



Side A JAPANESE
Side B ENGLISH

PROGRAMMABLE CONTROLLERS
MELSEC-F

FX3G-2AD-BD

INSTALLATION MANUAL



Manual Number	JY997D33501
Revision	F
Date	April 2015

This manual describes the part names, dimensions, mounting, and specifications of the product. Before use, read this manual and the manuals of all relevant products fully to acquire proficiency in handling and operating the product. Make sure to learn all the product information, safety information, and precautions. Store this manual in a safe place so that it can be taken out and read whenever necessary. Always forward it to the end user.

Registration:
The company and product names described in this manual are registered trademarks or the trademarks of their respective companies.

Effective April 2015
Specifications are subject to change without notice.

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Safety Precaution (Read these precautions before use.)

This manual classifies the safety precautions into two categories:

WARNING and CAUTION

	Indicates that incorrect handling may cause hazardous conditions, resulting in death or severe injury.
	Indicates that incorrect handling may cause hazardous conditions, resulting in medium or slight personal injury or physical damage.

Depending on the circumstances, procedures indicated by CAUTION may also cause severe injury. It is important to follow all precautions for personal safety.

Associated Manuals

Manual name	Manual No.	Description
FX3S/FX3G/FX3GC/FX3U/FX3UC Series User's Manual - Analog Control Edition	JY997D16701 MODEL CODE: 09R619	Describes specifications for analog control and programming method for FX3S/FX3G/FX3GC/FX3U/FX3UC Series PLC.
FX3S Series User's Manual - Hardware Edition	JY997D48601 MODEL CODE: 09R535	Explains FX3S Series PLC specifications for I/O, wiring, installation, and maintenance.
FX3G Series User's Manual - Hardware Edition	JY997D31301 MODEL CODE: 09R521	Explains FX3G Series PLC specifications for I/O, wiring, installation, and maintenance.

How to obtain manuals

For product manuals or documents, consult with the Mitsubishi Electric dealer from who you purchased your product.

Applicable standards

FX3G-2AD-BD units made in November, 2008 or later comply with the EC Directive (EMC Directive). Further information can be found in the following manual.

- FX3S Series Hardware Manual (Manual No. JY997D48301)
- FX3G Series Hardware Manual (Manual No. JY997D46001)

Attention

- This product is designed for use in industrial applications.

Note

- Authorized Representative in the European Community:
Mitsubishi Electric Europe B.V.
Gothaer Str. 8, 40880 Ratingen, Germany

Caution for EC Directive

The analog expansion boards have been found to be compliant to the European standards in the aforesaid manual and directive. However, for the very best performance from what are in fact delicate measuring and controlled output device Mitsubishi Electric would like to make the following points; As analog devices are sensitive by nature, their use should be considered carefully. For users of proprietary cables (integral with sensors or actuators), these users should follow those manufacturers installation requirements. Mitsubishi Electric recommend that shielded cables should be used. If NO other EMC protection is provided, then users may experience temporary loss or accuracy between ±10 % in very heavy industrial areas. However, Mitsubishi Electric suggest that if adequate EMC precautions are followed for the users complete control system, users should expect accuracy as specified in this manual.

- Sensitive analog cable should not be laid in the same trunking or cable conduit as high voltage cabling. Where possible users should run analog cables separately.
- Good cable shielding should be used. When terminating the shield at Earth - ensure that no earth loops are accidentally created.
- When reading analog values, EMC accuracy can be improved out by averaging the readings. This can be achieved either through functions on the analog expansion boards or through a users program in the PLC main unit.

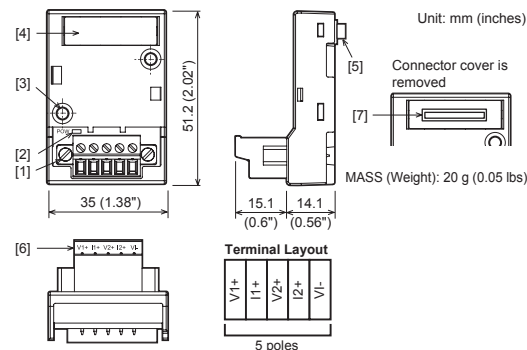
1. Outline

The FX3G-2AD-BD boards for analog input (hereinafter called 2AD-BD) is an expansion boards to add two analog input points.

1.1 Incorporated Items

Product	Analog input expansion board FX3G-2AD-BD
Included items	<ul style="list-style-type: none"> M3-8 tapping screws for installation: 2 pcs. Side cover Installation Manual (This manual)

1.2 External Dimensions, Part Names



- [1] Terminal block mounting screws
- [2] POW LED: Lit while power is properly supplied from main unit
- [3] Mounting holes (2-φ3.2)
- [4] Connector cover
- [5] Main unit connector
- [6] Terminal block to connect analog input
- [7] Memory cassette/Display module connector

2. Installation

INSTALLATION PRECAUTIONS

WARNING

- Make sure to cut off all phases of the power supply externally before attempting installation or wiring work. Failure to do so may cause electric shock or damage to the product.

INSTALLATION PRECAUTIONS

CAUTION

- Use the product within the generic environment specifications described in PLC main unit manual (Hardware Edition). Never use the product in areas with excessive dust, oily smoke, conductive dusts, corrosive gas (salt air, Cl₂, H₂S, SO₂, or NO₂), flammable gas, vibration or impacts, or expose it to high temperature, condensation, or rain and wind. If the product is used in such conditions, electric shock, fire, malfunctions, deterioration or damage may occur.
- When drilling screw holes or wiring, make sure cutting or wire debris does not enter the ventilation slits. Failure to do so may cause fire, equipment failures or malfunctions.
- Do not touch the conductive parts of the product directly. Doing so may cause device failures or malfunctions.
- Connect expansion board securely to their designated connectors. Loose connections may cause malfunctions.

For the installation, refer to the following manual.

- FX3S Series User's Manual - Hardware Edition
- FX3G Series User's Manual - Hardware Edition

3. Wiring

WIRING PRECAUTIONS

WARNING

- Make sure to cut off all phases of the power supply externally before attempting installation or wiring work. Failure to do so may cause electric shock or damage to the product.

WIRING PRECAUTIONS

CAUTION

- When drilling screw holes or wiring, make sure cutting or wire debris does not enter the ventilation slits. Failure to do so may cause fire, equipment failures or malfunctions.
- Make sure to observe the following precautions in order to prevent any damage to the machinery or accidents due to abnormal data written to the PLC under the influence of noise:
 - Do not bundle the power line or shield of the analog input/output cable together with or lay it close to the main circuit, high-voltage line, or load line. Otherwise, noise disturbance and/or surge induction are likely to take place. As a guideline, lay the control line at least 100mm (3.94") or more away from the main circuit, high-voltage line or load line.
 - Ground the shield of the analog input/output cable at one point on the signal receiving side. However, do not use common grounding with heavy electrical systems.
- Make sure to properly wire to the terminal block (European type) in accordance with the following precautions. Failure to do so may cause electric shock, equipment failures, a short-circuit, wire breakage, malfunctions, or damage to the product.
 - The disposal size of the cable end should follow the dimensions described in the manual.
 - Tightening torque should follow the specifications in the manual.
 - Twist the end of strand wire and make sure that there are no loose wires.
 - Do not solder-plate the electric wire ends.
 - Do not connect more than the specified number of wires or electric wires of unspecified size.
 - Affix the electric wires so that neither the terminal block nor the connected parts are directly stressed.
- Make sure to properly wire to the terminal blocks in accordance with the following precautions. Failure to do so may cause electric shock, equipment failures, a short-circuit, wire breakage, malfunctions, or damage to the product.
 - The disposal size of the cable end should follow the dimensions described in the manual.
 - Tightening torque should follow the specifications in the manual.

3.1 Applicable Cable and Terminal Tightening Torque

3.1.1 Terminal block (European type)

- Wire size
Wiring to analog device should use 20-22 AWG wire.
- Applicable cable

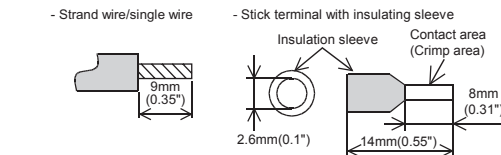
Type	Wire size
Single-wire	0.3 mm ² to 0.5 mm ² (AWG22 to 20)
2-wire	2 pieces of 0.3 mm ² (AWG22)

- Termination of cable end
Strip the coating of strand wire and twist the cable core before connecting it, or strip the coating of single wire before connecting it. An alternative connection is to use a ferrule with insulating sleeve. <Reference>

Manufacturer	Model	Caulking tool
Phoenix Contact Co., Ltd.	AI 0.5-8WH	CRIMPFOX 6 ^{*1} (or CRIMPFOX 6T-F ^{*2})

*1 Old model name: CRIMPFOX ZA 3

*2 Old model name: CRIMPFOX UD 6

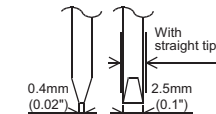


When using a stick terminal with insulating sleeve, choose a wire with proper cable sheath referring to the above outside dimensions, or otherwise, the wire cannot be inserted easily.

The tightening torque must be 0.22 to 0.25 N-m. Do not tighten terminal screws exceeding the specified torque. Failure to do so may cause equipment failures or malfunctions.

4) Tool

For tightening the terminal, use a commercially available small screwdriver having a straight form that is not widened toward the end as shown right.



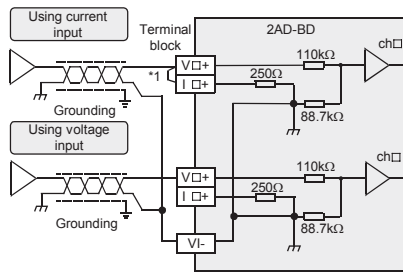
Caution:

If the diameter of screwdriver grip is too small, tightening torque will not be able to be achieved. Use the following recommended screwdriver or an appropriate replacement (grip diameter: approximately 25 mm (0.98")). <Reference>

Manufacturer	Model
Phoenix Contact Co., Ltd.	SZS 0.4×2.5

3.2 Wiring of Analog Input

→ For the terminal configuration, refer to Section 1.2



V□+, I□+, ch □: □ represents the channel number.

*1 Make sure to short-circuit the "V□+" and "I□+" terminals when current is input. (□: input channel number)

3.2.1 Cautions

- 1) Make sure to short-circuit the "V□+" and "I□+" terminals when ch is not used.
- 2) Use 2-core shielded twisted pair cable for the analog input lines, and separate the analog input lines from other power lines or inductive lines.
- 3) The grounding resistance should be 100 Ω or less.

3.3 Grounding

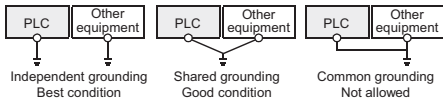
Grounding should be performed as stated below.

- The grounding resistance should be 100 Ω or less.
- Independent grounding should be performed for best results.

When independent grounding is not performed, perform "shared grounding" of the following figure.

For details, refer to the following manual.

→ FX3S Series User's Manual - Hardware Edition
→ FX3G Series User's Manual - Hardware Edition



- The grounding wire size should be AWG 22-20 (0.3-0.5 mm²).
- The grounding point should be close to the PLC, and all grounding wire should be as short as possible.

4. Specifications

STARTUP AND MAINTENANCE PRECAUTIONS	CAUTION
<ul style="list-style-type: none"> • Do not disassemble or modify the PLC. Doing so may cause fire, equipment failures, or malfunctions. * For repair, contact your local Mitsubishi Electric representative. • Do not drop the product or exert strong impact to it. Doing so may cause damage. 	

DISPOSAL PRECAUTIONS	CAUTION
<ul style="list-style-type: none"> • Please contact a certified electronic waste disposal company for the environmentally safe recycling and disposal of your device. 	

TRANSPORTATION AND STORAGE PRECAUTIONS	CAUTION
<ul style="list-style-type: none"> • The product is a precision instrument. During transportation, avoid any impacts. Failure to do so may cause failures in the product. After transportation, verify the operations of the product. 	

4.1 Applicable PLC

Model name	Applicability
FX3S Series PLC	Ver. 1.00 or later (from first production)
FX3G Series PLC	Ver. 1.10 or later

The version number can be checked by monitoring D8001/D8101 as the last three digits indicate it.

- The number of connectable expansion boards varies depending on the main unit as follows:
FX3S, FX3G-14M□, FX3G-24M□ Main units: 1 unit
FX3G-40M□, FX3G-60M□ Main units: 2 units
Never stack up two or more expansion boards.

For details on the system configuration, refer to the following manual.

→ FX3S/FX3G/FX3Gc/FX3U/FX3UC Series User's Manual - Analog Control Edition

4.2 General Specifications

The general specifications are equivalent to the PLC main unit.

For general specifications, refer to the following manuals.

→ FX3S Series User's Manual - Hardware Edition
→ FX3G Series User's Manual - Hardware Edition

4.3 Performance Specifications

Item	Specifications	
	Voltage input	Current input
Analog input range	0 to 10 V DC (Input resistance: 198.7 kΩ)	4 to 20 mA DC (Input resistance: 250 Ω)
Maximum absolute input	-0.5 V, +15 V	-2 mA, +30 mA
Digital output	12 bits, binary	11 bits, binary
Resolution	2.5 mV (10 V/4000)	8 μA (16 mA/2000)
Total accuracy	<ul style="list-style-type: none"> • ±0.5 % (±50 mV) for full scale of 10 V (when ambient temperature is 25 °C±5 °C) • ±1.0 % (±100 mV) for full scale of 10 V (when ambient temperature is 0 °C to 55 °C) 	<ul style="list-style-type: none"> • ±0.5 % (±80 μA) for full scale of 16 mA (when ambient temperature is 25 °C±5 °C) • ±1.0 % (±160 μA) for full scale of 16 mA (when ambient temperature is 0 °C to 55 °C)
A/D conversion time	180 μs (The data will be updated at every scan time of the PLC.)	
Input characteristics		
Insulation method	No insulation between each channel or the PLC.	
Occupied points	0 point (This number is not related to the maximum number of input/output points of the PLC.)	

4.4 List of Special Devices

R: Read W: Write

	Device number			Description	R/W
	FX3S	FX3G			
Special auxiliary relay		Board A	Board B		
Special auxiliary relay	M8260	M8260	M8270	Switches the input mode of channel 1 OFF: Voltage input ON: Current input	R/W
	M8261	M8261	M8271	Switches the input mode of channel 2 OFF: Voltage input ON: Current input	R/W
Special data register	D8260	D8260	D8270	Channel-1 input data	R
	D8261	D8261	D8271	Channel-2 input data	R
	D8264	D8264	D8274	Averaging time for channel-1 (Setting range: 1 to 4095)	R/W
	D8265	D8265	D8275	Averaging time for channel-2 (Setting range: 1 to 4095)	R/W
	D8268	D8268	D8278	Error status b0: Channel-1 over-scale detection b1: Channel-2 over-scale detection b2: Unused b3: Unused b4: EEPROM error b5: Averaging time setting error b6: 2AD-BD hardware error b7: 2AD-BD communication data error b8: Channel-1 under-scale detection*1 b9: Channel-2 under-scale detection*1 b10 to b15: Unused	R/W
	D8269	D8269	D8279	Model code = 3	R

*1 Only available for FX3S PLCs.

The under scale detection function is valid only for current input mode.

As for the details of the special devices, refer to following manual.

→ FX3S/FX3G/FX3Gc/FX3U/FX3UC Series User's Manual - Analog Control Edition

This manual confers no industrial property rights or any rights of any other kind, nor does it confer any patent licenses. Mitsubishi Electric Corporation cannot be held responsible for any problems involving industrial property rights which may occur as a result of using the contents noted in this manual.

Warranty

Mitsubishi will not be held liable for damage caused by factors found not to be the cause of Mitsubishi; opportunity loss or lost profits caused by faults in the Mitsubishi products; damage, secondary damage, accident compensation caused by special factors unpredictable by Mitsubishi; damages to products other than Mitsubishi products; and to other duties.

For safe use

- This product has been manufactured as a general-purpose part for general industries, and has not been designed or manufactured to be incorporated in a device or system used in purposes related to human life.
- Before using the product for special purposes such as nuclear power, electric power, aerospace, medicine or passenger movement vehicles, consult with Mitsubishi Electric.
- This product has been manufactured under strict quality control. However when installing the product where major accidents or losses could occur if the product fails, install appropriate backup or failsafe functions in the system.

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