

Programmable Controller

MELSEC iQ-F
series

Transition from MELSEC FX3 Series to MELSEC iQ-F Series Handbook (Intelligent Function Modules)

- FX3U-4AD-ADP
- FX3U-4AD
- FX3U-4DA-ADP
- FX3U-4DA
- FX3U-2HC
- FX3U-1PG
- FX3U-20SSC-H
- FX5-4AD-ADP
- FX5-4AD
- FX5-4DA-ADP
- FX5-4DA
- FX5-16ET/ES-H
- FX5-16ET/ESS-H
- FX5-2HC/ES
- FX5-20PG-P
- FX5-40SSC-S
- FX5-80SSC-S

SAFETY PRECAUTIONS

(Read the precautions before using this product.)
Before using this product, please read this manual and the relevant manuals introduced in this manual carefully and pay full attention to safety in order to handle the product correctly.
This manual classifies the safety precautions into two categories: [ WARNING] and [ CAUTION].

 WARNING	Indicates that incorrect handling may cause hazardous conditions, resulting in death or severe injury.
 CAUTION	Indicates that incorrect handling may cause hazardous conditions, resulting in minor or moderate injury or property damage.

Depending on the circumstances, failure to observe procedures indicated by [ CAUTION] may also cause severe injury.
It is important to follow all precautions for personal safety.
Store this manual in a safe place so that it can be read whenever necessary. Always forward it to the end user.

[DESIGN PRECAUTIONS]

WARNING

- Make sure to set up the following safety circuits outside the programmable controller to ensure safe system operation even during external power supply problems or programmable controller failure. Otherwise, malfunctions or incorrect outputs may cause serious accidents.
 - Most importantly, set up the following: an emergency stop circuit, a protection circuit, an interlock circuit for opposite movements (such as normal vs. reverse rotation), and an interlock circuit (to prevent damage to the equipment at the upper and lower positioning limits).
 - Note that when the CPU module detects an error, such as a watchdog timer error, during self-diagnosis, all outputs are turned off. Also, when an error that cannot be detected by the CPU module occurs in an input/output control block, output control may be disabled. External circuits and mechanisms should be designed to ensure safe machinery operation in such a case.
 - Note that the output current of the 24VDC service power supply varies depending on the model and the absence/presence of extension modules. If an overload occurs, the voltage automatically drops, inputs in the programmable controller are disabled, and all outputs are turned off. External circuits and mechanisms should be designed to ensure safe machinery operation in such a case.
 - Note that when an error occurs in a relay, triac or transistor of an output circuit, the output might stay on or off. For output signals that may lead to serious accidents, external circuits and mechanisms should be designed to ensure safe machinery operation in such a case.
- Construct an interlock circuit in the program so that the whole system always operates on the safe side before executing the control (for data change) of the programmable controller in operation. Read the manual thoroughly and ensure complete safety before executing other controls (program change, parameter change, forced output, and operation status change) to the programmable controller in operation. Otherwise, the machine may be damaged and accidents may occur due to erroneous operations.
- In an output circuit, when a load current exceeding the current rating or an overcurrent caused by a load short-circuit flows for a long time, it may cause smoke and fire. To prevent this, configure an external safety circuit, such as a fuse.
- For the operating status of each station after a communication failure of the network, refer to relevant manuals for the network. Incorrect output or malfunction may result in an accident.

[Precautions for using high-speed counter modules]

- Outputs may remain on or off due to a failure of a transistor for external output. For output signals that may lead to serious accidents, external circuits and mechanisms should be designed to ensure safe machinery operation in such a case.
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[DESIGN PRECAUTIONS]

CAUTION

- When an inductive load such as a lamp, heater, or solenoid valve is controlled, a large current (approximately ten times greater than normal) may flow when the output is turned from off to on. Take proper measures so that the flowing current dose not exceed the value corresponding to the maximum load specification of the resistance load.
- After the CPU module is powered on or is reset, the time taken to enter the RUN status varies depending on the system configuration, parameter settings, and/or program size.
Design circuits so that the entire system will always operate safely, regardless of this variation in time.
- Simultaneously turn on and off the power supplies of the CPU module and extension modules.
- If a long-time power failure or an abnormal voltage drop occurs, the programmable controller stops, and output is turned off. When the power supply is restored, it will automatically restart (when the RUN/STOP/RESET switch is on the RUN side).

[Precautions for using high-speed counter modules]

- Do not install the control lines or communication cables together with the main circuit lines or power cables. Keep a distance of 100mm or more between them. Failure to do so may result in malfunction due to noise.

[Security Precautions]

WARNING

- To maintain the security (confidentiality, integrity, and availability) of the programmable controller and the system against unauthorized access, denial-of-service (DoS) attacks, computer viruses, and other cyberattacks from unreliable networks and devices via the network, take appropriate measures such as firewalls, virtual private networks (VPNs), and antivirus solutions.

[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.
- Use the product within the generic environment specifications described in the User's Manual (Hardware) for the CPU module to be used.
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.

[INSTALLATION PRECAUTIONS]

CAUTION

- Do not touch the conductive parts of the product directly. Doing so may cause device failures or malfunctions.
 - When drilling screw holes or wiring, make sure that cutting and wiring debris do not enter the ventilation slits of the programmable controller. Failure to do so may cause fire, equipment failures or malfunctions.
 - For the product supplied together with a dust proof sheet, the sheet should be affixed to the ventilation slits before the installation and wiring work to prevent foreign objects such as cutting and wiring debris.
However, when the installation work is completed, make sure to remove the sheet to provide adequate ventilation. Failure to do so may cause fire, equipment failures or malfunctions.
 - Install the product on a flat surface. If the mounting surface is rough, undue force will be applied to the PC board, thereby causing nonconformities.
 - Install the product securely using a DIN rail or mounting screws.
 - Connect the expansion board and expansion adapter securely to their designated connectors. Loose connections may cause malfunctions.
 - Make sure to affix the expansion board with tapping screws.
Tightening torque should follow the specifications in the manual.
If the screws are tightened outside of the specified torque range, poor connections may cause malfunctions.
 - Work carefully when using a screwdriver such as installation of the product. Failure to do so may cause damage to the product or accidents.
 - Connect the extension cables, peripheral device cables, input/output cables and battery connecting cable securely to their designated connectors. Loose connections may cause malfunctions.
 - Turn off the power to the programmable controller before attaching or detaching the following devices.
Failure to do so may cause equipment failures or malfunctions.
 - Peripheral devices, expansion board, expansion adapter, and connector conversion adapter
 - Extension modules, bus conversion module, and connector conversion module
 - Battery
-

[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.
 - Make sure to attach the terminal cover, provided as an accessory, before turning on the power or initiating operation after installation or wiring work. Failure to do so may cause electric shock.
 - The temperature rating of the cable should be 80°C or more.
It may differ depending on the extension devices. For details, refer to the user's manual of the extension devices.
 - Make sure to wire the screw terminal block 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.
 - Tighten the screws using a Phillips-head screwdriver No.2 (shaft diameter 6mm or less). Ensure that the screwdriver does not touch the partition part of the terminal block.
 - 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 ends of stranded wires 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.
 - Fix the electric wires so that neither the terminal block nor the connected parts are directly stressed.
 - Make sure to properly wire to the spring clamp terminal block 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.
 - Twist the ends of stranded wires 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.
 - Fix the electric wires so that neither the terminal block nor the connected parts are directly stressed.
-

[WIRING PRECAUTIONS]

CAUTION

- Do not supply power externally to the [24+] and [24V] terminals (24VDC service power supply) on the CPU module or extension modules. Doing so may cause damage to the product.
- Perform class D grounding (grounding resistance: 100Ω or less) to the grounding terminal on the CPU module and extension modules with a wire 2 mm² or thicker.
Do not use common grounding with heavy electrical systems (refer to the User's Manual (Hardware) for the CPU module to be used).
- Connect the power supply wiring to the dedicated terminals described in this manual. If an AC power supply is connected to a DC input/output terminal or DC power supply terminal, the programmable controller will burn out.
- Do not wire vacant terminals externally. Doing so may cause damage to the product.
- Install module so that excessive force will not be applied to terminal blocks, power connectors, I/O connectors, communication connectors, or communication cables. Failure to do so may result in wire damage/breakage or programmable controller failure.
- Make sure to observe the following precautions in order to prevent any damage to the machinery or accidents due to malfunction of the programmable controller caused by abnormal data written to the programmable controller due to the effects of noise.
 - Do not bundle the power line, control line and communication cables together with or lay them close to the main circuit, high-voltage line, load line or power line. As a guideline, lay the power line, control line and communication cables at least 100 mm away from the main circuit, high-voltage line, load line or power line.
 - Ground the shield of the shield wire or shielded cable at one point on the programmable controller. However, do not use common grounding with heavy electrical systems.
 - Ground the shield of the analog I/O wire in accordance with the manuals of each model. However, do not use common grounding with heavy electrical systems.

[Precautions for using high-speed counter modules]

- Check the interface type and correctly connect the cable. Incorrect wiring (connecting the cable to an incorrect interface) may cause failure of the module and external device.
 - Connect the terminal block to a circuit separated from a dangerous voltage by a double/reinforced insulation.
 - Install module so that excessive force will not be applied to terminal blocks or communication cables. Failure to do so may result in wire damage/breakage or programmable controller failure.
-

[STARTUP AND MAINTENANCE PRECAUTIONS]

WARNING

- Do not touch any terminal while the programmable controller's power is on. Doing so may cause electric shock or malfunctions.
- Before cleaning or retightening terminals, cut off all phases of the power supply externally. Failure to do so may cause electric shock.
- Before modifying the program, performing forced output, or running or stopping the programmable controller while the system is running, read through this manual carefully, and ensure complete safety. An operation error may damage the machinery or cause accidents.
- Do not change the program in the programmable controller from two or more peripherals at the same time. (such as from an engineering tool and a GOT) Doing so may cause destruction or malfunction of the programmable controller program.
- Use the battery for memory backup in conformance to the User's Manual (Hardware) for the CPU module to be used.
 - Use the battery for the specified purpose only.
 - Connect the battery correctly.
 - Do not charge, disassemble, heat, put in fire, short-circuit, connect reversely, weld, swallow or burn the battery, or apply excessive forces (vibration, impact, drop, etc.) to the battery.
 - Do not store or use the battery at high temperatures or expose to direct sunlight.
 - Do not expose to water, bring near fire or touch liquid leakage or other contents directly.
 - When replacing the battery, make sure to use our specified product (FX3U-32BL).
 - When a battery error occurs ("BAT" LED is lit in red), follow the description in the User's Manual (Hardware) for the CPU module to be used.

Incorrect handling of the battery may cause excessive heat generation, bursting, ignition, liquid leakage or deformation, and lead to injury, fire or failures and malfunction of facilities and other equipment.

[STARTUP AND MAINTENANCE PRECAUTIONS]

CAUTION

- Do not disassemble or modify the programmable controller. Doing so may cause fire, equipment failures, or malfunctions.
For repair, contact your local Mitsubishi Electric representative.
 - Turn off the power to the programmable controller before connecting or disconnecting any extension cable. Failure to do so may cause equipment failures or malfunctions.
 - Turn off the power to the programmable controller before attaching or detaching the following devices. Failure to do so may cause equipment failures or malfunctions.
 - Peripheral devices, expansion board, expansion adapter, and connector conversion adapter
 - Extension modules, bus conversion module, and connector conversion module
 - Battery
 - Do not use the chemicals for cleaning.
 - If there is the possibility of touching the programmable controller inside a control panel in maintenance, make sure to discharge to avoid the influence of static electricity.
 - Since there are risks such as burn injuries, please do not touch the surface of the equipment with bare hands when it is operating in an environment where the ambient temperature exceeds 50°C.
 - Do not drop or apply strong shock to a module. Doing so may damage the module.
 - Before handling the module, touch a conducting object such as a grounded metal to discharge the static electricity from the human body. Failure to discharge the static electricity may cause the module to fail or malfunction.
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[OPERATION PRECAUTIONS]

CAUTION

- Construct an interlock circuit in the program so that the whole system always operates on the safe side before executing the control (for data change) of the programmable controller in operation. Read the manual thoroughly and ensure complete safety before executing other controls (program change, parameter change, forced output, and operation status change) to the programmable controller in operation. Otherwise, the machine may be damaged and accidents may occur due to erroneous operations.
-

[DISPOSAL PRECAUTIONS]

CAUTION

- Please contact a certified electronic waste disposal company for the environmentally safe recycling and disposal of your device.
 - When disposing of batteries, separate them from other waste according to local regulations. For details of the Battery Directive in EU countries, refer to the User's Manual (Hardware) for the CPU module to be used.
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[TRANSPORTATION PRECAUTIONS]

CAUTION

- When transporting the programmable controller with the optional battery, turn on the programmable controller before shipment, confirm that the battery mode is set using a parameter and the BAT LED is OFF, and check the battery life. If the programmable controller is transported with the BAT LED ON or the battery exhausted, the battery-backed data may be unstable during transportation.
 - The programmable controller is a precision instrument. During transportation, avoid impacts larger than those specified in the general specifications of the User's Manual (Hardware) for the CPU module to be used by using dedicated packaging boxes and shock-absorbing palettes. Failure to do so may cause failures in the programmable controller. After transportation, verify operation of the programmable controller and check for damage of the mounting part, etc.
 - When transporting lithium batteries, follow required transportation regulations. For details on the regulated products, refer to the User's Manual (Hardware) for the CPU module to be used.
 - When fumigants that contain halogen materials such as fluorine, chlorine, bromine, and iodine are used for disinfecting and protecting wooden packaging from insects, they cause malfunction when entering our products. Please take necessary precautions to ensure that remaining materials from fumigant do not enter our products, or treat packaging with methods other than fumigation (heat method). Additionally, disinfect and protect wood from insects before packing products.
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INTRODUCTION

This Replacement Manual describes extension device model selection for replacement from the MELSEC FX3 series to the MELSEC iQ-F series.

When replacing the MELSEC FX3 series with the MELSEC iQ-F series, the following items need to be considered beforehand: the replacement procedure, installation location, specifications comparison of the existing module and the new module, method to replace the network. For smooth replacement, please carefully consider beforehand.

Regarding use of this product

- 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 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.

Note

- If in doubt at any stage during the installation of the product, always consult a professional electrical engineer who is qualified and trained in the local and national standards. If in doubt about the operation or use, please consult the nearest Mitsubishi Electric representative.
- Since the examples indicated by this manual, technical bulletin, catalog, etc. are used as a reference, please use it after confirming the function and safety of the equipment and system. Mitsubishi Electric will accept no responsibility for actual use of the product based on these illustrative examples.
- This manual content, specification etc. may be changed, without a notice, for improvement.
- The information in this manual has been carefully checked and is believed to be accurate; however, if you notice a doubtful point, an error, etc., please contact the nearest Mitsubishi Electric representative. When doing so, please provide the manual number given at the end of this manual.

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RELEVANT MANUALS

MELSEC iQ-F series

Manual name <manual number>	Description
MELSEC iQ-F FX5S/FX5UJ/FX5U/FX5UC User's Manual (Hardware) <SH-082452ENG>	Describes the details of hardware of the CPU module, including performance specifications, wiring, installation, and maintenance.
MELSEC iQ-F FX5 User's Manual (Application) <JY997D55401>	Describes the basic knowledge required for program design, functions of the CPU module, devices/labels, and parameters.
MELSEC iQ-F FX5 Analog Module User's Manual <SH-081802ENG>	Describes the analog input modules, analog output modules, and multiple input modules.
MELSEC iQ-F FX5 High-Speed Counter Module User's Manual <SH-082631ENG>	Describes the specifications of the high-speed counter module
MELSEC iQ-F FX5 Positioning Module User's Manual <SH-081805ENG>	Describes the positioning modules.
MELSEC iQ-F FX5 Motion Module/Simple Motion Module User's Manual (Startup) <IB-0300251ENG>	Describes the specifications, procedures before operation, system configuration, wiring, and operation examples of the Motion module/Simple Motion module
MELSEC iQ-F FX5 Motion Module/Simple Motion Module User's Manual (Application) <IB-0300253ENG>	Describes the functions, input/output signals, buffer memory, parameter settings, programming, and troubleshooting of the Motion module/Simple Motion module
GX Works3 Operating Manual <SH-081215ENG>	Describes the system configuration, parameter settings, and online operations of GX Works3.
Transition from MELSEC FX3 Series to MELSEC iQ-F Series Handbook <SH-082703ENG>	Describes the transition from the MELSEC FX3 series to the MELSEC iQ-F series (CPU module)
Transition from MELSEC FX3 Series to MELSEC iQ-F Series Handbook (Intelligent Function Modules) [This manual] <L0810002ENG>	Describes the transition from the MELSEC FX3 series to the MELSEC iQ-F series (intelligent function modules).

MELSEC FX3 series

Manual name <manual number>	Description
FX3U Series User's Manual [Hardware Edition] <JY997D16501>	Describes hardware of the FX3U series, including input/output specifications, wiring, installation and maintenance.
FX3UC Series User's Manual [Hardware Edition] <JY997D28701>	Describes hardware of the FX3UC series, including input/output specifications, wiring, installation and maintenance.
FX3S/FX3G/FX3GC/FX3U/FX3UC SERIES USER'S MANUAL - Analog Control Edition <JY997D16701>	Describes the analog products of the FX3S, FX3G, FX3GC, FX3U, and FX3UC programmable controllers.
FX3U-2HC User's Manual <JY997D36701>	Describes the part names, external dimensions, installation, wiring, and specifications of the FX3U-2HC
FX3U-1PG User's Manual <JY997D47301>	Describes the handling of the FX3U-1PG pulse output blocks.
FX3U-20SSC-H User's Manual <JY997D21301>	Describes the handling and operations of the FX3U-20SSC-H positioning blocks.
GX Works2 Version 1 Operating Manual (Common) <SH-080779ENG>	Describes the system configuration, parameter settings, and online operations of GX Works2.

GENERIC TERMS AND ABBREVIATIONS

Unless otherwise specified, this manual uses the following generic terms and abbreviations.

Generic term/abbreviation	Description
Battery	A generic term for FX3U-32BL
Bus conversion module	A generic term for bus conversion modules (extension cable type) and bus conversion modules (extension connector type)
Bus conversion module (extension cable type)	A generic term for FX5-CNV-BUS
Bus conversion module (extension connector type)	A generic term for FX5-CNV-BUSC
Communication adapter	A generic term for FX5-232ADP and FX5-485ADP
Communication board	A generic term for FX5-232-BD, FX5-485-BD, and FX5-422-BD-GOT
Communication function expansion board	A generic term for FX3G-232-BD, FX3G-485-BD, FX3G-485-BD-RJ, FX3G-422-BD, FX3U-232-BD, FX3U-485-BD, FX3U-422-BD, and FX3U-USB-BD
Connector conversion adapter	A generic term for FX5-CNV-BC
Connector conversion module	A generic term for connector conversion modules (extension cable type) and connector conversion modules (extension connector type)
Connector conversion module (extension cable type)	A generic term for FX5-CNV-IF
Connector conversion module (extension connector type)	A generic term for FX5-CNV-IFC
Expansion adapter	A generic term for adapters for FX5 CPU modules
Expansion board	A generic term for boards for FX5S CPU modules, FX5UJ CPU modules, and FX5U CPU modules
Extended extension cable	A generic term for FX5-30EC and FX5-65EC
Extension module	A generic term for FX5 extension modules, FX3 extension modules, extension modules (extension cable type), and extension modules (extension connector type)
Extension module (extension cable type)	A generic term for input modules (extension cable type), output modules (extension cable type), input/output modules (extension cable type), powered input/output modules, high-speed pulse input/output modules, extension power supply modules (extension cable type), connector conversion modules (extension cable type), intelligent function modules, safety extension modules, and bus conversion modules (extension cable type)
Extension module (extension connector type)	A generic term for input modules (extension connector type), output modules (extension connector type), input/output modules (extension connector type), extension power supply modules (extension connector type), connector conversion modules (extension connector type), and bus conversion modules (extension connector type)
Extension power supply module	A generic term for FX5 extension power supply modules and FX3 extension power supply modules
FX3	A generic term for FX3G, FX3GC, FX3U, and FX3UC programmable controllers
FX3 extension module	A generic term for FX3 extension power supply modules and FX3 intelligent function modules
FX3 extension power supply module	A generic term for FX3U-1PSU-5V
FX3 intelligent function module	A generic term for FX3U-4AD, FX3U-4DA, FX3U-4LC, FX3U-1PG, FX3U-2HC, FX3U-16CCL-M, FX3U-64CCL, FX3U-128BTY-M, FX3U-128ASL-M, and FX3U-32DP
FX5	A generic term for FX5S, FX5UJ, FX5U, and FX5UC programmable controllers
FX5 analog adapter	A generic term for FX5-4AD-ADP, FX5-4DA-ADP, FX5-4AD-PT-ADP, FX5-4AD-TC-ADP, and FX5-4A-ADP
FX5 CPU module	A generic term for FX5S CPU modules, FX5UJ CPU modules, FX5U CPU modules, and FX5UC CPU modules
FX5 extension module	A generic term for I/O modules, FX5 extension power supply modules, FX5 intelligent function modules, and FX5 safety extension modules
FX5 extension power supply module	A generic term for FX5 extension power supply modules (extension cable type) and FX5 extension power supply modules (extension connector type)
FX5 extension power supply module (extension cable type)	A generic term for FX5-1PSU-5V
FX5 extension power supply module (extension connector type)	A generic term for FX5-C1PS-5V
FX5 intelligent function module	A generic term for FX5-4AD, FX5-4DA, FX5-8AD, FX5-4LC, FX5-20PG-P, FX5-20PG-D, FX5-40SSC-G, FX5-80SSC-G, FX5-40SSC-S, FX5-80SSC-S, FX5-ENET, FX5-ENET/IP, FX5-CCLGN-MS, FX5-CCLIEF, FX5-CCL-MS, FX5-ASL-M, and FX5-DP-M

Generic term/abbreviation	Description
FX5S CPU module	A generic term for FX5S-30MR/ES, FX5S-30MT/ES, FX5S-30MT/ESS, FX5S-40MR/ES, FX5S-40MT/ES, FX5S-40MT/ESS, FX5S-60MR/ES, FX5S-60MT/ES, FX5S-60MT/ESS, FX5S-80MR/ES ^{*1} , FX5S-80MT/ES ^{*1} , FX5S-80MT/ESS ^{*1} , FX5S-30MR/DS, FX5S-30MT/DS, FX5S-30MT/DSS, FX5S-40MR/DS, FX5S-40MT/DS, FX5S-40MT/DSS, FX5S-60MR/DS, FX5S-60MT/DS, FX5S-60MT/DSS, FX5S-80MR/DS ^{*1} , FX5S-80MT/DS ^{*1} , and FX5S-80MT/DSS ^{*1}
FX5U CPU module	A generic term for FX5U-32MR/ES, FX5U-32MT/ES, FX5U-32MT/ESS, FX5U-64MR/ES, FX5U-64MT/ES, FX5U-64MT/ESS, FX5U-80MR/ES, FX5U-80MT/ES, FX5U-80MT/ESS, FX5U-32MR/DS, FX5U-32MT/DS, FX5U-32MT/DSS, FX5U-64MR/DS, FX5U-64MT/DS, FX5U-64MT/DSS, FX5U-80MR/DS, FX5U-80MT/DS, and FX5U-80MT/DSS
FX5UC CPU module	A generic term for FX5UC-32MT/D, FX5UC-32MT/DSS, FX5UC-64MT/D, FX5UC-64MT/DSS, FX5UC-96MT/D, FX5UC-96MT/DSS, FX5UC-32MT/DS-TS, FX5UC-32MT/DSS-TS, and FX5UC-32MR/DS-TS
FX5UJ CPU module	A generic term for FX5UJ-24MR/ES, FX5UJ-24MT/ES, FX5UJ-24MT/ESS, FX5UJ-40MR/ES, FX5UJ-40MT/ES, FX5UJ-40MT/ESS, FX5UJ-60MR/ES, FX5UJ-60MT/ES, FX5UJ-60MT/ESS, FX5UJ-24MR/DS, FX5UJ-24MT/DS, FX5UJ-24MT/DSS, FX5UJ-40MR/DS, FX5UJ-40MT/DS, FX5UJ-40MT/DSS, FX5UJ-60MR/DS, FX5UJ-60MT/DS, and FX5UJ-60MT/DSS
High-speed pulse input/output module	A generic term for FX5-16ET/ES-H and FX5-16ET/ESS-H
I/O module	A generic term for input modules, output modules, I/O modules, powered input/output modules, and high-speed pulse input/output modules
Input module	A generic term for input modules (extension cable type) and input modules (extension connector type)
Input module (extension cable type)	A generic term for FX5-8EX/ES and FX5-16EX/ES
Input module (extension connector type)	A generic term for FX5-C16EX/D, FX5-C16EX/DS, FX5-C32EX/D, FX5-C32EX/DS, and FX5-C32EX/DS-TS
Input/output module	A generic term for input/output modules (extension cable type) and input/output modules (extension connector type)
Input/output modules (extension cable type)	A generic term for FX5-16ER/ES, FX5-16ET/ES, and FX5-16ET/ESS
Input/output modules (extension connector type)	A generic term for FX5-C32ET/D, FX5-C32ET/DSS, FX5-C32ET/DS-TS, and FX5-C32ET/DSS-TS
Intelligent function module	A generic term for FX5 intelligent function modules and FX3 intelligent function modules
Intelligent module	An abbreviation for intelligent function modules
Powered input/output module	A generic term for FX5-32ER/ES, FX5-32ET/ES, FX5-32ET/ESS, FX5-32ER/DS, FX5-32ET/DS, and FX5-32ET/DSS
Special communication adapter	A generic term for FX3U-232ADP, FX3U-232ADP-MB, FX3U-485ADP, FX3U-485ADP-MB, and FX3UENET-ADP

*1 Area-specific model

1 BEFORE REPLACEMENT

1.1 Overview of the MELSEC iQ-F Series

Designed on the concepts of outstanding performance, superior drive control and user centric programming, Mitsubishi Electric MELSEC-F Series has been reborn as the MELSEC iQ-F Series.

From stand alone use to networked system applications, MELSEC iQ-F Series brings your business to the next level of industry.

Outstanding performance

CPU performance

The sequence execution engine, the core of the MELSEC iQ-F, is equipped with a newly developed execution engine that supports the structured programs, multiple programs execution, the ST language, FBs, and other features.

High-speed system bus communication

The MELSEC iQ-F realizes high-speed CPU and high-speed system bus communication. This enables maximum performance even when using an intelligent function module with large amounts of data.

Security

The MELSEC iQ-F has advanced security functions (file password, remote password, and security key) to prevent data theft and illegal operations by unauthorized persons.

Interfacing with drive devices

Built-in positioning

The MELSEC iQ-F features positioning functionality with CPU module built-in pulse output^{*1} and up to eight axes of high-speed pulse input/output modules^{*2}. Positioning operations including interrupt, variable speed, and simple interpolation^{*2} can easily be set up in tables and executed.

*1 FX5UJ CPU module: Up to 3 axes

FX5S/FX5U/FX5UC CPU module: Up to 4 axes

*2 Only FX5U/FX5UC CPU module is supported.

Simple Motion module

By connecting the Simple Motion module equipped with positioning function compatible with SSCNETⅢ/H, and combining linear interpolation, 2-axis circular interpolation, and continuous trajectory control in the program set by table method, a smooth trajectory can be easily drawn.

By starting with parameter settings and the sequence program, the Simple Motion modules can easily realize a variety of motion control including positioning control, advanced synchronous control, cam control and speed-torque control.

Predefined protocol support for positioning

Only by simply setting the system configuration, the MELSEC iQ-F^{*1} and IAI ROBO Cylinder can be connected by MODBUS RTU connection to perform the positioning operation without the need to consider the transmission and reception of the communication commands.

*1 Only FX5U/FX5UC CPU module is supported.

Improved programming environment

User-friendly programming software (GX Works3)

■System design with a convenient parts library

With GX Works3, designing a system is as easy as preparing the module configuration diagram by dragging and dropping selected parts.

■Auto-generation of module parameters

When preparing the module configuration diagram, simply double-click the module to automatically generate the module parameters. A window with an easy-to-use parameter settings screen opens, enabling module parameters to be modified as needed.

■Main programming languages supported

The main IEC languages are supported by GX Works3. Various different programming languages can be used within the same project simultaneously, and the labels and devices used in each program can be shared.

1.2 Substitute Models

The recommended substitute models (FX5 intelligent function module) introduced in this manual are substitute models, with the performance specifications, product, and input/output terminal type (such as a terminal block/connector). According to usage and service condition, substitute models different from those described may be suitable. Also, the recommended substitute models may no longer be appropriate due to factors such as the release of new products to the market and function improvements.

Please plan replacement to a substitute model with the following procedures.

Procedure for replacing with substitute models

1. Investigation of the existing system

List the locations, number of modules, and types of installed intelligent function modules and analog adapters. Investigate the programs and wiring diagram, or others.

2. Diagnosis of the facilities

Conduct a diagnosis of the facility's importance, duration of service, and usage environment. Then, set priorities and plan the replacement procedure accordingly.

3. Selection of the models

Select a replacement model based on the corresponding functions, CPU modules, the availability of extension modules, or other features. Select from the latest FX5 intelligent function modules and analog adapters.

4. Reuse of the program

Consider either to reuse the program of the existing system, or create new program.

When reusing, convert and correct the read out program to the format of the new FX5 intelligent function modules and analog adapters.

5. Replacement of the models

Arrange the selected models and replace on-site.

6. Debug of the system

Test the system after replacement and adjust bugs and timing.

7. Completion

After debugging, migrate to live operation.

Selection and replacement of the models

The intelligent function modules and the expansion adapters of the MELSEC FX3 series can be replaced with the MELSEC iQ-F series as the successor models.

The following shows the substitute models.

Replacement target module	Module after replacement	Reference page
FX3U-4AD-ADP	FX5-4AD-ADP	Page 20 REPLACEMENT OF THE FX3U-4AD-ADP ANALOG INPUT EXPANSION ADAPTER
FX3U-4AD	FX5-4AD	Page 29 REPLACEMENT OF THE FX3U-4AD ANALOG INPUT BLOCK
FX3U-4DA-ADP	FX5-4DA-ADP	Page 41 REPLACEMENT OF THE FX3U-4DA-ADP ANALOG OUTPUT EXPANSION ADAPTER
FX3U-4DA	FX5-4DA	Page 50 REPLACEMENT OF THE FX3U-4DA ANALOG OUTPUT BLOCK
FX3U-2HC	FX5 CPU module built-in high-speed counter	Page 61 REPLACEMENT OF THE FX3U-2HC TYPE HIGH-SPEED COUNTER BLOCK
	FX5-16ET/ES-H, FX5-16ET/ESS-H	
	FX5-2HC/ES	
FX3U-1PG	FX5 CPU module built-in positioning	Page 85 REPLACEMENT OF THE FX3U-1PG PULSE OUTPUT BLOCK
	FX5-16ET/ES-H, FX5-16ET/ESS-H	
	FX5-20PG-P	
FX3U-20SSC-H	FX5-40SSC-S, FX5-80SSC-S	Page 116 REPLACEMENT OF THE FX3U-20SSC-H POSITIONING BLOCK

2 REPLACEMENT OF THE FX3U-4AD-ADP ANALOG INPUT EXPANSION ADAPTER

This chapter describes the specification differences, precautions, and replacement procedures when replacing the FX3U-4AD-ADP analog input adapters with the MELSEC iQ-F series FX5-4AD-ADP analog input expansion adapters.

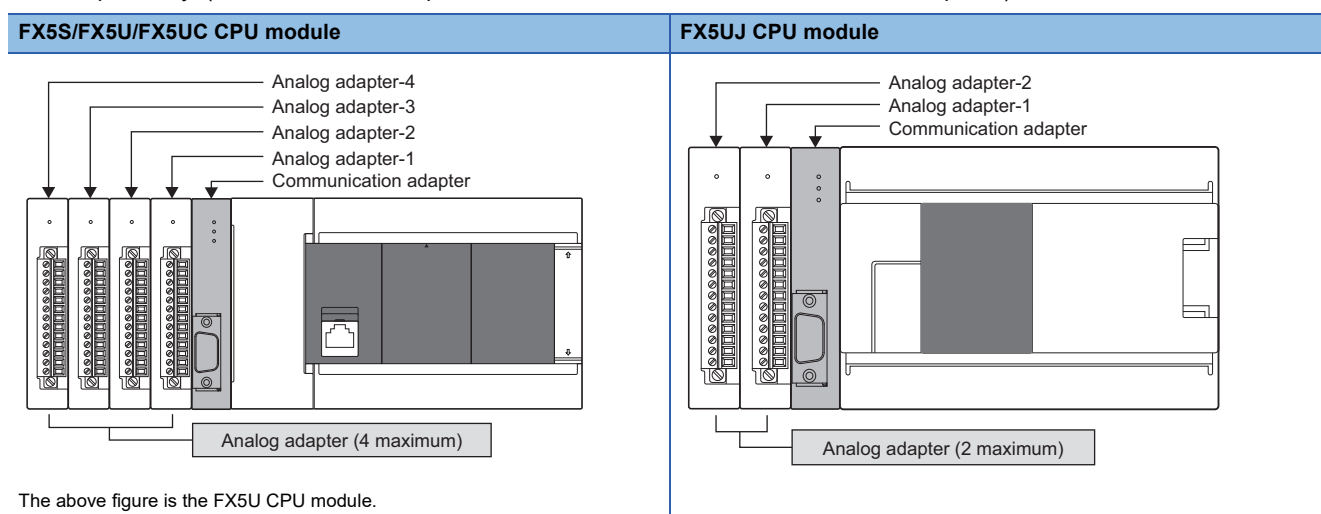
2.1 Overview of the FX5-4AD-ADP Analog Input Expansion Adapter

This section describes the system configuration to use FX5 analog adapters.

A maximum of four analog adapters can be connected to an FX5S/FX5U/FX5UC CPU module.

A maximum of two analog adapters can be connected to an FX5UJ CPU module.

The FX5 analog adapters are counted starting with the adapter closest to the CPU module as the first, followed by others in order of proximity. (Communication adapters are not counted towards the number of adapters.)



2.2 Substitute model

The FX3U-4AD-ADP can be replaced according to the details described below.

Before replacement	After replacement	Specification differences	Reference
FX3U-4AD-ADP	FX5-4AD-ADP*1	Hardware Terminal block type, terminal layout	Page 22 Wiring differences
		Parameter settings	Page 23 Converting projects
		Performance specifications - Resolution - Conversion speed	Page 24 Performance specifications

*1 The FX5-4AD-ADP can be connected to the following CPU modules.

- FX5S CPU module (supported from the first released product)
- FX5UJ CPU module (supported from the first released product)
- FX5U CPU module (supported from version 1.010)
- FX5UC CPU module (supported from version 1.010)

2.3 Replacement with the FX5-4AD-ADP

Precautions regarding the hardware

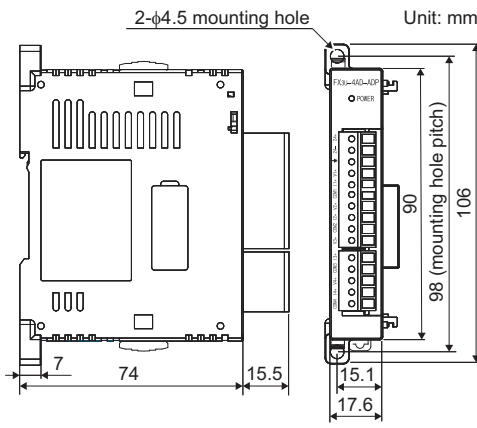
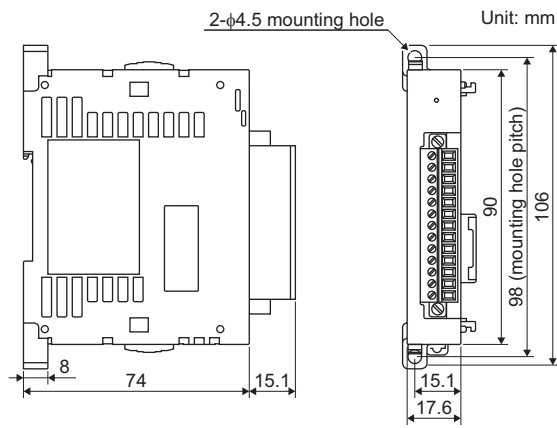
The main hardware differences between the FX3U-4AD-ADP and FX5-4AD-ADP are as follows.

Main differences in the specifications

Item	Difference	
	FX3U-4AD-ADP	FX5-4AD-ADP
Analog input voltage	0 to 10VDC (Input resistance value 194k Ω)	-10 to +10VDC (Input resistance value 1M Ω)
Analog input current	4 to 20mA DC (Input resistance value 250 Ω)	-20 to +20mA DC (Input resistance value 250 Ω)
Terminal block type ^{*1}	European-type terminal block	European-type terminal block

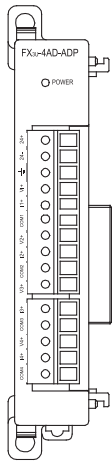
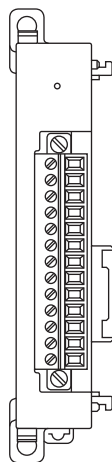
^{*1} The terminal blocks and terminal layouts are different. (☞ Page 22 Wiring differences)

External dimensions

FX3U-4AD-ADP	FX5-4AD-ADP
W × H × D (mm): 17.6 × 106 × 74 Weight: Approx. 0.1kg DIN rail mounting hook The mounting holes are positioned in the upper left and lower left corners of the module.  2-ϕ4.5 mounting hole Unit: mm Dimensions: 7, 74, 15.5, 15.1, 17.6, 90, 98 (mounting hole pitch), 106	W × H × D (mm): 17.6 × 106 × 74 Weight: Approx. 0.1kg DIN rail mounting hook The mounting holes are positioned in the upper left and lower left corners of the module.  2-ϕ4.5 mounting hole Unit: mm Dimensions: 8, 74, 15.1, 17.6, 90, 98 (mounting hole pitch), 106

Wiring differences

The terminal blocks and terminal layouts differ between the FX3U-4AD-ADP and the FX5-4AD-ADP.

FX3U-4AD-ADP	FX5-4AD-ADP																												
 FX3U-4AD-ADP POWER Terminal layout <table><tr><td>24+</td></tr><tr><td>24-</td></tr><tr><td>⏏</td></tr><tr><td>V1+</td></tr><tr><td>I1+</td></tr><tr><td>COM1</td></tr><tr><td>V2+</td></tr><tr><td>I2+</td></tr><tr><td>COM2</td></tr><tr><td>V3+</td></tr><tr><td>I3+</td></tr><tr><td>COM3</td></tr><tr><td>V4+</td></tr><tr><td>I4+</td></tr><tr><td>COM4</td></tr></table>	24+	24-	⏏	V1+	I1+	COM1	V2+	I2+	COM2	V3+	I3+	COM3	V4+	I4+	COM4	 Terminal layout <table><tr><td>V1+</td></tr><tr><td>I1+</td></tr><tr><td>COM1</td></tr><tr><td>V2+</td></tr><tr><td>I2+</td></tr><tr><td>COM2</td></tr><tr><td>V3+</td></tr><tr><td>I3+</td></tr><tr><td>COM3</td></tr><tr><td>V4+</td></tr><tr><td>I4+</td></tr><tr><td>COM4</td></tr><tr><td>⏏</td></tr></table>	V1+	I1+	COM1	V2+	I2+	COM2	V3+	I3+	COM3	V4+	I4+	COM4	⏏
24+																													
24-																													
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Wire the European-type terminal block in accordance with the following specifications.

Number of wires connected per terminal	Wire size	
	Solid wire, stranded wire	Ferrule with insulation sleeve
One	22 to 20 AWG (0.3mm ² to 0.5mm ²)	22 to 20 AWG (0.3mm ² to 0.5mm ²)
Two	22 AWG (0.3mm ²)	—

Power supply differences

Item	FX3U-4AD-ADP	FX5-4AD-ADP
A/D conversion circuit drive power supply	24VDC +20%/-15%, 40mA (A 24VDC power supply is required to be connected and supplied to the terminal block.)	24VDC, 20mA (Power is supplied internally from the 24VDC power supply of the CPU module.)
Interface drive power supply	5VDC, 15mA (Power is internally supplied by the FX3 main module.)	5VDC, 10mA (Power is supplied internally from the 5VDC power supply of the CPU module.)

Converting projects

For how to convert the project for the FX3 to the one for the FX5, refer to the following.

☞ Page 132 Converting FX3 (GX Works2) Projects to FX5 (GX Works3) Projects

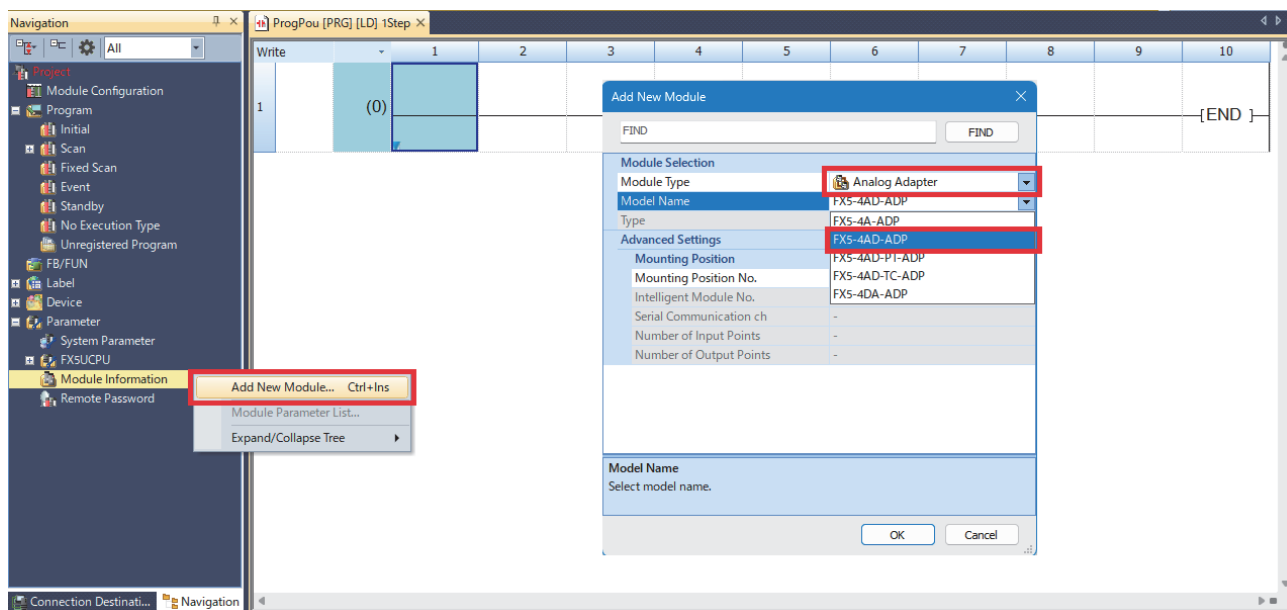
After converting the project to GX Works3, configure the parameters. In addition, modify the programs (instructions and devices) as required.

Parameter settings in GX Works3

The following shows the procedures for setting the FX5-4AD-ADP parameters using GX Works3.

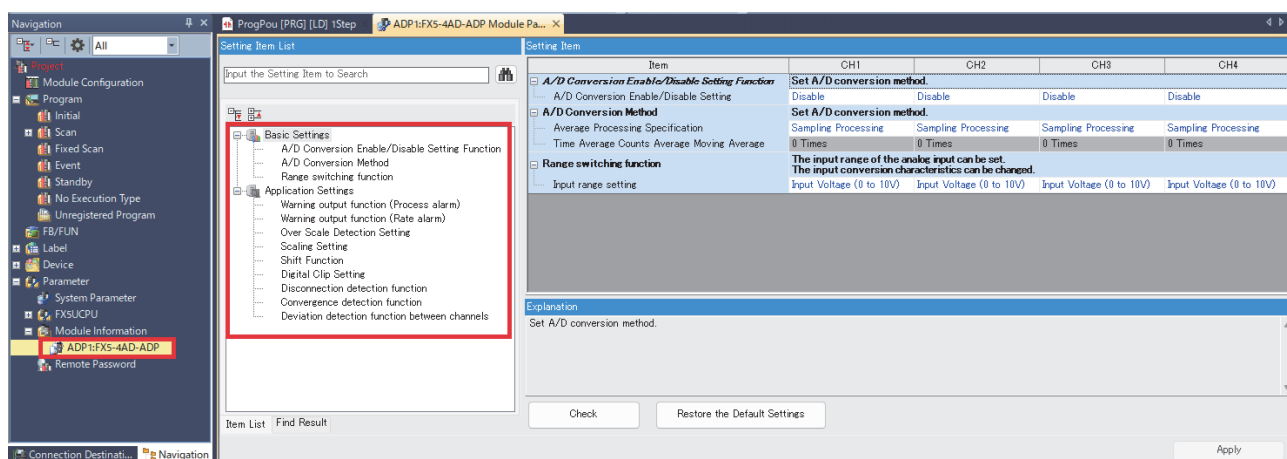
1. Add the FX5-4AD-ADP to the project.

☞ Navigation window ⇒ [Parameter] ⇒ Right-click [Module Information] ⇒ [Add New Module]
Module Type: [Analog Adapter], Model Name: [FX5-4AD-ADP]



2. Configure settings for each module parameter.

☞ Navigation window ⇒ [Parameter] ⇒ [Module Information] ⇒ Double-click [FX5-4AD-ADP]



For details, refer to the following.

☞ MELSEC iQ-F FX5 User's Manual (Application)

Specifications comparison

The following table lists the specifications comparisons.

General specifications

○: Compatible

Item		FX3U-4AD-ADP	FX5-4AD-ADP	Compatibility
Withstand voltage	Between a batch of all terminals and the ground terminal	500VAC for one minute	500VAC for one minute	○
Insulation resistance		5M Ω or higher by a 500VDC insulation resistance tester	10M Ω or higher by a 500VDC insulation resistance tester	○

Power supply specifications

○: Compatible, Δ : Partially different

Item		FX3U-4AD-ADP	FX5-4AD-ADP	Compatibility
A/D conversion circuit drive power supply		24VDC +20%/-15%, 40mA (A 24VDC power supply is required to be connected and supplied to the terminal block.)	24VDC, 20mA (Power is supplied internally from the 24VDC power supply of the CPU module.)	○
Interface drive power supply		5VDC, 15mA (Power is internally supplied by the FX3 main module.)	5VDC, 10mA (Power is supplied internally from the 5VDC power supply of the CPU module.)	Δ

Performance specifications

○: Compatible, Δ : Partially different, —: Not available for the current models

Item			FX3U-4AD-ADP		FX5-4AD-ADP		Compatibility
Number of channels			4ch		4ch		○
Analog input voltage			0 to 10VDC (input resistance 194k Ω)		-10 to +10VDC (input resistance 1M Ω)		○
Analog input current			4 to 20mA DC (input resistance 250 Ω)		-20 to +20mA DC (input resistance 250 Ω)		○
Absolute maximum input			Voltage: -0.5V, +15V, Current: -2mA, +30mA		Voltage: $\pm$ 15V, Current: $\pm$ 30mA		○
Digital output			Voltage input: 12-bit binary Current input: 11-bit binary		14-bit binary		○
Input characteristics, resolution	Voltage	0 to 10V	0 to 4000	2.5mV	0 to 16000	625 μ V	○
		0 to 5V	—		0 to 16000	312.5 μ V	—
		1 to 5V	—		0 to 12800	312.5 μ V	—
		-10 to 10V	—		-8000 to +8000	1250 μ V	—
	Current	0 to 20mA	—		0 to 16000	1.25 μ A	—
		4 to 20mA	0 to 1600	10 μ A	0 to 12800	1.25 μ A	○
		-20mA to 20mA	—		-8000 to +8000	2.5 μ A	—
Accuracy	Voltage	When the ambient temperature is 25°C $\pm$ 5°C	Accuracy for the full scale analog input value	Within $\pm$ 0.5% ($\pm$ 50mV)	Accuracy for the full scale of the digital output value	Within $\pm$ 0.1% ($\pm$ 16 digits)	○
		When the ambient temperature is 0°C to 55°C		Within $\pm$ 1.0% ($\pm$ 100mV)		Within $\pm$ 0.2% ($\pm$ 32 digits)	○
	Current	When the ambient temperature is 25°C $\pm$ 5°C		Within $\pm$ 0.5% ($\pm$ 80 μ A)		Within $\pm$ 0.1% ($\pm$ 16 digits)	○
		When the ambient temperature is 0°C to 55°C		Within $\pm$ 1.0% ($\pm$ 160 μ A)		Within $\pm$ 0.2% ($\pm$ 32 digits)	○
		When the ambient temperature is -20°C to 0°C		—		Within $\pm$ 0.3% ($\pm$ 48 digits)	—
	Voltage/current	When the ambient temperature is -20°C to 0°C		—		—	—
	Conversion speed (Data is updated at each operation cycle of the programmable controller.)		- FX3S/FX3G/FX3GC main module: 250μs - FX3U/FX3UC main module: 200μs		- FX5S CPU module: Up to 500μs - FX5UJ/FX5U/FX5UC CPU module: Up to 450μs		Δ

Item		FX3U-4AD-ADP	FX5-4AD-ADP	Compatibility
Insulation method	Between the input terminal and programmable controller	Photocoupler	Photocoupler	○
	Between the input terminal and channels	Not insulated	Not insulated	○
Number of occupied I/O points		0 points (This number is not related to the maximum number of I/O points of the programmable controller.)	0 points (This number is not related to the maximum number of I/O points of the programmable controller.)	○

Reference manuals and sections

■FX3U-4AD-ADP

Item	Reference manual	Reference section
FX3U-4AD-ADP general specifications	 FX3S/FX3G/FX3GC/FX3U/FX3UC SERIES USER'S MANUAL - Analog Control Edition	C. FX3U-4AD-ADP (4-channel Analog Input) ⇒ 2.1 Generic Specifications
FX3U-4AD-ADP power supply specifications		C. FX3U-4AD-ADP (4-channel Analog Input) ⇒ 2.2 Power Supply Specifications
FX3U-4AD-ADP performance specifications		C. FX3U-4AD-ADP (4-channel Analog Input) ⇒ 2.3 Performance Specifications

■FX5-4AD-ADP

Item	Reference manual	Reference section
FX5-4AD-ADP general specifications	 MELSEC iQ-F FX5S/FX5UJ/FX5U/FX5UC User's Manual (Hardware)	Chapter 4 GENERAL SPECIFICATIONS ⇒ Dielectric withstand voltage test and insulation resistance test ⇒ Expansion board, expansion adapter
FX5-4AD-ADP power supply specifications		Chapter 9 EXPANSION ADAPTER PERFORMANCE SPECIFICATIONS ⇒ 9.1 Analog Adapter ⇒ Power supply specifications
FX5-4AD-ADP analog input specifications	 MELSEC iQ-F FX5 User's Manual (Application)	Chapter 37 ANALOG ADAPTERS ⇒ 37.2 Specifications ⇒ Performance specifications ⇒ Analog input, analog output ⇒ Analog input specifications

Functional comparison

The following table shows the functional comparison.

○: Compatible

Item		Description	FX3U-4AD-ADP	FX5-4AD-ADP	Compatibility
Function					
Input mode switching		Allows for switching the input range of the analog input for each channel.	The FX3U-4AD-ADP can be set for current input or voltage input by turning on or off the special auxiliary relays. • Off: Voltage input • On: Current input	"Range switching function" is available instead of the input mode switching. The input conversion characteristics can be changed by switching the range. Each voltage range can be selected by setting a value between 0 and 3, and each current range can be selected by setting a value between 4 and 6.	○
A/D conversion method	Count (for averaging)	When count (for averaging) is set, the average data is stored as the input data.	In the FX3U-4AD-ADP, the average value is stored in the input data by setting count (for averaging). Count (for averaging) can be set for each channel.	"Count average" is available instead of count (for averaging). A/D conversion is executed for a set number of times of averaging processing, the averaged value excluding the maximum value and minimum value is output in digital, and values are stored in the digital output value, digital operation value, and analog input value monitor. Processing time = Set number of times × Scan time	○
Input data		Displays the input analog value.	The input data converted in the FX3U-4AD-ADP is stored in the special data register.	The A/D converted digital output value is stored in "Digital output value".	○
Error status		Stores the error status.	If an error occurs in the FX3U-4AD-ADP, the error status data is stored in the corresponding special data register.	If an error occurs in the FX5-4AD-ADP, the corresponding special relay turns on, and the error code is stored in the special register.	○
Model code		Stores the CPU module information.	When the FX3U-4AD-ADP is connected, the model code "1" is stored in the corresponding special data register.	"Module information" is available instead of the model code. The module information of the FX5-4AD-ADP is stored.	○

Reference manuals and sections

■FX3U-4AD-ADP

Item	Reference manual	Reference section
FX3U-4AD-ADP Input mode switching	 FX3S/FX3G/FX3GC/FX3U/FX3UC SERIES USER'S MANUAL - Analog Control Edition	C. FX3U-4AD-ADP (4-channel Analog Input) ⇒ 4.3 Switching of Input Mode
FX3U-4AD-ADP Count (for averaging)		C. FX3U-4AD-ADP (4-channel Analog Input) ⇒ 4.5 Averaging Time
FX3U-4AD-ADP Input data		C. FX3U-4AD-ADP (4-channel Analog Input) ⇒ 4.4 Input Data
FX3U-4AD-ADP Error status		C. FX3U-4AD-ADP (4-channel Analog Input) ⇒ 4.6 Error Status
FX3U-4AD-ADP Model code		C. FX3U-4AD-ADP (4-channel Analog Input) ⇒ 4.7 Model Code

■FX5-4AD-ADP

Item	Reference manual	Reference section
FX5-4AD-ADP A/D conversion enable/disable	 MELSEC iQ-F FX5 User's Manual (Application)	Chapter 37 ANALOG ADAPTERS ⇒ 37.6 Functions (Analog Input) ⇒ A/D conversion enable/disable setting function
FX5-4AD-ADP range switching function		Chapter 37 ANALOG ADAPTERS ⇒ 37.6 Functions (Analog Input) ⇒ Range switching function
FX5-4AD-ADP Count average		Chapter 37 ANALOG ADAPTERS ⇒ 37.6 Functions (Analog Input) ⇒ A/D conversion method ⇒ Averaging processing ⇒ Count average
FX5-4AD-ADP Analog input value monitor		Chapter 37 ANALOG ADAPTERS ⇒ 37.5 List of Functions ⇒ Analog input ⇒ Analog input value monitor
FX5-4AD-ADP error code		Appendix 3 Error Code
FX5-4AD-ADP Module information		Appendix 2 Special Register List ⇒ Analog adapter ⇒ Module information

Special device comparison

FX3U-4AD-ADP*1					FX5-4AD-ADP				
Function name	Adapter 1	Adapter 2	Adapter 3	Adapter 4	Function name	Adapter 1	Adapter 2	Adapter 3	Adapter 4
ch1 Input mode switching	M8260	M8270	M8280	M8290	CH1 Input range setting	SD6305	SD6665	SD7025	SD7385
ch2 Input mode switching	M8261	M8271	M8281	M8291	CH2 Input range setting	SD6345	SD6705	SD7065	SD7425
ch3 Input mode switching	M8262	M8272	M8282	M8292	CH3 Input range setting	SD6385	SD6745	SD7105	SD7465
ch4 Input mode switching	M8263	M8273	M8283	M8293	CH4 Input range setting	SD6425	SD6785	SD7145	SD7505
ch1 Input data	D8260	D8270	D8280	D8290	CH1 Digital output value*2	SD6300	SD6600	SD7020	SD7380
ch2 Input data	D8261	D8271	D8281	D8291	CH2 Digital output value*2	SD6340	SD6700	SD7060	SD7420
ch3 Input data	D8262	D8272	D8282	D8292	CH3 Digital output value*2	SD6380	SD6740	SD7100	SD7460
ch4 Input data	D8263	D8273	D8283	D8293	CH4 Digital output value*2	SD6420	SD6780	SD7140	SD7500
Number of averaging times for Ch1 (Setting range: 1 to 4095)	D8264	D8274	D8284	D8294	CH1 Averaging process setting*3	SD6303	SD6663	SD7023	SD7383
					CH1 Count average setting (Setting range: 4 to 32767 times)	SD6304	SD6664	SD7024	SD7384
Number of averaging times for Ch2 (Setting range: 1 to 4095)	D8265	D8275	D8285	D8295	CH2 Averaging process setting*3	SD6343	SD6703	SD7063	SD7423
					CH2 Count average setting (Setting range: 4 to 32767 times)	SD6344	SD6704	SD7064	SD7424
Number of averaging times for Ch3 (Setting range: 1 to 4095)	D8266	D8276	D8286	D8296	CH3 Averaging process setting*3	SD6383	SD6743	SD7103	SD7463
					CH3 Count average setting (Setting range: 4 to 32767 times)	SD6384	SD6744	SD7104	SD7464
Number of averaging times for Ch4 (Setting range: 1 to 4095)	D8267	D8277	D8287	D8297	CH4 Averaging process setting*3	SD6423	SD6783	SD7143	SD7503
					CH4 Count average setting (Setting range: 4 to 32767 times)	SD6424	SD6784	SD7144	SD7504

FX3U-4AD-ADP ^{*1}						FX5-4AD-ADP						
Function name		Adapter 1	Adapter 2	Adapter 3	Adapter 4	Function name		Adapter 1	Adapter 2	Adapter 3	Adapter 4	
Error status	Channel-1 over-scale detection	D8268.b0	D8278.b0	D8288.b0	D8298.b0	CH1 Over scale upper limit detection flag ^{*4}		SM6302	SM6662	SM7022	SM7382	
	Channel-2 over-scale detection	D8268.b1	D8278.b1	D8288.b1	D8298.b1	CH2 Over scale upper limit detection flag ^{*4}		SM6342	SM6702	SM7062	SM7422	
	Channel-3 over-scale detection	D8268.b2	D8278.b2	D8288.b2	D8298.b2	CH3 Over scale upper limit detection flag ^{*4}		SM6382	SM6742	SM7102	SM7462	
	Channel-4 over-scale detection	D8268.b3	D8278.b3	D8288.b3	D8298.b3	CH4 Over scale upper limit detection flag ^{*4}		SM6422	SM6782	SM7142	SM7502	
	EEPROM error	D8268.b4	D8278.b4	D8288.b4	D8298.b4	A/D conversion latest error code	Analog ADP memory error		SD6339	SD6699	SD7059	SD7419
	Averaging time setting error	D8268.b5	D8278.b5	D8288.b5	D8298.b5		Average time setting range error	CH1	SD6339	SD6699	SD7059	SD7419
								CH2	SD6379	SD6739	SD7099	SD7459
								CH3	SD6419	SD6779	SD7139	SD7499
								CH4	SD6459	SD6819	SD7179	SD7539
	4AD-ADP hardware error (Power supply error included)	D8268.b6	D8278.b6	D8288.b6	D8298.b6		Analog ADP hardware error		SD6339	SD6699	SD7059	SD7419
	4AD-ADP communication data error	D8268.b7	D8278.b7	D8288.b7	D8298.b7		Analog ADP communication error		SD6339	SD6699	SD7059	SD7419
	Channel-1 under-scale detection	D8268.b8	D8278.b8	D8288.b8	D8298.b8	CH1 Over scale lower limit detection flag		SM6303	SM6663	SM7023	SM7383	
	Channel-2 under-scale detection	D8268.b9	D8278.b9	D8288.b9	D8298.b9	CH2 Over scale lower limit detection flag		SM6343	SM6703	SM7063	SM7423	
	Channel-3 under-scale detection	D8268.b10	D8278.b10	D8288.b10	D8298.b10	CH3 Over scale lower limit detection flag		SM6383	SM6743	SM7103	SM7463	
Channel-4 under-scale detection	D8268.b11	D8278.b11	D8288.b11	D8298.b11	CH4 Over scale lower limit detection flag		SM6423	SM6783	SM7143	SM7503		
Model code		D8269	D8279	D8289	D8299	Module information		SD6280	SD6640	SD7000	SD7360	

*1 The memory assignment of the devices is for the FX3U/FX3UC series.

*2 Additionally, set "A/D conversion enable/disable setting" to "A/D conversion enable".

*3 When using Count average, set Averaging process specification to "2: Count average".

*4 Additionally, enable the over scale detection enable/disable setting.

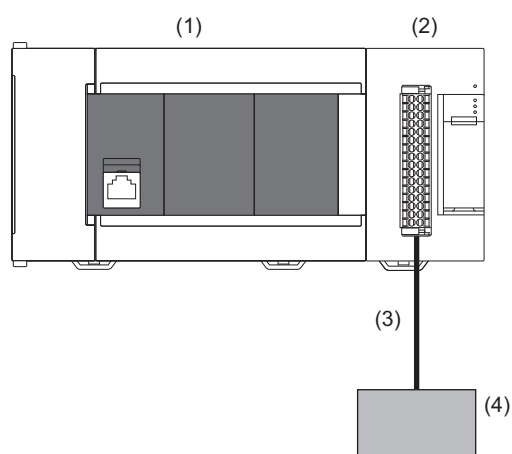
3 REPLACEMENT OF THE FX3U-4AD ANALOG INPUT BLOCK

This chapter describes the specification differences, precautions, and replacement procedures when replacing the FX3U-4AD analog input block with the MELSEC iQ-F series FX5-4AD analog input module.

3.1 Overview of the FX5-4AD Analog Input Module

The FX5-4AD analog input module converts four analog inputs (voltage or current) into digital values.

This module can be connected to the FX5UJ, FX5U, and FX5UC CPU modules and is capable of importing four channels of voltage/current data.



- (1) FX5 CPU module
- (2) FX5-4AD
- (3) Analog device connection cable
- (4) Analog device (such as flow sensor)

3.2 Substitute Models

The FX3U-4AD can be replaced according to the details described below.

Before replacement	After replacement	Specification differences	Reference
FX3U-4AD* ¹	FX5-4AD* ^{2,3}	Hardware - External dimensions - Terminal block type, terminal layout	Page 30 External dimensions Page 31 Wiring differences
		Parameter settings	Page 32 Converting projects
		Performance specifications - Resolution - Conversion speed	Page 33 Performance specifications

*¹ The FX2NC-CNV-IF or FX3UC-1PS-5V is required for connecting to the FX3GC/FX3UC main module or FX2NC extension block.
The FX5-CNV-BUS or FX5-CNV-BUSC is required for connecting to the FX5U/FX5UC CPU module.

*² The FX5-4AD can be connected to the following CPU modules.
FX5UJ CPU module (supported from the first released product)
FX5U CPU module (supported from version 1.050)
FX5UC CPU module (supported from version 1.050)
The FX5-CNV-IFC or FX5-C1PS-5V is required for connecting to the FX5UC CPU module.

*³ FX5U/FX5UC CPU module: Up to 16 modules can be connected.
FX5UJ CPU module: Up to 8 modules can be connected.

3.3 Replacement with the FX5-4AD

Precautions regarding the hardware

The main hardware differences between the FX3U-4AD and FX5-4AD are as follows.

Main differences in the specifications

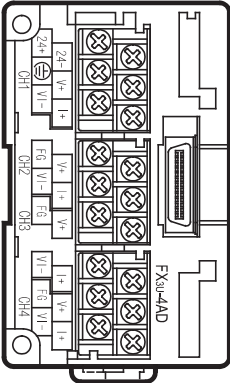
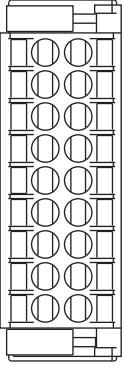
Item	Difference	
	FX3U-4AD	FX5-4AD
Analog input voltage	-10 to +10VDC (Input resistance value: 200kΩ)	-10 to +10VDC (Input resistance value: 400kΩ or higher)
Analog input current	4 to 20mA DC (Input resistance value: 250Ω)	-20 to +20mA DC (Input resistance value: 250Ω)
Terminal block type	M3 screw terminal block	Spring clamp terminal block

External dimensions

FX3U-4AD	FX5-4AD
W × H × D (mm): 55 × 90 × 87 Weight: Approx. 0.2kg The module can be mounted on a 35mm-width DIN rail. The mounting holes are located at the top-left and bottom-left corners of the module.	W × H × D (mm): 40 × 90 × 83 Weight: Approx. 0.2kg The module can be mounted on a 35mm-width DIN rail. The mounting holes are located at the top-center and bottom-center of the module.
Unit: mm	Unit: mm

Wiring differences

The terminal blocks and terminal layouts differ between the FX3U-4AD and the FX5-4AD.

FX3U-4AD	FX5-4AD
 Terminal layout CH1: 24+, 24-, V+, VI-, I+ CH2: FG, V+, VI-, I+, FG, V+ CH3: VI-, I+, FG, V+ CH4: VI-, I+, FG, V+ Terminal block connection (M3 screws)	 Terminal layout CH1: V+, I+, COM, V+, I+, COM CH2: V+, I+, COM, V+, I+, COM CH3: V+, I+, COM, V+, I+, COM CH4: V+, I+, COM, V+, I+, COM Spring clamp terminal block connection

The wires to connect the spring clamp terminal block are described below.

Number of wires connected per terminal	Wire size	
	Solid wire, stranded wire	Ferrule with insulation sleeve
One	24 to 16 AWG (0.2mm ² to 1.5mm ²)	23 to 19 AWG (0.25mm ² to 0.75mm ²)

Power supply differences

Item	FX3U-4AD	FX5-4AD
A/D conversion circuit drive power supply	24VDC $\pm 10\%$, 90mA (A 24VDC power is required to be supplied from the terminal block.)	24VDC, 40mA (Power is internally supplied from the CPU module.)
CPU drive power supply	5VDC, 110mA (Power is internally supplied from the main module.)	5VDC, 100mA (Power is internally supplied from the CPU module.)

Converting projects

For how to convert the FX3 project to the FX5 project, refer to the following.

Page 132 Converting FX3 (GX Works2) Projects to FX5 (GX Works3) Projects

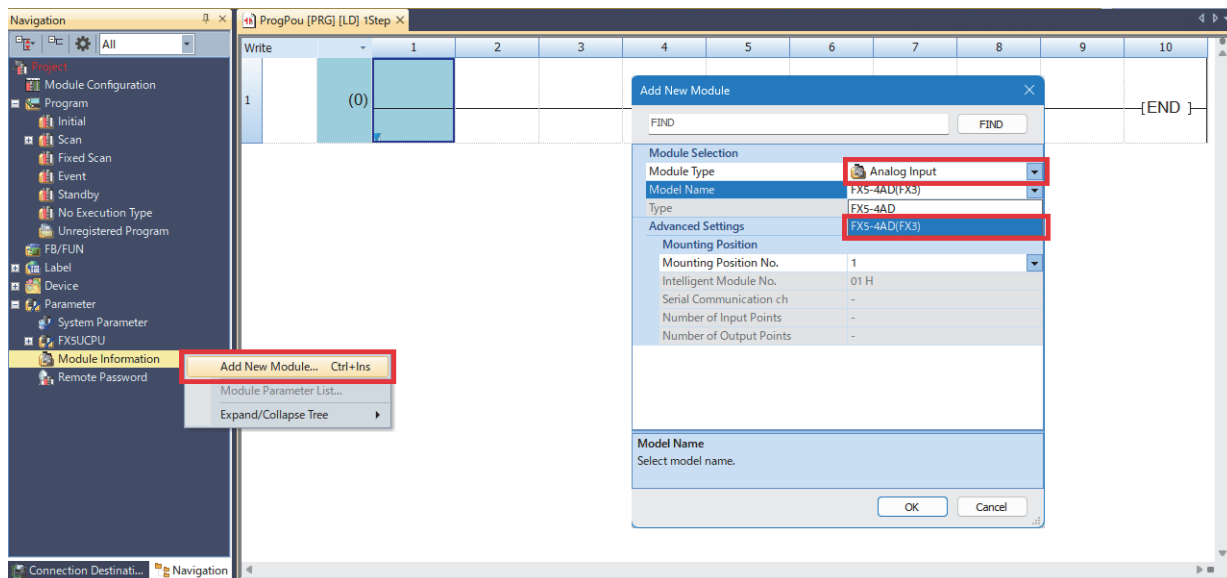
After converting the project to GX Works3, configure the parameters. In addition, modify the programs (instructions and devices) as required.

Parameter settings in GX Works3

The following shows the procedures for setting the FX5-4AD parameters using GX Works3.

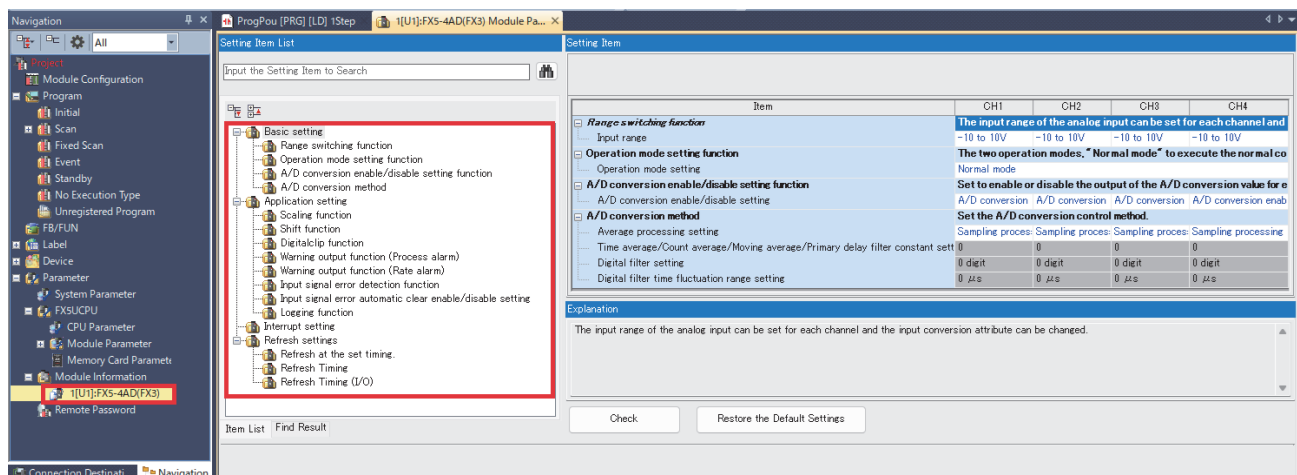
1. Add the FX5-4AD to the project.

Navigation window ⇒ [Parameter] ⇒ Right-click [Module Information] ⇒ [Add New Module]
Module Type: [Analog Input], Model Name: [FX5-4AD(FX3)]



2. Configure the module parameters.

Navigation window ⇒ [Parameter] ⇒ [Module Information] ⇒ Double-click [FX5-4AD(FX3)]



For details, refer to the following.

MELSEC iQ-F FX5 Analog Module User's Manual

Specifications comparison

The following table lists the specification comparisons.

General specifications

○: Compatible

Item		FX3U-4AD	FX5-4AD	Compatibility
Dielectric withstand voltage	Between a batch of all terminals and the ground terminal	500VAC for one minute	500VAC for one minute	○
Insulation resistance		5MΩ or higher by a 500VDC insulation resistance tester	10MΩ or higher by a 500VDC insulation resistance tester	○

Power supply specifications

○: Compatible, △: Partially different

Item	FX3U-4AD	FX5-4AD	Compatibility
A/D conversion circuit drive power supply	24VDC ±10%, 90mA (A 24VDC power supply is required to be connected and supplied to the terminal block.)	24VDC, 40mA (Power is internally supplied from the CPU module.)	○
CPU drive power	5VDC, 110mA (Power is internally supplied from the main module.)	5VDC, 100mA (Power is internally supplied from the CPU module.)	△

Performance specifications

○: Compatible, △: Partially different, —: Not available for the current models

Item			FX3U-4AD		FX5-4AD		Compatibility
Number of channels			4ch		4CH		○
Analog input voltage			-10 to +10VDC (input resistance value: 200kΩ)		-10 to +10VDC (input resistance value: 400kΩ or higher)		○
Analog input current			-20 to 20mA DC, 4 to 20mA (input resistance value: 250Ω)		-20 to +20mA DC (input resistance value: 250Ω)		○
Absolute maximum input			Voltage: ±15V, Current: ±30mA		Voltage: ±15V, Current: ±30mA		○
Digital output			Voltage input: 16-bit signed binary output Current input: 15-bit signed binary output		16-bit signed binary output		○
Input characteristics, resolution	Voltage	0V to 10V	—		0 to 32000	312.5μV	—
		0V to 5V				156.25μV	
		1V to 5V				125μV	
		-10V to 10V	-32000 to 32000	0.32mV	-32000 to 32000	312.5μV	○
			-4000 to 4000	2.5mV			
			-10000 to 10000	1.0mV			
		User range setting	—		-32000 to 32000	125μV* ¹	—
	Current	0mA to 20mA	—		0 to 32000	625nA	—
		4mA to 20mA	0 to 16000	1.25μA	0 to 32000	500nA	○
			0 to 4000	5.0μA			
			4000 to 20000	1.0μA			
		-20mA to 20mA	-16000 to 16000	1.25μA	-32000 to 32000	625nA	○
			-4000 to 4000	5.0μA			
			-20000 to 20000	1.0μA			
	User range setting	—		-32000 to 32000	500nA* ¹	—	

Item			FX3U-4AD		FX5-4AD		Compatibility
Accuracy	Voltage	When the ambient temperature is 25°C ±5°C	Accuracy for the full scale analog input value	Within ±0.3% (±60mV)	Accuracy for the full scale of the digital output value	Within ±0.1% (±64 digits)	○
		When the ambient temperature is 0°C to 55°C		Within ±0.5% (±100mV)		Within ±0.2% (±128 digits)	○
	Current	When the ambient temperature is 25°C ±5°C		Within ±0.5% (±200μA)		Within ±0.1% (±64 digits)	○
		When the ambient temperature is 0°C to 55°C		Within ±1.0% (±400μA)		Within ±0.2% (±128 digits)	○
	Voltage/ current	When the ambient temperature is - 20°C to 0°C		—		Within ±0.3% (±192 digits)	—
Conversion speed			500μs/ch (5ms with digital filter)		80μs/CH		△
Isolation method	Between the input terminal and programmable controller		Photocoupler		Photocoupler		○
	Between the input terminal and channels		Not insulated		Not insulated		○
Number of occupied I/O points			8 points (can be used for either input or output of the programmable controller)		8 points		○
Voltage offset			-10 to 9V*2		-10 to 10V*3		○
Voltage gain			-9 to 10V*2		-10 to 10V*3		○
Current offset			-20 to 17mA*4		0 to 20mA*5		△
Current gain			-17 to 30mA*4		0 to 20mA*5		△

*1 The value is the maximum resolution for the user range setting.

*2 The offset and gain values must satisfy the following relationship.

$$1V \leq (\text{Gain value} - \text{Offset value}) \leq 7.5V$$

*3 The offset and gain values must satisfy the following relationship.

$$(\text{Gain value} - \text{Offset value}) \geq 2.0V$$

*4 The offset and gain values must satisfy the following relationship.

$$3mA \leq (\text{Gain value} - \text{Offset value}) \leq 30mA$$

*5 The offset and gain values must satisfy the following relationship.

$$(\text{Gain value} - \text{Offset value}) \geq 6.0mA$$

Reference manuals and sections

■FX3U-4AD

Item	Reference manual	Reference section
FX3U-4AD general specifications	 FX3S/FX3G/FX3GC/FX3U/FX3UC SERIES USER'S MANUAL - Analog Control Edition	B. FX3U-4AD (4-channel Analog Input), FX3UC-4AD (4-channel Analog Input) ⇒ 2.1 Generic Specifications
FX3U-4AD power supply specifications		B. FX3U-4AD (4-channel Analog Input), FX3UC-4AD (4-channel Analog Input) ⇒ 2.2 Power Supply Specifications
FX3U-4AD performance specifications		B. FX3U-4AD (4-channel Analog Input), FX3UC-4AD (4-channel Analog Input) ⇒ 2.3 Performance Specifications

■FX5-4AD

Item	Reference manual	Reference section
FX5-4AD general specifications	 MELSEC iQ-F FX5 Analog Module User's Manual	1.2 Specifications ⇒ General specifications
FX5-4AD power supply specifications		1.2 Specifications ⇒ Power supply specifications
FX5-4AD Analog input specifications		1.2 Specifications ⇒ Performance specifications

Functional comparison

The following table lists the functional comparison.

○: Available, △: Partially different from current model, ×: Not available

Item		Availability		Remarks
Function	Description	FX3U-4AD	FX5-4AD	
A/D conversion enable/disable setting function	Controls whether to enable or disable the A/D conversion for each channel.	×	○	In the FX5-4AD, A/D conversion must be enabled or disabled for each channel. The setting can be performed either in the buffer memory or in the parameter settings in GX Works3. • Buffer memory - CH□ A/D conversion enable/disable setting • Parameter settings - Navigation window ⇒ [Parameter] ⇒ [Module Information] ⇒ Module model name ⇒ [Module Parameter] ⇒ [Basic Settings] ⇒ [A/D Conversion Enable/Disable Setting Function] FX5-4AD A/D conversion enable/disable setting function
Input mode specification	Allows for switching the input range of the analog input for each channel.	○	○	For the FX5-4AD, switch the analog input range in the buffer memory or in the parameter settings in GX Works3. Since the digital output range of this module is different from that of the FX3U-4AD, the program change is required. • Buffer memory - CH□ Range setting • Parameter settings - Navigation window ⇒ [Parameter] ⇒ [Module Information] ⇒ Module model name ⇒ [Module Parameter] ⇒ [Basic Settings] ⇒ [Range switching function] FX5-4AD range switching function
A/D conversion method	Count average	○	○	The FX5-4AD requires configuring an average processing method and count (for averaging) for each channel. In addition, the settable range of the count (for averaging) is determined by each averaging processing method. The setting can be performed either in the buffer memory or in the parameter settings in GX Works3. • Buffer memory - CH□ Average processing setting - CH□ Time average/Count average/Primary delay filter constant setting • Parameter settings - Navigation window ⇒ [Parameter] ⇒ [Module Information] ⇒ Module model name ⇒ [Module Parameter] ⇒ [Basic Settings] ⇒ [A/D Conversion Method] FX5-4AD averaging process setting
	Digital filter setting	○	○	When using the digital filter in the FX5-4AD, set the average processing specification for each channel to "Digital filter". In addition to "Digital filter setting", "Digital filter fluctuation range setting" must also be set. The setting can be performed either in the buffer memory or in the parameter settings in GX Works3. • Buffer memory - CH□ Average processing setting - CH□ Digital filter fluctuation range setting (L) - CH□ Digital filter fluctuation range setting (H) • Parameter settings - Navigation window ⇒ [Parameter] ⇒ [Module Information] ⇒ Module model name ⇒ [Module Parameter] ⇒ [Basic Settings] ⇒ [A/D Conversion Method] FX5-4AD digital filter
Data change disable	Disables buffer memory setting changes.	○	×	The FX5-4AD does not have a flag to disable setting changes. Instead, the module has a flag to apply the buffer memory settings to operation. To enable this, turn Operating condition setting request (Un\G70.b9) on and off.
Initialization function (resetting to factory default status)	Initializes all data in BFM#0 through #6999 to their factory defaults.	○	△	For the FX5-4AD, use the [Restore the Default Settings] button in the parameter setting in GX Works3 to initialize the settings to their factory defaults. For the offset/gain setting, use the offset/gain initialization function to initialize the settings to their factory defaults. FX5-4AD offset/gain initialization function

Item		Availability		Remarks
Function	Description	FX3U-4AD	FX5-4AD	
Adjustment of input characteristics function	Adjusts the gain and offset values.	○	○	The setting ranges of the gain/offset are different. Correct the gain/offset values. ☞ FX5-4AD adjustment of input characteristics function
Data addition function	Adds (shifts) the set conversion value shift amount to the digital output value and stores the result as the digital operation value.	○	○	For the FX5-4AD, set the conversion value shift amount for each channel in the buffer memory or in the parameter settings in GX Works3. • Buffer memory CH□ Conversion value shift amount • Parameter settings Navigation window ⇒ [Parameter] ⇒ [Module Information] ⇒ Module model name ⇒ [Module Parameter] ⇒ [Application Settings] ⇒ [Shift Function] ☞ FX5-4AD shift function
Peak value holding function	Stores the maximum value and minimum value of the digital operation value to the buffer memory areas for each channel.	○	○	When using the buffer memory in the FX5-4AD in normal mode, reset the peak value for each channel. • Buffer memory CH□ Minimum value CH□ Maximum value ☞ FX5-4AD maximum value/minimum value hold function
Upper/lower limit error status data automatic transfer function	Detects analog input values that fall outside the setting range.	○	○	For the FX5-4AD, the upper upper limit value/lower lower limit value to generate the alert and the upper upper limit value/lower lower limit value to cancel the alert are required to be set. Enabling/disabling the alert output setting for each channel is also required. The setting can be performed either in the buffer memory or in the parameter settings in GX Works3. • Buffer memory CH□ Alert output setting (Process alarm) CH□ Process alarm upper upper limit value CH□ Process alarm upper lower limit value CH□ Process alarm lower upper limit value CH□ Process alarm lower lower limit value • Parameter settings Navigation window ⇒ [Parameter] ⇒ [Module Information] ⇒ Module model name ⇒ [Module Parameter] ⇒ [Application Settings] ⇒ [Warning output function (Process alarm)] ☞ FX5-4AD process alarm
Abrupt change detection function	Outputs an alert when the difference the current and previous values exceeds the configured abrupt change detection function.	○	○	For the FX5-4AD, set the upper limit value and lower limit value of the rate alarm, and enable/disable the alert output for each channel. Then, set the rate alarm change rate selection and the rate alarm alert cycle setting. The setting can be performed either in the buffer memory or in the parameter settings in GX Works3. • Buffer memory CH□ Alert output setting (Rate alarm) CH□ Rate alarm change rate selection CH□ Rate alarm upper limit value CH□ Rate alarm lower limit value CH□ Rate alarm alert detection cycle setting • Parameter settings Navigation window ⇒ [Parameter] ⇒ [Module Information] ⇒ Module model name ⇒ [Module Parameter] ⇒ [Application Settings] ⇒ [Warning output function (Rate alarm)] ☞ FX5-4AD rate alarm

Item		Availability		Remarks
Function	Description	FX3U-4AD	FX5-4AD	
Over scale detection function	When an analog value outside the A/D conversion range is input, the over-scale bit (upper/lower limits) is turned (set to) on.	○	○	For the FX5-4AD, the input signal error detection setting and the upper/lower limit values of the input signal detection setting for each channel are required to be set. In addition, while the FX3U-4AD has separate flags for lower-limit detection and upper-limit detection, the FX5-4AD has a flag that indicates whether the error defined in the input signal error detection setting has occurred. The setting can be performed either in the buffer memory or in the parameter settings in GX Works3. • Buffer memory - CH□ Input signal error detection setting - CH□ Input signal error detection lower limit set value - CH□ Input signal error detection upper limit set value - Input signal error detection flag • Parameter settings - Navigation window ⇒ [Parameter] ⇒ [Module Information] ⇒ Module model name ⇒ [Module Parameter] ⇒ [Application Settings] ⇒ [Input signal error detection function] ☞ FX5-4AD input signal error detection function
Data update function	Stores the data history in the buffer memory.	○	○	When using the logging function in the FX5-4AD, set the logging enable/disable setting, logging data setting, logging cycle setting value, and logging cycle unit setting. The setting can be performed either in the buffer memory or in the parameter settings in GX Works3. • Buffer memory - CH□ Logging enable/disable setting - CH□ Logging data setting - CH□ Logging cycle setting value - CH□ Logging cycle unit setting • Parameter settings - Navigation window ⇒ [Parameter] ⇒ [Module Information] ⇒ Module model name ⇒ [Module Parameter] ⇒ [Application Settings] ⇒ [Logging function] ☞ FX5-4AD logging function
Data automatic transfer function	Transfers the specific data to the data register in the CPU module from the intelligent function module.	○	○	For the FX5-4AD, specify the transfer destination device in the refresh settings in the parameter settings. • Item (FX3U-4AD) Peak value : (FX5-4AD) Maximum value, minimum value (FX3U-4AD) Upper/lower limit value error status : (FX5-4AD) Warning output flag (Process alarm upper limit), warning output flag (Process alarm lower limit) (FX3U-4AD) Abrupt change detection status : (FX5-4AD) Warning output flag (Rate alarm upper limit), Warning output flag (Rate alarm lower limit) (FX3U-4AD) Over scale status : (FX5-4AD) Input signal error detection flag (FX3U-4AD) Error status : (FX5-4AD) Latest error code • Parameter settings - Navigation window ⇒ [Parameter] ⇒ [Module Information] ⇒ Module model name ⇒ [Module Parameter] ⇒ [Refresh settings] ⇒ [Transfer to the CPU] ☞ FX5-4AD parameter settings

Reference manuals and sections

■FX3U-4AD

Item	Reference manual	Reference section
FX3U-4AD input mode specification	 FX3S/FX3G/FX3GC/FX3U/FX3UC SERIES USER'S MANUAL - Analog Control Edition	B. FX3U-4AD (4-channel Analog Input), FX3UC-4AD (4-channel Analog Input) ⇒ 5.4.1 BFM#0: Input mode specification
FX3U-4AD count (for averaging)		B. FX3U-4AD (4-channel Analog Input), FX3UC-4AD (4-channel Analog Input) ⇒ 5.4.2 BFM#2 to #5: Averaging time
FX3U-4AD digital filter setting		B. FX3U-4AD (4-channel Analog Input), FX3UC-4AD (4-channel Analog Input) ⇒ 5.4.3 BFM#6 to #9: Digital filter setting
FX3U-4AD data change disable		B. FX3U-4AD (4-channel Analog Input), FX3UC-4AD (4-channel Analog Input) ⇒ 5.4.5 BFM#19: Data change disable
FX3U-4AD initialization function		B. FX3U-4AD (4-channel Analog Input), FX3UC-4AD (4-channel Analog Input) ⇒ 5.4.6 BFM#20: Initialization function (resetting to factory default status)
FX3U-4AD adjustment of input characteristics function		B. FX3U-4AD (4-channel Analog Input), FX3UC-4AD (4-channel Analog Input) ⇒ 5.4.7 BFM#21: Input characteristics writing
FX3U-4AD data addition function		B. FX3U-4AD (4-channel Analog Input), FX3UC-4AD (4-channel Analog Input) ⇒ 5.4.15 BFM#61 to #64: Addition data
FX3U-4AD peak value holding function		B. FX3U-4AD (4-channel Analog Input), FX3UC-4AD (4-channel Analog Input) ⇒ 5.3 Buffer Memory List (BFM)
FX3U-4AD upper/lower limit detection function		B. FX3U-4AD (4-channel Analog Input), FX3UC-4AD (4-channel Analog Input) ⇒ 5.4.9 BFM#26: Upper/lower limit error status
FX3U-4AD abrupt change detection function		B. FX3U-4AD (4-channel Analog Input), FX3UC-4AD (4-channel Analog Input) ⇒ 5.4.10 BFM#27: Abrupt change detection status
FX3U-4AD over scale detection function		B. FX3U-4AD (4-channel Analog Input), FX3UC-4AD (4-channel Analog Input) ⇒ 5.4.11 BFM#28: Over-scale status
FX3U-4AD data update function		B. FX3U-4AD (4-channel Analog Input), FX3UC-4AD (4-channel Analog Input) ⇒ 5.4.26 to 5.4.28
FX3U-4AD data automatic transfer function		B. FX3U-4AD (4-channel Analog Input), FX3UC-4AD (4-channel Analog Input) ⇒ 5.4.21 to 5.4.25

■FX5-4AD

Item	Reference manual	Reference section
FX5-4AD A/D conversion enable/disable setting function	 MELSEC iQ-F FX5 Analog Module User's Manual	1.4 Functions ⇒ A/D conversion enable/disable setting function
FX5-4AD range switching function		1.4 Functions ⇒ Range switching function
FX5-4AD averaging process setting		1.4 Functions ⇒ A/D conversion method ⇒ Averaging processing
FX5-4AD digital filter		1.4 Functions ⇒ A/D conversion method ⇒ Digital filter
FX5-4AD offset/gain initialization function		1.4 Functions ⇒ Offset/gain initialization function
FX5-4AD adjustment of input characteristics function		1.8 Offset/Gain Setting
FX5-4AD shift function		1.4 Functions ⇒ Shift function
FX5-4AD maximum value/minimum value hold function		1.4 Functions ⇒ Maximum value/minimum value hold function
FX5-4AD process alarm		1.4 Functions ⇒ Alert output function ⇒ Process alarm
FX5-4AD rate alarm		1.4 Functions ⇒ Alert output function ⇒ Rate alarm
FX5-4AD input signal error detection function		1.4 Functions ⇒ Input signal error detection function
FX5-4AD logging function		1.4 Functions ⇒ Logging function
FX5-4AD parameter settings		1.7 Parameter Settings

Buffer memory comparison

FX3U-4AD					FX5-4AD							
Name	ch1	ch2	ch3	ch4	Name	FX5-4AD(FX3): FX3 allocation mode						
						CH1	CH2	CH3	CH4			
Input mode setting	#0				Range setting	0						
Averaging time	#2	#3	#4	#5	CH□ Time average/Count average/ Moving average/Primary delay filter constant setting ^{*2}	2	3	4	5			
Digital filter setting	#6	#7	#8	#9	Digital filter setting ^{*3}	6	7	8	9			
Channel data (current data or average data)	#10	#11	#12	#13	CH□ Digital operation value	10	11	12	13			
Data change disable ^{*1}	#19				—	—						
Initialization function • K1 is written to this buffer memory area for initialization. After initialization completes, the value automatically changes to K0.	#20				—	*4						
					Offset/gain initialization enable code				4160			
					Offset/gain initialization request				Un\G70.b5			
Input characteristics writing • Writes the offset/gain values. After writing the values, they automatically change to 0000H. (b0 to b3 are all OFF.)	#21				Offset/gain setting function	*5						
Convenient function setting • Automatic send function • Data addition • Upper/lower limit detection • Abrupt change detection • Peak value holding	#22				• Automatic transfer function ⇨ Auto refresh • Data addition ⇨ Shift function • Upper lower limit value detection ⇨ Alarm output function (process alarm) • Sudden change detection ⇨ Alarm output function (rate alarm) • Peak value hold ⇨ Maximum value/ Minimum value hold function	*6						
Upper/lower limit value error status (Valid if b1 of BFM#22 is set to ON)	#26				Warning output flag (Process alarm upper limit/lower limit)	26						
Abrupt change detection status (Valid if b2 of BFM#22 is set to ON)	#27				Warning output flag (Rate alarm upper limit/lower limit)	27						
Over-scale status	#28				Input signal error detection flag ^{*7}	28						
Error status	#29				Latest error code	29						
Model code K2080	#30				Module Information	30						
Channel offset data (Unit: mV or μA)	#41	#42	#43	#44	Offset/gain setting function	*5						
Channel gain data (Unit: mV or μA)	#51	#52	#53	#54								
Channel addition data (Valid if b0 of BFM#22 is set to ON)	#61	#62	#63	#64	CH□ Conversion value shift amount	61	62	63	64			
Channel lower limit value error setting (Valid if b1 of BFM#22 is set to ON)	#71	#72	#73	#74	CH□ Process alarm lower lower limit value	71	72	73	74			
Channel upper limit value error setting (Valid if b1 of BFM#22 is set to ON)	#81	#82	#83	#84	CH□ Process alarm upper upper limit value	81	82	83	84			
Channel abrupt change detection value (Valid if b2 of BFM#22 is set to ON)	#91	#92	#93	#94	CH□ Rate alarm upper limit value	91	92	93	94			
Clear of upper/lower limit error data or abrupt change error data	#99				—	*8						
Channel minimum peak value (Valid if b3 of BFM#22 is set to ON)	#101	#102	#103	#104	CH□ Minimum value	101	102	103	104			
Minimum peak value resetting	#109				Minimum value reset request	109						
Channel maximum peak value (Valid if b3 of BFM#22 is set to ON)	#111	#112	#113	#114	CH□ Maximum value	111	112	113	114			
Maximum peak value resetting	#119				Maximum value reset request	119						

FX3U-4AD					FX5-4AD				
Name	ch1	ch2	ch3	ch4	Name	FX5-4AD(FX3): FX3 allocation mode			
						CH1	CH2	CH3	CH4
Peak values (Minimum: BFM#101 to #104/Maximum: #111 to #114) automatic transfer-to first data register specification (Valid if b4 of BFM#22 is set to ON/ Occupies 8 consecutive points)	#125				Auto refresh	*6			
Upper/lower limit error status data (BFM#26) automatic transfer-to data register specification (Valid if b5 of BFM#22 is set to ON)	#126				Auto refresh	*6			
Abrupt change detection status data (BFM#27) automatic transfer-to data register specification (Valid if b6 of BFM#22 is set to ON)	#127				Auto refresh	*6			
Over-scale status data (BFM#28) automatic transfer-to data register specification (Valid if b7 of BFM#22 is set to ON)	#128				Auto refresh	*6			
Error status data (BFM#29) automatic transfer-to data register specification (Valid if b8 of BFM#22 is set to ON)	#129				Auto refresh	*6			
Selection of cyclic data update function (function for data history)	#197				—	—			
Data history sampling time setting (Unit: ms)	#198				CH□ Logging cycle setting value	9181	9182	9183	9184
					CH□ Logging cycle unit setting* ⁹	9191	9192	9193	9194
Data history resetting/stoppage* ¹⁰	#199				CH□ Logging hold request* ¹⁰	9151	9152	9153	9154
Channel data history (initial value)	#200	#1900	#3600	#5300	CH□ Logging data (Initial value)	10000	20000	30000	40000
⋮	⋮				⋮	⋮			
Channel data history (1,700th value)	#1899	#3599	#5299	#6999	CH□ Logging data (10,000th-point value)	19999	29999	39999	49999

*1 The following buffer memory setting changes are prohibited.

- Input mode setting (BFM#0)
- Initialization function (BFM#20)
- Input characteristics writing (BFM#21)
- Convenient function setting (BFM#22)
- Offset data (BFM#41 to #44)
- Gain data (BFM#51 to #54)
- Automatic transfer-to data register specification (BFM#125 to #129)
- Data history sampling time setting (BFM#198)

*2 Additionally, set "CH□ Averaging process specification" to "Count average".

*3 Additionally, set "CH□ Averaging process specification" to "Digital filter".

*4 This item can initialize the settings to their factory defaults by using the [Restore the Default Settings] button in the parameter setting in GX Works3.

*5 This item can be configured through the module tool in GX Works3.

*6 The item can be configured in the parameter settings in GX Works3.

*7 Additionally, set "Input signal error detection setting", "Input signal error detection upper limit set value", and "Input signal error detection lower limit set value".

*8 If the conditions where a warning is output are not met, the warning output flag turns off.

*9 In the FX5-4AD, the logging cycle unit is specified using "Logging cycle unit setting". To use the logging function, use this buffer memory to specify the unit. The item can be configured in the parameter settings in GX Works3.

*10 The FX3-4AD has the data history reset function, however, the FX5-4AD does not have the reset function.

4 REPLACEMENT OF THE FX3U-4DA-ADP ANALOG OUTPUT EXPANSION ADAPTER

This chapter describes the specification differences, precautions, and replacement procedures when replacing the FX3U-4DA-ADP analog output adapters with the MELSEC iQ-F series FX5-4DA-ADP analog output expansion adapters.

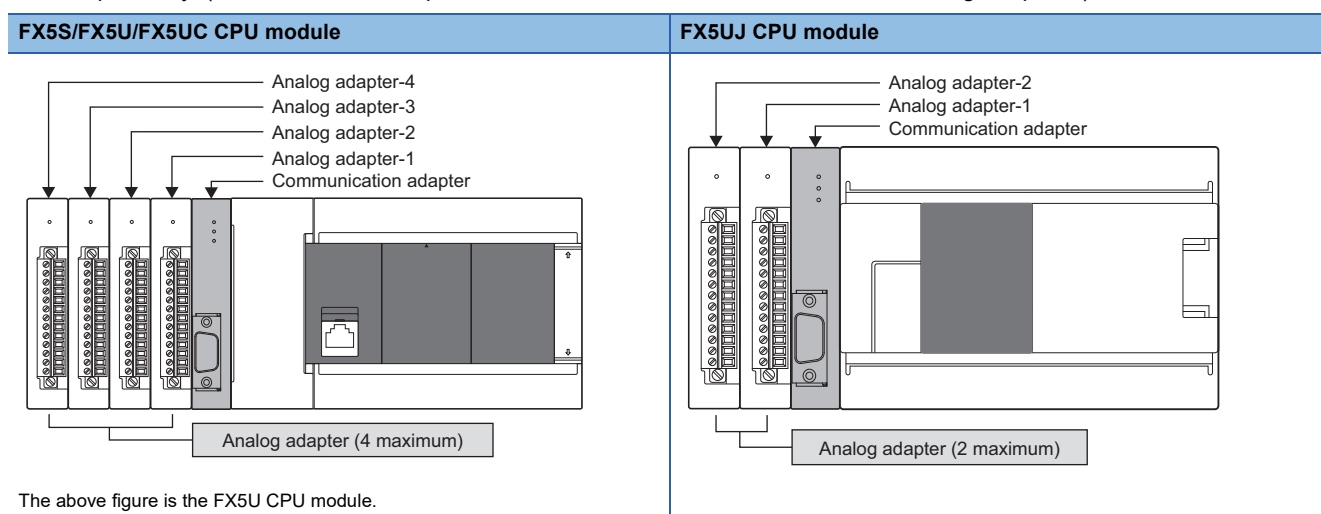
4.1 Overview of the FX5-4DA-ADP Analog Output Expansion Adapter

This section describes the system configuration to use FX5 analog adapters.

A maximum of four analog adapters can be connected to an FX5S/FX5U/FX5UC CPU module.

A maximum of two analog adapters can be connected to an FX5UJ CPU module.

The FX5 analog adapters are counted starting with the adapter closest to the CPU module as the first, followed by others in order of proximity. (Communication adapters are not counted towards the number of analog adapters.)



4.2 Substitute model

The FX3U-4DA-ADP can be replaced according to the details described below.

Before replacement	After replacement	Specification differences	Reference
FX3U-4DA-ADP	FX5-4DA-ADP ^{*1}	Hardware	Page 43 Wiring differences
		• Terminal block type, terminal layout	
		Parameter settings	Page 44 Converting projects
		Performance specifications	Page 45 Performance specifications
		• Resolution	
		• Conversion speed	

*1 The FX5-4DA-ADP modules can be connected to the following CPU modules.

- FX5S CPU module (supported from the first released product)
- FX5UJ CPU module (supported from the first released product)
- FX5U CPU module (supported from version 1.010)
- FX5UC CPU module (supported from version 1.010)

4.3 Replacement with the FX5-4DA-ADP

Precautions regarding the hardware

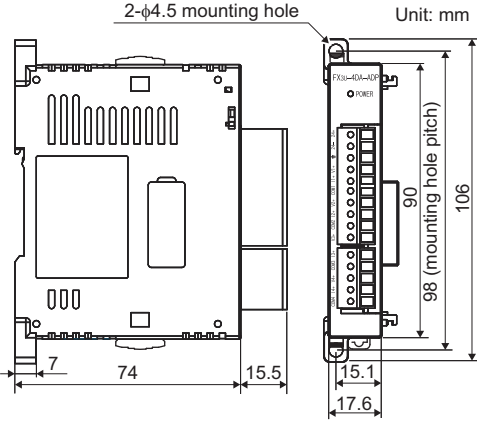
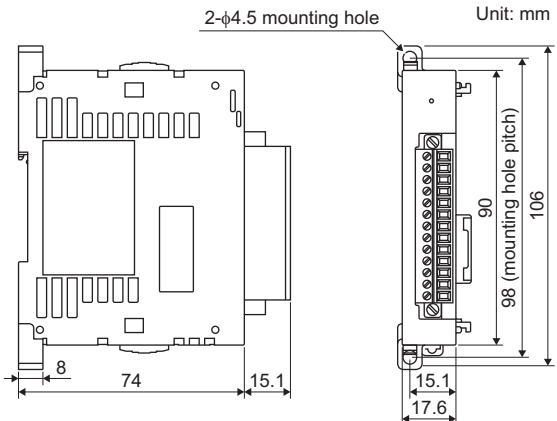
The main hardware differences between the FX3U-4DA-ADP and FX5-4DA-ADP are as follows.

Main differences in the specifications

Item	Difference	
	FX3U-4DA-ADP	FX5-4DA-ADP
Analog output voltage	0 to 10VDC (External load resistance value 5kΩ to 1MΩ)	-10 to +10VDC (External load resistance value 1kΩ to 1MΩ)
Analog output current	4 to 20 mA DC (External load resistance value 500Ω or less)	0 to 20mA DC (External load resistance value 0 to 500Ω)
Terminal block type*1	European-type terminal block	European-type terminal block

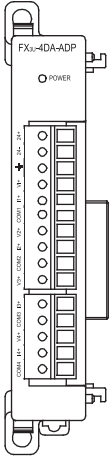
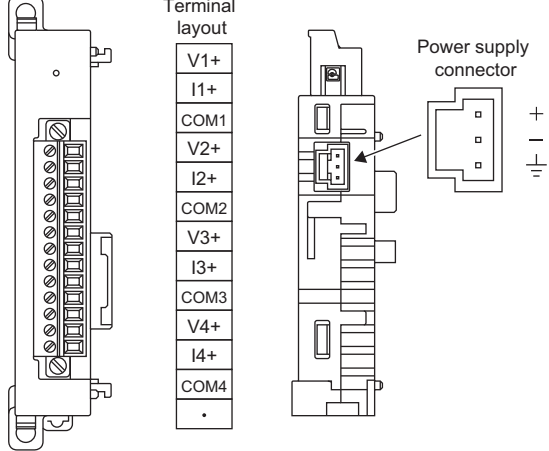
*1 The terminal blocks and terminal layouts are different. (Page 43 Wiring differences)

External dimensions

FX3U-4DA-ADP	FX5-4DA-ADP
W × H × D (mm): 17.6 × 106 × 74 Weight: Approx. 0.1kg DIN rail mounting hook The mounting holes are positioned in the upper left and lower left corners of the module.  2-φ4.5 mounting hole Unit: mm Dimensions: 7, 74, 15.5, 15.1, 17.6, 90, 98 (mounting hole pitch), 106	W × H × D (mm): 17.6 × 106 × 74 Weight: Approx. 0.1kg DIN rail mounting hook The mounting holes are positioned in the upper left and lower left corners of the module.  2-φ4.5 mounting hole Unit: mm Dimensions: 8, 74, 15.1, 15.1, 17.6, 90, 98 (mounting hole pitch), 106

Wiring differences

The terminal blocks and terminal layouts differ between the FX3U-4DA-ADP and the FX5-4DA-ADP.

FX3U-4DA-ADP	FX5-4DA-ADP
 Terminal layout 24+ 24- - GND - V1+ - I1+ - COM1 - V2+ - I2+ - COM2 - V3+ - I3+ - COM3 - V4+ - I4+ - COM4	 Terminal layout - V1+ - I1+ - COM1 - V2+ - I2+ - COM2 - V3+ - I3+ - COM3 - V4+ - I4+ - COM4 . Power supply connector + - - GND

Wire the European-type terminal block in accordance with the following specifications.

Number of wires connected per terminal	Wire size	
	Solid wire, stranded wire	Ferrule with insulation sleeve
One	22 to 20 AWG (0.3 to 0.5mm ²)	22 to 20 AWG (0.3 to 0.5mm ²)
Two	22 AWG (0.3mm ²)	—

Power supply differences

Item	FX3U-4DA-ADP	FX5-4DA-ADP
D/A conversion circuit drive power supply	24VDC +20%/-15%, 150mA (24VDC power must be connected and supplied to the terminal block.)	24VDC +20%/-15%, 160mA (Power is supplied externally through the power supply connector of the adapter.)
Interface drive power supply	5VDC, 15mA (Power is internally supplied by the FX3 main module.)	5VDC, 10mA (Power is supplied internally from the 5VDC power supply of the CPU module.)

Converting projects

For how to convert the project for the FX3 to the one for the FX5, refer to the following.

☞ Page 132 Converting FX3 (GX Works2) Projects to FX5 (GX Works3) Projects

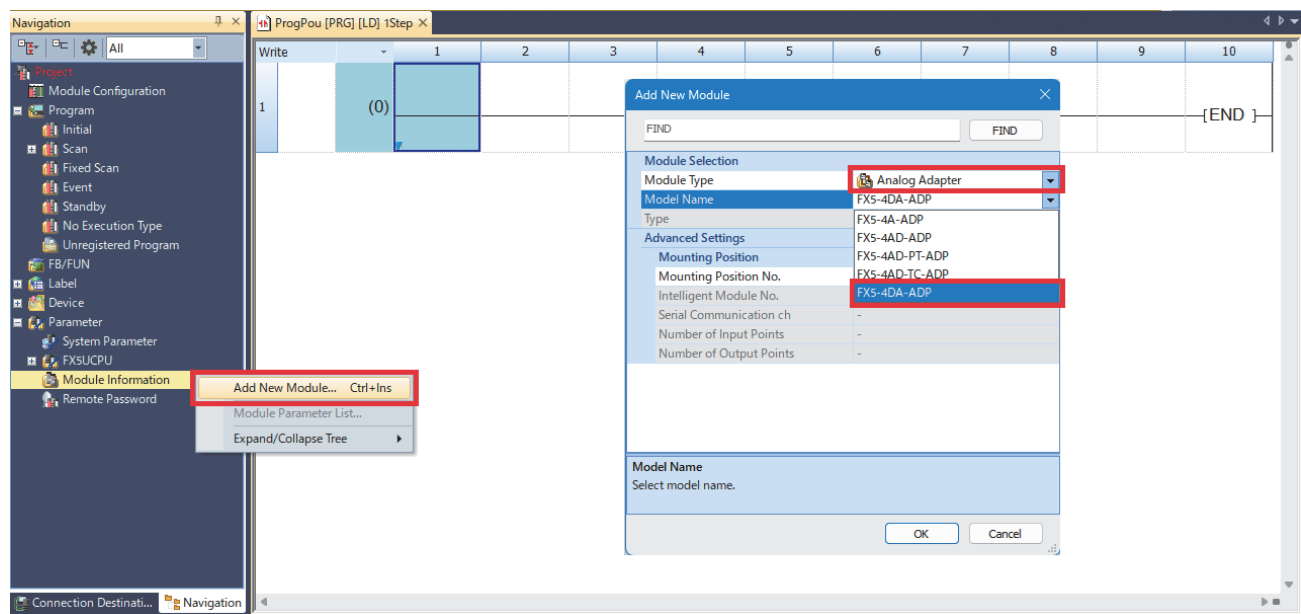
After converting the project to GX Works3, configure the parameters. In addition, modify the programs (instructions and devices) as required.

Parameter settings in GX Works3

The following shows the procedures for setting the FX5-4DA-ADP parameters using GX Works3.

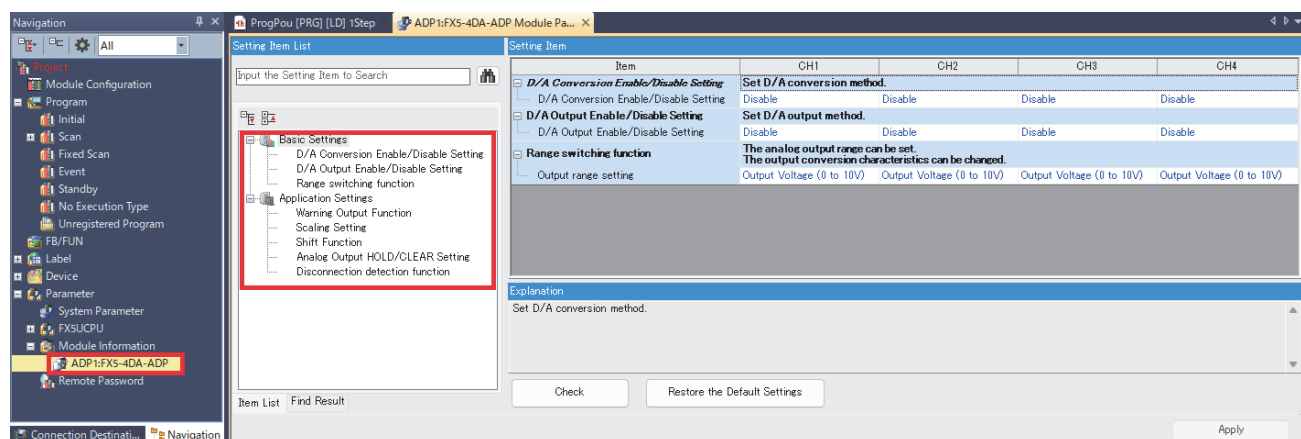
1. Add the FX5-4DA-ADP module to the project.

☞ Navigation window ⇒ [Parameter] ⇒ Right-click [Module Information] ⇒ [Add New Module]
Module Type: [Analog Adapter], Model Name: [FX5-4DA-ADP]



2. Configure settings for each module parameter.

☞ Navigation window ⇒ [Parameter] ⇒ [Module Information] ⇒ Double-click [FX5-4DA-ADP]



For details, refer to the following.

☞ MELSEC iQ-F FX5 User's Manual (Application)

Specifications comparison

The following table lists the specifications comparisons.

General specifications

○: Compatible

Item		FX3U-4DA-ADP	FX5-4DA-ADP	Compatibility
Withstand voltage	Between a batch of all terminals and the ground terminal	500VAC for one minute	500VAC for one minute	○
Insulation resistance		5MΩ or higher by a 500VDC insulation resistance tester	10MΩ or higher by a 500VDC insulation resistance tester	○

Power supply specifications

○: Compatible

Item		FX3U-4DA-ADP	FX5-4DA-ADP	Compatibility
D/A conversion circuit drive power supply		24VDC +20%/-15%, 150mA (24VDC power must be connected and supplied to the terminal block.)	24VDC +20%/-15%, 160mA (Power is supplied externally through the power supply connector of the adapter.)	○
Interface drive power supply		5VDC, 15mA (Power is internally supplied by the FX3 main module.)	5VDC, 10mA (Power is supplied internally from the 5VDC power supply of the CPU module.)	○

Performance specifications

○: Compatible, △: Partially different, —: Not available for the current models

Item			FX3U-4DA-ADP		FX5-4DA-ADP		Compatibility
Number of channels			4ch		4ch		○
Analog output voltage			0 to 10VDC (External load resistance value 5kΩ to 1MΩ)		-10 to +10VDC (external load resistance value 1kΩ to 1MΩ)		○
Analog output current			4 to 20mA DC (External load resistance value 500Ω or less)		0 to 20mA DC (external load resistance value 0Ω to 500Ω)		○
Digital input			12-bit binary		14-bit binary		○
Digital output			Voltage input: 12-bit binary Current input: 11-bit binary		14-bit binary		○
Output characteristics, resolution	Voltage	0 to 10V	0 to 4000	2.5mV	0 to 16000	625μV	○
		0 to 5V	—	312.5μV		—	
		1 to 5V	—	250μV		—	
		-10 to 10V	—	-8000 to 8000	1250μV	—	
	Current	0 to 20mA	—		0 to 16000	1.25μA	—
		4 to 20mA	0 to 4000	4μA	0 to 16000	1μA	○
Accuracy (accuracy for the full scale analog output value)	Voltage	When the ambient temperature is 25°C ±5°C	Within ±0.5% (±50mV)		Within ±0.1% (±20mV)		○
		When the ambient temperature is 0°C to 55°C	Within ±1.0% (±100mV)		Within ±0.2% (±40mV)* ¹		○
	Current	When the ambient temperature is 25°C ±5°C	Within ±0.5% (±80μA)		Within ±0.1% (±20μA)		○
		When the ambient temperature is 0°C to 55°C	Within ±1.0% (±160μA)		Within ±0.2% (±40μA)* ¹		○
Conversion speed (Data is updated at each operation cycle of the programmable controller.)			• FX3S/FX3G/FX3GC main module: 250μs • FX3U/FX3UC main module: 200μs		• FX5S CPU module: Up to 1100μs • FX5UJ/FX5U/FX5UC CPU module: Up to 950μs		△

Item		FX3U-4DA-ADP	FX5-4DA-ADP	Compatibility
Insulation method	Between the output terminal and programmable controller	Photocoupler	Photocoupler	○
	Between the output terminal and channels	Not insulated	Not insulated	○
Number of occupied I/O points		0 points (This number is not related to the maximum number of I/O points of the programmable controller.)	0 points (This number is not related to the maximum number of I/O points of the programmable controller.)	○

*1 Accuracy when the ambient temperature is -20°C to 55°C. Note that the operating ambient temperature is 0°C to 55°C for the products manufactured in June 2016 or earlier.

Reference manuals and sections

■FX3U-4DA-ADP

Item	Reference manual	Reference section
FX3U-4DA-ADP General specifications	 FX3S/FX3G/FX3GC/FX3U/FX3UC SERIES USER'S MANUAL - Analog Control Edition	F. FX3U-4DA-ADP (4-channel Analog Output) ⇒ 2.1 Generic Specifications
FX3U-4DA-ADP Power supply specifications		F. FX3U-4DA-ADP (4-channel Analog Output) ⇒ 2.2 Power Supply Specifications
FX3U-4DA-ADP Performance specifications		F. FX3U-4DA-ADP (4-channel Analog Output) ⇒ 2.3 Performance Specifications

■FX5-4DA-ADP

Item	Reference manual	Reference section
FX5-4DA-ADP general specifications	 MELSEC iQ-F FX5S/FX5UJ/FX5U/FX5UC User's Manual (Hardware)	Chapter 4 GENERAL SPECIFICATIONS ⇒ Dielectric withstand voltage test and insulation resistance test ⇒ Expansion board, expansion adapter
FX5-4DA-ADP power supply specifications		Chapter 9 EXPANSION ADAPTER PERFORMANCE SPECIFICATIONS ⇒ 9.1 Analog Adapter ⇒ Power supply specifications
FX5-4DA-ADP analog output specifications	 MELSEC iQ-F FX5 User's Manual (Application)	Chapter 37 ANALOG ADAPTERS ⇒ 37.2 Specifications ⇒ Performance specifications ⇒ Analog input, analog output ⇒ Analog output specifications

Functional comparison

The following table lists the functional comparison.

○: Available, ×: Not available

Item		Availability		Remarks
Function	Description	FX3U-4DA-ADP	FX5-4DA-ADP	
D/A conversion enable/disable function	Controls whether to enable or disable the D/A conversion for each channel.	×	○	In the FX5-4DA-ADP, D/A conversion must be enabled or disabled for each channel. The setting can be performed either in the special relay or in the parameter settings in GX Works3. - Special relay D/A conversion enable/disable setting - Parameter settings Navigation window ⇒ [Parameter] ⇒ [Module Information] ⇒ Module model name ⇒ [Module Parameter] ⇒ "Basic Settings" ⇒ "D/A conversion enable/disable setting function" FX5-4DA-ADP D/A conversion enable/disable function
D/A output enable/disable setting function	Specifies whether to output the D/A conversion value or offset value for each channel.	×	○	To output D/A conversion values from the FX5-4DA-ADP, the output enable/disable setting must be configured for each channel. The setting can be performed either in the special relay or in the parameter settings in GX Works3. - Special relay D/A output enable/disable setting - Parameter settings Navigation window ⇒ [Parameter] ⇒ [Module Information] ⇒ Module model name ⇒ [Module Parameter] ⇒ "Basic Settings" ⇒ "D/A Output Enable/Disable Setting" FX5-4DA-ADP D/A output enable/disable function
Output mode switching	Allows for switching the output range of the analog output for each channel. The output conversion characteristics can be changed by switching the range.	○	○	Although the same input range setting as the FX3U-4DA-ADP exists, the range of digital input values is different. Therefore, the program modification is required. FX3U-4DA-ADP output mode switching FX5-4DA-ADP range switching function
Output holding function cancellation setting	Allows for selecting whether to hold the analog output value or output the offset value (voltage output mode: 0V/current output mode: 4mA) when the status of the programmable controller switches from RUN to STOP.	○	○	For the FX5-4DA-ADP, the hold setting can be configured either in the special register or in the parameter settings in GX Works3. - Special register HOLD/CLEAR function setting - Parameter settings Navigation window ⇒ [Parameter] ⇒ [Module Information] ⇒ Module model name ⇒ [Module Parameter] ⇒ [Application Settings] ⇒ "Analog Output HOLD/CLEAR Setting" ⇒ "HOLD/CLEAR Setting" FX3U-4DA-ADP output holding function cancellation setting FX5-4DA-ADP analog output HOLD/CLEAR function
Output setting data	Stores the digital input value.	○	○	For the FX5-4DA-ADP, set the digital value for D/A conversion to the special register "digital value". Even if the same output range setting as the FX3U-4DA-ADP is configured, the range of digital input values is different. Therefore, the program modification is required. Special register Digital value FX3U-4DA-ADP output setting data FX5-4DA-ADP digital value
Error status	Stores the error status.	○	○	Since the specifications of the FX5-4DA-ADP error status differ, the program modification is required. FX3U-4DA-ADP error status FX5-4DA-ADP error code
Model code	Stores the CPU module information.	○	○	FX3U-4DA-ADP model code FX5-4DA-ADP module information

Reference manuals and sections

■FX3U-4DA-ADP

Item	Reference manual	Reference section
FX3U-4DA-ADP output mode switching	 FX3S/FX3G/FX3GC/FX3U/FX3UC SERIES USER'S MANUAL - Analog Control Edition	F. FX3U-4DA-ADP (4-channel Analog Output) ⇒ 4.3 Switching of Output Mode
FX3U-4DA-ADP output holding function cancellation setting		F. FX3U-4DA-ADP (4-channel Analog Output) ⇒ 4.4 Output Holding Function Cancellation Setting
FX3U-4DA-ADP output setting data		F. FX3U-4DA-ADP (4-channel Analog Output) ⇒ 4.5 Output Setting Data
FX3U-4DA-ADP error status		F. FX3U-4DA-ADP (4-channel Analog Output) ⇒ 4.6 Error Status
FX3U-4DA-ADP model code		F. FX3U-4DA-ADP (4-channel Analog Output) ⇒ 4.7 Model Code

■FX5-4DA-ADP

Item	Reference manual	Reference section
FX5-4DA-ADP D/A conversion enable/disable function	 MELSEC iQ-F FX5 User's Manual (Application)	Chapter 37 ANALOG ADAPTERS ⇒ 37.7 Functions (Analog Output) ⇒ D/A conversion enable/disable function
FX5-4DA-ADP D/A output enable/disable function		Chapter 37 ANALOG ADAPTERS ⇒ 37.7 Functions (Analog Output) ⇒ D/A output enable/disable setting function
FX5-4DA-ADP range switching function		Chapter 37 ANALOG ADAPTERS ⇒ 37.7 Functions (Analog Output) ⇒ Range switching function
FX5-4DA-ADP analog output HOLD/CLEAR function		Chapter 37 ANALOG ADAPTERS ⇒ 37.7 Functions (Analog Output) ⇒ Analog output HOLD/CLEAR function
FX5-4DA-ADP digital value		Chapter 37 ANALOG ADAPTERS ⇒ 37.5 List of Functions ⇒ Analog output ⇒ Digital value
FX5-4DA-ADP error code		Appendix 3 Error Code
FX5-4DA-ADP module information		Appendix 2 Special Register List ⇒ Analog adapter ⇒ Module information

Special device comparison

FX3U-4DA-ADP*1					FX5-4DA-ADP							
Function name		Adapter 1	Adapter 2	Adapter 3	Adapter 4	Function name		Adapter 1	Adapter 2	Adapter 3	Adapter 4	
ch1 Output mode switching		M8260	M8270	M8280	M8290	CH1 Output range setting		SD6305	SD6665	SD7025	SD7385	
ch2 Output mode switching		M8261	M8271	M8281	M8291	CH2 Output range setting		SD6345	SD6705	SD7065	SD7425	
ch3 Output mode switching		M8262	M8272	M8282	M8292	CH3 Output range setting		SD6385	SD6745	SD7105	SD7465	
ch4 Output mode switching		M8263	M8273	M8283	M8293	CH4 Output range setting		SD6425	SD6785	SD7145	SD7505	
ch1 Output holding function cancellation setting		M8264	M8274	M8284	M8294	CH1 HOLD/CLEAR function setting		SD6303	SD6663	SD7023	SD7383	
ch2 Output holding function cancellation setting		M8265	M8275	M8285	M8295	CH2 HOLD/CLEAR function setting		SD6343	SD6703	SD7063	SD7423	
ch3 Output holding function cancellation setting		M8266	M8276	M8286	M8296	CH3 HOLD/CLEAR function setting		SD6383	SD6743	SD7103	SD7463	
ch4 Output holding function cancellation setting		M8267	M8277	M8287	M8297	CH4 HOLD/CLEAR function setting		SD6423	SD6783	SD7143	SD7503	
ch1 Output setting data		D8260	D8270	D8280	D8290	CH1 Digital value		SD6300	SD6660	SD7020	SD7380	
ch2 Output setting data		D8261	D8271	D8281	D8291	CH2 Digital value		SD6340	SD6700	SD7060	SD7420	
ch3 Output setting data		D8262	D8272	D8282	D8292	CH3 Digital value		SD6380	SD6740	SD7100	SD7460	
ch4 Output setting data		D8263	D8273	D8283	D8293	CH4 Digital value		SD6420	SD6780	SD7140	SD7500	
Error status	ch1 Output data setting value error	D8268.b0	D8278.b0	D8288.b0	D8298.b0	Warning output upper limit value flag*2	CH1	SM6311	SM6671	SM7031	SM7391	
						Warning output lower limit value flag*2		SM6312	SM6672	SM7032	SM7392	
	ch2 Output data setting value error	D8268.b1	D8278.b1	D8288.b1	D8298.b1	Warning output upper limit value flag*2	CH2	SM6351	SM6711	SM7071	SM7431	
						Warning output lower limit value flag*2		SM6352	SM6712	SM7072	SM7432	
	ch3 Output data setting value error	D8268.b2	D8278.b2	D8288.b2	D8298.b2	Warning output upper limit value flag*2	CH3	SM6391	SM6751	SM7111	SM7471	
						Warning output lower limit value flag*2		SM6392	SM6752	SM7112	SM7472	
	ch4 Output data setting value error	D8268.b3	D8278.b3	D8288.b3	D8298.b3	Warning output upper limit value flag*2	CH4	SM6431	SM6791	SM7151	SM7511	
						Warning output lower limit value flag*2		SM6432	SM6792	SM7152	SM7512	
	EEPROM error	D8268.b4	D8278.b4	D8288.b4	D8298.b4	D/A conversion latest error code	Analog ADP memory error		SD6339	SD6699	SD7059	SD7419
	4DA-ADP hardware error (Power supply error included)	D8268.b6	D8278.b6	D8288.b6	D8298.b6		Analog ADP hardware error		SD6339	SD6699	SD7059	SD7419
	—						Error by CH	CH1	SD6339	SD6699	SD7059	SD7419
								CH2	SD6379	SD6739	SD7099	SD7459
								CH3	SD6419	SD6779	SD7139	SD7499
						CH4		SD6459	SD6819	SD7179	SD7539	
Model code		D8269	D8279	D8289	D8299	Module information		SD6290	SD6650	SD7010	SD7370	

*1 The memory assignment of the devices is for the FX3U/FX3UC series.

*2 Additionally, enable the warning output setting.

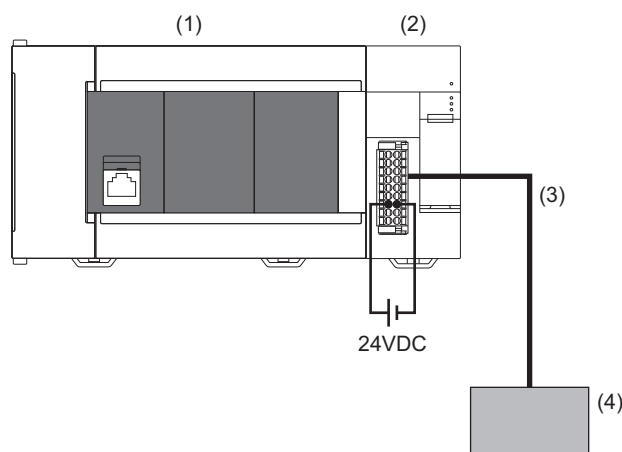
5 REPLACEMENT OF THE FX3U-4DA ANALOG OUTPUT BLOCK

This chapter describes the specification differences, precautions, and replacement procedures when replacing the FX3U-4DA analog output block with the MELSEC iQ-F series FX5-4DA analog output module.

5.1 Overview of the FX5-4DA Analog Output Module

The FX5-4DA analog output module converts four digital values into analog outputs (voltage or current).

This module can be connected to the FX5UJ, FX5U, and FX5UC CPU modules and is capable of outputting four channels of voltage/current data.



- (1) FX5 CPU module
- (2) FX5-4DA
- (3) Analog device connection cable
- (4) Analog device (such as inverter)

5.2 Substitute Models

The FX3U-4DA can be replaced according to the details described below.

Before replacement	After replacement	Specification differences	Reference
FX3U-4DA*1	FX5-4DA*2*3	Hardware - External dimensions - Terminal block type, terminal layout	Page 51 External dimensions Page 52 Wiring differences
		Parameter settings	Page 53 Converting projects
		Performance specifications - Resolution - Conversion speed	Page 54 Performance specifications

*1 The FX2NC-CNV-IF or FX3UC-1PS-5V is required for connecting to the FX3GC/FX3UC main module or FX2NC extension block. The FX5-CNV-BUS or FX5-CNV-BUSC is required for connecting to the FX5U/FX5UC CPU module.

*2 The FX5-4DA can be connected to the following CPU modules.
FX5UJ CPU module (supported from the first released product)
FX5U CPU module (supported from version 1.050)
FX5UC CPU module (supported from version 1.050)
The FX5-CNV-IFC or FX5-C1PS-5V is required for connecting to the FX5UC CPU module.

*3 FX5U/FX5UC CPU module: Up to 16 modules can be connected
FX5UJ CPU module: Up to 8 modules can be connected

5.3 Replacement with the FX5-4DA

Precautions regarding the hardware

The main hardware differences between the FX3U-4DA and FX5-4DA are as follows.

Differences between the specifications

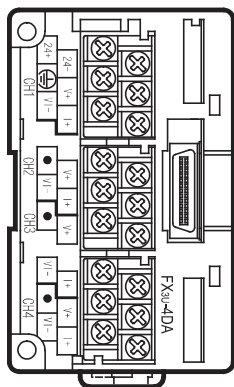
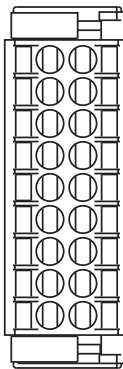
Item	Difference	
	FX3U-4DA	FX5-4DA
Terminal block type	M3 screw terminal block	Spring clamp terminal block

External dimensions

FX3U-4DA	FX5-4DA
W × H × D (mm): 55 × 90 × 87 Weight: Approx. 0.2kg The module can be mounted on a 35mm-width DIN rail. The mounting holes are located at the top-left and bottom-left corners of the module.	W × H × D (mm): 40 × 90 × 83 Weight: Approx. 0.2kg The module can be mounted on a 35mm-width DIN rail. The mounting holes are located at the top-center and bottom-center of the module.
Unit: mm	Unit: mm

Wiring differences

The terminal blocks and terminal layouts differ between the FX3U-4DA and the FX5-4DA.

FX3U-4DA	FX5-4DA																																																																		
 Terminal layout <table><tr><td>24+</td><td>24-</td><td rowspan="3">CH1</td></tr><tr><td>V+</td><td>V+</td></tr><tr><td>V-</td><td>I+</td></tr><tr><td>V+</td><td>V+</td><td rowspan="3">CH2</td></tr><tr><td>V-</td><td>I+</td></tr><tr><td>V+</td><td>V+</td></tr><tr><td>V+</td><td>V+</td><td rowspan="3">CH3</td></tr><tr><td>V-</td><td>I+</td></tr><tr><td>V+</td><td>V+</td></tr><tr><td>V+</td><td>V+</td><td rowspan="3">CH4</td></tr><tr><td>V-</td><td>I+</td></tr><tr><td>V+</td><td>V+</td></tr></table> Terminal block connection (M3 screws)	24+	24-	CH1	V+	V+	V-	I+	V+	V+	CH2	V-	I+	V+	V+	V+	V+	CH3	V-	I+	V+	V+	V+	V+	CH4	V-	I+	V+	V+	 Terminal layout <table><tr><td>V+</td><td>V+</td><td rowspan="3">CH1</td><td>V+</td><td>V+</td><td rowspan="3">CH3</td></tr><tr><td>I+</td><td>I+</td></tr><tr><td>COM</td><td>COM</td></tr><tr><td>V+</td><td>V+</td><td rowspan="3">CH2</td><td>V+</td><td>V+</td><td rowspan="3">CH4</td></tr><tr><td>I+</td><td>I+</td></tr><tr><td>COM</td><td>COM</td></tr><tr><td>24V</td><td>24G</td><td></td><td>24V</td><td>24G</td><td></td></tr><tr><td>V+</td><td>V+</td><td></td><td>V+</td><td>V+</td><td></td></tr><tr><td>V-</td><td>V-</td><td></td><td>V-</td><td>V-</td><td></td></tr></table> Spring clamp terminal block connection	V+	V+	CH1	V+	V+	CH3	I+	I+	COM	COM	V+	V+	CH2	V+	V+	CH4	I+	I+	COM	COM	24V	24G		24V	24G		V+	V+		V+	V+		V-	V-		V-	V-	
24+	24-	CH1																																																																	
V+	V+																																																																		
V-	I+																																																																		
V+	V+	CH2																																																																	
V-	I+																																																																		
V+	V+																																																																		
V+	V+	CH3																																																																	
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V+	V+																																																																		
V+	V+	CH1	V+	V+	CH3																																																														
I+	I+																																																																		
COM	COM																																																																		
V+	V+	CH2	V+	V+	CH4																																																														
I+	I+																																																																		
COM	COM																																																																		
24V	24G		24V	24G																																																															
V+	V+		V+	V+																																																															
V-	V-		V-	V-																																																															

The wires to connect the spring clamp terminal block are described below.

Number of wires connected per terminal	Wire size	
	Solid wire, stranded wire	Ferrule with insulation sleeve
1	24 to 16 AWG (0.2mm ² to 1.5mm ²)	23 to 19 AWG (0.25mm ² to 0.75mm ²)

Power supply differences

Item	FX3U-4DA	FX5-4DA
D/A conversion circuit drive power	24VDC $\pm 10\%$, 160mA (24VDC power must be supplied from the terminal block.)	24VDC $+20\%/-15\%$, 150mA (24VDC power must be supplied from the terminal block.)
CPU drive power supply	5VDC, 120mA (Power is internally supplied by the FX3 main module.)	5VDC, 100mA

Converting projects

For how to convert the project for the FX3 to the one for the FX5, refer to the following.

Page 132 Converting FX3 (GX Works2) Projects to FX5 (GX Works3) Projects

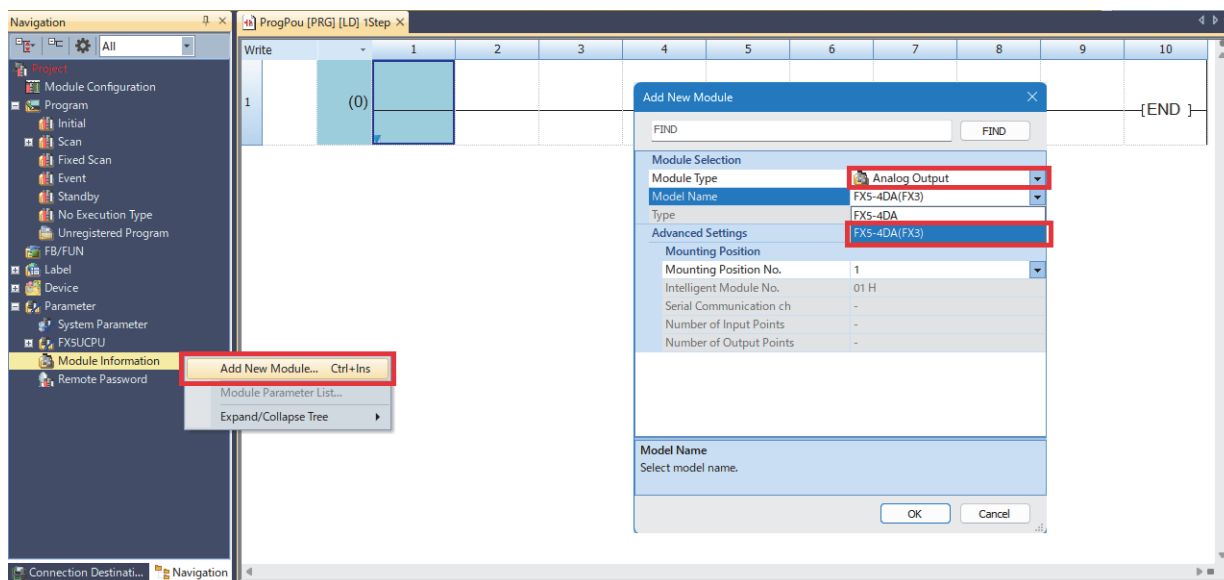
After converting the project to GX Works3, configure the parameters. In addition, modify the programs (instructions and devices) as required.

Parameter settings in GX Works3

The following shows the procedures for setting the FX5-4DA parameters using GX Works3.

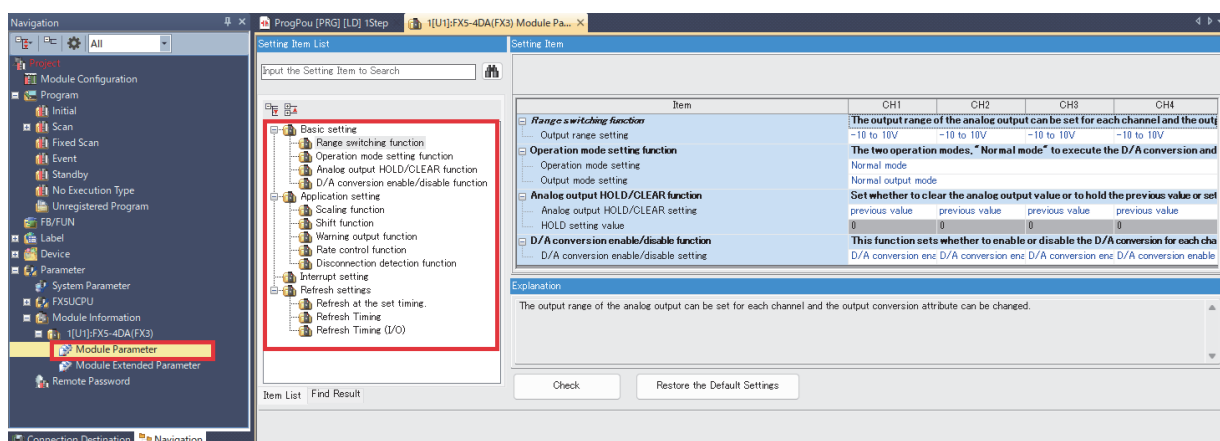
1. Add the FX5-4DA to the project.

Navigation window ⇒ [Parameter] ⇒ Right-click [Module Information] ⇒ [Add New Module]
Module Type: [Analog Output], Model Name: [FX5-4DA(FX3)]



2. Configure the module parameters.

Navigation window ⇒ [Parameter] ⇒ [Module Information] ⇒ [FX5-4DA(FX3)] ⇒ Double-click [Module Parameter]



For details, refer to the following.

MELSEC iQ-F FX5 Analog Module User's Manual

Specifications comparison

The following table lists the specification comparison.

General specifications

○: Compatible

Item		FX3U-4DA	FX5-4DA	Compatibility
Dielectric withstand voltage	Between batch of all terminals and ground terminal	500VAC for one minute	500VAC for one minute	○
Isolation resistance		5MΩ or higher by 500VDC insulation resistance tester	10MΩ or higher by 500VDC insulation resistance tester	○

Power supply specifications

○: Compatible

Item	FX3U-4DA	FX5-4DA	Compatibility
D/A conversion circuit drive power	24VDC $\pm 10\%$, 160mA (24VDC power must be supplied from the terminal block.)	24VDC $+20\%/-15\%$, 150mA (24VDC power must be supplied from the terminal block.)	○
CPU drive power supply	5VDC, 120mA (Power is internally supplied by the FX3 main module.)	5VDC, 100mA	○

Performance specifications

○: Compatible, △: Partially different, —: Not available for the current models

Item			FX3U-4DA		FX5-4DA		Compatibility
Number of channels			4 channels		4 channels		○
Analog output voltage			-10 to +10VDC (External load resistance value 1kΩ to 1MΩ)		-10 to +10VDC (external load resistance value 1kΩ to 1MΩ)		○
Analog output current			0 to 20mA DC, 4 to 20mA DC (External load resistance value 500Ω or less)		0 to 20mA DC (external load resistance value 0Ω to 500Ω)		○
Digital input			Voltage output: 16-bit signed binary Current output: 15-bit binary		16-bit signed binary		○
Output characteristics, resolution	Voltage	0 to 10V	—		0 to 32000	312.5μV	—
		0 to 5V				156.25μV	
		1 to 5V				125μV	
		-10 to 10V	-32000 to 32000	0.32mV	-32000 to 32000	312.5μV	○
			-10000 to 10000	1.0mV			
		User range setting	—		-32000 to 32000	312.5μV ^{*2}	—
	Current	0 to 20mA	0 to 32000	0.63μA	0 to 32000	0.625μA	○
			0 to 20000	1μA			
		4 to 20mA	0 to 32000	0.63μA	0 to 32000	0.5μA	○
		User range setting	—		-32000 to 32000	0.5μA ^{*2}	—

Item			FX3U-4DA	FX5-4DA	Compatibility
Accuracy (accuracy for the full scale analog output value)	Voltage	When the ambient temperature is 25°C±5°C	Within ±0.3% (±60mV)	Within ±0.1% (±20mV)	○
		When the ambient temperature is 0°C to 55°C	Within ±0.5% (±100mV)	Within ±0.2% (±40mV)	○
	Current	When the ambient temperature is 25°C±5°C	Within ±0.3% (±60μA)	Within ±0.1% (±20μA)	○
		When the ambient temperature is 0°C to 55°C	Within ±0.5% (±100μA)	Within ±0.2% (±40μA)	○
	Voltage/ current	When the ambient temperature is - 20°C to 0°C	—	Within ±0.3% (±60mV, ±60μA)	—
Conversion speed			1ms, regardless of the number of channels used	80μs/CH	△
Isolation method	Between the output terminal and programmable controller		Photocoupler	Photocoupler	○
	Between output terminal channels		Non-isolation	Non-isolation	○
Number of occupied I/O points			8 points (can be used for either input or output of the programmable controller)	8 points	○
Voltage offset			-10 to 9V ^{*3}	-10 to 10V ^{*4}	○
Voltage gain			-9 to 10V ^{*3}	-10 to 10V ^{*4}	○
Current offset			0 to 17mA ^{*5}	0 to 20mA ^{*6}	○
Current gain			3 to 30mA ^{*5}	0 to 20mA ^{*6}	△

*1 Accuracy when the ambient temperature is -20°C to 55°C. Note that the operating ambient temperature is 0°C to 55°C for the products manufactured in June 2016 or earlier.

*2 The value is the maximum resolution for the user range setting.

*3 The offset and gain values must satisfy the following relationship.
 $1V \leq (\text{Gain value} - \text{Offset value}) \leq 7.5V$

*4 The offset and gain values must satisfy the following relationship.
 $(\text{Gain value} - \text{Offset value}) \geq 2.0V$

*5 The offset and gain values must satisfy the following relationship.
 $3mA \leq (\text{Gain value} - \text{Offset value}) \leq 30mA$

*6 The offset and gain values must satisfy the following relationship.
 $(\text{Gain value} - \text{Offset value}) \geq 6.0mA$

Reference manuals and sections

■FX3U-4DA

Item	Manual	Section
FX3U-4DA general specifications	 FX3S/FX3G/FX3GC/FX3U/FX3UC SERIES USER'S MANUAL - Analog Control Edition	E. FX3U-4DA (4-channel Analog Output) ⇒ 2.1 Generic Specifications
FX3U-4DA power supply specifications		E. FX3U-4DA (4-channel Analog Output) ⇒ 2.2 Power Supply Specifications
FX3U-4DA performance specifications		E. FX3U-4DA (4-channel Analog Output) ⇒ 2.3 Performance Specifications

■FX5-4DA

Item	Manual	Section
FX5-4DA general specifications	 MELSEC iQ-F FX5 Analog Module User's Manual	2.2 Specifications ⇒ General specifications
FX5-4DA power supply specifications		2.2 Specifications ⇒ Power supply specifications
FX5-4DA analog output specifications		2.2 Specifications ⇒ Performance specifications

Functional comparison

The following table lists the functional comparison.

○: Available, △: Partially different from current model, ×: Not available

Item		Availability		Remarks
Function	Description	FX3U-4DA	FX5-4DA	
D/A conversion enable/disable function	Controls whether to enable or disable the D/A conversion for each channel.	×	○	In the FX5-4DA, D/A conversion must be enabled or disabled for each channel. The setting can be performed either in the buffer memory or in the parameter settings in GX Works3. • Buffer memory CH□ D/A conversion enable/disable setting • Parameter setting Navigation window ⇒ [Parameter] ⇒ [Module Information] ⇒ Module model name ⇒ [Module Parameter] ⇒ [Basic Settings] ⇒ [D/A conversion enable/disable setting function]  FX5-4DA D/A conversion enable/disable function
D/A output enable/disable function	Specifies whether to output the D/A conversion value or offset value for each channel.	×	○	To output D/A conversion values from the FX5-4DA, the output enable/disable flag must be set for each channel. • Flag CH□ Output enable/disable flag  FX5-4DA D/A output enable/disable function
Output mode specification	Allows switching the output range of an analog output for each channel.	○	△	For the FX5-4DA, switch the analog output range in the buffer memory or in the parameter settings in GX Works3. There are no ranges compatible with "Voltage output analog value mV specification mode" and "Current output analog value μA specification mode". • Buffer memory CH□ Range setting • Parameter setting Navigation window ⇒ [Parameter] ⇒ [Module Information] ⇒ Module model name ⇒ [Module Parameter] ⇒ [Basic Settings] ⇒ [Range switching function]  FX5-4DA range switching function
Output setting upon PLC stop	Sets whether to clear the analog output value or to hold the previous value or the setting value when the CPU module operating status is RUN, STOP, or a stop error.	○	○	For the FX5-4DA, whether the output value is held or cleared when the programmable controller is in STOP state can be configured either in the buffer memory or in the parameter settings in GX Works3. • Buffer memory CH□ HOLD setting value • Parameter setting Navigation window ⇒ [Parameter] ⇒ [Module Information] ⇒ Module model name ⇒ [Module Parameter] ⇒ [Basic Settings] ⇒ [Analog Output HOLD/CLEAR Setting]  FX5-4DA analog output HOLD/CLEAR function
Upper/lower limit function	Outputs an alarm when the digital value exceeds the warning output upper limit value or is below the warning output lower limit value.	○	○	For the FX5-4DA, the function behavior and the upper and lower limit values can be configured either in the buffer memory or in the parameter settings in GX Works3. • Buffer memory CH□ Alert output setting CH□ Alert output upper limit value CH□ Alert output lower limit value • Parameter setting Navigation window ⇒ [Parameter] ⇒ [Module Information] ⇒ Module model name ⇒ [Module Parameter] ⇒ [Application Settings] ⇒ [Warning Output Function]  FX5-4DA alert output function
Table output function	Sets a predetermined output pattern as a data table and outputs analog signals according to the data table.	○	○	The wave pattern must be reviewed. The wave data can be set either in the buffer memory or in the parameter settings in GX Works3. • Buffer memory Wave data registry area • Parameter setting Navigation window ⇒ [Parameter] ⇒ [Module Information] ⇒ Module model name ⇒ [Module Extended Parameter] ⇒ [Create Wave Output Data]  FX5-4DA wave output function

Item		Availability		Remarks
Function	Description	FX3U-4DA	FX5-4DA	
Adjustment of output characteristics	Corrects errors in D/A conversion values for each channel.	○	○	For the FX5-4DA, the offset and gain settings can be performed either in the buffer memory and in the module tool in GX Works3. Note that when the settings are performed in the buffer memory, the program must be modified, as a mode change and an operating condition setting request are necessary. Module tool [Tool] ⇒ [Module Tool List] ⇒ [Analog Output] ⇒ [Offset/Gain Setting] FX5-4DA offset/gain setting
Data change disable	Disables buffer memory setting changes.	○	×	The FX5-4DA does not have a flag to disable setting changes. Instead, the module has a flag to apply the buffer memory setting values to operation. To enable this, turn Operating condition setting request (Un\G70.b9) on and off.
Initialization function (resetting to factory default status)	Initializes all data in BFM#0 through #3098 to their factory defaults.	○	△	For the FX5-4DA, use the [Restore the Default Settings] button in the parameter setting in GX Works3 to initialize the settings to their factory defaults. For the offset/gain setting, use the offset/gain initialization function to initialize the setting to their factory defaults. FX5-4DA offset/gain initialization function
Disconnection detection status	Detects a disconnection by monitoring the analog output value.	○	○	In the FX5-4DA, as long as 'Disconnection Detection Automatic Clear Enable/Disable Setting' is enabled, the disconnection detection signal remains on until the error clear request is turned on. - Buffer memory Disconnection detection automatic clear enable/disable setting - Parameter setting Navigation window ⇒ [Parameter] ⇒ [Module Information] ⇒ Module model name ⇒ [Module Parameter] ⇒ [Application Settings] ⇒ [Disconnection detection function] FX5-4DA disconnection detection function
Power supply error	Detects that the 24VDC external power supply is not being supplied or the supply stopped.	○	○	FX5-4DA external power supply disconnection detection function
Automatic data transfer function	Transfers the specific data to the data register in the CPU module from the intelligent function module.	○	○	For the FX5-4DA, specify the transfer destination device in the refresh settings in the parameter settings. - Items (FX3U-4DA) Error status: (FX5-4DA) Latest error code (FX3U-4DA) Upper/lower limit function status: (FX5-4DA) Alarm output upper limit flag, Alarm output lower limit flag (FX3U-4DA) Disconnection detection status: (FX5-4DA) Disconnection detection flag - Parameter setting Navigation window ⇒ [Parameter] ⇒ [Module Information] ⇒ Module model name ⇒ [Module Parameter] ⇒ [Refresh settings] ⇒ [Transfer to the CPU] FX5-4DA parameter settings

Reference manuals and sections

■FX3U-4DA

Item	Manual	Section
FX3U-4DA output mode specification	 FX3S/FX3G/FX3GC/FX3U/FX3UC SERIES USER'S MANUAL - Analog Control Edition	E. FX3U-4DA (4-channel Analog Output) ⇒ 5.4.1 BFM#0: Output mode specification
FX3U-4DA output setting upon PLC stop		E. FX3U-4DA (4-channel Analog Output) ⇒ 5.4.3 BFM#5: Output setting upon PLC stop
FX3U-4DA upper/lower limit function		E. FX3U-4DA (4-channel Analog Output) ⇒ 5.4.13 BFM#38: Upper/lower limit function setting
FX3U-4DA table output function		E. FX3U-4DA (4-channel Analog Output) ⇒ 6. Table Output Function
FX3U-4DA adjustment of output characteristics		E. FX3U-4DA (4-channel Analog Output) ⇒ 7. Changing Output Characteristics
FX3U-4DA initialization function		E. FX3U-4DA (4-channel Analog Output) ⇒ 5.4.8 BFM#20: Initialization function
FX3U-4DA Disconnection detection status		E. FX3U-4DA (4-channel Analog Output) ⇒ 5.4.9 BFM#28: Disconnection detection status
FX3U-4DA power supply error		E. FX3U-4DA (4-channel Analog Output) ⇒ 5.4.10 BFM#29: Error status
FX3U-4DA automatic data transfer function		Refer to the following sections in E. FX3U-4DA (4-channel Analog Output) • 5.4.18 BFM#60: Status automatic transfer function setting • 5.4.19 BFM#61: Error status data automatic transfer-to data register specification • 5.4.20 BFM#62: Upper/lower limit function status data automatic transfer-to data register specification • 5.4.21 BFM#63: Specification of data register for automatic transfer at disconnection detection

■FX5-4DA

Item	Manual	Section
FX5-4DA D/A conversion enable/disable function	 MELSEC iQ-F FX5 Analog Module User's Manual	2.4 Functions ⇒ D/A conversion enable/disable function
FX5-4DA D/A output enable/disable function		2.4 Functions ⇒ D/A output enable/disable function
FX5-4DA range switching function		2.4 Functions ⇒ Range switching function
FX5-4DA analog output HOLD/CLEAR function		2.4 Functions ⇒ Analog output HOLD/CLEAR function
FX5-4DA alert output function		2.4 Functions ⇒ Alert output function
FX5-4DA wave output function		2.4 Functions ⇒ Wave output function
FX5-4DA offset/gain setting		2.8 Offset/Gain Setting
FX5-4DA offset/gain initialization function		2.4 Functions ⇒ Offset/gain initialization function
FX5-4DA disconnection detection function		2.4 Functions ⇒ Disconnection detection function
FX5-4DA external power supply disconnection detection function		2.4 Functions ⇒ External power supply disconnection detection function
FX5-4DA parameter settings		2.7 Parameter Settings

Buffer memory comparison

FX3U-4DA					FX5-4DA				
Name	ch1	ch2	ch3	ch4	Name	FX5-4DA(FX3): FX3 allocation mode			
						CH1	CH2	CH3	CH4
Output mode setting for channels 1 to 4	#0				CH□ Range setting	0			
Output data	#1	#2	#3	#4	CH□ Digital value	1	2	3	4
Output setting upon PLC stop	#5				Analog output HOLD/CLEAR setting	*1			
Output status	#6				CH□ Output status	6			
Command to write offset/gain setting value of channels 1 to 4	#9				Offset/gain setting	*2			
Offset data (Unit: mV or μA)	#10	#11	#12	#13					
Gain data (Unit: mV or μA)	#14	#15	#16	#17					
Setting change prohibition	#19				—	—			
Initialization function	#20				—	*3			
					Offset/gain initialization enable code	4160			
					Offset/gain initialization request	Un\G70.b5			
Disconnection detection status	#28				Disconnection detection flag	28			
Error status	#29				Latest error code	29			
Model code K3030	#30				Module information	30			
Data to be output from each channel upon PLC stop	#32	#33	#34	#35	CH□ HOLD setting value	32	33	34	35
Upper/lower limit function setting	#38				CH□ Alert output setting	38			
Upper/lower limit function status	#39				Alarm output flag	39			
Clear of upper/lower limit function status	#40				Alarm output clear request	70.b14			
Lower limit value of upper/lower limit function for each channel	#41	#42	#43	#44	CH□ Alert output lower limit value	41	42	43	44
Upper limit value of upper/lower limit function for each channel	#45	#46	#47	#48	CH□ Alert output upper limit value	45	46	47	48
Corrective function setting by load resistance	#50				—	—			
Load resistance value for each channel (Unit: Ω)	#51	#52	#53	#54	—	—			
Status automatic transfer function setting	#60				Auto refresh	*1			
Error status data (BFM#29) automatic transfer-to data register specification (Valid if b0 of BFM#60 is set to ON)	#61				Auto refresh	*1			
Upper/lower limit function status data (BFM#39) automatic transfer-to data register specification (Valid if b1 of BFM#60 is set to ON)	#62				Auto refresh	*1			
Disconnection detection status data (BFM#28) automatic transfer-to data register specification (Valid if b2 of BFM#60 is set to ON)	#63				Auto refresh	*1			
Start/stop of table output function	#80				CH□ Wave output start/stop request	9131	9132	9133	9134
Output pattern of each channel	#81	#82	#83	#84	Wave Pattern No.	*1			
Number of table output execution cycles for each channel	#85	#86	#87	#88	CH□ Wave pattern output repetition setting	9221	9222	9223	9224
Output completion flag of table output function	#89				CH□ Wave output status monitor	9001	9002	9003	9004
Table output error code	#90				Latest error code	29			
Table output error occurrence number	#91				—	—			
Head device number in data table	#98				CH□ Wave pattern start address setting	9180, 9181	9182, 9183	9184, 9185	9186, 9187
Data table transfer command	#99				Transferring wave output data	*1			

FX3U-4DA					FX5-4DA				
Name	ch1	ch2	ch3	ch4	Name	FX5-4DA(FX3): FX3 allocation mode			
						CH1	CH2	CH3	CH4
Data table in pattern 1	#100 to #398				Wave data registry area	10000 to 89999			
Data table in pattern 2	#400 to #698								
Data table in pattern 3	#700 to #998								
Data table in pattern 4	#1000 to #1298								
Data table in pattern 5	#1300 to #1598								
Data table in pattern 6	#1600 to #1898								
Data table in pattern 7	#1900 to #2198								
Data table in pattern 8	#2200 to #2498								
Data table in pattern 9	#2500 to #2798								
Data table in pattern 10	#2800 to #3098								

*1 The item can be configured in the parameter settings in GX Works3.

*2 This item can be configured through the module tool in GX Works3.

*3 This item can initialize the settings to their factory defaults by using the [Restore the Default Settings] button in the parameter setting in GX Works3.

6 REPLACEMENT OF THE FX3U-2HC TYPE HIGH-SPEED COUNTER BLOCK

This chapter describes the replacement selection, specification differences, precautions, and replacement procedures when replacing the FX3U-2HC high-speed counter block with the MELSEC iQ-F series high-speed counter function.

6.1 Overview of the MELSEC iQ-F Series High-Speed Counter Function

The MELSEC iQ-F series features the high-speed counter function with CPU modules, high-speed pulse input/output modules (FX5-16ET/ES(S)-H), and high-speed counter modules (FX5-2HC/ES).

Since the specifications and functions of each product are different, check the following sections and consider replacing the modules.

6.2 Selection of Substitute Models

For the FX3U-2HC, the configuration can be replaced with the one specified below, as required.

Target	Configuration		Specifications comparison			
	CPU module (main module)	Intelligent module (extension module)	Input type	Maximum input frequency	Number of channels	Engineering tool
Current model	FX3U	FX3U-2HC	Open collector Differential line driver	200kHz	2	GX Works2
Substitute model 1	FX5S	— (CPU module built-in high-speed counter function)	Open collector* ²	100kHz	8	GX Works3* ³
	FX5UJ			200kHz		
	FX5U FX5UC					
Substitute model 2	FX5UJ FX5U FX5UC	FX5-16ET/ES(S)-H* ^{1*4}	Open collector* ²	200kHz	2	
Substitute model 3	FX5UJ FX5U FX5UC	FX5-2HC/ES* ^{1*5}	Differential line driver	2MHz		

*1 The FX5-CNV-IFC or FX5-C1PS-5V is required for connecting to the FX5UC CPU module.

*2 Only 24V input is supported.

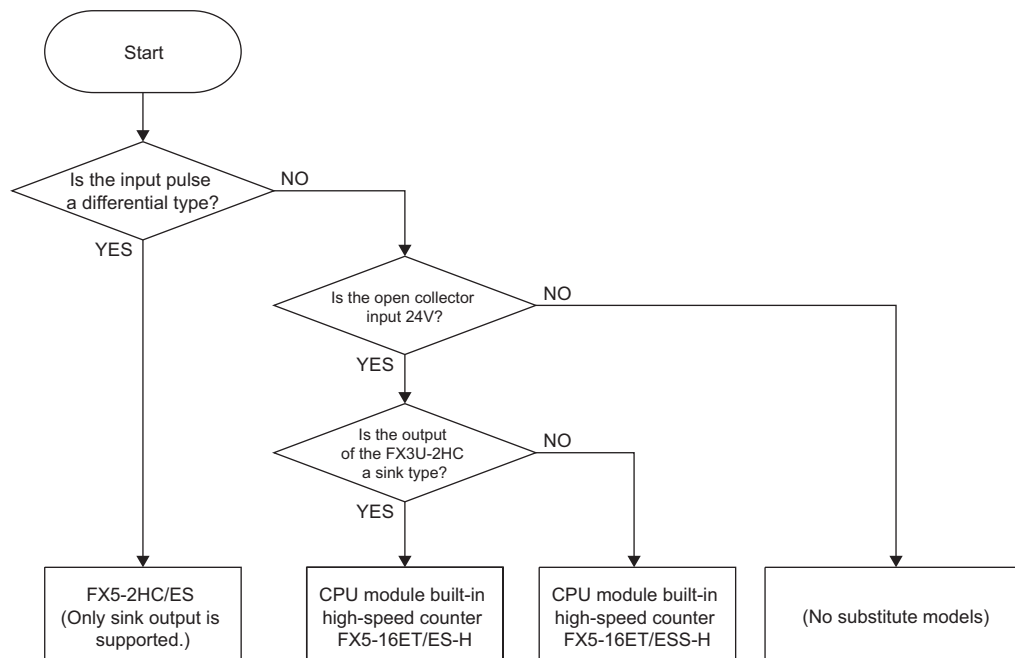
*3 The parameter settings and the buffer memory assignment cannot be replaced. Reconfiguration is required.

*4 Each module has 2 channels, and a maximum of 4 modules can be connected to the CPU module. Therefore, a total of 16 channels can be used in this configuration, including the number of channels available in the CPU module.

*5 Each module has 2 channels, and the maximum number of connectable CPU modules is 15 for the FX5U, 13 for the FX5UC, and 8 for the FX5UJ. Therefore, the total number of available channels in this configuration is 38 for the FX5U, 34 for the FX5UC, and 24 for the FX5UJ.

Selection flow

The following figure shows the selection flow.



6.3 Replacement of the FX5 CPU Module Built-in High-Speed Counter

Precautions regarding the hardware

The following table lists the hardware differences between the FX3U-2HC and the FX5 CPU module built-in high-speed counter.

Differences between the specifications

Item	Difference					Precautions	
	FX3U-2HC		FX5 CPU module built-in high-speed counter				
			FX5S	FX5UJ	FX5U		FX5UC
Input signal voltage/current	[A24+], [B24+], [P24+]	24VDC ±10%, 8mA or lower	24VDC +20%, -15% X0 to X7: 5.1mA/24VDC X10 or later: 4.0mA/24VDC	24VDC +20%, -15% X0 to X7: 5.3mA/24VDC X10 or later: 4.0mA/24VDC	24VDC +20%, -15% X0 to X17: 5.3mA/24VDC X20 or later: 4.0mA/24VDC		
	[A12+], [B12+], [P12+]	12VDC ±10%, 8mA or lower	—				
	[A5+], [B5+], [P5+]	3.0 to 5.5VDC, 12.5mA or lower	—				
	[XD24]	10.8 to 26.4VDC, 15mA or lower	24VDC +20%, -15% X0 to X7: 5.1mA/24VDC X10 or later: 4.0mA/24VDC	24VDC +20%, -15% X0 to X7: 5.3mA/24VDC X10 or later: 4.0mA/24VDC	24VDC +20%, -15% X0 to X17: 5.3mA/24VDC X20 or later: 4.0mA/24VDC		
	[XD5]	5VDC ±10%, 8mA or lower	—				
Terminal block type	40-pin (1-key) socket connectors compliant with MIL-C-83503		M3 screw terminal block			Spring clamp terminal block/connector type	
						Since the terminal block types differ, the wiring adjustment is required.	

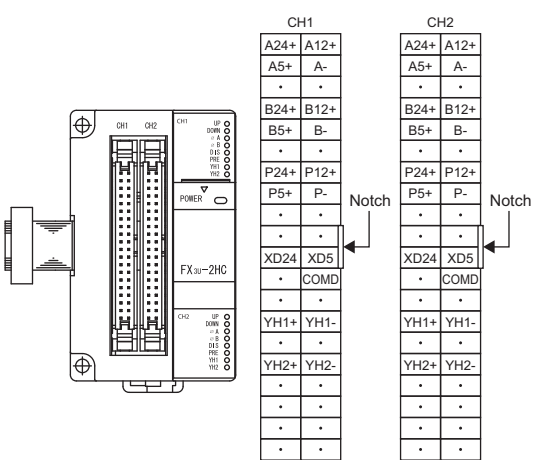
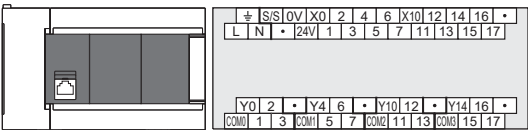
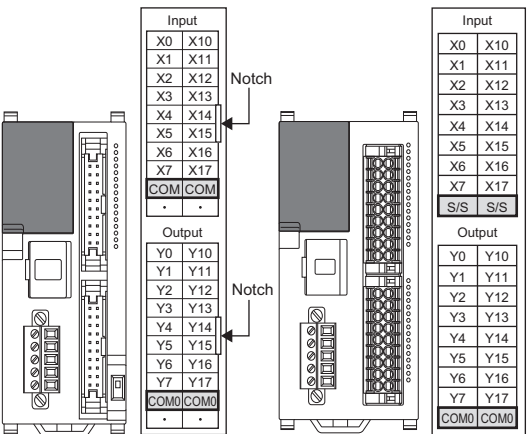
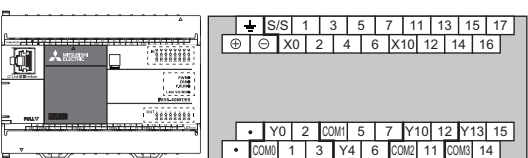
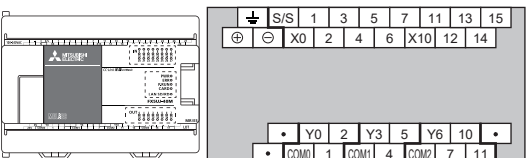
External dimensions

When directly replacing the FX3U-2HC with a CPU module built-in high-speed counter of the MELSEC iQ-F, refer to the following for details on the external dimensions of each CPU module.

 Transition from MELSEC FX3 Series to MELSEC iQ-F Series Handbook

Wiring differences

The terminal blocks and terminal layouts differ between the FX3U-2HC and FX5 CPU modules.

FX3U-2HC	FX5 CPU module built-in high-speed counter																																								
 CH1 <table border="1"> <tr><td>A24+</td><td>A12+</td></tr> <tr><td>A5+</td><td>A-</td></tr> <tr><td>B24+</td><td>B12+</td></tr> <tr><td>B5+</td><td>B-</td></tr> <tr><td>P24+</td><td>P12+</td></tr> <tr><td>P5+</td><td>P-</td></tr> <tr><td>XD24</td><td>XD5</td></tr> <tr><td>COMD</td><td></td></tr> <tr><td>YH1+</td><td>YH1-</td></tr> <tr><td>YH2+</td><td>YH2-</td></tr> </table> CH2 <table border="1"> <tr><td>A24+</td><td>A12+</td></tr> <tr><td>A5+</td><td>A-</td></tr> <tr><td>B24+</td><td>B12+</td></tr> <tr><td>B5+</td><td>B-</td></tr> <tr><td>P24+</td><td>P12+</td></tr> <tr><td>P5+</td><td>P-</td></tr> <tr><td>XD24</td><td>XD5</td></tr> <tr><td>COMD</td><td></td></tr> <tr><td>YH1+</td><td>YH1-</td></tr> <tr><td>YH2+</td><td>YH2-</td></tr> </table> Notch For wiring, use a 40-pin (1-key) socket connector compliant with MIL-C-83503.	A24+	A12+	A5+	A-	B24+	B12+	B5+	B-	P24+	P12+	P5+	P-	XD24	XD5	COMD		YH1+	YH1-	YH2+	YH2-	A24+	A12+	A5+	A-	B24+	B12+	B5+	B-	P24+	P12+	P5+	P-	XD24	XD5	COMD		YH1+	YH1-	YH2+	YH2-	■Replacement with the FX5U (32-point type)  Replace the wiring with connections to terminals compatible with M3 screw-type terminal blocks. When replacing the wiring, check the terminal layout based on the CPU module I/O assignment. The same applies to 64-point and 80-point types.
A24+	A12+																																								
A5+	A-																																								
B24+	B12+																																								
B5+	B-																																								
P24+	P12+																																								
P5+	P-																																								
XD24	XD5																																								
COMD																																									
YH1+	YH1-																																								
YH2+	YH2-																																								
A24+	A12+																																								
A5+	A-																																								
B24+	B12+																																								
B5+	B-																																								
P24+	P12+																																								
P5+	P-																																								
XD24	XD5																																								
COMD																																									
YH1+	YH1-																																								
YH2+	YH2-																																								
	■Replacement with the FX5UC (32-point type)  Left: FX5UC (connector type) Right: FX5UC (spring clamp terminal block) For wiring, replace the wiring according to the connector types. When replacing the wiring, check the terminal layout based on the CPU module I/O assignment. The same applies to 64-point and 96-point types.																																								
	■Replacement with the FX5S (30-point type)  Replace the wiring with connections to terminals compatible with M3 screw-type terminal blocks. When replacing the wiring, check the terminal layout based on the CPU module I/O assignment. The same applies to 40-point, 60-point, and 80-point types.																																								
	■Replacement with the FX5UJ (24-point type)  Replace the wiring with connections to terminals compatible with M3 screw-type terminal blocks. When replacing the wiring, check the terminal layout based on the CPU module I/O assignment. The same applies to 40-point and 60-point types.																																								

For details on when replacing the FX3U-2HC with a CPU module built-in high-speed counter of the MELSEC iQ-F, refer to the following.

📖 Transition from MELSEC FX3 Series to MELSEC iQ-F Series Handbook

For details on the wiring for the CPU module built-in high-speed counter of the MELSEC iQ-F, refer to the following.

📖 MELSEC iQ-F FX5S/FX5UJ/FX5U/FX5UC User's Manual (Hardware)

Project conversion

For how to convert the FX3U/FX3UC project with an FX5 project, refer to the following.

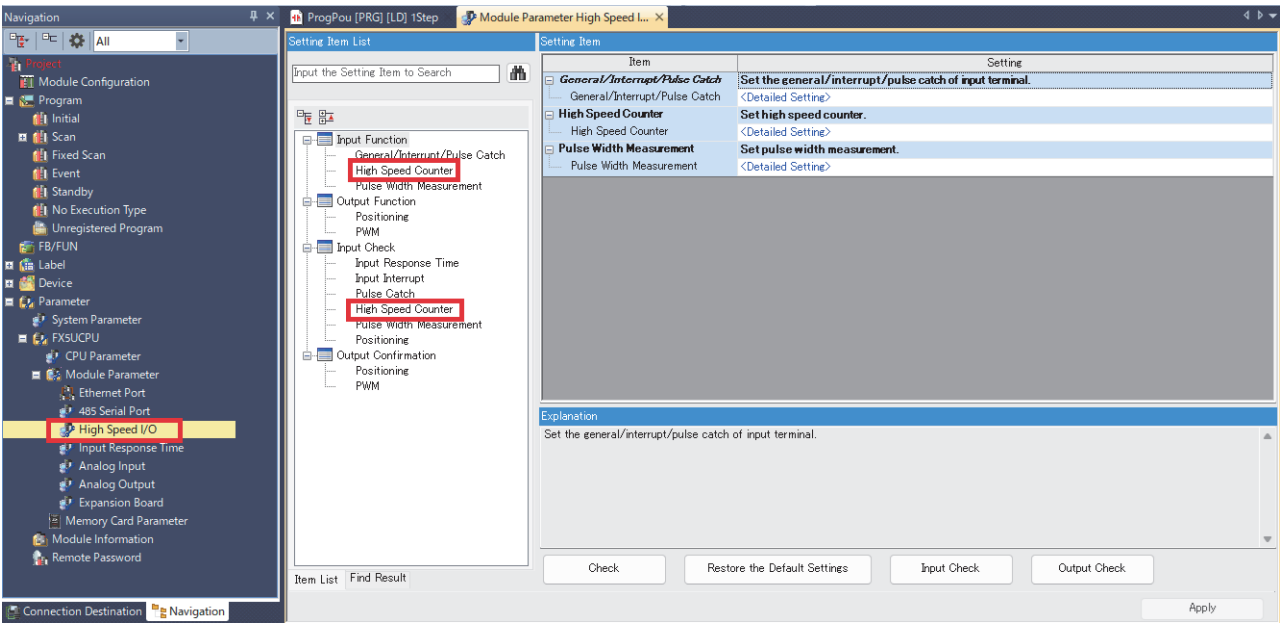
📖 Page 132 Converting FX3 (GX Works2) Projects to FX5 (GX Works3) Projects

After converting the project into GX Works3, configure the parameters. In addition, modify the programs (instructions and devices) as required.

Parameter settings in GX Works3

After converting the project into GX Works3, configure the settings shown below.

🖱️ Navigation window ⇒ [Parameter] ⇒ [FX5UCPU] ⇒ [Module Parameter] ⇒ Double-click [High Speed I/O]



For details on the programs and parameter settings for the CPU module replacement, refer to the following.

📖 Transition from MELSEC FX3 Series to MELSEC iQ-F Series Handbook

Specifications comparison

The following table lists the specifications comparison.

General specifications

○: Compatible

Item			FX3U-2HC	FX5 CPU module built-in high-speed counter				Compatibility
				FX5S	FX5UJ	FX5U	FX5UC	
Withstand voltage	Between the power supply terminal (AC power supply) and ground terminal	AC power supply type module	—	1.5kVAC for one minute				○
	Between the power supply terminal (DC power supply) and ground terminal	DC power supply type module						
	Between the input terminal (24VDC) and ground terminal	Module with input circuit						
	Between the output terminal (transistor) and ground terminal	Module with transistor output circuit						
	Between the 24VDC service power supply and ground terminal	Module with 24VDC service power supply	—	1.5kVAC for one minute				
	Between the output terminal (relay) and ground terminal	Module with relay output circuit						
Insulation resistance			5MΩ or higher by a 500VDC insulation resistance tester	10MΩ or higher by a 500VDC insulation resistance tester				

Power supply specifications

○: Compatible, —: Not available for the current models

Item	FX3U-2HC	FX5 CPU module built-in high-speed counter				Compatibility
		FX5S	FX5UJ	FX5U	FX5UC	
Drive power supply	5VDC 245mA (internal power supply)	—				—
Allowable instantaneous power failure time	Operation can be continued upon occurrence of an instantaneous power failure for 1ms or less.	AC power supply: Operation can be continued upon occurrence of an instantaneous power failure for 10ms or less. DC power supply: Operation can be continued upon occurrence of an instantaneous power failure for 5ms or less.				○

Performance specifications

○: Compatible, △: Partially different, —: Not available for the current models

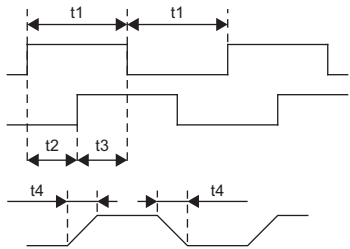
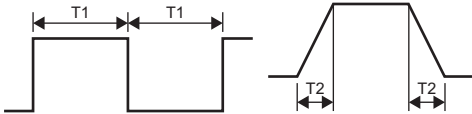
Item			FX3U-2HC	FX5 CPU module built-in high-speed counter				Compatibility
				FX5S	FX5UJ	FX5U	FX5UC	
Input specifications	Number of input points		• Phase A, phase B: 4 points (2 points × 2 channels) • PRESET: 2 points (1 point × 2 channels) • DISABLE: 2 points (1 point × 2 channels)		• Phase A, phase B: 16 points (2 points × 8 channels) • Input external PRESET: 8 points (1 point × 8 channels) • Input external ENABLE: 8 points (1 point × 8 channels)			○
	Input type		Sink: NPN open collector transistor Source: PNP open collector transistor Differential line driver		Sink: NPN open collector transistor Source: PNP open collector transistor			△
	Maximum response frequency	1-phase input	1 input: 200kHz 2 input: 200kHz		1 input: 100kHz 2 input: 100kHz		1 input: 200kHz 2 input: 200kHz	○
		2-phase input	Multiple of 1: 200kHz Multiple of 2: 100kHz Multiple of 4: 50kHz		Multiple of 1: 100kHz Multiple of 2: 50kHz Multiple of 4: 25kHz		Multiple of 1: 200kHz Multiple of 2: 100kHz Multiple of 4: 50kHz	○
	Input voltage (per terminal)	Phase A, phase B, PRESET	[A24+] [B24+] [P24+]	24VDC ±10%, 8mA or lower	24VDC +20%, -15% X0 to X7: 5.1mA/24VDC X10 or later: 4.0mA/24VDC	24VDC +20%, -15% X0 to X7: 5.3mA/24VDC X10 or later: 4.0mA/24VDC	24VDC +20%, -15% X0 to X17: 5.3mA/24VDC X20 or later: 4.0mA/24VDC	○
			[A12+] [B12+] [P12+]	12VDC ±10%, 8mA or lower	—			—
			[A5+] [B5+] [P5+]	3.0 to 5.5VDC, 12.5mA or lower	—			—
		DISABLE	[XD24]	10.8 to 26.4VDC, 15mA or lower	24VDC +20%, -15% X0 to X7: 5.1mA/24VDC X10 or later: 4.0mA/24VDC	24VDC +20%, -15% X0 to X7: 5.3mA/24VDC X10 or later: 4.0mA/24VDC	24VDC +20%, -15% X0 to X17: 5.3mA/24VDC X20 or later: 4.0mA/24VDC	○
			[XD5]	5VDC ±10%, 8mA or lower	—			—
		Pulse waveform		 Page 69 Performance specifications for the pulse waveform				
Count specifications	Counting range		• For 32-bit specification: -2147483648 to +2147483647 • For 16-bit specification: 0 to 65535 (upper limit can be specified by BFM #3, #2, #43, and #42)		• When ring length is not set: -2147483648 to +2147483647 • When ring length is set: 0 to 2147483647			○
	Type		Automatic up/down However, the counting direction is determined by the following command for the 1-phase 1-input counter. • H/W up/down: Up/down is counted by turning off or on of the phase A input terminal. • S/W up/down: Up/down is counted by the current value (K0/K1) of BFM #1 and #41.		Automatic up/down However, the counting direction is determined by the following command for the 1-phase 1-input counter. • H/W up/down: Up/down is counted by turning off or on of the phase B input terminal. • S/W up/down: Up/down is counted by the counting direction switching bit. For other available modes on the FX5, refer to the following.  iQ-F high-speed input/output function			○

Item		FX3U-2HC	FX5 CPU module built-in high-speed counter				Compatibility
			FX5S	FX5UJ	FX5U	FX5UC	
Output specifications	Number of output points	4 points (2 points × 2 channels)	Assign functions to the required bit devices (Y, M) and interrupt pointers (I16 to 23).				—
	Output type	Transistor output	Transistor output FX5S-□MT/DS FX5S-□MT/DSS	Transistor output FX5UJ-□MT/DS FX5UJ-□MT/DSS	Transistor output FX5U-□MT/DS FX5U-□MT/DSS	Transistor output FX5UC-32MT/DS-TS FX5UC-□MT/DSS	○
	Output capacity	5 to 24VDC, 0.5A	5 to 30VDC, 0.5A/point				○
	Coincidence output	When the current value of the counter matches the comparison setting value, the comparison output is set (turned on) within 30μs, and the value is cleared (turned off) within 100μs by the reset command.	The CPU module can use the coincidence output function by the dedicated instructions (DHSCS, DHSCR, and DHSZ), high-speed comparison table, and multiple point output high-speed comparison table. The time from the pulse input through the count value comparison (match) to output to Y is as follows. • FX5S/FX5UJ CPU module: 10μs + input response time • FX5U/FX5UC CPU module: 5μs + input response time				○

■Performance specifications for the pulse waveform

The performance specifications of the pulse waveform are as follows.

FX3U-2HC	FX5 CPU module built-in high-speed counter			
	FX5S	FX5UJ	FX5U	FX5UC

				
	- t1 (on/off pulse width): 1.5μs or more (at 200kHz) - t2 (phase difference between A and B): 0.75μs or more (at 200kHz) - t3 (overlap time): 0.7μs or more (at 200kHz) - t4 (rise/fall time): 0.75μs or less - PRESET (phase Z) input signal width: ON width 1.5μs or more, OFF width 30μs or more - DISABLE (start disabled) input signal width: ON width 100μs or more, OFF width 100μs or more	■T1 (pulse width) X0, X1, X3, X4: 5μs or more X2, X5, X6, X7: 50μs or more ■T2 (rise/fall time) X0, X1, X3, X4: 2.5μs or more X2, X5, X6, X7: 25μs or more	■T1 (pulse width) FX5U-32M□: - X0 to X5: 2.5μs or more - X6 to X17: 50μs or more FX5U-64M□, FX5U-80M□: - X0 to X7: 2.5μs or more - X10 to X17: 50μs or more ■T2 (rise/fall time) FX5U-32M□: - X0 to X5: 1.25μs or less - X6 to X17: 25μs or less FX5U-64M□, FX5U-80M□: - X0 to X7: 1.25μs or less - X10 to X17: 25μs or less	■T1 (pulse width) FX5UC-32M□: - X0 to X5: 2.5μs or more - X6 to X17: 50μs or more FX5UC-64M□, FX5UC-96M□: - X0 to X7: 2.5μs or more - X10 to X17: 50μs or more ■T2 (rise/fall time) FX5UC-32M□: - X0 to X5: 1.25μs or less - X10 to X17: 25μs or less FX5UC-64M□, FX5UC-96M□: - X0 to X7: 1.25μs or less - X10 to X17: 25μs or less

Reference manuals and sections

■FX3U-2HC

Item	Manual	Reference section
FX3U-2HC general specifications	 FX3U-2HC User's Manual	4.1 General Specifications
FX3U-2HC power supply specifications		4.2 Power Supply Specifications
FX3U-2HC performance specifications		4.3 Performance Specifications

■FX5 CPU module built-in high-speed counter

Item	Manual	Reference section
iQ-F general specifications	 MELSEC iQ-F FX5S/FX5UJ/FX5U/FX5UC User's Manual (Hardware)	Chapter 4 GENERAL SPECIFICATIONS
iQ-F CPU power specifications		5.2 Power Supply Specifications
iQ-F CPU input specifications		5.3 Input Specifications
iQ-F CPU output specifications		5.4 Output Specifications

Functional comparison

The following table lists the main function.

○: Compatible

Function	FX3U-2HC	CPU module built-in counter	Compatibility
32-bit counter	 FX3U-2HC counter mode	 iQ-F special relay high-speed input/output function	○
16-bit counter			○
2-phase input counter (multiple of 1)		 iQ-F high-speed counter (normal mode)	○
2-phase input counter (multiple of 2)			○
2-phase input counter (multiple of 4)			○
1-phase 2-input counter			○
1-phase 1-input counter (H/W up/down)		 iQ-F high-speed counter (normal mode)  iQ-F special relay high-speed input/output function	○
1-phase 1-input counter (S/W up/down)		 iQ-F special relay high-speed input/output function	○
PRESET function	 FX3U-2HC preset data	 iQ-F high-speed counter function	○
DISABLE function	 FX3U-2HC command	 iQ-F high-speed counter (normal mode)	○
Comparison output	 FX3U-2HC comparison status	 iQ-F high-speed counter high-speed comparison table	○

Reference manuals and sections

■FX3U-2HC

Item	Manual	Reference section
FX3U-2HC counter mode	 FX3U-2HC User's Manual	5.2.1 Counter mode
FX3U-2HC preset data		5.2.5 Preset data
FX3U-2HC command		5.2.4 Command
FX3U-2HC comparison status		5.2.9 Compare results

■FX5 CPU module built-in high-speed counter

Item	Manual	Reference section
iQ-F high-speed input/output function	 MELSEC iQ-F FX5 User's Manual (Application)	Chapter 26 HIGH-SPEED INPUT/OUTPUT FUNCTION
iQ-F high-speed counter function		26.1 High-speed Counter Function
iQ-F special relay high-speed input/output function		APPENDIX 1 Special Relay List ⇒ High-speed input/output function
iQ-F high-speed counter (normal mode)		26.1 High-speed Counter Function ⇒ High-speed counter (normal mode)
iQ-F high-speed counter high-speed comparison table		26.1 High-speed Counter Function ⇒ High-speed comparison table

6.4 Replacement of the FX5-16ET/ES(S)-H High-Speed Pulse Input/Output Module

Precautions regarding the hardware

The following table lists the hardware differences between the FX3U-2HC and the FX5-16ET/ES(S)-H.

Differences between the specifications

Item	Difference		Precautions
	FX3U-2HC	FX5-16ET/ES(S)-H	
Optional when connected	The FX2NC-CNV-IF or FX3UC-1PS-5V is required for connecting to the FX3UC main module or FX2NC extension block.		—
Input signal voltage/current	[A24+] [B24+] [P24+]	24VDC $\pm 10\%$, 8mA or lower	- The input signal current value of the replacement module is lower than that of the module before replacement. Check the specifications of the external devices when replacing the module. 12V input and 5V input are not supported.
	[A12+] [B12+] [P12+]	12VDC $\pm 10\%$, 8mA or lower	
	[A5+] [B5+] [P5+]	3.0 to 5.5VDC, 12.5mA or lower	
	[XD24]	10.8 to 26.4VDC, 15mA or lower	
	[XD5]	5VDC $\pm 10\%$, 8mA or lower	
Terminal block type	40-pin (1-key) socket connectors compliant with MIL-C-83503	M3 screw terminal block	Since the terminal block types differ, the wiring adjustment is required.

External dimensions

FX3U-2HC	FX5-16ET/ES(S)-H
W × H × D (mm): 55 × 90 × 87 Weight: Approx. 0.2kg The module can be mounted on a 35mm-width DIN rail. The mounting holes are located at the left corner in the top and bottom of the module.	W × H × D (mm): 40 × 90 × 83 Weight: Approx. 0.25kg The module can be mounted on a 35mm-width DIN rail. The mounting holes are located at the center in the top and bottom of the module.
Unit: mm	Unit: mm

Wiring differences

The pitch of the holes for installation in a control panel differs between the FX3U-2HC and a substitute model. To install the module directly in a control panel, add installation holes. In addition, the terminal block cannot be replaced because their types are different. (👉 Page 71 External dimensions)

FX3U-2HC

CH1

A24+	A12+
A5+	A-
.	.
B24+	B12+
B5+	B-
.	.
P24+	P12+
P5+	P-
.	.
XD24	XD5
.	COMD
YH1+	YH1-
.	.
YH2+	YH2-
.	.
.	.
.	.

CH2

A24+	A12+
A5+	A-
.	.
B24+	B12+
B5+	B-
.	.
P24+	P12+
P5+	P-
.	.
XD24	XD5
.	COMD
YH1+	YH1-
.	.
YH2+	YH2-
.	.
.	.
.	.

Notch

For wiring, use a 40-pin (1-key) socket connector compliant with MIL-C-83503.

FX5-16ET/ES(S)-H

CH1

S	X
0	1
2	3
4	5
6	7
Y	0
1	2
3	4
5	6
7	+
+	V

CH2

S	X
0	1
2	3
4	5
6	7
Y	0
1	2
3	4
5	6
7	+
+	V

Notch

Replace the wiring with connections to terminals compatible with M3 screw-type terminal blocks. For wiring replacement, check the terminal layout changes for each module.

For details on the wiring, refer to the following.

MELSEC iQ-F FX5S/FX5UJ/FX5U/FX5UC User's Manual (Hardware)

Power supply differences

Item	FX3U-2HC	FX5-16ET/ES(S)-H	Precautions
Power requirements	5VDC, 245mA (internal power supply)	5VDC (powered by a CPU module via an expansion cable) 24VDC (24VDC service power supply or external power supply) Current consumption: 100mA/5VDC 125mA/24VDC (including the current of the input circuit)	Perform additional connections for 24VDC service power supply or external power supply.

Project conversion

For how to convert the FX3U/FX3UC project with an FX5 project, refer to the following.

☞ Page 132 Converting FX3 (GX Works2) Projects to FX5 (GX Works3) Projects

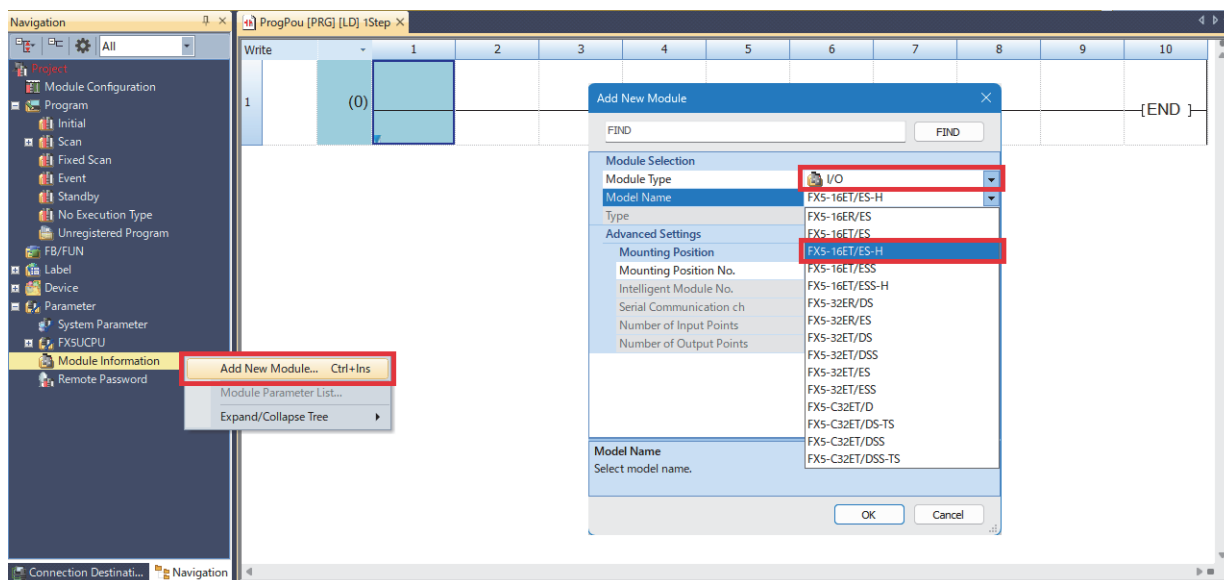
After converting the project into GX Works3, configure the parameters. In addition, modify the programs (instructions and devices) as required.

Parameter settings in GX Works3

The setting procedure for the FX5-16ET/ES-H parameters in GX Works3 is as follows.

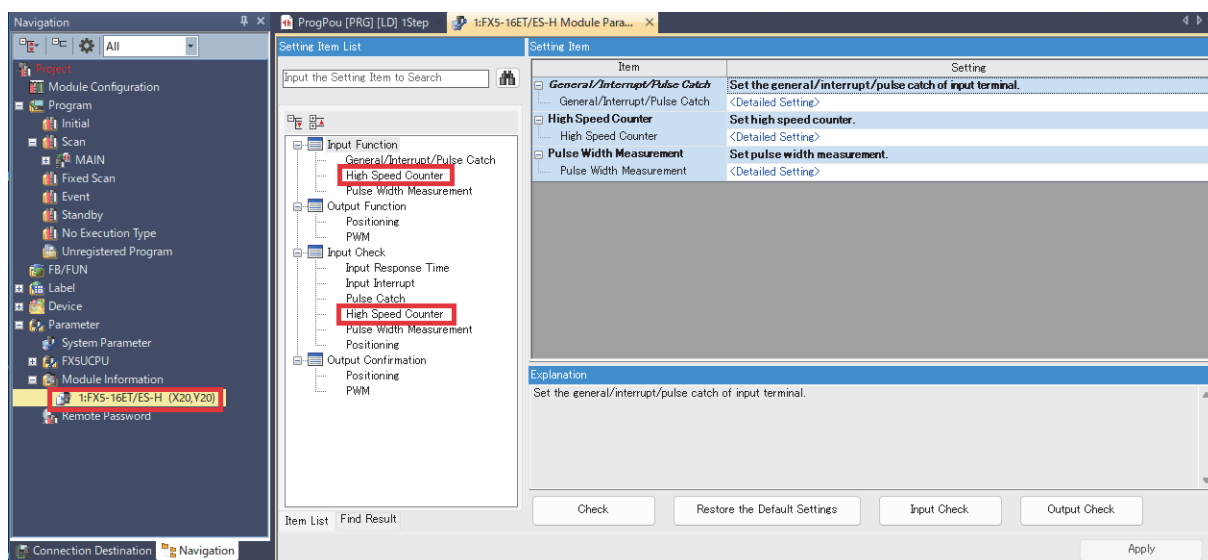
1. Add the required modules to a project according to the CPU configuration.

☞ Navigation window ⇒ [Parameter] ⇒ Right-click [Module Information] ⇒ [Add New Module]
Module Type: [I/O], Model Name: [FX5-16ET/ES-H]



2. Set the module parameters.

☞ Navigation window ⇒ [Parameter] ⇒ [Module Information] ⇒ Double-click [FX5-16ET/ES-H]



For details on the parameter settings, refer to the high-speed input/output function in the following manual.

☞ MELSEC iQ-F FX5 User's Manual (Application)



When using the FX5-16ET/ESS-H, select the FX5-16ET/ESS-H in the above procedure.

Specifications comparison

The following table lists the specifications comparison.

General specifications

○: Compatible

Item		FX3U-2HC	FX5-16ET/ES-H	FX5-16ET/ESS-H	Compatibility
Withstand voltage	Between the power supply terminal (DC power supply) and ground terminal	500VAC for one minute	500VAC for one minute		○
	Between the I/O terminal and ground terminal				
Insulation resistance		5MΩ or higher by a 500VDC insulation resistance tester	10MΩ or higher by a 500VDC insulation resistance tester		○

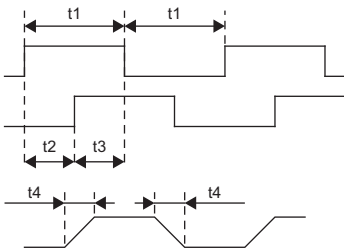
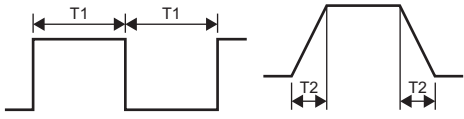
Power supply specifications

○: Compatible, —: Not available for the current models

Item	FX3U-2HC	FX5-16ET/ES-H	FX5-16ET/ESS-H	Compatibility
Drive power supply	5VDC 245mA (internal power supply)	5VDC (internal power supply) 24VDC (24VDC service power supply or external power supply) Current consumption: 100mA/5VDC, 125mA/24VDC (including current in the input circuit)		○
Allowable instantaneous power failure time	Operation can be continued upon occurrence of an instantaneous power failure for 1ms or less.	—		—

Performance specifications

○: Compatible, △: Partially different, —: Not available for the current models

Item		FX3U-2HC		FX5-16ET/ES-H	FX5-16ET/ESS-H	Compatibility
Input specifications	Number of input points	• Phase A, phase B: 4 points (2 points × 2 channels) • PRESET: 2 points (1 point × 2 channels) • DISABLE: 2 points (1 point × 2 channels)		• Phase A, phase B: 2 points (1 point × 2 channels) • PRESET input: 2 points (1 point × 2 channels) • ENABLE input: 2 points (1 point × 2 channels)		○
	Input type		Sink: NPN open collector transistor Source: PNP open collector transistor Differential line driver		Sink: NPN open collector transistor Source: PNP open collector transistor	△
	Maximum response frequency	1-phase input	1 input: 200kHz 2 input: 200kHz		1 input: 200kHz 2 input: 200kHz	○
		2-phase input	Multiple of 1: 200kHz Multiple of 2: 100kHz Multiple of 4: 50kHz		Multiple of 1: 200kHz Multiple of 2: 100kHz Multiple of 4: 50kHz	○
	Input voltage (per terminal)	Phase A, phase B, PRESET	[A24+] [B24+] [P24+]	24VDC ±10%, 8mA or lower		24VDC +20%, -15% 5.3mA/24VDC
[A12+] [B12+] [P12+]			12VDC ±10%, 8mA or lower		—	—
[A5+] [B5+] [P5+]			3.0 to 5.5VDC, 12.5mA or lower			
DISABLE		[XD24]	10.8 to 26.4VDC, 15mA or lower		24VDC + 20%, -15% 5.3mA/24VDC	○
		[XD5]	5VDC ±10%, 8mA or lower		—	—
Pulse waveform						△
		• t1 (on/off pulse width): 1.5μs or more (at 200kHz) • t2 (phase difference between A and B): 0.75μs or more (at 200kHz) • t3 (overlap time): 0.7μs or more (at 200kHz) • t4 (rise/fall time): 0.75μs or less • PRESET (phase Z) input signal width: ON width 1.5μs or more, OFF width 30μs or more • DISABLE (start disabled) input signal width: ON width 100μs or more, OFF width 100μs or more		• T1 (pulse width): X□ to X□ + 5: 2.5μs or more X□ + 6, X□ + 7: 50μs or more • T2 (rise/fall time): X□ to X□ + 5: 1.25μs or less X□ + 6, X□ + 7: 25μs or less □: Start input number for each high-speed pulse input/output module		

Item		FX3U-2HC	FX5-16ET/ES-H	FX5-16ET/ESS-H	Compatibility
Count specifications	Counting range	- For 32-bit specification: -2147483648 to +2147483647 - For 16-bit specification: 0 to 65535 (upper limit can be specified by BFM #3, #2, #43, and #42)	- When ring length is not set: -2147483648 to +2147483647 - When ring length is set: 0 to 2147483647		○
	Type	Automatic up/down However, the counting direction is determined by the following command for the 1-phase 1-input counter. - H/W up/down: Up/down is counted by turning off or on of the phase A input terminal. - S/W up/down: Up/down is counted by the current value (K0/K1) of BFM #1 and #41.	Automatic up/down However, the counting direction is determined by the following command for the 1-phase 1-input counter. - H/W up/down: Up/down is counted by turning off or on of the phase B input terminal. - S/W up/down: Up/down is counted by the counting direction switching bit. For other modes available in a high-speed pulse input/output module, refer to the following.  iQ-F high-speed input/output function		○
Output specifications	Number of output points	4 points (2 points × 2 channels)	8 points		○
	Output type	Transistor output	Transistor output		○
	Output capacity	5 to 24VDC, 0.5A	5 to 30VDC, 1.6A/8 points common		○
	Coincidence output	When the current value of the counter matches the comparison setting value, the comparison output is set (turned on) within 30μs, and the value is cleared (turned off) within 100μs by the reset command.	Uses the coincidence output function in the high-speed comparison table. The coincidence output from the high-speed comparison table is possible only in the same module. The time from the pulse input through the count value comparison (match) to output to Y is 5μs + the input response time.		○

Reference manuals and sections

■FX3U-2HC

Item	Manual	Reference section
FX3U-2HC general specifications	 FX3U-2HC User's Manual	4.1 General Specifications
FX3U-2HC power supply specifications		4.2 Power Supply Specifications
FX3U-2HC performance specifications		4.3 Performance Specifications

■FX5-16ET/ES(S)-H

Item	Manual	Reference section
iQ-F general specifications	 MELSEC iQ-F FX5S/FX5UJ/FX5U/FX5UC User's Manual (Hardware)	Chapter 4 GENERAL SPECIFICATIONS
FX5-16ET/ES(S)-H performance specifications		6.5 High-Speed Pulse Input/Output Module
FX5-16ET/ES(S)-H power supply specifications	 MELSEC iQ-F FX5-16ET/ES(S)-H Hardware Manual	2.3 Power Supply Specification
FX5-16ET/ES(S)-H input specifications		2.4 Input Specification
FX5-16ET/ES(S)-H output specifications		2.5 Output Specification

Functional comparison

The following table lists the main function.

○: Compatible

Function	FX3U-2HC	FX5-16ET/ES(S)-H	Compatibility
32-bit counter	FX3U-2HC counter mode	iQ-F high-speed counter function	○
16-bit counter		iQ-F special relay high-speed input/output function	○
2-phase input counter (multiple of 1)		iQ-F high-speed counter (normal mode)	○
2-phase input counter (multiple of 2)			○
2-phase input counter (multiple of 4)			○
1-phase 2-input counter			○
1-phase 1-input counter (H/W up/down)			○
1-phase 1-input counter (S/W up/down)			○
PRESET function	FX3U-2HC preset data	iQ-F high-speed counter (normal mode) iQ-F special relay high-speed input/output function	○
DISABLE function	FX3U-2HC command		○
Comparison output	FX3U-2HC comparison status	iQ-F high-speed counter high-speed comparison table	○

Reference manuals and sections

■FX3U-2HC

Item	Manual	Reference section
FX3U-2HC counter mode	FX3U-2HC User's Manual	5.2.1 Counter mode
FX3U-2HC preset data		5.2.5 Preset data
FX3U-2HC command		5.2.4 Command
FX3U-2HC comparison status		5.2.9 Compare results

■FX5-16ET/ES(S)-H

Item	Manual	Reference section
iQ-F high-speed input/output function	MELSEC iQ-F FX5 User's Manual (Application)	Chapter 26 HIGH-SPEED INPUT/OUTPUT FUNCTION
iQ-F high-speed counter function		26.1 High-speed Counter Function
iQ-F special relay high-speed input/output function		APPENDIX 1 Special Relay List ⇒ High-speed input/output function
iQ-F high-speed counter (normal mode)		26.1 High-speed Counter Function ⇒ High-speed counter (normal mode)
iQ-F high-speed counter high-speed comparison table		26.1 High-speed Counter Function ⇒ High-speed comparison table

6.5 Replacement of FX5-2HC/ES High-Speed Counter Module

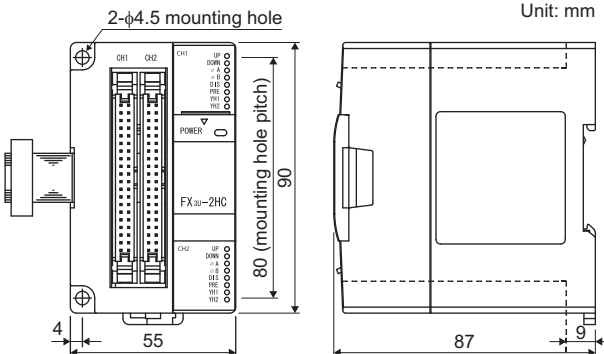
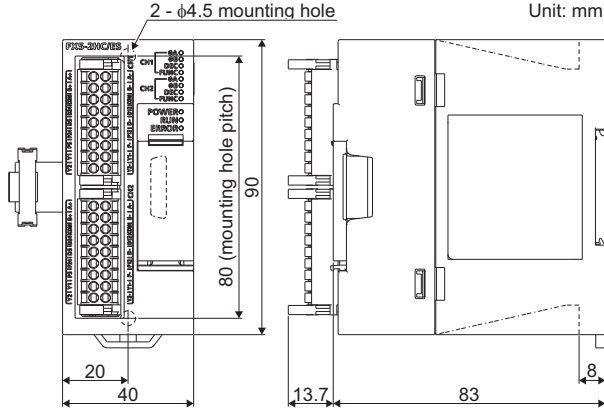
Precautions regarding the hardware

The following table lists the hardware differences between the FX3U-2HC and the FX5-2HC/ES.

Differences between the specifications

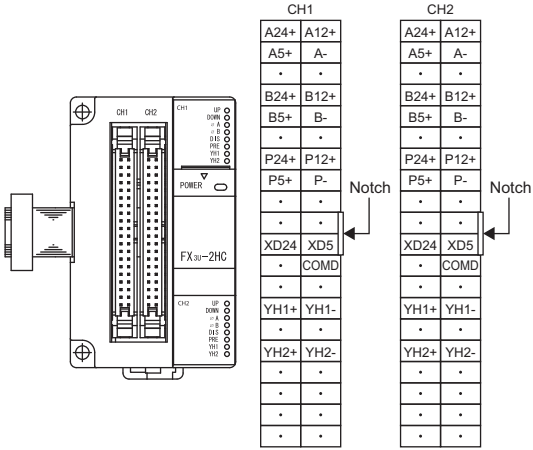
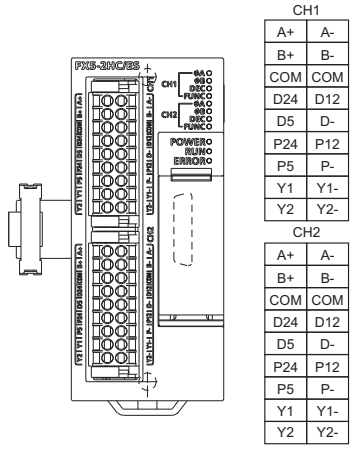
Item	Difference		Precautions
	FX3U-2HC	FX5-2HC/ES	
Optional when connected	The FX2NC-CNV-IF or FX3UC-1PS-5V is required for connecting to the FX3UC main module or FX2NC extension block.		—
Input signal voltage/current	[A24+] [B24+]	24VDC $\pm 10\%$, 8mA or lower	Since the phase A/phase B input is the differential line driver, check the specifications of the external devices when replacing the module.
	[A12+] [B12+]	12VDC $\pm 10\%$, 8mA or lower	
	[A5+] [B5+]	3.0 to 5.5VDC, 12.5mA or lower	
	[P24+]	24VDC $\pm 10\%$, 8mA or lower	
	[P12+]	12VDC $\pm 10\%$, 8mA or lower	
	[P5+]	3.0 to 5.5VDC, 12.5mA or lower	
	[XD24]	10.8 to 26.4VDC, 15mA or lower	
	—	—	
	[XD5]	5VDC $\pm 10\%$, 8mA or lower	
Terminal block type	40-pin (1-key) socket connectors compliant with MIL-C-83503	Spring clamp terminal block	Since the terminal block types differ, the wiring adjustment is required.

External dimensions

FX3U-2HC	FX5-2HC/ES
W × H × D (mm): 55 × 90 × 87 Weight: Approx. 0.2kg The module can be mounted on a 35mm-width DIN rail. The mounting holes are located at the left corner in the top and bottom of the module. 	W × H × D (mm): 40 × 90 × 83 Weight: Approx. 0.2kg The module can be mounted on a 35mm-width DIN rail. The mounting holes are located at the center in the top and bottom of the module. 

Wiring differences

The pitch of the holes for installation in a control panel differs between the FX3U-2HC and a substitute model. To install the module directly in a control panel, add installation holes. In addition, the terminal block cannot be replaced because their types are different. ( Page 78 External dimensions)

FX3U-2HC	FX5-2HC/ES																																																																												
 CH1 <table border="1"> <tr><td>A24+</td><td>A12+</td></tr> <tr><td>A5+</td><td>A-</td></tr> <tr><td>B24+</td><td>B12+</td></tr> <tr><td>B5+</td><td>B-</td></tr> <tr><td>P24+</td><td>P12+</td></tr> <tr><td>P5+</td><td>P-</td></tr> <tr><td>XD24</td><td>XD5</td></tr> <tr><td>COMD</td><td></td></tr> <tr><td>YH1+</td><td>YH1-</td></tr> <tr><td>YH2+</td><td>YH2-</td></tr> </table> CH2 <table border="1"> <tr><td>A24+</td><td>A12+</td></tr> <tr><td>A5+</td><td>A-</td></tr> <tr><td>B24+</td><td>B12+</td></tr> <tr><td>B5+</td><td>B-</td></tr> <tr><td>P24+</td><td>P12+</td></tr> <tr><td>P5+</td><td>P-</td></tr> <tr><td>XD24</td><td>XD5</td></tr> <tr><td>COMD</td><td></td></tr> <tr><td>YH1+</td><td>YH1-</td></tr> <tr><td>YH2+</td><td>YH2-</td></tr> </table> Notch Notch For wiring, use a 40-pin (1-key) socket connector compliant with MIL-C-83503.	A24+	A12+	A5+	A-	B24+	B12+	B5+	B-	P24+	P12+	P5+	P-	XD24	XD5	COMD		YH1+	YH1-	YH2+	YH2-	A24+	A12+	A5+	A-	B24+	B12+	B5+	B-	P24+	P12+	P5+	P-	XD24	XD5	COMD		YH1+	YH1-	YH2+	YH2-	 CH1 <table border="1"> <tr><td>A+</td><td>A-</td></tr> <tr><td>B+</td><td>B-</td></tr> <tr><td>COM</td><td>COM</td></tr> <tr><td>D24</td><td>D12</td></tr> <tr><td>D5</td><td>D-</td></tr> <tr><td>P24</td><td>P12</td></tr> <tr><td>P5</td><td>P-</td></tr> <tr><td>Y1</td><td>Y1-</td></tr> <tr><td>Y2</td><td>Y2-</td></tr> </table> CH2 <table border="1"> <tr><td>A+</td><td>A-</td></tr> <tr><td>B+</td><td>B-</td></tr> <tr><td>COM</td><td>COM</td></tr> <tr><td>D24</td><td>D12</td></tr> <tr><td>D5</td><td>D-</td></tr> <tr><td>P24</td><td>P12</td></tr> <tr><td>P5</td><td>P-</td></tr> <tr><td>Y1</td><td>Y1-</td></tr> <tr><td>Y2</td><td>Y2-</td></tr> </table> Replace the wiring with terminals compatible with spring clamp terminal blocks. For details on the wiring, refer to the following.  MELSEC iQ-F FX5 High-Speed Counter Module User's Manual	A+	A-	B+	B-	COM	COM	D24	D12	D5	D-	P24	P12	P5	P-	Y1	Y1-	Y2	Y2-	A+	A-	B+	B-	COM	COM	D24	D12	D5	D-	P24	P12	P5	P-	Y1	Y1-	Y2	Y2-
A24+	A12+																																																																												
A5+	A-																																																																												
B24+	B12+																																																																												
B5+	B-																																																																												
P24+	P12+																																																																												
P5+	P-																																																																												
XD24	XD5																																																																												
COMD																																																																													
YH1+	YH1-																																																																												
YH2+	YH2-																																																																												
A24+	A12+																																																																												
A5+	A-																																																																												
B24+	B12+																																																																												
B5+	B-																																																																												
P24+	P12+																																																																												
P5+	P-																																																																												
XD24	XD5																																																																												
COMD																																																																													
YH1+	YH1-																																																																												
YH2+	YH2-																																																																												
A+	A-																																																																												
B+	B-																																																																												
COM	COM																																																																												
D24	D12																																																																												
D5	D-																																																																												
P24	P12																																																																												
P5	P-																																																																												
Y1	Y1-																																																																												
Y2	Y2-																																																																												
A+	A-																																																																												
B+	B-																																																																												
COM	COM																																																																												
D24	D12																																																																												
D5	D-																																																																												
P24	P12																																																																												
P5	P-																																																																												
Y1	Y1-																																																																												
Y2	Y2-																																																																												

Power supply differences

Item	FX3U-2HC	FX5-2HC/ES	Precautions
Power requirements	5VDC, 245mA (internal power supply)	5VDC, 210mA (internal power supply)	—

Project conversion

For how to convert the FX3U/FX3UC project with an FX5 project, refer to the following.

☞ Page 132 Converting FX3 (GX Works2) Projects to FX5 (GX Works3) Projects

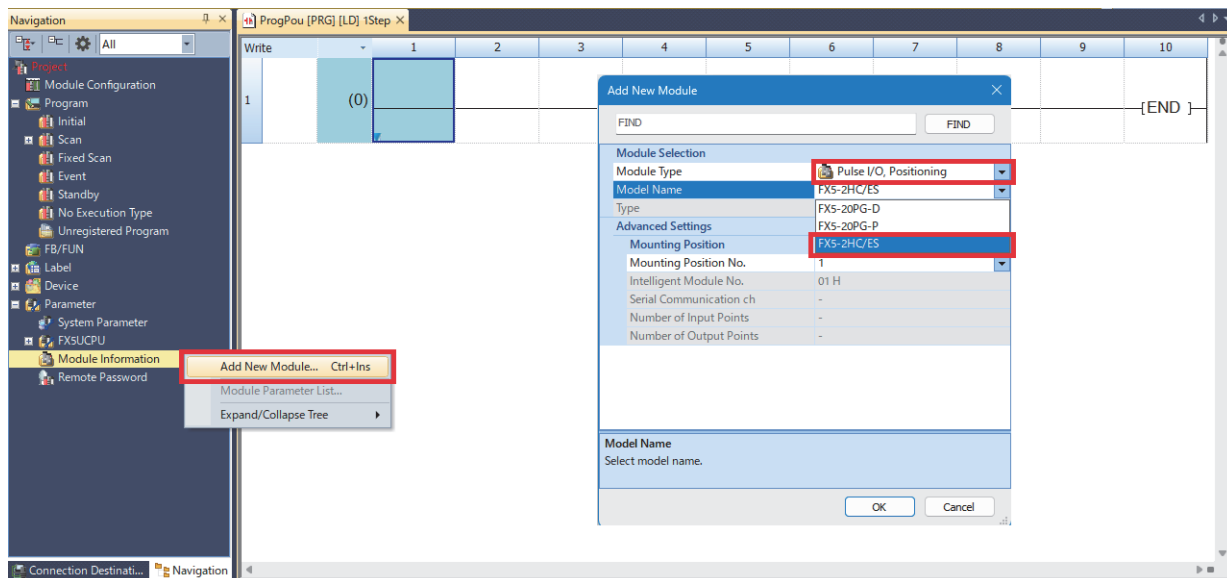
After converting the project into GX Works3, configure the parameters. In addition, modify the programs (instructions and devices) as required.

Parameter settings in GX Works3

The setting procedure for the FX5-2HC/ES parameters in GX Works3 is as follows.

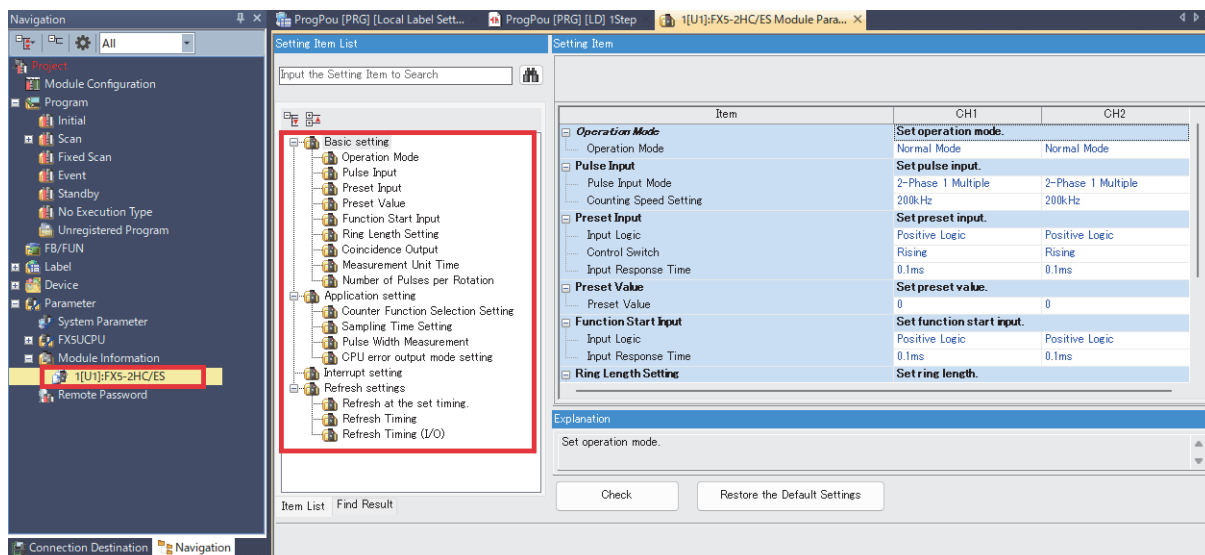
1. Add the module to the project.

☞ Navigation window ⇒ [Parameter] ⇒ Right-click [Module Information] ⇒ [Add New Module]
Module Type: [Pulse I/O, Positioning], Model Name: [FX5-2HC/ES]



2. Set the module parameters.

☞ Navigation window ⇒ [Parameter] ⇒ [Module Information] ⇒ Double-click [FX5-2HC/ES]



For details, refer to the chapter on the parameter settings in the following manual.

📖 MELSEC iQ-F FX5 High-Speed Counter Module User's Manual

Specifications comparison

The following table lists the specifications comparison.

General specifications

○: Compatible

Item		FX3U-2HC	FX5-2HC/ES	Compatibility
Withstand voltage	Between the power supply terminal and ground terminal	500VAC for one minute	500VAC for one minute	○
	Between the I/O terminal and ground terminal			
Insulation resistance		5MΩ or higher by a 500VDC insulation resistance tester	10MΩ or higher by a 500VDC insulation resistance tester	○

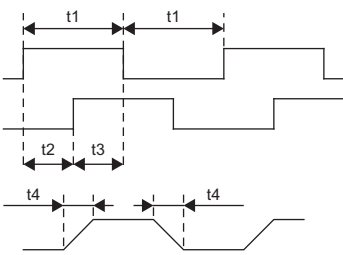
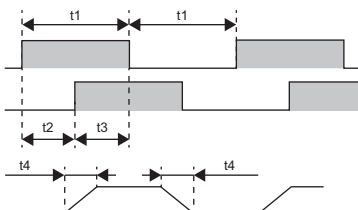
Power supply specifications

○: Compatible, —: Not available for the current models

Item	FX3U-2HC	FX5-2HC/ES	Compatibility
Drive power supply	5VDC 245mA (internal power supply)	5VDC, 210mA	○
Allowable instantaneous power failure time	Operation can be continued upon occurrence of an instantaneous power failure for 1ms or less.	—	—

Performance specifications

○: Compatible, △: Partially different, —: Not available for the current models

Item		FX3U-2HC		FX5-2HC/ES	Compatibility	
Input specifications	Number of input points	- Phase A, phase B: 4 points (2 points × 2 channels) - PRESET: 2 points (1 point × 2 channels) - DISABLE: 2 points (1 point × 2 channels)		- Differential input (phase A, phase B): 2 points (1 point × 2 channels) - PRESET input: 2 points (1 point × 2 channels) The number of connectable modules differs depending on the FX5UJ, FX5U, or FX5UC CPU modules. - FX5UJ CPU module: 8 maximum - FX5U CPU module: 15 maximum - FX5UC CPU module: 13 maximum	○	
	Input type	Sink: NPN open collector transistor Source: PNP open collector transistor Differential line driver		Differential line driver	△	
	Maximum response frequency	1-phase input	1 input: 200kHz 2 input: 200kHz		1 input: 2MHz 2 input: 2MHz	○
		2-phase input	Multiple of 1: 200kHz Multiple of 2: 100kHz Multiple of 4: 50kHz		Multiple of 1: 2MHz Multiple of 2: 1MHz Multiple of 4: 500kHz	○
Input voltage (per terminal)	Phase A, phase B	[A24+] [B24+]	24VDC ±10%, 8mA or lower		—	
		[A12+] [B12+]	12VDC ±10%, 8mA or lower			
		[A5+] [B5+]	3.0 to 5.5VDC, 12.5mA or lower			
	PRESET	[P24+]	24VDC ±10%, 8mA or lower		[P24]: 24VDC ±10%, current consumption 10mA or lower	○
		[P12+]	12VDC ±10%, 8mA or lower		[P12]: 12VDC ±10%, current consumption 10mA or lower	○
		[P5+]	3.0 to 5.5VDC, 12.5mA or lower		[P5] 2.4 to 5.5VDC, current consumption 25mA or lower	○
	DISABLE	[XD24]	10.8 to 26.4VDC, 15mA or lower		[D24]: 24VDC ±10%, current consumption 8mA or lower	○
		—			[D12]: 12VDC ±10%, current consumption 8mA or lower	—
		[XD5+]	5VDC ±10%, 8mA or lower		[D5]: 5VDC ±10%, current consumption 7mA or lower	○
	Pulse waveform					△
		- t1 (on/off pulse width): 1.5μs or more (at 200kHz) - t2 (phase difference between A and B): 0.75μs or more (at 200kHz) - t3 (overlap time): 0.7μs or more (at 200kHz) - t4 (rise/fall time): 0.75μs or less - PRESET (phase Z) input signal width: ON width 1.5μs or more, OFF width 30μs or more - DISABLE (start disabled) input signal width: ON width 100μs or more, OFF width 100μs or more		- t1 (on/off pulse width): 0.25μs or more - t2 (phase difference between A and B): 0.125μs or more - t3 (overlap time): 0.125μs or more - t4 (rise/fall time): 0.12μs or less - PRESET (phase Z) input signal width: ON width 1.5μs or more, OFF width 2.5μs or more - Function start input terminal: ON width 100μs or more, OFF width 100μs or more		

Item		FX3U-2HC	FX5-2HC/ES	Compatibility
Count specifications	Counting range	- For 32-bit specification: -2147483648 to +2147483647 - For 16-bit specification: 0 to 65535 (upper limit can be specified by BFM #3, #2, #43, and #42)	32-bit signed binary: -2147483648 to +2147483647	○
	Type	Automatic up/down However, the counting direction is determined by the following command for the 1-phase 1-input counter. - H/W up/down: Up/down is counted by turning off or on of the phase A input terminal. - S/W up/down: Up/down is counted by the current value (K0/K1) of BFM #1 and #41.	Automatic up/down However, the counting direction is determined by the following command for the 1-phase 1-input counter. - H/W up/down: Up/down is counted by turning off or on of the phase B input terminal. - S/W up/down: Up/down is counted by CH1 count direction switch (Un\G1).	○
Output specifications	Number of output points	4 points (2 points × 2 channels)	4 points (2 points × 2 channels)	○
	Output type	Transistor output	Transistor output	○
	Output capacity	5 to 24VDC, 0.5A	5 to 30VDC, 0.5A/point (resistive load)	○
	Coincidence output	When the current value of the counter matches the comparison setting value, the comparison output is set (turned on) within 30μs, and the value is cleared (turned off) within 100μs by the reset command.	- Comparison result: Setting value < count value, Setting value = count value, Setting value > count value, - Coincidence output response: Counting speed setting 2MHz: 3μs A value other than the counting speed setting above: (150/counting speed setting (kHz) + 3)μs	○

Reference manuals and sections

■FX3U-2HC

Item	Manual	Reference section
FX3U-2HC general specifications	 FX3U-2HC User's Manual	4.1 General Specifications
FX3U-2HC power supply specifications		4.2 Power Supply Specifications
FX3U-2HC performance specifications		4.3 Performance Specifications

■FX5-2HC/ES

Item	Manual	Reference section
FX5-2HC/ES generic specifications	 MELSEC iQ-F FX5-2HC/ES Hardware Manual	4.2 General Specifications
FX5-2HC/ES power supply specifications		4.3 Power Supply Specifications
FX5-2HC/ES performance specifications		4.4 Performance Specifications
FX5-2HC/ES Input/output specifications		4.5 Input/output Specifications
FX5-2HC/ES input specifications		4.5 Input/output Specifications ⇒ Input specifications
FX5-2HC/ES output specifications		4.5 Input/output Specifications ⇒ Output specifications
FX5-2HC/ES performance specifications	 MELSEC iQ-F FX5 High-Speed Counter Module User's Manual	2.3 Performance Specifications
FX5-2HC/ES counting specifications		2.4 Counting Specifications

Functional comparison

The following table lists the main function.

○: Compatible

Function	FX3U-2HC	FX5-2HC/ES	Compatibility
32-bit counter	☞ FX3U-2HC counter mode	☞ FX5-2HC/ES counter type selection	○
16-bit counter			○
2-phase input counter (multiple of 1)		☞ FX5-2HC/ES details of buffer memory areas	○
2-phase input counter (multiple of 2)			○
2-phase input counter (multiple of 4)			○
1-phase 2-input counter			○
1-phase 1-input counter (H/W up/down)			○
1-phase 1-input counter (S/W up/down)			○
PRESET function	☞ FX3U-2HC preset data		○
DISABLE function	☞ FX3U-2HC command	☞ FX5-2HC/ES counter function selection	○
Comparison output	☞ FX3U-2HC comparison status	☞ FX5-2HC/ES CH1/CH2 comparison status	○

Reference manuals and sections

■FX3U-2HC

Item	Manual	Reference section
FX3U-2HC counter mode	☞ FX3U-2HC User's Manual	5.2.1 Counter mode
FX3U-2HC preset data		5.2.5 Preset data
FX3U-2HC command		5.2.4 Command
FX3U-2HC comparison status		5.2.9 Compare results

■FX5-2HC/ES

Item	Manual	Reference section
FX5-2HC/ES counter type selection	☞ MELSEC iQ-F FX5 High-Speed Counter Module User's Manual	4.2 Selecting a Counter Type
FX5-2HC/ES counter function selection		4.5 Counter Function Selection
FX5-2HC/ES details of buffer memory areas		Appendix 3 Buffer Memory Areas ⇒ Details of buffer memory areas
FX5-2HC/ES CH1/CH2 comparison status		Appendix 3 Buffer Memory Areas ⇒ CH1/CH2 compare results

7 REPLACEMENT OF THE FX3U-1PG PULSE OUTPUT BLOCK

This chapter describes the replacement selection, specification differences, precautions, and replacement procedures when replacing the FX3U-1PG pulse output block with the MELSEC iQ-F series positioning function.

7.1 Overview of the MELSEC iQ-F Series Positioning Function

The MELSEC iQ-F features positioning functionality with CPU modules, high-speed pulse input/output modules (FX5-16ET/ES(S)-H), and positioning modules (FX5-20PG-P).

Since the specifications and functions of each product are different, check the following sections and consider replacing the modules.

7.2 Selection of Substitute Models

For the FX3U-1PG, the configuration can be replaced with the one specified below, as required.

Model	Configuration		Specifications comparison		
	CPU module (main module)	Intelligent module (extension module)	Maximum output frequency	Number of control axes	Configuration tool
Before replacement	FX3U	FX3U-1PG	200kHz	1 axis	GX Works2
Substitute model 1	FX5S	— (CPU module built-in positioning function)	100kpps	4 axes	GX Works3 ^{*2}
	FX5UJ		200kpps	3 axes	
	FX5U FX5UC		200kpps	4 axes	
Substitute model 2	FX5UJ FX5U FX5UC	FX5-16ET/ES-H ^{*1*3} FX5-16ET/ESS-H ^{*1*3}	200kpps	2 axes	
Substitute model 3	FX5UJ FX5U FX5UC	FX5-20PG-P ^{*1*4}	200kpps	2 axes	

*1 The FX5-CNV-IFC or FX5-C1PS-5V is required for connecting to the FX5UC CPU module.

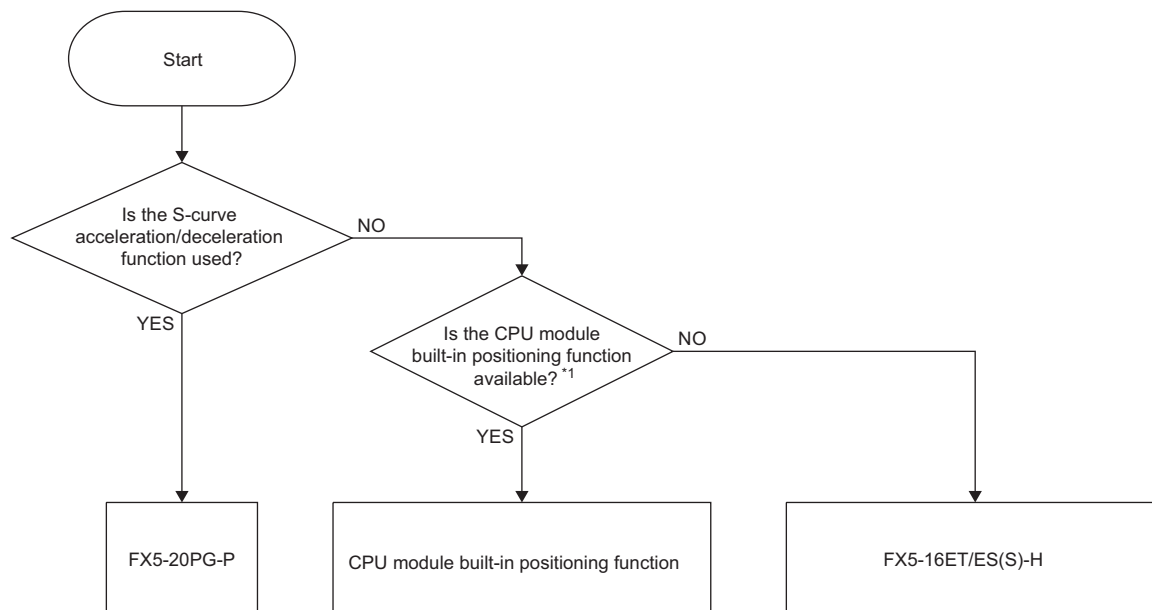
*2 The parameter settings and the buffer memory assignment cannot be replaced. Reconfiguration is required.

*3 Each module has 2 axes, and a maximum of 4 modules can be connected to the CPU module. Therefore, the total number of available axes in this configuration is 11 for the FX5UJ CPU module and 12 for the FX5U/FX5UC CPU module.

*4 Each module has 2 axes, and the maximum number of modules is 8 for the FX5UJ, 16 for the FX5U, and 15 for the FX5UC. Therefore, the total number of available axes in this configuration is 19 for the FX5UJ, 36 for the FX5U, and 34 for the FX5UC.

Selection flow

The following shows the selection flow.



*1 Available when all of the following conditions are met:

- The total number of axes is four or less.
- The number of points that can be used for positioning is reserved in the CPU module built-in I/O.

7.3 Replacement of the FX5 CPU Module Built-in Positioning

Precautions regarding the hardware

The main hardware differences between the FX3U-1PG and FX5 CPU module built-in positioning are as follows.

Main differences in the specifications

Item	Difference				Precautions	
	FX3U-1PG	FX5 CPU module built-in positioning				
		FX5S	FX5UJ	FX5U		FX5UC
Extended extension method	For extended extension, an optional extended extension cable (FX0N-65EC/ FX0N-30EC) and the FX2N-CNV-BC are required. Only one extended extension cable can be used for each system.	—			—	
Input signal current	STOP and DOG inputs: 7.0mA (24VDC) PG0 (zero point signal input): 20mA or lower (5 to 24VDC)	X0 to X7: 5.3mA/ 24VDC X10 or later: 4.0mA/24VDC	X0 to X7: 5.3mA/ 24VDC X10 or later: 4.0mA/24VDC	X0 to X17: 5.3mA/24VDC X20 or later: 4.0mA/24VDC	The input signal current value of the replacement module is lower than that of the module before replacement. Check the specifications of the external devices when replacing the module.	
Input response time (delay time of the hardware filter)	DOG input: 1ms STOP input: 4ms PG0 (zero point signal input): 4μs	• X0, X1, X3, X4 On: 5.0μs or less Off: 5.0μs or less • X2, X5 to X7 On: 30μs or less Off: 50μs or less • X10 to X17 On: 50μs or less Off: 150μs or less • X20 or later On: Approx. 10ms Off: Approx. 10ms		■For the FX5U-32M • X0 to X5 On: 2.5μs or less Off: 2.5μs or less • X6 to X17 On: 30μs or less Off: 50μs or less ■For the FX5U-64M and FX5U-80M • X0 to X7 On: 2.5μs or less Off: 2.5μs or less • X10 to X17 On: 30μs or less Off: 50μs or less • X20 or later On: 50μs or less Off: 150μs or less	■For the FX5UC-32M • X0 to X5 On: 2.5μs or less Off: 2.5μs or less • X6 to X17 On: 30μs or less Off: 50μs or less ■For the FX5UC-64M and FX5UC-96M • X0 to X7 On: 2.5μs or less Off: 2.5μs or less • X10 to X17 On: 30μs or less Off: 50μs or less • X20 or later On: 50μs or less Off: 150μs or less	Noise that was not detected by the FX3U/ FX3UC main module may be captured as an input. Take external measures against noise, or set an appropriate input response time parameter.

External dimensions

For details on when replacing the FX3U-1PG with a CPU module built-in positioning of the MELSEC iQ-F, refer to the following.

 Transition from MELSEC FX3 Series to MELSEC iQ-F Series Handbook

Wiring differences

For details on when replacing the FX3U-1PG with a CPU module built-in positioning of the MELSEC iQ-F, refer to the following.

 Transition from MELSEC FX3 Series to MELSEC iQ-F Series Handbook

Converting projects

For how to convert the FX3U/FX3UC project with an FX5 project, refer to the following.

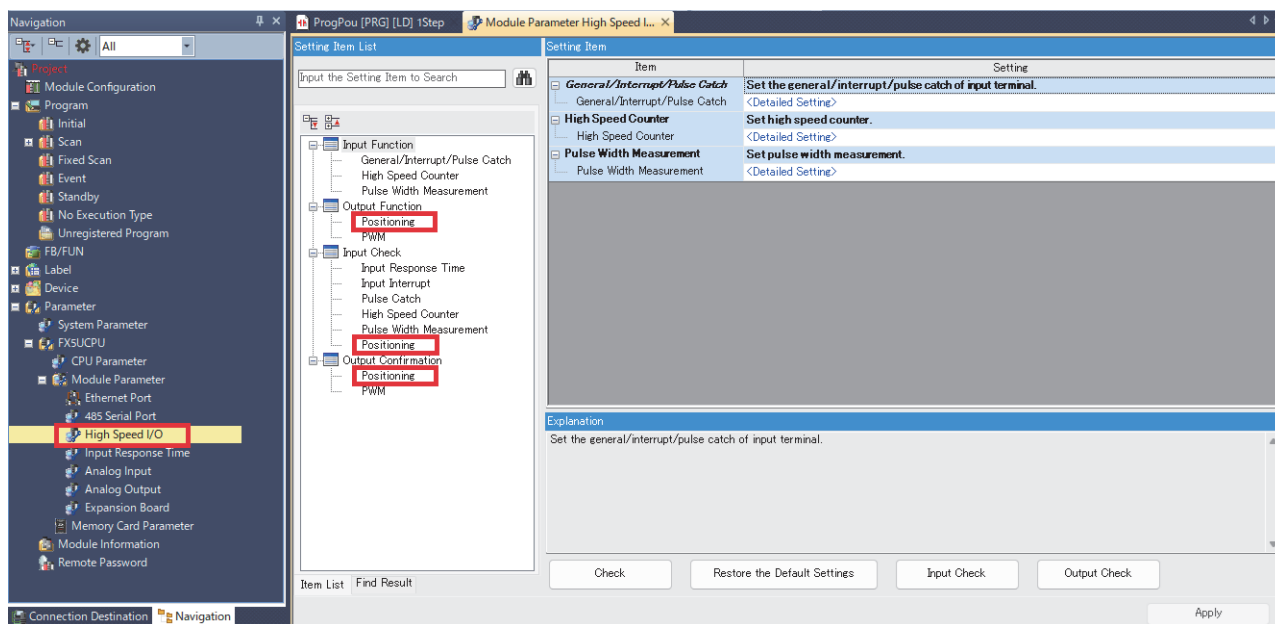
📖 Page 132 Converting FX3 (GX Works2) Projects to FX5 (GX Works3) Projects

After converting the project into GX Works3, configure the parameters. In addition, modify the programs (instructions and devices) as required.

Parameter settings in GX Works3

After converting the project into GX Works3, configure the settings shown below.

🖱️ Navigation window ⇒ [Parameter] ⇒ [FX5UCPU] ⇒ [Module Parameter] ⇒ Double-click [High Speed I/O]



For details on the programs and parameter settings for the CPU module replacement, refer to the following.

📖 Transition from MELSEC FX3 Series to MELSEC iQ-F Series Handbook

Specifications comparison

The following table lists the specification comparisons.

General specifications

○: Compatible

Item			FX3U-1PG	CPU module built-in positioning				Compatibility
				FX5S	FX5UJ	FX5U	FX5UC	
Withstand voltage	Between the power supply terminal (AC power supply) and ground terminal	AC power supply type module	—	1.5kVAC for one minute				○
	Between the power supply terminal (DC power supply) and ground terminal	DC power supply type module	500VAC for one minute	500VAC for one minute				
	Between the input terminal (24VDC) and ground terminal	Module with input circuit						
	Between the output terminal (transistor) and ground terminal	Module with transistor output circuit						
	Between 24VDC service power supply and ground terminal	Module with 24VDC service power supply	—	1.5kVAC for one minute				
	Between the output terminal (relay) and ground terminal	Module with relay output circuit						
Insulation resistance			5MΩ or higher by a 500VDC insulation resistance tester	10MΩ or higher by a 500VDC insulation resistance tester				

Power supply specifications

○: Compatible, —: Not available for the current models

Item		FX3U-1PG	CPU module built-in positioning				Compatibility
			FX5S	FX5UJ	FX5U	FX5UC	
Drive power supply	For input signal	24VDC ±10% Current consumption 40mA or lower	24VDC +20%, -15%				○
		X0 to X7: 5.1mA/24VDC X10 or later: 4.0mA/24VDC	X0 to X7: 5.3mA/24VDC X10 or later: 4.0mA/24VDC	X0 to X17: 5.3mA/24VDC X20 or later: 4.0mA/24VDC			
	For output signal	Pulse output: 5 to 24VDC, current consumption 35mA or lower CLR signal: 5 to 24VDC, current consumption 20mA or lower	Transistor output: 5 to 30VDC (external power supply)				○
	For internal control	5VDC, current consumption 150mA (internal power supply)	—				—

Performance specifications

○: Compatible, △: Partially different, —: Not available for the current models

Item		FX3U-1PG	CPU module built-in positioning				Compatibility
			FX5S	FX5UJ	FX5U	FX5UC	
Number of control axes		1 axis	4 axes ^{*1}	3 axes	4 axes ^{*1}		○
Positioning program		Created in sequence program (Using a method such as the FROM, TO, or MOV instruction to directly specify buffer memory addresses)	Created in sequence program Table operation (configurable in GX Works3) • When the positioning table data is written to a device: 100 data points/axis • When the positioning table data is not written to a device: 32 data points/axis				○
Positioning	Method	Increment, absolute	Increment, absolute				○
	Unit	• Motor system (PLS, Hz) • Machine system (μm, cm/min) • Machine system (10 ⁻⁴ inch, inch/min) • Machine system (mdeg, 10deg/min) • Combined system (μm, Hz) • Combined system (10 ⁻⁴ inch, Hz) • Combined system (mdeg, Hz)	Motor system, machine system, multiple system 0: Motor System (pulse, pps) 1: Machine System (μm, cm/min) 2: Machine system (10 ⁻⁴ inch, inch/min) 3: Machine System (mdeg, 10deg/min) 4: Multiple System (μm, pps) 5: Multiple system (10 ⁻⁴ inch, pps) 6: Multiple system (mdeg, pps)				○
	Unit magnification	1, 10, 100, 1000 times	1, 10, 100, 1000 times				○
	Range	-2147483648 to 2147483647	Number of pulses per rotation: 0 to 2147483647 Travel distance per rotation: 1 to 2147483647 Positioning range: -2147483648 to +2147483647 ^{*2}				○
	Output frequency	1Hz to 200kHz	1pps to 100kpps	1pps to 200kpps		○	
	Acceleration/ deceleration process	Trapezoidal acceleration/deceleration: 1 to 32767ms S-curve acceleration/deceleration: 1 to 5000ms	Trapezoidal acceleration/deceleration Acceleration time: 0 to 32767ms Deceleration time: 0 to 32767ms				△
	Startup time	Motor system: 1ms or less Mechanical: 2ms or less	When using the external start signal: 50μs or less	When using the external start signal: 50μs or less	When using the external start signal: 50μs or less		○
Number of occupied I/O points		8 points (can be used for either input or output)	—				—

*1 The number of control axes is two when the pulse output mode is CW/CCW mode.

*2 Set the number of output pulses per positioning operation to 2147483647 or less.

Input specifications

○: Compatible, △: Partially different, —: Not available for the current models

Item		FX3U-1PG	CPU module built-in positioning				Compatibility
			FX5S	FX5UJ	FX5U	FX5UC	
Input signal name	Group 1	STOP: Used for Deceleration stop input or interrupt input during External command positioning or Interrupt 2-speed positioning operation.	Stop command: Create a program that performs the following operations when the line-connected input is turned on. • Turn off the positioning instruction activation. • Turn on the pulse output stop command. • Turn on the pulse decelerate and stop command.				○
		DOG: Used for DOG input during DOG type mechanical zero return operation or interrupt input during External command positioning, Interrupt 1-speed positioning operation, Interrupt stop, or Interrupt 2-speed positioning operation.	Near-point signal (DOG): X0 to X17 can be assigned. Connect a line to the input specified in the parameter setting of GX Works3.				
	Group 2	PG0: Zero point signal input Used for DOG type mechanical zero return operation	Zero signal: X0 to X17 can be assigned. Connect a line to the input specified in the parameter setting of GX Works3.				○
	Group 1	Signal voltage	24VDC (power supplied from the S/S terminal)	24VDC +20%, -15%			
	Input current	7.0mA	X0 to X7: 5.1mA/24VDC X10 or later: 4.0mA/24VDC	X0 to X7: 5.3mA/24VDC X10 or later: 4.0mA/24VDC	X0 to X17: 5.3mA/24VDC X20 or later: 4.0mA/24VDC		○
	ON current	4.5mA or higher	X0 to X7: 3.5mA or higher X10 or later: 3.0mA or higher		X0 to X17: 3.5mA or higher X20 or later: 3.0mA or higher		○
	OFF current	1.5mA or lower	1.5mA or lower				○
	Signal type	No-voltage contact input • Sink input: NPN open collector transistor • Source input: PNP open collector transistor	No-voltage contact input • Sink input: NPN open collector transistor • Source input: PNP open collector transistor		FX5UC-□MT/D No-voltage contact input NPN open collector transistor		○
					FX5UC-□MT/DSS No-voltage contact input • Sink input: NPN open collector transistor • Source input: PNP open collector transistor		

Item		FX3U-1PG	CPU module built-in positioning				Compatibility
			FX5S	FX5UJ	FX5U	FX5UC	
Group 1	Response time	DOG input: 1ms STOP input: 4ms	Delay time of the hardware filter • X0, X1, X3, X4: On: 5.0μs or less Off: 5.0μs or less • X2, X5 to X7: On: 30μs or less Off: 50μs or less • X10 to X17: On: 50μs or less Off: 150μs or less • X20 and later: On: Approx. 10ms Off: Approx. 10ms	Delay time of the hardware filter • X0, X1, X3, X4: On: 5.0μs or less Off: 5.0μs or less • X2, X5 to X7: On: 30μs or less Off: 50μs or less X10 to X17: On: 50μs or less Off: 150μs or less X20 and later: On: Approx. 10ms Off: Approx. 10ms	Delay time of the hardware filter • FX5U-32MT/□ X0 to X5: • FX5U-64MT/□, FX5U-80MT/□ X0 to X7: On: 2.5μs or less Off: 2.5μs or less • FX5U-32MT/□ X6 to X17: • FX5U-64MT/□, FX5U-80MT/□ X10 to X17: On: 30μs or less Off: 50μs or less • FX5U-64MT/□, FX5U-80MT/□ X20 or later: On: 50μs or less Off: 150μs or less	Delay time of the hardware filter • FX5UC-32MT/□ X0 to X5: • FX5UC-64MT/□, FX5UC-96MT/□ X0 to X7: On: 2.5μs or less Off: 2.5μs or less • FX5UC-32MT/□ X6 to X17: • FX5UC-64MT/□, FX5UC-96MT/□ X10 to X17: On: 30μs or less Off: 50μs or less • FX5UC-64MT/□, FX5UC-96MT/□ X20 or later: On: 50μs or less Off: 150μs or less	—
			Digital filter setting value (X0 to X17 only): None, 10μs, 50μs, 0.1ms, 0.2ms, 0.4ms, 0.6ms, 1ms, 5ms, 10ms (default), 20ms, 70ms	Digital filter setting value: None, 10μs, 50μs, 0.1ms, 0.2ms, 0.4ms, 0.6ms, 1ms, 5ms, 10ms (initial values), 20ms, 70ms			
	Circuit insulation	Photo-coupler insulation	Photocoupler				○
	Operation display	LED ON at input ON	LED turns on when input is on.				○
	Group 2	Signal voltage	5 to 24VDC	Same as Group 1 input specifications			
Input current		20mA or lower	—				
ON current		4.0mA or higher	—				
OFF current		0.5mA or lower	—				
Signal type		NPN open collector transistor	○				
Response time		4μs or more	—				
Circuit insulation		Photo-coupler insulation	○				
Operation display		LED ON at input ON	○				

Output specifications

○: Compatible, —: Not available for the current models

Item		FX3U-1PG	CPU module built-in positioning				Compatibility
			FX5S	FX5UJ	FX5U	FX5UC	
Output signal name	Group 1	FP: Forward pulse or pulse train RP: Reverse pulse or direction signal	Pulse output destination: PULSE/CW Rotation direction signal: SIGN/CCW	Pulse output destination: PULSE Rotation direction signal: SIGN	Pulse output destination: PULSE/CW Rotation direction signal: SIGN/CCW		○
	Group 2	CLR: CLR signal	Clear signal				○
Group 1	Output form	Transistor	Transistor				○
	Output system	Forward (FP) and reverse (RP) pulse or pulse (PLS) with direction (DIR) can be selected.	PULSE/SIGN mode CW/CCW mode	PULSE/SIGN mode	PULSE/SIGN mode CW/CCW mode		○
	Output frequency	1Hz to 200kHz	1pps to 100kpps	1pps to 200kpps			○
	Rated load voltage	5 to 24VDC	5 to 30VDC				○
	Max. load current	20mA or lower	0.5A/point The total load current per common terminal should be the following value or less. • 3 output point common: 0.6A • 4 output point common: 0.8A		0.5A/point The total load current per common terminal should be the following value or less. • 4 output point common: 0.8A • 8 output point common: 1.6A	Y0 to Y3: 0.3A/point Y4 or later: 0.1A/point The total load current per common terminal should be 0.8A or less.*1	○
	V _{IN} current consumption	5 to 24VDC, 35mA or lower	—				—
	Output ON voltage	1.0V or lower	Y0 to Y3: 1.0V or lower Y4 or later: 1.5V or lower	Y0 to Y2: 1.0V or lower Y3 or later: 1.5V or lower	Y0 to Y3: 1.0V or lower Y4 or later: 1.5V or lower		○
	Operation display	LED ON at output ON	LED turns on when output is on.				○
Group 2	Output form	Transistor	Same as Group 1 output specifications				○
	Output system	Pulse (output pulse width: 20ms)					○
	Rated load voltage	5 to 24VDC					○
	Max. load current	20mA or lower					○
	Output ON voltage	1.5V or lower					○
	Operation display	LED ON at output ON					○

*1 When two COM■ (or +V■) terminals are connected outside the CPU module, the total load current will be 1.6A or lower.
■ represents any of 0, 1, or 2.

Reference manuals and sections

■FX3U-1PG

Item	Manual	Reference section
FX3U-1PG general specifications	 FX3U-1PG User's Manual	2.1 General Specifications
FX3U-1PG power supply specifications		2.2 Power Supply Specifications
FX3U-1PG performance specifications		2.3 Performance Specifications
FX3U-1PG input specifications		2.4 Input Specification
FX3U-1PG output specifications		2.5 Output Specifications

■FX5 CPU module built-in positioning

Item	Manual	Reference section
iQ-F General specifications	 MELSEC iQ-F FX5S/FX5UJ/FX5U/FX5UC User's Manual (Hardware)	Chapter 4 GENERAL SPECIFICATIONS
iQ-F CPU Power specifications		5.2 Power Supply Specifications
iQ-F CPU Performance specifications	 MELSEC iQ-F FX5 User's Manual (Application)	29.1 Performance Specifications
iQ-F CPU Input specifications		29.2 Input Specification
iQ-F CPU Output specifications		29.3 Output Specifications

Operation mode comparison

○: Compatible, △: Partially different

Function	FX3U-1PG	CPU module built-in positioning (FX5S/FX5UJ/FX5U/FX5UC)	Compatibility
1-speed positioning operation	FX3U-1PG 1-speed positioning operation	iQ-F CPU 1-speed Positioning Operation	○
Interrupt 1-speed positioning operation	FX3U-1PG interrupt 1-speed positioning operation	iQ-F CPU Interrupt 1-speed positioning	○
2-speed positioning operation	FX3U-1PG 2-speed positioning operation	iQ-F CPU 2-speed Positioning Operation	○
External command positioning operation	FX3U-1PG external command positioning operation	iQ-F CPU External Command Positioning Operation	△
Variable speed operation	FX3U-1PG variable speed operation	iQ-F CPU Variable speed operation	○
Interrupt stop operation	FX3U-1PG interrupt stop operation	iQ-F CPU Interrupt Stop Operation	○
Interrupt 2-speed positioning operation	FX3U-1PG interrupt 2-speed positioning operation	iQ-F CPU Interrupt 2-speed positioning	○

Reference manuals and sections

■FX3U-1PG

Item	Manual	Reference section
FX3U-1PG 1-speed positioning operation	FX3U-1PG User's Manual	9.2 1-speed Positioning Operation
FX3U-1PG interrupt 1-speed positioning operation		9.3 Interrupt 1-speed Positioning Operation
FX3U-1PG 2-speed positioning operation		9.4 2-speed Positioning Operation
FX3U-1PG external command positioning operation		9.5 External Command Positioning Operation
FX3U-1PG variable speed operation		9.6 Variable Speed Operation
FX3U-1PG interrupt stop operation		9.7 Interrupt Stop Operation
FX3U-1PG interrupt 2-speed positioning operation		9.8 Interrupt 2-speed Positioning Operation

■FX5 CPU module built-in positioning

Item	Manual	Reference section
iQ-F CPU 1-speed Positioning Operation	iMELSEC iQ-F FX5 User's Manual (Application)	30.3 Positioning Control ⇒ 1-speed positioning
iQ-F CPU Interrupt 1-speed positioning		30.3 Positioning Control ⇒ Interrupt 1-speed positioning
iQ-F CPU 2-speed Positioning Operation		30.3 Positioning Control ⇒ 2-speed positioning 32.9 Multiple-table Operation 32.10 Multiple-axis Table Operation
iQ-F CPU External Command Positioning Operation		30.3 Positioning Control ⇒ Interrupt 1-speed positioning
iQ-F CPU Variable speed operation		30.3 Positioning Control ⇒ Variable speed operation 31.2 Details of Parameters ⇒ Items related to speed ⇒ Acceleration Time
iQ-F CPU Interrupt Stop Operation		30.3 Positioning Control ⇒ Interrupt stop
iQ-F CPU Interrupt 2-speed positioning		30.3 Positioning Control ⇒ Interrupt 2-speed positioning

Functional comparison

○: Compatible, —: Not available for the current models

Function	FX3U-1PG	CPU module built-in positioning (FX5S/FX5UJ/FX5U/FX5UC)	Compatibility
Forward limit/reverse limit	FX3U-1PG forward limit/reverse limit	iQ-F CPU Forward limit and reverse limit	○
STOP command	FX3U-1PG STOP command	iQ-F CPU STOP command	○
Remaining distance operation	FX3U-1PG remaining distance operation	iQ-F CPU Remaining distance operation	○
Approximate S-shaped acceleration/deceleration function	FX3U-1PG approximate S-shaped Acceleration/Deceleration Function	—	—
Operation speed change function	FX3U-1PG operation speed change function	iQ-F CPU Operation speed change function	○
Target address change function	FX3U-1PG target address change function	iQ-F CPU Target address change function	○
Starting delay time	FX3U-1PG starting delay time	—	—

Reference manuals and sections

■FX3U-1PG

Item	Manual	Reference section
FX3U-1PG forward limit/reverse limit	FX3U-1PG User's Manual	6.4 Handling the Forward Limit and Reverse Limit
FX3U-1PG STOP command		6.5.1 Operation by the STOP command
FX3U-1PG remaining distance operation		6.5.2 Remaining distance operation
FX3U-1PG approximate S-shaped Acceleration/Deceleration Function		6.8 Approximate S-shaped Acceleration/Deceleration Function
FX3U-1PG operation speed change function		6.6 Operation Speed Change Function
FX3U-1PG target address change function		6.7 Target Address Change Function
FX3U-1PG starting delay time		7.4.1 [BFM#16] Starting delay time

■FX5 CPU module built-in positioning

Item	Manual	Reference section
iQ-F CPU Forward limit and reverse limit	MELSEC iQ-F FX5 User's Manual (Application)	30.4 Auxiliary Function ⇨ Forward limit and reverse limit
iQ-F CPU STOP command		32.1 Common Items ⇨ Pulse output stop
iQ-F CPU Remaining distance operation		30.4 Auxiliary Function ⇨ Remaining distance operation
iQ-F CPU Operation speed change function		30.4 Auxiliary Function ⇨ Command speed change during positioning operation
iQ-F CPU Target address change function		30.4 Auxiliary Function ⇨ Positioning address change during positioning operation

7.4 Replacement of the FX5-16ET/ES(S)-H High-Speed Pulse Input/Output Module

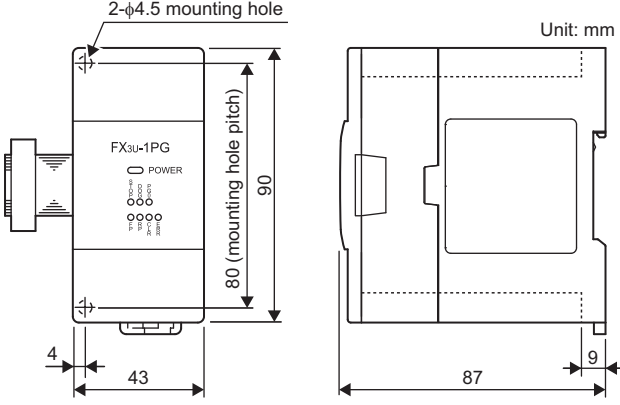
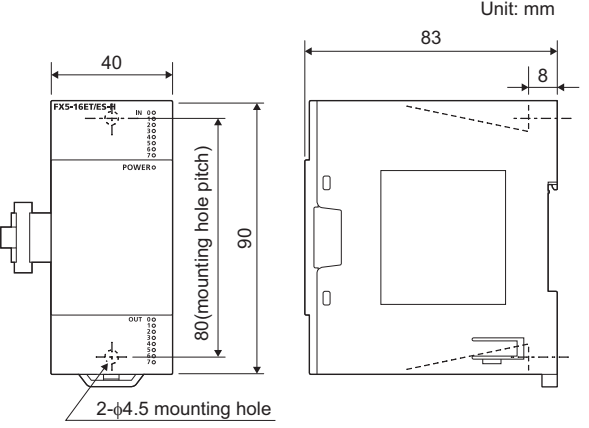
Precautions regarding the hardware

The main hardware differences between the FX3U-1PG and FX5-16ET/ES(S)-H are as follows.

Main differences in the specifications

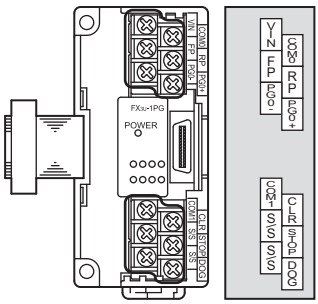
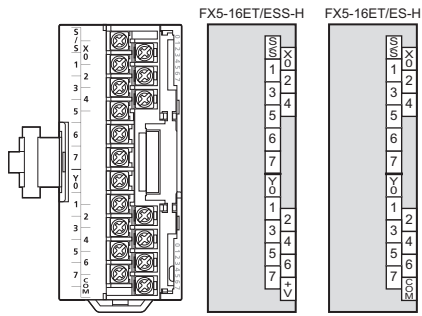
Item	Difference			Precautions
	FX3U-1PG	FX5-16ET/ES-H	FX5-16ET/ESS-H	
Optional when connected	The FX2NC-CNV-IF or FX3UC-1PS-5V is required for connecting to the FX3UC main module.	The FX5-CNV-IFC or FX5-C1PS-5V is required for connecting to the FX5UC CPU module.		—
Extended extension method	For extended extension, an optional extended extension cable (FX0N-65EC/FX0N-30EC) and the FX2N-CNV-BC are required. One extended extension cable can be used for each system.	For extended extension, an optional extended extension cable (FX5-65EC/FX5-30EC) and the connector conversion adapter (FX5-CNV-BC) are required. One extended extension cable can be used for each system.		—
Input signal current	STOP and DOG inputs: 7.0mA (24VDC) PG0 (zero point signal input): 20mA or lower (5 to 24VDC)	5.3mA/24VDC		The input signal current value of the replacement module is lower than that of the module before replacement. Check the specifications of the external devices when replacing the module.
Input response time (delay time of the hardware filter)	DOG input: 1ms STOP input: 4ms PG0 (zero point signal input): 4μs	X□ to X□+5: On: 2.5μs or less Off: 2.5μs or less X□+6, X□+7: On: 30μs or less Off: 50μs or less □: Start input number for each high-speed pulse input/output module		Noise that was not detected by the FX3U/FX3UC main module may be captured as an input. Take external measures against noise, or set an appropriate input response time parameter.

External dimensions

FX3U-1PG	FX5-16ET/ES(S)-H
W × H × D (mm): 43 × 90 × 87 Weight: Approx. 0.2kg The module can be mounted on a 35mm-width DIN rail. The mounting holes are located at the top-left and bottom-left corners of the module. 	W × H × D (mm): 40 × 90 × 83 Weight: Approx. 0.25kg The module can be mounted on a 35mm-width DIN rail. The mounting holes are located at the top-center and bottom-center of the module. 

Wiring differences

The terminal blocks and terminal layouts differ between the FX3U-1PG and the FX5-16ET/ES(S)-H.

FX3U-1PG	FX5-16ET/ES(S)-H
	
Terminal block connection (M3 screws)	Terminal block connection (M3 screws)

Power supply differences

Item	FX3U-1PG	FX5-16ET/ES(S)-H	Precautions
Power requirements	5VDC, current consumption 150mA Powered by a main module via an expansion cable	5VDC (powered by a CPU module via an expansion cable) 24VDC (24VDC service power supply or external power supply) Current consumption: 100mA/5VDC 125mA/24VDC (including the current of the input circuit)	When connecting an external 24VDC power supply, consider the current consumption of this module.

Converting projects

For how to convert the FX3U/FX3UC project with an FX5 project, refer to the following.

📖 Page 132 Converting FX3 (GX Works2) Projects to FX5 (GX Works3) Projects

After converting the project into GX Works3, configure the parameters. In addition, modify the programs (instructions and devices) as required.

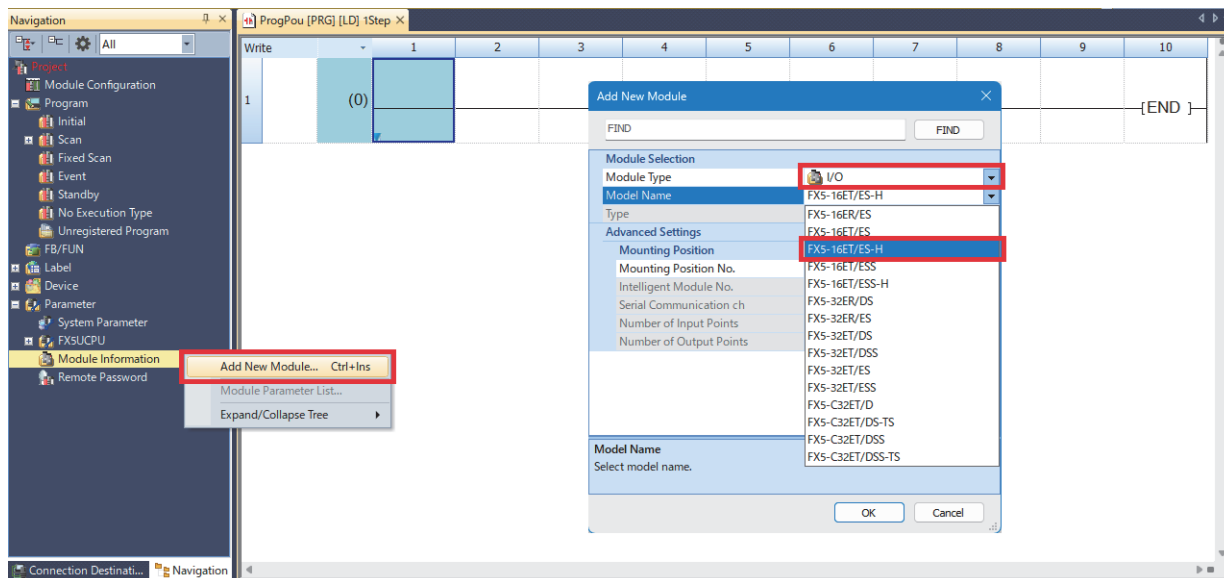
Parameter settings in GX Works3

The setting procedure for the FX5-16ET/ES-H parameters in GX Works3 is as follows.

1. Add the required modules to a project according to the CPU configuration.

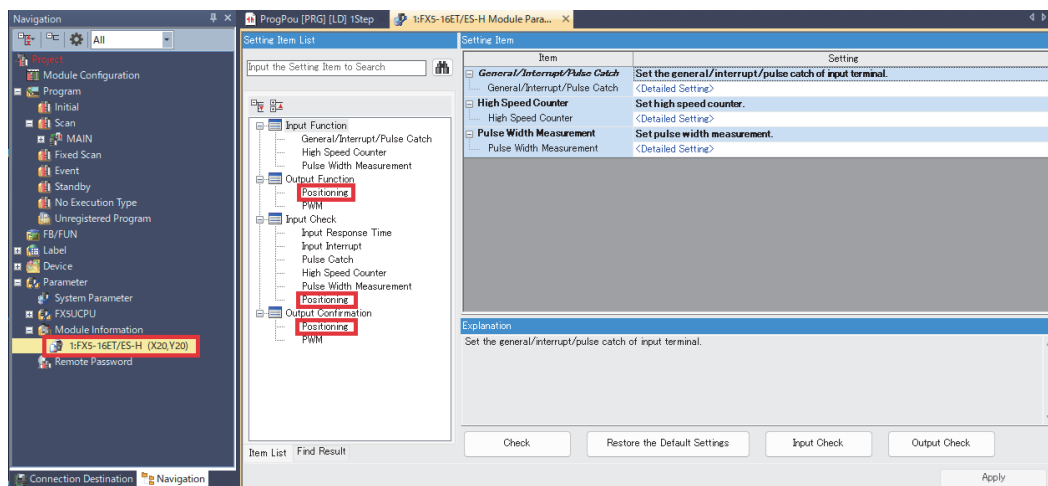
🖱️ Navigation window ⇒ [Parameter] ⇒ Right-click [Module Information] ⇒ [Add New Module]

Module Type: [I/O], Model Name: [FX5-16ET/ES-H]



2. Set the module parameters.

🖱️ Navigation window ⇒ [Parameter] ⇒ [Module Information] ⇒ Double-click [FX5-16ET/ES-H]



For details on the parameter settings, refer to the positioning parameters in the following manual.

📖 MELSEC iQ-F FX5 User's Manual (Application)



When using the FX5-16ET/ESS-H, select the FX5-16ET/ESS-H in the above procedure.

Specifications comparison

The following table lists the specification comparisons.

General specifications

○: Compatible

Item		FX3U-1PG	FX5-16ET/ES-H	FX5-16ET/ESS-H	Compatibility
Withstand voltage	Between power supply terminal (DC power supply) and ground terminal	500VAC for one minute	500VAC for one minute		○
	Between I/O terminal and ground terminal				
Insulation resistance		5MΩ or higher by a 500VDC insulation resistance tester	10MΩ or higher by a 500VDC insulation resistance tester		○

Power supply specifications

○: Compatible, △: Partially different

Item		FX3U-1PG	FX5-16ET/ES-H	FX5-16ET/ESS-H	Compatibility
Drive power supply	For input signal	24VDC ±10% Current consumption 40mA or lower	24VDC +20%/-15% Input signal current: 5.3mA/24VDC		○
	For output signal	Pulse output: 5 to 24VDC, current consumption 35mA or lower CLR signal: 5 to 24VDC, current consumption 20mA or lower	External power supply: Transistor output: 5 to 30VDC Maximum load: 1.6A/8 point common		○
	For internal control	5VDC, current consumption 150mA (internal power supply)	5VDC (internal power supply) 24VDC (24VDC service power supply or external power supply) Current consumption: 100mA/5VDC 125mA/24VDC (including the current of the input circuit)		△

Performance specifications

○: Compatible, △: Partially different

Item		FX3U-1PG	FX5-16ET/ES-H	FX5-16ET/ESS-H	Compatibility
Number of control axes		1 axis	2 axes, up to 4 modules can be connected		○
Positioning program		Created in sequence program (Using a method such as the FROM, TO, or MOV instruction to directly specify buffer memory addresses)	Created in sequence program Table operation (configurable in GX Works3) • When the positioning table data is written to a device: 100 data points/axis		○
Positioning	Method	Increment, absolute	Increment, absolute		○
	Unit	• Motor system (PLS, Hz) • Machine system (μm, cm/min) • Machine system (10⁻⁴ inch, inch/min) • Machine system (mdeg, 10deg/min) • Combined system (μm, Hz) • Combined system (10⁻⁴inch, Hz) • Combined system (mdeg, Hz)	Motor system, machine system, multiple system 0: Motor System (pulse, pps) 1: Machine System (μm, cm/min) 2: Machine System (0.0001 inch, inch/min) 3: Machine System (mdeg, 10deg/min) 4: Multiple System (μm, pps) 5: Multiple System (0.0001 inch, pps) 6: Multiple system (mdeg, pps)		○
	Unit magnification	1, 10, 100, 1000 times	1, 10, 100, 1000 times		○
	Range	-2147483648 to 2147483647	Number of pulses per rotation: 0 to 2147483647 Travel distance per rotation: 1 to 2147483647 Positioning range: -2147483648 to +2147483647*1		○
	Output frequency	1Hz to 200kHz	1pps to 200kpps		○
	Acceleration/ deceleration process	Trapezoidal acceleration/deceleration: 1 to 32767ms S-curve acceleration/deceleration: 1 to 5000ms	Trapezoidal acceleration/deceleration Acceleration time: 0 to 32767ms Deceleration time: 0 to 32767ms		△
	Startup time	Motor system: 1ms or less Mechanical: 2ms or less	When using the external start signal: 300μs or less		○
Number of occupied I/O points		8 points (count of either input or output, whichever is desired)	16 points		○

*1 Set the number of output pulses per positioning operation to 2147483647 or less.

Input specifications

○: Compatible, △: Partially different, —: Not available for the current models

Item		FX3U-1PG	FX5-16ET/ES-H	FX5-16ET/ESS-H	Compatibility
Input signal name	Group 1	STOP: Used for Deceleration stop input or interrupt input during External command positioning or Interrupt 2-speed positioning operation. DOG: Used for DOG input during DOG type mechanical zero return operation or interrupt input during External command positioning, Interrupt 1-speed positioning operation, Interrupt stop, or Interrupt 2-speed positioning operation.	Stop command*¹ Create a program that performs the following operations when the line-connected input is turned on. • Turn off the positioning instruction activation. • Turn on the pulse output stop command. • Turn on the pulse decelerate and stop command. Near-point signal (DOG)*¹ All input points can be assigned to all axes. Connect a line to the input specified in the parameter setting of GX Works3.		○
	Group 2	PG0: Zero point signal input Used for DOG type mechanical zero return operation	Zero signal: Connect a line to fixed assignment input in each module. The inputs that have not been assigned to a function by the GX Works3 parameter can be used as general-purpose inputs.		○
Group 1	Signal voltage	24VDC (power supplied from the S/S terminal)	24VDC +20%, -15%		○
	Input current	7.0mA	5.3mA/24VDC		○
	ON current	4.5mA or higher	3.5mA or higher		○
	OFF current	1.5mA or lower	1.5mA or lower		○
	Signal type	No-voltage contact input • Sink input: NPN open collector transistor • Source input: PNP open collector transistor	No-voltage contact input • Sink input: NPN open collector transistor • Source input: PNP open collector transistor		○
	Response time	DOG input: 1ms STOP input: 4ms	• Delay time of the hardware filter X□ to X□ +5 On: 2.5μs or less Off: 2.5μs or less X□ +6, X□ +7 On: 30μs or less Off: 50μs or less • Digital filter setting value: None, 10μs, 50μs, 0.1ms, 0.2ms, 0.4ms, 0.6ms, 1ms, 5ms, 10ms (initial values), 20ms, 70ms		—
	Circuit insulation	Photo-coupler insulation	Photocoupler		○
	Operation display	LED ON at input ON	LED turns on when input is on.		○
Group 2	Signal voltage	5 to 24VDC	Same as Group 1 input specifications		△
	Input current	20mA or lower			—
	ON current	4.0mA or higher			—
	OFF current	0.5mA or lower			—
	Signal type	NPN open collector transistor			○
	Response time	4μs or more			—
	Circuit insulation	Photo-coupler insulation			○
	Operation display	LED ON at input ON			○

*1 CPU module inputs can also be used.

Output specifications

○: Compatible, —: Not available for the current models

Item		FX3U-1PG	FX5-16ET/ES-H	FX5-16ET/ESS-H	Compatibility
Output signal name	Group 1	FP: Forward pulse or pulse train RP: Reverse pulse or direction signal	Pulse output destination: PULSE/CW Rotation direction signal: SIGN/CCW		○
	Group 2	CLR: CLR signal	Clear signal		○
Group 1	Output form	Transistor	Transistor/sink output	Transistor/source output	○
	Output system	Forward (FP) and reverse (RP) pulse or pulse (PLS) with direction (DIR) can be selected.	PULSE/SIGN mode CW/CCW mode		○
	Output frequency	1Hz to 200kHz	1pps to 200kpps		○
	Rated load voltage	5 to 24VDC	5 to 30VDC		○
	Max. load current	20mA or lower	1.6A/8 point common		—
	V _{IN} current consumption	5 to 24VDC, 35mA or lower	—		—
	Output ON voltage	1.0V or lower	Y□, Y□ +1, Y□ +4, Y□ +5: 1.0V or lower Y□ +2, Y□ +3, Y□ +6, Y□ +7: 1.5V or lower		○
	Operation display	LED ON at output ON	LED turns on when output is on.		○
	Operation display	LED ON at output ON	LED turns on when output is on.		○
Group 2	Output form	Transistor	Same as Group 1 output specifications		○
	Output system	Pulse (output pulse width: 20ms)			○
	Rated load voltage	5 to 24VDC			○
	Max. load current	20mA or lower			—
	Output ON voltage	1.5V or lower			○
	Operation display	LED ON at output ON			○

7

Reference manuals and sections

■FX3U-1PG

Item	Manual	Reference section
FX3U-1PG general specifications	MELSEC iQ-F FX3U-1PG User's Manual	2.1 General Specifications
FX3U-1PG power supply specifications		2.2 Power Supply Specifications
FX3U-1PG performance specifications		2.3 Performance Specifications
FX3U-1PG input specifications		2.4 Input Specification
FX3U-1PG output specifications		2.5 Output Specifications

■FX5-16ET/ES(S)-H

Item	Manual	Reference section
FX5-16ET/ES(S)-H general specifications	MELSEC iQ-F FX5S/FX5UJ/FX5U/FX5UC User's Manual (Hardware)	Chapter 4 GENERAL SPECIFICATIONS
FX5-16ET/ES(S)-H performance specifications		6.5 High-Speed Pulse Input/Output Module
FX5-16ET/ES(S)-H power supply specifications	MELSEC iQ-F FX5-16ET/ES(S)-H Hardware Manual	2.3 Power Supply Specifications
FX5-16ET/ES(S)-H input specifications		2.4 Input Specification
FX5-16ET/ES(S)-H output specifications		2.5 Output Specifications

Operation mode comparison

○: Compatible, △: Partially different

Function	FX3U-1PG	FX5-16ET/ES-H, FX5-16ET/ESS-H	Compatibility
1-speed positioning operation	FX3U-1PG 1-speed positioning operation	FX5-16ET/ES(S)-H 1-speed positioning operation	○
Interrupt 1-speed positioning operation	FX3U-1PG interrupt 1-speed positioning operation	FX5-16ET/ES(S)-H interrupt 1-speed positioning operation	○
2-speed positioning operation	FX3U-1PG 2-speed positioning operation	FX5-16ET/ES(S)-H 2-speed positioning operation	○
External command positioning operation	FX3U-1PG external command positioning operation	FX5-16ET/ES(S)-H external command positioning operation	△
Variable speed operation	FX3U-1PG variable speed operation	FX5-16ET/ES(S)-H variable speed operation	○
Interrupt stop operation	FX3U-1PG interrupt stop operation	FX5-16ET/ES(S)-H interrupt stop operation	○
Interrupt 2-speed positioning operation	FX3U-1PG interrupt 2-speed positioning operation	The interrupt 2-speed operation is enabled by performing the interrupt 1-speed positioning operation and the command speed change during positioning operation.	△

Reference manuals and sections

■FX3U-1PG

Item	Manual	Reference section
FX3U-1PG 1-speed positioning operation	FX3U-1PG User's Manual	9.2 1-speed Positioning Operation
FX3U-1PG interrupt 1-speed positioning operation		9.3 Interrupt 1-speed Positioning Operation
FX3U-1PG 2-speed positioning operation		9.4 2-speed Positioning Operation
FX3U-1PG external command positioning operation		9.5 External Command Positioning Operation
FX3U-1PG variable speed operation		9.6 Variable Speed Operation
FX3U-1PG interrupt stop operation		9.7 Interrupt Stop Operation
FX3U-1PG interrupt 2-speed positioning operation		9.8 Interrupt 2-speed Positioning Operation

■FX5-16ET/ES(S)-H

Item	Manual	Reference section
FX5-16ET/ES(S)-H 1-speed positioning operation	MELSEC iQ-F FX5 User's Manual (Application)	30.3 Positioning Control ⇒ 1-speed positioning
FX5-16ET/ES(S)-H interrupt 1-speed positioning operation		30.3 Positioning Control ⇒ Interrupt 1-speed positioning
FX5-16ET/ES(S)-H 2-speed positioning operation		30.3 Positioning Control ⇒ 2-speed positioning 32.9 Multiple-table Operation 32.10 Multiple-axis Table Operation
FX5-16ET/ES(S)-H external command positioning operation		30.3 Positioning Control ⇒ Interrupt 1-speed positioning
FX5-16ET/ES(S)-H variable speed operation		30.3 Positioning Control ⇒ Variable speed operation 31.2 Details of Parameters ⇒ Items related to speed ⇒ Acceleration Time
FX5-16ET/ES(S)-H interrupt stop operation		30.3 Positioning Control ⇒ Interrupt stop

Functional comparison

○: Compatible, —: Not available for the current models

Function	FX3U-1PG	High-speed pulse input/output module FX5-16ET/ES-H, FX5-16ET/ESS-H	Compatibility
Forward limit/reverse limit	FX3U-1PG forward limit/reverse limit	FX5-16ET/ES(S)-H forward limit/reverse limit	○
STOP command	FX3U-1PG STOP command	FX5-16ET/ES(S)-H STOP command	○
Remaining distance operation	FX3U-1PG remaining distance operation	FX5-16ET/ES(S)-H remaining distance operation	○
Approximate S-shaped acceleration/deceleration function	FX3U-1PG approximate S-shaped Acceleration/Deceleration Function	—	—
Operation speed change function	FX3U-1PG operation speed change function	FX5-16ET/ES(S)-H operation speed change function	○
Target address change function	FX3U-1PG target address change function	FX5-16ET/ES(S)-H target address change function	○
Starting delay time	FX3U-1PG starting delay time	—	—

Reference manuals and sections

■FX3U-1PG

Item	Manual	Reference section
FX3U-1PG forward limit/reverse limit	FX3U-1PG User's Manual	6.4 Handling the Forward Limit and Reverse Limit
FX3U-1PG STOP command		6.5.1 Operation by the STOP command
FX3U-1PG remaining distance operation		6.5.2 Remaining distance operation
FX3U-1PG approximate S-shaped Acceleration/Deceleration Function		6.8 Approximate S-shaped Acceleration/Deceleration Function
FX3U-1PG operation speed change function		6.6 Operation Speed Change Function
FX3U-1PG target address change function		6.7 Target Address Change Function
FX3U-1PG starting delay time		7.4.1 [BFM#16] Starting delay time

■FX5-16ET/ES(S)-H

Item	Manual	Reference section
FX5-16ET/ES(S)-H forward limit/reverse limit	MELSEC iQ-F FX5 User's Manual (Application)	30.4 Auxiliary Function ⇒ Forward limit and reverse limit
FX5-16ET/ES(S)-H STOP command		32.1 Common Items ⇒ Pulse output stop
FX5-16ET/ES(S)-H remaining distance operation		30.4 Auxiliary Function ⇒ Remaining distance operation
FX5-16ET/ES(S)-H operation speed change function		30.4 Auxiliary Function ⇒ Command speed change during positioning operation
FX5-16ET/ES(S)-H target address change function		30.4 Auxiliary Function ⇒ Positioning address change during positioning operation

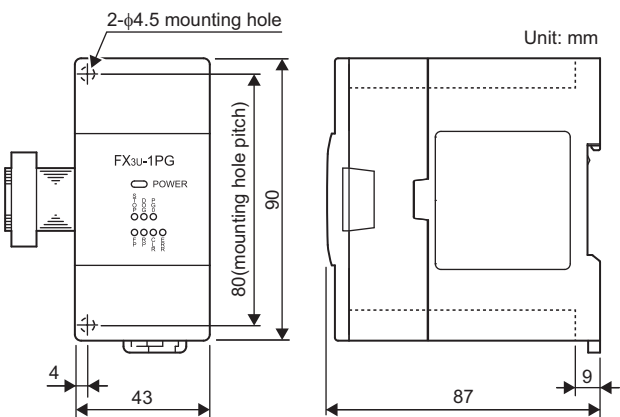
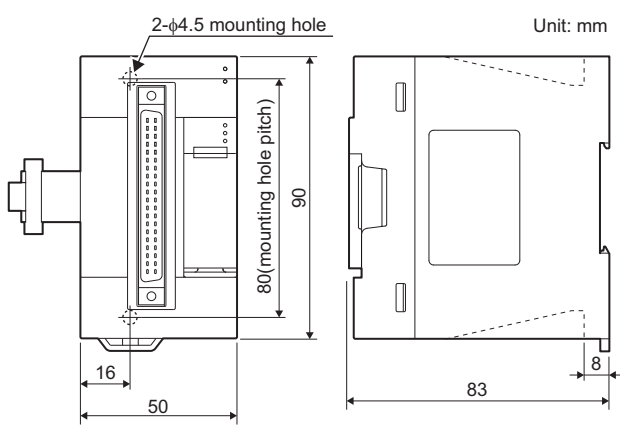
7.5 Replacement of the FX5-20PG-P-H 2-Axis Pulse Train Positioning Module

Precautions regarding the hardware

Main differences in the specifications

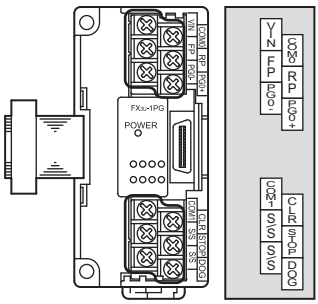
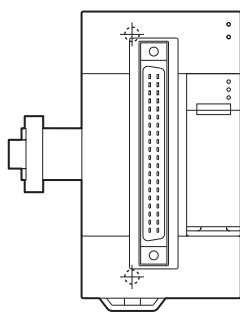
Item	Difference		Precautions
	FX3U-1PG	FX5-20PG-P	
Optional when connected	The FX2NC-CNV-IF or FX3UC-1PS-5V is required for connecting to the FX3UC main module.	The FX5-CNV-IFC or FX5-C1PS-5V is required for connecting to the FX5UC CPU module.	—
Extended extension method	For extended extension, an optional extended extension cable (FX0N-65EC/FX0N-30EC) and the FX2N-CNV-BC are required. One extended extension cable can be used for each system.	For extended extension, an optional extended extension cable (FX5-65EC/FX5-30EC) and the connector conversion adapter (FX5-CNV-BC) are required. One extended extension cable can be used for each system.	—
Input signal current	STOP and DOG inputs: 7.0mA (24VDC) PG0 (zero point signal input): 20mA or lower (5 to 24VDC)	5mA/24VDC	The input signal current value of the replacement module is lower than that of the module before replacement. Check the specifications of the external devices when replacing the module.
Input response time (delay time of the hardware filter)	DOG input: 1ms STOP input: 4ms PG0 (zero point signal input): 4μs	Zero point signal, DOG: 1ms or less READY, STOP, FLS, RLS signals: 4ms or less External command signal (CHG): 20μs	—
Terminal block type	M3 screw terminal block	40-pin external connector	Select the required 40-pin connectors as described in the user's manual.

External dimensions

FX3U-1PG	FX5-20PG-P
W × H × D (mm): 43 × 90 × 87 Weight: Approx. 0.2kg The module can be mounted on a 35mm-width DIN rail. The mounting holes are located at the top-left and bottom-left corners of the module. 	W × H × D (mm): 50 × 90 × 83 Weight: Approx. 0.2kg The module can be mounted on a 35mm-width DIN rail. The mounting hole is located on the left side of the 40-pin connectors. 

Wiring differences

The terminal blocks and terminal layouts differ between the FX3U-1PG and the FX5-20PG-P.

FX3U-1PG	FX5-20PG-P																																								
 Terminal block connection (M3 screws)	 40-pin external connector <table border="1"> <tr><td>B20</td><td>A20</td></tr> <tr><td>B19</td><td>A19</td></tr> <tr><td>B18</td><td>A18</td></tr> <tr><td>B17</td><td>A17</td></tr> <tr><td>B16</td><td>A16</td></tr> <tr><td>B15</td><td>A15</td></tr> <tr><td>B14</td><td>A14</td></tr> <tr><td>B13</td><td>A13</td></tr> <tr><td>B12</td><td>A12</td></tr> <tr><td>B11</td><td>A11</td></tr> <tr><td>B10</td><td>A10</td></tr> <tr><td>B9</td><td>A9</td></tr> <tr><td>B8</td><td>A8</td></tr> <tr><td>B7</td><td>A7</td></tr> <tr><td>B6</td><td>A6</td></tr> <tr><td>B5</td><td>A5</td></tr> <tr><td>B4</td><td>A4</td></tr> <tr><td>B3</td><td>A3</td></tr> <tr><td>B2</td><td>A2</td></tr> <tr><td>B1</td><td>A1</td></tr> </table>	B20	A20	B19	A19	B18	A18	B17	A17	B16	A16	B15	A15	B14	A14	B13	A13	B12	A12	B11	A11	B10	A10	B9	A9	B8	A8	B7	A7	B6	A6	B5	A5	B4	A4	B3	A3	B2	A2	B1	A1
B20	A20																																								
B19	A19																																								
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B5	A5																																								
B4	A4																																								
B3	A3																																								
B2	A2																																								
B1	A1																																								

Prepare dedicated cables and connectors for the FX5-20PG-P. For the connector types, refer to the following table.

Type	Model	Applicable wiring			
		Size	Type	Material	Temperature rating
Soldering type connector (Straight type)	A6CON1 ^{*1}	0.088 to 0.3mm ² (28 to 22 AWG)	Strand wire	Copper wire	80°C or more
Crimping type connector (Straight type)	A6CON2	0.088 to 0.24mm ² (28 to 24 AWG)			
Soldering type connector Dual purpose (straight/oblique) type	A6CON4 ^{*1}	0.088 to 0.3mm ² (28 to 22 AWG)			

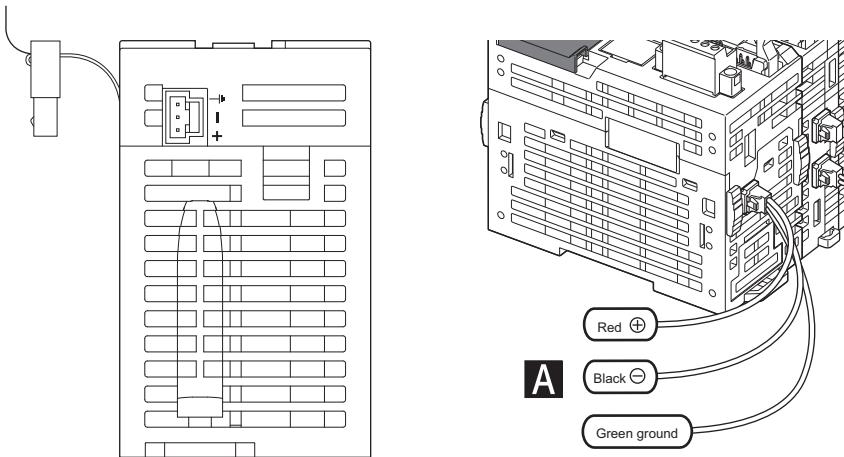
^{*1} When using 40 pins, use wires with a sheath outside diameter of 1.3mm or less. Select a wire that matches the current value to be used. For details on the connector wiring, refer to the following.

 MELSEC iQ-F FX5 Positioning Module User's Manual

Power supply differences

Item	FX3U-1PG	FX5-20PG-P
Power requirements	5VDC, current consumption 150mA Powered by a main module via an expansion cable	External power supply 24VDC Current consumption 120mA For details on the external power supply, refer to the following figure.*1
Power cable requirements	The cable used for the power supply (for VIN and COM0 signals) must be 30m or less.	FX2NC-100MPCB power supply cable (1m, three-wire cable)

*1 For details on the connection method of the external power supply, refer to the following figure. Use the FX2NC-100MPCB connector shown in [A].



Precautions when converting the projects

For how to convert the FX3U/FX3UC project with an FX5 project, refer to the following.

☞ Page 132 Converting FX3 (GX Works2) Projects to FX5 (GX Works3) Projects

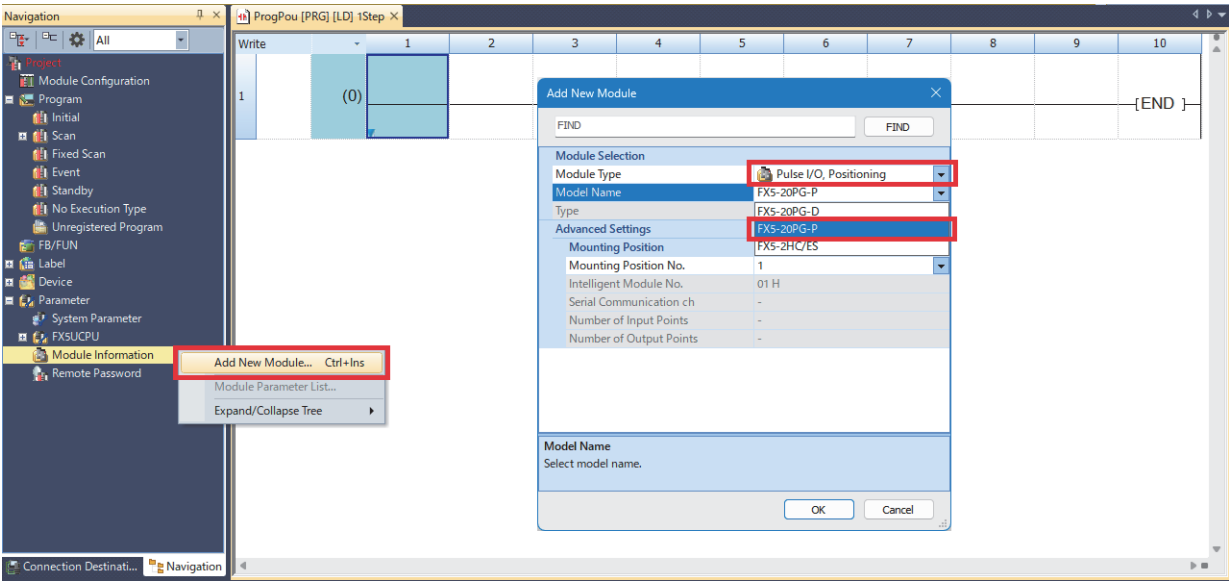
After converting the project into GX Works3, configure the parameters. In addition, modify the programs (instructions and devices) as required.

Parameter settings in GX Works3

The following shows the procedures for setting the FX5-20PG-P parameters using GX Works3.

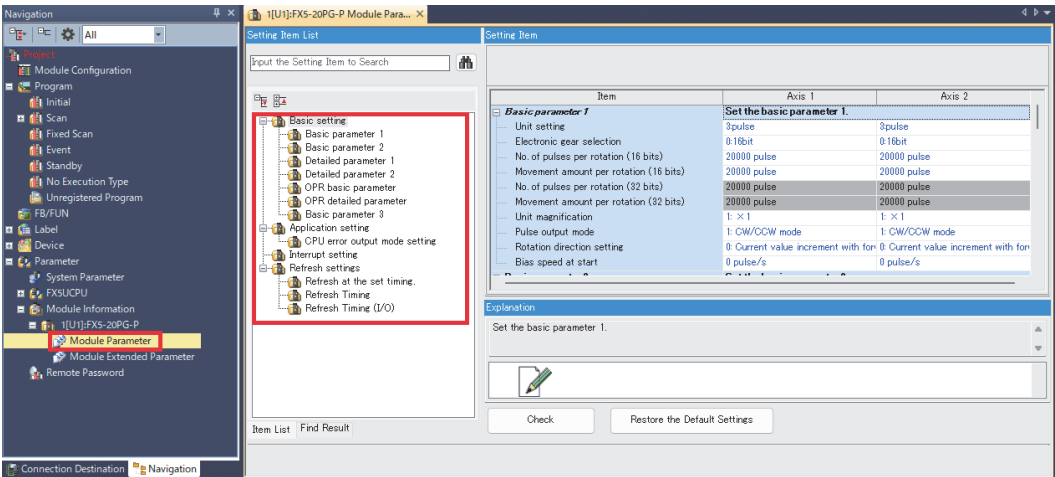
1. Add the module to the project.

☞ Navigation window ⇒ [Parameter] ⇒ Right-click [Module Information] ⇒ [Add New Module]
Module Type: [Pulse I/O, Positioning], Model Name: [FX5-20PG-P]



2. Set the module parameters.

☞ Navigation window ⇒ [Parameter] ⇒ [Module Information] ⇒ [FX5-20PG-P] ⇒ Double-click [Module Parameter]



For details, refer to the chapter on the parameter settings in the following manual.

☞ MELSEC iQ-F FX5 Positioning Module User's Manual

Specifications comparison

The following table lists the specification comparisons.

General specifications

○: Compatible

Item		FX3U-1PG	FX5-20PG-P	Compatibility
Withstand voltage	Between power supply terminal and ground terminal	500VAC for one minute	500VAC for one minute	○
	Between I/O terminal and ground terminal			
Insulation resistance		5MΩ or higher by a 500VDC insulation resistance tester	10MΩ or higher by a 500VDC insulation resistance tester	○

Power supply specifications

○: Compatible, ×: Incompatible

Item		FX3U-1PG	FX5-20PG-P	Compatibility
Drive power supply	For input signal	24VDC ±10% Current consumption 40mA or lower	Since the voltage and the current consumption of input signals vary depending on the signal, refer to "I/O signals electrical specifications ⇒ Input specifications" in the following manual. MELSEC iQ-F FX5 Positioning Module User's Manual	○
	For output signal	Pulse output: 5 to 24VDC, current consumption 35mA or lower CLR signal: 5 to 24VDC, current consumption 20mA or lower	Since the voltage and the current consumption of output signals vary depending on the signal, refer to "I/O signals electrical specifications ⇒ Output specifications" in the following manual. MELSEC iQ-F FX5 Positioning Module User's Manual	○
	For internal control	5VDC, current consumption 150mA (internal power supply)	External power supply 24VDC +20%, -15% Current consumption 120mA	×

Performance specifications

○: Compatible, —: Not available for the current models

Item		FX3U-1PG	FX5-20PG-P	Compatibility
Number of control axes		1 axis	2 axes The number of connectable modules differs depending on the FX5UJ, FX5U, or FX5UC CPU modules. • FX5UJ: 8 maximum • FX5U: 16 maximum • FX5UC: 15 maximum	○
Positioning program		Created in sequence program (Using a method such as the FROM, TO, or MOV instruction to directly specify buffer memory addresses)	Created in sequence program Use either labels and general-purpose function blocks (configurable in GX Works3) or direct specification of the buffer memory. • Positioning data: 600 data/axis	○
Positioning	Method	Increment, absolute	Increment, absolute	○
	Unit	• Motor system (PLS, Hz) • Machine system (μm, cm/min) • Machine system (10⁻⁴ inch, inch/min) • Machine system (mdeg, 10deg/min) • Combined system (μm, Hz) • Combined system (10⁻⁴inch, Hz) • Combined system (mdeg, Hz)	mm, inch, degree, pulse	○
	Unit magnification	1, 10, 100, 1000 times	—	—
	Range	-2147483648 to 2147483647	■ In absolute system • -214748364.8 to 214748364.7μm • -21474.83648 to 21474.83647 inch • 0 to 359.99999 degree • -2147483648 to 2147483647 pulse ■ In incremental system • -214748364.8 to 214748364.7μm • -21474.83648 to 21474.83647 inch • -21474.83648 to 21474.83647 degree • -2147483648 to 2147483647 pulse ■ In speed-position switching control (INC mode)/position-speed switching control • 0 to 214748364.7μm • 0 to 21474.83647 inch • 0 to 21474.83647 degree • 0 to 2147483647 pulse ■ In speed-position switching mode (ABS control)*1 • 0 to 359.99999 degree	○
	Output frequency	1Hz to 200kHz	1pps to 200kpps	○
	Acceleration/deceleration process	Trapezoidal acceleration/deceleration: 1 to 32767ms S-curve acceleration/deceleration: 1 to 5000ms	Trapezoidal acceleration/deceleration, S-curve acceleration/deceleration Acceleration/deceleration time: 1 to 8388608ms (Four patterns can be set for both acceleration and deceleration time.)	○
	Startup time	Motor system: 1ms or less Mechanical: 2ms or less	1-axis linear control: 0.5ms*2 1-axis speed control: 0.5ms*2	○
Number of occupied I/O points		8 points (count of either input or output, whichever is desired)	8 points	○

*1 The speed-position switching control (ABS mode) can only be used with "degree" for the control unit.

*2 The analysis time of the positioning data varies depending on the operation status of the partner axis. This manual describes the startup time and operating timing when operations of all axes are stopped.

Input specifications

○: Compatible, △: Partially different

Item		FX3U-1PG	FX5-20PG-P	Compatibility
Input signal name	Group 1	STOP: Used for Deceleration stop input or interrupt input during External command positioning or Interrupt 2-speed positioning operation.	Drive unit READY (READY) Stop signal (STOP) Upper limit signal (FLS) Lower limit signal (RLS)	○
		DOG: Used for DOG input during DOG type mechanical zero return operation or interrupt input during External command positioning, Interrupt 1-speed positioning operation, Interrupt stop, or Interrupt 2-speed positioning operation.	Near-point dog signal (DOG)	
	Group 2	PG0: Zero point signal input Used for DOG type mechanical zero return operation	Zero signal (PG05/PG024)	○
Group 1	Signal voltage	24VDC (power supplied from the S/S terminal)	24VDC	○
	Input current	7.0mA	5mA	○
	ON current	4.5mA or higher	17.5VDC or higher, 3.5mA or higher	○
	OFF current	1.5mA or lower	7VDC or lower/1.7mA or lower	△
	Signal type	No-voltage contact input • Sink input: NPN open collector transistor • Source input: PNP open collector transistor	No-voltage contact input • Sink input: NPN open collector transistor • Source input: PNP open collector transistor	○
	Response time	DOG input: 1ms STOP input: 4ms	1ms or less (DOG) 4ms or less (STOP)	△
	Circuit insulation	Photo-coupler insulation	Photocoupler	○
	Operation display	LED ON at input ON	No LED display (can be checked in the buffer memory)	△
Group 2	Signal voltage	5 to 24VDC	(PG05) 5VDC (PG024) 24VDC	○
	Input current	20mA or lower	5mA	△
	ON current	4.0mA or higher	(PG05) 2VDC or higher/2mA or higher (PG024) 10VDC or higher/3mA or higher	△
	OFF current	0.5mA or lower	(PG05) 0.5VDC or lower/0.5mA or lower (PG024) 3VDC or lower/0.2mA or lower	△
	Signal type	NPN open collector transistor	NPN open collector transistor	○
	Response time	4μs or more	1ms or less	△
	Circuit insulation	Photo-coupler insulation	Photocoupler	○
	Operation display	LED ON at input ON	No LED display (can be checked in the buffer memory)	△

Output specifications

○: Compatible, △: Partially different, —: Not available for the current models

Item		FX3U-1PG	FX5-20PG-P	Compatibility
Output signal name	Group 1	FP: Forward pulse or pulse train RP: Reverse pulse or direction signal	Pulse output (PULSE F) Pulse output (PULSE R)	○
	Group 2	CLR: CLR signal	Deviation counter clear (CLEAR)	○
Group 1	Output form	Transistor	Transistor	○
	Output system	Forward (FP) and reverse (RP) pulse or pulse (PLS) with direction (DIR) can be selected.	PULSE/SIGN mode, CW/CCW mode, phase and B (multiple of 4), phase A and B (multiple of 1)	○
	Output frequency	1Hz to 200kHz	1pps to 200kpps	○
	Rated load voltage	5 to 24VDC	5 to 24VDC	○
	Max. load current	20mA or lower	50mA	△
	V _{IN} current consumption	5 to 24VDC, 35mA or lower	—	—
	Output ON voltage	1.0V or lower	1.0V or lower	○
	Operation display	LED ON at output ON	No LED display (can be checked in the buffer memory)	△
Group 2	Output form	Transistor	Transistor	○
	Output system	Pulse (output pulse width: 20ms)	Pulse	○
	Rated load voltage	5 to 24VDC	5 to 24VDC	○
	Max. load current	20mA or lower	100mA	—
	Output ON voltage	1.5V or lower	1.5V or lower	○
	Operation display	LED ON at output ON	No LED display (can be checked in the buffer memory)	△

Reference manuals and sections

■FX3U-1PG

Item	Manual	Reference section
FX3U-1PG general specifications	 FX3U-1PG User's Manual	2.1 General Specifications
FX3U-1PG power supply specifications		2.2 Power Supply Specifications
FX3U-1PG performance specifications		2.3 Performance Specifications
FX3U-1PG input specifications		2.4 Input Specification
FX3U-1PG output specifications		2.5 Output Specifications

■FX5-20PG-P

Item	Manual	Reference section
FX5-20PG-P general specifications	 MELSEC iQ-F FX5 Positioning Module User's Manual	2.1 General Specifications
FX5-20PG-P power supply specifications		2.2 Power Supply Specifications
		2.4 External Device I/O Interface Specifications ⇨ I/O signals electrical specifications
FX5-20PG-P performance specifications		2.3 Performance Specifications
FX5-20PG-P input specifications		2.4 External Device Output Interface Specifications ⇨ I/O signals electrical specifications ⇨ Input specifications
FX5-20PG-P output specifications		2.4 External Device Output Interface Specifications ⇨ I/O signals electrical specifications ⇨ Output specifications

Operation mode comparison

○: Compatible, △: Partially different, —: Not available for the current models

Function	FX3U-1PG	FX5-20PG-P	Compatibility
1-speed positioning operation	FX3U-1PG 1-speed positioning operation	FX5-20PG-P 1-axis linear control	○
Interrupt 1-speed positioning operation	FX3U-1PG interrupt 1-speed positioning operation	FX5-20PG-P position-speed switching control	○
2-speed positioning operation	FX3U-1PG 2-speed positioning operation	FX5-20PG-P continuous path control	○
External command positioning operation	FX3U-1PG external command positioning operation	FX5-20PG-P speed-position switching control (INC mode)	△
Variable speed operation	FX3U-1PG variable speed operation	FX5-20PG-P speed control	○
Interrupt stop operation	FX3U-1PG interrupt stop operation	—	—
Interrupt 2-speed positioning operation	FX3U-1PG interrupt 2-speed positioning operation	On the FX5-20PG-P, the interrupt 2-speed operation is enabled using the speed position switching control and speed change function.	△

Reference manuals and sections

■FX3U-1PG

Item	Manual	Reference section
FX3U-1PG 1-speed positioning operation	FX3U-1PG User's Manual	9.2 1-speed Positioning Operation
FX3U-1PG interrupt 1-speed positioning operation		9.3 Interrupt 1-speed Positioning Operation
FX3U-1PG 2-speed positioning operation		9.4 2-speed Positioning Operation
FX3U-1PG external command positioning operation		9.5 External Command Positioning Operation
FX3U-1PG variable speed operation		9.6 Variable Speed Operation
FX3U-1PG interrupt stop operation		9.7 Interrupt Stop Operation
FX3U-1PG interrupt 2-speed positioning operation		9.8 Interrupt 2-speed Positioning Operation

■FX5-20PG-P

Item	Manual	Reference section
FX5-20PG-P 1-axis linear control	iMELSEC iQ-F FX5 Positioning Module User's Manual	9.2 Positioning Data Settings ⇒ 1-axis linear control
FX5-20PG-P position-speed switching control		9.2 Positioning Data Settings ⇒ Position-speed switching control
FX5-20PG-P continuous path control		9.1 Overview of the Major Positioning Controls ⇒ Operation pattern of major positioning control ⇒ Continuous path control
FX5-20PG-P speed-position switching control (INC mode)		9.2 Positioning Data Settings ⇒ Speed-position switching control (INC mode)
FX5-20PG-P speed control		9.2 Positioning Data Settings ⇒ Speed control 17.2 List of Buffer Memory Addresses

Functional comparison

○: Compatible, △: Partially different

Function	FX3U-1PG	FX5-20PG-P	Compatibility
Forward limit/reverse limit	FX3U-1PG forward limit/reverse limit	FX5-20PG-P hardware stroke limit function	○
STOP command	FX3U-1PG STOP command	Page 107 Wiring differences FX5-20PG-P axis stop signal	○
Remaining distance operation	FX3U-1PG remaining distance operation	FX5-20PG-P restart	○
Approximate S-shaped acceleration/deceleration function	FX3U-1PG approximate S-shaped Acceleration/Deceleration Function	FX5-20PG-P acceleration/deceleration processing function	○
Operation speed change function	FX3U-1PG operation speed change function	FX5-20PG-P speed change function	○
Target address change function	FX3U-1PG target address change function	FX5-20PG-P target position change function	○
Starting delay time	FX3U-1PG starting delay time	FX5-20PG-P start time adjustment function	△

Reference manuals and sections

■FX3U-1PG

Item	Manual	Reference section
FX3U-1PG forward limit/reverse limit	FX3U-1PG User's Manual	6.4 Handling the Forward Limit and Reverse Limit
FX3U-1PG STOP command		6.5.1 Operation by the STOP command
FX3U-1PG remaining distance operation		6.5.2 Remaining distance operation
FX3U-1PG approximate S-shaped Acceleration/Deceleration Function		6.8 Approximate S-shaped Acceleration/Deceleration Function
FX3U-1PG operation speed change function		6.6 Operation Speed Change Function
FX3U-1PG target address change function		6.7 Target Address Change Function
FX3U-1PG starting delay time		7.4.1 [BFM#16] Starting delay time

■FX5-20PG-P

Item	Manual	Reference section
FX5-20PG-P hardware stroke limit function	MELSEC iQ-F FX5 Positioning Module User's Manual	12.4 Function to Limit Control ⇒ Hardware stroke limit function
FX5-20PG-P axis stop signal		12.8 Function Related to Stop 16.3 Details of Output Signals ⇒ Axis stop signal
FX5-20PG-P restart		7.3 Restarting
FX5-20PG-P acceleration/deceleration processing function		12.9 Other Functions ⇒ Acceleration/deceleration processing function
FX5-20PG-P speed change function		12.5 Functions that Change Control Details ⇒ Speed change function
FX5-20PG-P target position change function		12.5 Functions that Change Control Details ⇒ Target position change function
FX5-20PG-P start time adjustment function		12.6 Function Related to Start ⇒ Start time adjustment function 17.3 Basic Setting ⇒ Detailed parameter 2 ⇒ Start adjustment time

8 REPLACEMENT OF THE FX3U-20SSC-H POSITIONING BLOCK

This chapter describes the specification differences, precautions, and replacement procedures when replacing the FX3U-20SSC-H positioning block with the MELSEC iQ-F series Simple Motion module.

8.1 Overview of the MELSEC iQ-F Series Simple Motion Module

With the Simple Motion module (FX5-40SSC-S), motion control by SSCNET Ⅲ/H can be performed for up to four axes per module.

With the Simple Motion module (FX5-80SSC-S), motion control by SSCNET Ⅲ/H can be performed for up to eight axes per module.

8.2 Substitute Models

The FX3U-20SSC-H can be replaced according to the details described below.

Item	Configuration		Specifications comparison			
	CPU module (main module)	Intelligent module (extension module)	Network	Number of control axes (per module)	Maximum number of control axes (Maximum number of connectable modules)	Configuration tool
Before replacement	FX3U	FX3U-20SSC-H	SSCNETⅢ	2 axes	16 axes (When connected with 8 modules)	GX Works2
After replacement	FX5UJ FX5U FX5UC	FX5-40SSC-S	SSCNETⅢ/H	4 axes	16 axes ^{*1} (When connected with 4 modules)	GX Works3 ^{*2}
		FX5-80SSC-S		8 axes	32 axes ^{*1} (When connected with 4 modules)	

*1 When the FX5UJ CPU module is used, one module per system can be connected.

When the FX5U CPU module is used, up to 16 modules per system can be connected.

When the FX5UC CPU module is used, up to 15 modules per system can be connected.

*2 The parameter settings and the buffer memory assignment cannot be replaced. Reconfiguration is required.

8.3 Replacement with the FX5-40SSC-S and FX5-80SSC-S

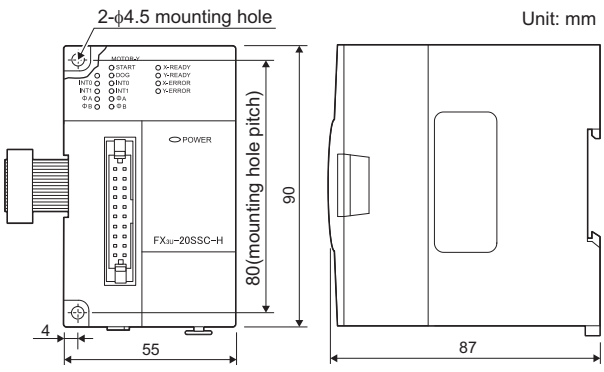
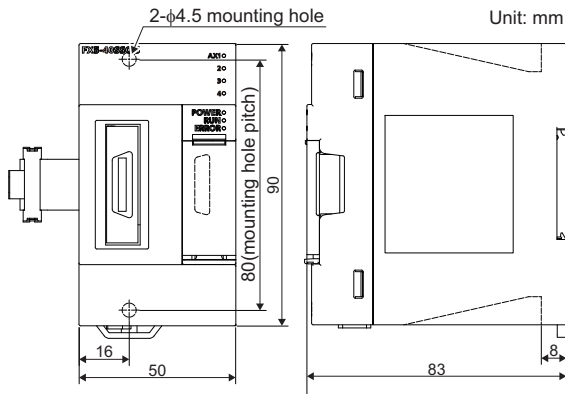
Precautions regarding the hardware

The main hardware differences between the FX3U-20SSC-H and FX5-40SSC-S/FX5-80SSC-S and precautions are as follows.

Main differences in the specifications

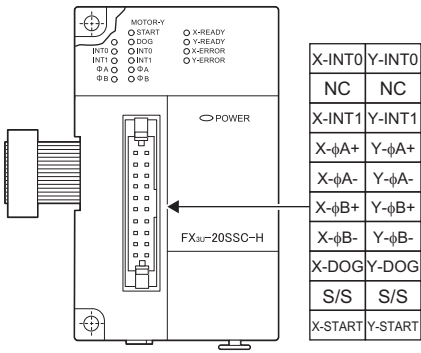
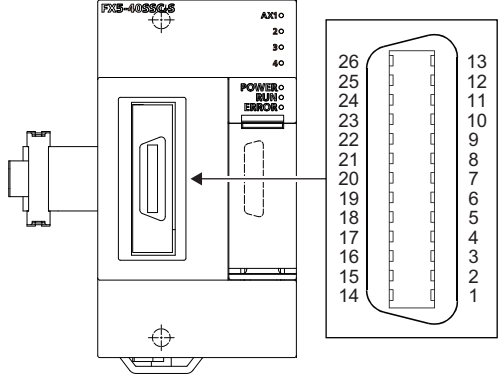
Item	FX3U-20SSC-H	FX5-40SSC-S, FX5-80SSC-S	Precautions
LED indication	LEDs to indicate the external input signal status are provided.	LEDs to indicate the external input signal status are not provided.	To check the input signal status, use GX Works3.
Interrupt input	2 inputs per axis	Not supported	—
DOG signal	1 input per axis	4 inputs of external signals/switching signals per module	—
START input	1 input per axis	4 inputs of external signals/switching signals per module	—
Manual pulse generator	1 input per axis	1 input per module	—
Input signal voltage	20.4V to 28.8V	19.2V to 26.4V	Since the input signal voltage ranges differ, check the specifications of the external devices when replacing the module.
ON current	4.5mA or higher	3.5mA or higher	Since the specifications of the ON current/OFF current differ, check the specifications of the external devices when replacing the module.
OFF current	1.5mA or lower	1mA or lower	
Input connector	20-pin (1-key) sockets compliant with MIL-C-83503	LD77MHIOCON	As the connector types are different, the connectors need to be changed.

External dimensions

FX3U-20SSC-H	FX5-40SSC-S, FX5-80SSC-S
W × H × D (mm): 55 × 90 × 87 Weight: Approx. 0.3kg The module can be mounted on a 35mm-width DIN rail. The mounting holes are located at the top-left and bottom-left corners of the module.  Unit: mm	W × H × D (mm): 50 × 90 × 83 Weight: Approx. 0.3kg The module can be mounted on a 35mm-width DIN rail. The mounting holes are located at the top-center and bottom-center of the module.  Unit: mm

Wiring differences

The terminal blocks and terminal layouts differ among the FX3U-20SSC-H, the FX5-40SSC-S, and the FX5-80SSC-S.

FX3U-20SSC-H	FX5-40SSC-S, FX5-80SSC-S
 Connector compliant with MIL-C-83503 (20-pin connector)	 LD77MHIOCON (26-pin connector)

Prepare dedicated connectors for the FX5-40SSC-S and FX5-80SSC-S.

Type	Connector	Connector case	Suitable wiring
Soldering-type (one-touch lock type)	10126-3000PE	10326-52F0-008	30 to 24 AWG (0.05 to 0.2mm ²)
Soldering-type (screw-tightening type)	10126-3000PE	10326-52A0-008	
Crimping type (one-touch lock type)	10126-6000EL	10326-3210-000	28 AWG (stranded wire, 0.08mm ²)

For details on the connector wiring, refer to "Appendix 3 Connection with External Devices [FX5-SSC-S]" in the following manual.

📖 MELSEC iQ-F FX5 Motion Module/Simple Motion Module User's Manual (Startup)

Power supply differences

Item	FX3U-20SSC-H	FX5-40SSC-S, FX5-80SSC-S	Precautions
Power requirements	5W (220mA/24VDC)	6W (250mA/24VDC)	The power consumption is higher than that of the module before replacement. Check the specifications of the source power supply when replacing the module.

Precautions when converting the projects

For how to convert the FX3 project to the FX5 project, refer to the following.

☞ Page 132 Converting FX3 (GX Works2) Projects to FX5 (GX Works3) Projects

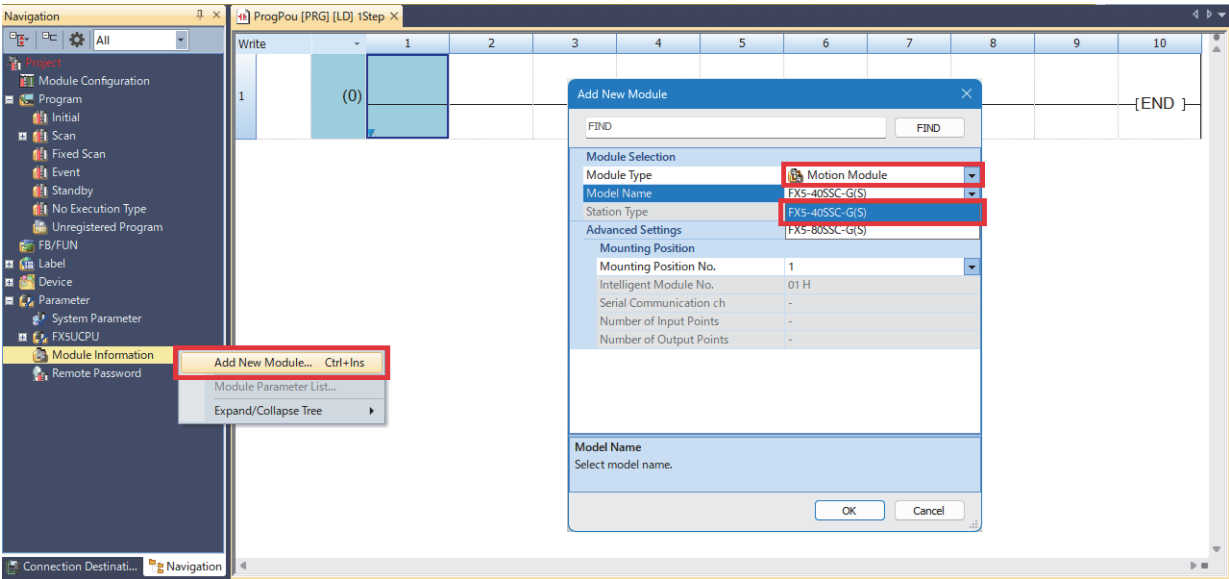
After converting the project into GX Works3, configure the parameters. In addition, modify the programs (instructions and devices) as required.

Parameter settings in GX Works3

The following shows the procedures for setting the FX5-40SSC-S parameters using GX Works3.

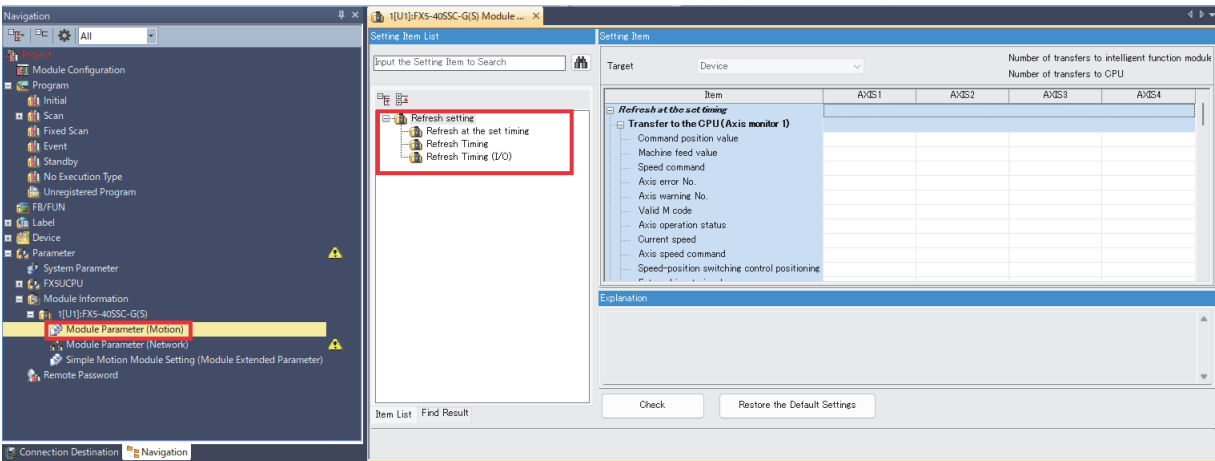
1. Add the module to the project.

☞ Navigation window ⇒ [Parameter] ⇒ Right-click [Module Information] ⇒ [Add New Module]
Module Type: [Motion Module], Model Name: [FX5-40SSC-G(S)]



2. Configure the module parameters.

☞ Navigation window ⇒ [Parameter] ⇒ [Module Information] ⇒ [FX5-40SSC-G(S)] ⇒ Double-click [Module Parameter (Motion)]



For details, refer to the chapter on the parameter settings in the following manual.

📖 MELSEC iQ-F FX5 Motion Module/Simple Motion Module User's Manual (Application)



When using the FX5-80SSC-S, select the FX5-80SSC-G(S) in the above procedure.

Specifications comparison

The following table lists the specification comparisons.

General specifications

○: Compatible

Item		FX3U-20SSC-H	FX5-40SSC-S, FX5-80SSC-S	Compatibility
All terminals in a batch and between grounding terminals	Withstand voltage	500VAC for one minute	500VAC for one minute	○
	Insulation resistance	5MΩ or higher by a 500VDC insulation resistance tester	10MΩ or higher by a 500VDC insulation resistance tester	○

Power supply specifications

○: Compatible, △: Partially different, —: Not available for the current models

Item		FX3U-20SSC-H	FX5-40SSC-S, FX5-80SSC-S	Compatibility
External power supply	Power supply voltage	24VDC +20%/-15%, ripple (p-p) within 5%	24VDC +20%/-15%	○
	Allowable instantaneous power failure time	Operation continues if an instantaneous power failure is shorter than 5ms.	Operation can be continued upon occurrence of an instantaneous power failure for 5ms or less.	○
	Power consumption	5W (220mA/24VDC)	6W (250mA/24VDC)	△
	Power fuse	1A	1A	○
Internal power supply	Supplied from the programmable controller	5VDC 100mA	Not used	—

Performance specifications

○: Compatible, △: Partially different, —: Not available for the current models

Item		FX3U-20SSC-H	FX5-40SSC-S, FX5-80SSC-S	Compatibility
Number of control axes		2 axes	FX5-40SSC-S: 4 axes FX5-80SSC-S: 8 axes	○
Backup		Positioning parameters, servo parameters, and table information can be stored in the flash memory. Number of writes: 100,000 times maximum	Parameters, positioning data, and block start data are stored in the flash ROM (batteryless) Number of writes: 100,000 times maximum	○
Compatible programmable controller		FX3U/FX3UC main module • Up to 8 modules can be added to the FX3U/FX3UC (D, DS, or DSS) main module • Up to 7 modules can be added to the FX3UC-32MT-LT or FX3UC-32MT-LT-2 main module The FX2NC-CNV-IF or FX3UC-1PS-5V is required for connecting to the FX3UC main module.	iQ-F series • FX5UJ: 1 module per system (Only one module in the whole system can be connected. The module cannot be used together with the FX5-80SSC-S.) • FX5U: Up to 16 modules in the whole system • FX5UC: Up to 15 modules in the whole system The FX5-CNV-IFC is required for connecting to the FX5UCCPU module.	—
Number of occupied I/O points		8 points (count of either input or output, whichever is desired)	8 points	○
Connectable servo amplifier		• MELSERVO-J3-□B (up to 2 modules can be connected) • MELSERVO-J3W-□B (1 module can be connected)* ¹ • MELSERVO-J3-□BS (up to 2 modules can be connected)* ² • MELSERVO-J4-□B (up to 2 modules can be connected)* ³ • MELSERVO-J4W2-□B (1 module can be connected)* ³ Standard cable: 20m maximum between stations Long length cable: 50m maximum between stations	• MR-J3 series MR-J3-□B□, MR-J3W-□B, MR-J3-□BS□ • MR-J4 series MR-J4-□B□, MR-J4W□-□B, MR-J4-□B□-RJ • MR-J5 series MR-J5-□B□, MR-J5W□-□B, MR-J5-□B□-RJ Distance between stations (maximum) SSCNETⅢ/H: 100m SSCNETⅢ: 50m	△
Servo bus		SSCNETⅢ	SSCNETⅢ/H	○
Operation cycle		1.77ms	0.888ms/1.777ms	○

Item		FX3U-20SSC-H	FX5-40SSC-S, FX5-80SSC-S	Compatibility
Control input		• Interrupt input: 2 inputs per axis (INT0, INT1) • DOG: 1 input per axis • START input: 1 input per axis • Manual pulse generator: 1 input per axis (phase A/phase B)	• External signal/switching signal (4 inputs per module) • Forced stop input part (1 input per module) • Manual pulse generator/INC synchronous encoder input part (1 input per module)	△
Positioning data		300 tables	600 points of data/axis	○
Positioning program		• Created in sequence program (by instructions such as FROM/TO) • Direct operation (1 program each for X and Y axis) • Table operation (300 tables each for X, Y, and XY axis)	Table operation	—
Positioning	Method	Increment/absolute	Increment/absolute	○
	Unit	PLS, μm , 10^{-4} inch, mdeg	mm, inch, degree, pulse	○
	Unit magnification	1, 10, 100, 1000 times	1, 10, 100, 1000 times	○
	Positioning range	-2147483648 to 2147483647 PLS	In absolute system • -214748364.8 to 214748364.7μm • -21474.83648 to 21474.83647 inch • 0 to 359.99999 degree • -2147483648 to 2147483647 pulse In incremental system • -214748364.8 to 214748364.7μm • -21474.83648 to 21474.83647 inch • -21474.83648 to 21474.83647 degree • -2147483648 to 2147483647 pulse In speed-position switching control (INC mode)/position-speed switching control • 0 to 214748364.7μm • 0 to 21474.83647 inch • 0 to 21474.83647 degree • 0 to 2147483647 pulse In speed-position switching control (ABS mode) • 0 to 359.99999 degree	○
	Acceleration/deceleration process	Trapezoidal acceleration/deceleration, approximate S-curve acceleration/deceleration	Trapezoidal acceleration/deceleration, S-curve acceleration/deceleration	○
	Acceleration/deceleration time	1 to 5000ms	1 to 8388608ms Four patterns can be set for both acceleration time and deceleration time.	○
	Sudden stop deceleration time	1 to 5000ms	1 to 8388608ms	○
	Startup time	1.6ms or less	1.777ms	△
	Interpolation function	2-axes linear interpolation, 2-axes circular interpolation	2-axes, 3-axes, 4-axes linear interpolation 2-axes circular interpolation	○

*1 The MR-J3W-□B series can be connected within the functional range of the MR-J3-□B.

*2 The MR-J3-□BS series can be connected with the FX3U-20SSC-H with version 1.40 or later. Note that the combination does not support the fully closed loop system.

*3 The MR-J4(W2)-□B series can be connected within the functional range of "J3 compatibility mode". Note that the combination does not support the fully closed loop system.

Input specifications

○: Compatible, △: Partially different, —: Not available for the current models

Item		FX3U-20SSC-H	FX5-40SSC-S, FX5-80SSC-S	Compatibility
Input signal name	Group 1	X-axis interrupt input: X-INT0, X-INT1 Used in interrupt operation	—	—
		Y-axis interrupt input: Y-INT0, Y-INT1 Used in interrupt operation		—
		X-axis near-point dog input: X-DOG Used in homing		○
		Y-axis near-point dog input: Y-DOG Used in homing		○
		START command in X-axis positioning operation: X-START		○
		START command in Y-axis positioning operation: Y-START		○
	Group 2	Manual pulse generator in X-axis: X-φA+/X-φA-, X-φB+/X-φB- Counted in 2-phase, 2-count, multiple of 1	Phase A/phase B (multiples of 4, 2, and 1), PULSE/SIGN	○
		Manual pulse generator in Y-axis: Y-φA+/Y-φA-, Y-φB+/Y-φB- Counted in 2-phase, 2-count, multiple of 1		○
	Group 3	External power supply for signals: S/S Power supplies for INT0, INT1, DOG, and START are connected	Common terminal	○
Group 1	Operation display	LED ON at input ON	No LED display (can be checked in the buffer memory)	△
	Signal voltage	24VDC +20%, -15% (power supplied from the S/S terminal)	19.2 to 26.4VDC (24VDC +10%/-20%, within 5% of ripple ratio)	△
	Input current	7.0mA±1mA/24VDC	Approximately 5mA	○
	ON current	4.5mA or higher	17.5VDC or higher, 3.5mA or higher	○
	OFF current	1.5mA or lower	7VDC or lower, 1mA or lower	△
	Signal type	No-voltage contact input • Sink input: NPN open collector transistor • Source input: PNP open collector transistor	Shared between the positive common and negative common	○
	Response time	Hardware filter 1ms or less	1ms or less	○
	Circuit insulation	Photocoupler	Photocoupler	○
Group 2	Operation display	LED ON at input ON	No LED display (can be checked in the buffer memory)	△
	Signal voltage	3 to 5.25VDC	2.0 to 5.25VDC	○
	Input current	3.0mA to 8.5mA	— (Not defined)	—
	ON current	3.0mA or higher	— (Not defined)	—
	OFF current	0.5mA or lower	— (Not defined)	—
	Signal type	Differential line driver (AM26LS31 equivalent)	Differential output type (26LS31 equivalent)	○
	Response frequency	2-phase pulse 100kHz or less (duty ratio 50%)	1M pulse/s (in multiple of 4, 4M pulse/s maximum)	○
	Circuit insulation	Photocoupler	—	—
Group 3	Power supply voltage	24VDC +20%/-15%	19.2 to 26.4VDC (24VDC +10%/-20%, within 5% of ripple ratio)	△
	Current consumption	64mA or lower	—	—

Interface internal circuit

The internal circuit of the interface for sink input is shown below.

○: Compatible

Item	FX3U-20SSC-H	FX5-40SSC-S, FX5-80SSC-S	Compatibility														
Interface internal circuit	DC24V Power supply for INT0, INT1, DOG, and START Switch (sink type) Interrupt input INT0 Interrupt input INT1 START command Near-point DOG input Manual pulse generator input phase A Manual pulse generator (differential output type) Phase A Phase B Manual pulse generator input phase B 20SSC-H S/S □ represents either X or Y.	<table><tr><th>Signal name</th><th>Pin number</th></tr><tr><td>DI_□</td><td>11</td></tr><tr><td>□: 1 to 4</td><td>24</td></tr><tr><td></td><td>12</td></tr><tr><td></td><td>25</td></tr><tr><td>COM</td><td>13</td></tr><tr><td></td><td>26</td></tr></table>	Signal name	Pin number	DI_□	11	□: 1 to 4	24		12		25	COM	13		26	Wiring example ○ Internal circuit 24 V DC Either polarity of + and - for 24VDC is applicable.
		Signal name	Pin number														
DI_□	11																
□: 1 to 4	24																
	12																
	25																
COM	13																
	26																

Input connector, power supply connector

○: Compatible, ×: Incompatible

Item	FX3U-20SSC-H	FX5-40SSC-S, FX5-80SSC-S	Compatibility
Input connector	Connector pin layout (viewed from the aperture)	Connector pin layout (viewed from the front of the module)	×
Power supply connector			○

Reference manuals and sections

■FX3U-20SSC-H

Item	Manual	Section
FX3U-20SSC-H general specifications	 FX3U-20SSC-H User's Manual	3.1 General Specifications
FX3U-20SSC-H power supply specifications		3.2 Power Supply Specification
FX3U-20SSC-H performance specifications		3.3 Performance Specification
FX3U-20SSC-H input specifications		3.4 Input Specifications

■FX5-40SSC-S, FX5-80SSC-S

Item	Manual	Section
FX5-SSC-S general specifications	 MELSEC iQ-F FX5 Motion Module/ Simple Motion Module User's Manual (Startup)	2.1 General Specifications
FX5-SSC-S power supply specifications		2.2 Power Supply Specifications
FX5-SSC-S performance specifications		2.3 Performance Specifications
FX5-SSC-S input specifications		2.4 Specifications of Interfaces with External Devices [FX5-SSC-S]
FX5-SSC-S connectable servo amplifier	 MELSEC iQ-F FX5 Motion Module/ Simple Motion Module User's Manual (Application)	Appendix 2 Compatible Devices with SSCNETⅢ(/H) [FX5-SSC-S]

Functional comparison

○: Compatible, △: Partially different, —: Not available for the current models

Function	FX3U-20SSC-H	FX5-40SSC-S, FX5-80SSC-S	Compatibility
	How to use ^{*1}	How to use ^{*2}	
S-curve acceleration/deceleration	Turning on b11 of BFM #14000 (operation parameter I) activates approximate S-curve acceleration/deceleration.	Setting [Pr.34] Acceleration/deceleration process selection to 1: S-curve acceleration/deceleration process activates S-curve acceleration/deceleration.	○
Software limit	Sets the upper limit value for BFM #14034 and #14035 (software limit (upper)) and the lower limit value for BFM #14036 and #14037 (software limit (lower)). To disable the software limit, set the value for the software limit as follows. Software limit (upper) ≤ Software limit (lower) Setting range: -2147483648 to 2147483647 (user unit)	The function name changes to "software stroke limit function". This function sets the upper limit value for [Pr.12] Software stroke limit upper limit value and the lower limit value for [Pr.13] Software stroke limit lower limit value. To disable the software stroke limit function, set the value as follows. Software stroke limit upper limit value = Software stroke limit lower limit value Setting range: Differs depending on the setting in [Pr.1] Unit setting. For details, refer to the manual of the replacement module.	○
Ring counter setting	Turning on b3 of BFM #14002 (operation parameter II) activates ring operation in the current address. Set BFM #14100 and #14101 (Ring counter upper limit value) to the ring value for ring operation. With BFM #530 (Ring operation rotation direction for absolute address), set the rotation direction for when the absolute address is specified in the ring operation. - Setting range: 0: Direction for shorter rotation 1: Direction where the current value increases (clockwise) 2: Direction where the current value decreases (counterclockwise)	Only when [Pr.1] Unit setting is set to 2: degree, this function activates the ring operation within the range between 0 and 359.99999°. Under any conditions other than those mentioned above, ring operation is not supported. Specify the rotation direction with [Cd.40] ABS direction in degrees. - Setting range: 0: Takes a shortcut. (Specified direction ignored.) 1: ABS circular right 2: ABS circular left	△
Acceleration/deceleration time selection	Turning on or off b5 of BFM #519 (Operation command II) switches between two types of acceleration/deceleration time. Off: Operation according to the following setting values Acceleration time: BFM #14018 (acceleration time) Deceleration time: BFM #14020 (deceleration time) On: Operation according to the following setting values Acceleration time: BFM #14108 (acceleration time 2) Deceleration time: BFM #14110 (deceleration time 2) Setting range: 1 to 5000ms	Select 4 patterns of acceleration/deceleration time in [Da.3] Acceleration time No. and [Da.4] Deceleration time No. (Acceleration time and deceleration time can be specified separately.) The acceleration/deceleration time is set as follows. Acceleration time 0: [Pr.9] Acceleration time 0 Acceleration time 1 to 3: [Pr.25] Acceleration time 1 to [Pr.27] Acceleration time 3 Deceleration time 0: [Pr.10] Deceleration time 0 Deceleration time 1 to 3: [Pr.28] Deceleration time 1 to [Pr.30] Deceleration time 3 Setting range: 1 to 8388608 (ms)	○
Positioning completion signal output waiting time	Set BFM #14106 (Positioning completion signal output waiting time) for the time taken from the positioning completion until BFM #28.b6 (Positioning completion flag) turns on. Setting range: 0 to 5000ms	When [Da.1] Operation pattern is set to "00: Positioning complete", set [Da.9] Dwell time for the time taken from the positioning completion until [Md.31] Status: b15 (Positioning complete signal) turns on. When [Da.1] Operation pattern is set to "01: Continuous positioning control", the time until the succeeding positioning control starts is set. Setting range: 0 to 65535ms	○
STOP command (deceleration stop)	When BFM #14002.b4 (Sudden stop selection (STOP command)) is set to off, turning on BFM #518.b1 (STOP command) decelerates and stops the operation.	When [Pr.39] Stop group 3 sudden stop selection is set to "0: Normal deceleration stop", turning on [Cd.180] Axis stop decelerates and stops the operation.	○

Function	FX3U-20SSC-H	FX5-40SSC-S, FX5-80SSC-S	Compatibility
	How to use* ¹	How to use* ²	
STOP command (Sudden stop)	When BFM #14002.b4 (Sudden stop selection (STOP command)) is set to on, turning on BFM #518.b1 (STOP command) suddenly stops the operation. The time until the speed reaches 0 at the sudden stop is set by either of the following BFM. In other than interpolation operation: BFM #14102 (Sudden stop deceleration time) In interpolation operation: BFM #14104 (Sudden stop interpolation time constant) Setting range: 0 to 5000ms	When [Pr.39] Stop group 3 sudden stop selection is set to "1: Sudden stop", turning on [Cd.180] Axis stop suddenly stops the operation. The time until the speed reaches 0 from [Pr.8] Speed limit value at the sudden stop is set by [Pr.36] Sudden stop deceleration time. Setting range: 1 to 8388608ms	○
Servo amplifier side limit	Connect the servo amplifier side limit (forward rotation limit 2 (FLS) and reverse rotation limit 2 (RLS)) to the upper stroke limit (FLS) and lower stroke limit (RLS) of the servo amplifier. Set External input selection of the positioning parameter as follows. - Turn on BFM #14044.b0 (Selection of FLS/ RLS signal) (set to Use) - Turn on BFM #14044.b8 (Logic of FLS/RLS signal) (set to N/C contact (servo amplifier))	For the FX5-40SSC-S, the hardware stroke limit function allows for using either the external input signal of the servo amplifier or the external input signal via the CPU. The signals cannot be used together. - When using the external input signal of the servo amplifier (equivalent to the servo amplifier side limit): Specify "1 (0001H): Servo amplifier" for [Pr.116] FLS signal selection and [Pr.117] RLS signal selection. - When using the external input signal via the CPU (equivalent to the programmable controller side limit): Specify "2 (0002H): Buffer memory" for [Pr.116] FLS signal selection and [Pr.117] RLS signal selection. Interlock the forward rotation limit 1 (LSF) and the reverse rotation limit 1 (LSR) connected to the CPU module using [Cd.44] External input signal operation device. b0: Axis 1 Upper limit signal (FLS) b1: Axis 1 Lower limit signal (RLS) b4: Axis 2 Upper limit signal (FLS) b5: Axis 2 Lower limit signal (RLS) * For the compatible bit for replacement with Axis 3 and subsequent axes, refer to the manual.	△
Programmable controller side limit	Connect the programmable controller side limit (forward rotation limit 1 (LSF) and reverse rotation limit 1 (LSR)) to the input terminal of the programmable controller, and control Operation command I of the 20SSC-H with sequence programs. Interlock the forward rotation limit 1 (LSF) and reverse rotation limit 1 (LSR) connected to the programmable controller with the forward rotation limit flag and reverse rotation limit flag of Operation command I. - BFM #518.b2 (Forward rotation limit (LSF)) - BFM #518.b3 (Reverse rotation limit (LSR))	b0: Axis 1 Upper limit signal (FLS) b1: Axis 1 Lower limit signal (RLS) b4: Axis 2 Upper limit signal (FLS) b5: Axis 2 Lower limit signal (RLS) * For the compatible bit for replacement with Axis 3 and subsequent axes, refer to the manual.	△
Operation speed change	While BFM #518.b12 (Change command in operation disabled) is off, turning on BFM #518.b13 (Speed change command in positioning operation) changes the operation speed during positioning operation to the speed specified in BFM #512 and #513 (Speed change value). Setting range: 1 to 2147483647 (user unit)	Setting [Cd.15] Speed change request to "1: Executes speed change" changes the operation speed during positioning operation to the speed specified in [Cd.14] Speed change value. Functions equivalent to "Change command in operation disabled" are not provided. Setting range: Differs depending on the setting in [Pr.1] Unit setting. For details, refer to the manual of the replacement module.	○
Override function	Changes the operation speed for the positioning operation in accordance with the ratio set in BFM #508 (Override setting). Setting range: 0.1 to 3000.0%	Changes the operation speed for the positioning operation in accordance with the ratio set in [Cd.13] Positioning operation speed override. Setting range: 1 to 300%	△
Target address change	While BFM #518.b12 (Change command in operation disabled) is off, turning on BFM #518.b14 (Target position change command in positioning operation) changes the target address and operation speed during positioning operation to the value specified in BFM #514 or #515 (Target position change value (address)) and BFM #516 or #517 (Target position change value (speed)). Setting range Address: -2147483648 to 2147483647 (user unit) Speed: 1 to 2147483647 (user unit)	Setting [Cd.29] Target position change request flag to "1: Requests a change in the target position" changes the target address and operation speed during positioning operation to the values specified in [Cd.27] Target position change value (New address) and [Cd.28] Target position change value (New speed). Setting range: Differs depending on the setting in [Pr.1] Unit setting. For details, refer to the manual of the replacement module.	○

Function	FX3U-20SSC-H	FX5-40SSC-S, FX5-80SSC-S	Compatibility
	How to use ^{*1}	How to use ^{*2}	
Simultaneous start	While BFM #518.b10 (Simultaneous START flag) of the X axis is on, turning on BFM #518.b9 (START command) of the X axis starts operation of both the X and Y axes simultaneously.	While the following axis control data is set for axis 1, writing "1: Positioning start signal requested" to [Cd.184] Positioning start starts operation of both the axes 1 and 2 simultaneously. • [Cd.43] Simultaneous starting axis 02000001H (Simultaneously starting axis No.1: Axis 2, Number of simultaneously starting axes: Two) • [Cd.30] Simultaneous starting own axis start data No. Start data number for axis 1 • [Cd.31] Simultaneous starting axis start data No.1 Start data number for axis 2 • [Cd.32] Simultaneous starting axis start data No.2 and [Cd.33] Simultaneous starting axis start data No.3 0 (Will not start simultaneously) • [Cd.3] Positioning start No. 9004 (Simultaneous start) Combination with other axes is also available with the settings of [Cd.43] Simultaneous starting axis. For details, refer to the manual of the replacement module.	○
Zero return interlock	Turning on BFM #14002.b2 (Zero return interlock setting enabled/disabled) disables the START command when homing has not completed.	Setting [Pr.55] Operation setting for incompleteness of home position return to "0: Positioning control is not executed" disables positioning control when homing has not completed.	○
Servo ready check	When BFM #14002.b1 (Servo ready check enabled/disabled) is on, this function checks the ready signal (completion of preparation) of the servo motor at startup of operation or during operation. If the servo ready signal indicates an unintended status, a servo-ready error occurs and the operation stops.	Forcibly stops the servo motor if the servo ready signal is off. This function cannot be invalid.	△
Servo end check	Determines the completion of positioning operation with the in-position signal of the servo status. Once the in-position signal of the servo status turns on within the determination time period of the servo end check after the operation completes, it is determined that the positioning operation is complete. If the in-position signal does not turn on within the period of time set in the servo end determination time, an external error occurs and the operation stops.	—	—
Servo ON/OFF	Controls the servo-on or off for each axis using BFM #519.b8 (Servo OFF command). • Servo OFF command is off: Servo ON • Servo OFF command is on: Servo OFF	Controls on/off of all the connected servo amplifiers by setting [Cd.191] All axis servo ON to either of the following values. The status is servo OFF at startup. • 1: Servo ON • Other than 1: Servo OFF To separately control the on/off status, set "1: Servo OFF" in [Cd.100] Servo OFF command in advance for the axis that should be prevented from entering the servo ON status.	○
Torque limit	When BFM #510 (Torque output setting value) is set to 0, this function sets the torque limit value of the servo motor to the value specified in BFM #14038 (Torque limit value). If the motor is operated at the homing speed (creep speed) for the machine homing, BFM #14040 (Zero return torque limit value) is used. • Setting range: 1 to 10000 (× 0.1%)	When [Cd.101] Torque output setting value is set to 0, this function sets the torque limit value of the servo motor to the value specified in [Pr.17] Torque limit setting value. If the motor is operated at the homing speed (creep speed) for the machine homing, [Pr.54] Home position return torque limit value is used. • Setting range: 1 to 10000 (× 0.1%)	○
Follow-up function	Monitors the amount of monitor rotation in the servo OFF status, and applies it to the current value.	—	—
Servo parameter update stop command	Prevents the servo parameters in the 20SSC-H (buffer memory) from being updated even when the servo parameters in the servo amplifier side are updated.	—	—

*1 Only buffer memory addresses for the X-axis of the FX3U-20SSC-H are described.

*2 Data of [Pr.XX] and [Da.XX] for the FX5-40SSC-S can be set with the parameters of GX Works3.

Positioning operation comparison

○: Compatible, △: Partially different, ×: Not available

Function	FX3U-20SSC-H	FX5-40SSC-S, FX5-80SSC-S	Compatibility
	How to use ^{*1*3}	How to use ^{*2*3}	
1-speed positioning operation	Turning on b0 (1-speed positioning) of BFM #520 (Operation pattern selection) starts 1-speed positioning operation.	Performs 1-speed positioning operation with the linear control of axis 1. Set either of the following values in [Da.2] Control method. • 01H: ABS Linear 1 • 02H: INC Linear 1	○
Interrupt 1-speed constant quantity feed	Turning on b1 (Interrupt 1-speed constant quantity feed) of BFM #520 (Operation pattern selection) starts interrupt 1-speed constant quantity feed. Once the interrupt input (INT0) turns on, the workpiece moves based on the amount set in the target address I at operation speed I, then the positioning completion signal turns on and the operation ends.	Performs 1-speed positioning operation with the speed-position switching control. Set either of the following values in [Da.2] Control method. • 06H: FWD V/P • 07H: RVS V/P Use the external command signal (DI) for interrupt input. To use DI1, configure settings as follows: • [Pr.95] External command signal selection: "1: DI1" • [Cd.45] Speed-position switching device selection: "0": Use the external command signal for switching from speed control to position control"	○
2-speed positioning operation	Turning on b2 (2-speed positioning) of BFM #520 (Operation pattern selection) starts 2-speed positioning operation.	Performs 2-speed positioning operation with the combination of two linear controls of axis 1. Set either of the following values in [Da.2] Control method of two consecutive positioning data numbers. • 01H: ABS Linear 1 • 02H: INC Linear 1 Set "11: Continuous path control" in [Da.1] Operation pattern for the first positioning data.	○
Interrupt 2-speed constant quantity feed	Turning on b3 (Interrupt 2-speed constant quantity feed) of BFM #520 (Operation pattern selection) starts interrupt 2-speed constant quantity feed. Once the interrupt input (INT0) turns on, acceleration or deceleration for operation speed II starts. Once the interrupt input (INT1) turns on, the workpiece moves based on the amount set in the target address I at operation speed II, then the positioning completion signal turns on and the operation ends.	A substitute for the function is available by switching the speed to a speed equivalent to operation speed II using the speed change function during speed control at operation speed I in the speed/position switching control. Set either of the following values in [Da.2] Control method. • 06H: FWD V/P • 07H: RVS V/P Connect INT0 to the input device of the CPU, and use a buffer memory area of a sequence program as a substitute. Use the external command signal (DI) of the FX5-40SSC-S for INT1. Neither INT0 nor INT1 can be connected to the external command signal (DI). ■INT0 Set the value set for operation speed II to [Cd.14] Speed change value. When the input turns on in the sequence program, "1: Executes speed change" is written to [Cd.15] Speed change request. If rapid responses are required, use the interrupt function of the CPU. ■INT1 To use DI1, configure settings as follows: • [Pr.95] External command signal selection: "1: DI1" • [Cd.45] Speed-position switching device selection: "0": Use the external command signal for switching from speed control to position control"	○
Interrupt stop operation	Turning on b4 (Interrupt stop) of BFM #520 (Operation pattern selection) activates interrupt stop operation.	Similar control is available by stopping the operation in the middle of the linear control on axis 1 using the stop signal from the external input signal or using the axis stop signal. Note that, unlike the interrupt stop in the FX3U-20SSC-H, the positioning complete signal does not turn on.	×

Function	FX3U-20SSC-H	FX5-40SSC-S, FX5-80SSC-S	Compatibility
	How to use ^{*1*3}	How to use ^{*2*3}	
Variable speed operation	Turning on b5 (Variable speed operation) of BFM #520 (Operation pattern selection) starts variable speed operation. Changing the values in BFM #502 and #503 (Operation speed I) during operation changes the operation speed to the specified speed.	Changes the speed with the speed change function during the speed control on axis 1. Set either of the following values in [Da.2] Control method. • 04H: Forward run speed 1 • 05H: Reverse run speed 1 When the operation speed after change is specified in [Cd.14] Speed change value during operation and [Cd.15] Speed change request is set to "1: Executes speed change", the operation speed changes to the specified value. Once the speed change is accepted, 0 is automatically written by the FX5-40SSC-S.	○
Multi-speed operation	The multi-speed operation is positioning operation that can be used only in the table operation. Set the multi-speed operation for the operation information in each table. Turning on b9 (Table operation (individual)) or b10 (Table operation (simultaneous)) of BFM #520 (Operation pattern selection) starts table operation.	Performs multi-speed operation with the combination of multiple linear controls of axis 1. Set either of the following values in [Da.2] Control method of consecutive positioning data numbers. • 01H: ABS Linear 1 • 02H: INC Linear 1 Set "11: Continuous path control" in [Da.1] Operation pattern for any of the positioning data other than the last one. As positioning control is always table operation in the FX5-40SSC-S, settings for table operation are not required.	○
Linear interpolation operation	Turning on b7 (Linear interpolation) of BFM #520 (Operation pattern selection) starts linear interpolation operation.	Performs linear interpolation operation with the linear interpolation control of axis 2. When performing linear interpolation operation between axis 2 and axis 1 as the reference axis, configure settings as follows for axis 1. Set either of the following values in [Da.2] Control method. • 0AH: ABS Linear 2 • 0BH: INC Linear 2 Set "1: Axis 2 selected" in [Da.20] Axis to be interpolated No.1.	○
Linear interpolation operation (interrupt stop)	Turning on b8 (Linear interpolation (interrupt stop)) of BFM #520 (Operation pattern selection) starts linear interpolation operation (interrupt stop).	Similar control is available by stopping the operation in the middle of the linear control on axis 2 using the stop signal from the external input signal or using the axis stop signal. Note that, unlike the interrupt stop in the FX3U-20SSC-H, the positioning complete signal does not turn on.	×
Circular interpolation operation	This function is positioning operation that can be used only in the table operation. Set the circular interpolation operation for the operation information in each table. Turning on b10 (Table operation (simultaneous)) of BFM #520 (Operation pattern selection) starts table operation in axis 2. This function has two types of specification methods; the center coordinate specification and radius specification.	Performs the circular interpolation operation with circular interpolation control. The circular interpolation control has two types of specification methods; the center point designation and sub point designation. When performing circular interpolation operation between axis 2 and axis 1 as the reference axis, configure settings as follows for axis 1. Set either of the following values in [Da.2] Control method. • For center point designation: 0FH: ABS Circular right 10H: ABS Circular left 11H: INC Circular right 12H: INC Circular left • For sub point designation: 0DH: ABS Circular sub 0EH: INC Circular sub Set "1: Axis 2 selected" in [Da.20] Axis to be interpolated No.1.	○
Reciprocal movement instruction	Turning on b11 (Reciprocal movement instruction) of BFM #520 (Operation pattern selection) starts reciprocal movement instruction.	—	×
Table operation	Turning on b9 (Table operation (individual)) or b10 (Table operation (simultaneous)) of BFM #520 (Operation pattern selection) starts table operation.	As positioning control is always table operation in the FX5-40SSC-S, settings for table operation are not required.	○
Manual pulse generator operation	Turning on b6 (Manual pulse generator operation) of BFM #520 (Operation pattern selection) starts manual pulse generator operation.	Setting [Cd.21] Manual pulse generator enable flag to "1" while [Md.141] BUSY is off enables manual pulse generator operation.	○

Function	FX3U-20SSC-H	FX5-40SSC-S, FX5-80SSC-S	Compatibility
	How to use ^{*1*3}	How to use ^{*2*3}	
JOG operation	Forward rotation pulses are output when BFM #518.b4 (Forward rotation JOG) is on. Reverse rotation pulses are output when BFM #518.b5 (Reverse rotation JOG) is on.	Forward rotation pulses are output when [Cd.181] Forward run JOG start is set to "1". Reverse rotation pulses are output when [Cd.182] Reverse run JOG start is on. Set "0" in [Cd.16] Inching movement amount.	○
Inching operation	If the activation time in BFM #518.b4 (Forward rotation JOG) or BFM #518.b5 (Reverse rotation JOG) is less than or equal to those set in BFM #14014 (JOG command determination time), a pulse string equivalent to ± 1 (user unit) is output at the current address to perform inching operation.	When [Cd.16] Inching movement amount is set to a value other than 0 and [Cd.181] Forward JOG start or [Cd.182] Reverse run JOG is set to 1, the workpiece moves by the amount specified in [Cd.16] Inching movement amount in the direction specified by the start signal. JOG operation and inching operation cannot be switched between each other by the length of the activation time for the start signal.	△
DOG type mechanical zero return	While BFM #14031 (Zero return mode) is set to "0: DOG", turning on BFM #518.b6 (Mechanical zero return command) executes DOG type mechanical zero return. Once the workpiece passes DOG, the zero point signals are counted by the number of times specified by BFM #14030 (Zero signal count), and then the homing operation stops.	While [Pr.43] Home position return method is set to "0: Proximity dog method" and [Cd.3] Positioning start No. is set to "9001: Machine home position return", writing "1: Positioning start signal requested" to [Cd.184] Positioning start executes DOG type machine homing. The number of the zero point signal count cannot be set. (The number is fixed to 1.)	△
Data-set type mechanical zero return	While BFM #14031 (Zero return mode) is set to "1: Data set type", turning on BFM #518.b6 (Mechanical zero return command) executes data-set type mechanical zero return.	While [Pr.43] Home position return method is set to "6: Data set method" and [Cd.3] Positioning start No. is set to "9001: Machine home position return", writing "1: Positioning start signal requested" to [Cd.184] Positioning start executes data-set type machine homing.	○
Stopper type mechanical zero return - Stopper type (1)	While BFM #14031 (Zero return mode) is set to "2: Stopper #1", turning on BFM #518.b6 (Mechanical zero return command) executes stopper type mechanical zero return.	—	×
Stopper type mechanical zero return - Stopper type (2)	While BFM #14031 (Zero return mode) is set to "3: Stopper #2", turning on BFM #518.b6 (Mechanical zero return command) executes stopper type mechanical zero return.	—	×

*1 Only buffer memory addresses for the X-axis of the FX3U-20SSC-H are described.

*2 Data of [Pr.XX] and [Da.XX] for the FX5-40SSC-S can be set with the parameters of GX Works3.

*3 For the detailed positioning settings, refer to the manual for each module.

 FX3U-20SSC-H User's Manual

 MELSEC iQ-F FX5 Motion Module/Simple Motion Module User's Manual (Application)

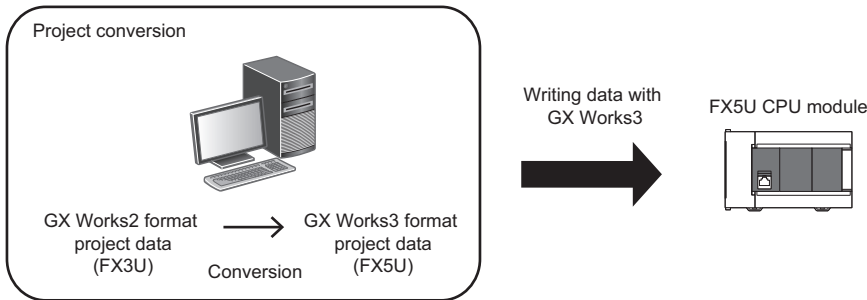
APPENDIX

Appendix 1 Converting FX3 (GX Works2) Projects to FX5 (GX Works3) Projects

When converting FX3 projects to FX5 projects, use GX Works3.
After the projects are converted, adjustments may be required in the programs (instructions, devices) and parameters.

Ex.

The following shows an example of converting an FX3U project to an FX5U project.



To convert the projects, install the engineering tool with the following version.

Engineering tool	Version	Remarks
GX Works3	1.020W or later	—
GX Works2	1.519R or later	GX Works2 is supplied with GX Works3.

Precautions

When reading projects of GX Works2 using GX Works3, note the following.

- Administrator rights are required.
- Convert the projects using GX Works2^{*1} before reading them. Note that even if the project is converted using GX Works2, conversion may not proceed depending on the state of the projects. If the program has an error, reading will be canceled.

^{*1} Convert the projects via the menu [Compile] in GX Works2. (📖 GX Works2 Version 1 Operating Manual (Common))

- Delete the security (user management and access authority settings) of GX Works2 beforehand, then read the projects. If the security is set to the GX Works2 project, the reading will be canceled.

Operating procedure

For the operating procedure, refer to the following.

📖 Transition from MELSEC FX3 Series to MELSEC iQ-F Series Handbook

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REVISIONS

Revision date	*Manual number	Description
March 2026	L(NA)0810002ENG-A	First edition

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WARRANTY

Please confirm the following product warranty details before using this product.

1. Gratis Warranty Term and Gratis Warranty Range

If any faults or defects (hereinafter "Failure") found to be the responsibility of Mitsubishi occurs during use of the product within the gratis warranty term, the product shall be repaired at no cost via the sales representative or Mitsubishi Service Company. However, if repairs are required onsite at domestic or overseas location, expenses to send an engineer will be solely at the customer's discretion. Mitsubishi shall not be held responsible for any re-commissioning, maintenance, or testing on-site that involves replacement of the failed module.

[Gratis Warranty Term]

The gratis warranty term of the product shall be for one year after the date of purchase or delivery to a designated place. Note that after manufacture and shipment from Mitsubishi, the maximum distribution period shall be six (6) months, and the longest gratis warranty term after manufacturing shall be eighteen (18) months. The gratis warranty term of repair parts shall not exceed the gratis warranty term before repairs.

[Gratis Warranty Range]

- (1) The range shall be limited to normal use within the usage state, usage methods and usage environment, etc., which follow the conditions and precautions, etc., given in the instruction manual, user's manual and caution labels on the product.
- (2) Even within the gratis warranty term, repairs shall be charged for in the following cases.
 1. Failure occurring from inappropriate storage or handling, carelessness or negligence by the user. Failure caused by the user's hardware or software design.
 2. Failure caused by unapproved modifications, etc., to the product by the user.
 3. When the Mitsubishi product is assembled into a user's device, Failure that could have been avoided if functions or structures, judged as necessary in the legal safety measures the user's device is subject to or as necessary by industry standards, had been provided.
 4. Failure that could have been avoided if consumable parts (battery, backlight, fuse, etc.) designated in the instruction manual had been correctly serviced or replaced.
 5. Relay failure or output contact failure caused by usage beyond the specified life of contact (cycles).
 6. Failure caused by external irresistible forces such as fires or abnormal voltages, and failure caused by force majeure such as earthquakes, lightning, wind and water damage.
 7. Failure caused by reasons unpredictable by scientific technology standards at time of shipment from Mitsubishi.
 8. Any other failure found not to be the responsibility of Mitsubishi or that admitted not to be so by the user.

2. Onerous repair term after discontinuation of production

- (1) Mitsubishi shall accept onerous product repairs for seven (7) years after production of the product is discontinued.
Discontinuation of production shall be notified with Mitsubishi Technical Bulletins, etc.
- (2) Product supply (including repair parts) is not available after production is discontinued.

3. Overseas service

Overseas, repairs shall be accepted by Mitsubishi's local overseas FA Center. Note that the repair conditions at each FA Center may differ.

4. Exclusion of loss in opportunity and secondary loss from warranty liability

Regardless of the gratis warranty term, Mitsubishi shall not be liable for compensation to:

- (1) Damages caused by any cause found not to be the responsibility of Mitsubishi.
- (2) Loss in opportunity, lost profits incurred to the user by Failures of Mitsubishi products.
- (3) Special damages and secondary damages whether foreseeable or not, compensation for accidents, and compensation for damages to products other than Mitsubishi products.
- (4) Replacement by the user, maintenance of on-site equipment, start-up test run and other tasks.

5. Changes in product specifications

The specifications given in the catalogs, manuals or technical documents are subject to change without prior notice.

6. Product application

- (1) In using the Mitsubishi MELSEC programmable controller, the usage conditions shall be that the application will not lead to a major accident even if any problem or fault should occur in the programmable controller device, and that backup and fail-safe functions are systematically provided outside of the device for any problem or fault.
- (2) The Mitsubishi programmable controller has been designed and manufactured for applications in general industries, etc. Thus, applications in which the public could be affected such as in nuclear power plants and other power plants operated by respective power companies, and applications in which a special quality assurance system is required, such as for railway companies or public service purposes shall be excluded from the programmable controller applications.
In addition, applications in which human life or property that could be greatly affected, such as in aircraft, medical applications, incineration and fuel devices, manned transportation, equipment for recreation and amusement, and safety devices, shall also be excluded from the programmable controller range of applications. However, in certain cases, some applications may be possible, providing the user consults their local Mitsubishi representative outlining the special requirements of the project, and providing that all parties concerned agree to the special circumstances, solely at the user's discretion.
- (3) Mitsubishi shall have no responsibility or liability for any problems involving programmable controller trouble and system trouble caused by DoS attacks, unauthorized access, computer viruses, and other cyberattacks.

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