

Multiplex Transmission Device

TOLINE-XM

Instruction Manual

(For Conductor Bar Transmission Unit)

Introduction

Thank you for purchasing our product. Read this instruction manual carefully before using the product and follow proper procedures.

Caution about the product

- The product specifications are subject to change without any notice for adding functions or improving the quality.
- When designing a system that uses the product, take appropriate measures to compose the system fail-safe to prepare for malfunction before using the product.
- Do not use the product in a situation that requires extremely high reliability such as a system that involves human lives or medical equipment.
- Deliver this instruction manual to workplace safety managers and instruct them to read it carefully before using the product.

Safety Instructions



Danger

: Indicates a hazardous condition that may result from improper handling, which may cause death, a serious injury or a substantial material damage.



Caution

: Indicates a hazardous condition that may result from improper handling, which may cause moderate harm, a minor injury, or physical damage.



Prohibited

: Indicates that an action or activity is prohibited.

(1) Caution concerning design



Danger

- Install an external safety circuit to guide the entire system to ensure safety operation even in case of external power failure or breakdown of the unit itself. An output error or malfunction may cause a breakdown.
 - (1) Do not include the emergency stop signal in the multiplex transmission circuits.
 - (2) All output units turn off if there is an error in the communication of the multiplex transmission. All output units may be turned on by an error in the input and output control section. Configure an external fail-safe circuit or install a mechanism to guide the machine to safe operation in such a case.
 - (3) The output may remain on or off due to a breakdown of the output unit relay, transistor, etc. Install an external monitoring circuit for an output signal that may cause a serious accident.
- Install an external safety circuit such as a fuse to prevent smoke or fire in case of long-hour continuous overcurrent due to load current exceeding the rated value or load short-circuit in the output unit.



Caution

- Do not wire or place communication cables with or near the power line, etc. Keep a distance of 10 cm or more.
- When controlling a lamp, heater, solenoid valve, etc. as a load in the output unit, a large current may flow when turning the output from off to on (approx. 10 times the normal flow). Do not directly connect the unit if there is not sufficient margin for the rated current.

For a large load, place a relay that can be driven in between.

(2) Installation

Caution

- Do not use the product in settings other than those specified in the Instruction Manual. Use of the product in an environment with high temperatures, high humidity, dust, corrosive gases, vibration, or shock may cause an electric shock, fire, or malfunction.
- Do not insert wire scrap or other foreign objects into the product. Such a foreign object may cause a fire, breakdown, or a malfunction.

(3) Maintenance

Prohibited

- Do not disassemble or modify the product. Such a change may cause a fire, breakdown, or a malfunction.

Danger

- Do not attach or remove the unit when the power is on. Leaving the power on may result in an electric shock, malfunction, or breakdown. Cut off all external power supply before attaching or removing the unit.
- Do not touch the terminals when power is turned on. It may cause accidents such as an electric shock.

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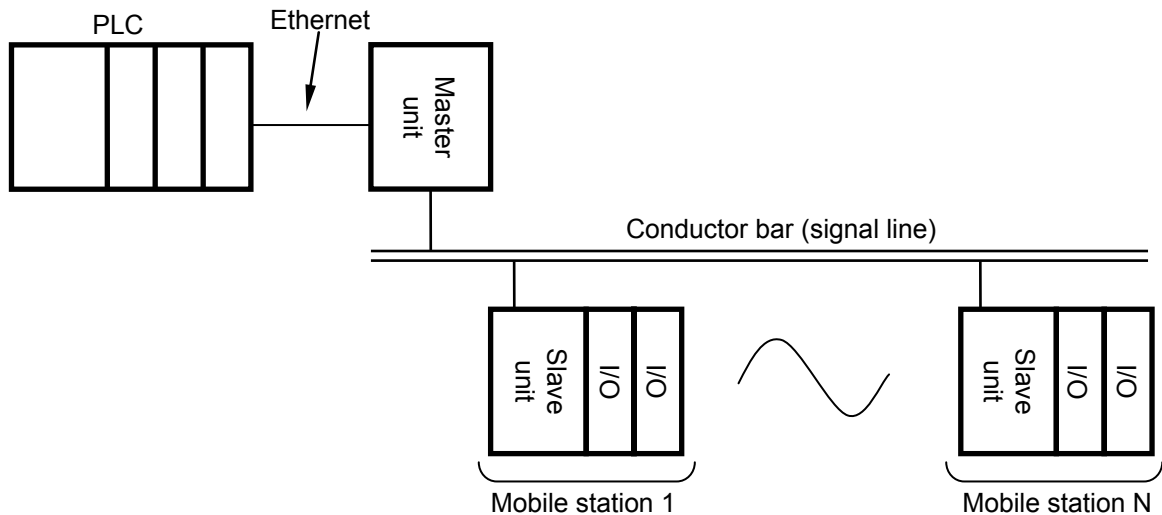
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1. Product Overview

1.1 System configuration

1.1.1 Case of combination of XM-TBM32 and XM-TBS32

This system transmits signals with multiple mobile stations mainly through conductor rails or bars. The system is configured by combining a master unit, slave units, and I/O units (input units and output units).



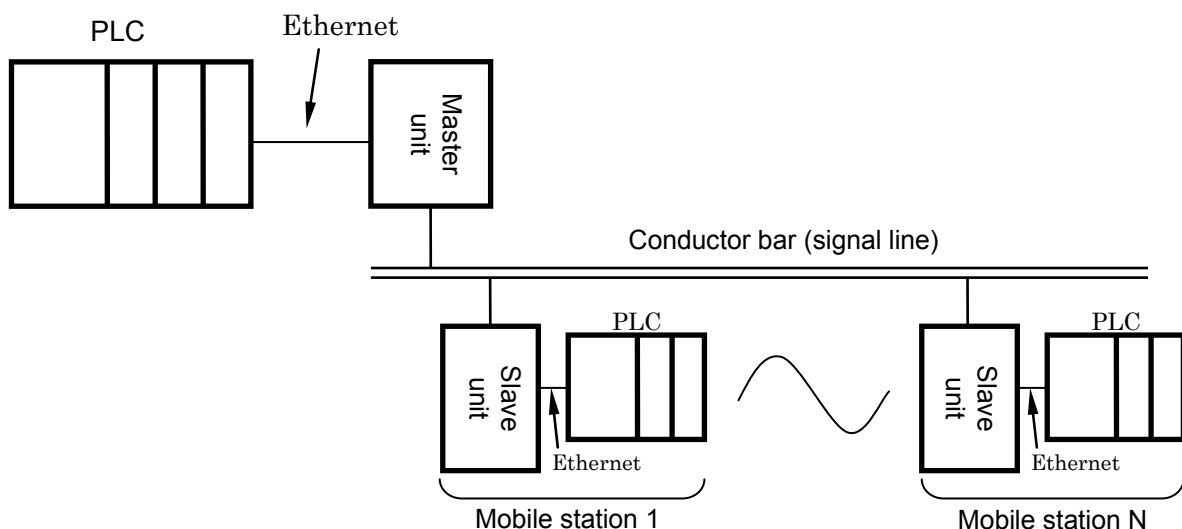
The master unit connects with the PLC through Ethernet. The internal input/output operation of the PLC enables the control of the I/O units connected to slave units.

The number of input and output points on the side of slave units can be changed with the I/O unit selection. All of the configuration of I/O units connected to slave units must be the same. ex): If a slave unit has 4 I/O units. Other slave units must have 4 I/O units.

The maximum number of transmission points per slave unit is 112 (14 bytes), and that of reception points per slave unit is also 112 (14 bytes).

1.1.2 Case of combination of XM-TBM32 and XM-TSE32

This is similar system with above, although, the slave unit“XM-TSE32”does not transmit input and output signals with I/O units but the slave unit directly transmit I/O signals with Ethernet connected PLC.



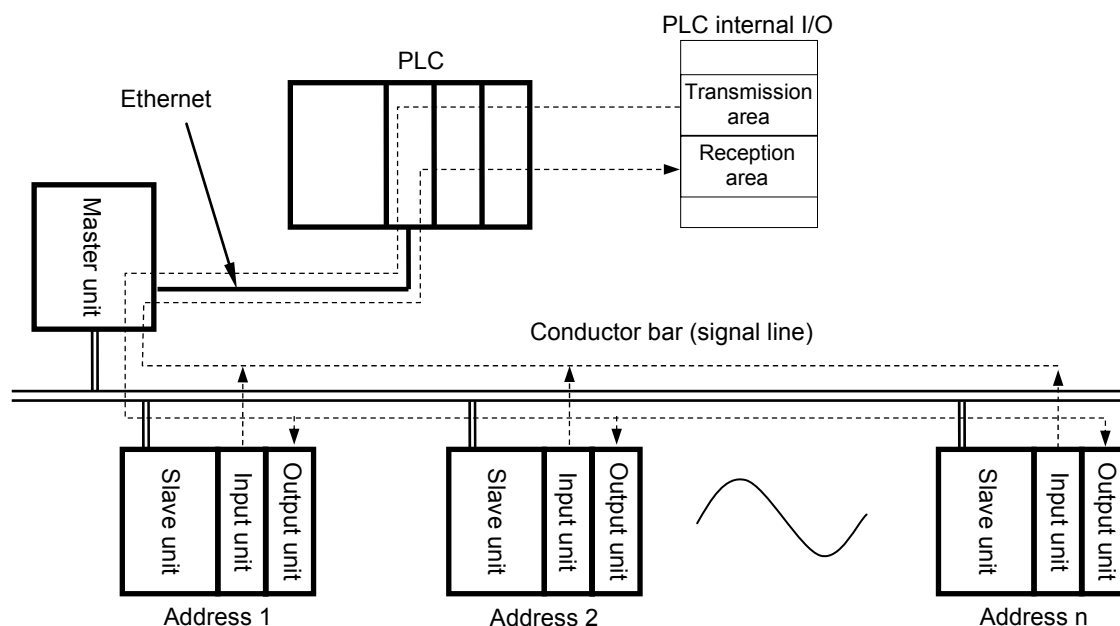
The master unit “XM-TBM32” connects with the PLC through Ethernet. The slave unit “XM-TSE32” also connects with the PLC through Ethernet.

The system enables the input/output communication between each master unit and slave units by operating internal input/output register of each PLCs.

The maximum number of transmission I/O points per slave unit is 112 (14 bytes), and that of reception I/O points per slave unit is also 112 (14 bytes). All slave units are capable to handle the number of I/O points that configured with Master unit.

1.2 Overview of operation

1.2.1 Case of combination of XM-TBM32 and XM-TBS32



(1) PLC internal I/O allocation

Communication between the PLC and master unit is performed using a dedicated protocol, which allows reading and writing of the status of the internal data register without creating a program. Therefore, the detail data allocation to be exchanged with the PLC internal data register through the multiplex transmission are set in the master unit.

(2) Transmission operation from PLC to slave units

When data are set in the transmission area of the PLC internal data register, the master unit receives the data via Ethernet. The master unit sends data to the slave unit at the address specified by the multiplex transmission. The slave unit sends the received data to each output unit.

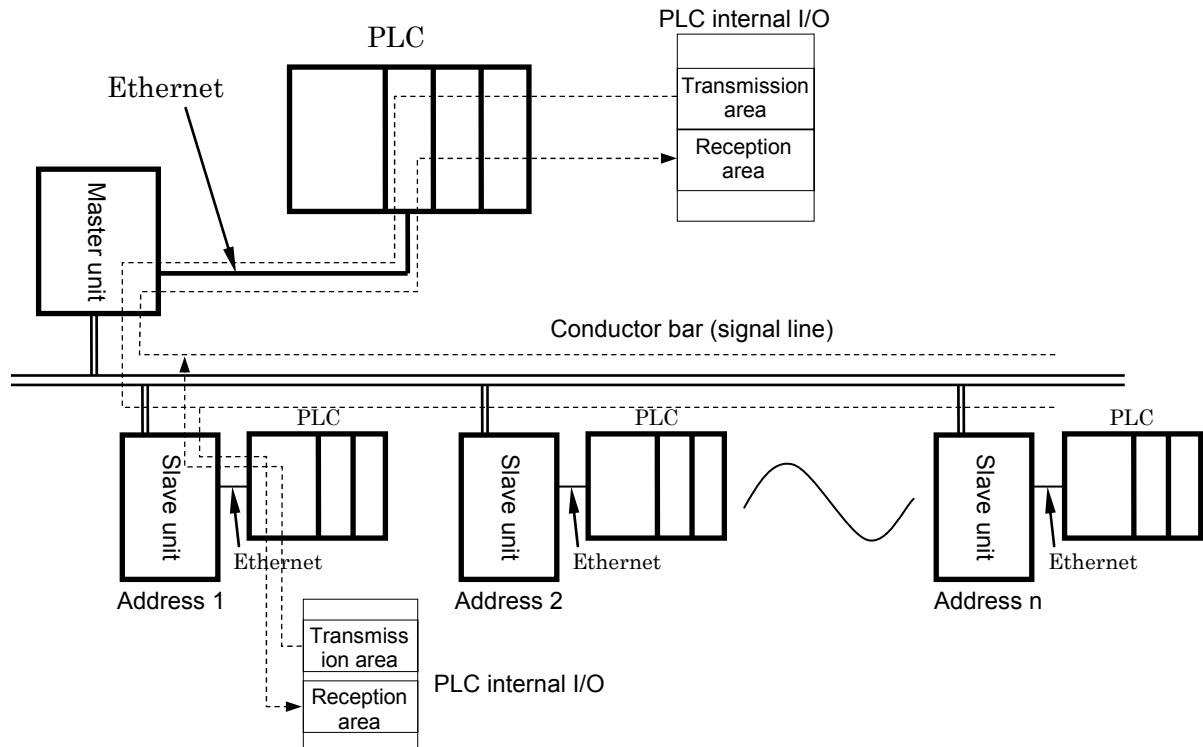
(3) Transmission operation from slave units to PLC

Data fed to the input unit are read by slave units and sent to the master unit through multiplex transmission. The master unit sends the received data to the PLC via Ethernet. The PLC unfolds the data that have been sent in the reception area of the internal data register.

(4) Broadcast operation from PLC to slave units

There is a function that all of the slave units receive the same data simultaneously (broadcast function). When this function is set to be used, the broadcast data areas are assigned from the first address in the transmission area. When data are set in the PLC internal data register area, the master unit receives data in the same way as the normal transmission operation; however, the master unit sends data simultaneously to all slave units. The slave units receive the data regardless of their addresses and send them to their assigned output units for broadcast.

1.2.2 Case of combination of XM-TBM32 and XM-TSE32



(1) PLC internal I/O allocation

Communication between the PLC and master unit is performed using a dedicated protocol, which allows reading and writing of the status of the internal data register without creating a program. Therefore, the detail data allocation to be exchanged with the PLC internal data register through the multiplex transmission are required to set in the master unit and slave unit.

(2) Transmission operation from Master PLC to slave PLCs

When the data are set in the transmission area of the PLC internal data register, the master unit receives the data via Ethernet. The master unit sends data to the slave unit at the address specified by the multiplex transmission setting. The slave unit sends the received data to the connected PLC via Ethernet. The slave connected PLC reflects the data to the reception area of the internal data register.

(3) Transmission operation from slave PLCs to master PLC

When the data set to the internal data register of slave connected PLC, the slave units receive the data via Ethernet. The slave unit transmits received data to master unit. The master unit sends the received data to internal data register of master connected PLC via Ethernet.

(4) Broadcast operation from master PLC to slave PLCs

There is a function that all of the slave units receive the same data simultaneously (broadcast function). When this function is set to be used, the broadcast data areas are assigned from the first address in the transmission area. When data are set in the PLC internal data register area, the master unit receives data in the same way as the normal transmission operation; however, the master unit sends data simultaneously to all slave units. The slave units receive the data regardless of their addresses and send them to their connected PLCs via Ethernet. The slave connected PLC reflects the data to the broad casting area of the internal data register.

1.3 Basic specifications

Item	Specifications
Operating temperature and humidity range	-10 °C – 55 °C, 30% – 85% RH (non-condensation)
Storage temperature and humidity range	-20 °C – 75 °C, 20% – 90% RH (non-condensation)
Vibration resistance	JIS C 60068-2-6 Frequency range: 10 – 55 Hz, constant acceleration: 21.43yd/s ² Number of sweeps: 10 times each in direction X,Y, and Z
Shock resistance	JIS C 60068-2-27 (147m/s ² , 3 times each in 3 directions X, Y, and Z)
Atmosphere for use	There is no corrosive or combustible gas and there is no conductive dust.
Altitude for use	2,000 m or less Do not use the system in an environment pressurized more than the atmospheric pressure. Doing do may cause a breakdown.
How to install	Set the DIN rail on the control panel wall
Structure	Package type
Operating voltage	DC24V ± 10%
Memory backup system	EEPROM

1.4 Specifications of multiplex transmission section (XM-TBM32 and XM-TBS32)

Item	Specifications
Transmission format	Original communication format
Transmission method	Positive and negative pulse-synchronous
Signal voltage	±48V
Max. number of slave unit(s)	32
Max. number of I/O points per slave unit(s)	Digital: 112 input points and 112 output points (14 bytes each for input and output)
Max. number of I/O units per slave unit	14 (derating is necessary when connecting the max. number of units.)
Error checking	Parity checking and BCC
Transmission line	Conductor bars and slip rings Twisted pair cable of 0.75 sq. or higher (polyethylene-insulated cable) 2-sq cabtyre cable (lead wire)
Transmission speed settings	4 stages (2x, standard, 1/2x, and 1/4x)
Transmission distance (total length distance)	300 m, 750 m, 1 km, and 1 km (correspond to each communication speed) The total distance will be the above or less when using a 2.0 sq. cabtyre cable with a length of 100 m or less as the wire leading the signal line to the trolley.
Broadcast function	Up to 56 points (7 bytes), set in units of byte
Output hold function	Output hold can be set in units of 4 points for each output unit (16-point output unit)
Insulation resistance	30 MΩ or higher between signal line and internal circuit (using insulation resistance tester)
Dielectric withstand voltage	AC 1500 V/minute between signal line and internal circuit

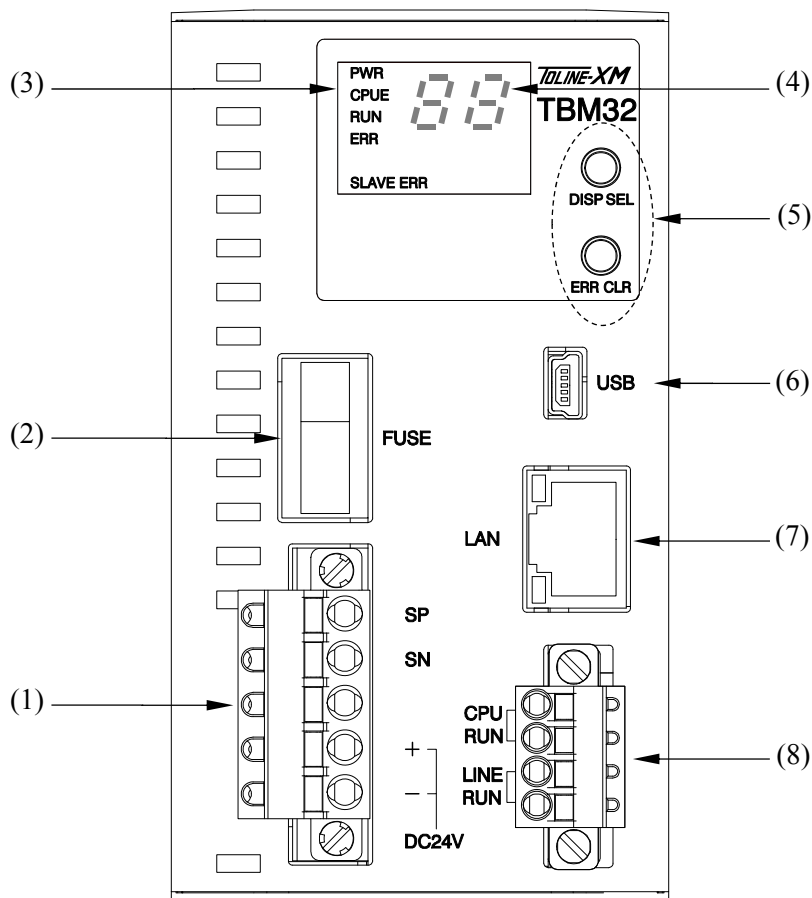
1.5 Model list

Parts	Model	Specifications
Master unit for conductor bar	XM-TBM32	Master unit, with Ethernet I/F
Slave unit for conductor bar	XM-TBS32	Slave unit, I/O unit connection
Ethernet communication slave unit for conductor bar	XM-TSE32	Slave unit, Ethernet connection
Digital input unit	XM-XD216	16-point DC 24V voltage input
Digital output unit	XM-YTN16	18-point DC 24V transistor output (sink type)

2. Communication unit

2.1 XM-TBM32 (Master unit for conductor bar)

2.1.1 External view



2.1.2 Name and function of each part

- (1) Power input / communication line connectors (included in the master and slave unit)

DC 24 V (+) (-): Power connection terminals. DC 24V must be supplied.

SP and SN: These are signal line connection terminals. Match the polarity to connect them.

- (2) Fuse (included in the master and slave unit. One spare fuse is also included.)

This is the signal line fuse. The system uses MP10 (1A) manufactured by Daito Communication Apparatus Co., Ltd.

The upper display window turns red if the fuse has blown.

- (3) Operation display monitor lamps

PWR (green): The power lamp that lights up when the power is on.

CPUE (red): Lights up when the unit is in an abnormal condition.

RUN (green): Lights up when the multiplex transmission is operated under normal conditions.

ERR (red): Lights up when the multiplex transmission is not in operation.

SLAVE ERR (red): Lights up when a slave unit is in an abnormal condition.

- (4) 7-segment number display

An error status is indicated with numbers (double-digit numbers).

(5) Push-button switch

DISP SEL: A push-button to change the display of the number display LED.

ERR CLR: A push-button to clear an abnormal condition.

(6) USB connector

A PC in which the support tool software is installed can connect to configure the settings for this unit. The configuration of the connector is mini-B type (the connection cable is not included).

(7) RJ45 Ethernet connector

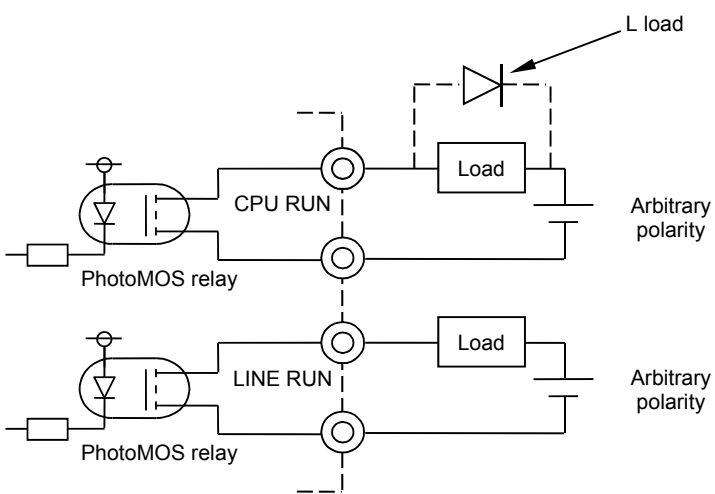
It connects with PLC, etc. with an Ethernet cable. Refer to the PLC connection manual for the method of connection with PLC.

(8) Output connector terminals (included in the master and slave unit)

CPURUN: A contact point turned on when this unit is in normal operation. (no polarity)

LINERUN: A contact point turned on when the multiplex transmission of this unit is in normal operation. (no polarity)

2.1.3 Specifications

Item	Specifications
Power supply terminal	Power-supply voltage: DC 24V $\pm$ 10% Consumption current: See Section 2-3.
USB	USB 2.0 full-speed (12 Mbps) mini-B connector
Output at contact	Output specifications: PhotoMOS relay output Output voltage: max. DC 30 V; output current: max 50 mA (resistance load) ON-resistance: max. 2 Ω
Contact output circuit and connection examples	
Insulation resistance	Between power terminal and internal circuit: 30 M Ω or higher Between power terminal and signal terminal: 30 M Ω or higher Between output terminal and internal circuit: 30 M Ω or higher
Dielectric withstand voltage	Between power terminal and internal circuit: AC 1500 V/minute Between power terminal and signal terminal: AC 1500 V/minute Between output terminal and internal circuit: AC 500 V/minute
External dimensions	101.3 mm (H) x 56.7 mm (W) x 76 mm (D) See the external dimension diagram for details.
Weight	240 g

2.1.4 Ethernet specifications

Item	Description
Type of interface	RJ45 (MDI fixed), 100BASE-TX/10BASE-T
Data transmission speed	100 BASE-TX: 100 Mbps 10 BASE-T: 10 Mbps

2.1.5 Ethernet-compatible PLC

The following shows compatible PLCs.

Mitsubishi PLC

Item	Description
Available PLC CPUs	CPUs other than the following Multi-CPU systems, duplex systems, and CPUs with multi-drop connection through C24, etc.
Access station	Local station
Protocol	MC Protocol 3E Frame ^{*1} of Mitsubishi PLC Q Series

^{*1}: Compatible with CPU units with built-in Ethernet, Ethernet units (QJ71E71)
FX Series is not compatible as it only has 1E frames.

OMRON PLC

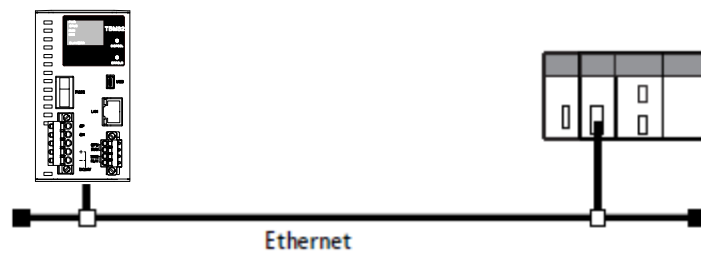
Item	Description	
PLC	OMRON PLC CJ1 and CJ2 Series	
Model	CJ1: CPU unit with built-in Ethernet	CJ1M-CPU1 -ETN
	CJ2: CPU unit ^{*1}	CJ2M-CPU
	Ethernet unit	CJ1W-ETN21
Protocol	FINS UDP	

^{*1} Ethernet can be used with a multifunction unit with built-in Ethernet, but do not use both Ethernet and IP at the same time.

JTEKT PLC

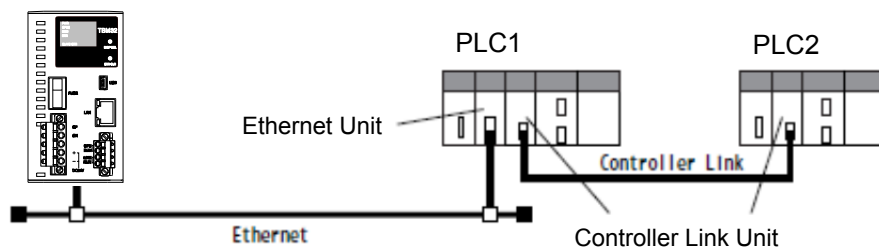
Item	Description	
PLC	JTEKT PLC PC10 Series	
Model	CPU unit (Built-in Ethernet port)	PC10G-CPU
	Communication module (Ethernet)	2Port-EFR
Transmission function	Computer link function	

Ethernet communication can be used within a local network. A local network is a single network that does not go through a relay.



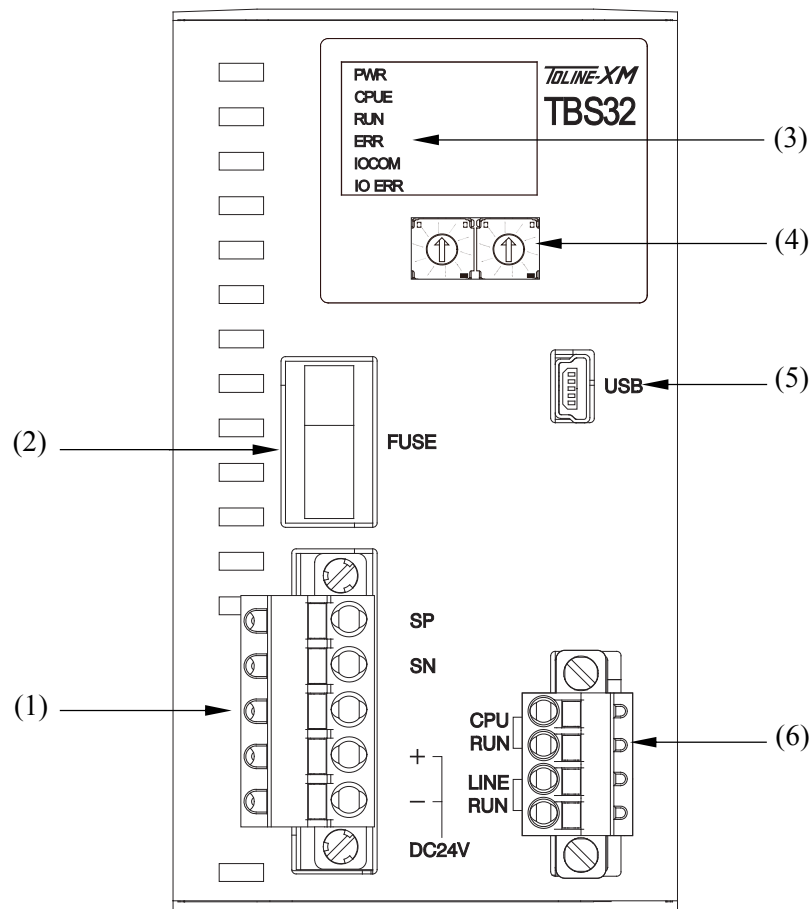
In the case of the following diagram, PLC 1 is connected to the local network from the perspective of the master unit.

PLC2 is not a local network.



2.2 XM-TBS 32 (Slave unit for conductor bar)

2.2.1 External view



2.2.2 Name and function of each part

- (1) Power input / communication line connector terminals (included in the main unit)

DC 24 V (+) (-): Power connection terminals. DC 24V must be supplied.

SP and SN: These are signal line connection terminals. Match the polarity to connect them.

- (2) Fuse (included in the master and slave unit. One spare fuse is also included.)

This is the signal line fuse. The unit installs MP10 (1A) manufactured by Daito Communication Apparatus.

The upper display window turns red if the fuse has blown.

- (3) Operation display monitor lamp

PWR (green): The power lamp that lights up when the power is on.

CPUE (red): Lights up when the unit is in an abnormal condition.

RUN (green): Lights up when the multiplex transmission is operated under normal conditions. It flashes if the address setting is larger than the number of connected units set for the master unit.

ERR (red): Lights up when the multiplex transmission is not in operation. It flashes if the address setting is not between 1 and 32.

IO COM (green): Flashes when communicating with an I/O unit.

IO ERR (red): Flashes when the configuration of I/O unit connection is not correct. It lights up when an I/O unit breaks down.

(4) Address setting switch

It sets the addresses of slave units.
The setting range is between 1 and 32.

(5) USB connector

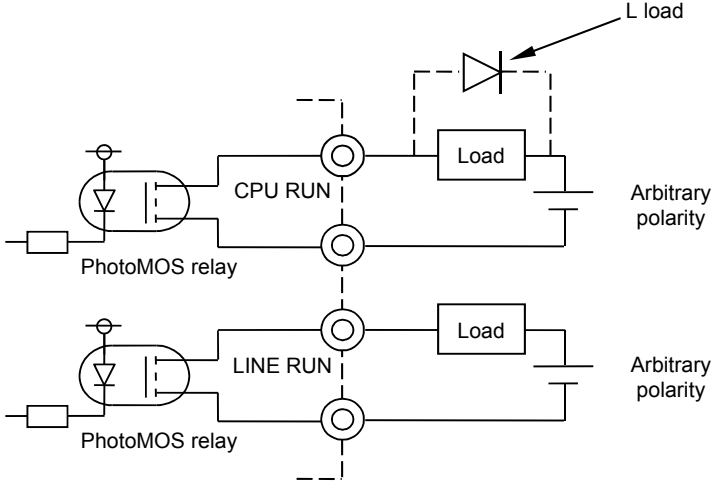
It is used for maintenance (connected to a PC).

(6) Output connector terminals (included in the main unit)

CPURUN: A contact point turned on when this unit is in normal operation. (no polarity)

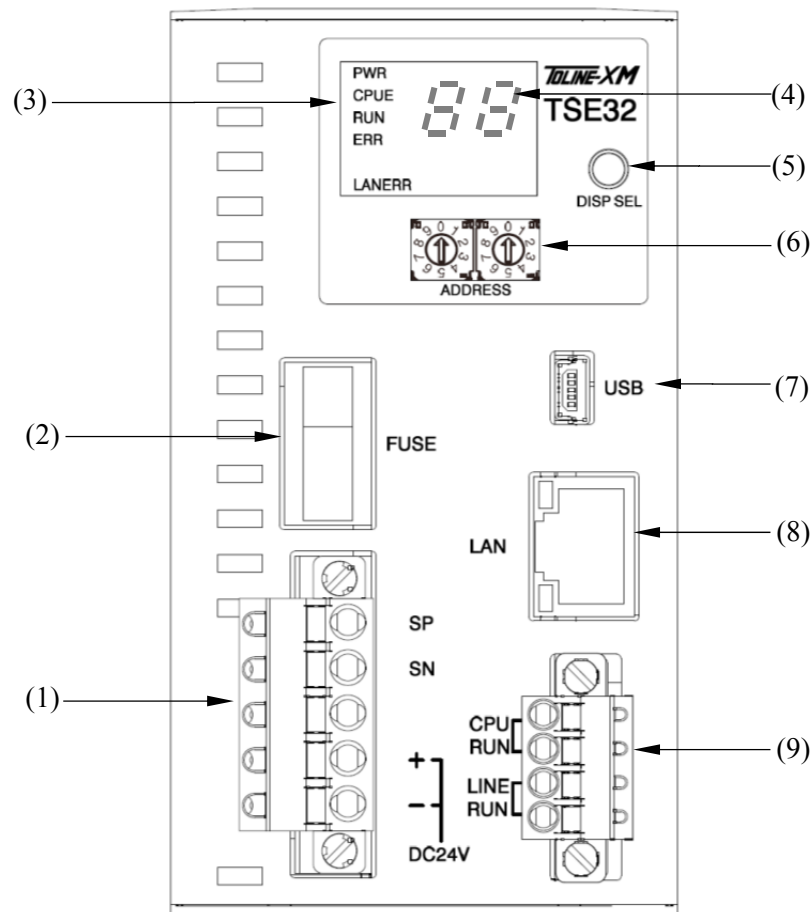
LINERUN: A contact point turned on when the multiplex transmission of this unit is in normal operation. (no polarity)

2.2.3 Specifications

Item	Specifications
Power supply terminal	Power-supply voltage: DC 24V $\pm$ 10% Consumption current: See Section 2-3.
USB	USB 2.0 full-speed (12 Mbps) mini-B connector
Output at contact	Output specifications: PhotoMOS relay output Output voltage: max. DC 30 V; output current: max 50 mA (resistance load) ON-resistance: max. 2 Ω
Contact output circuit and connection examples	
Insulation resistance	Between power terminal and internal circuit: 30 M Ω or higher Between power terminal and signal terminal: 30 M Ω or higher Between output terminal and internal circuit: 30 M Ω or higher
Dielectric withstand voltage	Between power terminal and internal circuit: AC 500 V/minute Between power terminal and signal terminal: AC 1500 V/minute Between output terminal and internal circuit: AC 500 V/minute
External dimensions	101.3 mm (H) x 56.7 mm (W) x 76 mm (D) See the external dimension diagram for details.
Weight	240g (incl. bus connector)

2.3 XM-TSE 32 (Slave unit for conductor bar, with ethernet)

2.3.1 External view



2.3.2 Name and function of each part

- (1) Power input / communication line connector terminals (included in the main unit)

DC 24 V (+) (-): Power connection terminals. DC 24V must be supplied.

SP and SN: These are signal line connection terminals. Match the polarity to connect them.

- (2) Fuse (included in the master and slave unit. One spare fuse is also included.)

This is the signal line fuse. The unit installs MP10 (1A) manufactured by Daito Communication Apparatus.

The upper display window turns red if the fuse has blown.

- (3) Operation display monitor lamps

PWR (green): The power lamp that lights up when the power is on.

CPUE (red): Lights up when the unit is in an abnormal condition.

RUN (green): Lights up when the multiplex transmission is operated under normal conditions.

ERR (red): Lights up when the multiplex transmission is not in operation.

LAN ERR (red): Lights up when an abnormality of the Ethernet communication.

- (4) 7-segment number display

An error status is indicated with numbers (double-digit numbers).

- (5) Push-button switch

DISP SEL: A push-button to change the display of the number display LED.

(6) Address setting switch

It sets the addresses of slave units.
The setting range is between 1 and 32.

(7) USB connector

A PC in which the support tool software is installed can connect to configure the settings for this unit. The configuration of the connector is mini-B type (the connection cable is not included).

(8) RJ45 Ethernet connector

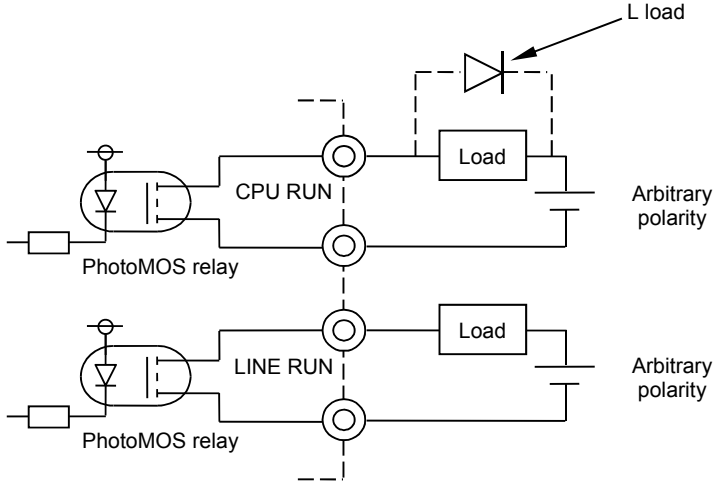
It connects with PLC, etc. with an Ethernet cable. Refer to the PLC connection manual for the method of connection with PLC.

(9) Output connector terminals (included in the master and slave unit)

CPURUN: A contact point turned on when this unit is in normal operation. (no polarity)

LINERUN: A contact point turned on when the multiplex transmission of this unit is in normal operation. (no polarity)

2.3.3 Specifications

Item	Specifications
Power supply terminal	Power-supply voltage: DC 24V $\pm$ 10% Consumption current: 250mA at DC24V.
USB	USB 2.0 full-speed (12 Mbps) mini-B connector
Output at contact	Output specifications: PhotoMOS relay output Output voltage: max. DC 30 V; output current: max 50 mA (resistance load) ON-resistance: max. 2 Ω
Contact output circuit and connection examples	
Insulation resistance	Between power terminal and internal circuit: 30 M Ω or higher Between power terminal and signal terminal: 30 M Ω or higher
Dielectric withstand voltage	Between power terminal and internal circuit: AC 500 V/minute Between power terminal and signal terminal: AC 1500 V/minute Between output terminal and internal circuit: AC 500 V/minute
External dimensions	101.3 mm (H) x 56.7 mm (W) x 76 mm (D) See the external dimension diagram for details.
Weight	230g

2.3.4 Ethernet specifications

Item	Description
Type of interface	RJ45 (MDI fixed), 100BASE-TX/10BASE-T
Data transmission speed	100 BASE-TX: 100 Mbps 10 BASE-T: 10 Mbps

2.3.5 Ethernet-compatible PLC

It is compatible with Mitsubishi and Omron PLC.

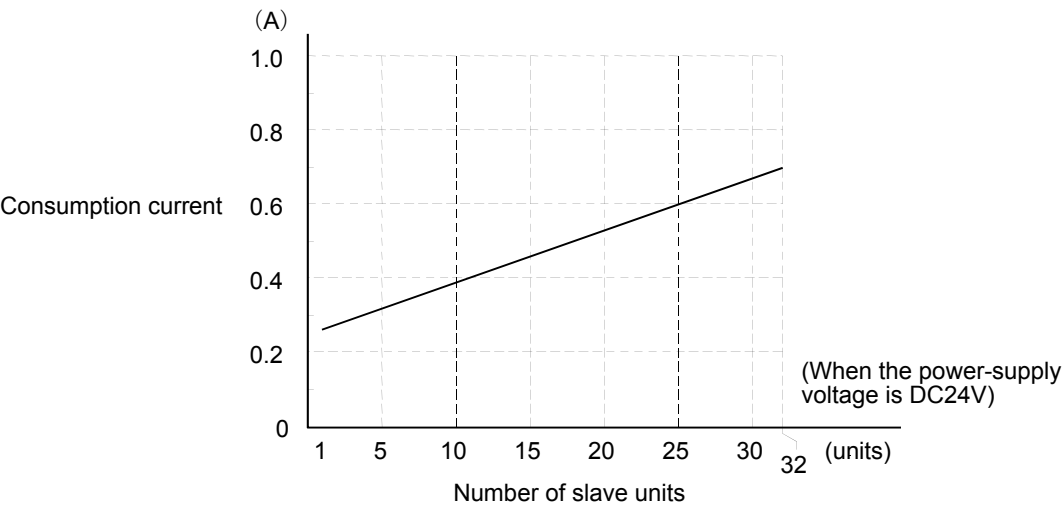
Please see contents 2.1.5 for detail.

JTEKT PLC Ethernet protocol is developing.

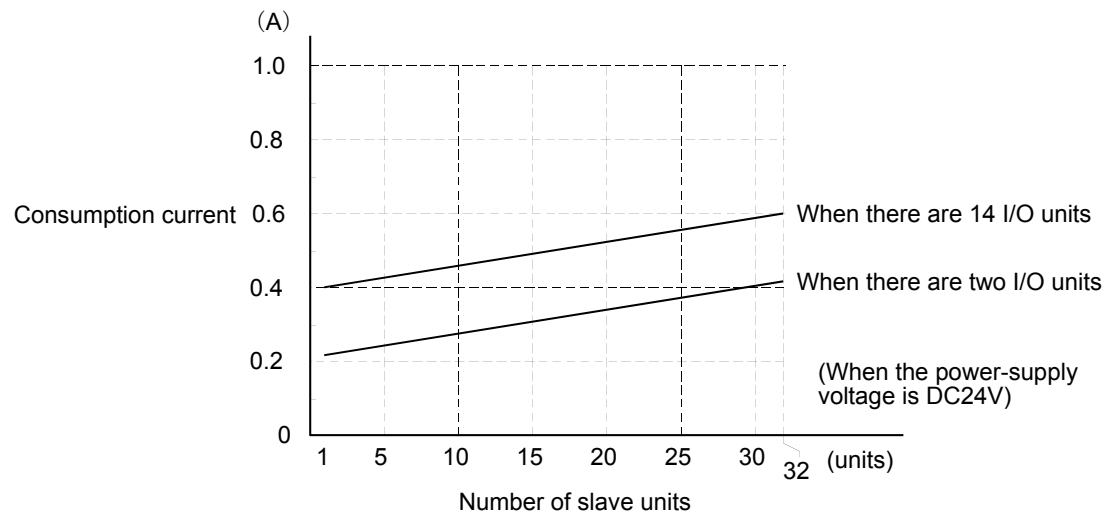
2.4 Consumption current

Refer to the following graphs for the consumption current of XM-TBM32 and XM-TBS32.

2.4.1 Consumption current (typ) of XM-TBM32



2.4.2 Consumption current (typ) of XM-TBS32



2.5 Connector terminals and compatible terminals (sleeves)

The following shows the connector terminals used for the master unit (XM-TBM) and slave unit (XM-TBS) and the compatible terminals used for them.

- Connector models for power supply and signal lines

TFKC 2,5/5-STF-5,08 (manufacturer: Phoenix Contact)

[Reference sleeve modes and product numbers] (manufacturer: Phoenix Contact)

AI 0,5 -10 WH (3201275): for 0.5 mm²

AI 0,75-10 GY (3201288): for 0.75 mm²

AI 1,0 -10 RD (3200182): for 1.0 mm²

AI 1,5- 10 BK (3200195): for 1.5 mm²

AI 2,5 -10 BU (3200275): for 2.5 mm²

Length of wire peeling when rod terminals are not used: 10 mm

- Connector model for output terminals

FK-MCP 1,5/4-STF-3,5 (manufacturer: Phoenix Contact)

[Reference sleeve mode and product number] (manufacturer: Phoenix Contact)

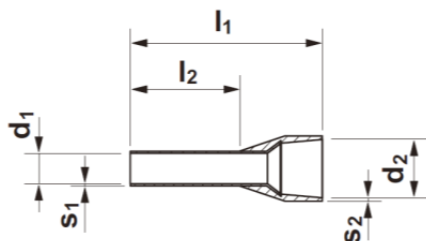
AI 0,5 -10 WH (3201275): for 0.5 mm²

Length of wire peeling when rod terminals are not used: 9 mm

- Dimensions of Phoenix Contact AI... series

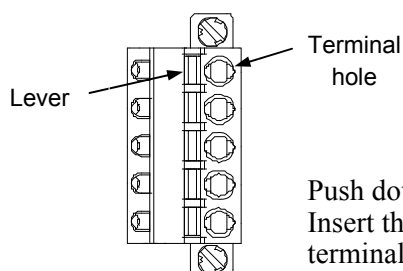
Size	l1	l2	d1	s1	d2	s2	Color	Model	Order No.
0.5 mm ²	16.0mm	10.0 mm	1.1 mm	0.15 mm	2.5 mm	0.3 mm	White	AI 0,5-10WH	3201275
0.75 mm ²	16.0 mm	10.0 mm	1.3 mm	0.15 mm	2.8 mm	0.3 mm	Gray	AI 0,75-10GY	3201288
1.0 mm ²	16.5 mm	10.0 mm	1.5 mm	0.15 mm	3.0 mm	0.3 mm	Red	AI 1,0-10RD	3200182
1.5 mm ²	16.5 mm	10.0 mm	1.8 mm	0.15 mm	3.4 mm	0.3 mm	Black	AI 1,5-10BK	3200195

(AI...GB series for wires with thick coating is also available.)



l₁ = 全長
l₂ = スリーブ長
d₁ = スリーブ内径
s₁ = スリーブの厚さ
d₂ = 絶縁スリーブの内径 g sleeve
s₂ = 絶縁スリーブの厚さ eave

- A terminal (sleeve) of a different manufacturer can be used if the dimensions are the same.
- Crimping tool recommend by the above terminal manufacturer: CRIMPFOX 6 (1212034) by Phoenix Contact
- Terminal connection method



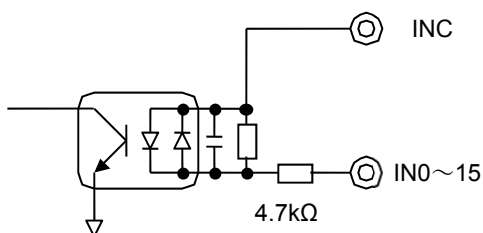
Push down the orange lever to insert the terminal into the hole.
Insert the terminal deeply into the hole and return the lever to fix the terminal.

3. I/O unit

3.1 XM-XD216

Item		Description	Appearance of panel
Parts		16-point DC 24V voltage input unit	
Rated input voltage		DC24V ± 10%	
Rated input current		Approx. 5mA	
Input resistance		Approx. 4.7 kΩ	
Input derating		None	
ON voltage/ON current		10.8V or higher/2.3mA or higher	
OFF voltage/OFF current		5V or lower/0.8mA or lower	
Response time	OFF → ON	2 ms or less (excl. delay in multiplex transmission)	
	ON → OFF	2 ms or less (excl. delay in multiplex transmission)	
Number of input points		16 points	
Wiring method for common		1 Common	
Common terminal polarity		None	
Insulation system		Photocoupler insulation	
Insulation resistance		30 MΩ or higher between input and internal circuit (using insulation resistance tester)	
Dielectric withstand voltage		AC 1500 V/minute between input and internal circuit	
Input connection		Connector connection	
External dimensions		109.6 mm (H) x 18.9 mm (W) x 76.5 mm (D)	
DC5V internal circuit consumption current		typ 37 mA (max. 41 mA), all points ON	
Weight		75 g (incl. bus connector)	
<u>Description of LED display</u> RUN lamp: Green light comes on when this unit is in normal operation. Red light comes on when the address setting of this unit is in an abnormal condition. Red light is flashing when communication with a slave unit has failed. CPUE lamp: Red light comes on when the unit has made an abnormal stop.			

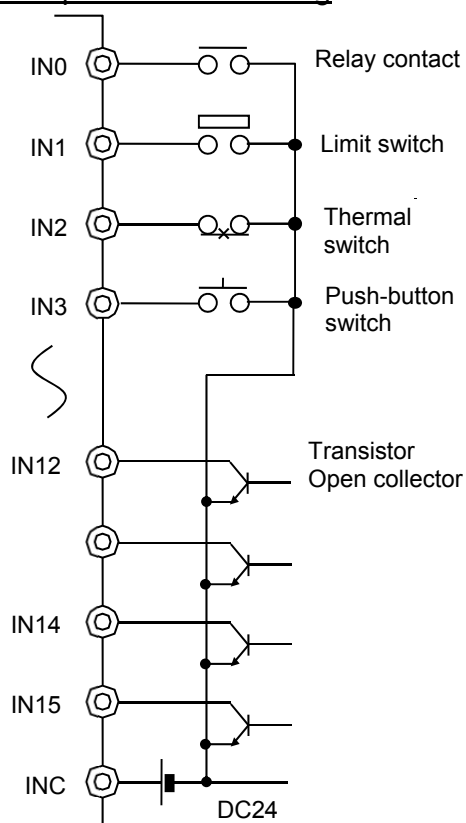
Output circuit



Remark

- Connectors used
FCN-361J040-AU (soldering type)
FCN-360C040-B (cover)
Manufacturer: Use a product equivalent to products of Fujitsu.
Contact the connector manufacturer if a product other than the soldering type is needed.

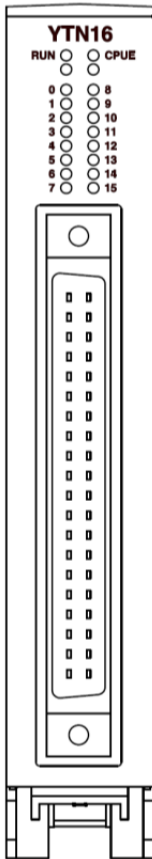
Example of external wiring



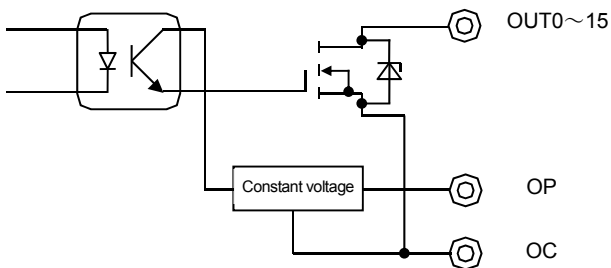
Connector table

B		A
INC	20	INC
INC	19	INC
IN0	18	
IN1	17	
IN2	16	
IN3	15	
IN4	14	
IN5	13	
IN6	12	
IN7	11	
IN8	10	
IN9	9	
IN10	8	
IN11	7	
IN12	6	
IN13	5	
IN14	4	
IN15	3	
	2	
	1	

3.2 XM-YTN16

Item		Description	Appearance of panel
Parts		16-point DC24V 0.1 A transistor output (sink type)	
Max. output voltage		DC30V	
Max. output current		0.1A (1 circuit), OUT0 ~ 7, OUT8 ~ 15, each total 0.5A	
Max. output inrush current		0.6A 10ms or less	
Leakage current in OFF-state		0.1mA or less	
Surge absorber		Zener diode	
Fuse		None	
Response time	OFF → ON	2 ms or less (excl. delay in multiplex transmission)	
	ON → OFF	2 ms or less (excl. delay in multiplex transmission)	
External power supply	Voltage	DC12-24V (+20%/-10%)	
	Current	Max. 10mA (when DC24V, all points ON)	
Number output points		16 points	
Wiring method for common		1 common	
Common terminal polarity		Negative common	
Output hold function		Set 4 points each using the switch.	
Output protection function		Overcurrent protection, overheat protection	
Insulation system		Photocoupler	
Insulation resistance		30 MΩ or higher between output and internal circuit (using insulation resistance tester)	
Dielectric withstand voltage		AC 1500 V/minute between output and internal circuit	
Output connection		Connector connection	
External dimensions		109.6 mm (H) x 18.9 mm (W) x 76.5 mm (D)	
DC5V internal circuit consumption current		typ. 44 mA (max. 48 mA), all points ON	
Weight		75g (incl. bus connector)	
Description of LED display			
RUN lamp: Green light comes on when this unit is in normal operation.			
Red light is flashing when the unit is in an abnormal condition.			
Red light comes on when communication with a slave unit has failed.			
CPUE lamp: Red light comes on when the unit has made an abnormal stop.			

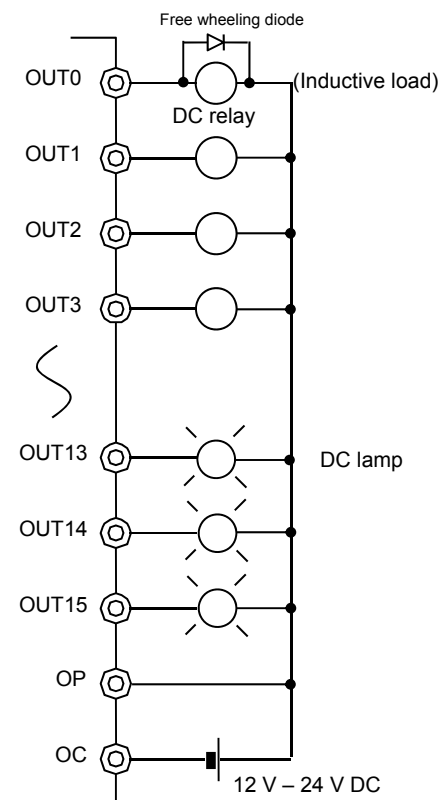
Output circuit



Remark

- Connectors used
FCN-361J040-AU (soldering type)
FCN-360C040-B (cover)
Manufacturer: Use a product equivalent to products of Fujitsu.
- Contact the connector manufacturer if a product other than the soldering type is needed.

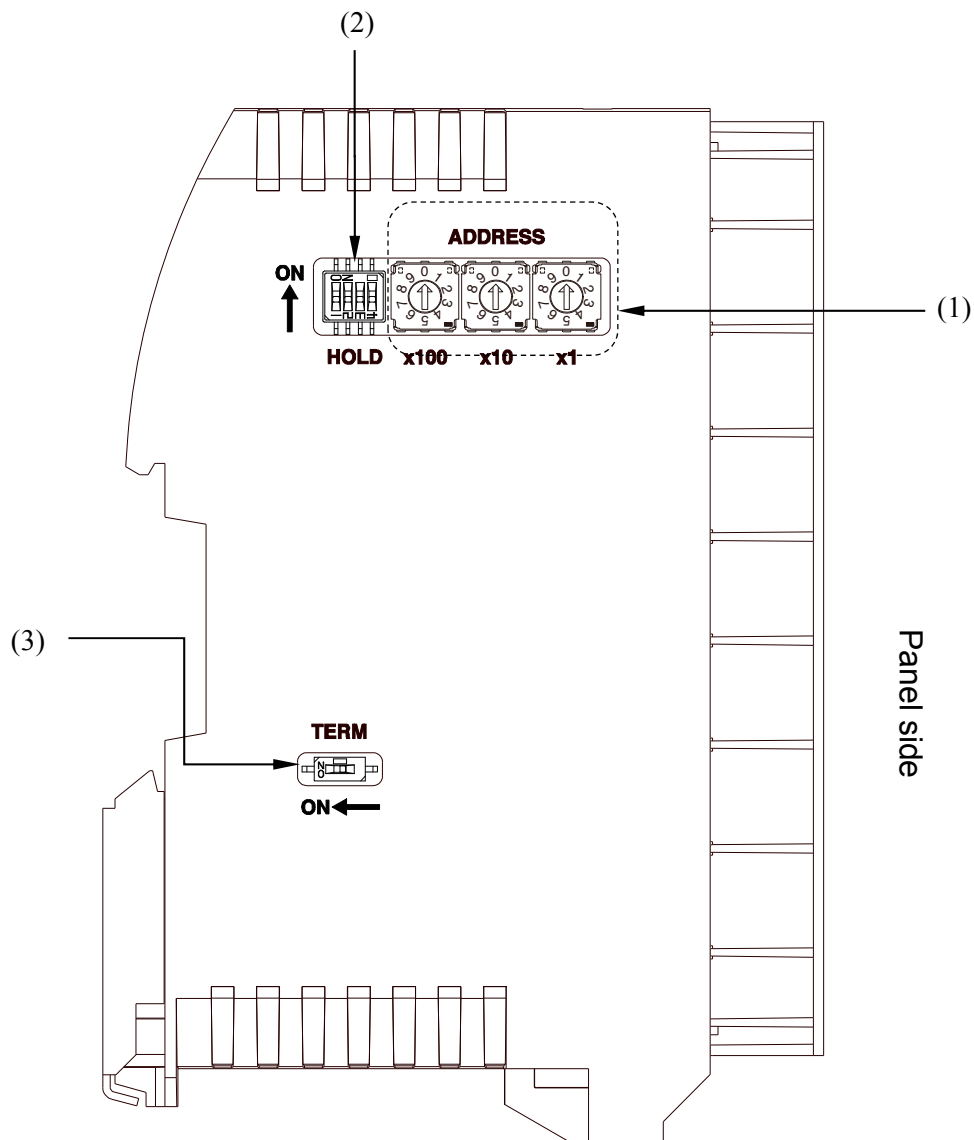
Example of external wiring



Connector table

B		A
OP	20	OP
OP	19	OP
	18	OUT0
	17	OUT1
	16	OUT2
	15	OUT3
	14	OUT4
	13	OUT5
	12	OUT6
	11	OUT7
	10	OUT8
	9	OUT9
	8	OUT10
	7	OUT11
	6	OUT12
	5	OUT13
	4	OUT14
	3	OUT15
OC	2	OC
OC	1	OC

3.3 I/O unit setting switches



(1) Unit address setting switch

This switch identifies each I/O unit address.

(2) Output hold setting switch (output unit only)

This switch is included only in output units and sets whether to hold the output status or turn it off when a communication error occurs.

Among the four switches, Switch 1 corresponds to OUT 0 – 3. Switch 2 corresponds to OUT 4 – 7, Switch 3 corresponds to OUT 8 – 11, and Switch 4 corresponds to OUT 12 – 15, and the output is held by turning them on (Set in units of 4 output points).

(3) I/O communication bus terminator switch

This switch turns on and off the communication bus terminator.

Turn on the switch of only one I/O unit located the furthest from the slave unit.

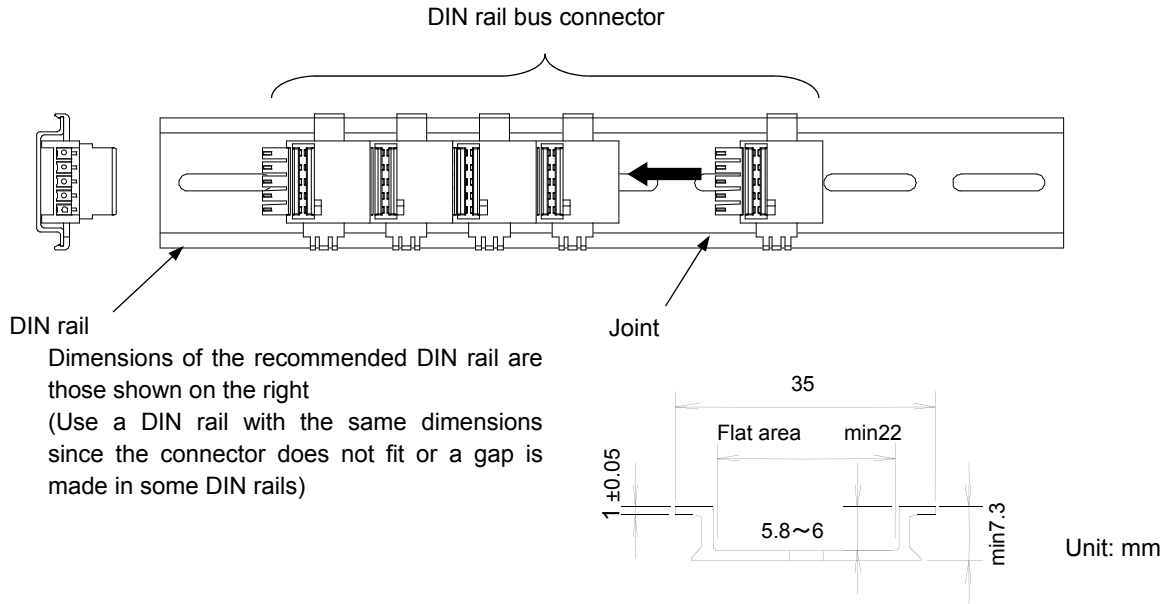
4. Installation

4.1 Installation of DIN rail bus connector for slave unit and I/O bus

DIN rail bus connectors are included in the slave units and I/O units (A slave unit uses two DIN rail bus connectors and I/O unit uses one).

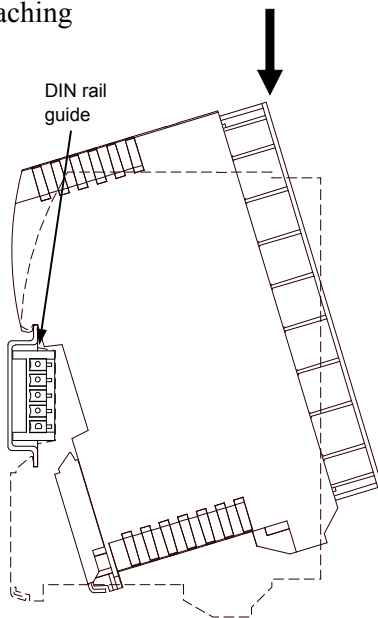
Power is supplied from a slave unit to I/O units through DIN rail bus connectors to control I/O.

Install bus connectors on the DIN rail as shown below.



4.2 Attaching and detaching the unit

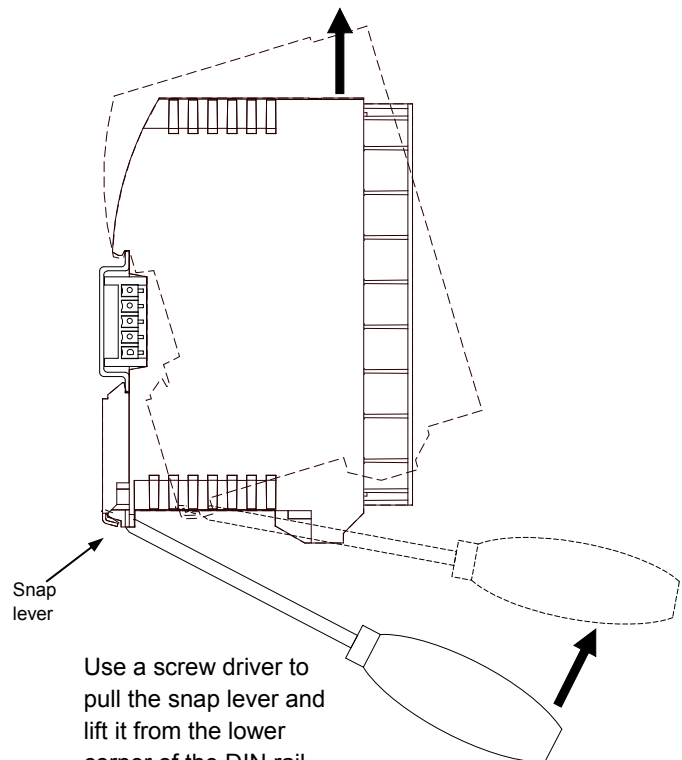
• Attaching



Set the DIN rail guide for the unit in the upper corner of the DIN rail and hold it down to install it.

For a slave unit, place two bus connectors to fit them on the right side of the DIN rail.

• Detaching



Use a screw driver to pull the snap lever and lift it from the lower corner of the DIN rail to detach it.

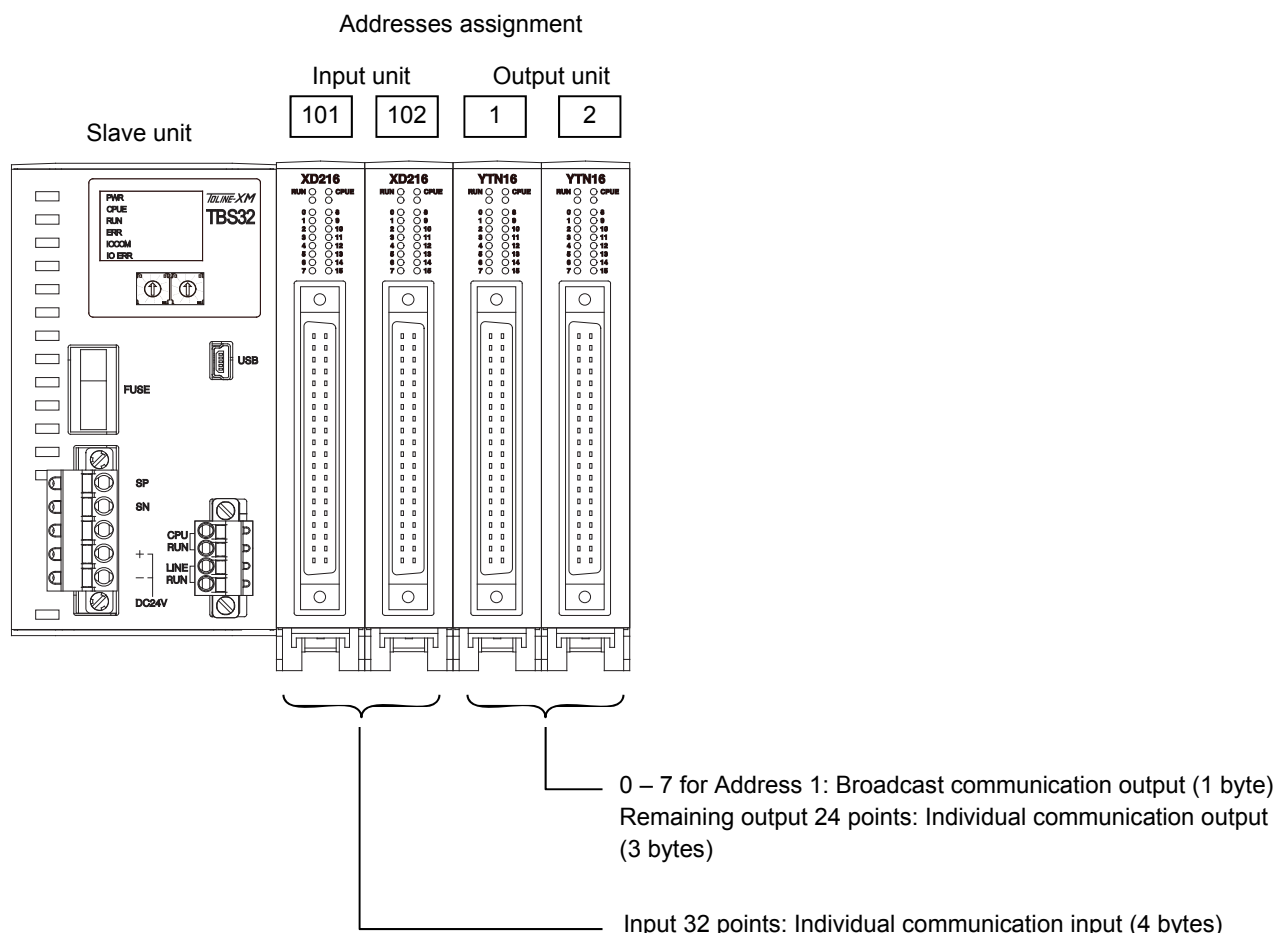
5. Setting

5.1 Allocation of slave units(XM-TBS32) and I/O units

Each slave unit(XM-TBS32) is capable of handling input of 1 to 14 bytes and output of 1 to 14 bytes.

The broadcast communication area and individual communication areas are allocated to the output unit of I/O units. From the smallest number of unit address, the broadcast communication area is allocated for its number of bytes and, subsequently, individual communication areas are allocated for their numbers of bytes. For the input units, too, the areas are allocated from the smallest number of their unit address.

(Example setting) 1 byte for the broadcast communication area, 3 bytes for the individual transmission area, and 4 bytes for the individual reception area



Note:

- Place I/O units on right-hand-side of the slave units (they cannot be placed on the left-hand side).
- The order of arranging the units is not relevant. The address settings determine the order of switch assignment.
- Set the output unit addresses from 1 and input unit addresses from 101.
- The maximum number of I/O units that can be connected to slave units is seven when using 16-point input units and also seven when using 16-point output units (a total of 14 units).
- If the number of input and output bytes set for the master unit and the I/O configuration of slave units do not match, the slave units will not perform the input and output operations (When 16-point units are used as in the above example, the sum of the byte number of the broadcast communication and individual transmission must be an even number to be set on the master unit. Likewise, the number of individual received bytes must be an even number when it is set on the master unit).
- If multiple slave units are connected to a single circuit, all I/O unit configurations must be the same. The system does not operate normally with an incorrect configuration.
- It is not available to compose a system only using input units or only using output units.
- Turn on the switch of the I/O communication bus terminator only for the I/O unit at the right end.

5.2 Master unit (XM-TBM32) Parameter setting

Set operation parameters for the master unit. Connect a PC with a support tool (PC software) installed and a USB to set the parameters. Multiplex communication parameters can be set using the PLC command register.

5.2.1 Multiplex communication parameters

Item	Description and range of settings	Unit
Number of bytes for broadcast data	0 – 7	Byte
Number of bytes for transmission data	1 – 14	Byte
Number of bytes for reception data	1 – 14	Byte
Final slave unit address	1 – 32	CH
Multiplex communication speed settings	1/4x, 1/2x, standard, and 2x	—
Sets the wait of network establishment of the slave unit	0 – 1,000	Scan
Number of times to retry errors with slave unit communication (settings for master unit)	0 – 10	Times
Slave multiplex communication timeout time (settings for slave unit)	1 – 255	x 100ms
How to operate multiplex communication	Continuous operation / controlled by PLC system register	—
Hold/clear setting for Ethernet communication error	Clear / hold	—

5.2.2 Ethernet communication parameter

Item	Description and range of settings	Unit
Ethernet communication setting: Protocol selection	0 : Mitsubishi PLC MC protocol 3E frame 1 : OMRON PLC FINS UDP 2 : JTEKT PLC Ethernet computer link	—
Ethernet communication transmission interval	0 – 60,000	ms
Ethernet communication time out	1 – 40 ^{*1}	x 250ms
	10 – 1,000 ^{*2}	x 10ms
	200 – 1,000 ^{*3}	x 10ms
PLC CPU device allocation 1	First device value for status information	—
PLC CPU device allocation 2	First device value for multiplex reception data / error information	—
PLC CPU device allocation 3	First device value for multiplex transmission data	—
PLC CPU device allocation 4	First system register for system register	—
PLC CPU device allocation 5	First system register for command register	—
Use or non-use of command area	0 :Use / 1 : non-use	—
Use or non-use of command area	0 :Use / 1 : non-use	—
Multiplex Unit: IP Address	E.g. 192.168.1.2	—
Local station subnet mask	E.g. 255.255.255.0	—
Local station port number ^{*4}	E.g. 6000	—
Sequencer: IP Address	E.g. 192.168.1.2	—
Counterpart station port number	E.g. 6001	—
Number of retries when communication error occurs ^{*2}	0 – 10	Times
Local station node number ^{*2}	1 – 254	—
Counterpart station node number ^{*2}	1 – 254	—
Function mode ^{*3}	0 : PC10 mode / 1 : PC10 standard mode	—
Program No. ^{*3}	0 – 2 : Program P1 – P3	—

- *1: Settings when Mitsubishi PLC is selected for Ethernet communication protocol.
 *2: Settings when OMRON PLC is selected for Ethernet communication protocol.
 *3: Settings when JTEKT PLC is selected for Ethernet communication protocol.
 *4: Only for monitoring. It is not available for setting.

5.3 Slave unit (XM-TSE32) Parameter setting

Set operation parameters for the slave unit(XM-TSE32). Connect a PC with a support tool (PC software) installed and a USB to set the parameters.

5.3.1 Ethernet communication parameter

Item	Description and range of settings	Unit
Ethernet communication setting: Protocol selection	0 : Mitsubishi PLC MC protocol 3E frame 1 : OMRON PLC FINS UDP 2 : JTEKT PLC Ethernet computer link	—
Ethernet communication transmission interval	0 – 60,000	ms
Ethernet communication time out	1 – 40 ^{*1}	x 250ms
	10 – 1,000 ^{*2}	x 10ms
	200 – 1,000 ^{*3}	x 10ms
PLC CPU device allocation 1	First device value for status information / multiplex reception data	—
PLC CPU device allocation 2	First device value for multiplex transmission data	—
Multiplex Unit: IP Address	E.g. 192.168.1.2	—
Local station subnet mask	E.g. 255.255.255.0	—
Local station port number ^{*4}	E.g. 6000	—
Sequencer: IP Address	E.g. 192.168.1.2	—
Counterpart station port number	E.g. 6001	—
Number of retries when communication error occurs ^{*2}	0 – 10	Times
Local station node number ^{*2}	1 – 254	—
Counterpart station node number ^{*2}	1 – 254	—
Function mode ^{*3}	0 : PC10 mode / 1 : PC10 standard mode	—
Program No. ^{*3}	0 – 2 : Program P1 – P3	—

- *1: Settings when Mitsubishi PLC is selected for Ethernet communication protocol.
 *2: Settings when OMRON PLC is selected for Ethernet communication protocol.
 *3: Settings when JTEKT PLC is selected for Ethernet communication protocol.
 *4: Only for monitoring. It is not available for setting.

5.4 Communication between PLCs (upper)

5.4.1 Communication protocol

Ethernet communication protocols of Mitsubishi PLC MC protocol 3E frame and OMRON PLC FINS UDP and JTEKT PLC computer link function are available.

5.4.2 Data list (XM-TBM32)

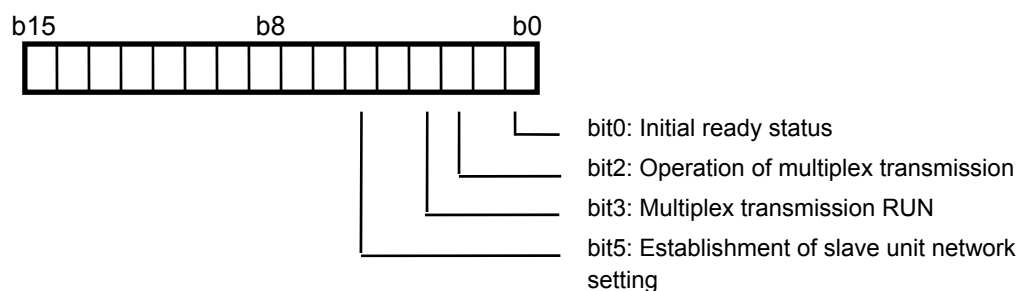
Item	Description	Size (Byte)	Data direction
Status Information (48 Byte)	Unit status	2	TOLINE-XM→PLC
	Survival checking counter	2	
	Current abnormal condition (flag)	2	
	Error history 1 - 5 (error code)	10	
	Slave unit status	32	
Reception data (448 Byte)	Multiplex reception data	448	TOLINE-XM→PLC
Transmission data (448 Byte)	Multiplex broadcast / transmission data	448	PLC→TOLINE-XM
System register (4 Byte)	Control register	2	PLC→TOLINE-XM
	Response register	2	TOLINE-XM→PLC
Command register (100 Byte)	Command request register	2	PLC→TOLINE-XM
	Command response register	2	TOLINE-XM↔PLC
	Data area	96	TOLINE-XM↔PLC

5.4.3 Data list (XM-TSE32)

Item	Description	Size (Byte)	Data direction
Status Information (20 Byte)	Unit status	2	TOLINE-XM → PLC
	Survival checking counter	2	
	Current abnormal condition (flag)	2	
	Error history 1 - 5 (error code)	10	
	Reserve	4	
Reception data (14Byte)	Multiplex broadcast/reception data	14	TOLINE-XM → PLC
Transmission data (14Byte)	Multiplex transmission data	14	PLC → TOLINE-XM

5.4.4 Status information

Unit status



(1) Initial ready status

This bit becomes “1” when the initialization of master unit is completed.

If this bit is not “on” when the power is turned on, an equipment error occurs and the system cannot be used.

0: Running a self-check or equipment error

1: Self-check and initialization are properly completed.

(2) Operation of multiplex transmission

This becomes “1” when operating multiplex transmission.

(3) Multiplex transmission RUN

This becomes “1” when multiplex transmission is operated under normal conditions.

(4) Establishment of slave unit network setting

The default settings of the multiplex unit are normal, and this bit becomes 1 when the multiplex transmission operates and the slave network is established. The bit becomes “0” while the multiplex transmission is stopped.

Status checking counter

It is a counter that counts up in units of 10 ms. It returns to 0x0000 after counting up to 0xFFFF.

Current abnormal condition and error history

Current abnormal condition (flag)
Error history 1 (error code)
Error history 2 (error code)
Error history 3 (error code)
Error history 4 (error code)
Error history 5 (error code)

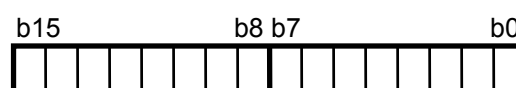
Error histories 1 – 5: Error codes for abnormal conditions occurred in the past are stored in a chronological order.

Examples

E1 → 1 (binary)

EA → 10 (binary)

Current abnormal condition: Information on the abnormal condition currently occurring is stored.



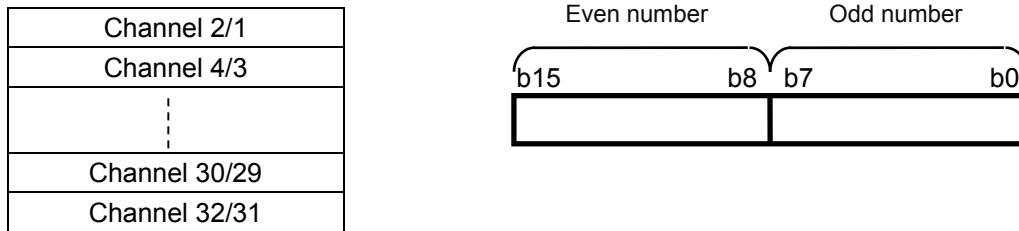
- 0bit:E0 Unit failure (ROM, multiplex gate array)
- 1bit:E1 Unit failure (EEPROM)
- 2bit:E2 Unit failure (watchdog error)
- 3bit:E3 Unit failure (multiplex power failure)
- 5bit:E5 Master unit error (XM-TBM32 only)
- 6bit:E6 Multiplex transmission error (XM-TSE32 only)
- 7bit:E7 Slave unit error (XM-TBM32 only)
- 8bit:E8 Ethernet communication failure (connection)
- 9bit:E9 Ethernet communication failure (command, XM-TBM32 only)
- 10bit:EA USB communication failure
- 11bit:EB Multiplex transmission address setting error (Greater than the final address, XM-TSE32 only)
- 14bit:EC Multiplex transmission address setting range error (XM-TSE32 only)

Bit 4, 6, 12, 13, 15 are reserve and fixed at 0.

A bit does not correspond to unit is fixed at 0.

Slave unit status (XM-TBM32 only)

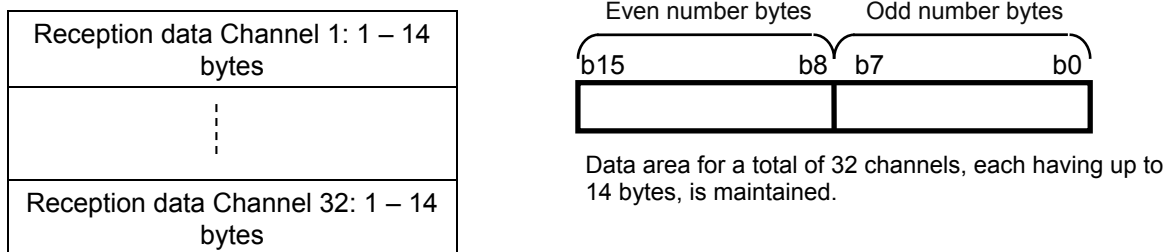
The details of slave unit errors (error codes) are stored.



■ Error code list

Error code	Item	Description
0x00	Normal multiplex communication	Communication is normal.
0x42	Output unit allocation error	The total numbers of broadcast bytes and transmitted bytes and the number of installed output units do not match.
0x44	Input unit allocation error	The number of received bytes and the number of installed input units do not match.
0x48	I/O unit error	I/O unit is indicating an error.
0xFE	Master unit reception error	Master unit did not properly receive data from a slave unit.
0xFF	Slave unit error	Slave unit did not properly receive data from the master unit.

5.4.5 Reception data (XM-TBM32)

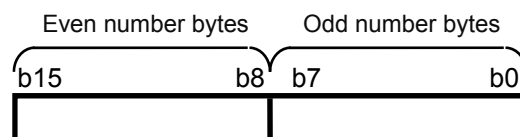


Data are placed tightly to increase an available area. For example, when the final address is set to Channel 3 and the number of received bytes is four, the data area is in a total of six words as shown in the table below.

Address	Reception data area
+0	Ch. 1: 2 nd byte/1 st byte
+1	Ch. 1: 4 th byte/3 rd byte
+2	Ch. 2: 2 nd byte/1 st byte
+3	Ch. 2: 4 th byte/3 rd byte
+4	Ch. 3: 2 nd byte/1 st byte
+5	Ch. 3: 4 th byte/3 rd byte

5-4-6. Reception data (XM-TSE32)

Address	Reception data area
+0	2 nd byte/1 st byte
+1	4 th byte/3 rd byte
+2	6 th byte/5 th byte
+3	8 th byte/7 th byte
+4	10 th byte/9 th byte
+5	12 th byte/11 th byte
+6	14 th byte/13 th byte



When using XM-TSE32, Reception data area is reserved 14 bites. Regardless of received bite numbers.

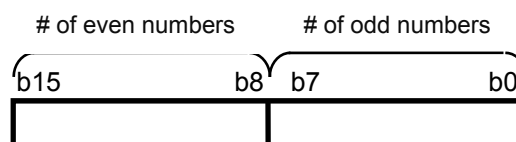
When using broadcasting function, broadcasting data area is placed tightly from the first bit of an available area. When not using, reception data area is placed tightly from the first bit.

For example, when the number of broadcast bytes is three, and the number of received bytes is five, the data area is in a total of four words as shown in the table below.

Address	Reception data area
+0	2 nd byte(Broadcast)/1 st byte(Broadcast)
+1	1 nd byte(Reception)/3 st byte(Broadcast)
+2	3 nd byte(Reception)/2 st byte(Reception)
+3	5 nd byte(Reception)/4 st byte(Reception)
+4	Reserve / Reserve
+5	Reserve / Reserve
+6	Reserve / Reserve

5.4.7 transmission data (XM-TBM32)

Broadcast data: 1 – 7 bytes
Reception data Channel 1: 1 – 14 bytes
⋮
Transmission data Channel 32: 1 – 14 bytes



Data area of up to 7 bytes for broadcast data and up to 14 bytes per channel for transmission data is maintained for a total of 32 channels.

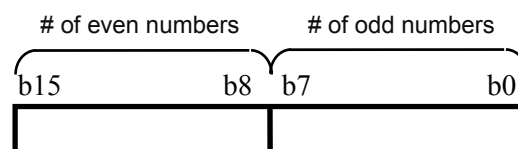
Transmission signal data also placed tightly to increase an available area. When the setting of the number of broadcast bytes is other than 0, the broadcast data area is acquired from the first address. If the setting is 0, the transmission data area is acquired from the first address.

For example, when the final address is set to Channel 3, the number of broadcast bytes is two, and the number of transmitted bytes is four, the data area is in a total of seven words as shown in the table below.

Address	Transmission data area	
+0	Broadcast data	2 nd byte/1 st byte
+1	Transmission data	Ch. 1: 2 nd byte/1 st byte
+2	Transmission data	Ch. 1: 4 th byte/3 rd byte
+3	Transmission data	Ch. 2: 2 nd byte/1 st byte
+4	Transmission data	Ch. 2: 4 th byte/3 rd byte
+5	Transmission data	Ch. 3: 2 nd byte/1 st byte
+6	Transmission data	Ch. 3: 4 th byte/3 rd byte

5-4-8. transmission data (XM-TSE32)

Address	Transmission data area
+0	2 nd byte/1 st byte
+1	4 th byte/3 rd byte
+2	6 th byte/5 th byte
+3	8 th byte/7 th byte
+4	10 th byte/9 th byte
+5	12 th byte/11 th byte
+6	14 th byte/13 th byte



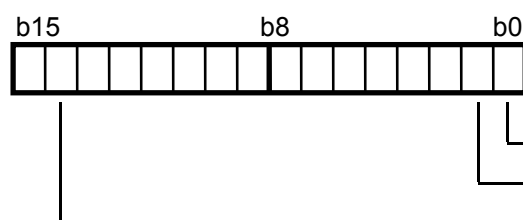
When using XM-TSE32, transmission data area is reserved 14 bites. Regardless of transmitting bite numbers.

When the transmission data area is set lower than 14 bites, unused area is reserved.

5.4.9 System register (XM-TBM32 only)

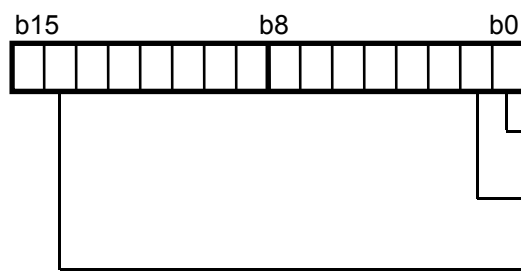
Settings and clearing of the “control register” are made by the user (PLC). When the master unit completes a request assigned by the [control register], the response flag is ON. After confirming this, clear the “control register”. When the request of the “control register” is turned OFF, the completion flag of the response register is also turned OFF.

[Control register]



- (1) Request to stop multiplex communication: Edge from OFF to ON stops multiplex communication.
 - (2) Request to operate multiplex communication: Edge from OFF to ON operates (starts) multiplex communication.
- *If requests to stop and operate multiplex communication are made simultaneously, the request to stop is prioritized.
- (3) Error reset: Operation from OFF to ON clears the abnormal condition currently occurring.

[Response register]



- (1) Request to stop multiplex communication has been accepted: Acceptance turns the request to stop multiplex communication ON.
- (2) Request to operate multiplex communication has been accepted: Acceptance turns the request to operate multiplex communication ON.

5.4.10 Command register (XM-TBM32 only)

Command request register	1 word	See the command list below.
Command response register	1 word	
Data area	98 words	

- (1) PLC sets the setting data corresponding to the command in the “data area” and clears the “command response register” as 0. Subsequently, it sets the command to the “command request register”.
- (2) In response, the master unit executes the command.
- (3) Set the results of command execution to the “command response register” and “data area”.

Results of command execution

Description	Response register	Detailed Description
Normal end	01	Normal completion
Abnormal en	02	Undefined command
	03	Outside of setting range

Command List

Item	Command	Data area		
		Size (Byte)	Setting data (PLC→TOLINE-XM)	Response data (TOLINE-XM→PLC)
Basic multiplex unit settings	H '0001	2	Number of broadcast bytes	No
		2	Number of transmitted bytes	
		2	Number of received bytes	
		2	Final truck number	
		2	Multiplex communication speed settings	
		2	Sets the wait of network establishment of the slave unit	
		2	Number of times to examine errors with slave unit communication	
		2	Slave unit timeout time	
		2	How to operate multiplex communication	
		2	Hold/clear setting for Ethernet communication error	
		4	Reserve	
Read Setting Info.	H '0031	80	No	See “Setting Information”.

Setting Information

The following lists the multiplex parameters and responses of Ethernet communication settings for the Read Setting Info command.

Address	Item	Description	Size (Byte)
+0	Multiplex parameters	Number of broadcast bytes	2
+2		Number of output bytes	2
+4		Number of input bytes	2
+6		Final truck number	2
+8		Multiplex communication speed settings	2
+10		Sets the wait of network establishment of the slave unit	2
+12		Number of times to examine errors with slave unit communication	2
+14		Slave unit timeout time	2
+16		Multiplex operation control settings	2
+18		Hold/clear setting for Ethernet communication error	2
+20		Reserved	4
+24	Ethernet communication settings	Ethernet Communication Setting: Protocol Selection	2
+26		Ethernet communication transmission interval	2
+28		Ethernet communication time out	2
+30		Number of retries when communication error occurs	2
+32		PLC CPU device allocation 1	4
+36		PLC CPU device allocation 2	4
+40		PLC CPU device allocation 3	4
+44		PLC CPU device allocation 4	4
+48		PLC CPU device allocation 5	4
+52		PLC CPU device allocation 6	4
+56		Use or non-use of command area	2
+58		Multiplex Unit: IP Address ^{*1}	4
+62		Local station subnet mask ^{*1}	4
+66		Local station port number	2
+68		Sequencer: IP Address ^{*1}	4
+72		Counterpart station port number	2
+74		Local station node number	1
+75		Counterpart station node number	1
+76		Mode	2
+78		Program No.	2

The abovementioned contents are available to configure by using support tool.

It is not required to control by command register when the setting is completed by support tool.

*1: Ex.) 192.168.1.2
 LL +0 : 192
 +1 : 168
 +2 : 1
 HH +3 : 2

6. Display and operation (XM-TBM32, XM-TSE32)

◆ Operation: press button switch of XM-TBM32

DISPSEL switch : Press to change display contents. When the button has been pressed for 3 sec. or longer, it changes the display mode.

ERRCLR switch : Press to clear the current occurring error. Clear all errors when several errors occurring. Press for 3 sec. or longer error histories are clear when using error history mode.

◆ Operation: press button switch of XM-TSE32

DISPSEL switch : Press to change display contents. When the button has been pressed for 3 sec. or longer, it changes the display mode. In the error display mode, the button has been pressed for 3 sec. or longer, It changes error history mode. Furthermore, the button has been pressed for 3 more sec. Error histories are cleared.

◆ Display: 7-Segment display

2 display modes are selectable “Error display mode” and “Error history mode”. Press DISPSEL switch for 3 sec. to select display modes. Despite of the display mode, when the button has not been pressed for 30 sec. automatically return to the top of the error display mode.

Error display mode

- It becomes "_0" displayed when an abnormality has not occurred.
- It will display as follows: If an error has occurred.

No.	Name	Content
1	Currently occurring system errors	It displays an error code that is currently occurring. Display example) "E1" If there is more than one error occurred simultaneously, it displays an error code each time by pressing the “DISPSEL” switch.
2	Currently occurring slave errors	In case of the slave unit displays "E7", to press the DISPSEL switch, it displays a slave unit address which is occurring error. Display example of the address 1 will be "01". If there is more than one error slave unit is in the error condition, it sequentially displays error slave unit address each time by pressing the “DISPSEL” switch.

Error history mode

It displays 5 latest error histories that occurred in the past.

No.	Name	Content
1	Error history 1	The latest error history. Ex.) “1.5”
2	Error history 2	The second latest error history. Ex.) “2.8”
3	Error history 3	The Third latest error history. Ex.) “3.7”
4	Error history 4	The fourth latest error history. Ex.) “4.8”
5	Error history 5	The fifth latest error history. Ex.) “5.7”

It displays the next error history each time by pressing the “DISPSEL” switch.

Ex.) Error history 1 → Error history 2 → ... → Error history 5 → Error history 1 → ...

7. Display and operation (XM-TBM32, XM-TSE32)

Display	Content	Recovery method
E0	Unit internal error (ROM, FPGA)	1. Turn the power off and on of this unit. 2. Replace the unit. (If the unit is not recovered in procedure "1")
E1	Unit internal error (EEPROM)	1. Re-setting of the unit by the support tool. Then turn the power on again. 2. Replace the unit. (If the unit is not recovered in procedure "1")
E2	Unit internal error (watchdog error)	1. Turn the power off and on of this unit. It may have occur abnormal due to the effect of noise. Please check the enviroment if there is any noise source.
E3	Unit internal error (Abnormality of communication power supply)	1. Turn the power on and off of this unit. 2. Replace the unit. (If the unit is not recovered in procedure "1")
E5	Master error (XM-TBM32 only)	1. Check the cable connection of multiplexed transmission line. 2. Press the ERRCLR switch. 3. Replace the unit. (If the unit is not recovered in procedure "2")
E6	Multiplex transmission error (XM-TSE32 only)	1. Check the cable connection of multiplexed transmission line 2. Check the connections and settings of the master unit
E7	Slave unit error (XM-TBM32 only)	1. Verify the configuration and connection of the error occuring slave unit. 2. Check the assignment of the slave unit.
E8	Ethernet communication error (connection)	1. Check the ethernet cable connection. 2. Check the setting of the IP address and port number. 3. Check the Ethernet configuration of the PLC.
E9	Ethernet communication error (command, XM-TBM32 only)	1. Check the error code of the PLC.
EA	USB communication error	1. Check the USB cable connection. 2. Check the support tool status . 3. Press the ERRCLR switch. 4. Restart the PC installed support tool. Turn the power off and on of this unit. (If the unit is not recovered in procedure "3")
EB	Multiplex transmission address setting error (XM-TSE32 only)	1. Check the address setting of the slave unit. 2. Check the last slave unit address of the master unit.
EE	Multiplex transmission address setting range error (XM-TSE32 only)	1. Check the address setting of the slave unit.

- If the several errors occurred simultaneously, the smallest error number is displayed first.
- If factors of E6~E9 error is removed and restored normal, automatically error display will disappear.
- E5 and E7 error display will disappear by pressing the ERRCLR switch during multiplex transmission has been stopped.

In the case of E7 error clearing, also clears the status of the slave unit.

If the abnormal factor is not removed, it is detected again error in the operation of multiplex transmission.

8. Transmission speed

8.1 Maximum communication time between the master unit and slave unit: Tms

The communication time between the master unit and slave unit is determined by the following formula.

$$Tms = ((\text{number of transmitted bytes} + \text{number of received bytes} + 8) \times \text{final slave address} + (\text{number of broadcast bytes} + 4) \times d + 6) \times Tb \text{ [ms]}$$

[when number of broadcast bytes = 0, d = 0; when number of broadcast bytes ≠ 0, d = 1]

[when speed is 2x, Tb = 0.288; when speed is standard, Tb = 0.576, when speed is 1/2x, Tb = 1.152, when speed is 1/4x, Tb = 2.304]

8.2 Maximum data transfer time between a slave unit and I/O unit: Tsio

The data transfer time between a slave unit and I/O unit is determined by the following formula.

$$Tsio = \text{number of I/O units} + 2 \text{ [ms]}$$

8.3 Maximum communication time between the master unit and PLC: Tmp

The maximum communication time between the master unit and PLC is determined by the following formula.

$$Tmp = Ttrans + Tint$$

“Ttrans” is the time taken for the master unit to transfer data to a PLC. This data transfer time is affected by the PLC’s scan time and the type of Ethernet port (Built-in Ethernet port CPU or uses an expansion slot).

For example, the data transfer time, “Ttrans” is approximately 20ms when Ethernet built into a CPU of Type Q03 is used without a ladder program in **one-to-one communication with Mitsubishi PLC**. Under the same conditions, “Ttrans” is approximately 30 ms when scan time is 600μs and there is a ladder program.

“Tint” is the time set as a transmission interval in Ethernet communication settings. If any Ethernet device other than this product and PLC is connected, this time may not be constant and may become longer.

8.4 Total maximum communication time: Tpio

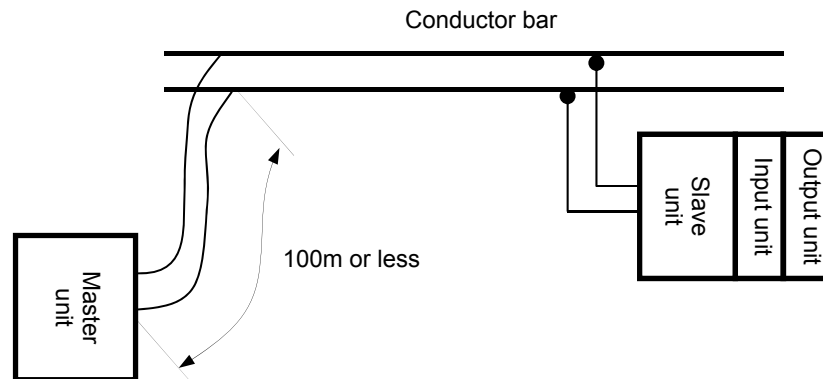
Therefore, the maximum communication time between the PLC’s internal data register and I/O unit becomes the following.

$$Tpio = Tms + Tsio + Tmp \text{ [ms]}$$

9. Notes when using the product

9.1 Signal line connection

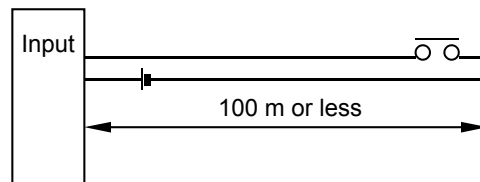
- See the diagram in “1.2 Overview of operation” for the unit connection.
- Use a twisted pair cable of 0.75 sq or above for the signal lines.
- Limit the length of the lead wire to 100 m or less.



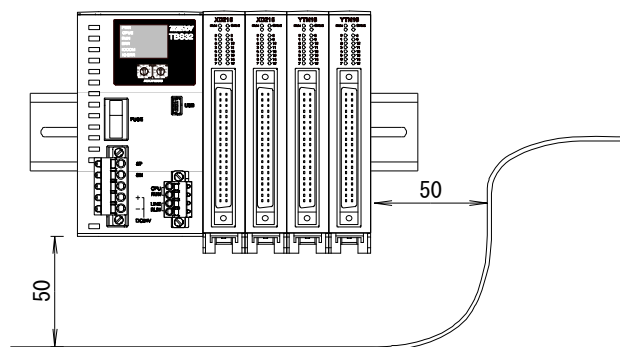
- Do not combine the signal line and power line into one cable, separate them in different cables and place them more than 10 meters apart when possible.
- Do not allow signal lines to share one line when cabling signal lines for multiple systems at one location. Do not place multiple signal lines in the same cable. This may cause a communication error due to cross talk.
- The transmission distance (total length) is limited to 250 m or below when using double speed mode and a 2 sq. cap-tire cable (or the equivalent) is used for the signal line.

9.2 Connection between the unit and devices

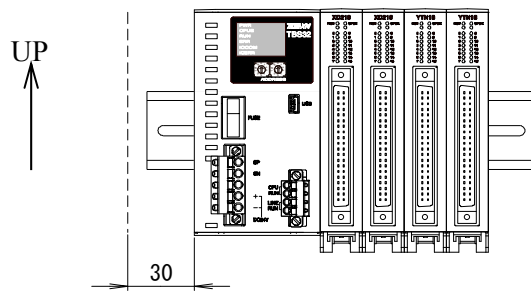
- Limit the length of the lead wire for input signals to 100 m or less and install it in the same cable or pipe as the input common.



- If other power cords must be placed around the unit, keep them out more than 50 mm from the main body of the unit.

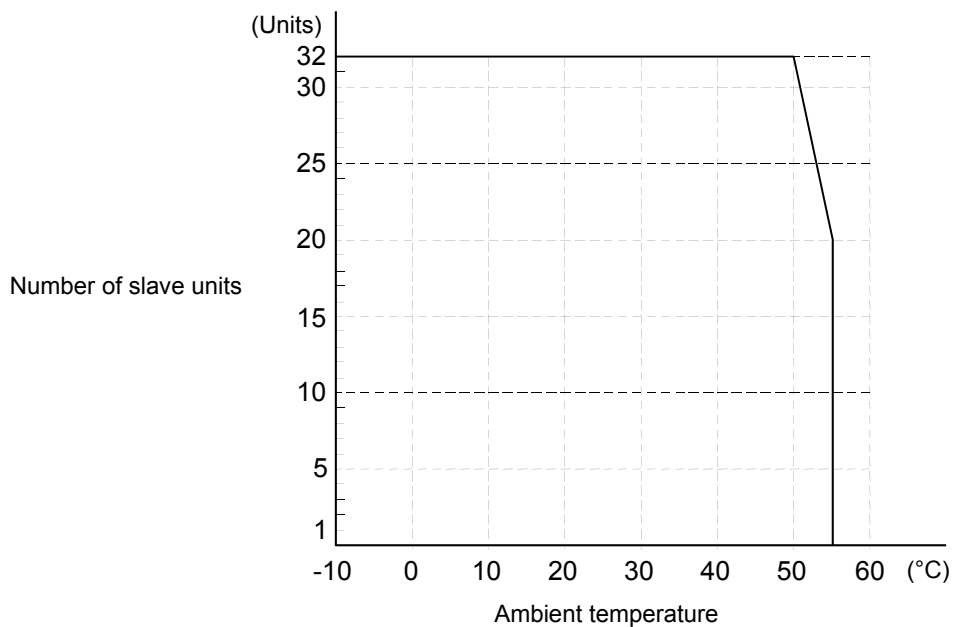


- Place the unit in a vertical, upward position due to ventilation. In addition, the left side of the communication unit, please open the space of 30mm.



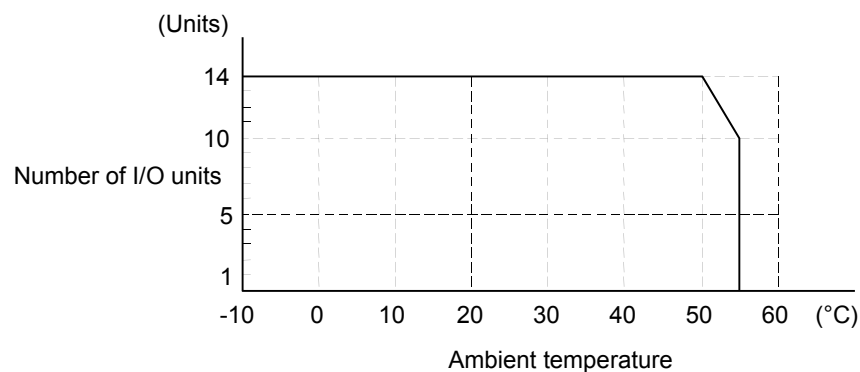
9.3 Number of slave units connected to the master unit and derating of ambient temperature used

If the number of slave units connected to the master unit exceeds 20, use them within the range shown in the following graph.



9.4 Number of I/O units connected to a slave unit and derating of ambient temperature used

If the number of I/O units connected to a slave unit exceeds 10, use them within the range shown in the following graph.



10. Lighting and operation status of lamps

The statuses of lamp lighting under the following conditions are indicated in the table on the next page.

- a. The PLC and Ethernet are not connected or disconnected
- b. Signal Line SP or SN is detached, or if Signal Line SP or SN is connected
- c. The master unit is malfunctioning
- d. The configuration of I/O unit connection set by the master unit and that set by the slave units do not match
- e. The number of addresses set by the slave units is larger than the number of connected slave set by the master unit
- f. The number of connected slave units is smaller than the number of connected slave set by the master unit
- g. The addresses of slave units are not 1 through 32
- h. A slave unit has broken down and must be replaced
- j. Any of the I/O units has broken down and must be replaced
- k. Continuous data errors have occurred in the communications between a slave unit and I/O unit
- m. The master unit has indicated an error due to noise, signal line short circuit, etc. and the multiplex communication has stopped
- n. The signal waveform is weak

■ Case of combination of XM-TBM32 and XM-TBS32

		Normal	a	B	c	d	e	f	g	h	j	k	m	n
Master unit (TBM32)	PWR													
	CPUE													
	RUN													
	ERR													
	SLAVE ERR													
	7-segment display	0	E8	E7	E0 – E3	E7	0	E7	E7	E7	E7	E7	E5	E7
	CPURUN output	ON	ON	ON	OFF	ON	ON	ON	ON	ON	ON	ON	ON	ON
	LINERUN output	ON	ON	ON	OFF	ON	ON	ON	ON	ON	ON	ON	OFF	ON
Slave unit (TBS32)	PWR													
	CPUE													
	RUN													
	ERR													
	IOCOM													
	IOERR													
	CPURUN output	ON	ON	ON	ON	ON	ON	ON	ON	OFF	ON	ON	ON	ON
	LINERUN output	ON	ON	OFF	OFF	OFF	OFF	ON	OFF	OFF	ON	ON	OFF	OFF
							*2							*4
I/O unit	RUN	Green	Green	Green	Green	Green	Green	Green	Green	Red flashing	Red	Green	Green	Green
	CPUE													
	Operation where output is ON	ON	OFF *1	OFF *1	OFF *1	OFF	OFF	ON	OFF	OFF	OFF	OFF *1	OFF *1	OFF *1
											*3 *5			

*1: Output is held where a hold switch is "ON".

*2: Indicating a slave unit that has set more addresses than the number of connected units defined by the master unit

*3: Indicating a malfunctioning I/O unit and the slave unit to which it is connected (the malfunctioning I/O unit may have a red light flashing). The combinations of slave units and I/O units that are properly functioning are the same as they are in normal times. The output is ON.

*4: Indicating a slave unit having a reception error. Properly functioning units are the same as in normal times and the output is ON.

*5: I/O units may not become like this depending on the breakdown condition.

Off Flashing On

■ Case of combination of XM-TBM32 and XM-TSE32

		Normal	a	b	c	d	e	f	g	h	j	k	m	n
Master unit (TBM32)	PWR	○	○	○	○	/	○	○	○	○	/	/	○	○
	CPUE	●	●	●	○	/	●	●	●	●	/	/	●	●
	RUN	○	○	○	●	/	○	○	○	○	/	/	●	○
	ERR	●	●	●	●	/	●	●	●	●	/	/	○	●
	SLAVE ERR	●	●	○	●	/	●	○	○	○	/	/	●	○
	7-segment display	0	E8	E7	E0 – E3	/	0	E7	E7	E7	/	/	E5	E7
	CPURUN output	ON	ON	ON	OFF	/	ON	ON	ON	ON	/	/	ON	ON
	LINERUN output	ON	ON	ON	OFF	/	ON	ON	ON	ON	/	/	OFF	ON
Slave unit (TSE32)	PWR	○	○	○	○	/	○	○	○	○	/	/	○	○
	CPUE	●	●	●	●	/	●	●	●	○	/	/	●	●
	RUN	○	○	●	●	/	◐	○	●	●	/	/	●	●
	ERR	●	●	○	○	/	○	●	◐	●	/	/	○	○
	IOCOM	●	○	●	●	/	●	●	●	●	/	/	●	●
	IOERR	0	E8	E6	E6	/	Eb	0	EE	E0 – E3	/	/	E6	E6
	CPURUN output	ON	ON	ON	ON	/	ON	ON	ON	OFF	/	/	ON	ON
	LINERUN output	ON	ON	OFF	OFF	/	OFF	ON	OFF	OFF	/	/	OFF	OFF
						/	*6				/	/		*7

*6: Indicating a slave unit that has set more addresses than the number of connected units defined by the master unit

*7: Indicating a slave unit having a reception error. Properly functioning units are the same as in normal times.

○ On ◐ Flashing ● Off

11. External dimensions

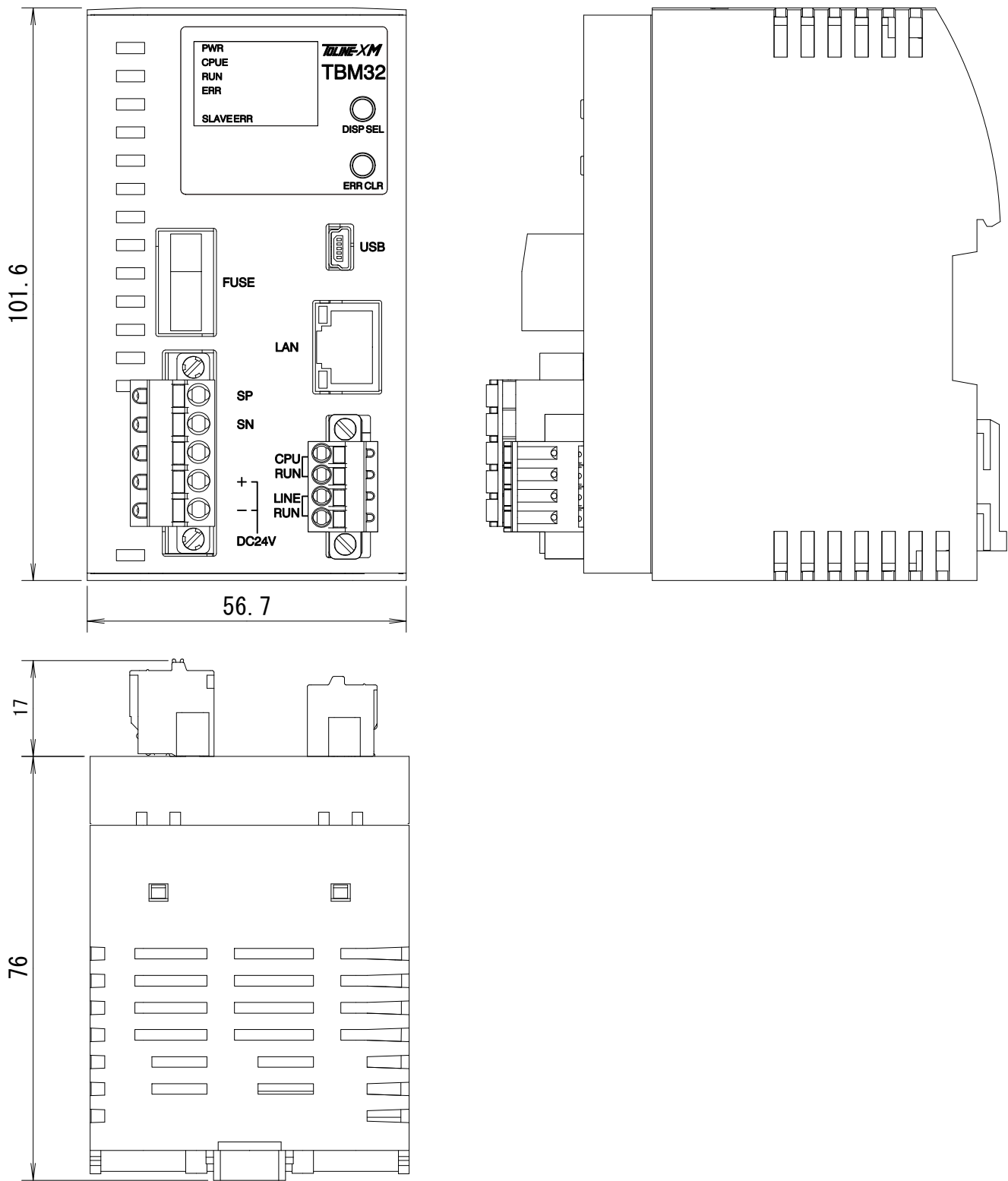


Figure 1. External view of XM-TBM32

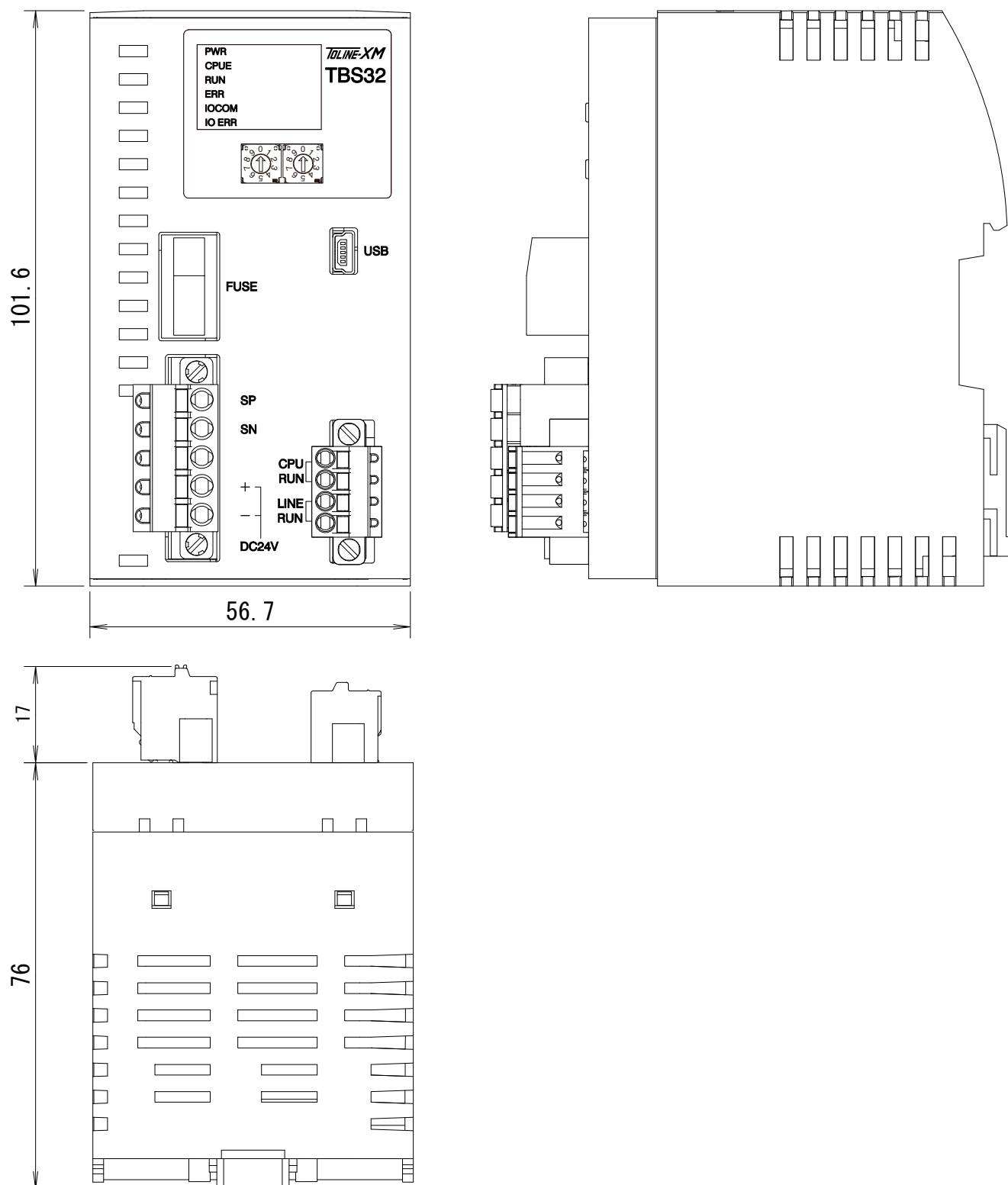


Figure 2. External view of XM-TBS32

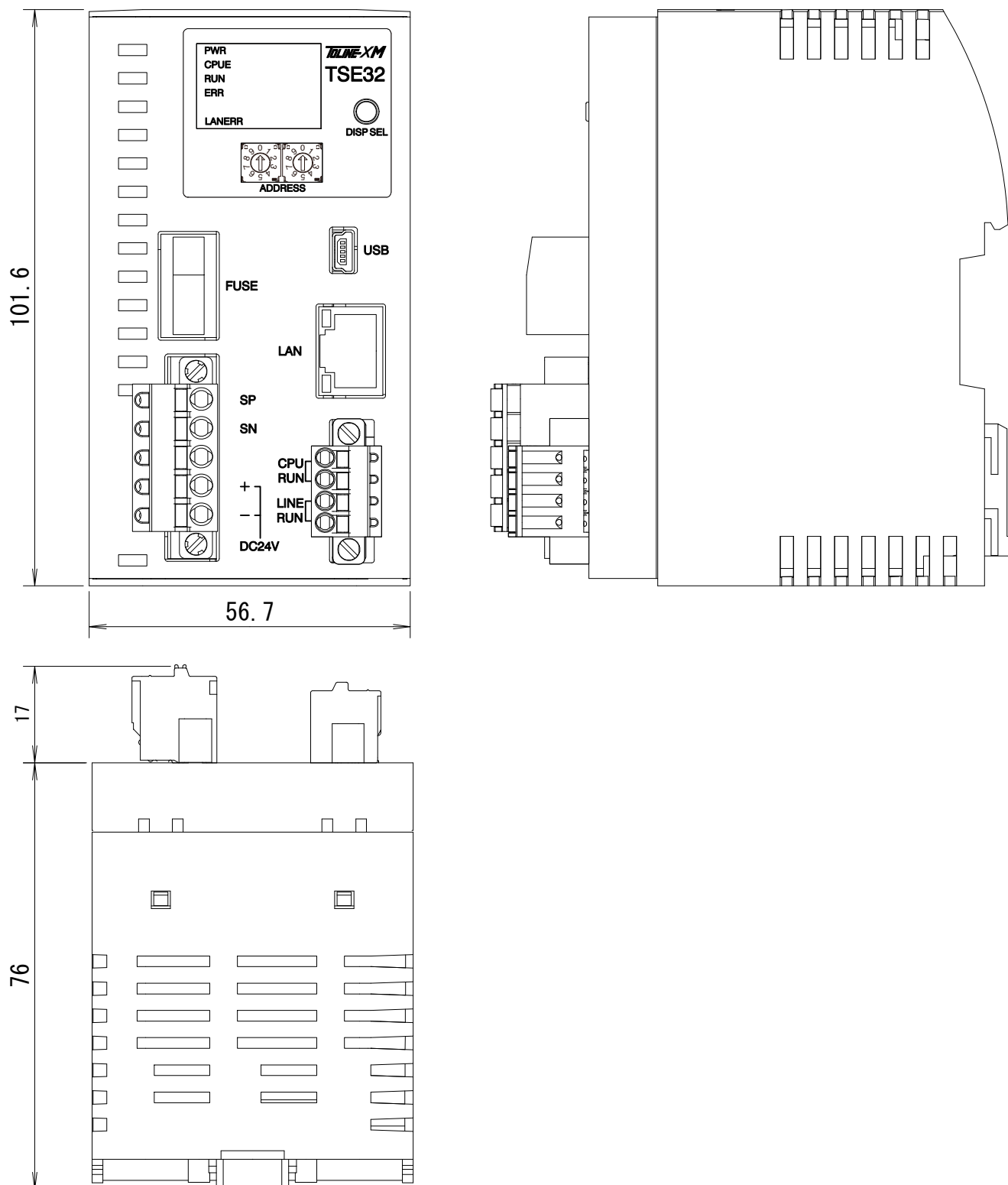


Figure 3. External view of XM-TSE32

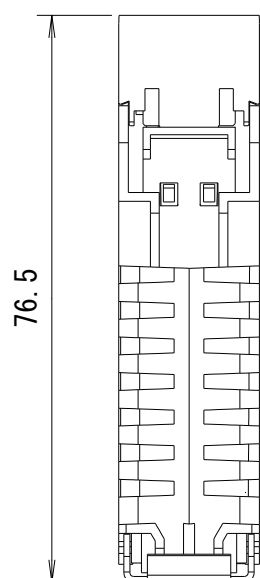
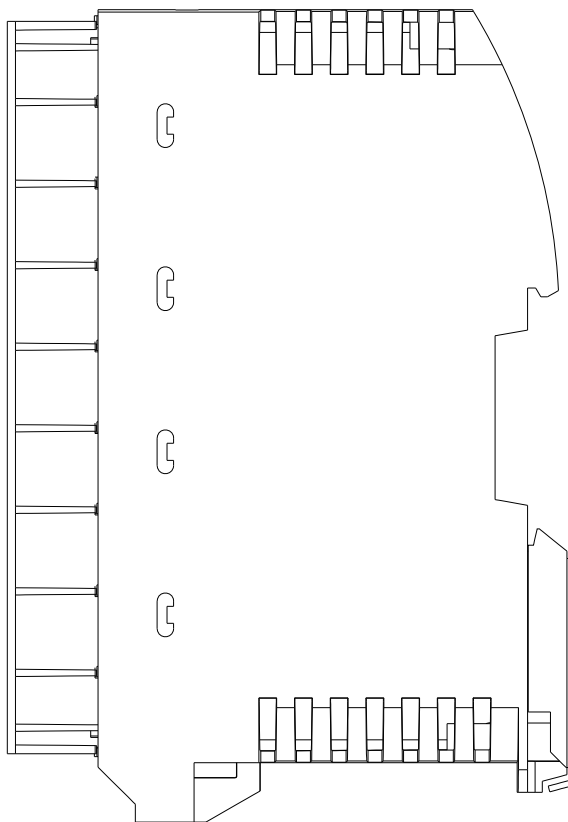
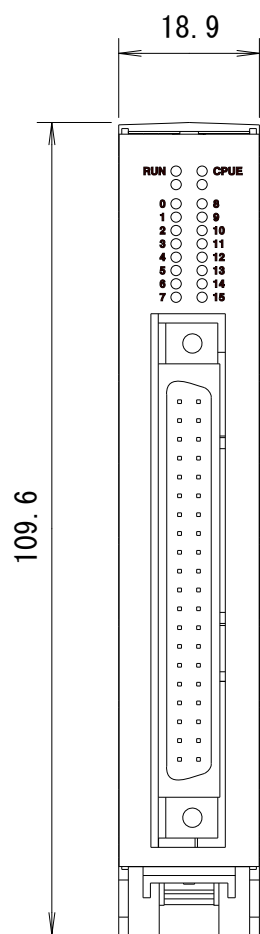


Figure 4. External view of XM-XD216 and XM-YTN16

12. Warranty

[Warranty period]

The warranty period for the product of Toho Technology is one (1) year from the date of delivery to the location assigned by the purchaser.

[Scope of warranty]

Toho Technology will repair or replace the malfunctioning parts free of charge if the malfunction is deemed attributable to Toho Technology during the above period of warranty.

However, the above warranty does not apply in the following cases.

- (1) Malfunction due to improper treatment or use by the customer
- (2) Malfunction due to modification or repair performed by a party other than Toho Technology
- (3) Malfunction due to natural disasters and other force majeure causes not attributable to Toho Technology

Toho Technology will not be liable for any damage resulting from malfunction of the product. We may not accept a repair order if the condition is deemed beyond repair.

13. Scope of services

The product price does not include services such as dispatch of engineers. The following cases require individual payment of service fees.

- (1) Participation in installation, adjustment, and test operation
- (2) Inspection/maintenance and repair/adjustment outside the scope of the above warranty
- (3) Technical training and education

[illegible]

Revision History

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Note:

The information in this document is subject to change without notice.



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