaseT / 100BaseT
Speed	10M / 100Mbps
Communication Method	Base Band
Switching Method	AUTO MDIX
Maximum Segment Length	100m (Between Hub)
Communication Cable	UTP (Unshielded Twisted Pair)

When using HUB for connection, use a straight cable.

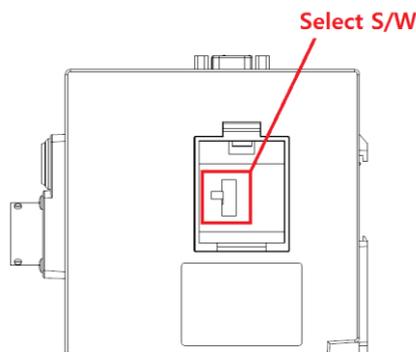
When HUB is not used but a direct connection is attempted instead, please use a cross cable.

\* RJ-45 Pin layout is as follows.

RJ45	PIN No.	Color	Signal
	1	White Orange	TD+ (Twisted Pair Output +)
	2	Orange	TD- (Twisted Pair Output -)
	3	White Green	RD+ (Twisted Pair Input +)
	4	Blue	Reserve
	5	White Blue	Reserve
	6	Green	RD- (Twisted Pair Input -)
	7	White Brown	Reserve
	8	Brown	Reserve

- **COM1 and ETHERNET cannot be connected at the same time.**

COM1 or ETHERNET can be selectively used by selecting S/W positioned as seen below.  
The settings of TOPRH main body and TOPRHWS should be identical.



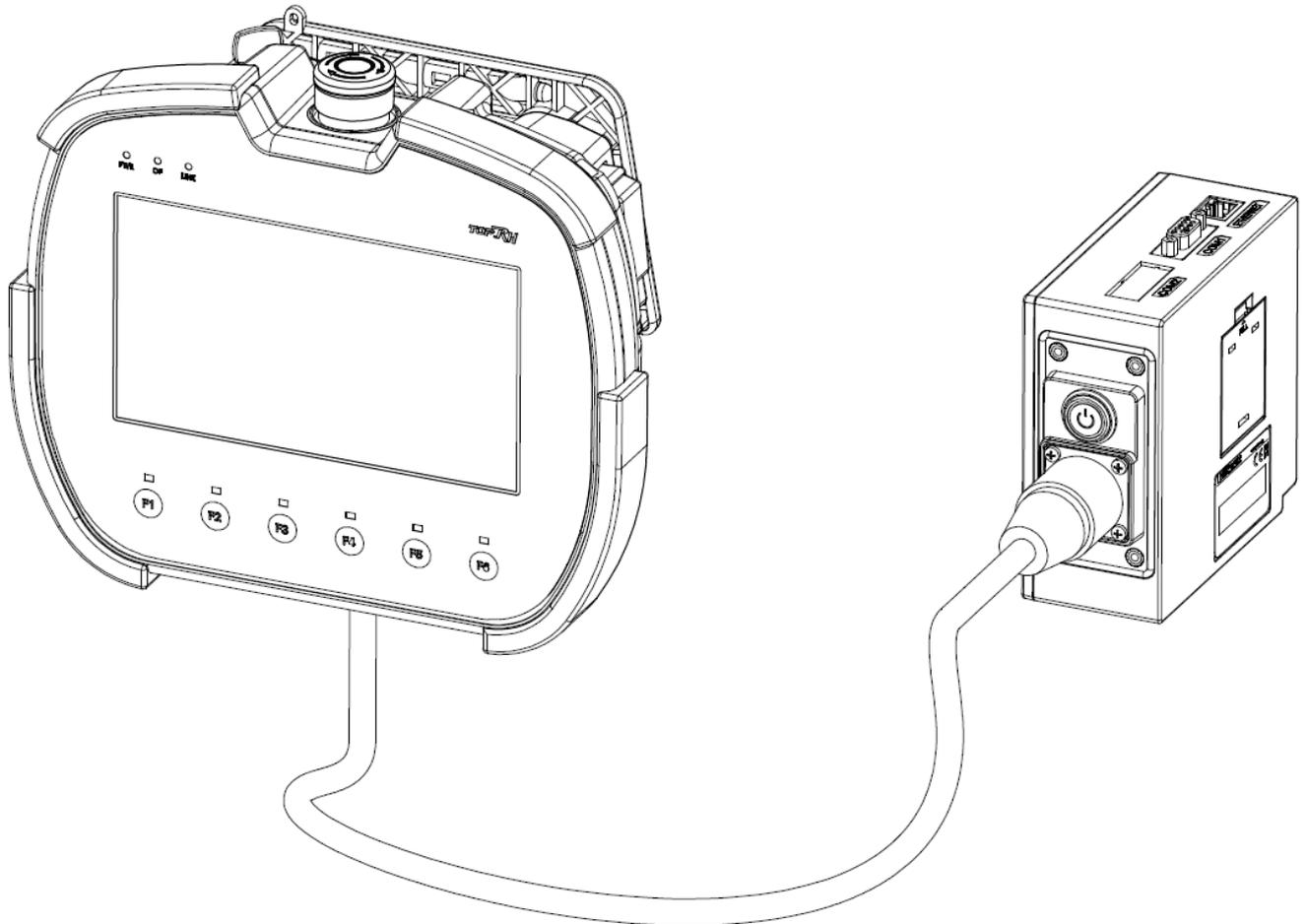
## Chapter6. Block Diagram for Installation

There are two ways to install the product: one is installing it to a separate panel cut, exposing the front and the other is fixing it to DIN-Rail of the rear.

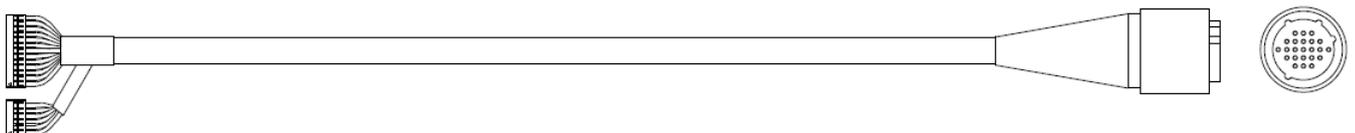
TOPRHWS is connected to TOPRH0700WD with predefined 26-fin cable.

### 6.1 Connection Diagram

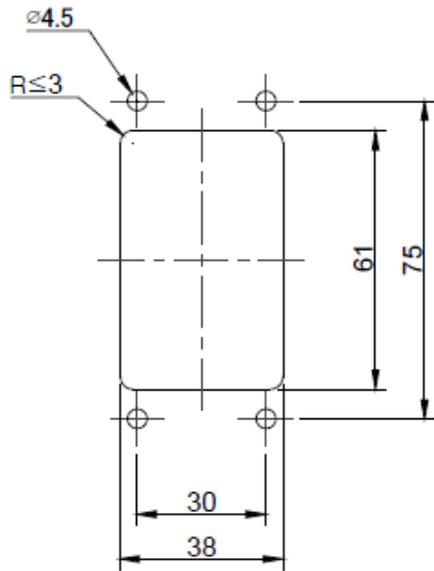
TOPRHWS should be connected with the main body of TOPRH0700WD for operation. Therefore, it cannot be used independently.



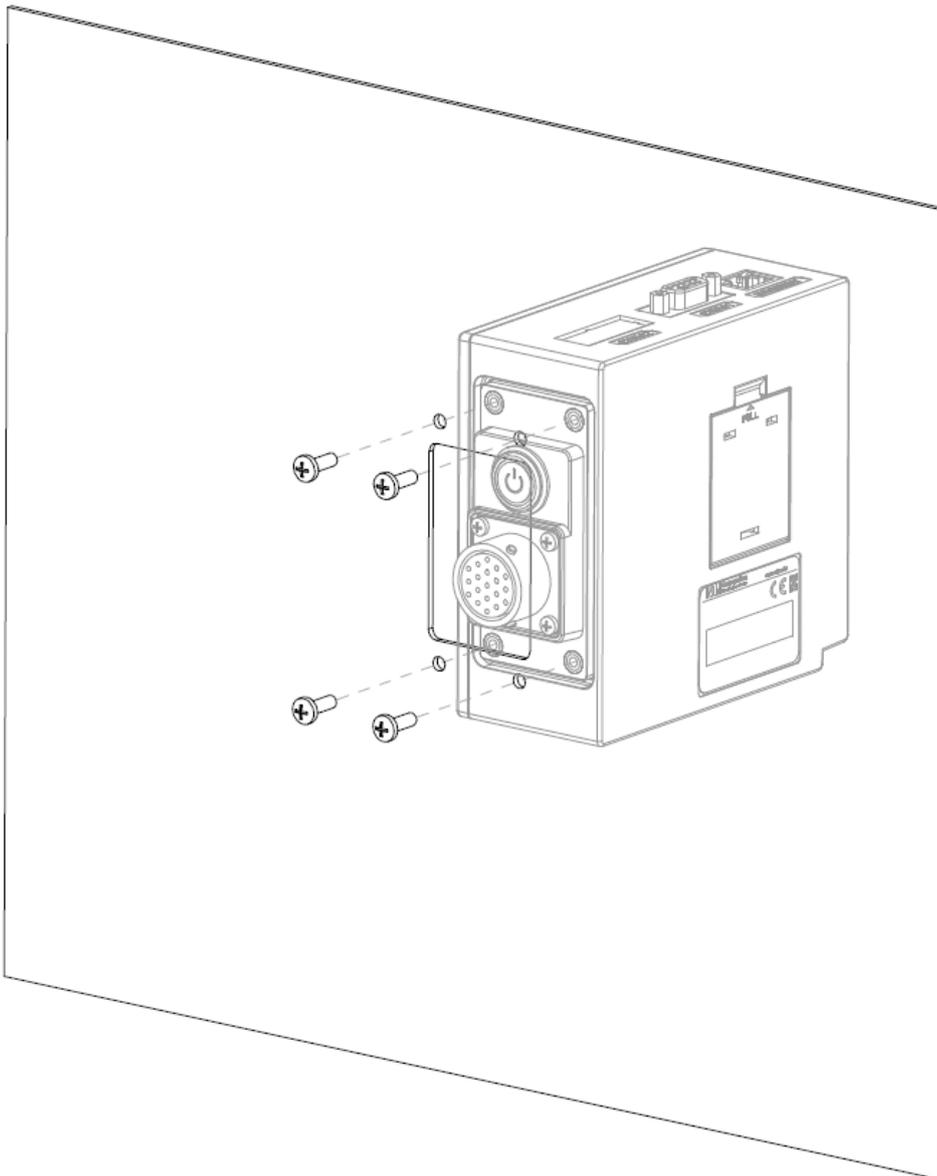
The cables to TOPRH0700WD can be made 3, 5, and 10M in length.  
(It is a twisted pair cable and should be properly wired for an intended purpose.)



The size of the panel cut for front-open installation



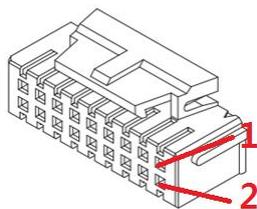
Example of front-open installation



## 6.2 Cable Diagram

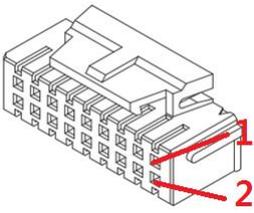
### 6.2.1 Basic Connector Pin Assignment

TOPRH0700WD cable connectors



Connector (1): Yeonho Electronics SMH200-26C, Cable 26AWG

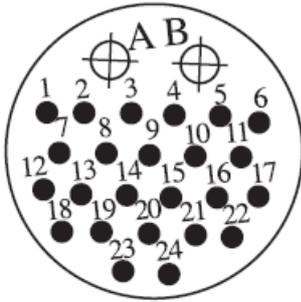
PIN NO.	SIGNAL. NAME	Description	Pair Line
1	COMM_0	COM1 or Ethernet SEL #1	PAIR1(+)
2	VCC_IN	<b>TOPRH Power IN 24V</b>	PAIR3(+)
3	COMM_1	COM1 or Ethernet SEL #2	PAIR1(-)
4	VCC_IN	<b>TOPRH Power IN 24V</b>	PAIR4(+)
5	COMM_2	COM1 or Ethernet SEL #3	PAIR2(+)
6	PGND	TOPRH Power GND	PAIR3(-)
7	COMM_3	COM1 or Ethernet SEL #4	PAIR2(-)
8	PGND	TOPRH Power GND	PAIR4(-)
9	X	NC	
10	X	NC	
11	X	NC	
12	X	NC	
13	COMM_9	EMG A1_com	PAIR5(+)
14	COMM_8	EMG A1 contact	PAIR5(-)
15	EXT0_EMG_B1	EMG B1_com	PAIR6(+)
16	EXT0_EMG_A1	EMG B1 contact	PAIR6(-)
17	COMM_13	EMG B2_com	PAIR7(+)
18	COMM_12	EMG B2 contact	PAIR7(-)
19	3P_SW_A0_COM	3Position Switch A_com	PAIR8(+)
20	3P_SW_A0	3Position Switch A_contact	PAIR8(-)
21	3P_SW_A2_COM	3Position Switch A2_com	PAIR9(+)
22	3P_SW_A2	3Position Switch A2_contact	PAIR9(-)
23	X	NC	
24	COM_SG	COM1 Signal GND	PAIR10(+)
25	X	NC	
26	X	NC	



**Connector (2): Yeonho Electronics SMH200-12C, Cable 26AWG**

PIN NO.	SIGNAL. NAME	Description	Pair Line
1	KEY0_A	KEYLOCK	PAIR14(+)
2	KEY0_COM	KEYLOCK_COM	PAIR14(-)
3	X	NC	
4	X	NC	
5	X	NC	
6	COM0	FUNCTION_COM	PAIR10(-)
7	DOUT5	FUNCTION_6	PAIR11(+)
8	DOUT4	FUNCTION_5	PAIR11(-)
9	DOUT3	FUNCTION_4	PAIR12(+)
10	DOUT2	FUNCTION_3	PAIR12(-)
11	DOUT1	FUNCTION_2	PAIR13(+)
12	DOUT0	FUNCTION_1	PAIR13(-)

## The harness cable connector to TOPRHWS



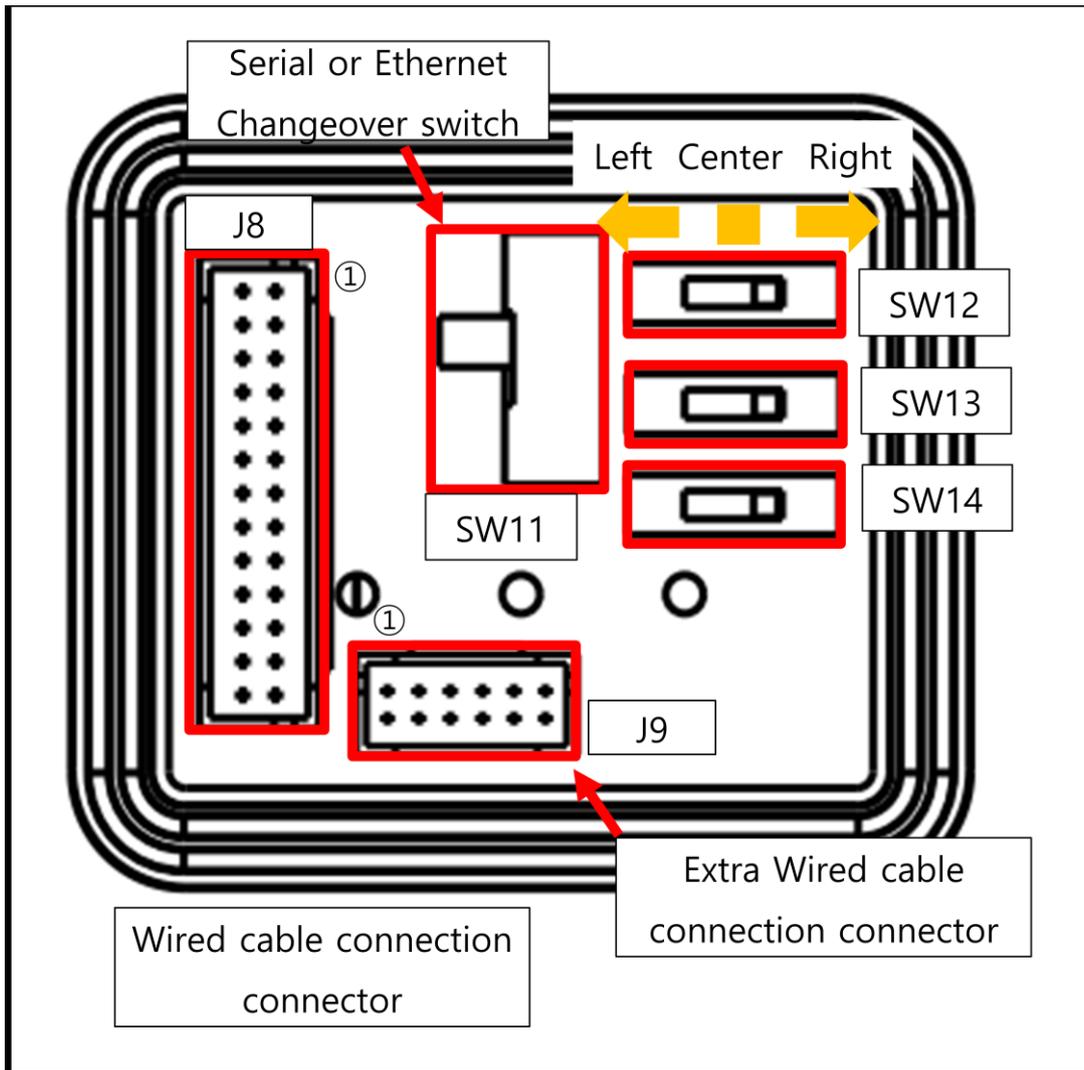
Connector(3): Sam Woo Electronics Co., Ltd. SRC6A-21-26P

PIN NO.	Description	Pair Line	NOTE	Function Details
1	COM1 or Ethernet SEL #1	PAIR1(+)	SD,RX+,TXP	RS-232C,RS-422/485,Ethernet
2	COM1 or Ethernet SEL #2	PAIR1(-)	RD,RX-,TXN	RS-232C,RS-422/485,Ethernet
3	COM1 or Ethernet SEL #3	PAIR2(+)	TX+,RXP	RS-422/485,Ethernet
4	COM1 or Ethernet SEL #4	PAIR2(-)	TX-,RXN	RS-422/485,Ethernet
5	EMG A1_com	PAIR5(+)		Emergency_A1 com
6	EMG A1 contact	PAIR5(-)		Emergency_A1 Out
7	EMG B1_com	PAIR6(+)		Emergency_B1 com
8	EMG B1 contact	PAIR6(-)		Emergency_B1 Out
9	EMG B2_com	PAIR7(+)		Emergency_B2 com
10	EMG B2 contact	PAIR7(-)		Emergency_B2 Out
11	3Position Switch A1_com	PAIR8(+)		3Position A1 Contact com1
12	3Position Switch A1_contact	PAIR8(-)		3Position A1 Contact Out1
13	3Position Switch A2_com	PAIR9(+)		3Position A2 Contact com2
14	3Position Switch A2_contact	PAIR9(-)		3Position A2 Contact Out2
15	COM1 Signal GND	PAIR10(+)		RS-232C/422/485 Signal GND
16	DOUT_com	PAIR10(-)		Funtion Key_com
17	DOUT 5	PAIR11(+)		FUNCTION_6
18	DOUT 4	PAIR11(-)		FUNCTION_5
19	DOUT 3	PAIR12(+)		FUNCTION_4
20	DOUT 2	PAIR12(-)		FUNCTION_3
21	DOUT 1	PAIR13(+)		FUNCTION_2
22	DOUT 0	PAIR13(-)		FUNCTION_1
23	KEYLOCK	PAIR14(+)		KEYLOCK
24	KEYLOCK_COM	PAIR14(-)		KEYLOCK COM
A	TOPRH POWER GND	PAIR3,4(-)		24V(-) GROUND
B	TOPRH POWER IN 24VDC	PAIR3,4(+)		24V(+)

## 6.3 Mechanical Switch Setting of TOPRH0700WD Main Body

### 6.3.1 S/W Layout

This product is designed to selectively use necessary operation by controlling S/W of TOPRH0700WD.



### 6.3.2 Allocating Operation to TOPRH0700WD S/W (SW12, SW13, SW14)

When using TOPRHWS, position all S/W to the right.

## 6.4 Serial and Ethernet Communication Setting Switches

### 6.4.1 Communication Channel and I/F Setting

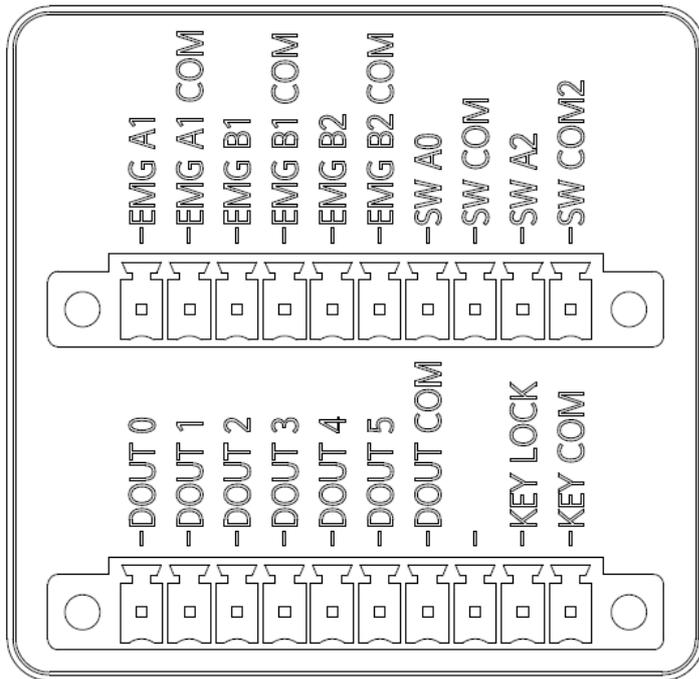
- For SW11 switch, the settings of TOPRH0700WD and TOPRHWS should be identical.
  - a. It can be set for serial Ethernet communication.
  - b. When using serial communication mode, it is possible to use RS-232C/422/485.
 

When Ethernet is selected for communication, COM1 serial communication cannot be used.
  - c. The setting of serial communication can be changed at 'System Control Panel' -> 'Serial' menu.
  - d. The setting of Ethernet communication can be changed at 'System Control Panel' -> 'Ethernet' menu. IP of PLC can be set and changed in the communication device PLC.
 

For it, however, Ethernet PLC should be included in the design.

### 6.5 The Purpose and examples of External Functions

The wiring work to this product should be done with the insulation source (<23Vdc) with limited voltage and current, and a fuse or Class 2 circuit.



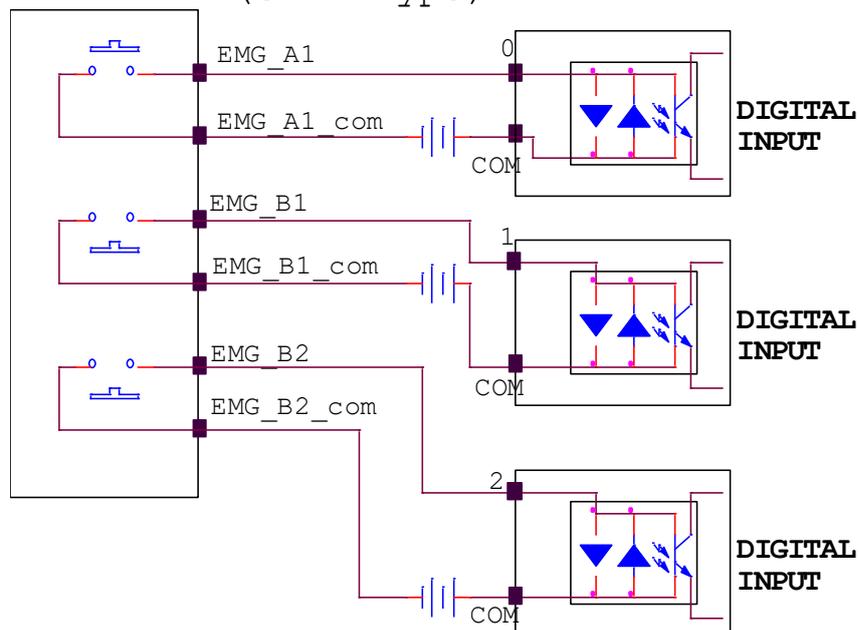
- Emergency switch: wiring diagram

The emergency switch is a PUSH/PULL switch to stop operation for an emergency.

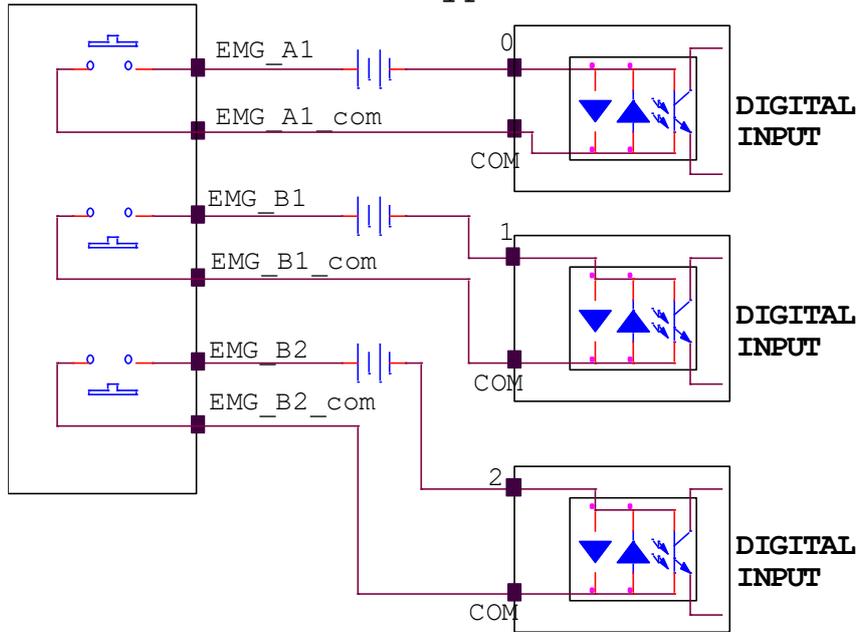
In general, it is wired as follows.

Position	EMG_A1	EMG_B1	EMG_B2
Not Pressed	Open(OFF)	Short(ON)	Short(ON)
Pressed	Short(ON)	Open(OFF)	Open(OFF)

TOPRH EMG Switch  
(Sink Type)



TOPRH EMG Switch  
(Source Type)



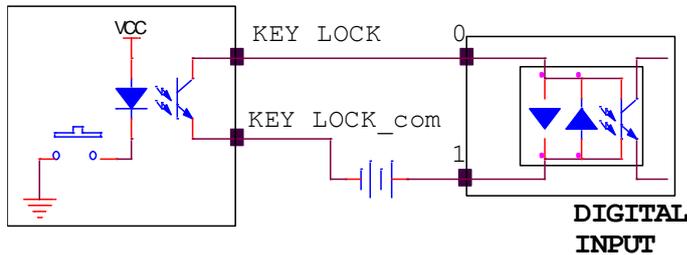
(\* It is a mechanical switch, which can operate regardless on/off status of main body.)

- Keylock: wiring diagram

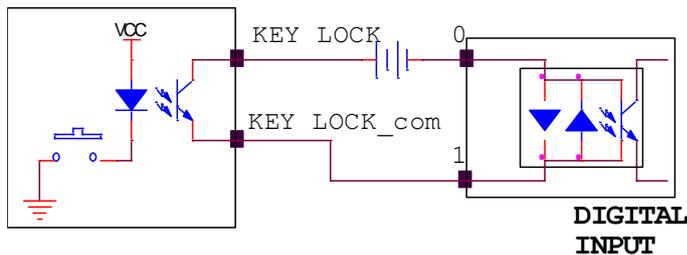
For safety, it additionally controls the controllability of the controller.

Position	Status
"A" direction	Open(OFF)
"B" direction	Short(ON)

TOPRH KEY LOCK Switch  
(Sink Type)



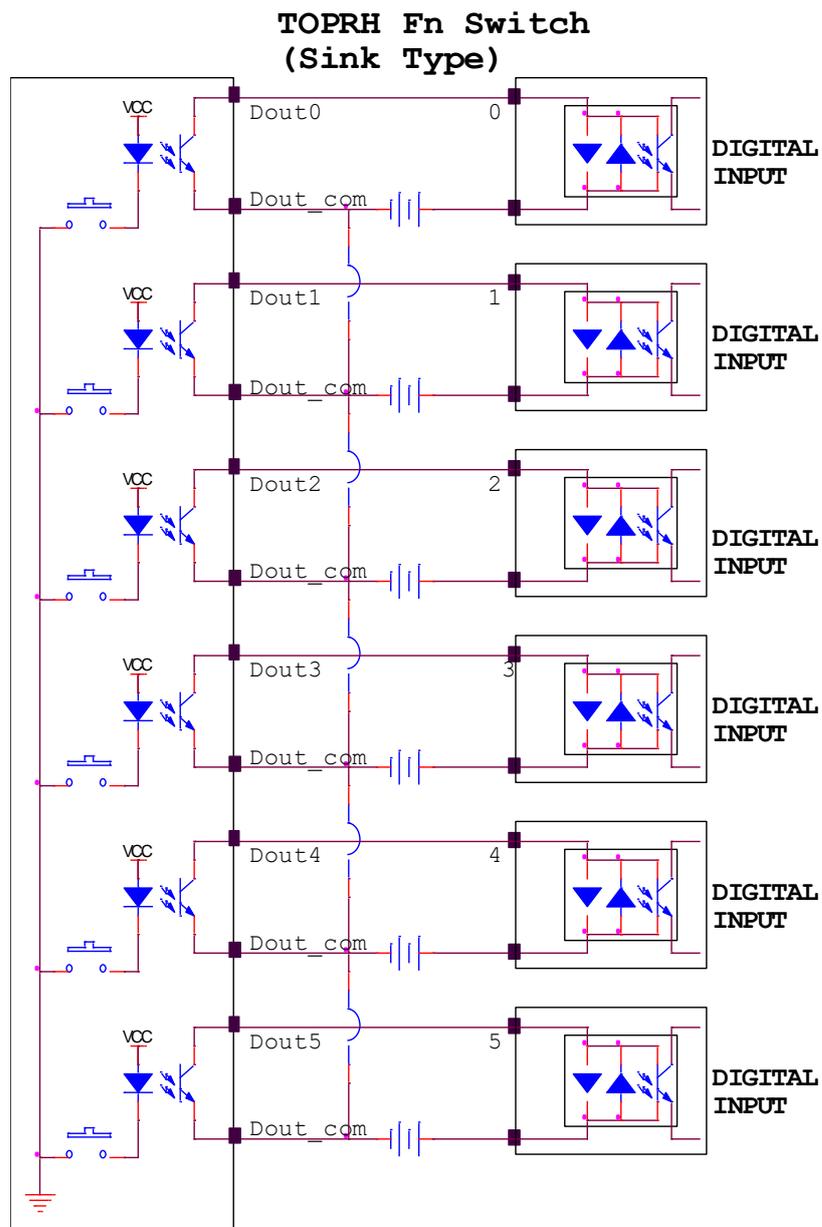
TOPRH KEY LOCK Switch  
(Source Type)



(\* It runs with a photocoupler, so it can be controlled only when the main body turns on.)

- Function key: wiring diagram
  - a. It additionally controls the controllability of the controller.
  - b. A source-type function key cannot be used.

Signal	Fn
Dout 0	F1
Dout 1	F2
Dout 2	F3
Dout 3	F4
Dout 4	F5
Dout 5	F6
Dout_com	-



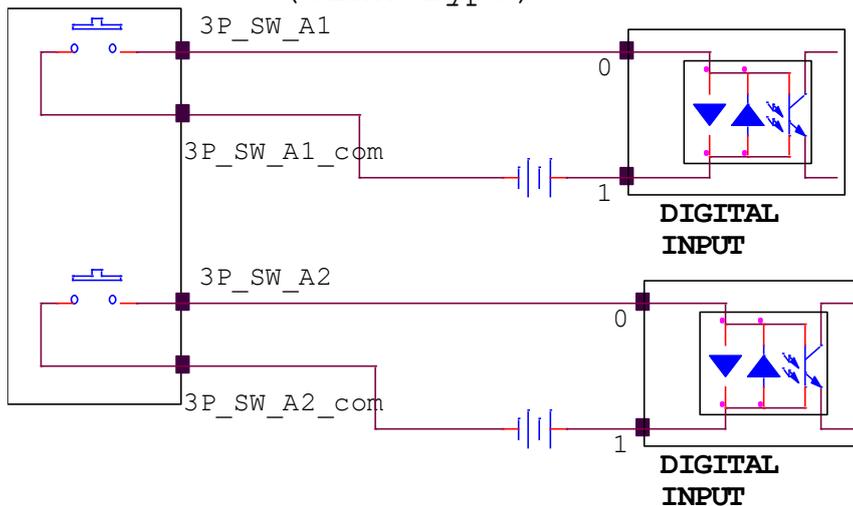
(\* It runs with a photocoupler, so it can be controlled only when the main body is on.)

- 3-Position switch: wiring diagram

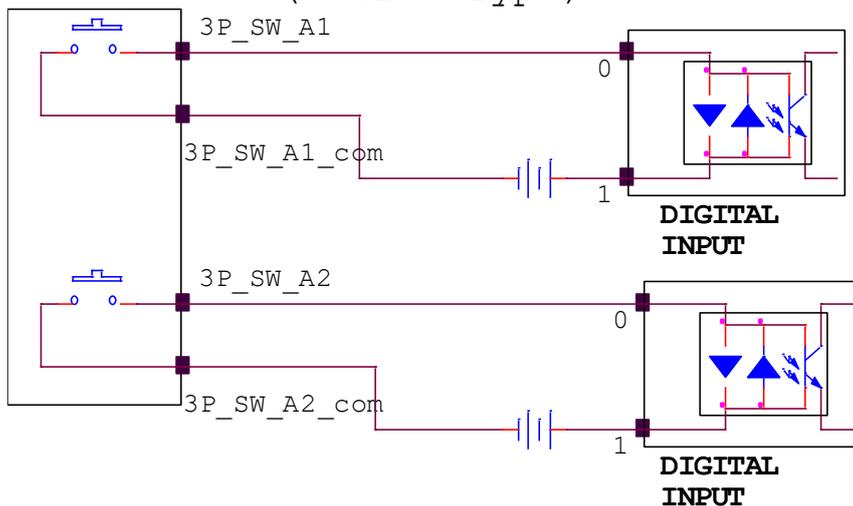
For safety, it controls the controllability of the controller

Position	3P_SW_A0	3P_SW_A2
Not Pressed	Open(OFF)	Open(OFF)
HALF Pressed	Short(ON)	Short(ON)
Fully Pressed	Open(OFF)	Open(OFF)

TOPRH 3-Position Switch (Sink Type)



TOPRH 3-Position Switch (Source Type)



(\* It is a mechanical switch, which can operate regardless on/off status of main body.)

# Chapter 7. Installation and Wiring

## 7.1 Selecting installation Location

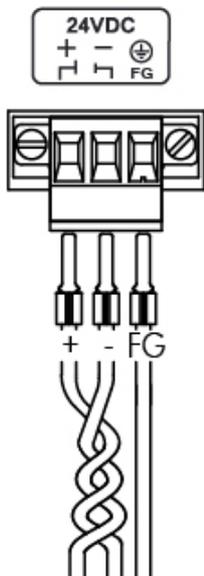
- a. Where the movement of TOPRH0700WD (main body) is secured after it is connected (fixed) to the front panel or DIN-rail of the rear.
- b. Where there is no sunlight exposure.
- c. Where there is no noise and power failure.

## 7.2 Connection of the Cable Pack to the Main Body

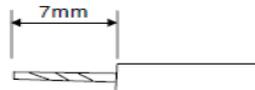
For connection to the main body, use a housing and a terminal fit to the connector of the main body.  
For details, refer to the manual for TOPRH0700WD (main body)

## 7.3 Power Wiring

- a. When installing the power plug, use a pin terminal to improve the coupling of power wire and electrical transmission.
- b. Attach the power cable to the power terminal of the equipment as below.



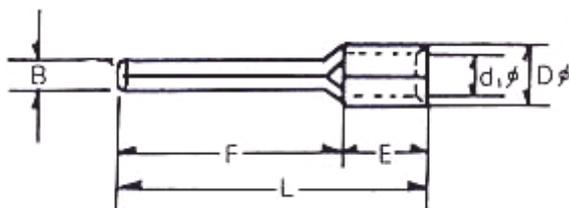
(1) Below are the dimensions of the power cable and the earth cable.

Power Cable Specification	18~22AWG
FG Cable Specification	Over 4mm <sup>2</sup> (11AWG)
Conductor Type	Simple or Standard Wire
Bolt tightening force	≥ 0.4N.m 
Conductor length	

(2) Below are the dimensions of the power terminal and the earth terminal.

Caution: Failure to use a pin terminal in accordance with the following dimensions when installing the power terminal and the earthing terminal may cause abnormal loss or damage to the cable and trigger spark, which carries the risk of explosion.

Therefore, a user is advised to be familiar with how to use a pin terminal below.



B	L	F	E	D	d
1.8~2.0	22~18	12~14	5	3.3~3.8	2~2.5

## Chapter 8. Maintenance

### 8.1 Cable Pack Management Warning

#### (1) Storage

- a. Don't press on the cable.
- b. Don't heat the cable.
- c. Don't pull the cable with excessive force.

#### (2) Handling cable pack

- a. Let the cable pack have enough place to prevent a vended area in cable pack from affecting by extra pressure
- b. Be careful not to lose the water sealing when disassembling it.
- c. Be careful that no damage is made to the sheath of the cable.
- d. Use caution when inserting the cable pack. Forced attachment/detachment may cause damage to it.
- e. Fasten the external connection wires of the cable pack to the device so they cannot be tangled.

### 8.2 Regular Inspection Warning

For the best operational condition, the product needs regular inspection.

#### (1) Environment

- a. Does the equipment operate within the allowable range of temperature(-10°C~50°C)?
- b. Does the equipment operate within the allowable range of humidity(10%~80%RH)?
- c. Is there no corrosive gas around?

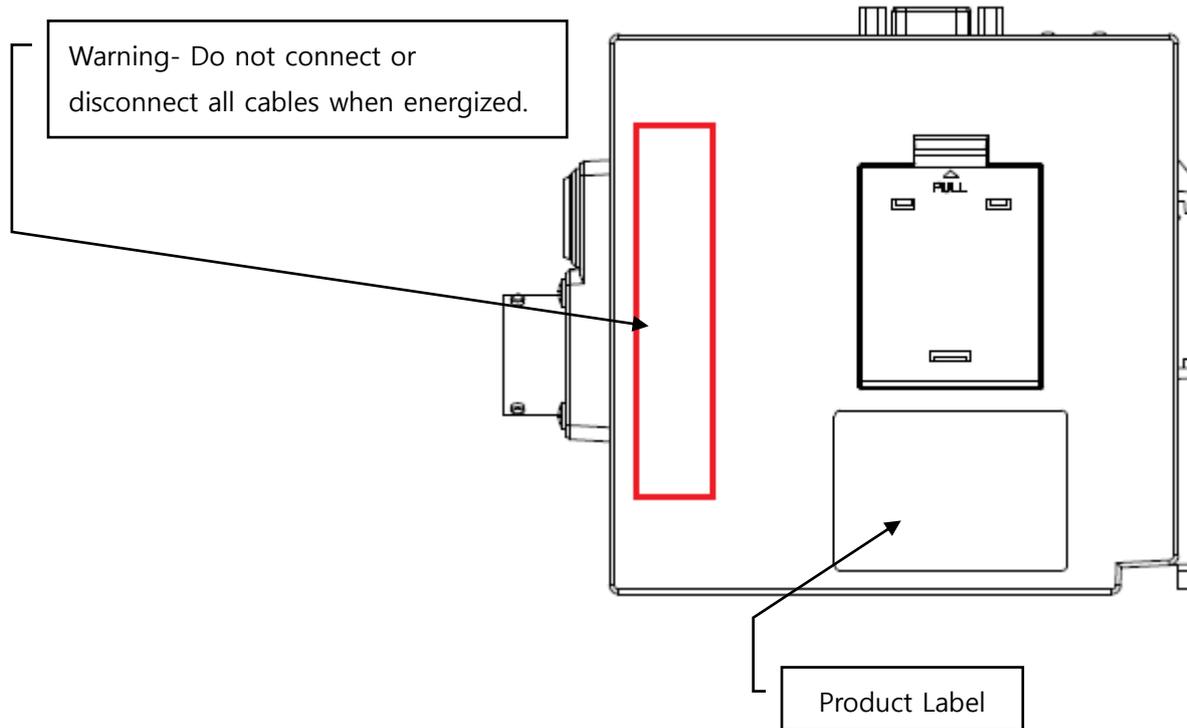
#### (2) Power

Is the input voltage range -15%~+10%?

### 8.3 Problems with the Product Warning

- a. When a problem occurs during operation, stop using the product and contact the A/S department of M2I Corporation to report the problem(s) you faced.
- b. Only an authorized worker by M2I Corporation can check and repair the product in relation to the malfunctions of the product.
- c. In case that the problem is not fixed at the site of installation, the equipment can be brought to M2I Corporation for repair.
- d. The manufacturer, M2I Corporation, is not liable for any damage or malfunctions of the equipment caused by a user's arbitrary installation and use not described, specified, and/or recommended in this manual.

## Chapter 9. Warning Labels



## Chapter 10. Product Labels



Manufacture (AS): M2I Corporation

11-35, Simin-daero 327beon-gil, Dongan-gu, Anyang-si, Gyeonggi-do 14055, Korea

Tel: 82-31-465-3366    www.m2i.co.kr

Equipment Type: HMI Interface Module

Model Name: **TOPRHWS**

Workable Ambient Temperature:  $-10\text{ }^{\circ}\text{C} \leq T_a \leq +50\text{ }^{\circ}\text{C}$

Power Specifications: Less 24Vdc, 20W

KC Certificate No.:

Product No.:

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[www.m2i.co.kr](http://www.m2i.co.kr)

- When using M2I equipment, read the user manual with care and handle it, paying attention to safety.
- Keep the user manual in a safe place so it can be referred to whenever needed.