Thank you for purchasing the EX Module (hereafter referred to as the “this unit”) for the Pro-face’s LT3000 Series. This unit is intended for use with expansion I/O module designed for the LT3000 Series Graphical Logic Controller unit (hereby referred to as “LT”).
Before actually beginning to use this product, please be sure to read through this manual and other related manuals to fully understand all the settings and functions.

NOTICE

1. Copying this manual’s contents, either in whole or in part, is prohibited without the express permission of Digital Electronics Corporation, Japan.
2. The information contained in this manual is subject to change without notice.
3. If you should you find any errors or omissions in this document, please contact Digital Electronics Corporation to report your findings.
4. Regardless of Clause 3 above, Digital Electronics Corporation shall not be held responsible for any damages, losses or third-party damages resulting from the use of this product.

Product names used in this manual are the trademarks / registered trademarks of their respective owners.

1. Essential Safety Precautions

⚠ DANGER

- An emergency stop circuit and an interlock circuit should be constructed outside of this unit. Constructing these circuits inside this unit may cause a runaway situation, system failure, or an accident due to unit failure.
- Systems using this unit should be designed so that output signals which could cause a serious accident are monitored from outside the unit.
- This unit is designed to be a general-purpose device for general industries, and is neither designed nor produced to be used with equipment or systems in potentially life-threatening conditions. If you are considering using this unit for special uses, including nuclear power control devices, electric power devices, aerospace equipment, medical life support equipment, or transportation vehicles, please contact your local distributor.

⚠ WARNING

- Whenever installing, dismantling, wiring, and conducting maintenance or inspections, be sure to disconnect power to this unit to prevent the possibility of electric shock or fire.
- Do not disassemble or remodel this unit, since it may lead to an electric shock or fire.
- Do not use this unit in an environment that contains flammable gases since an explosion may occur.
- Do not use this unit in an environment that is not specified in the manuals. Otherwise, an electric shock, fire, malfunction or other failure may occur.
- Because of the possibility of an electric shock or malfunction, do not touch any power terminals while the unit is operating.

⚠ CAUTION

- Communication cables or I/O signal lines must be wired separately from the main circuit (high-voltage, large-current) line, high-frequency lines such as inverter lines, and the power line. Otherwise, a malfunction may occur due to noise.
- This unit must be properly installed according to directions in the manuals. Improper installation may cause the unit to malfunction, or fail.
- This unit must be properly wired according to directions in the manuals. Improper wiring may cause a malfunction, failure or electric shock.
- Do not allow foreign substances, including chips, wire pieces, water, or liquids to enter inside this unit's case. Otherwise, a malfunction, failure, electric shock, or fire may occur.
- When disposing of this unit, handle it as an industrial waste.

■ To Avoid Damage

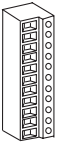
- Avoid storing or operating this unit in either direct sunlight or excessively dusty or dirty environments.
- Because this unit is a precision instrument, do not store or use it in locations where excessive shocks or vibration may occur.
- Avoid covering this unit’s ventilation holes, or operating it in an environment that may cause it to overheat.

- Avoid operating this unit in locations where sudden temperature changes can cause condensation to form inside the unit.
- Do not use paint thinner or organic solvents to clean this unit.

2. Package Contents

(1) EX Module Unit (1)

(2) Terminal Connector (1)
The type of connector depends on the model (10 pin or 11 pin) (EXM-DDI16DT and EXM-DRA16RT are 2-piece package respectively.)
(Models that use MIL connector excluded)



(3) Warning/Caution Information (1)

This unit has been carefully packed, with special attention to quality. However, should you find anything damaged or missing, please contact your Pro-face local distributor immediately.

3. Supported Model

LT3000 Series

IMPORTANT

- The LT3000 Series with a project file, GP-Pro EX ver.2.0 or later, should be used. (Version of transfer tool should be GP-Pro EX Ver.2.0 or later)

4. EX Modules Model Names

Product Name	Model No.	Description
EX Module (8-point input module)	EXM-DDI8DT	8-point sink/source shared I/O Unit. 24VDC input signal can be connected.
EX Module (16-point input module)	EXM-DDI16DT	16-point sink/source shared I/O Unit. 24VDC input signal can be connected.
EX Module (8-point relay-output module)	EXM-DRA8RT	8-point relay output/2 common type I/O Unit.
EX Module (16-point relay-output module)	EXM-DRA16RT	16-point relay output/2 common type I/O Unit.
EX Module (8-point sink-output module)	EXM-DDO8UT	8-point transistor output sink I/O Unit.
EX Module (8-point source-output module)	EXM-DDO8TT	8-point transistor output source I/O Unit.
EX Module (16-point sink-output module)	EXM-DDO16UK	16-point transistor output sink I/O Unit.
EX Module (16-point source-output module)	EXM-DDO16TK	16-point transistor output source I/O Unit.

Product Name	Model No.	Description
EX Module (4-point inputs/4-point relay-output module)	EXM-DMM8DRT	4-point input sink-source/4-point relay-output/1 common type I/O Unit.
EX Module (2-ch analog-input module)	EXM-AMI2HT	2-ch analog Input Unit.
EX Module (Thermocouple Pt100 input/1-ch analog-output module)	EXM-ALM3LT	2-ch temperature Input/1-ch analog Output Unit.
EX Module (2-ch analog-input/1-ch analog-output module)	EXM-AMM3HT	2-ch analog Input/1-ch analog Output Unit.
EX Module (1-ch analog-output module)	EXM-AMO1HT	1-ch analog Output Unit.

5. About the Manual

For the detailed information on LT3000 series, refer to the following manual.

- LT3000 Series Hardware Manual
- GP-Pro EX Reference Manual “Controlling External I/O”
- Maintenance/Troubleshooting

The manuals can be selected from the help menu of GP-Pro EX or downloaded from Pro-face Home Page.

URL
http://www.pro-face.com/otasuke/

6. Inquiry

Do you have any questions about difficulties with this product?

Please access our site anytime that you need help with a solution.

http://www.pro-face.com/otasuke/

If you are a first-time user, please go to the “Contact us“ screen.

7. UL/c-UL Approval

This unit is UL/c-UL listed product: (UL File No. E210412)
This product conforms to the following standards:

- UL508

Industrial Control Equipment

- UL1604

Electrical Equipment for Use in Class I and II, Division 2, and Class III Hazardous (classified) Locations

- CSA-C22.2 No.142-M1987 (c-UL Approval)

Standard for Process Control Equipment

- CSA-C22.2 No.213-M1987 (c-UL Approval)

Non-Incendive Electrical Equipment for Use in Class I, Division 2 Hazardous Locations

This equipment is suitable for use in Class I, Division 2, Groups A, B, C, D or non-hazardous locations only.

Warning - Explosion Hazard - Substitution of components may impair suitability for Class I, Division 2.

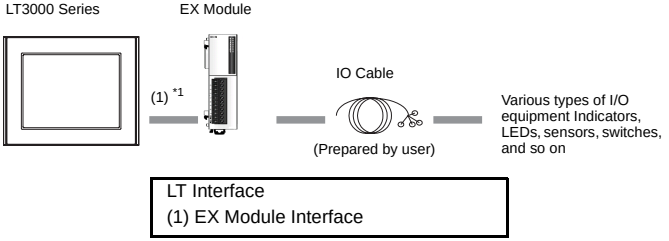
Warning - Explosion Hazard - Do not disconnect equipment unless power has been switched off or the area is known to be non-hazardous.

8. CE Marking

This unit is CE marked product that conforms to EMC directives, EN55011 Class A and EN61131-2.

9. Contents

10. System Design



*1 Up to two EX modules can be connected to the rear side of the LT-3201A.

11. Accessories

11.1 Maintenance Items

Product Name	Model No.	Description
Terminal Connector (10 pin) for EX Module	CA6-EXMCNRS10P-01	10 pin connector (terminal block) only for EX module (a set of 5)
Terminal Connector (11 pin) for EX Module	CA6-EXMCNRS11P-01	11 pin connector (terminal block) only for EX module (a set of 5)
MIL Connector (20 pin) for EX Module	CA6-EXMCNHE20P-01	20 pin connector (MIL connector) only for EX module (a set of 5)

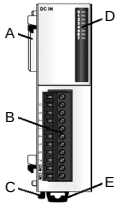
12. Part Names and Functions

EXM-DDI8DT
EXM-DDO8UT
EXM-DDO8TT
EXM-DRA8RT
EXM-DMM8DRT
EXM-AMI2HT
EXM-ALM3LT
EXM-AMM3HT
EXM-AMO1HT

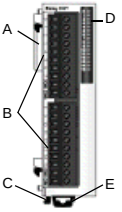
EXM-DDI16DT
EXM-DRA16RT

EXM-DDO16UK
EXM-DDO16TK

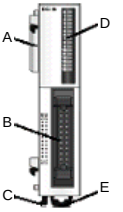
Front



Front



Front



	Name		Description
A	Extension Connector		Connect the extension connector to the EX module interface at the rear side of the LT or connect the extension connector as the second connector for the LT to the EX module (the first unit). The extension plug-type connector is on the left side and the extension socket-type connector is mounted on the right side.
B	Terminal Block	EXM-DDI8DT EXM-DDO8UT EXM-DDO8TT EXM-DRA8RT EXM-DMM8DRT EXM-AMI2HT EXM-ALM3LT EXM-AMM3HT EXM-AMO1HT EXM-DDI16DT EXM-DRA16RT	Terminals for external I/O interfaces
	MIL Connector	EXM-DDO16UK EXM-DDO16TK	
C	Latch Button		Bracket that secures the EX module to the LT or secures two EX modules.

	Name	Description
D	Status LED	Indicator that switches on and off as the input and the output signals turn on and off. (I/O module only)
	Power Indicator LED (PWR)	(Analog type only)
E	Clamp	For the extension (DIN rail mounting)

13. General Specifications

13.1 Electrical Specifications

Power Supply	Rated Voltage		5 VDC (Supplied from LT)
	Power Consumption	EXM-DDI8DT	0.17 W max.
		EXM-DDI16DT	0.27 W max.
		EXM-DRA8RT	1.16 W max.
		EXM-DRA16RT	2.10 W max.
		EXM-DDO8UT	0.55 W max.
		EXM-DDO8TT	0.55 W max.
		EXM-DDO16UK	1.03 W max.
		EXM-DDO16TK	1.03 W max.
		EXM-DMM8DRT	0.65 W max.
		EXM-AMM3HT	0.34 W max.
		EXM-ALM3LT	0.34 W max.
		EXM-AMI2HT	0.34 W max.
		EXM-AMO1HT	0.34 W max.

13.2 Environmental Specifications

Physical	Surrounding Operating Temperature	0 to +55°C
	Storage Temperature	-25 to +70°C
	Ambient Humidity	30 to 95%RH (Wet bulb temperature: 39°C max. - no condensation.)
	Storage Humidity	30 to 95%RH (Wet bulb temperature: 39°C max. - no condensation.)
	Pollution Degree	For use in Pollution Degree 2 environment

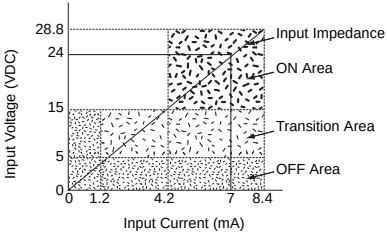
Installation Configuration	Connect the EX module directly to the rear side of the LT or to the right side of the EX module attached to the rear side of the LT.	
Cooling Method	Natural air circulation	
Weight Approx.	EXM-DDI8DT: 85 g EXM-DDI16DT: 100 g EXM-DDO8UT: 85 g EXM-DDO8TT: 85 g EXM-DDO16UK: 70 g EXM-DDO16TK: 70 g	EXM-DRA8RT: 110 g EXM-DRA16RT: 145 g EXM-DMM8DRT: 95 g EXM-AMI2HT: 85 g EXM-ALM3LT: 85 g EXM-AMM3HT: 85 g EXM-AMO1HT: 85 g
Protective Structure	IP20	

14. I/O Specifications

14.1 8-point/16-point input module

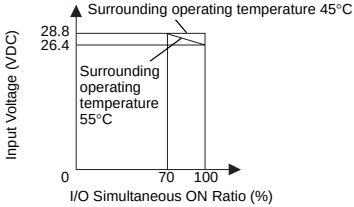
		EXM-DDI8DT	EXM-DDI16DT
Rated Input Voltage		24 VDC	
Rated Input Voltage Range		20.4 VDC to 28.8 VDC	
Rated Input Current		7.3 mA/input (when 24 VDC is applied)	
No. of Input Points		8 points (sink/source type - dual use)	16 points (sink/source type - dual use)
No. of Common		1	
Input ON Voltage		15 VDC or higher *1	
Input OFF Voltage		5 VDC or less *1	
Input Impedance		3.3 kΩ	
Isolation Method		Between input terminals and internal circuit: photocoupler isolated Between input terminals: not isolated	
Input Delay	OFF-ON	4 ms	
	ON-OFF	4 ms	
Usage Limits		No limits	Limits *2
External Connection		10-pin terminal connector	

*1 Operating Range



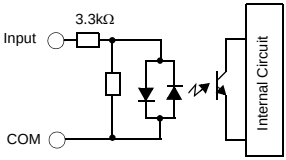
Input voltage / current characteristics 24 VDC (Input sink/source type)

*2 Usage Limits (for EXM-DDI16DT)

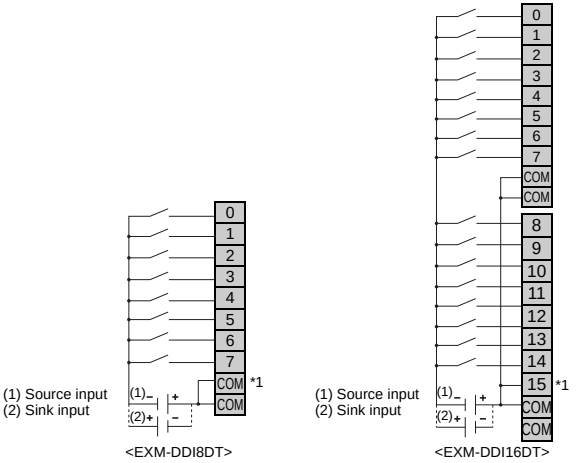


■ Input Circuit Drawings

◆ Internal Circuit



◆ Wiring



*1 The terminals are connected together internally.

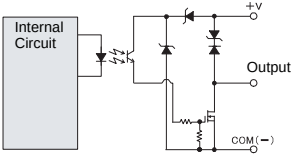
14.2 8-point/16-point sink-output module

		EXM-DDO8UT	EXM-DDO16UK
Rated Output Voltage		24 VDC	
Rated Output Voltage Range		20.4 to 28.8 VDC	
Output Method		Transistor sink output	
No. of Output Points		8 points	16 points
No. of Common		1	
Common Design		8 points/1 common	16 points/1 common
Maximum Load Voltage	Per Channel	0.3 A	0.1 A
	Per Common	3 A	1 A
Output Protection Type		Output is unprotected	
Output Voltage Drop		1 VDC or less (voltage between COM and output terminals when output is on)	
Clamp Voltage		39 VDC ± 1 V	
Voltage Leakage (When OFF)		0.1 mA or less	
Output Delay Time	OFF-ON	300 µs or less	
	ON-OFF	300 µs or less	

	EXM-DDO8UT	EXM-DDO16UK
Isolation Method	Between output terminals and internal circuit: photocoupler isolated Between output terminals: not isolated	
External Connection	10-pin terminal connector	MIL connector

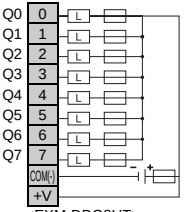
■ Input Circuit Drawings

◆ Internal Circuit

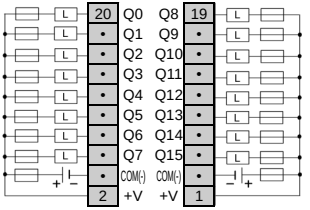


◆ Wiring

□ indicates a fuse. L indicates load.



<EXM-DDO8UT>



<EXM-DDO16UK>

NOTE

- Since the output terminals are not electrically protected, an output line might be shortcircuited or a connection fault might damage this product. Please install an applicable fuse to prevent an overload in the circuit, if necessary.

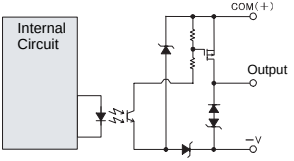
14.3 8-point/16-point source-output module

	EXM-DDO8TT	EXM-DDO16TK
Rated Output Voltage	24 VDC	
Rated Output Voltage Range	20.4 to 28.8 VDC	
Output Method	Transistor source output	
No. of Output Points	8 points	16 points
No. of Common	1	

		EXM-DDO8TT	EXM-DDO16TK
Common Design		8 points/1 common	16 points/1 common
Maximum Load Voltage	Per Channel	0.3 A	0.1 A
	Per Common	3 A	1 A
Output Protection Type		Output is unprotected	
Output Voltage Drop		1 VDC or less (voltage between COM and output terminals when output is on)	
Clamp Voltage		39 VDC ± 1 V	
Voltage Leakage (when OFF)		0.1 mA or less	
Output Delay Time	OFF-ON	300 µs or less	
	ON-OFF	300 µs or less	
Isolation Method		Between output terminals and internal circuit: photocoupler isolated Between output terminals: not isolated	
External Connection		10-pin terminal connector	MIL connector

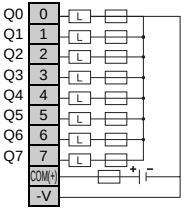
■ Input Circuit Drawings

◆ Internal Circuit

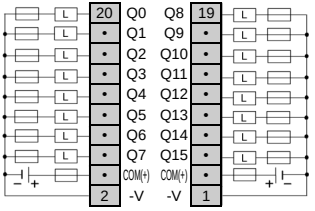


◆ Wiring

□ indicates a fuse. L indicates load.



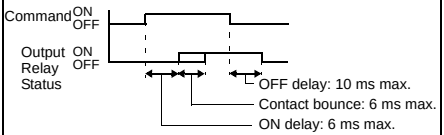
<EXM-DDO8TT>



<EXM-DDO16TK>

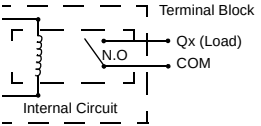
NOTE

- Since the output terminals are not electrically protected, an output line might be shortcircuited or a connection fault might damage this product. Please install an applicable fuse to prevent an overload in the circuit, if necessary.

		EXM-DRA8RT	EXM-DRA16RT
No. of Output Points		8 points (4 points/1 common)	16 points (8 points/1 common)
No. of Common		2	
Output Method		1a-contact	
Maximum Load Voltage	Per Channel	2 A or less	
	Per Common	7 A or less	8 A or less
Maximum Load Voltage		0.1 mA/0.1 VDC (reference value)	
Contact Rating		240 VAC, 2 A (resistance load, cos θ=0.4 induced load) 30 VDC, 2 A (resistance load, L/R-7 ms induced load)	
Initial Shorting Resistance		30 mΩ max.	
Electrical Life		100,000 operations or more (rated resistive load 1,800 operations/h)	
Mechanical Life		20 million operations or more (no load 18,000 operations/h)	
Voltage Endurance		Between output to terminals: 1500 VAC, 1 minute Between output terminal and internal circuit: 1500 VAC, 1 minute Between output groups: 1500 VAC, 1 minute	
Output Delay Time			
External Connection		11-pin terminal connector	10-pin terminal connector

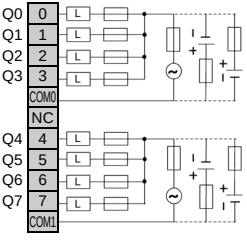
■ Input Circuit Drawings

◆ Internal Circuit

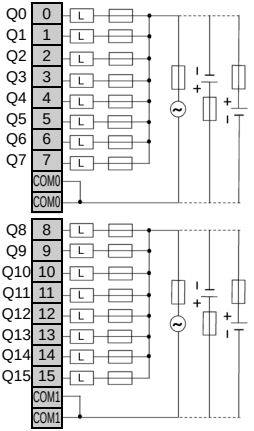


◆ Wiring

▭ indicates a fuse. L indicates load.



<EXM-DRA8RT>



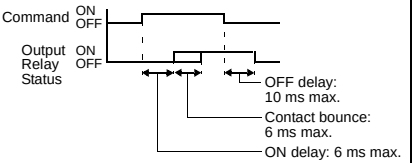
<EXM-DRA16RT>

NOTE

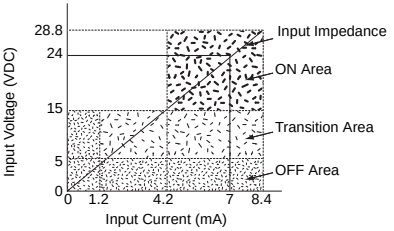
- The relay specifications can change the COM power supply.
- Since the output terminals are not electrically protected, an output line might be shortcircuited or a connection fault might damage this product. Please install an applicable fuse to prevent an overload in the circuit, if necessary.
- The COM0 and COM1 terminals are not connected together internally.

14.5 4-point inputs/4-point relay-output module

	EXM-DMM8DRT
Rated Input Voltage	24 VDC
Rated Input Voltage Range	20.4 VDC to 28.8 VDC
Rated Input Current	7.3 mA/input (when 24 VDC is applied)
No. of Input Points	4 points (sink/source type - dual use)
No. of Common	1
Input ON Voltage	15 VDC or higher *1
Input OFF Voltage	5 VDC or less *1

		EXM-DMM8DRT
Input Impedance		3.3 kΩ
Isolation Method		Between input terminals and internal circuit: photocoupler isolated Between input terminals: not isolated
Input Delay	OFF-ON	4 ms
	ON-OFF	4 ms
External Load for I/O Interconnection		Not needed
Signal Determination Method		Static
No. of Output Points		4 points (4 points/1 common)
No. of Common		1
Output Method		1a-contact
Maximum Load Current *2	Per Channel	2 A or less
	Per Common	7 A or less
Min. Open/Close Load		0.1 mA/0.1 VDC (reference value)
Contact Rating		240 VAC, 2 A (resistance load, cos ø=0.4 induced load) 30 VDC, 2 A (resistance load, L/R-7 ms induced load)
Output Delay Time		
Initial Shorting Resistance		30 mΩ max.
Electrical Life		100,000 operations or more (rated resistive load 1,800 operations/h)
Mechanical Life		20 million operations or more (no load 18,000 operations/h)
Voltage Endurance		Between output to terminals: 1500 VAC, 1 minute Between output terminal and internal circuit: 1500 VAC, 1 minute Between output groups: 1500 VAC, 1 minute
External Connection		11-pin terminal connector

*1 Operating Range

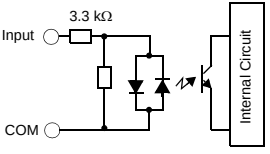


*2 Value when the resistance load or induction load is applied.

■ Input/Output Circuit Drawings

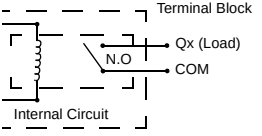
◆ Internal Circuit

<Input>



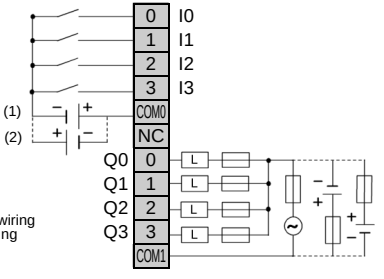
<Output>

• Relay Output Contact



◆ Wiring

□ indicates a fuse. L indicates load.



NOTE

• The COM0 and COM1 terminals are not connected together internally.

The detail of the external power supply is: the rated supply voltage is 24 VDC, the rated input voltage ranges from 20.4 VDC to 28.8 VDC. The consumption current is 35 mA (24 VDC) when the input is not-open, output 100%.

		EXM-AMI2HT	
Characteristics of Analog Voltage Inputs		Voltage Input	Current Input
Input Range		From 0 to 10 VDC	From 4 to 20 mA DC
Input Impedance		1 MΩ min.	10 Ω
Input Points		2 points	
A-D Conversion	Sample Duration Time	20 ms max.	
	Sample Repetition Time	20 ms max.	
	Total Input System Transfer Time *1	105 ms + 1 scan time	
	Input Type	Single-ended input	Differential input
	Operating Mode	Self-scan	
	Conversion Mode	ΣΔ type ADC	
Input Error	Maximum Error at 25°C (77°F)	±0.2% of full scale	
	Temperature Coefficient	±0.006% of full scale/°C	
	Repeatable after Stabilization Time	±0.5% of full scale	
	Nonlinear	±0.2% of full scale	
	Maximum error	±1% of full scale	
Data	Digital Resolution	4096 increments (12 bits)	
	Input Value of LSB	2.5 mV	4 µA
	Data Type in Application Program	0 to 4095 (12 bit data) -32768 to 32767 (optional range designation) *2	
	Monotonicity	Yes	
	Input Data Out of Range	Detectable *3	
Noise Resistance	Maximum Temporary Deviation during Electrical Noise Tests	±3% maximum when a 500V clamp voltage is applied to the power and I/O wiring	
	Common Mode Characteristics	Common mode reject ratio (CMRR): -50 dB	
	Common Mode Voltage	16 VDC	
	Input Filter	No	
	Cable	Twisted-pair shielded cable is recommended for improved noise immunity	
	Crosstalk	2 LSB max.	
Voltage Endurance		500 V between input and power circuit	
Isolation Method		Photocoupler Isolation between input and internal circuit	

	EXM-AMI2HT	
Characteristics of Analog Voltage Inputs	Voltage Input	Current Input
Maximum Permanent Allowed Overload (No Damage)	13 VDC	40 mA DC
Selection of Analog Input Signal Type	Using software programming	
Calibration or Verification to Maintain Rated Accuracy	Approximately 10 years	
Disconnection detection	No	
External Connection	11-pin terminal connector	

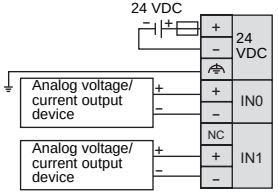
*1 Total input system transfer time = sample repetition × 2 + internal operation time + 1 scan time.

*2 The 12-bit data (0 to 4095) and 10-bit data (0 to 1023) processed in the Analog I/O module can be linear converted to a value between -32768 and 32767.
The Optional range designation and analog I/O data minimum and maximum values can be selected using data registers allocated to analog I/O modules.

*3 If the input data is not in the range of 4 to 20 mA DC at power-on, the error code RGEF130 (Input data error) is output for the analog module. Once the error occurs, input data from the point of the error is no longer updated. For more information about error codes, read the “Maintenance/Troubleshooting Guide”.

◆ Wiring

▭ indicates a fuse.



IMPORTANT

- The power for the analog module should be supplied separately from the LT.
  Turn the analog module on before turning the LT on. Wait at least 30 seconds after power-off to restart the external power-supply or it may not operate properly.
- Be sure the analog OUT lines are placed in a separate duct from high-frequency, live lines such as high-voltage, high-power lines, inverters, etc.

NOTE

- Connect a fuse appropriate for the applied voltage and current draw, at the position shown in the diagram.
- Do not connect any wiring to unused channels.
- The (-) poles of inputs IN0 and IN1 are connected internally.

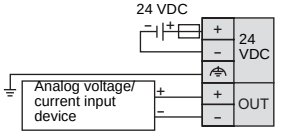
The detail of the external power supply is: the rated supply voltage is 24 VDC, the rated input voltage ranges from 20.4 VDC to 28.8 VDC. The consumption current is 40 mA (24 VDC) when the input is not-open, output 100%.

		EXM-AMO1HT	
Analog Output Specifications		Voltage Output	Current Output
Rated Output Voltage Range		From 0 to 10 VDC	From 4 to 20 mA DC
Load	Load Impedance	2 kΩ max.	300 Ω max.
	Application Load Type	Resistive load	
D-A Conversion	Settling Time	50 ms	
	Total Output System Transfer Time	50 ms + 1 scan time	
Output Error	Maximum Error at 25°C (77°F)	±0.2% of full scale	
	Temperature Coefficient	±0.015% of full scale/°C	
	Repeatable after Stabilization Time	±0.5% of full scale	
	Output Voltage Drop	±1% of full scale	-
	Nonlinear	±0.2% of full scale	
	Output Ripple	1 LSB max.	
	Overshoot	0%	
	Total Error	±1% of full scale	
Data	Digital Resolution	4,096 increments (12 bits)	
	Output Value of LSB	2.5 mV	4 µA
	Data Type in Application Program	0 to 4095 (12 bit data) -32768 to 32767 (optional range designation) *1	
	Monotonicity	Yes	
	Current Loop Open	-	Not detectable
Noise Resistance	Maximum Temporary Deviation during Electrical Noise Tests	±3% max. when a 500 V clamp voltage is applied to the power and I/O wiring	
	Cable	Twisted-pair shielded cable is recommended for improved noise immunity	
	Crosstalk	No crosstalk because of 1 channel output	
Voltage Endurance		500V between output and power circuit	
Isolation Method		Photocoupler Isolation between output and internal circuit	
Selection of Analog Output Signal Type		Using software programming	
Calibration or Verification to Maintain Rated Accuracy		Approximately 10 years	
External Connection		11-pin terminal connector	

*1 The 12-bit data (0 to 4095) processed in the Analog I/O module can be linear converted to a value between -32768 and 32767. The optional range designation and analog I/O data minimum and maximum values can be selected using data registers allocated to analog I/O modules

◆ Wiring

▭ indicates a fuse.



IMPORTANT

- The power for the analog module should be supplied separately from the LT.
  Turn the analog module on before turning the LT on. Wait at least 30 seconds after power-off to restart the external power-supply or it may not operate properly.
- Be sure the analog OUT lines are placed in a separate duct from high-frequency, live lines such as high-voltage, high-power lines, inverters, etc.

NOTE

- Connect a fuse appropriate for the applied voltage and current draw, at the position shown in the diagram.
- Do not connect any wiring to unused channels.

14.8 2-ch analog-input/1-ch analog-output module

The detail of the external power supply is: the rated supply voltage is 24 VDC, the rated input voltage ranges from 20.4 VDC to 28.8 VDC. The consumption current is 45 mA (24 VDC) when the input is not-open, output 100%.

		EXM-AMM3HT	
Characteristics of Analog Voltage Inputs		Voltage Input	Current Input
Input Range		From 0 to 10 VDC	From 4 to 20 mA DC
Input Impedance		1 MΩ min.	10 Ω
Input Points		2 points	
A-D Conversion	Sample Duration Time	20 ms max.	
	Sample Repetition Time	20 ms max.	
	Total Input System Transfer Time *1	105 ms + 1 scan time	
	Input Type	Single-ended input	Differential input
	Operating Mode	Self-scan	
	Conversion Mode	ΣΔ type ADC	
Input Error	Maximum Error at 25°C (77°F)	±0.2% of full scale	
	Temperature Coefficient	±0.006% of full scale/°C	
	Repeatable After Stabilization Time	±0.5% of full scale	
	Nonlinear	±0.2% of full scale	
	Maximum Error	±1% of full scale	

		EXM-AMM3HT	
Characteristics of Analog Voltage Inputs		Voltage Input	Current Input
Data	Digital Resolution	4096 increments (12 bits)	
	Input Value of LSB	2.5 mV	4 μA
	Data Type in Application Program	0 to 4095 (12 bit data) -32768 to 32767 (optional range designation) *2	
	Monotonicity	Yes	
	Input Data Out of Range	Detectable *3	
Noise Resistance	Maximum Temporary Deviation during Electrical Noise Tests	±3% maximum when a 500V clamp voltage is applied to the power and I/O wiring	
	Common Mode Characteristics	Common mode reject ratio (CMRR): -50 dB	
	Common Mode Voltage	16 VDC	
	Input Filter	No	
	Cable	Twisted-pair shielded cable is recommended for improved noise immunity	
	Crosstalk	2 LSB max.	
Voltage Endurance		500 V between input and power circuit	
Isolation Method		Photocoupler between input and internal circuit	
Maximum Permanent Allowed Overload (No Damage)		13 VDC	40 mA DC
Selection of Analog Input Signal Type		Using software programming	
Calibration or Verification to Maintain Rated Accuracy		Approximately 10 years	
Disconnection detection		No	
External Connection		11-pin terminal connector	

*1 Total input system transfer time = sample repetition × 2 + internal operation time +1 scan time.

*2 The 12-bit data (0 to 4095) and 10-bit data (0 to 1023) processed in the Analog I/O module can be linear converted to a value between -32768 and 32767.
The Optional range designation and analog I/O data minimum and maximum values can be selected using data registers allocated to analog I/O modules.

*3 If the input data is not in the range of 4 to 20 mA DC at power-on, the error code RGEF130 (Input data error) is output for the analog module. Once the error occurs, input data from the point of the error is no longer updated. For more information about error codes, read the “Maintenance/Troubleshooting Guide”.

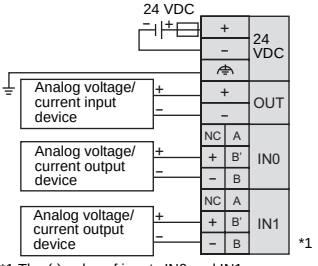
		EXM-AMM3HT	
Analog Output Specifications		Voltage Output	Current Output
Rated Output Voltage Range		From 0 to 10 VDC	From 4 to 20 mA DC
Load	Load Impedance	2 kΩ max.	300 Ω max.
	Application Load Type	Resistive load	

		EXM-AMM3HT	
Analog Output Specifications		Voltage Output	Current Output
D-A Conversion	Settling Time	50 ms	
	Total Output System Transfer Time	50 ms + 1 scan time	
Output Error	Maximum Error at 25°C (77°F)	±0.2% of full scale	
	Temperature Coefficient	±0.015% of full scale/°C	
	Repeatable after Stabilization Time	±0.5% of full scale	
	Output Voltage Drop	±1% of full scale	-
	Nonlinear	±0.2% of full scale	
	Output Ripple	1 LSB max.	
	Overshoot	0%	
	Total Error	±1% of full scale	
Data	Digital Resolution	4,096 increments (12 bits)	
	Output Value of LSB	2.5 mV	4 µA
	Data Type in Application Program	0 to 4095 (12 bit data) -32768 to 32767 (optional range designation) *1	
	Monotonicity	Yes	
	Current Loop Open	-	Not detectable
Noise Resistance	Maximum Temporary Deviation during Electrical Noise Tests	±3% max. when a 500 V clamp voltage is applied to the power and I/O wiring	
	Cable	Twisted-pair shielded cable is recommended for improved noise immunity	
	Crosstalk	No crosstalk because of 1 channel output	
Voltage Endurance		500 V between output and power circuit	
Isolation Method		Photocoupler Isolation between output and internal circuit	
Selection of Analog Output Signal Type		Using software programming	
Calibration or Verification to Maintain Rated Accuracy		Approximately 10 years	
Disconnection detection		No	
External Connection		11-pin terminal Connector	

*1 The 12-bit data (0 to 4095) processed in the Analog I/O module can be linear converted to a value between -32768 and 32767. The optional range designation and analog I/O data minimum and maximum values can be selected using data registers allocated to analog I/O modules

◆ Wiring

▭ indicates a fuse.



*1 The (-) poles of inputs IN0 and IN1 are connected internally

IMPORTANT

- The power for the analog module should be supplied separately from the LT.
  Turn the analog module on before turning the LT on. Wait at least 30 seconds after power-off to restart the external power-supply or it may not operate properly.
- Be sure the analog IN/OUT lines are placed in a separate duct from high-frequency, live lines such as high-voltage, high-power lines, inverters, etc.

NOTE

- Connect a fuse appropriate for the applied voltage and current draw, at the position shown in the diagram.
- Do not connect any wiring to unused channels.

14.9 Thermocouple Pt100 input/1-ch analog-output module

The detail of the external power supply is: the rated supply voltage is 24 VDC, the rated input voltage ranges from 20.4 VDC to 28.8 VDC. The consumption current is 40 mA (24 VDC) when the input is not-open, output 100%.

		EXM-ALM3LT	
Characteristics of Thermocouple & Temperature Inputs		Thermocouple	Temperature Probes
Input Range		Type K: 0 to 1300°C/ 32 to 2372°F Type J: 0 to 1200°C/ 32 to 2192°F Type T: 0 to 400°C/ 32 to 742°F	(RTD) Pt 100, 3-wire type (-100 to 500°C) (-148 to 932°F)
Input Impedance		1 MΩ min.	
A-D Conversion	Sample Duration Time	20 ms max.	
	Sample Repetition Time	20 ms max.	
	Total Input System Transfer Time *1	200 ms + 1 scan time	
	Input Type	Differential input	

		EXM-ALM3LT	
Characteristics of Thermocouple & Temperature Inputs		Thermocouple	Temperature Probes
A-D Conversion	Operating Mode	Self-scan	
	Conversion Mode	ΣΔ type ADC	
Input error	Maximum Error at 25°C (77°F)	±0.2% of full scale plus reference Junction compensation accuracy ±4°C max	±0.2% of full scale
	Temperature Coefficient	±0.006% of full scale/°C	
	Repeatable after Stabilization Time	±0.5% of full scale	
	Nonlinear	±0.2% of full scale	
	Maximum Error	±1% of full scale	
Data	Digital Resolution	4,096 increments (12 bits)	
	Input Value of LSB	Type K: 0.325°C/0.585°F Type J: 0.300°C/0.540°F Type T: 0.100°C/0.180°F	0.15°C/0.27°F
	Data Type in Application Program	0 to 4095 (12 bit data) -32768 to 32767 (optional range designation) *2	
	Monotonicity	Yes	
	Input Data Out of Range	Detectable *3	
Noise resistance	Maximum Temporary Deviation during Electrical Noise Tests	±3% maximum when a 500V Clamp voltage is applied to the power and I/O wiring	Accuracy is not assured when noise is applied.
	Common Mode Characteristics	Common mode reject ratio (CMRR): –50 dB	
	Common Mode Voltage	16 VDC	
	Input Filter	No	
	Crosstalk	2 LSB max.	
Voltage Endurance		500 V between input and power circuit	
Isolation Method		Photocoupler Isolation between input and internal circuit	
Selection of Analog Input Signal Type		Using software programming	

	EXM-ALM3LT	
Characteristics of Thermocouple & Temperature Inputs	Thermocouple	Temperature Probes
Calibration or Verification to Maintain Rated Accuracy	Approximately 10 years	
Disconnection detection	No	
External Connection	11-pin terminal connector	

*1 Total input system transfer time = sample repetition × 2 + internal operation time +1 scan time.

*2 The 12-bit data (0 to 4095) and 10-bit data (0 to 1023) processed in the analog I/O module can be linear-converted to a value between -32768 and 32767.
The optional range designation and analog I/O data minimum and maximum values can be selected using data registers allocated to analog I/O modules.

*3 If the input data is not in the range of 4 to 20 mA DC at power-on, the error code RGEF130 (Input data error) is output for the analog module. Once the error occurs, input data from the point of the error is no longer updated. For more information about error codes, read the “Maintenance/Troubleshooting Guide”.

Model No.		EXM-ALM3LT	
Analog Output Specifications		Voltage Output	Current Output
Rated Output Voltage Range		From 0 V to 10 VDC	From 4 mA to 20 mA DC
Load	Load Impedance	2 kΩ max.	300 Ω max.
	Application Load Type	Resistive load	
D-A Conversion	Settling Time	130 ms	
	Total Output System Transfer Time	130 ms + 1 scan time	
Output Error	Maximum Error at 25°C (77°F)	±0.2% of full scale	
	Temperature Coefficient	±0.015% of full scale/°C	
	Repeatable after Stabilization Time	±0.5% of full scale	
	Output Voltage Drop	±1% of full scale	-
	Nonlinear	±0.2% of full scale	
	Output Ripple	1 LSB max.	
	Overshoot	0%	
	Total Error	±1% of full scale	
Data	Digital Resolution	4,096 increments (12 bits)	
	Output Value of LSB	2.5 mV	4 µA
	Data Type in Application Program	0 to 4095 (12 bit data) -32768 to 32767 (optional range designation) *1	
	Monotonicity	Yes	
	Current Loop Open	-	Not detectable

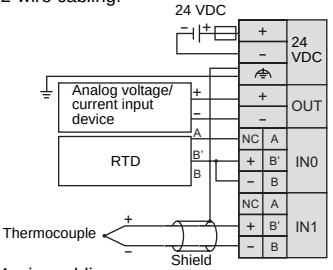
Model No.		EXM-ALM3LT	
Analog Output Specifications		Voltage Output	Current Output
Noise Resistance	Maximum Temporary Deviation during Electrical Noise Tests	±3% max. when a 500 V clamp voltage is applied to the power and I/O wiring	
	Cable	Twisted-pair shielded cable is recommended for improved noise immunity	
	Crosstalk	No crosstalk because of 1 channel output	
Voltage Endurance		500 V between output and power circuit	
Isolation Method		Photocoupler Isolation between output and internal circuit	
Selection of Analog Output Signal Type		Using software programming	
Calibration or Verification to Maintain Rated Accuracy		Approximately 10 years	
Disconnection detection		No	
External Connection		11-pin terminal connector	

*1 The 12-bit data (0 to 4095) processed in the Analog I/O module can be linear converted to a value between -32768 and 32767. The optional range designation and analog I/O data minimum and maximum values can be selected using data registers allocated to analog I/O modules.

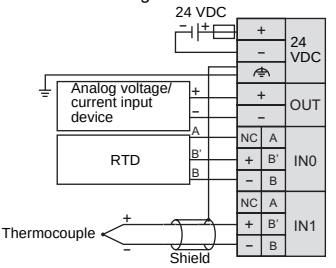
◆ Wiring

▭ indicates a fuse.

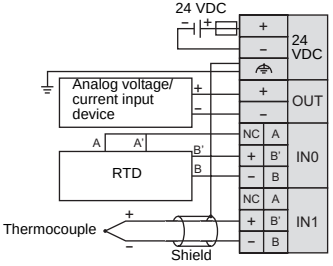
2-wire cabling:



3-wire cabling:



4-wire cabling:



*1

*1 For 4-wire cabling, output A' is not connected.

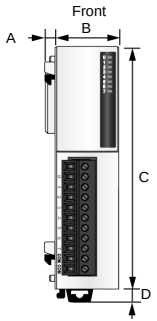
IMPORTANT

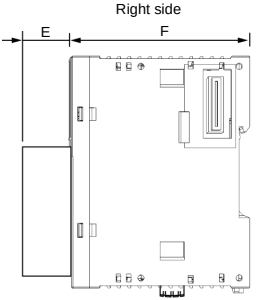
- The power for the analog module should be supplied separately from the LT.
  Turn the analog module on before turning the LT on. Wait at least 30 seconds after power-off to restart the external power-supply or it may not operate properly.
- Be sure the analog IN/OUT lines (especially, Temperature Probes) are placed in a separate duct from high-frequency, live lines such as high-voltage, high-power lines, inverters, etc.

NOTE

- Connect a fuse appropriate for the applied voltage and current draw, at the position shown in the diagram.
- Do not connect cables to a channel that is not used.
- When connecting an RTD, connect the three wires to terminals A, B', and B of input channel 0 or 1.
- When connecting a thermocouple, connect the two wires to terminals B' and B of input channel 0 or 1.

15. Dimensions





Unit: mm [in.]

Model No.	A	B	C	D	E	F
EXM-DDI16DT EXM-DDI8DT EXM-DRA8RT EXM-DRA16RT EXM-DDO8UT EXM-DDO8TT EXM-DMM8DRT EXM-AMI2HT EXM-ALM3LT EXM-AMM3HT EXM-AMO1HT	3.8 [0.15]	23.5 [0.93]	90 [3.54]	4.5*1 [0.18]	14.6 [0.57]	70 [2.76]
EXM-DDO16UK EXM-DDO16TK	3.8 [0.15]	17.6 [0.69]	90 [3.54]	4.5*1 [0.18]	11.3 [0.44]	70 [2.76]

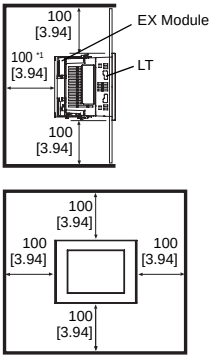
*1 The length of the pulled out hook is 8.5mm [0.33in.].

16. Installation

16.1 Installation requirements

- In order to improve maintenance performance, operability, and aeration performance, provide the following amount of space between the LT that mounts the EX module and other parts or structural objects.

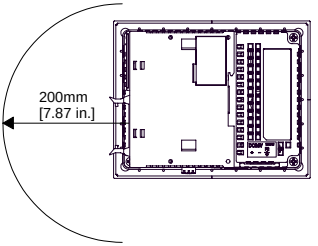
Unit: mm [in.]



*1 As with the LT, provide space (100 mm [3.94 in.]) between the EX module on the rear side of the LT and other structural objects (the EX module as a unit requires 80 mm [3.15 in.] space).

IMPORTANT

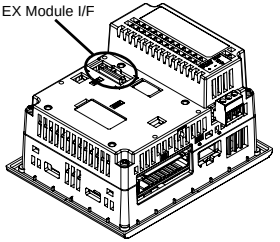
- Be sure to clamp the I/O cables wired for EX module within 200mm [7.87in.] position from the connector to prevent EX module's damage.



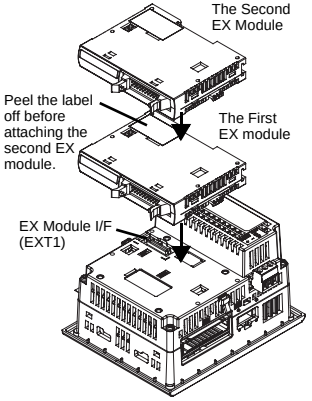
16.2 Attachment/Removal

■ Attachment

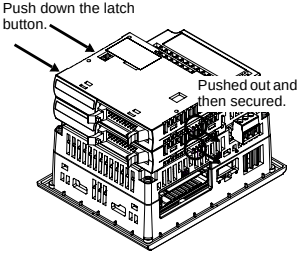
(1) Peel off the label from the EX module interface on the rear side of the LT.



(2) Attach the first EX module to the rear side of the LT.
Insert the extension connector at the left side of the first EX module to the EX module interface (EXT1) of the LT.
Attach the second EX module in a similar manner.



(3) Push down the latch buttons on the top to secure the EX module to the LT.

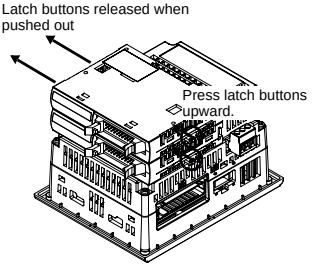


IMPORTANT

- Up to two EX modules can be connected to the rear side of the LT.
- Make sure to fix the EX modules to the LT securely using the latch buttons.

■ Removal

(1) To remove the EX module, push up the latch buttons to unlock it.



17. I/O Cable Wiring

17.1 Terminal Connector

NOTE

- Models that have interfaces to the terminal connector are as follows:

  10 pin connector compatible models:

  EXM-DDI8DT EXM-DDO8TT
  EXM-DDI16DT EXM-DRA16RT
  EXM-DDO8UT

  11 pin connector compatible models:

  EXM-DRA8RT EXM-AMO1HT
  EXM-DMM8DRT EXM-AMM3HT
  EXM-AMI2HT EXM-ALM3LT

■ I/O Cable Specification

I/O Cable Diameter	0.32 to 1.29mm^2 (28 - 16 AWG)
Cable Length	3M (max.)
Conductor Type	Simple or Twisted Wire*1

*1 If the conductor's end (individual) wires are not twisted correctly, the end wires may either short against each other, or against an electrode.

NOTE

- Terminal connector is CA6-EXMCNRS10P-01(10 pins)/ CA6-EXMCNRS11P-01(11 pins) from Digital Electronics Corporation, or MC1,5/10-ST-3,5(10 pins)/MC1,5/11-ST-3,5(11 pins) from PHOENIX CONTACT.

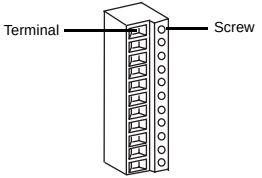
Use the following items when performing wiring. Items are made by Phoenix Contact.

Recommended Driver	SZS 0,4X2,5 (1205037)
Recommended Pin Terminals	AI 1,5-8 BK (3200043) (For FG only) AI 1-8 RD(3200030) AI-TWIN2X0,75-8 GY (3200807) AI 0,5-8 WH (3200014) AI-TWIN2X0,5-8 WH (3200933)
Recommended Pin Terminal Crimp Tool	CRIMPFOX ZA 3 (1201882)

■ I/O Cable Connection

(1) Confirm that the power cord of the unit, connected the EX module, is unplugged from the power supply.

(2) Loosen the screw of the terminal connector to which the I/O cable is connected.



(3) Strip the I/O cable and twist the core of the I/O cable. Insert it into the pin terminal and crimp the terminal. Attach the terminal to the terminal connector.

(4) Fasten the screw of the terminal connector to secure the I/O cable.

IMPORTANT

- Use a flat-blade screwdriver (Size 0.4 × 2.5) to tighten the terminal screws. The torque required to tighten these screws is 0.22 to 0.25N•m.
- Do not solder the cable connection.

(5) Insert the terminal connector, which the I/O cable is connected to, into the terminal block.

NOTE

- The terminal connector withstands insertion and removal more than 100 times.

17.2 MIL Connector

NOTE

- Models that have MIL connector interfaces are as follows:

  EXM-DDO16UK

  EXM-DDO16TK

■ I/O Cable Specifications

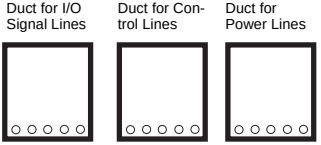
I/O Cable Diameter	1.27 mm^2 (28 AWG)
Cable Length	3M (max.)

NOTE

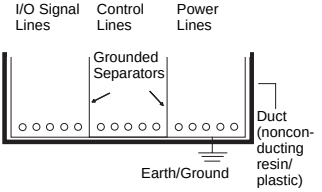
- MIL connector from Oki Electric Cable Co., Ltd. FL20A2F0 is recommended.

17.3 Wiring Precaution

- To help prevent noise and interference problems, separate all control, communication and power lines by placing them in a separate ducts.



If different wires must be placed in the same duct, separate them with an earthed/grounded divider.



NOTE

- If the lines cannot be separated, use shielded lines and create a ground from the shield line.

IMPORTANT

- Use noise-reducing external wiring methods to increase overall system reliability.
- To prevent power surges or noise interference, use ducts to separate all DC I/O or current circuit wires from communication cables.
- To prevent malfunctions due to noise, communication cables must be wired separately from high-frequency lines and power lines such as high-voltage lines, high-current lines, and inverters.