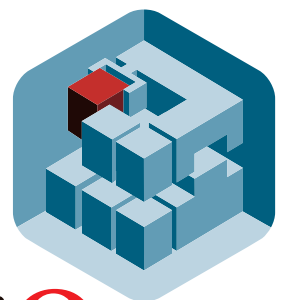
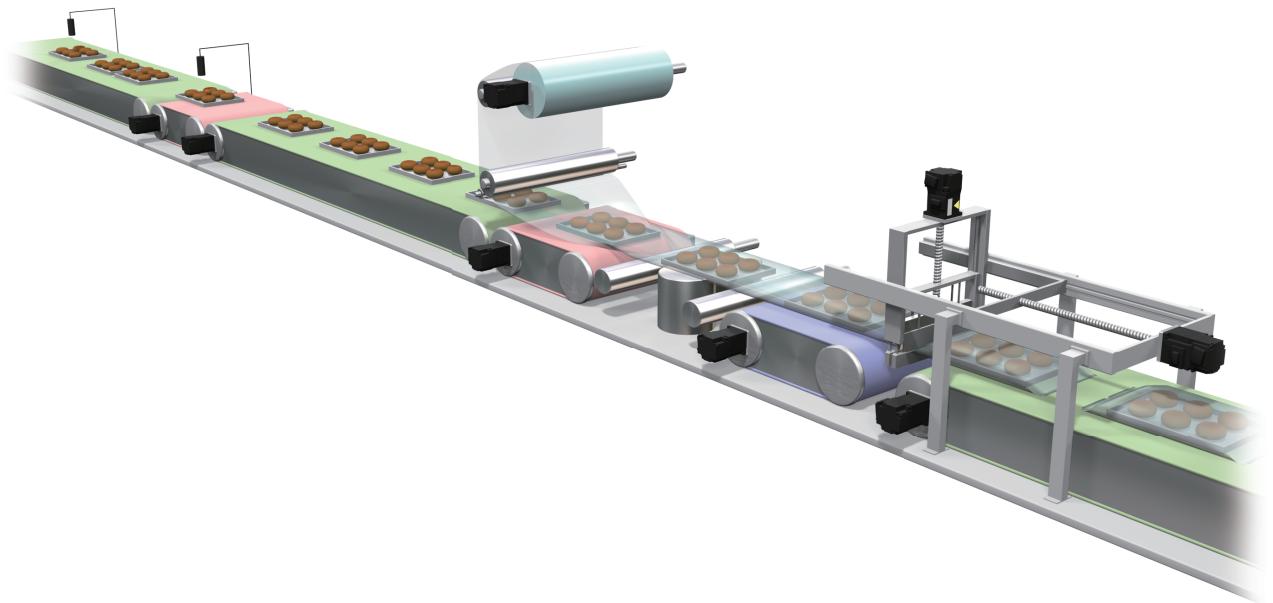


## FA Application Package iQ Monozukuri PACKAGING

### Instruction Manual (For MELSEC iQ-F)

- AP20-PAC004AA-MA
- AP20-PAC004AA-MB
- AP20-PAC004AA-MC
- AP20-PAC004AA-MD
- AP20-PAC004AA-ME
- AP20-PAC004AA-ML



**iQ** Monozukuri







# SAFETY PRECAUTIONS

---

(Read these precautions before use.)

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].

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

Depending on the circumstances, 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 PLC to ensure safe system operation even during external power supply problems or PLC failure. Otherwise, malfunctions 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 24 V DC 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 PLC 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, transistor or triac 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 PLC in operation.  
Read the manual thoroughly and ensure complete safety before executing other controls (for program change, parameter change, forcible output and operation status change) of the PLC 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.
  - To maintain the safety of the programmable controller system against unauthorized access from external devices via the network, take appropriate measures. To maintain the safety against unauthorized access via the Internet, take measures such as installing a firewall.
-

## [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 does 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 PLC stops, and output is turned off. When the power supply is restored, it will automatically restart (when the RUN/STOP/RESET switch is on RUN side).
- 

## [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 generic specifications of the user's manual (Hardware) of the CPU module to use.  
Never use the product in areas with excessive dust, oily smoke, conductive dusts, corrosive gas (salt air, Cl<sub>2</sub>, H<sub>2</sub>S, SO<sub>2</sub> or NO<sub>2</sub>), 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 PLC. Failure to do so may cause fire, equipment failures or malfunctions.
- For 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.
  - When using an SD memory card, insert it into the SD memory card slot. Check that it is inserted completely. Poor contact may cause malfunction.
  - Turn off the power to the PLC 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.
  - 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 6 mm (0.24") or less). Make sure 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.
    - Affix the electric wires so that neither the terminal block nor the connected parts are directly stressed.
- 

## [WIRING PRECAUTIONS]

---

### **CAUTION**

- Do not supply power to the [24 +] and [24 V] terminals (24 V DC service power supply) on the CPU module or extension modules. Doing so may cause damage to the product.
  - Perform class D grounding (grounding resistance: 100 Ω or less) of the grounding terminal on the CPU module and extension modules with a wire 2 mm<sup>2</sup> or thicker.

Do not use common grounding with heavy electrical systems. Refer to the user's manual (Hardware) of the CPU module to use for the details.
  - Connect the power supply wiring to the dedicated terminals described in the manual. If an AC power supply is connected to a DC input/output terminal or DC power supply terminal, the PLC will burn out.
  - Do not wire vacant terminals externally. Doing so may damage 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 PLC failure.
-

---

## CAUTION

- Make sure to observe the following precautions in order to prevent any damage to the machinery or accidents due to malfunction of the PLC caused by abnormal data written to the PLC 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 (3.94") 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 PLC. However, do not use common grounding with heavy electrical systems.
    - Ground the shield of the analog input/output cable at one point on the signal receiving side. However, do not use common grounding with heavy electrical systems.
- 

## [STARTUP AND MAINTENANCE PRECAUTIONS]

---

### WARNING

- Do not touch any terminal while the PLC'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 in the power ON status may cause electric shock.
  - Before modifying the program in operation, forcible output, running or stopping the PLC, read through the manual carefully, and ensure complete safety. An operation error may damage the machinery or cause accidents.
  - Do not change the program in the PLC from two or more peripheral equipment devices at the same time. (i.e. from an engineering tool and a GOT) Doing so may cause destruction or malfunction of the PLC program.
  - Use the battery for memory backup in conformance to the user's manual (Hardware) of the CPU module to use.
    - 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.
- Incorrect handling of the battery may cause excessive 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 PLC. Doing so may cause fire, equipment failures, or malfunctions. For repair, contact your local Mitsubishi Electric representative.
  - After the first use of the SD memory card, do not insert/remove the memory card more than 500 times. 500 times or more may cause malfunction.
  - Turn off the power to the PLC before connecting or disconnecting any extension cable. Failure to do so may cause equipment failures or malfunctions.
  - Turn off the power to the PLC 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
- 

## [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 PLC in operation. Read the manual thoroughly and ensure complete safety before executing other controls (for program change, parameter change, forcible output and operation status change) of the PLC in operation. Otherwise, the machine may be damaged and accidents may occur by 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 on the Battery Directive in EU countries, refer to the user's manual (Hardware) of the CPU module to use.
-

## [TRANSPORTATION PRECAUTIONS]

---

### CAUTION

- When transporting the PLC with the optional battery, turn on the PLC 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 PLC is transported with the BAT LED ON or the battery exhausted, the battery-backed data may be unstable during transportation.
  - The PLC is a precision instrument. During transportation, avoid impacts larger than those specified in the general specifications by using dedicated packaging boxes and shock-absorbing palettes. Failure to do so may cause failures in the PLC. After transportation, verify operation of the PLC and check for damage of the mounting part, etc. For details on the general specifications, refer to the user's manual (Hardware) of the CPU module to use.
  - When transporting lithium batteries, follow required transportation regulations. For details on the regulated products, refer to the user's manual (Hardware) of the CPU module to use.
  - When fumigants that contain halogen materials such as fluorine, chlorine, bromine, and iodine 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.
- 

## [PRECAUTIONS ON INTRODUCTION OF USER PROGRAMS]

---

### CAUTION

- To utilize the application program (example) and the screens (example) for an actual system, sufficiently confirm that the program and the screens will not cause system control problems on user's own responsibility. Examine the positions where interlock conditions are required in a target system and add them.
  - Mitsubishi Electric Corporation cannot be held responsible for any damages or problems which may occur as a result of using the application program and the screens.
  - The application program and screens provided by Mitsubishi Electric Corporation may be changed without any notice.
-

# CONDITIONS OF USE FOR THE PRODUCT

---

(1) Mitsubishi programmable controller ("the PRODUCT") shall be used in conditions;

- i) where any problem, fault or failure occurring in the PRODUCT, if any, shall not lead to any major or serious accident; and
- ii) where the backup and fail-safe function are systematically or automatically provided outside of the PRODUCT for the case of any problem, fault or failure occurring in the PRODUCT.

(2) The PRODUCT has been designed and manufactured for the purpose of being used in general industries.

MITSUBISHI SHALL HAVE NO RESPONSIBILITY OR LIABILITY (INCLUDING, BUT NOT LIMITED TO ANY AND ALL RESPONSIBILITY OR LIABILITY BASED ON CONTRACT, WARRANTY, TORT, PRODUCT LIABILITY) FOR ANY INJURY OR DEATH TO PERSONS OR LOSS OR DAMAGE TO PROPERTY CAUSED BY the PRODUCT THAT ARE OPERATED OR USED IN APPLICATION NOT INTENDED OR EXCLUDED BY INSTRUCTIONS, PRECAUTIONS, OR WARNING CONTAINED IN MITSUBISHI'S USER, INSTRUCTION AND/OR SAFETY MANUALS, TECHNICAL BULLETINS AND GUIDELINES FOR the PRODUCT.

("Prohibited Application")

Prohibited Applications include, but not limited to, the use of the PRODUCT in;

- Nuclear Power Plants and any other power plants operated by Power companies, and/or any other cases in which the public could be affected if any problem or fault occurs in the PRODUCT.
- Railway companies or Public service purposes, and/or any other cases in which establishment of a special quality assurance system is required by the Purchaser or End User.
- Aircraft or Aerospace, Medical applications, Train equipment, transport equipment such as Elevator and Escalator, Incineration and Fuel devices, Vehicles, Manned transportation, Equipment for Recreation and Amusement, and Safety devices, handling of Nuclear or Hazardous Materials or Chemicals, Mining and Drilling, and/or other applications where there is a significant risk of injury to the public or property.

Notwithstanding the above, restrictions Mitsubishi may in its sole discretion, authorize use of the PRODUCT in one or more of the Prohibited Applications, provided that the usage of the PRODUCT is limited only for the specific applications agreed to by Mitsubishi and provided further that no special quality assurance or fail-safe, redundant or other safety features which exceed the general specifications of the PRODUCTS are required. For details, please contact the Mitsubishi representative in your region.

# INTRODUCTION

---

Thank you for purchasing the "iQ Monozukuri" product.

This manual describes the design, procedures before operation, functions, and programming required for constructing a system using this application. Before using this product, please read this manual and the relevant manuals carefully and develop familiarity with the functions and performance of this application to design the product correctly.

To utilize the program introduced in this manual for an actual system, sufficiently confirm that the program will not cause system control problems.

## 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.

# CONTENTS

SAFETY PRECAUTIONS	1
CONDITIONS OF USE FOR THE PRODUCT	8
INTRODUCTION	9
RELEVANT MANUALS	13
TERMS	14
REQUESTING AND REGISTERING A LICENSE KEY	16
<b>CHAPTER 1 OVERVIEW</b>	<b>17</b>
1.1 Packaging Application Package	17
1.2 Application Examples	17
1.3 Operations of Pillow Packaging Machines	19
1.4 Functions of Each Packaging Machine	20
1.5 Product Configuration	25
Products in the iQ Monozukuri PACKAGING package	25
1.6 Files in DVD-ROM	26
1.7 Applicable Hardware and Software	26
<b>CHAPTER 2 SETTING AND PROCEDURE BEFORE OPERATION</b>	<b>27</b>
2.1 Registering a License Key	27
2.2 Registering the FB Library	32
2.3 Updating Library Elements	35
2.4 Certifying the License Key	36
<b>CHAPTER 3 SYSTEM CONSTRUCTION</b>	<b>38</b>
3.1 System Configuration Example	38
3.2 Control Overview	40
Function block configuration example	40
Configuration example of advanced synchronous control	41
Operation timing example	42
<b>CHAPTER 4 FB LIBRARY</b>	<b>43</b>
4.1 Functions of the FB Library	43
List of FBs	43
Version history	43
Restrictions and precautions common to all FBs	44
I/O signal processing	45
Combination of FBs	46
Synchronous control parameters [Pr.XX]	48
Synchronous control data [Cd.XX]	49
Mark detection setting parameters [Pr.XX]	51
Mark detection control data [Cd.XX]	52
Positioning data [Da.XX]	52
4.2 Details of the FB Library	53
STD_MakeRotaryCutterCam (Cam auto-generation for rotary cutter)	53
STD_MakeFlyingShearCam (Cam auto-generation for flying shear)	57
PAC_MakeLongDwellDCam (Cam auto-generation for D-cam)	63
STD_ReadMarkDetectData (Mark detection data reading)	68
PAC_CalcMarkCompensation (Automatic compensation calculation using mark detection)	72



	STD_CtrlAuxiliaryAxis (Auxiliary axis correction) . . . . .	76
	PAC_CalcGap (Work gap adjustment compensation amount calculation) . . . . .	80
	PAC_CalcPhase (Work loading position adjustment compensation amount calculation) . . . . .	85
<b>4.3</b>	<b>List of Structures</b> . . . . .	<b>89</b>
	AXIS_REF (Axis setting) . . . . .	89
	PAC_COMPENSATION_REF (Compensation control setting) . . . . .	89

**CHAPTER 5 APPLICATION PROGRAM EXAMPLE 90**

---

<b>5.1</b>	<b>Rotary Cutter</b> . . . . .	<b>91</b>
	System configuration . . . . .	91
	Control specifications . . . . .	92
	Program configuration . . . . .	92
	Parameter . . . . .	93
	Program processing . . . . .	96
<b>5.2</b>	<b>Long Dwell</b> . . . . .	<b>105</b>
	System configuration . . . . .	105
	Control specifications . . . . .	106
	Program configuration . . . . .	106
	Parameter . . . . .	107
	Program processing . . . . .	110
<b>5.3</b>	<b>Alignment Conveyor</b> . . . . .	<b>119</b>
	System configuration . . . . .	119
	Control specifications . . . . .	120
	Program configuration . . . . .	120
	Parameter . . . . .	121
	Program processing . . . . .	123
	Troubleshooting of the alignment conveyor . . . . .	128
<b>5.4</b>	<b>Application Program Control FBs</b> . . . . .	<b>129</b>
	MotionReady (Simplemotion ready) . . . . .	129
	HomePositionReturn (Home position return) . . . . .	130
	ReadStrokeCamData (Cam data reading for stroke ratio data format) . . . . .	131
	ReadCoordinateCamData (Cam data reading for coordinate data format) . . . . .	133
	CtrlOutputAxisSync (Output axis synchronization control) . . . . .	135
	SaveCompensationBuffer (Compensation amount buffer) . . . . .	140
<b>5.5</b>	<b>Application Program Example: Operation Procedure</b> . . . . .	<b>143</b>

**CHAPTER 6 GOT APPLICATION SCREEN EXAMPLES 145**

---

<b>6.1</b>	<b>Screen Layout</b> . . . . .	<b>145</b>
	Screen transition (All screens) . . . . .	145
	Screen transition (Common) . . . . .	146
<b>6.2</b>	<b>Basic Screen Layout</b> . . . . .	<b>147</b>
<b>6.3</b>	<b>Description of Common Items</b> . . . . .	<b>148</b>
	Descriptions of character colors . . . . .	148
	Switch . . . . .	148
	Key window . . . . .	148
	Title bar . . . . .	149
	Main menu . . . . .	149
	Sub menu . . . . .	150
	Window screens common in all screens . . . . .	151
<b>6.4</b>	<b>When the GOT is Started</b> . . . . .	<b>152</b>

Start logo screen . . . . .	152
Operation to be performed when the GOT is started for the first time . . . . .	152
<b>6.5 Base Screen . . . . .</b>	<b>153</b>
Home screen . . . . .	154
Equipment menu Rotary cutter screen . . . . .	155
Equipment menu Long dwell screen . . . . .	157
Equipment menu Cam monitor screen . . . . .	159
Equipment menu Mark compensation screen . . . . .	160
Equipment menu Alignment conveyor screen . . . . .	164
Servo axis setting screen . . . . .	170
Production screen . . . . .	174
<b>6.6 Window Screen . . . . .</b>	<b>175</b>
<b>6.7 List of Devices to be Used . . . . .</b>	<b>176</b>
List of global labels . . . . .	176
List of GOT devices . . . . .	180
<b>APPENDICES . . . . .</b>	<b>181</b>
<hr/>	
<b>Appendix 1 List of Error Codes . . . . .</b>	<b>181</b>
FB library Warning . . . . .	181
FB library Error . . . . .	182
Application program control FB Warning . . . . .	184
Application program control FB Error . . . . .	184
<b>Appendix 2 Functional Restrictions by Version . . . . .</b>	<b>185</b>
<b>Appendix 3 Temporary License Registration . . . . .</b>	<b>186</b>
<b>INSTRUCTION INDEX . . . . .</b>	<b>190</b>
<hr/>	
REVISIONS . . . . .	192
WARRANTY . . . . .	193
TRADEMARKS . . . . .	194

# RELEVANT MANUALS

Manual name [manual number]	Description	Available form
MELSEC iQ-F FX5 Simple Motion Module User's Manual (Startup) [IB-0300251]	Specifications, procedures before operation, system configuration, wiring, and operation examples of the Simple Motion module	Print book e-Manual PDF
MELSEC iQ-F FX5 Simple Motion Module User's Manual (Application) [IB-0300253]	Functions, input/output signals, buffer memories, parameter settings, programming, and troubleshooting of the Simple Motion module	Print book e-Manual PDF
MELSEC iQ-F FX5 Simple Motion Module User's Manual (Advanced Synchronous Control) [IB-0300255]	Functions and programming for the synchronous control of the Simple Motion module	Print book e-Manual PDF

This manual does not include information on restrictions of use such as combination with modules or PLC CPUs. Please make sure to read the user's manual of the corresponding products before using this application package.

## Point

e-Manual refers to the Mitsubishi FA electronic book manuals that can be browsed using a dedicated tool.

e-Manual has the following features:

- Required information can be cross-searched in multiple manuals.
- Other manuals can be accessed from the links in the manual.
- The hardware specifications of each part can be found from the product figures.
- Pages that users often browse can be bookmarked.

# TERMS

Unless otherwise specified, this manual uses the following terms.

Term	Description
Alignment conveyor	This function aligns unevenly placed workpieces to be packaged and transfers them to the supply conveyor.
Box motion	This mechanism performs sealing and cutting with elliptical movements of two axes, the travel axis and seal axis. A cutter seals and cuts the sheet or film conveyed by the conveyor into the specified size at the speed synchronized with the sheet or film while moving downward and forward at the same time. After completion of cutting, the cutter moves upward and returns to the waiting point.
Center seal	To adhere a film or sheet on the back of an item to form a tube in packaging. This processing is also called back sealing.
Cut pitch	This word indicates the cutting interval of a sheet or film.
Cycle stop	This function stops a series of operations to be performed by the machine at a specified position after a stop request is issued.
Discharge conveyor	This conveyor carries packaged items to outside the packaging machine.
Emergency stop	This function immediately stops the operation of the machine.
End seal	This mechanism adheres a sheet or film to seal items to be packaged.
FB	The abbreviation for a function block
Film	This word indicates a thin film in general. For the packaging machine, this word indicates a film for packaging workpieces.
Finger	This mechanism keeps the intervals of packaging target items or products constant on the conveyor.
Flying shear	This mechanism performs traveling cutting synchronized with one axis in synchronization with the sheet. A cutter travels (forward/backward) at a synchronous speed to cut the sheet or film conveyed by the conveyor into the specified size.
Gap adjustment conveyor	This conveyor aligns unevenly placed workpieces to be packaged.
GOT	The abbreviation for Graphic Operation Terminal
Gusset	This word indicates a margin. A gusset bag has margins on both sides. A packaged product is rectangular in shape.
Inching	This function operates the machine while the button is pressed.
Loading conveyor	This conveyor loads workpieces to be packaged.
Long dwell	This mechanism seals and cuts a sheet or film in the circular motion including straight motion (similar to the shape of the letter "D"). The straight section is used to synchronize the conveyor speed, seal and cut the sheet or film. The straight section ensures sufficient sealing and cutting time.
Mark compensation	This function detects a registration mark and compensates the gap between the mark and reference point.
Meandering adjustment	This function compensates the deformation of a sheet detected during sheet feeding.
No Gap No Seal	This function stops end seal processing to protect the mechanism when the space between packaging target items is too narrow to package.
No Product No Bag	This function stops end seal processing and film feeding to prevent packaging mistakes when no packaging target items are conveyed.
Potentiometer	This device detects a rotation angle by applying a constant voltage between fixed terminals of a variable resistor and measuring the voltage of a slide terminal.
Product	This word indicates a packaged item.
Product length	The size of an item to be packaged
Pulse generator	A pulse generator is used for detecting the rotation speed of the feed roll. This generator is also called rotary encoder.
Reel change	This function automatically replaces the film or sheet.
Register mark	This mark is used as the index for the interval of a sheet. This mark is also called register mark or match mark.
Rotary cutter	This mechanism seals and cuts a sheet or film with a cutter consisting of a circular blade and a fixed blade. A rotating cutter seals and cuts the sheet or film conveyed by the conveyor into the specified size while adjusting the speed. The cutter rotates at the peripheral speed synchronized with the sheet or film.
Rotary encoder	Refer to "Pulse generator".
Seal axis	This axis moves vertically to the line in the box motion.
Sealing	To adhere a sheet or film by heat, pressure, or ultrasonic wave
Sensor	A tension detector, proximity switch, or pulse generator
Supply conveyor	This conveyor carries packaging target items to a packaging machine.

Term	Description
Temperature control	This control regulates a heat source such as a heater at a set temperature.
Temporary license	A license for using the application before getting an official license. The temporary license is available for two months (from the registration date of the temporary license to the same day in the month after next).
Tension control	This control performs rewinding/unwinding with a constant tension regardless of winding diameter changes.
Travel axis	This axis moves in parallel to the line in the box motion.
Work	This word indicates a packaging target item.
Work length	The size of an item to be packaged

# REQUESTING AND REGISTERING A LICENSE KEY

To use the application, register a license key to the CPU module.

Before starting up the system, follow the "License Key Request Instructions" supplied with this product to get a license key.

**1.** The following information is required to request a license key.

- Application information (product name, model, and product ID)

This information is described in the "License Certificate" supplied with this product.

- Hardware information (model and serial number)

The model and serial number (manufacturing number for MELSEC iQ-F series) of the CPU module to be used. For the manufacturing number, refer to the following.

📖 MELSEC iQ-F FX5U User's Manual (Hardware)

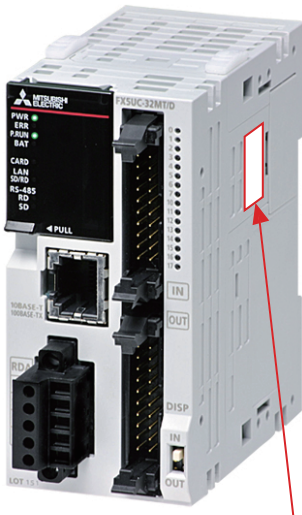
**2.** Register the license key to the CPU module before creating an application program.

For the registration procedure, refer to the following.

👉 Page 27 SETTING AND PROCEDURE BEFORE OPERATION

**3.** Attach the supplied "iQ Monozukuri seal" on the CPU module for which a license key has been registered.

For the position to attach the seal, refer to the following.



Position where the seal is attached:  
Side of the module  
Next to the subsequent extension connector cover



Position where the seal is attached:  
Right of the MELSEC mark

# 1 OVERVIEW

## 1.1 Packaging Application Package

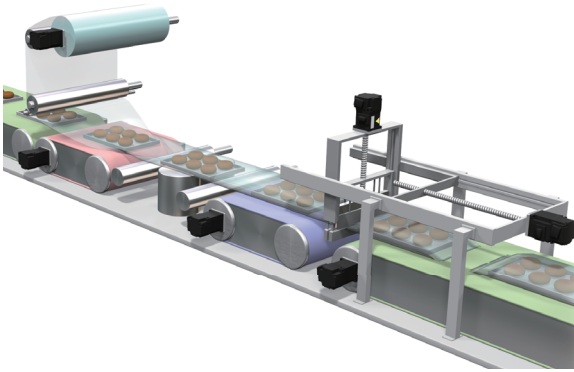
The "packaging application package" provides the FB library of the standard functions used for packaging control and application examples of the library (programs and GOT screens).

Users can easily create applications by programming with the libraries required for the system used and utilizing screen examples.

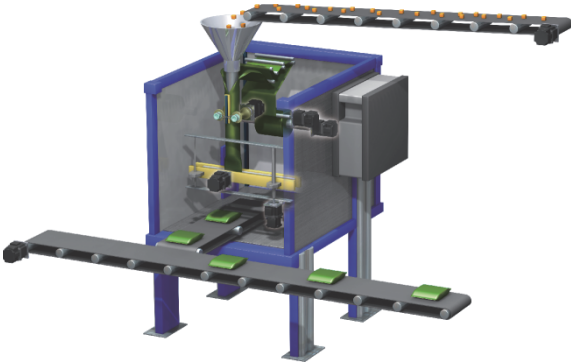
## 1.2 Application Examples

This application package can be used for controlling product packaging machines and cutting machines for film, paper, and boards as shown below.

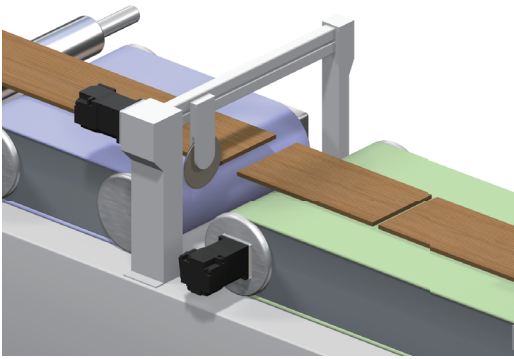
### Horizontal pillow packaging machine



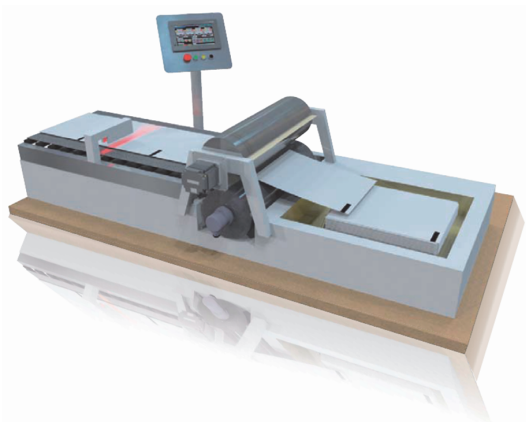
### Vertical pillow packaging machine



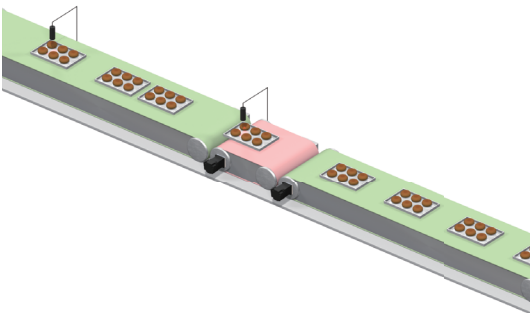
## Cross-cutting machine



## Rotary cutter



## Conveyor line



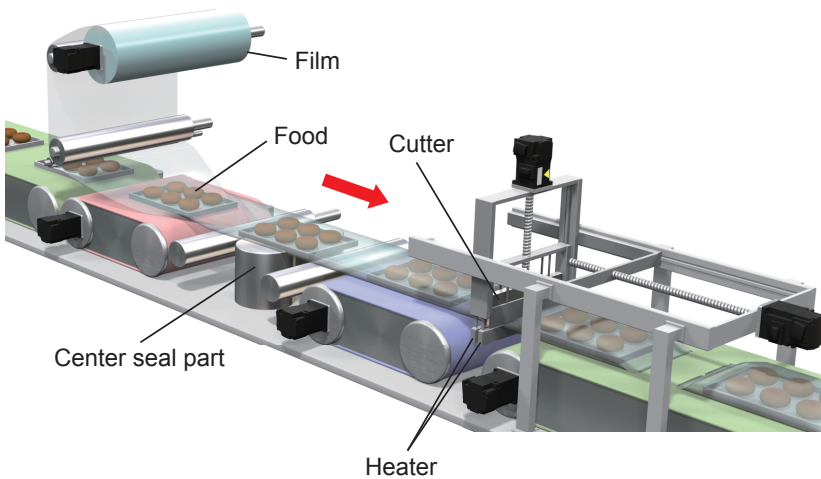


# 1.3 Operations of Pillow Packaging Machines

The following describes the operations of pillow packaging machines.

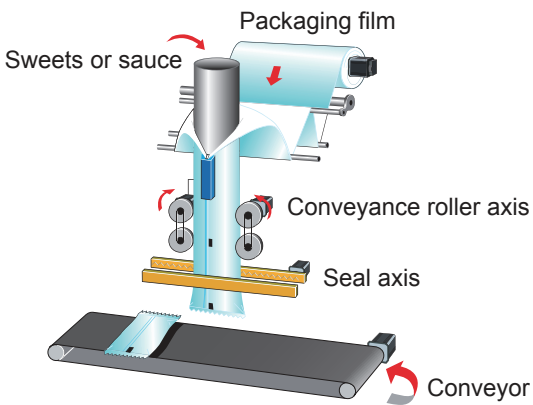
## Horizontal pillow packaging machine

This machine feeds a roll of packaging film, wraps workpieces such as food conveyed on conveyor belts with the film, and adheres both ends of the film on the back of the workpieces lengthways to form a film tube. The workpieces arranged at regular intervals in the tube are conveyed to the next step and this machine performs sealing and cutting widthways so that they are packed one by one.



## Vertical pillow packaging machine

This machine feeds a roll of packaging film, and the conveyance roller axis feeds the film by the size of one bag and adheres both ends of the film lengthways to form a bag. After a workpiece such as food is put into the bag, this machine performs sealing and cutting the top of the bag. Packed workpieces are conveyed by the conveyor.



# 1.4 Functions of Each Packaging Machine

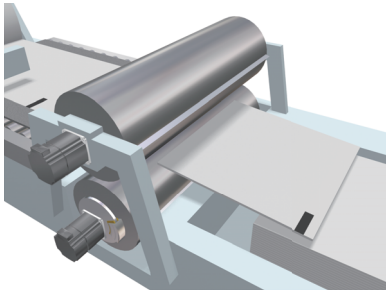
The following describes functions of each packaging machine.

## Rotary cutter

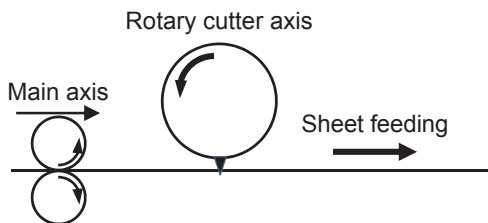
This function performs sealing and cutting with a circular movement of one axis.

A cutter seals and cuts the sheet or film conveyed by the conveyor into the specified size while adjusting the speed. The cutter rotates at the peripheral speed synchronized with the sheet or film.

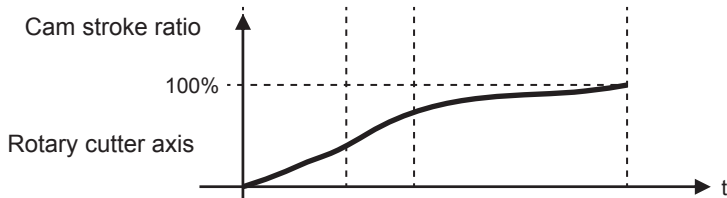
### ■Mechanism image



### ■Operation outline



### ■Cam pattern

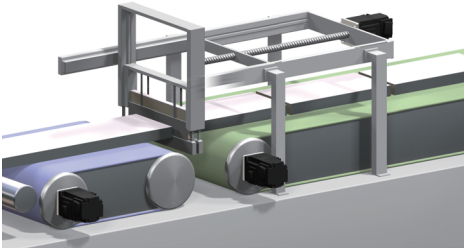


## Flying shear

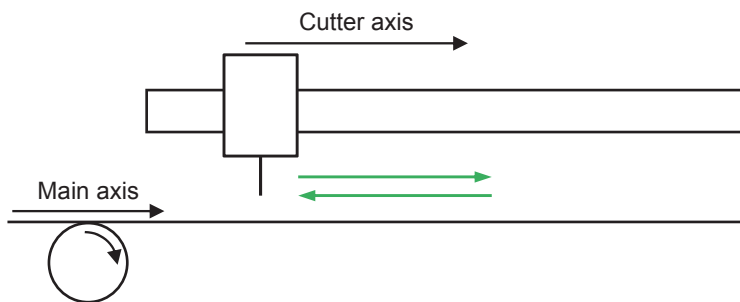
This function performs traveling cutting with one axis in synchronization with the sheet.

A cutter travels (forward/backward) to cut the sheet or film conveyed by the conveyor into the specified size.

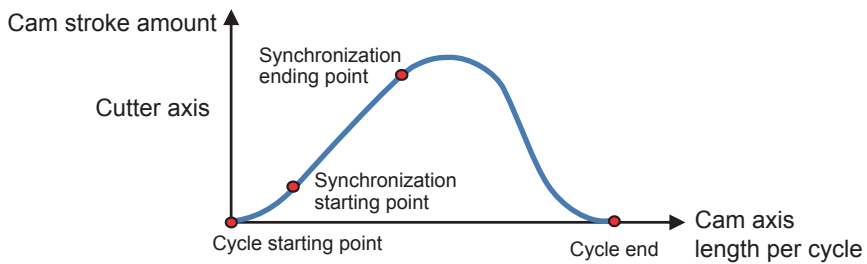
### ■Mechanism image



### ■Operation outline



### ■Cam pattern



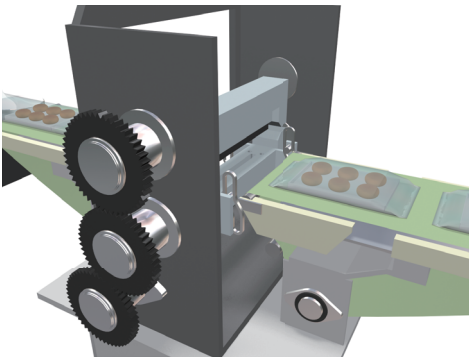
## Long dwell

This function performs sealing and cutting with elliptical movements of one axis.

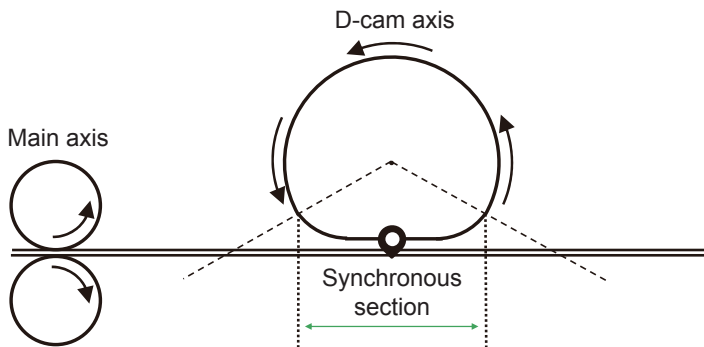
A cutter seals and cuts the sheet or film conveyed by the conveyor into the specified size while adjusting the speed. The cutter rotates at the peripheral speed synchronized with the sheet or film.

Section	Movement	Remarks
1)	Moving to the synchronization starting point	—
2)	Moving to the seal process point	Main axis - D-cam axis synchronous section
3)	Sealing and cutting operation	
4)	Sealing complete D-cam axis retraction	
5)	Moving to the D-cam axis waiting point	—

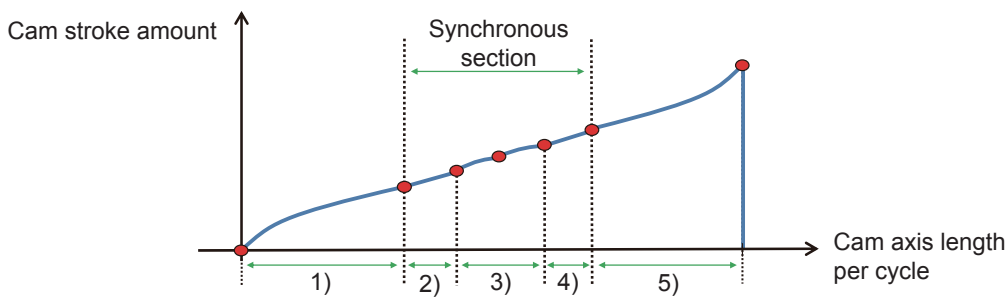
### ■Mechanism image



### ■Operation outline



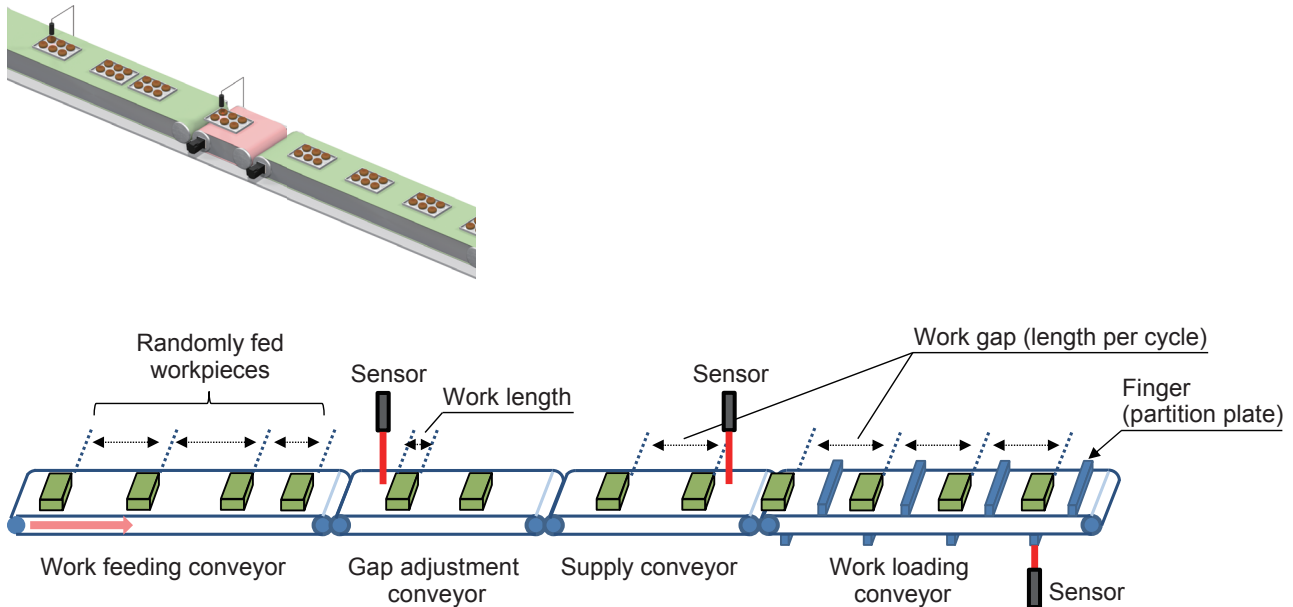
### ■Cam pattern



## Alignment conveyor

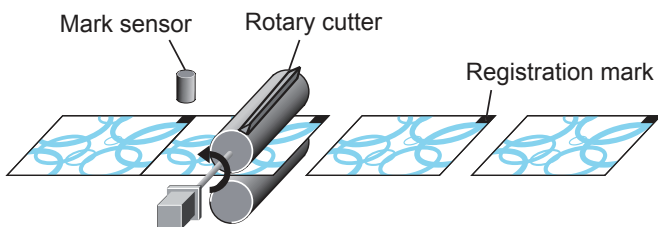
This function aligns the workpieces randomly fed from the upstream conveyor at equal spaces and discharges them to the loading conveyor.

### ■ Mechanism image



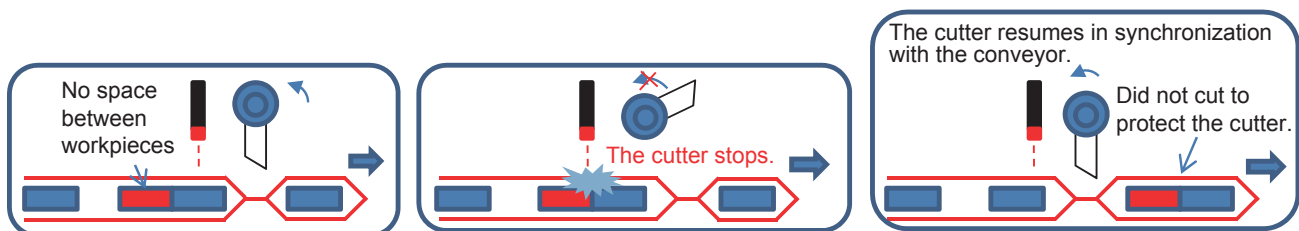
## Mark compensation

This function detects registration marks printed on a sheet for packaging workpieces and compensates the cutter axis or sheet feeding axis.



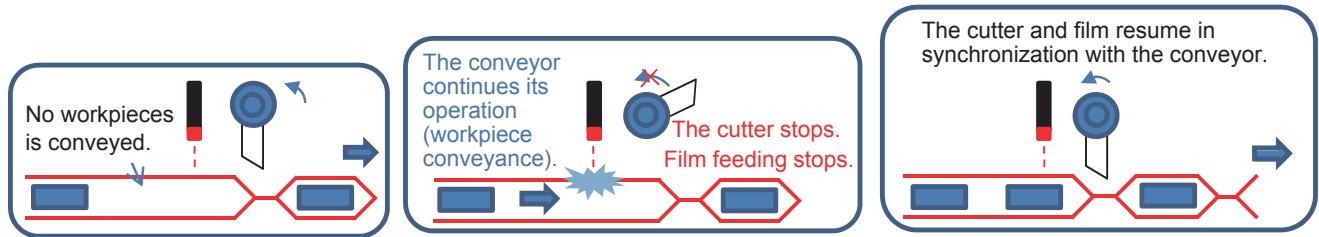
## No Gap No Seal

This function protects the cutter mechanism by stopping the cutter axis when spaces between products (workpieces) are too narrow to package them.



## No Product No Bag

This function stops the cutter axis and film feeding axis to prevent packaging mistakes when no products (workpieces) are conveyed by the conveyor.



# 1.5 Product Configuration


This product is the PACKAGING package for MELSEC iQ-F series.

Select and prepare MELSEC iQ-F PLC CPUs, I/Os, intelligent modules, servo amplifiers, driving devices such as inverters, and GOTs appropriate to the system used.

## Products in the iQ Monozukuri PACKAGING package

### AP20-PAC004AA-M□

Check that all the products in the following table are included in a package.

Name	Quantity	Remarks
Before Using the Product	1	
END-USER SOFTWARE LICENSE AGREEMENT	1	
License Certificate	1	
PACKAGING package (DVD-ROM)	1	For details, refer to the following.  Page 26 Files in DVD-ROM
License Key Request Instructions	1	
iQ Monozukuri seal	Number of licenses × 2 <sup>*1</sup>	

\*1 There are two iQ Monozukuri seals included for each license (one spare seal).

# 1.6 Files in DVD-ROM

The following table describes the composition of the files in the DVD-ROM (PACKAGING package) included in this package.

Folder			File name <sup>*1</sup>	File type (Extension)	Description	Required application
Package root	Manual	English	bcnb62005808eng*	PDF file (.pdf)	iQ Monozukuri PACKAGING Instruction Manual (English)	Adobe Reader
			bcnb62005808eng*	e-Manual file (.ema)		e-Manual Viewer
		Japanese	bcnb62005807*	PDF file (.pdf)	iQ Monozukuri PACKAGING Instruction Manual (Japanese)	Adobe Reader
			bcnb62005807*	e-Manual file (.ema)		e-Manual Viewer
		Simplified Chinese	bcnb62005809chn*	PDF file (.pdf)	iQ Monozukuri PACKAGING Instruction Manual (Chinese (Simplified))	Adobe Reader
			bcnb62005809chn*	e-Manual file (.ema)		e-Manual Viewer
	Lib	PAC_PackagingControl_F_****	Application library (.mslm)	FB library for packaging applications	MELSOFT GX Works3	
	Project	AP20-PAC004AA-FX5U-40SSC_RotaryCutter_****	GX Works3 project file (.gx3)	Application program examples using the rotary cutter	MELSOFT GX Works3	
		AP20-PAC004AA-FX5U-40SSC_LongDwell_****	GX Works3 project file (.gx3)	Application program examples using the long dwell	MELSOFT GX Works3	
		AP20-PAC004AA-FX5U-80SSC_AlignmentConveyor_****	GX Works3 project file (.gx3)	Program examples for work alignment on the conveyor	MELSOFT GX Works3	
		AP20-PAC004AA-GT2105Q_****	GT Designer3 project file (.GTX)	Screen examples for packaging applications	MELSOFT GT Works3	
		AP20-PAC004AAGT2105Q_AlignmentConveyor_****	GT Designer3 project file (.GTX)	Screen examples for packaging applications	MELSOFT GT Works3	
	LicRegSupport	LicRegSupport	Tool (.xlsm)	License key registration support tool	Microsoft Excel	
		AP20-PAC004AA_FX5U_LicWrite	GX Works3 project file (.gx3)	Programs for registering a license key to the CPU module	MELSOFT GX Works3	
—	AP20-PAC004AA	Text file (.txt)	Version information	—		

\*1 \*\*\*\* indicates their versions.

# 1.7 Applicable Hardware and Software

The following table lists applicable models and versions of the engineering tool.

Item	Model
CPU module	FX5UCPU, FX5UCCPU Use the module with a firmware version of "1.060" or later.
Simple Motion module	FX5-40SSC-S, FX5-80SSC-S
Engineering environment (controller)	MELSOFT GX Works3 Version 1.055H or later <sup>*1</sup>
Engineering environment (GOT)	MELSOFT GT Works3 Version 1.190Y or later <sup>*1</sup>

\*1 The projects included in this product were created in the indicated version.



# 2 SETTING AND PROCEDURE BEFORE OPERATION

## 2.1 Registering a License Key

To use this application package, register a license key to the PLC CPU module that executes applications. Follow the steps below to register a license key.

### Point

To execute the application before getting a license key, use a temporary license. The temporary license is valid for two months (from the registration date of the temporary license to the same day in the month after next). For how to register a temporary license, refer to the following.  
☞ Page 186 Temporary License Registration

### Items to be prepared

Item	Description
Product ID	Numbers that are described in the "License Certificate" <input type="text" value="123-123456789"/>
License key	Follow the "License Key Request Instructions" to get a license key. <input type="text" value="11AA12AB13AC14AD21BA22BB23BC24BD31CA32CB33CC34CD41DA42DB43DC44DD"/>
License key registration project (AP20-PAC004AA_FX5U_LicWrite.gx3)	A project for registering a license key to the PLC CPU module. It is included in the supplied DVD. <FB> FormatLicense (Macro type) PAC_LicenseWrite (Macro type)
License key registration support tool (LicRegSupport.xlsm)	A tool that generates a license key registration program (ST instructions). It is included in the supplied DVD. When the operating environment for Office is not installed, register the license key manually without this tool. [Operating environment] Microsoft Office 2010, Microsoft Office 2013, Microsoft Office 2016

### Creating and executing the program

#### 1. Opening the license key registration project (AP20-PAC004AA\_FX5U\_LicWrite.gx3)

Copy the license key registration project (AP20-PAC004AA\_FX5U\_LicWrite.gx3) in the supplied DVD to a folder on the personal computer, then open the file.

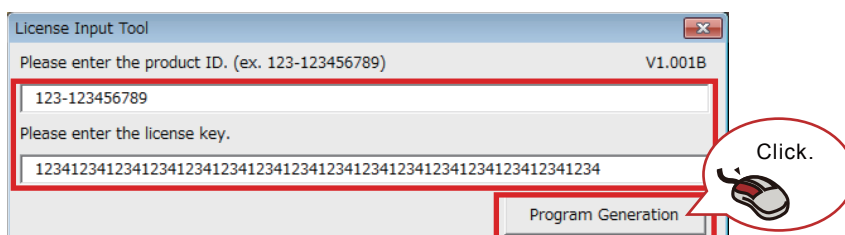
The project is created for the FX5UCPU. When using a model other than FX5UCPU, change the model.

\* When registering a license key to multiple PLC CPU modules, register it one by one.

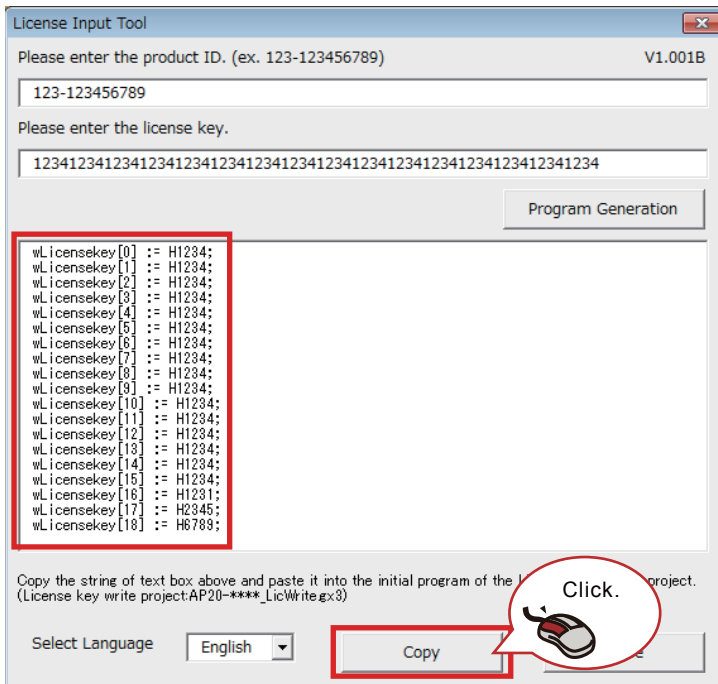
#### 2. Preparing the program using the license key registration support tool

When this tool is not used, follow the procedure described in "3. Editing the initial program".

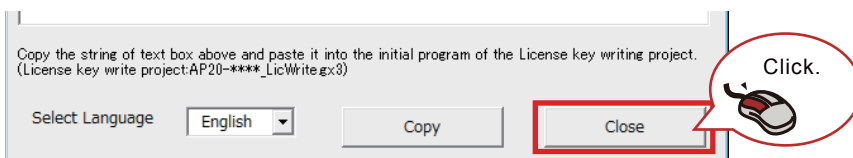
- Copy the license key registration support tool (LicRegSupport.xlsm) in the supplied DVD to a folder in the personal computer, and open the file. When the file is read-only, clear the read-only status. Enable the macro if it is disabled.
- Input the product ID and license key, and press the [Program Generation] button.



- The program in ST language is output. Press the [Copy] button. The output program is copied to the clipboard.



- Follow the steps described in "3. Editing the initial program" to edit the program. After editing the program, press the [Close] button to end the tool.



## Precautions

Any operation in Excel is disabled while the license key registration support tool is being used. End the tool after using it.

### 3. Editing the initial program

Select "Program" → "Initial" in the Navigation window and open the registered program. (Program name: Initial)

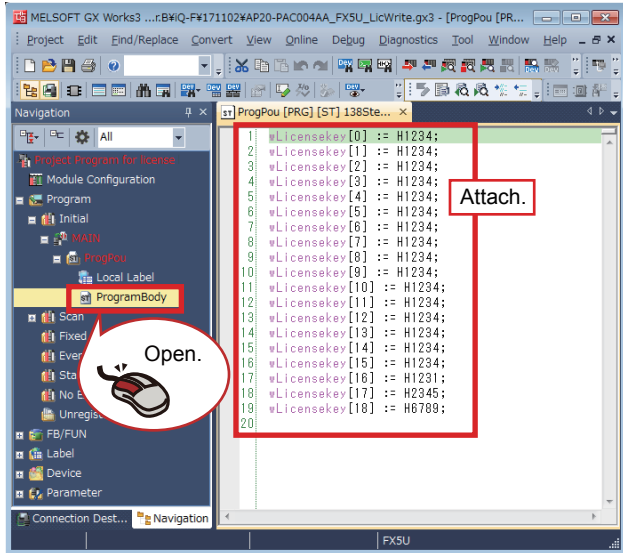
Set the license key to the license key label (wLicensekey) of the initial program.

■ Setting with the license key registration support tool

When the license key registration support tool is not used, refer to "Manual setting".

Press the [Copy] button to copy the program in ST language which is output to the license key registration support tool to the clipboard.

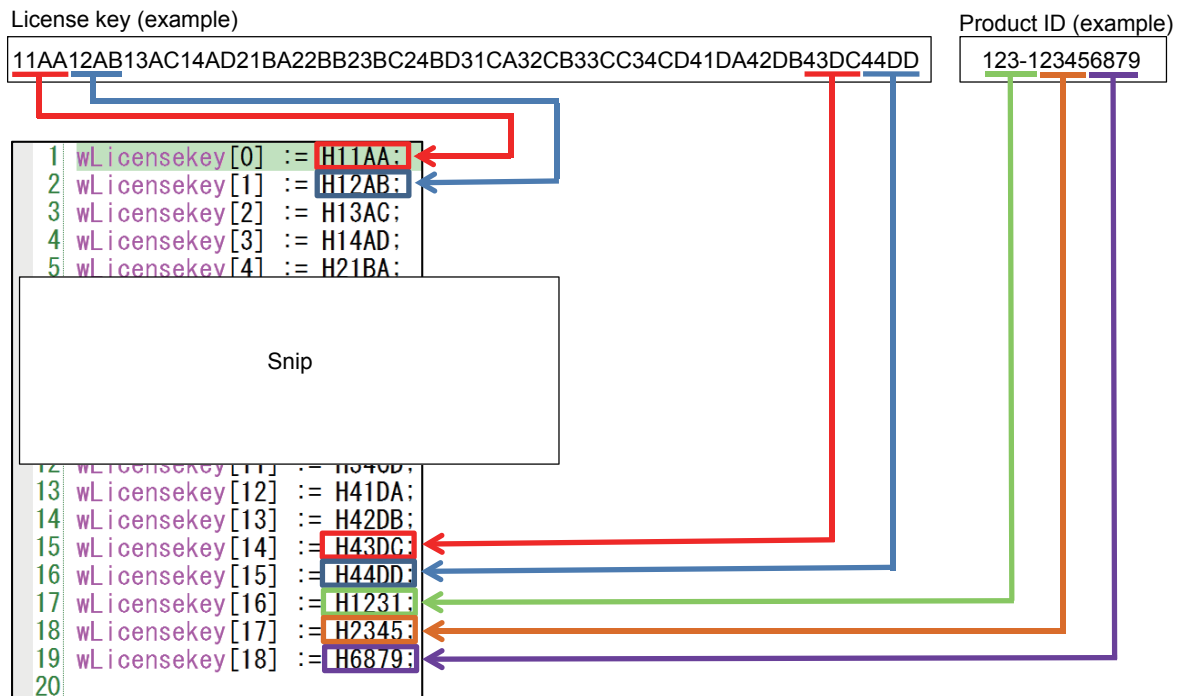
Select all of the existing ST program and paste the copied program in the initial program.



After pasting the program, follow the procedure described in "4. Writing and executing the program".

■ Manual setting

Refer to the following example to set the license key and product ID to the initial program.



#### 4. Writing and executing the program

Write the created program to the PLC CPU module and execute it.

- Select "Convert" → "Rebuild All" from the menu and convert all the program created in step 3. When an error occurs, check the details and correct the program.
- Select "Online" → "Write to PLC" from the menu and write all the program to the PLC CPU module.
- Set the PLC CPU module to the RUN state and execute the scan program. Select "Program" → "Scan" in the Navigation window and open the registered program. (Program name: LicenseWrite) The scan program includes the function block (FormatLicense) for formatting the license key registration area and the function block (PAC\_LicenseWrite) for writing the license key.

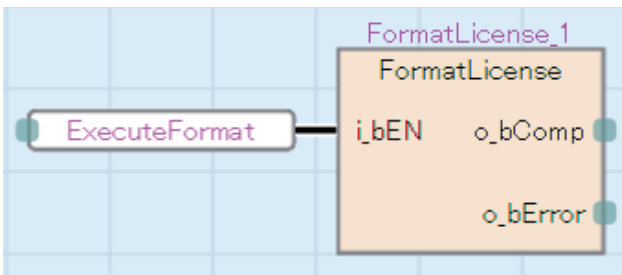
#### Point

- When registering the license key to the PLC CPU module for the first time, format the license key registration area. Format it before registering the license key.
- When another license of iQ Monozukuri has been registered, register the license without formatting it.
- When the temporary license has already been registered, the expiration date is cleared by registering the obtained license key.

#### ■ Formatting the license key registration area

Turn on the execution flag (ExecuteFormat) of the function block (FormatLicense) in the scan program. Normal completion (o\_bComp) or Error completion (o\_bError) becomes TRUE. At the error completion, check the PLC CPU error details.

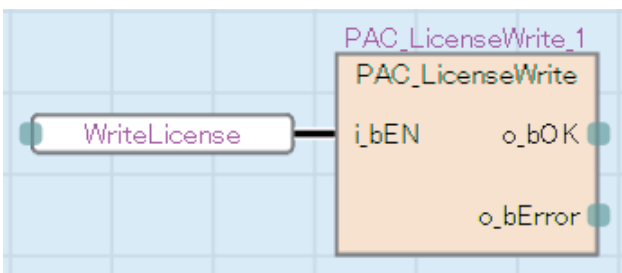
Turn off the execution flag (ExecuteFormat) after checking the output of the function block.



#### ■ Registering the license key

Turn on the execution flag (WriteLicense) of the function block (PAC\_LicenseWrite) in the scan program. Normal completion (o\_bOK) or Error completion (o\_bError) becomes TRUE. At the error completion, refer to Troubleshooting. (Page 31 Troubleshooting)

When Normal operation (o\_bOK) turns on, the license key registration is completed. Turn off the execution flag (WriteLicense).

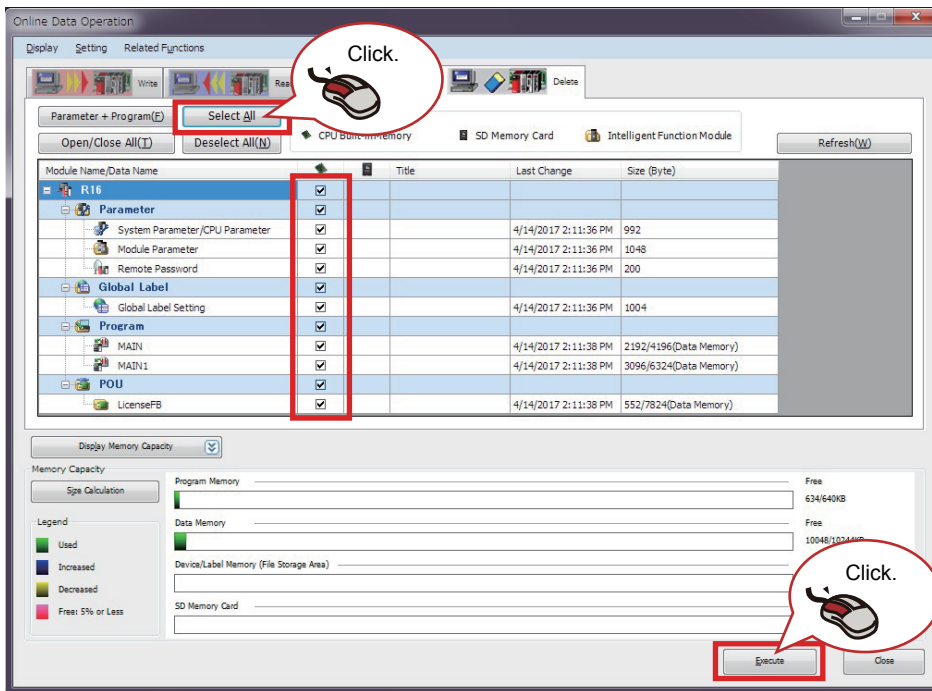


## 5. Deleting the license key registration program

After the license key registration has been completed, delete the program in the PLC CPU module.

Select "Online" → "Delete PLC Data" from the menu and select the [Select All] button in the "Online Data Operation" window to delete the program.

The license key registration project is not used after the registration. Save it as necessary and end it.



## Troubleshooting

The following table lists errors that occur during the license key registration and corrective actions.

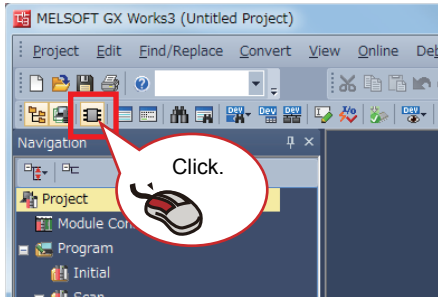
Error details	Cause	Corrective action
After "PAC_LicenseWrite" has been executed, Error completion (o_bError) turns on and Normal completion (o_bOK) remains off.	<ul style="list-style-type: none"> <li>The license key registration area has never been formatted.</li> <li>The license key outside the range of the memory was trying to be written.</li> </ul>	Format the license key registration area using "FormatLicense" and register the license key using "PAC_LicenseWrite". Using "FormatLicense" deletes other registered license keys. Register them again.
After "PAC_LicenseWrite" is executed, neither of Normal completion (o_bOK) and Error completion (o_bError) turns on.	<ul style="list-style-type: none"> <li>The PLC CPU module is not in the RUN state.</li> <li>"Macro type" is not specified for "FB type" of the license key registration FB.</li> </ul>	<ul style="list-style-type: none"> <li>Set the PLC CPU module to the RUN state.</li> <li>Specify "Macro type" for "FB type" of the license key registration FB.</li> </ul>

## Precautions

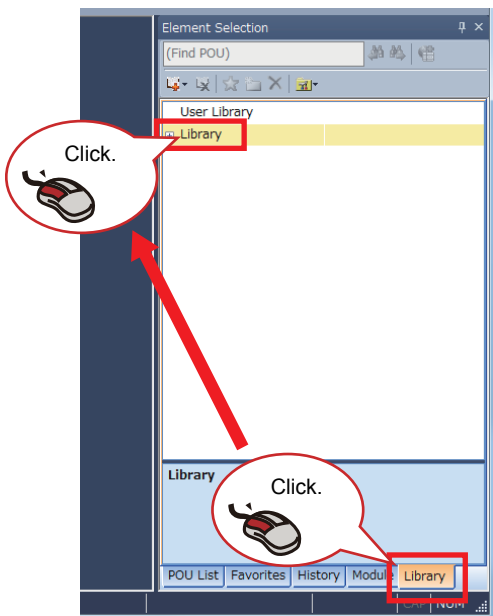
- The license key is held after the power-off since it is written to the device data storage file.
- If the data memory has been reset by operating the CPU memory of GX Works3, registration information of all registered license keys will be lost.
- If the license key registration area of the device data storage file has been operated with SLMP or the FTP server function, license information may be lost.
- For the license key registration FB, set "FB type" to "Macro type".

## 2.2 Registering the FB Library

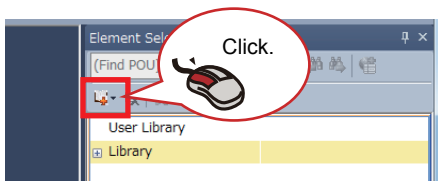
The following describes the procedure for registering the FB library in the list. For the library file name and details of the library, refer to "Page 43 FB LIBRARY".



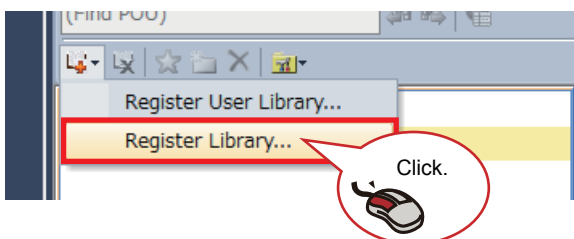
1. Copy the library file (\*.mslm) in the supplied DVD to anywhere in a personal computer.
2. Start GX Works3, select "Project" → "New", and click the [Element Selection] icon.



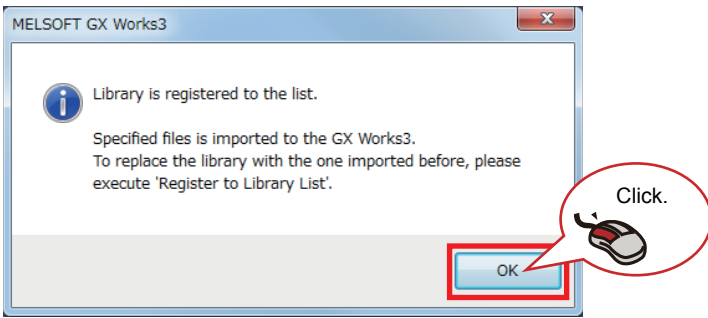
3. The Element Selection window appears. Click the Library tag and select the library.



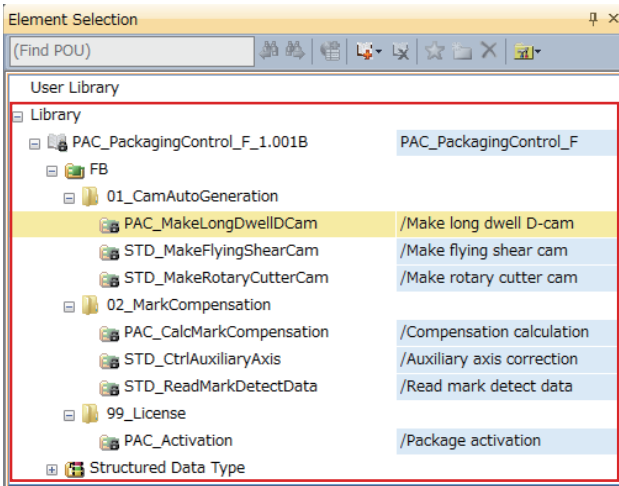
4. Click the [Register to Library List] icon.



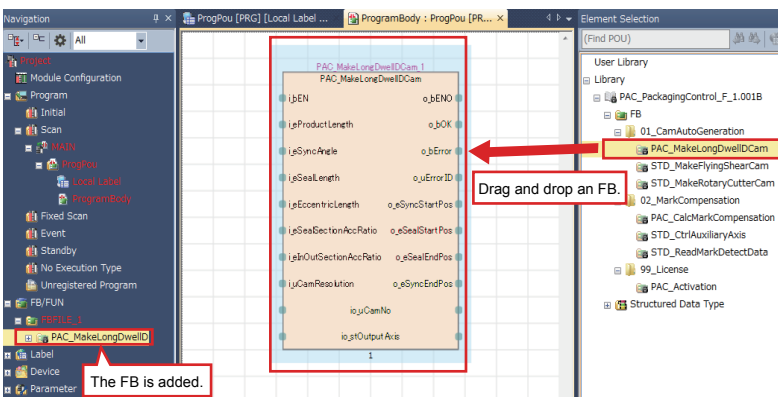
5. Click [Register Library].



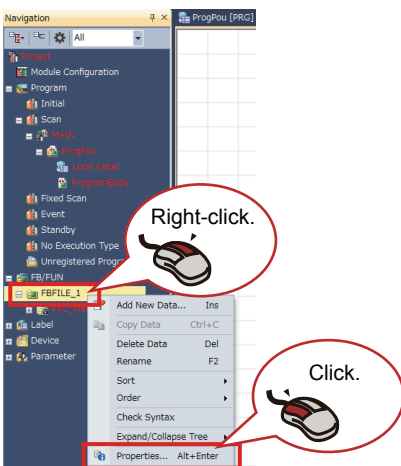
- The dialog box shown on the left appears. Click the [OK] button.
- The "Register Library to Library List" window appears. Select the library file (\*.mslm) copied in the personal computer and click the [Open] button.



- Imported FBs are displayed in the Element Selection window.

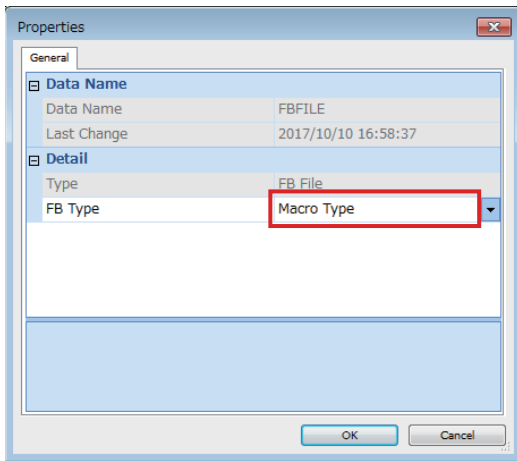


- Select the FB to be used from the Element Selection window, and drag and drop it into the work window. The FB is added in the Navigation window.



- Open "Property".

## 11. Select an FB type.



### Point

When the subroutine type is set as the FB type, the size of programs can be reduced but the processing speed becomes slow.


Fixed cycle execution is recommended for some FBs. Check the fixed cycle interval setting of the inter-module synchronization.



## 2.3 Updating Library Elements

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The procedure for updating the library elements differs depending on the type of the programming language. For details on the procedure for updating the library elements, refer to the following.

 GX Works3 Operating Manual

If the elements of a library imported to a project cannot be updated, delete the library elements (FBs and structures) in the Navigation window, and then drag and drop FBs of a new version into the Navigation window. Unless the old library elements in the Navigation window are deleted, the update cannot be performed.

## 2.4 Certifying the License Key

To use the FB library supplied with this application package, certify the registered license key.  
For the license key certification, arrange the function block in the scan program of the user program.

Item	Description
License certification FB (PAC_Activation)	This FB certifies the license. It is supplied with the FB library. Set "FB type" to "Macro type" before using this function block.

### Placement of the license certification FB (PAC\_Activation) in the user program

The license certification FB (PAC\_Activation) must be executed before the library FBs.

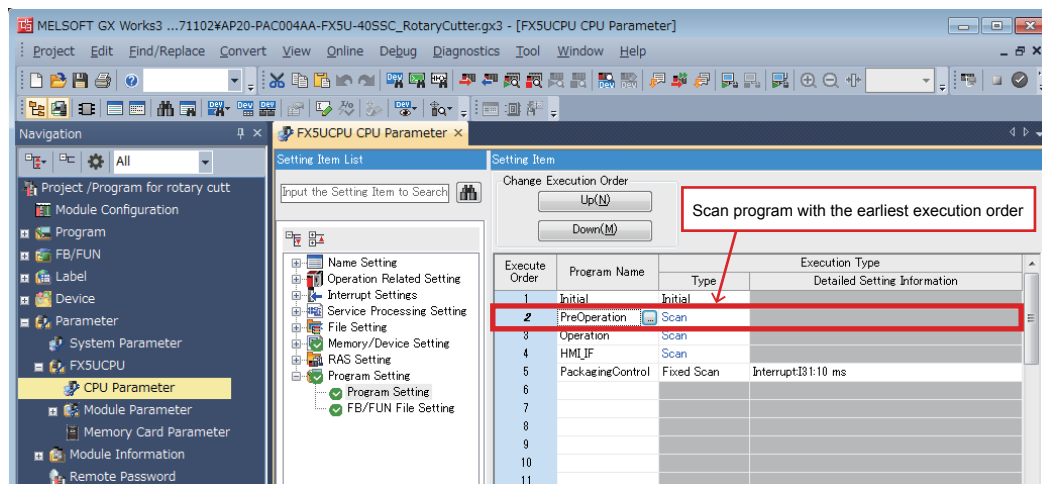
Place it at the front of the user-created GX Works3 project scan program.

If there are multiple scan programs, place it in the program with the earliest execution order.

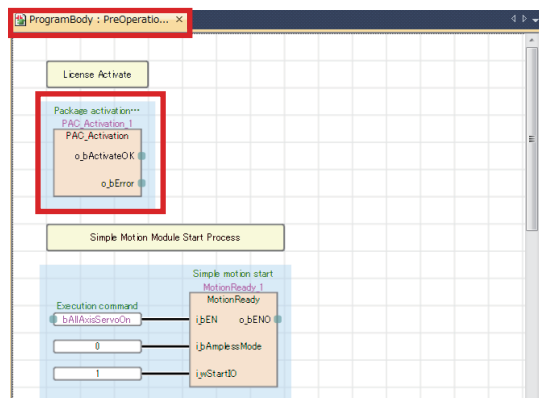
The license certification FB does not operate correctly in non-scan programs.

The license certification FB is executed by simply placing it in the program.

#### How to check the program with the earliest execution order



#### Placement in the license certification FB scan program




## Operation check of user program certification

Write the user program to the PLC CPU module and check the operation of the license certification FB (PAC\_Activation).



When the license key is normally certified, Normal completion (o\_bActivateOK) becomes TRUE.

When Error completion (o\_bError) turns on, check "Troubleshooting".

After checking the normal operation, attach the "iQ Monozukuri seal" on the CPU module. (  REQUESTING AND REGISTERING A LICENSE KEY)

## Troubleshooting

The following table lists errors that occur during the license key certification and corrective actions.

Error details	Cause	Corrective action
"o_bActivateOK" of "PAC_Activation" is not TRUE but "o_bError" is TRUE.	The license key of the corresponding application package is not registered.	Register the license key. (  Page 27 Registering a License Key)
	The expiration date of the temporary license (two months) passed.	Get and register the license key. (  Page 27 Registering a License Key)
The CPU module outputs the error code (3100H) and stops.	The firmware version of the PLC CPU module is not "1.060" or later.	Update the firmware version of the PLC CPU module to "1.060" or later.
The PLC CPU module outputs the error code (32FFH) and stops.	An incorrect license key is registered. 1) The product ID, PLC CPU module model, or manufacturing information at the request is incorrect. 2) The license key is trying to be certified with a PLC CPU module that is not requested.	1) Delete the registered license key using "FormatLicense" and register the correct license key. 2) Delete the registered license key from the PLC CPU module where data is accidentally written by using "FormatLicense" and register the license key in the requested PLC CPU module. Using "FormatLicense" deletes other registered license keys. Register them again.

## Replacing method of the module

### ■ When replacing the PLC CPU module

To replace the CPU module, a new license key is required.

For the new license key, please contact your local Mitsubishi Electric representative.

### ■ When replacing a module other than the PLC CPU module (such as a Simple Motion module)

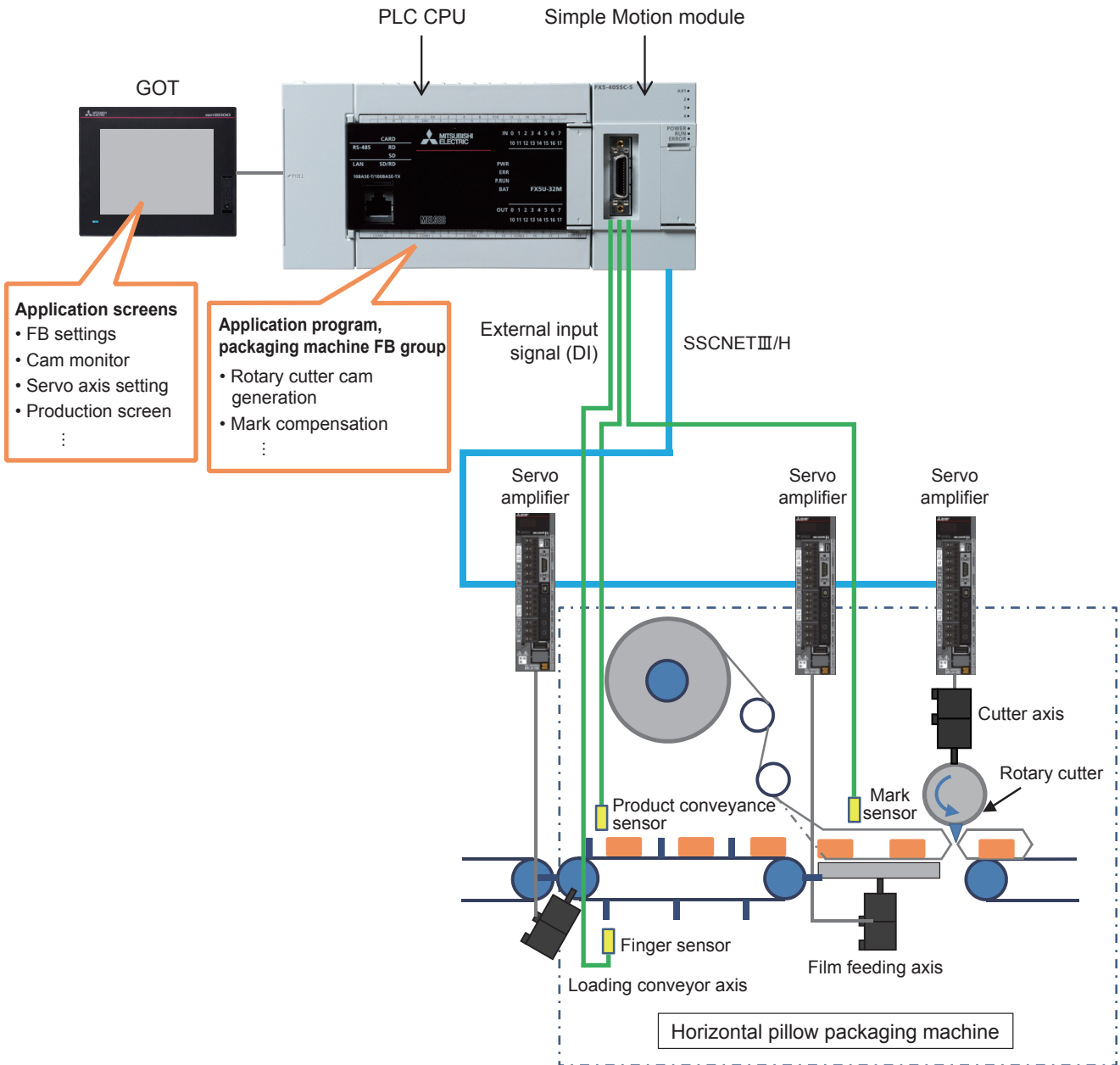
No specific operation is required. Refer to the manual of the module to replace the module.

# 3 SYSTEM CONSTRUCTION

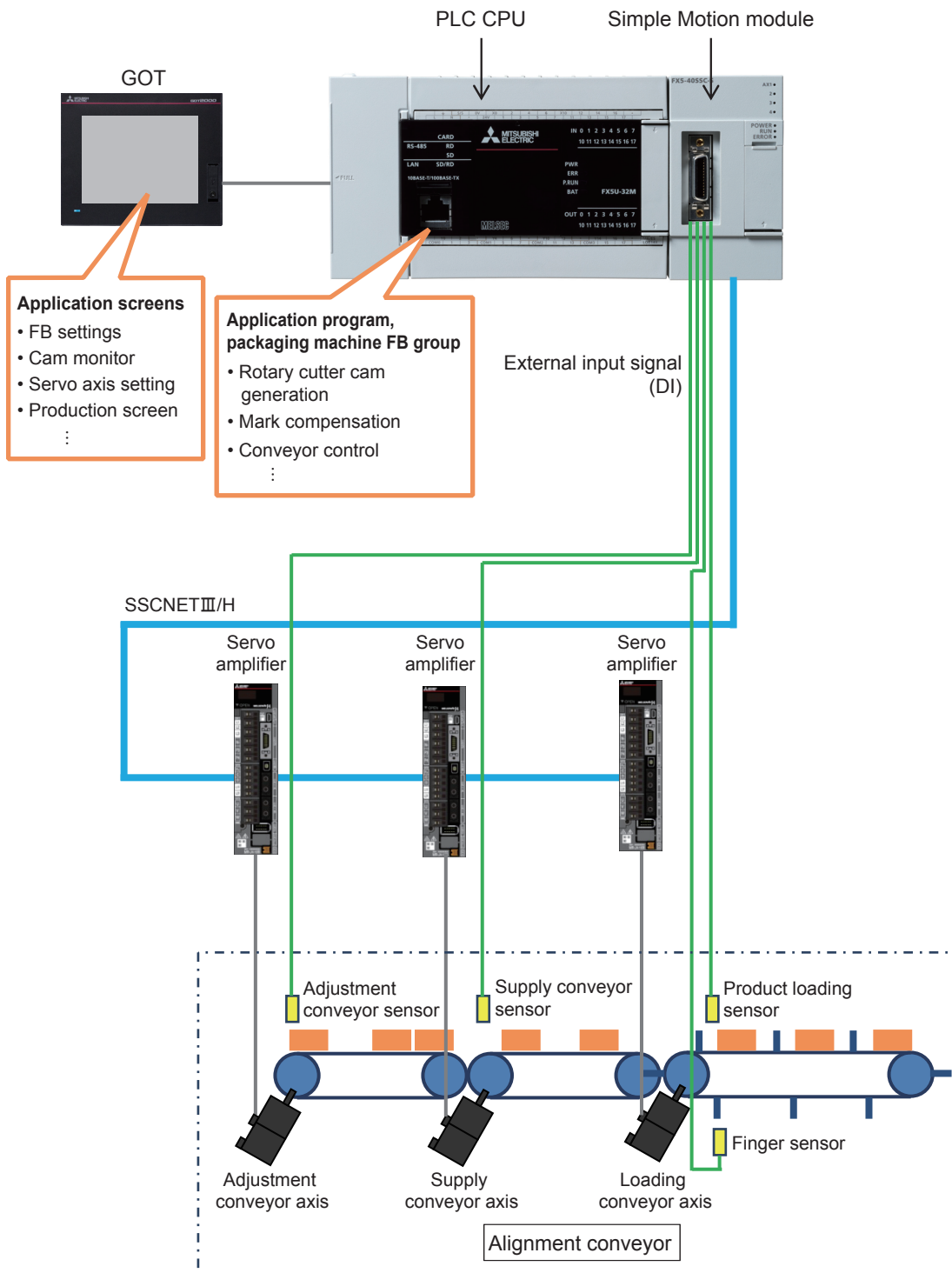
## 3.1 System Configuration Example

The following figure shows the system configuration example of the horizontal pillow packaging machine with this application.

### Rotary cutter/long dwell



# Alignment conveyor



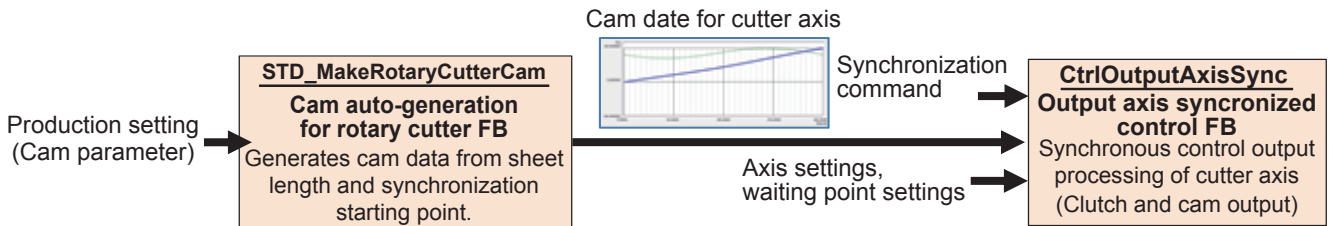
## 3.2 Control Overview

### Function block configuration example

The following shows the FB configuration examples for controlling the horizontal pillow packaging machine with this library. They can be used for rotary cutter and long dwell by replacing the cam generation FB in accordance with the mechanism of equipment.

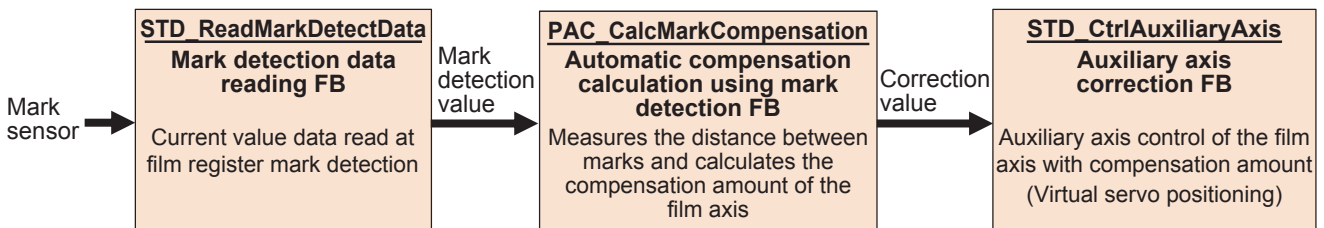
#### Rotary cutter control (cutter axis)

A cam pattern for the cutter axis is generated by inputting cam parameters of sheet length and synchronization width in the rotary cutter cam generation FB.



#### Mark compensation control

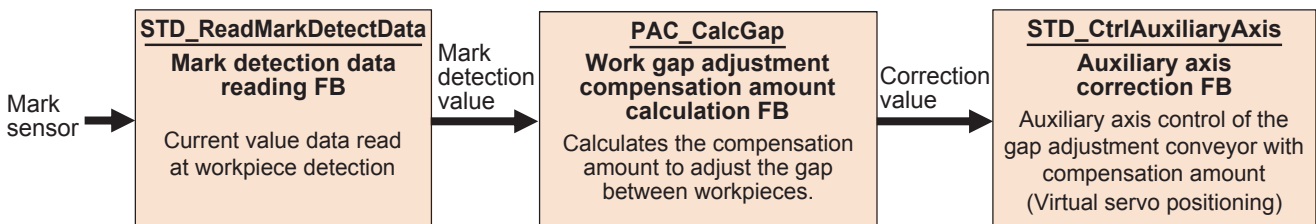
A difference between the command value and the mark pitch calculated from the current value of the film axis at mark detection is output as a compensation value.



#### Alignment conveyor control

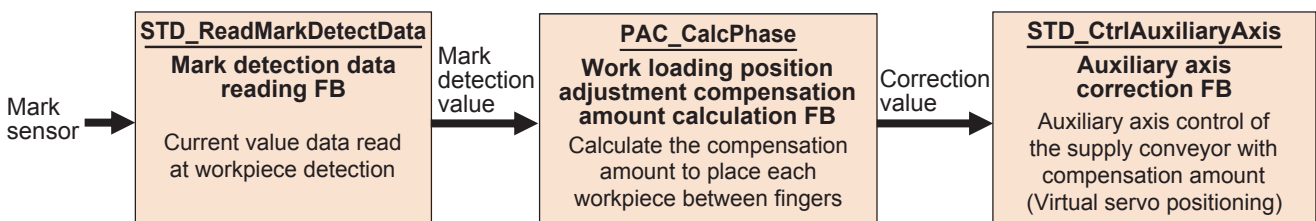
##### ■ Gap adjustment control

The work gap is calculated from the workpiece position detected on the gap adjustment conveyor to output the compensation amount so that the randomly fed workpieces from the upstream conveyor is equally spaced (between fingers) on the downstream conveyor.



##### ■ Loading position adjustment control

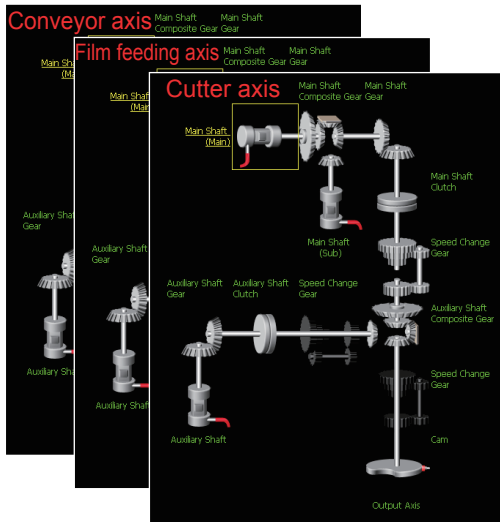
The deviation is calculated between the position of workpiece detected on the supply conveyor and the finger position of the loading conveyor to output the compensation amount so that each workpiece aligned (between fingers) on the upstream conveyor is placed between fingers of the loading conveyor.



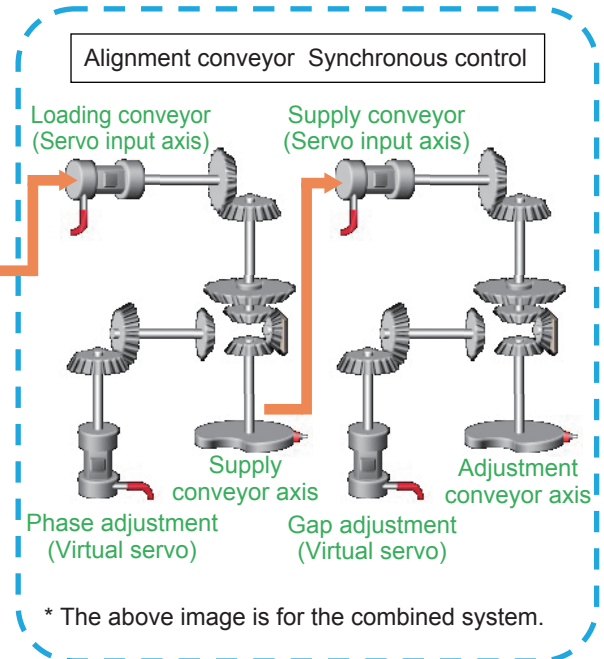
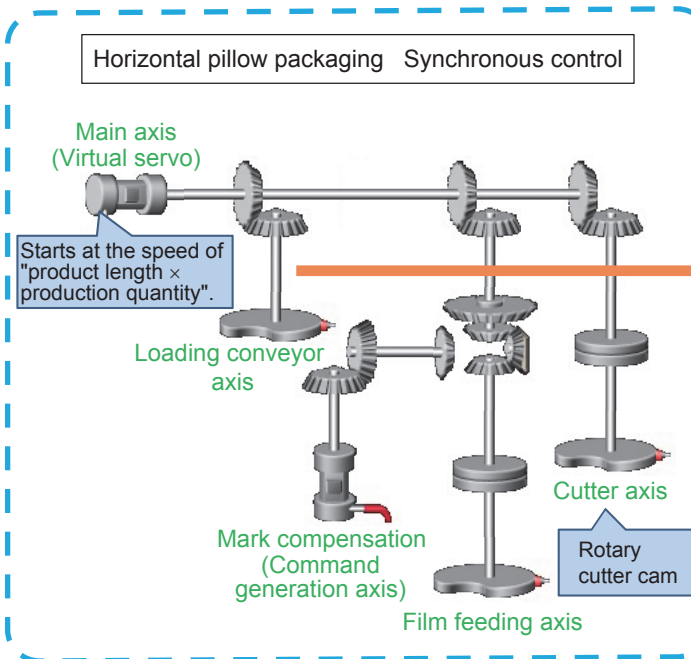
# Configuration example of advanced synchronous control

The following shows a configuration example of advanced synchronous control with the Simple Motion module for controlling the horizontal pillow packaging machine with the library provided with this application package.

Horizontal pillow packaging  
Each axis synchronous control setting



Alignment conveyor  
Each axis synchronous control setting



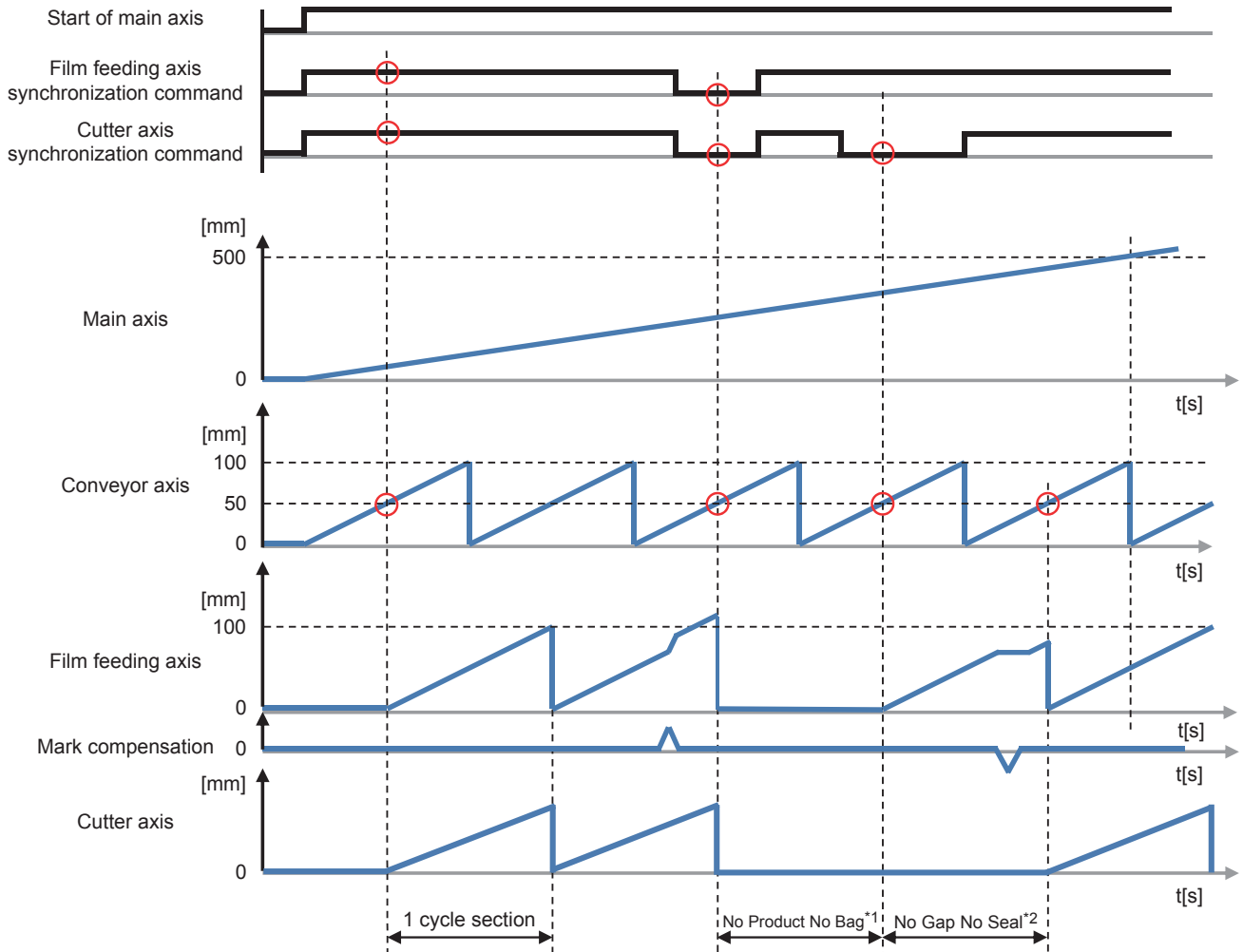
Synchronous control operation image

# Operation timing example

The following figure shows an operation timing example for controlling the horizontal pillow packaging machine with the library provided with this application package.

[Setting example]

- 1 cycle (product length): 100 mm
- Film feeding axis waiting point: 50 mm
- Cutter axis waiting point: 50 mm



\*1 When workpieces are not conveyed or the spaces between workpieces are too wide, this function stops the cutter axis and film feeding axis to prevent packaging mistakes.

\*2 When spaces between workpieces are too narrow, this function stops the cutter axis to prevent sealing and cutting on workpieces.



# 4 FB LIBRARY

This FB library is designed for packaging using the Simple Motion module.

## 4.1 Functions of the FB Library

### List of FBs

The following table lists the FBs in the FB library (PAC\_PackagingControl\_F).

No.	Item	FB name	Description	Cutting and sealing control			Mark compensation	Alignment conveyor		Reference
				Rotary cutter	Flying shear	Long dwell		Gap adjustment	Loading position adjustment	
01	Cam auto-generation	STD_MakeRotaryCutter Cam	Cam auto-generation for rotary cutter	◎	—	—	—	—	—	Page 53
		STD_MakeFlyingShear Cam	Cam auto-generation for flying shear	—	◎	—	—	—	—	Page 57
		PAC_MakeLongDwellD Cam	Cam auto-generation for D-cam	—	—	◎	—	—	—	Page 63
02	Mark compensation	STD_ReadMarkDetect Data	Mark detection data reading	—	—	—	◎	◎	◎	Page 68
		PAC_CalcMarkCompensation	Auto deviation compensation calculation with mark detection	—	—	—	◎	—	—	Page 72
		STD_CtrlAuxiliaryAxis	Auxiliary axis correction	—	—	—	◎	◎	◎	Page 76
03	Alignment conveyor	PAC_CalcGap	Work gap adjustment compensation amount calculation	—	—	—	—	◎	—	Page 80
		PAC_CalcPhase	Work loading position adjustment compensation amount calculation	—	—	—	—	—	◎	Page 85
99	Activation	PAC_Activation	License activation	◎	◎	◎	◎	◎	◎	Page 36

◎: FB required for control

### Version history

The following table shows the version history of the FB library (PAC\_PackagingControl\_F).

Version	Description
1.000A	First edition
1.001B	<ul style="list-style-type: none"> <li>PAC_MakeLongDwellDCam (Cam auto-generation for D-cam) is added.</li> <li>The subroutine type is supported for the compile method of FB library.</li> <li>PAC_Activation (License activation) is added.</li> </ul>
1.002C	<ul style="list-style-type: none"> <li>PAC_CalcGap (Work gap adjustment compensation amount calculation) is added.</li> <li>PAC_CalcPhase (Work loading position adjustment compensation amount calculation) is added.</li> <li>The input label specification of STD_CtrlAuxiliaryAxis (Auxiliary axis correction) is changed.</li> </ul>
1.003D	PAC_Activation (License activation) has supported the temporary license.
1.004E	The following FBs are modified. <ul style="list-style-type: none"> <li>PAC_CalcMarkCompensation (Automatic compensation calculation using mark detection)</li> </ul>


## Restrictions and precautions common to all FBs

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- The number of FB steps in a program varies depending on the CPU model to be used and I/O definitions.
- The circuit setting is required for any input label.

### **Point**

The restrictions and precautions specific to each FB are separately described. Refer to the following.

 [Page 53 Details of the FB Library](#)

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# I/O signal processing

The timing on when each I/O signal turns on/off may differ from the following timing depending on the FB used. For details, refer to "Page 53 Details of the FB Library".

Status	Pulsed execution (multiple scan execution type)	Real-time execution
Normal completion	<p>Hold <i>i_bEN</i> (Execution command) on until <i>o_bOK</i> (Normal completion) turns on. When <i>i_bEN</i> (Execution command) is turned off before <i>o_bOK</i> (Normal completion) or <i>o_bErr</i> (Error completion) turns on, stop the FB processing and end it with <i>o_bOK</i> (Normal completion) or <i>o_bErr</i> (Error completion) that remains off.</p>	
Error completion		
A value input to the FB is outside the range.		

\*1 When a value outside the range is input during normal operation, an error code is output but the previous operation continues. After that, when a normal value is input, the error code is cleared.

# Combination of FBs

The following shows combinations of FBs required for each mechanism control of the packaging machine.

For details of each FB and label, refer to "Page 53 Details of the FB Library".

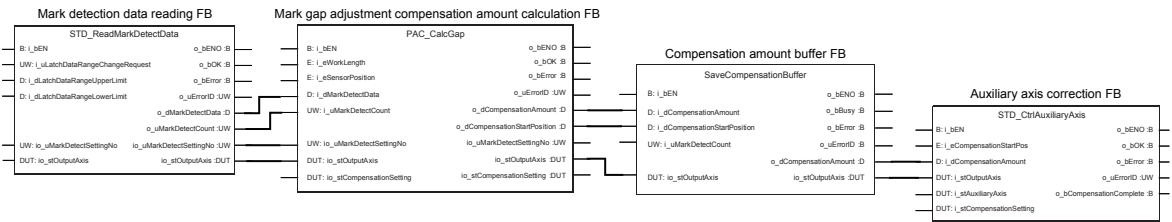
For connection examples and operation timing of FBs, refer to "Page 90 APPLICATION PROGRAM EXAMPLE".

Mechanism	Combination of FBs
Rotary cutter	<ul style="list-style-type: none"> <li>The cam auto-generation FB for rotary cutter generates cam data.</li> <li>The generated cam data is used for starting the synchronous control in the output axis synchronous control FB to drive the cutter axis.*1</li> </ul> <p>Cam auto-generation FB for rotary cutter</p> <p>Output axis synchronous control FB (Cutter axis)</p>
Flying shear	<ul style="list-style-type: none"> <li>The cam auto-generation FB for flying shear generates cam data.</li> <li>The generated cam data is used for starting the synchronous control in the output axis synchronous control FB to drive the flying shear axis.*1</li> </ul> <p>Cam auto-generation FB for flying shear</p> <p>Output axis synchronous control FB (Flying shear axis)</p>
Long dwell D-cam	<ul style="list-style-type: none"> <li>The cam auto-generation for D-cam FB generates cam data.</li> <li>The generated cam data is used for starting the synchronous control in the output axis synchronous control FB to drive the D-cam axis.*1</li> </ul> <p>Cam auto-generation for D-cam FB</p> <p>Output axis synchronized control FB (D-cam axis)</p>
Mark compensation	<ul style="list-style-type: none"> <li>The mark detection data read FB reads mark detection data from the Simple Motion module.</li> <li>The auto deviation compensation calculation FB with mark detection automatically calculates the compensation amount from the read mark detection data.</li> <li>The calculated compensation amount is used to drive the auxiliary axis corresponding to the output axis in the auxiliary axis correction FB and compensate the auxiliary axis.</li> </ul> <p>Mark detection data reading FB</p> <p>Automatic compensation calculation using mark detection FB</p> <p>Auxiliary axis correction FB</p>

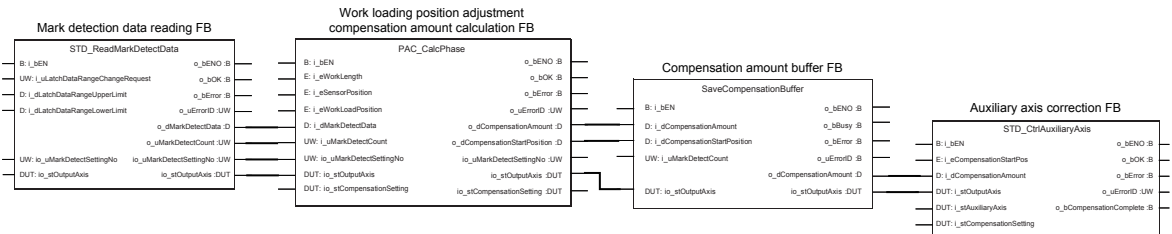
**Mechanism**      **Combination of FBS**

Alignment conveyor

- The work gap adjustment compensation amount calculation FB is used to align unevenly fed workpieces at equal spaces.
- The mark detection data reading FB reads mark detection data from the Simple Motion module.
- The work gap adjustment compensation amount calculation FB calculates the compensation amount by using the read mark detection data.
- The compensation amount buffer FB performs buffering of the calculated compensation amount and compensation starting position.\*<sup>2</sup>
- With the buffered compensation amount, the auxiliary axis correction FB starts the auxiliary axis corresponding to the output axis and performs compensation.



- When a phase adjustment with the loading conveyor is required after the work gap adjustment, the work loading position adjustment compensation amount calculation FB is used.
- The mark detection data reading FB reads mark detection data from the Simple Motion module.
- The work loading position adjustment compensation amount calculation FB calculates the compensation amount by using the read mark detection data.
- The compensation amount and compensation starting position calculated by the compensation amount buffer FB are buffered.\*<sup>2</sup>
- With the buffered compensation amount, the auxiliary axis correction FB starts the auxiliary axis corresponding to the output axis and performs compensation.



\*1 For details of the output axis synchronous control FB, refer to the following.

☞ Page 90 APPLICATION PROGRAM EXAMPLE

\*2 For details of the compensation amount buffer FB, refer to the following.

☞ Page 90 APPLICATION PROGRAM EXAMPLE

## Synchronous control parameters [Pr.XX]

The following table lists the synchronous control parameters required for the operation of the FBs.

Set servo input axis parameters ([Pr.300] to [Pr.304]), synchronous encoder axis parameters ([Pr.320] to [Pr.329]), and synchronous parameters ([Pr.438] to [Pr.468]) with the Simple Motion setting tool or user programs as needed.

However, do not use user programs to set or change the parameters ([Pr.400] to [Pr.437]) to be set by FBs, input labels, or structures.

For details of synchronous control parameters, refer to the following.

 MELSEC iQ-F FX5 Simple Motion Module User's Manual (Advanced Synchronous Control)

Parameter type		Parameter No.	Name	Setting method STD_CtrlAuxiliaryAxis (auxiliary axis correction)
Servo input axis parameter		Pr.300	Servo input axis type <u>Fetch cycle: At power supply ON</u>	△
Synchronous encoder axis parameter		Pr.320	Synchronous encoder axis type <u>Fetch cycle: At power supply ON</u>	△
		Pr.321	Synchronous encoder axis unit setting <u>Fetch cycle: At power supply ON</u>	△
		Pr.324	Synchronous encoder axis length per cycle <u>Fetch cycle: At power supply ON</u>	△
Command generation axis parameter		Pr.340	Command generation axis valid setting <u>Fetch cycle: At power supply ON</u>	△
Synchronous parameter	Main axis	Pr.400	Main input axis No. <u>Fetch cycle: At start of synchronous control</u>	△
		Pr.402	Composite main shaft gear <u>Fetch cycle: Operation cycle</u>	△
		Pr.403	Main shaft gear: Numerator <u>Fetch cycle: At start of synchronous control</u>	△
		Pr.404	Main shaft gear: Denominator <u>Fetch cycle: At start of synchronous control</u>	△
	Auxiliary axis	Pr.418	Auxiliary shaft axis No. <u>Fetch cycle: At start of synchronous control</u>	○ (i_stAuxiliaryAxis)
		Pr.419	Composite auxiliary shaft gear <u>Fetch cycle: Operation cycle</u>	◎ (0011H)
		Pr.420	Auxiliary shaft gear: Numerator <u>Fetch cycle: At start of synchronous control</u>	◎ (1)
		Pr.421	Auxiliary shaft gear: Denominator <u>Fetch cycle: At start of synchronous control</u>	◎ (1)

◎: Set with FBs (setting value)

○: Set with labels (label name)

△: Set by users as needed


# Synchronous control data [Cd.XX]

The following table lists the synchronous control data required for the operation of FBs.

Set synchronous encoder axis control data ([Cd.320] to [Cd.325]) and cam operation control data (cam position calculation: [Cd.612] to [Cd.618]) with user programs as needed.

However, do not use user programs to set or change cam operation control data (cam data operation: ([Cd.600] to [Cd.607]) and cam auto-generation ([Cd.608] to [Cd.611]) to be used in FBs.

For details of control data, refer to the following.

 MELSEC iQ-F FX5 Simple Motion Module User's Manual (Advanced Synchronous Control)

Memory area	Control data No.	Name	Setting method				
			1)	2)	3)	4)	
			<b>1) STD_MakeRotaryCutterCam (Cam auto-generation for rotary cutter)</b> <b>2) STD_MakeFlyingShearCam (Cam auto-generation for flying shear)</b> <b>3) PAC_MakeLongDwellDCam (Cam auto-generation for D-cam)</b> <b>4) STD_CtrlAuxiliaryAxis (Auxiliary axis correction)</b>				
Synchronous control system control data	Cd.380	Synchronous control start <u>Fetch cycle: Operation cycle</u>	—	—	—	△	
Cam operation control data	Cam data operation	Cd.600	Cam data operation request <u>Fetch cycle: Main cycle</u>	—	◎	◎	—
		Cd.601	Operation cam No. <u>Fetch cycle: At requesting cam data operation</u>	—	◎	◎	—
		Cd.602	Cam data first position <u>Fetch cycle: At requesting cam data operation</u>	—	◎	◎	—
		Cd.603	Number of cam data operation points <u>Fetch cycle: At requesting cam data operation</u>	—	◎	◎	—
		Cd.604	Cam data format <u>Fetch cycle: At requesting cam data operation</u> <u>Refresh cycle: At completing cam data operation</u>	—	◎	◎	—
		Cd.605	Cam resolution/coordinate number <u>Fetch cycle: At requesting cam data operation</u> <u>Refresh cycle: At completing cam data operation</u>	—	◎	◎	—
		Cd.606	Cam data starting point <u>Fetch cycle: At requesting cam data operation</u> <u>Refresh cycle: At completing cam data operation</u>	—	◎	◎	—
		Cd.607	Cam data value <u>Fetch cycle: At requesting cam data operation</u> <u>Refresh cycle: At completing cam data operation</u>	—	◎	◎	—

Memory area		Control data No.	Name	Setting method			
				1)	2)	3)	4)
				1) STD_MakeRotaryCutterCam (Cam auto-generation for rotary cutter) 2) STD_MakeFlyingShearCam (Cam auto-generation for flying shear) 3) PAC_MakeLongDwellDCam (Cam auto-generation for D-cam) 4) STD_CtrlAuxiliaryAxis (Auxiliary axis correction)			
Cam operation control data	Cam auto-generation	Cd.608	Cam auto-generation request Fetch cycle: <u>Main cycle</u>	⊙	—	—	—
		Cd.609	Cam auto-generation cam No. Fetch cycle: <u>At requesting cam auto-generation</u>	⊙	—	—	—
		Cd.610	Cam auto-generation type Fetch cycle: <u>At requesting cam auto-generation</u>	⊙	—	—	—
		Cd.611	Cam auto-generation data Fetch cycle: <u>At requesting cam auto-generation</u>	⊙	—	—	—

⊙: Set with FBs

△: Set by users as needed




## Mark detection setting parameters [Pr.XX]

The following table lists the mark detection setting parameters required for the operation of FBs.

Set detailed parameters 2 ([Pr.42] to [Pr.95]) and mark detection setting parameters ([Pr.800] to [Pr.807]) with the Simple Motion setting tool or user programs depending on the system configuration.

However, do not use user programs to set or change the mark detection setting parameters to be used in FBs.

For details on the parameters, refer to the following.

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

Parameter type	Parameter No.	Name	Setting method STD_ReadMarkDetectData (Mark detection data reading)
Detailed parameters 2	Pr.42	External command function selection Fetch cycle: <u>At writing to buffer memory</u>	△
	Pr.95	External command signal selection Fetch cycle: <u>At the rising edge of "[Cd.190] PLC READY signal"</u>	△
Mark detection setting	Pr.800	Mark detection signal setting Fetch cycle: <u>At power supply ON</u>	△
	Pr.801	Mark detection signal compensation time Fetch cycle: <u>At power supply ON or the rising edge of "[Cd.190] PLC READY signal"</u>	△
	Pr.802	Mark detection data type Fetch cycle: <u>At power supply ON</u>	△
	Pr.803	Mark detection data axis No. Fetch cycle: <u>At power supply ON</u>	△
	Pr.804	Mark detection data buffer memory No. Fetch cycle: <u>At power supply ON</u>	△
	Pr.805	Latch data range upper limit value Fetch cycle: <u>At power supply ON, the rising edge of "[Cd.190] PLC READY signal", or latch data range change request</u>	○ (i_dLatchDataRangeUpperLimit)
	Pr.806	Latch data range lower limit value Fetch cycle: <u>At power supply ON, the rising edge of "[Cd.190] PLC READY signal", or latch data range change request</u>	○ (i_dLatchDataRangeLowerLimit)
Pr.807	Mark detection mode setting Fetch cycle: <u>At power supply ON or the rising edge of "[Cd.190] PLC READY signal"</u>	△ (0: Available, other than 0: Not available)	

○: Set with labels (label name)

△: Set by users as needed

## Mark detection control data [Cd.XX]

The following table lists the mark detection control data required for the operation of FBs.

Set mark detection control data ([Cd.800] to [Cd.802]) with user programs depending on the system configuration.

However, do not use user programs to set or change the mark detection control data to be used in FBs.

For details of control data, refer to the following.

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

Control data type	Control data No.	Name	Setting method STD_ReadMarkDetectData (Mark detection data reading)
Axis control data	Cd.8	External command valid Fetch cycle: At request	△
Mark detection control data	Cd.800	Number of mark detection clear request Fetch cycle: Operation cycle	◎
	Cd.801	Mark detection invalid flag Fetch cycle: Operation cycle	△
	Cd.802	Latch data range change request Fetch cycle: Operation cycle or DI input	○ (i_uLatchDataRangeChangeRequest)

◎: Set with FBs (setting value)

○: Set with labels (label name)

△: Set by users as needed

## Positioning data [Da.XX]

The following table lists the positioning data required for the operation of FBs.

Set positioning data ([Da.1] to [Da.29]) with user programs depending on the program used.

However, do not use user programs to set or change the positioning data to be used in FBs.

For details of positioning data, refer to the following.

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

Positioning data	Name	Setting method STD_CtrlAuxiliaryAxis (Auxiliary axis correction)
Da.1	Operation pattern	◎ (0)
Da.2	Control method	◎ (02H)
Da.3	Acceleration time No.	○ (i_st CompensationSetting)
Da.4	Deceleration time No.	○ (i_st CompensationSetting)
Da.6	Positioning address/movement amount	○ (i_dCompensationAmount)
Da.8	Command speed	○ (i_st CompensationSetting)
Da.9	Dwell time/JUMP destination positioning data No.	△
Da.10	M code/Condition data No./Number of LOOP to LEND repetitions/ Number of pitches	△

◎: Set with FBs (setting value)

○: Set with labels (label name)

△: Set by users as needed

## 4.2 Details of the FB Library

This section describes the details of each FB.

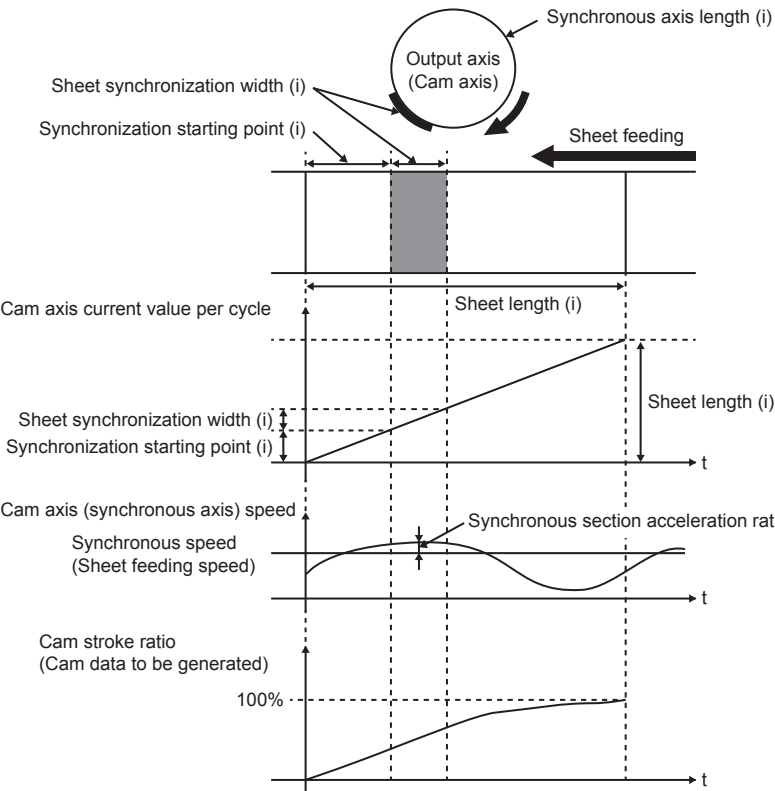
### STD\_MakeRotaryCutterCam (Cam auto-generation for rotary cutter)

#### Name


STD\_MakeRotaryCutterCam

#### Function overview

Item	Description																																									
Function overview	This FB automatically generates cam data for rotary cutter.																																									
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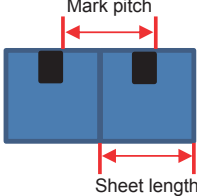
Item	Description
Function description	<p>This FB automatically generates cam data for driving the rotary cutter.</p> <ul style="list-style-type: none"> <li>Turning on <i>i_bEN</i> (Execution command) starts generating cam data based on the set data.</li> <li>When the cam generation is normally completed, <i>o_bOK</i> (Normal completion) turns on.</li> </ul>  <ul style="list-style-type: none"> <li><i>i_eSyncSectionAccRatio</i> (Synchronous section speed acceleration ratio) changes the speed in the synchronous section.</li> <li>If a warning related to the cam data operation occurs in the Simple Motion module during cam generation, an error (ErrorID: 2203H) is stored.</li> <li>If an error has occurred in the FB, Error turns on and the error code is stored in ErrorID.</li> <li>For details of error codes, refer to "Page 181 List of Error Codes".</li> </ul>
Restrictions and precautions	<ul style="list-style-type: none"> <li>If a value other than 0 to 3 has been set in "[Pr.1] Unit setting", this FB is executed with the unit [mm].</li> <li>The cam to be automatically generated is in the stroke ratio data format.</li> <li>The cam data to be automatically generated will be saved in the cam open area.</li> <li>If <i>i_bEN</i> (Execution command) turns off during cam generation, the cam may not be normally generated.</li> <li>When generating multiple cams at the same time, input <i>o_bOK</i> (Normal completion) of the cam auto-generation FB as an interlock condition so that the generation of the next cam starts after the generation of one cam is successfully completed.</li> <li>If the cam generation fails, the cam data may be undefined. Try the cam auto-generation again. Check that normal cam is generated and then perform the operation.</li> <li>Since cam operation control data ([Cd.608] to [Cd.611]) is set in this FB, do not use user programs to set or change the data.*1</li> <li>Use the FB <i>CtrlOutputAxisSync</i> or create a user program for the operation of the cutter axis.</li> </ul>
Compiling method	Macro type, subroutine type
FB operation type	Pulsed execution (multiple scan execution type)

\*1 For details of control data, refer to the following.

 MELSEC iQ-F FX5 Simple Motion Module User's Manual (Advanced Synchronous Control)

## Labels

### Input labels

Name	Label name	Data type	Read timing*1	Setting range	Description
Execution command	i_bEN	Bit	<input type="checkbox"/>	On, off	On: The FB is activated. Off: The FB is not activated.
Sheet length	i_eSheetLength	Single precision real number	↑	Refer to the description.	Set the sheet length. Set this value for the cam axis length per cycle.  • $0.01 \leq \text{Sheet length} \leq 10000.00$ [[Optional] Same unit (with two digits after the decimal point (fixed))]
Sheet synchronization width	i_eSheetSyncWidth	Single precision real number	↑	Refer to the description.	Set the length of the section where the output axis is synchronized with the sheet. • $0.01 \leq \text{Sheet synchronization width} < \text{Sheet length}$ and synchronous axis length [[Optional] Same unit (with two digits after the decimal point (fixed))]
Synchronous axis length	i_eSyncAxisLength	Single precision real number	↑	Refer to the description.	Set the cycle length of the output axis (rotary cutter). • $0.01 \leq \text{Synchronous axis length} \leq 10000.00$ [[Optional] Same unit (with two digits after the decimal point (fixed))]
Synchronization starting point	i_eSyncStartPoint	Single precision real number	↑	Refer to the description.	Set the synchronization starting point of the output axis to the sheet. • $0.00 \leq \text{Synchronization starting point} < \text{Sheet length}$ [[Optional] Same unit (with two digits after the decimal point (fixed))]
Synchronous section acceleration ratio	i_eSyncSectionAccRatio	Single precision real number	↑	$-50.00 \leq \text{Synchronous section acceleration ratio} \leq 50.00$ [%]	Set this item when the fine adjustment of the synchronous speed in the synchronous section is required. Synchronous section speed = Synchronous speed $\times$ (100% + Synchronous section acceleration ratio)
Cam resolution	i_uCamResolution	Word [Unsigned]	↑	256/512/1024/2048/4096/8192/16384	Set the cam resolution of the cam to be generated.

\*1 : Always, ↑: When the FB is started (cannot be changed)

### Output labels

Name	Label name	Data type	Value to be held*1	Description
Execution status	o_bENO	Bit	—	On: Execution command is on. Off: Execution command is off.
Normal completion	o_bOK	Bit	—	This label indicates that the cam auto-generation has been completed and the FB has been normally completed.
Error completion	o_bError	Bit	—	On: An error has occurred in the FB. Off: No error has occurred.
Error code	o_uErrorID	Word [Unsigned]	—	The error code of the error that has occurred in the FB is stored.

\*1 ○: The value will be held after the FB stops. —: The value will be cleared after the FB stops.

## ■ I/O labels

Name	Label name	Data type	Read timing*1	Setting range	Description
Cam auto-generation cam No.	io_uCamNo	Word [Unsigned]	↑	1 ≤ Cam auto-generation cam No. ≤ 64	Set the cam No. to be automatically generated for the cutter axis.
Output axis setting	io_stOutputAxis	AXIS_REF	—	—	Refer to the output axis setting below.

### Output axis setting (AXIS\_REF structure)

Name	Label name	Data type	Read timing*1	Setting range	Description
Axis number	AxisNo	Word [Signed]	↑	1 ≤ Axis No. ≤ maximum number of axes of the module used	Set the axis No. of the output axis to be used for the cutter axis. This FB uses the unit set in "[Pr.1] Unit setting" of the axis No.
Unit number	StartIO	Word [Signed]	↑	1H ≤ Unit number ≤ 10H	Simple Motion unit number

\*1 □: Always, ↑: When the FB is started (cannot be changed)

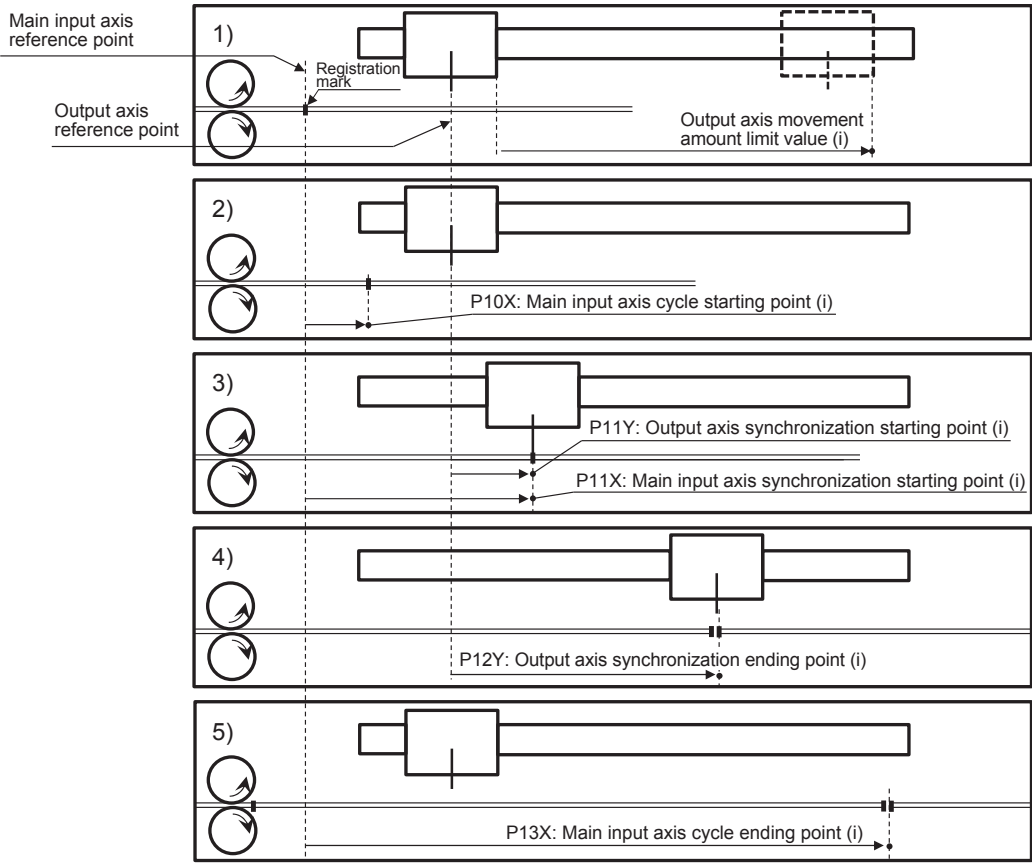
# STD\_MakeFlyingShearCam (Cam auto-generation for flying shear)

## Name

STD\_MakeFlyingShearCam

## Function overview

Item	Description																																																
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	Engineering software	GX Works3																																															
Number of steps	4808 steps																																																
FB dependence	—																																																

Item	Description
Function description	<p>This FB automatically generates cam for driving the flying shear.</p> <ul style="list-style-type: none"> <li>• Turning on i_bEN (Execution command) starts generating cam data based on the set data.</li> <li>• Calculate the main input axis length per cycle as the product length.</li> <li>• Specify the main input axis cycle starting point, synchronization starting point, cycle ending point of the flying shear (output axis) to the main input axis, and specify the synchronization starting point and synchronization ending point to the flying shear (output axis) to generate a cam pattern.*<sup>1</sup></li> </ul>  <p>Main input axis reference point</p> <p>Output axis reference point</p> <p>1) Registration mark</p> <p>Output axis movement amount limit value (i)</p> <p>2) P10X: Main input axis cycle starting point (i)</p> <p>3) P11Y: Output axis synchronization starting point (i)</p> <p>P11X: Main input axis synchronization starting point (i)</p> <p>4) P12Y: Output axis synchronization ending point (i)</p> <p>5) P13X: Main input axis cycle ending point (i)</p> <p>* (i) ... Input label</p>



Item	Description
Function description	<ul style="list-style-type: none"> <li>The cam pattern to be generated is a reciprocated cam pattern.</li> <li>After the cam generation is normally completed and the following output data is updated, o_bOK (Normal completion) turns on.</li> <li>"o_eMainInputAxisSyncStartPos (Synchronization starting point)"</li> <li>"o_eMainInputAxisSyncEndPos (Synchronization ending point)"</li> <li>"o_eMainInputAxisCycleDonePos (Cycle ending point)"</li> </ul> <p>Even though i_bEN (Execution command) turns off, the above output data will be held. The above output data will be cleared when i_bEN (Execution command) turns on.</p> <ul style="list-style-type: none"> <li>When performing the synchronous control with the FB CtrlOutputAxisSync, set the main input axis cycle starting point for i_eWaitingPos (Waiting point).</li> <li>If the calculated output axis movement amount exceeds the value of i_eOutputAxisMaxLength (Output axis movement amount limit value), an error (ErrorID: 2200H) is stored.*<sup>2</sup></li> <li>i_eSyncSectionAccRatio (Synchronous section speed acceleration ratio) changes the speed in the synchronous section.</li> <li>If a warning related to the cam data operation occurs in the Simple Motion module during cam generation, an error (ErrorID: 2203H) is stored.</li> <li>If a value other than "0" has been set in "[Cd.600] Cam data operation request" at the cam generation, an error (ErrorID: 2205H) is stored.</li> <li>If an error has occurred in the FB, Error turns on and the error code is stored in ErrorID.</li> <li>For details of error codes, refer to "Page 181 List of Error Codes".</li> </ul>
Restrictions and precautions	<ul style="list-style-type: none"> <li>If a value other than 0 to 3 has been set in "[Pr.1] Unit setting", this FB is executed with the unit [mm].</li> <li>The cam to be automatically generated is in the coordinate data format.</li> <li>The cam data that has been automatically generated is saved in the cam storage area.</li> <li>If i_bEN (Execution command) turns off during cam generation, the cam may not be normally generated.</li> <li>When generating multiple cams at the same time, input o_bOK (Normal completion) of the cam auto-generation FB as an interlock condition so that the generation of the next cam starts after the generation of one cam is successfully completed.</li> <li>If the cam generation fails, the cam data may be undefined. Try the cam auto-generation again. Check that normal cam is generated and then perform the operation.</li> <li>Since cam operation control data ([Cd.600] to [Cd.607]) is set in this FB, do not use user programs to set or change the data.*<sup>3</sup></li> <li>Use the FB CtrlOutputAxisSync or create a user program for the operation of the flying shear axis.</li> </ul>
Compiling method	Macro type, subroutine type
FB operation type	Pulsed execution (multiple scan execution type)

\*1 By setting the main input axis cycle starting point to "0" and the cycle ending point to the "product length", a cam pattern is generated at the main input axis per cycle = cam axis per cycle.

By setting the main input axis cycle starting point to "a value larger than 0" or the cycle ending point to "a value smaller than product length", a cam pattern is generated at the main input axis per cycle ≠ cam axis per cycle.

\*2 By setting i\_eOutputAxisMaxLength to "0", the movement amount limit is ignored.

\*3 For details of control data, refer to the following.

MELSEC iQ-F FX5 Simple Motion Module User's Manual (Advanced Synchronous Control)

## Labels

### Input labels

Name	Label name	Data type	Read timing*1	Setting range	Description
Execution command	i_bEN	Bit	<input type="checkbox"/>	On, off	On: The FB is activated. Off: The FB is not activated.
Main input axis cycle starting point	i_eMainInputAxisStartPos	Single precision real number	↑	Refer to the description.	Set the main input axis point where the one cycle operation starts. <ul style="list-style-type: none"> <li>• <math>0.0 \leq</math> Main input axis cycle starting point <math>\leq 100000.0</math> [mm]</li> <li>• <math>0.00 \leq</math> Main input axis cycle starting point <math>\leq 10000.00</math> [inch]</li> <li>• <math>0.00 \leq</math> Main input axis cycle starting point <math>\leq 10000.00</math> [degree]</li> <li>• <math>0 \leq</math> Main input axis cycle starting point <math>\leq 9999999</math> [pulse]</li> </ul> [The unit setting depends on the axis No. setting value in the output axis setting.]
Main input axis synchronization starting point	i_eMainInputAxisSyncStartPos	Single precision real number	↑	Refer to the description.	Set the main input axis point at the start of the synchronous section. <ul style="list-style-type: none"> <li>• <math>0.1 \leq</math> Main input axis synchronization starting point <math>\leq 100000.0</math> [mm]</li> <li>• <math>0.01 \leq</math> Main input axis synchronization starting point <math>\leq 10000.00</math> [inch]</li> <li>• <math>0.01 \leq</math> Main input axis synchronization starting point <math>\leq 10000.00</math> [degree]</li> <li>• <math>1 \leq</math> Main input axis synchronization starting point <math>\leq 9999999</math> [pulse]</li> </ul> [The unit setting depends on the axis No. setting value in the output axis setting.]
Main input axis cycle ending point	i_eMainInputAxisCycleEndPos	Single precision real number	↑	Refer to the description.	Set the end point of the main input axis 1 cycle. <ul style="list-style-type: none"> <li>• <math>0.1 \leq</math> Main input axis cycle ending point <math>\leq 100000.0</math> [mm]</li> <li>• <math>0.01 \leq</math> Main input axis cycle ending point <math>\leq 10000.00</math> [inch]</li> <li>• <math>0.01 \leq</math> Main input axis cycle ending point <math>\leq 10000.00</math> [degree]</li> <li>• <math>1 \leq</math> Main input axis cycle ending point <math>\leq 9999999</math> [pulse]</li> </ul> [The unit setting depends on the axis No. setting value in the output axis setting.]
Output axis synchronization starting point	i_eOutputAxisSyncStartPos	Single precision real number	↑	Refer to the description.	Set the output axis point at the start of the synchronous section. <ul style="list-style-type: none"> <li>• <math>0.1 \leq</math> Output axis synchronization starting point <math>\leq 100000.0</math> [mm]</li> <li>• <math>0.01 \leq</math> Output axis synchronization starting point <math>\leq 10000.00</math> [inch]</li> <li>• <math>0.01 \leq</math> Output axis synchronization starting point <math>\leq 10000.00</math> [degree]</li> <li>• <math>1 \leq</math> Output axis synchronization starting point <math>\leq 9999999</math> [pulse]</li> </ul> [The unit setting depends on the axis No. setting value in the output axis setting.]
Output axis synchronization ending point	i_eOutputAxisSyncEndPos	Single precision real number	↑	Refer to the description.	Set the output axis point at the end of the synchronous section. <ul style="list-style-type: none"> <li>• <math>0.1 \leq</math> Output axis synchronization ending point <math>\leq 100000.0</math> [mm]</li> <li>• <math>0.01 \leq</math> Output axis synchronization ending point <math>\leq 10000.00</math> [inch]</li> <li>• <math>0.01 \leq</math> Output axis synchronization ending point <math>\leq 10000.00</math> [degree]</li> <li>• <math>1 \leq</math> Output axis synchronization ending point <math>\leq 9999999</math> [pulse]</li> </ul> [The unit setting depends on the axis No. setting value in the output axis setting.]

Name	Label name	Data type	Read timing*1	Setting range	Description
Output axis movement amount limit value	i_eOutputAxisMaxLength	Single precision real number	↑	Refer to the description.	Set the movement amount limit value of the output axis. "0" = Limit value invalid, other than "0" = Limit value valid <ul style="list-style-type: none"> <li>• <math>0.1 \leq</math> Output axis movement amount limit value <math>\leq 100000.0</math> [mm]</li> <li>• <math>0.01 \leq</math> Output axis movement amount limit value <math>\leq 10000.00</math> [inch]</li> <li>• <math>0.01 \leq</math> Output axis movement amount limit value <math>\leq 10000.00</math> [degree]</li> <li>• <math>1 \leq</math> Output axis movement amount limit value <math>\leq 9999999</math> [pulse]</li> </ul> [The unit setting depends on the axis No. setting value in the output axis setting.]
Synchronous section acceleration ratio	i_eSyncSectionAccelerationRatio	Single precision real number	↑	$-50.00 \leq$ Synchronous section acceleration ratio $\leq 50.00$ [%]	Set this item when the fine adjustment of the synchronous speed in the synchronous section is required. Synchronous section speed = Synchronous speed $\times$ (100% + Acceleration ratio)
Cam resolution	i_uCamResolution	Word [Unsigned]	↑	$5 \leq$ Cam resolution $\leq 2048$	Set the cam resolution (Number of coordinates) of the cam to be generated.

\*1 □: Always, ↑: When the FB is started (cannot be changed)

## ■ Output labels

Name	Label name	Data type	Value to be held*1	Description
Execution status	o_bENO	Bit	—	On: Execution command is on. Off: Execution command is off.
Normal completion	o_bOK	Bit	—	This label indicates that the cam auto-generation has been completed and the FB has been normally completed.
Error completion	o_bError	Bit	—	On: An error has occurred in the FB. Off: No error has occurred.
Error code	o_uErrorID	Word [Unsigned]	—	The error code of the error that has occurred in the FB is stored.
Synchronization starting point	o_eMainInputAxisSyncStartPos	Single precision real number	○	The main input axis point at the start of the synchronization is stored. [The unit setting depends on the axis No. setting value in the output axis setting.]
Synchronization ending point	o_eMainInputAxisSyncEndPos	Single precision real number	○	The main input axis point at the end of the synchronization is stored. [The unit setting depends on the axis No. setting value in the output axis setting.]
Cycle ending point	o_eMainInputAxisCycleDonePos	Single precision real number	○	The main input axis point at the end of the operation is stored. [The unit setting depends on the axis No. setting value in the output axis setting.]

\*1 ○: The value will be held after the FB stops. —: The value will be cleared after the FB stops.

## ■ I/O labels

Name	Label name	Data type	Read timing*1	Setting range	Description
Cam auto-generation cam No.	io_uCamNo	Word [Unsigned]	↑	1 ≤ Cam auto-generation cam No. ≤ 64	Set the cam No. to be automatically generated for the flying shear.
Output axis setting	io_stOutputAxis	AXIS_REF	↑	—	Refer to the output axis setting below.

### Output axis setting (AXIS\_REF structure)

Name	Label name	Data type	Read timing*1	Setting range	Description
Axis number	AxisNo	Word [Signed]	↑	1 ≤ Axis No. ≤ maximum number of axes of the module used	Set the axis No. of the output axis to be used for the flying shear axis. This FB uses the unit set in "[Pr. 1] Unit setting" of the axis No.
Unit number	StartIO	Word [Signed]	↑	1H ≤ Unit number ≤ 10H	Simple Motion unit number

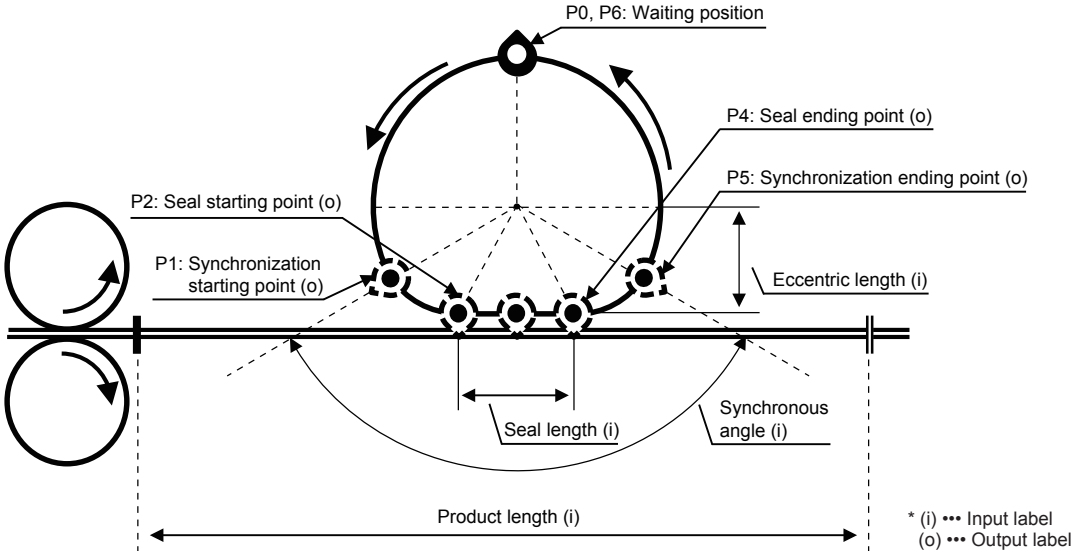
\*1 □: Always, ↑: When the FB is started (cannot be changed)

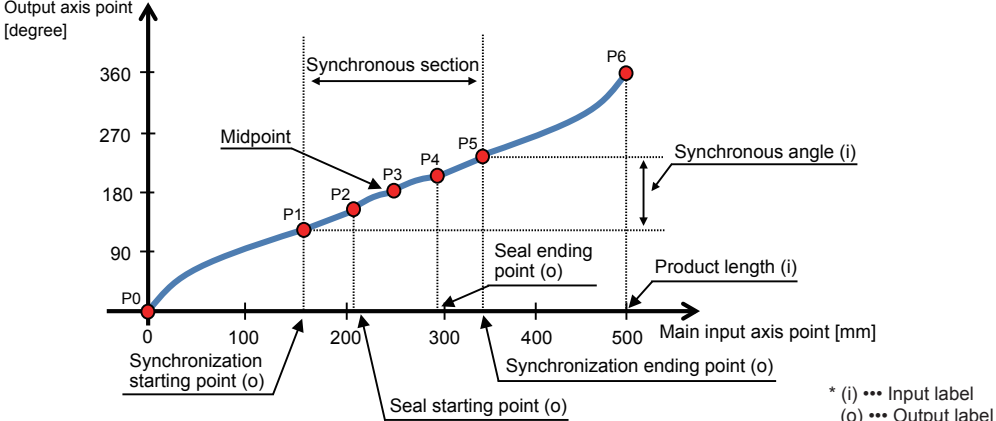
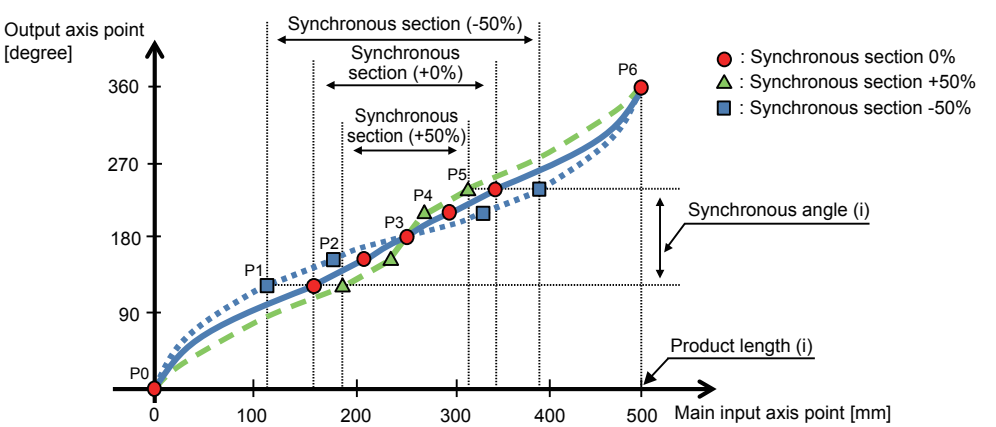
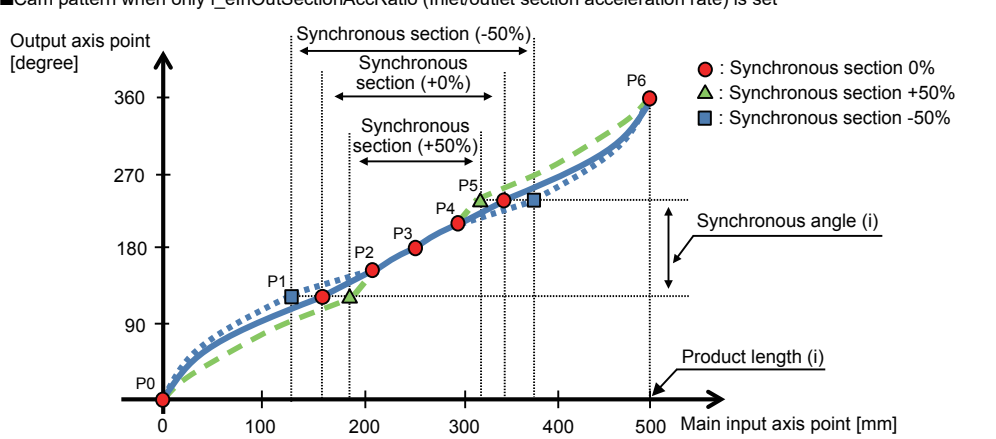
# PAC\_MakeLongDwellIDCam (Cam auto-generation for D-cam)

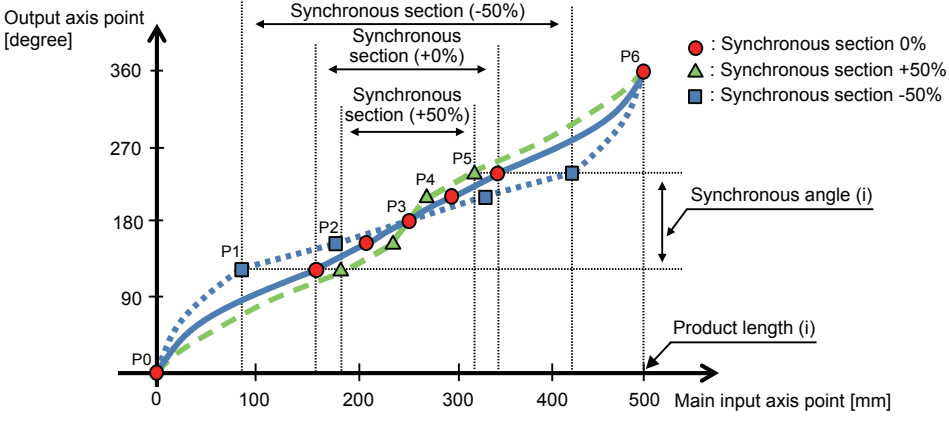
## Name

PAC\_MakeLongDwellIDCam

## Function details

Item	Description																																									
Function overview	This FB automatically generates a cam pattern for the long dwell.																																									
Symbol	<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;"> <p style="text-align: center;">PAC_MakeLongDwellIDCam</p> <table border="0" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">Execution command</td> <td style="width: 30%;">B: i_bEN</td> <td style="width: 30%;">o_bENO :B</td> <td style="width: 10%;">Execution status</td> </tr> <tr> <td>Product length</td> <td>E: i_eProductLength</td> <td>o_bOK :B</td> <td>Normal completion</td> </tr> <tr> <td>Synchronous angle</td> <td>E: i_eSyncAngle</td> <td>o_bError :B</td> <td>Error completion</td> </tr> <tr> <td>Seal length</td> <td>E: i_eSealLength</td> <td>o_uErrorID :UW</td> <td>Error code</td> </tr> <tr> <td>Eccentric length</td> <td>E: i_eEccentricLength</td> <td>o_eSyncStartPos :E</td> <td>Synchronization starting point</td> </tr> <tr> <td>Seal section acceleration rate</td> <td>E: i_eSealSectionAccRatio</td> <td>o_eSealStartPos :E</td> <td>Seal starting point</td> </tr> <tr> <td>Inlet/outlet section acceleration rate</td> <td>E: i_eInOutSectionAccRatio</td> <td>o_eSealEndPos :E</td> <td>Seal ending point</td> </tr> <tr> <td>Cam resolution</td> <td>UW: i_uCamResolution</td> <td>o_eSyncEndPos :E</td> <td>Synchronization ending point</td> </tr> <tr> <td>Cam auto-generation cam No.</td> <td>UW: io_uCamNo</td> <td>io_uCamNo :UW</td> <td>Cam auto-generation cam No.</td> </tr> <tr> <td>Output axis setting</td> <td>DUT: io_stOutputAxis</td> <td>io_stOutputAxis :DUT</td> <td>Output axis setting</td> </tr> </table> </div>		Execution command	B: i_bEN	o_bENO :B	Execution status	Product length	E: i_eProductLength	o_bOK :B	Normal completion	Synchronous angle	E: i_eSyncAngle	o_bError :B	Error completion	Seal length	E: i_eSealLength	o_uErrorID :UW	Error code	Eccentric length	E: i_eEccentricLength	o_eSyncStartPos :E	Synchronization starting point	Seal section acceleration rate	E: i_eSealSectionAccRatio	o_eSealStartPos :E	Seal starting point	Inlet/outlet section acceleration rate	E: i_eInOutSectionAccRatio	o_eSealEndPos :E	Seal ending point	Cam resolution	UW: i_uCamResolution	o_eSyncEndPos :E	Synchronization ending point	Cam auto-generation cam No.	UW: io_uCamNo	io_uCamNo :UW	Cam auto-generation cam No.	Output axis setting	DUT: io_stOutputAxis	io_stOutputAxis :DUT	Output axis setting
Execution command	B: i_bEN	o_bENO :B	Execution status																																							
Product length	E: i_eProductLength	o_bOK :B	Normal completion																																							
Synchronous angle	E: i_eSyncAngle	o_bError :B	Error completion																																							
Seal length	E: i_eSealLength	o_uErrorID :UW	Error code																																							
Eccentric length	E: i_eEccentricLength	o_eSyncStartPos :E	Synchronization starting point																																							
Seal section acceleration rate	E: i_eSealSectionAccRatio	o_eSealStartPos :E	Seal starting point																																							
Inlet/outlet section acceleration rate	E: i_eInOutSectionAccRatio	o_eSealEndPos :E	Seal ending point																																							
Cam resolution	UW: i_uCamResolution	o_eSyncEndPos :E	Synchronization ending point																																							
Cam auto-generation cam No.	UW: io_uCamNo	io_uCamNo :UW	Cam auto-generation cam No.																																							
Output axis setting	DUT: io_stOutputAxis	io_stOutputAxis :DUT	Output axis setting																																							
Applicable hardware and software	Applicable module	FX5-40SSC-S, FX5-80SSC-S																																								
	Applicable CPU	MELSEC iQ-F series																																								
	Engineering software	GX Works3																																								
Number of steps	9226 steps																																									
FB dependence	—																																									
Function description	<p>This FB automatically generates a cam pattern for the long dwell mechanism (D-cam axis) increases the sealing time.</p> <ul style="list-style-type: none"> <li>Turning on i_bEN (Execution command) starts generating cam data based on the set data.</li> <li>In calculation, one cycle length of the main input axis is the product length.</li> <li>The cam pattern is generated so that the D-cam axis rotates once (360 degree) per product length (1 cycle length) [mm].</li> </ul> 																																									

Item	Description
Function description	<p>■ Cam pattern to be generated</p>
	 <p>* (i) ... Input label (o) ... Output label</p> <ul style="list-style-type: none"> <li>• <math>i\_eSealSectionAccRatio</math> (Seal section acceleration rate) changes the speed in the sealing section.</li> <li>• <math>i\_eInOutSectionAccRatio</math> (Inlet/outlet section acceleration rate) changes the speed in the entrance/exit section.</li> </ul>
	<p>■ Cam pattern when only <math>i\_eSealSectionAccRatio</math> (Seal section acceleration rate) is set</p>  <p>* (i) ... Input label</p>
	<p>■ Cam pattern when only <math>i\_eInOutSectionAccRatio</math> (Inlet/outlet section acceleration rate) is set</p>  <p>* (i) ... Input label</p>

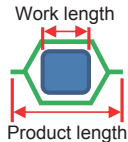
Item	Description
Function description	<p>■ Cam pattern when both <code>i_eSealSectionAccRatio</code> and <code>i_eInOutSectionAccRatio</code> are set</p>  <p>• After the cam generation is normally completed and the output label is updated, <code>o_bOK</code> (Normal completion) turns on.</p> <p>• If a warning related to the cam data operation occurs in the Simple Motion module during cam generation, an error (ErrorID: 2203H) is stored.</p> <p>• If a value other than "0" has been set in "[Cd.600] Cam data operation request" at the cam generation, an error (ErrorID: 2205H) is stored.</p> <p>• If an error has occurred in the FB, Error turns on and an error code is stored in ErrorID.</p> <p>• For details of error codes, refer to "Page 181 List of Error Codes".</p>
Restrictions and precautions	<ul style="list-style-type: none"> <li>• The cam to be automatically generated is in the coordinate data format.</li> <li>• The cam data that has been automatically generated is saved in the cam storage area.</li> <li>• If <code>i_bEN</code> (Execution command) turns off during cam generation, the cam may not be normally generated.</li> <li>• When generating multiple cams at the same time, input <code>o_bOK</code> (Normal completion) of the cam auto-generation FB as an interlock condition so that the generation of the next cam starts after the generation of one cam is successfully completed.</li> <li>• If the cam generation fails, the cam data may be undefined. Try the cam auto-generation again. Check that normal cam is generated and then perform the operation.</li> <li>• Since cam operation control data ([Cd.600] to [Cd.607]) is set in this FB, do not use user programs to set or change the data.*1</li> <li>• Use the FB <code>CtrlOutputAxisSync</code> or create a user program for the operation of the D-cam axis.</li> <li>• The number of FB steps in a program varies depending on the CPU model to be used and I/O definitions.</li> </ul>
Compiling method	Macro type, subroutine type
FB operation type	Pulsed execution (multiple scan execution type)

\*1 For details of control data, refer to the following.

📖 MELSEC iQ-F FX5 Simple Motion Module User's Manual (Advanced Synchronous Control)

## Labels

### Input labels

Name	Label name	Data type	Read timing*1	Setting range	Description
Execution command	i_bEN	Bit	<input type="checkbox"/>	On, off	On: The FB is activated. Off: The FB is not activated.
Product length	i_eProductLength	Single precision real number	↑	$0.1 \leq \text{Product length} \leq 100000.0$ [mm]	Set the product length. 
Synchronous angle	i_eSyncAngle	Single precision real number	↑	$0.1 \leq \text{Synchronous angle} \leq 180.0$ [degree]	Set the angle including the seal section and inlet/outlet section.
Seal length	i_eSealLength	Single precision real number	↑	$0.1 \leq \text{Seal length} \leq 100000.0$ [mm]	Set the seal section length.
Eccentric length	i_eEccentricLength	Single precision real number	↑	$0.1 \leq \text{Eccentric length} \leq 100000.0$ [mm]	Set the distance from the center of the seal section to the center of the circle.
Seal section acceleration rate	i_eSealSectionAccRatio	Single precision real number	↑	$-50.0 \leq \text{Seal section acceleration rate} \leq 50.0$ [%]	Set this item when fine adjustment of the synchronous speed in the sealing section is required. Synchronous section speed = Synchronous speed × (100% + Acceleration ratio)
Inlet/outlet section acceleration rate	i_eInOutletSectionAccRatio	Single precision real number	↑	$-50.0 \leq \text{Inlet/outlet section acceleration rate} \leq 50.0$ [%]	Set this item when the fine adjustment of the synchronous speed in the inlet/outlet section is required. Synchronous section speed = Synchronous speed × (100% + Acceleration ratio)
Cam resolution	i_uCamResolution	Word [Unsigned]	↑	$9 \leq \text{Cam resolution} \leq 1024$	Set the cam resolution of the cam to be generated.

\*1 : Always, ↑: When the FB is started (cannot be changed)

### Output labels

Name	Label name	Data type	Value to be held*1	Description
Execution status	o_bENO	Bit	—	On: Execution command is on. Off: Execution command is off.
Normal completion	o_bOK	Bit	—	This label indicates that the cam auto-generation has been completed and the FB has been normally completed.
Error completion	o_bError	Bit	—	On: An error has occurred in the FB. Off: No error has occurred.
Error code	o_uErrorID	Word [Unsigned]	—	The error code of the error that has occurred in the FB is stored.
Synchronization starting point	o_eSyncStartPos	Single precision real number	○	The main input axis point at the start of the synchronization is stored. [mm]
Seal starting point	o_eSealStartPos	Single precision real number	○	The main input axis point at the start of the seal is stored. [mm]
Seal ending point	o_eSealEndPos	Single precision real number	○	The main input axis point at the end of the seal is stored. [mm]
Synchronization ending point	o_eSyncEndPos	Single precision real number	○	The main input axis point at the end of the synchronization is stored. [mm]

\*1 ○: The value will be held after the FB stops. —: The value will be cleared after the FB stops.



## ■ I/O labels

Name	Label name	Data type	Read timing *1	Setting range	Description
Cam auto-generation cam No.	io_uCamNo	Word [Unsigned]	↑	1 ≤ Cam auto-generation cam No. ≤ 64	Set the cam No. to be automatically generated for the D-cam axis.
Output axis setting	io_stOutputAxis	AXIS_REF	↑	—	Refer to the output axis setting below.

### Output axis setting (AXIS\_REF structure)

Name	Label name	Data type	Read timing *1	Setting range	Description
Axis No.	AxisNo	Word [Signed]	↑	1 ≤ Axis No. ≤ maximum number of axes of the module used	Set the axis No. of the output axis to be used for the D-cam axis.
Module number	StartIO	Word [Signed]	↑	1H ≤ Module number ≤ 10H	Simple Motion module number

\*1 □: Always, ↑: When the FB is started (cannot be changed)

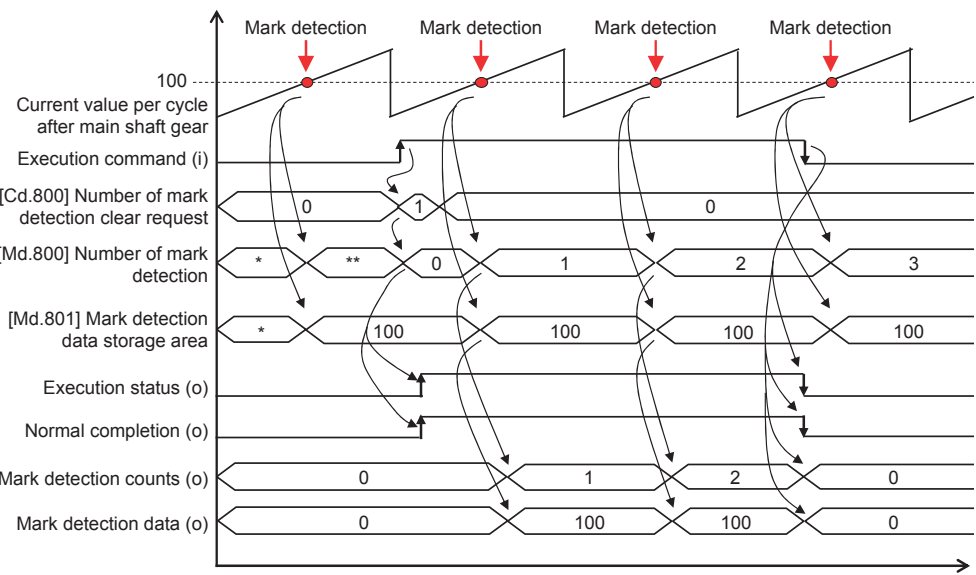
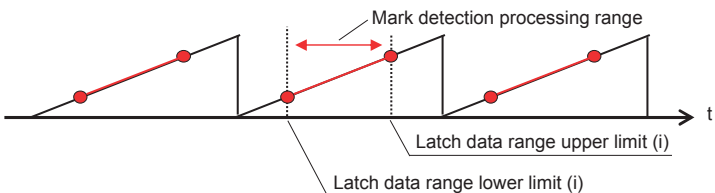
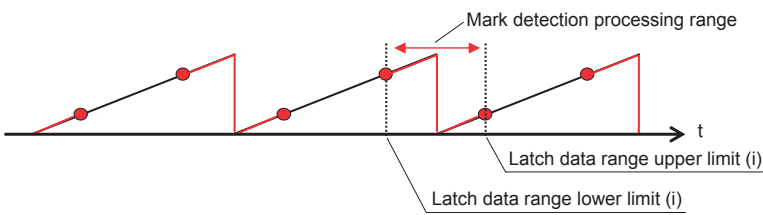
# STD\_ReadMarkDetectData (Mark detection data reading)


## Name

STD\_ReadMarkDetectData

## Function overview

Item	Description																																				
Function overview	This FB reads mark detection data.																																				
Symbol	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="4" style="text-align: center;">STD_ReadMarkDetectData</th> </tr> </thead> <tbody> <tr> <td style="width: 30%;">Execution command</td> <td style="width: 30%;">B: i_bEN</td> <td style="width: 20%;">o_bENO :B</td> <td style="width: 20%;">Execution status</td> </tr> <tr> <td>Latch data range change request</td> <td>UW: i_uLatchDataRangeChangeRequest</td> <td>o_bOK :B</td> <td>Normal completion</td> </tr> <tr> <td>Latch data range upper limit</td> <td>D: i_dLatchDataRangeUpperLimit</td> <td>o_bError :B</td> <td>Error completion</td> </tr> <tr> <td>Latch data range lower limit</td> <td>D: i_dLatchDataRangeLowerLimit</td> <td>o_uErrorID :UW</td> <td>Error code</td> </tr> <tr> <td></td> <td></td> <td>o_dMarkDetectData :D</td> <td>Mark detection data</td> </tr> <tr> <td></td> <td></td> <td>o_uMarkDetectCount :UW</td> <td>Mark detection counts</td> </tr> <tr> <td>Mark detection setting No.</td> <td>UW: io_uMarkDetectSettingNo</td> <td>io_uMarkDetectSettingNo :UW</td> <td>Mark detection setting No.</td> </tr> <tr> <td>Output axis setting</td> <td>DUT: io_stOutputAxis</td> <td>io_stOutputAxis :DUT</td> <td>Output axis setting</td> </tr> </tbody> </table>	STD_ReadMarkDetectData				Execution command	B: i_bEN	o_bENO :B	Execution status	Latch data range change request	UW: i_uLatchDataRangeChangeRequest	o_bOK :B	Normal completion	Latch data range upper limit	D: i_dLatchDataRangeUpperLimit	o_bError :B	Error completion	Latch data range lower limit	D: i_dLatchDataRangeLowerLimit	o_uErrorID :UW	Error code			o_dMarkDetectData :D	Mark detection data			o_uMarkDetectCount :UW	Mark detection counts	Mark detection setting No.	UW: io_uMarkDetectSettingNo	io_uMarkDetectSettingNo :UW	Mark detection setting No.	Output axis setting	DUT: io_stOutputAxis	io_stOutputAxis :DUT	Output axis setting
STD_ReadMarkDetectData																																					
Execution command	B: i_bEN	o_bENO :B	Execution status																																		
Latch data range change request	UW: i_uLatchDataRangeChangeRequest	o_bOK :B	Normal completion																																		
Latch data range upper limit	D: i_dLatchDataRangeUpperLimit	o_bError :B	Error completion																																		
Latch data range lower limit	D: i_dLatchDataRangeLowerLimit	o_uErrorID :UW	Error code																																		
		o_dMarkDetectData :D	Mark detection data																																		
		o_uMarkDetectCount :UW	Mark detection counts																																		
Mark detection setting No.	UW: io_uMarkDetectSettingNo	io_uMarkDetectSettingNo :UW	Mark detection setting No.																																		
Output axis setting	DUT: io_stOutputAxis	io_stOutputAxis :DUT	Output axis setting																																		
Applicable hardware and software	Applicable module	FX5-40SSC-S, FX5-80SSC-S																																			
	Applicable CPU	MELSEC iQ-F series																																			
	Engineering software	GX Works3																																			
Number of steps	1113 steps																																				
FB dependence	—																																				
Function description	<p>This FB reads mark detection data.</p> <ul style="list-style-type: none"> <li>Turning on i_bEN (Execution command) normally starts the FB and turns on o_bOK (Normal completion). o_dMarkDetectData (Mark detection data) and o_dMarkDetectCount (Mark detection counts), the data of the set io_uMarkDetectSettingNo (Mark detection setting No.), is stored.</li> <li>While i_bEN (Execution command) is on, o_dMarkDetectData (Mark detection data) and o_dMarkDetectCount (Mark detection counts) are updated at every scan.</li> </ul> <p>■ Main input axis current point and current feed value</p> <p style="text-align: right;">* (i) ... Input label (o) ... Output label</p>																																				

Item	Description
Function description	<p>■ Current value per cycle</p>  <p style="text-align: right;">* (i) ... Input label (o) ... Output label</p> <ul style="list-style-type: none"> <li>By setting <code>i_dLatchDataRangeUpperLimit</code> (Latch data range upper limit) and <code>i_dLatchDataRangeLowerLimit</code> (Latch data range lower limit) and turning on <code>i_uLatchDataRangeChangeRequest</code> (Latch data range change request), mark detection is performed when the data at mark detection is within the range.</li> <li>■ When the latch data range upper limit is equal to the latch data range lower limit When the upper limit value is equal to the lower limit value, the range of mark detection data is not checked. The mark detection processing is executed within the entire range.</li> <li>■ When the latch data range upper limit is larger than the latch data range lower limit When the upper limit value is larger than the lower limit value, the mark detection processing is executed when mark detection data is "equal to or larger than the lower limit value and smaller than the upper limit value".</li> </ul>  <ul style="list-style-type: none"> <li>■ When the latch data range upper limit is smaller than the latch data range lower limit When the upper limit value is smaller than the lower limit value, the mark detection processing is executed when mark detection data is "equal to or larger than the lower limit value or smaller than the upper limit value".</li> </ul>  <ul style="list-style-type: none"> <li>If an error has occurred in the FB, Error turns on and the error code is stored in ErrorID.</li> <li>For details of error codes, refer to "Page 181 List of Error Codes".</li> </ul>
Restrictions and precautions	<ul style="list-style-type: none"> <li>If a series of processing (from operation processing to compensation completion) is not completed until the next mark detection, execute this FB in the fixed cycle execution type.</li> <li>If a value other than 0 to 3 has been set in "[Pr.1] Unit setting", this FB is executed with the unit [mm].</li> <li>This FB supports only the continuous detection mode. Do not set a value other than "0" in "[Pr.807] Mark detection mode setting". Configure the mark detection settings with the Simple Motion setting tool or user programs before execution of the FB.</li> <li>"[Pr.800] to [Pr.804], [Pr.807] (0: Available, other than 0: Not available), [Pr.95], [Pr.42], [Cd.8]"</li> <li>Since control data ([Cd.800], [Cd.802]) is set in this FB, do not use user programs to set or change the data.*1</li> <li>This FB reads the mark detection data stored in the Simple Motion module.</li> </ul>
Compiling method	Macro type, subroutine type
FB operation type	Real-time execution

\*1 For details of the mark detection setting, refer to the following.  
 MELSEC iQ-F FX5 Simple Motion Module User's Manual (Application)

## Labels

### Input labels

Name	Label name	Data type	Read timing*1	Setting range	Description
Execution command	i_bEN	Bit	<input type="checkbox"/>	On, off	On: The FB is activated and reading of mark detection data starts. Off: The FB is not activated.
Latch data range change request	i_uLatchDataRangeChangeRequest	Word [Unsigned]	<input type="checkbox"/>	$0 \leq \text{Latch data range change request} \leq 2$	Request the latch data range processing. Set either of the following values according to the timing to update a new value. 1: At the next operation cycle after the request 2: At the next DI input after the request This label is used as a fetch trigger of the latch data range upper/lower limit value.
Latch data range upper limit value	i_dLatchDataRangeUpperLimit	Double word [Signed]	When requesting the latch data range change	$-2147483648 \leq \text{Latch data range upper limit} \leq 2147483647$ [The unit setting depends on the axis No. setting value in the output axis setting.] ( $10^{-4}$ mm, $10^{-5}$ inch, $10^{-5}$ degree, pulse)	Set a valid upper limit value as latch data at mark detection.
Latch data range lower limit value	i_dLatchDataRangeLowerLimit	Double word [Signed]		$-2147483648 \leq \text{Latch data range lower limit} \leq 2147483647$ [The unit setting depends on the axis No. setting value in the output axis setting.] ( $10^{-4}$ mm, $10^{-5}$ inch, $10^{-5}$ degree, pulse)	Set a valid lower limit value as latch data at mark detection.

\*1 : Always, : When the FB is started (cannot be changed)

### Output labels

Name	Label name	Data type	Value to be held*1	Description
Execution status	o_bENO	Bit	—	On: Execution command is on. Off: Execution command is off.
Normal completion	o_bOK	Bit	—	This label indicates that the FB has normally started.
Error completion	o_bError	Bit	—	On: An error has occurred in the FB. Off: No error has occurred.
Error code	o_uErrorID	Word [Unsigned]	—	The error code of the error that has occurred in the FB is stored.
Mark detection data	o_dMarkDetectData	Double word [Signed]	—*2	Latch data at mark detection is stored. Data range: $-2147483648 \leq \text{Mark detection data} \leq 2147483647$ [The unit setting depends on the axis No. setting value in the output axis setting.] ( $10^{-4}$ mm, $10^{-5}$ inch, $10^{-5}$ degree, pulse) Refresh cycle: At updating mark detection counts
Mark detection counts	o_uMarkDetectCount	Word [Unsigned]	—*2	The mark detection counts after Execution command turns on is stored. Data range: $0 \leq \text{Mark detection counts} \leq 65535$ (Ring counter) Refresh cycle: At updating mark detection counts

\*1 ○: The value will be held after the FB stops. —: The value will be cleared after the FB stops.

\*2 The value is held when an error has occurred.

## ■ I/O labels

Name	Label name	Data type	Read timing*1	Setting range	Description
Mark detection setting No.	io_uMarkDetectSettingNo	Word [Unsigned]	↑	1 ≤ Mark detection setting No. ≤ maximum number of mark detection settings of the module used	Set the reference number of mark detection data.
Output axis setting	io_stOutputAxis	AXIS_REF	—	—	Refer to the output axis setting below.

### Output axis setting (AXIS\_REF structure)

Name	Label name	Data type	Read timing*1	Setting range	Description
Axis number	AxisNo	Word [Signed]	↑	1 ≤ Axis No. ≤ maximum number of axes of the module used	Set the axis No. of the output axis used for mark compensation. This FB uses the unit setting of the main input axis corresponding to the output axis.
Unit number	StartIO	Word [Signed]	↑	1H ≤ Unit number ≤ 10H	Simple Motion unit number

\*1 □: Always, ↑: When the FB is started (cannot be changed)

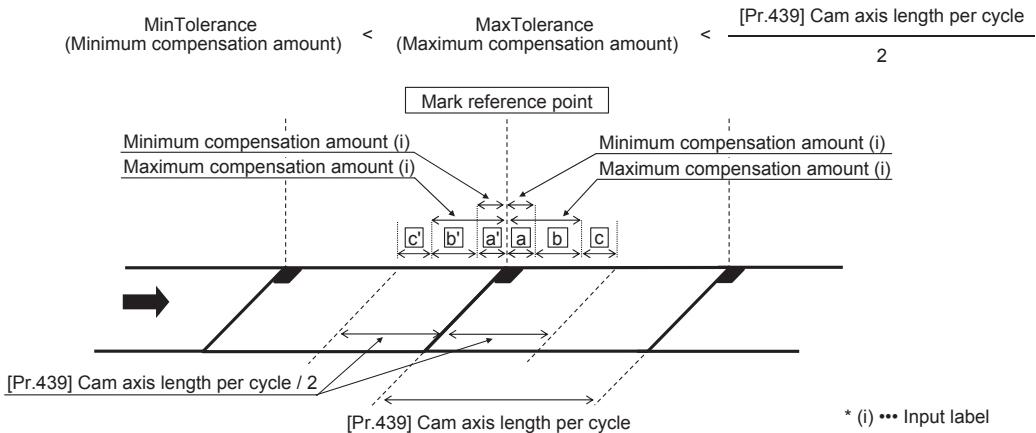
# PAC\_CalcMarkCompensation (Automatic compensation calculation using mark detection)

## Name

PAC\_CalcMarkCompensation

## Function overview

Item	Description																												
Function overview	This FB detects a registration mark on the film using the mark detection function of the Simple Motion module and outputs the compensation amount for the deviation from the mark reference point.																												
Symbol	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="3" style="text-align: center;">PAC_CalcMarkCompensation</th> </tr> </thead> <tbody> <tr> <td style="text-align: right;">Execution command</td> <td>B: i_bEN</td> <td>o_bENO :B Execution status</td> </tr> <tr> <td style="text-align: right;">Mark detection setting No.</td> <td>UW: i_uMarkDetectSettingNo</td> <td>o_bOK :B Normal completion</td> </tr> <tr> <td style="text-align: right;">Mark detection data</td> <td>D: i_dMarkDetectData</td> <td>o_bError :B Error completion</td> </tr> <tr> <td style="text-align: right;">Mark detection counts</td> <td>UW: i_uMarkDetectCount</td> <td>o_uErrorID :UW Error code</td> </tr> <tr> <td style="text-align: right;">Mark undetected permissible counts</td> <td>UW: i_uMissedMarkLimit</td> <td>o_dCompensationAmount :D Compensation amount</td> </tr> <tr> <td></td> <td></td> <td>o_uMissedMarkAmount :UW Mark undetected counts</td> </tr> <tr> <td style="text-align: right;">Output axis setting</td> <td>DUT: io_stOutputAxis</td> <td>io_stOutputAxis :DUT Output axis setting</td> </tr> <tr> <td style="text-align: right;">Compensation control setting</td> <td>DUT: io_stCompensationSetting</td> <td>io_stCompensationSetting :DUT Compensation control setting</td> </tr> </tbody> </table>		PAC_CalcMarkCompensation			Execution command	B: i_bEN	o_bENO :B Execution status	Mark detection setting No.	UW: i_uMarkDetectSettingNo	o_bOK :B Normal completion	Mark detection data	D: i_dMarkDetectData	o_bError :B Error completion	Mark detection counts	UW: i_uMarkDetectCount	o_uErrorID :UW Error code	Mark undetected permissible counts	UW: i_uMissedMarkLimit	o_dCompensationAmount :D Compensation amount			o_uMissedMarkAmount :UW Mark undetected counts	Output axis setting	DUT: io_stOutputAxis	io_stOutputAxis :DUT Output axis setting	Compensation control setting	DUT: io_stCompensationSetting	io_stCompensationSetting :DUT Compensation control setting
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Output axis setting	DUT: io_stOutputAxis	io_stOutputAxis :DUT Output axis setting																											
Compensation control setting	DUT: io_stCompensationSetting	io_stCompensationSetting :DUT Compensation control setting																											
Applicable hardware and software	Applicable module	FX5-40SSC-S, FX5-80SSC-S																											
	Applicable CPU	MELSEC iQ-F series																											
	Engineering software	GX Works3																											
Number of steps	3473 steps																												
FB dependence	—																												

Item	Description
Function description	<ul style="list-style-type: none"> <li>Turning on i_bEN (Execution command) normally starts the FB and turns on o_bOK (Normal completion).</li> <li>At the timing when i_uMarkDetectCount (Mark detection counts) is refreshed, the interval between register marks is calculated from the current value and previous value of i_dMarkDetectData (Mark detection data) and the difference from "[Pr.439] Cam axis length per cycle" of the axis set in the output axis setting is output to o_dCompensationAmount (Compensation amount).</li> <li>For i_dMarkDetectData (Mark detection data), set the real current value ([Pr.802] = 2).</li> <li>Since this FB uses the previous value of i_dMarkDetectData (Mark detection data) for the compensation amount calculation, this FB does not calculate the compensation amount at the first update of i_uMarkDetectCount (Mark detection counts). This FB calculates the compensation amount at the second update or later.</li> <li>This FB can set a compensation target range to the calculated compensation amount. By setting the compensation range with MaxTolerance (Maximum compensation amount) and MinTolerance (Minimum compensation amount), the compensation amount is output to o_dCompensationAmount (Compensation amount) only when the calculated compensation amount is within the compensation range. When the calculated compensation amount is outside the compensation range, the FB functions as follows.             <ul style="list-style-type: none"> <li>When the absolute value of the calculated compensation amount is smaller than the value in MinTolerance (Minimum compensation amount), "0" is stored in o_dCompensationAmount (Compensation amount) and the calculated compensation amount is used as the cumulative compensation amount and added to the compensation amount to be calculated at the next update. The cumulative compensation amount is held until it is output to o_dCompensationAmount (Compensation amount).</li> <li>When the absolute value of the calculated compensation amount is larger than the value in MaxTolerance (Maximum compensation amount), "0" is stored in o_dCompensationAmount (Compensation amount) and an outside mark range error (ErrorID: 2123H) is stored. The calculated compensation amount is discarded and the cumulative compensation amount is held.*1</li> </ul> </li> <li>Set MinTolerance (Minimum compensation amount) and MaxTolerance (Maximum compensation amount) to satisfy the following formula.             <math display="block">\text{MinTolerance (Minimum compensation amount)} &lt; \text{MaxTolerance (Maximum compensation amount)} &lt; \frac{[\text{Pr.439}] \text{ Cam axis length per cycle}}{2}</math>  </li> </ul> <p>* (i) ... Input label</p> <ul style="list-style-type: none"> <li>Mark detection points: Area a and a' o_dCompensationAmount (Compensation amount): 0 is output. The calculated compensation amount is added to the cumulative compensation amount and held.</li> <li>Mark detection points: Area b and b' o_dCompensationAmount (Compensation amount): The calculated compensation amount is output. The cumulative compensation amount is reset.</li> <li>Mark detection points: Area c and c' o_dCompensationAmount (Compensation amount): 0 is output. ErrorID: 2123H is stored in the error code and the operation continues. The calculated compensation amount is discarded. The cumulative compensation amount is held.</li> </ul> <ul style="list-style-type: none"> <li>This FB determines that no mark is detected if i_uMarkDetectCount (Mark detection counts) has not been refreshed even if "[Md.101] Real current value" moves by a certain amount after i_uMarkDetectCount (Mark detection counts) is refreshed. Once movement amount of "[Md.101] Real current value" from the detection of a mark to the detection of the next mark exceeds the sum of "[Pr.439] Cam axis length per cycle" and MaxTolerance (Maximum compensation amount), o_uMissedMarkAmount (Mark undetected counts) is incremented by one for each "[Pr.439] Cam axis length per cycle". After the movement amount of "[Md.101] Real current value" exceeds the sum of "[Pr.439] Cam axis length per cycle" and MaxTolerance (Maximum compensation amount), o_uMissedMarkAmount (Mark undetected counts) is incremented by one for each "[Pr.439] Cam axis length per cycle". When the value of o_uMissedMarkAmount (Mark undetected counts) exceeds the value of i_uMarkMissedMarkLimit (Mark undetected permissible counts), an error (ErrorID: 2201H) is stored and the FB stops. The value of o_uMissedMarkAmount (Mark undetected counts) is cumulative. The value of o_uMissedMarkAmount (Mark undetected counts) is held even after the update of i_uMarkDetectCount (Mark detection counts), and this FB adds 1 to the counts every mark undetection.</li> <li>Use output values of STD_ReadMarkDetectData for i_dMarkDetectData (Mark detection data) and i_uMarkDetectCount (Mark detection counts).</li> <li>To compensate the compensation amount calculated by this FB, use STD_CtrlAuxiliaryAxis. The compensation direction depends on the compensation target. To compensate the film axis, use o_dCompensationAmount (Compensation amount). To compensate the rotary cutter or flying shear axis, use o_dCompensationAmount (Compensation amount) in reverse.</li> <li>If an error has occurred in the FB, Error turns on and the error code is stored in ErrorID.</li> <li>For details of error codes, refer to "Page 181 List of Error Codes".</li> </ul>

Item	Description
Restrictions and precautions	<ul style="list-style-type: none"> <li>Execute this FB in a fixed cycle.</li> <li>If a value other than 0 to 3 has been set in "[Pr.1] Unit setting", this FB is executed with the unit [mm].</li> <li>When using this FB, construct a system in which "[Md.101] Real current value" operates in the increasing direction.</li> <li>To improve accuracy in calculation of the compensation amount, data to be set to i_dMarkDetectdata (Mark detection data) has been changed from the cam axis current value per cycle ([Pr.802] = 11 or 12) to the real current value ([Pr.802] = 2). Use this FB in the following combinations. This FB [Ver1.001B or earlier] → Cam axis current value per cycle ([Pr.802] = 11 or 12) This FB [Ver1.002C or later] → Real current value ([Pr.802] = 2)</li> </ul>
Compiling method	Macro type, subroutine type
FB operation type	Real-time execution

\*1 The operation of the FB continues. If the mark pitch is normal at the next cycle, "0" is stored in error.

## Labels

### Input labels

Name	Label name	Data type	Read timing *1	Setting range	Description
Execution command	i_bEN	Bit	<input type="checkbox"/>	On, off	On: The FB is activated. Off: The FB is not activated.
Mark detection setting No.	i_uMarkDetectSetting No	Word [Unsigned]	↑	1 ≤ Mark detection setting No. ≤ Maximum number of mark detection settings of the module used	Set the reference number of mark detection data.
Mark detection data	i_dMarkDetectData	Double word [Signed]	<input type="checkbox"/>	-2147483648 ≤ Mark detection data ≤ 2147483647 [The unit setting depends on the axis No. setting value in the output axis setting.] (10 <sup>-4</sup> mm, 10 <sup>-5</sup> inch, 10 <sup>-5</sup> degree, pulse)	Enter o_dMarkDetectData (Mark detection data) of the FB STD_ReadMarkDetectData.
Mark detection counts	i_uMarkDetectCount	Word [Unsigned]	<input type="checkbox"/>	0 ≤ Mark detection counts ≤ 65535 [times] (Ring counter)	Enter o_uMarkDetectCount (Mark detection counts) of the FB STD_ReadMarkDetectData. A compensation amount is calculated at update of this data.
Mark undetected permissible counts	i_uMissedMarkLimit	Word [Unsigned]	<input type="checkbox"/>	0 ≤ Mark undetected permissible counts ≤ 100 [times]	Set the permissible value of the mark undetected counts. If the value of the mark undetected counts exceeds this setting, an error is stored. 0: Invalid 1 to 100: Permissible value of the mark undetected counts

\*1 : Always, ↑: When the FB is started (cannot be changed)



## Output labels

Name	Label name	Data type	Value to be held <sup>*1</sup>	Description
Execution status	o_bENO	Bit	—	On: Execution command is on. Off: Execution command is off.
Normal completion	o_bOK	Bit	—	This label indicates that the FB has normally started.
Error completion	o_bError	Bit	—	On: An error has occurred in the FB. Off: No error has occurred.
Error code	o_uErrorID	Word [Unsigned]	—	The error code of the error that has occurred in the FB is stored.
Compensation amount	o_dCompensationAmount	Double word [Signed]	—	The calculated compensation amount is stored. If the absolute value of the compensation amount is smaller than the minimum compensation amount or larger than the maximum compensation amount, "0" is output. Data range: $-2147483648 \leq \text{Compensation amount} \leq 2147483647$ [The unit setting depends on the axis No. setting value in the output axis setting.] ( $10^{-4}$ mm, $10^{-5}$ inch, $10^{-5}$ degree, pulse)
Mark undetected counts	o_uMissedMarkAmount	Word [Unsigned]	— <sup>*2</sup>	The value of the mark undetected counts is stored. If this data exceeds the mark undetected permissible counts, an error is stored.

\*1 ○: The value will be held after the FB stops. —: The value will be cleared after the FB stops.

\*2 The value is held when an error has occurred.

## I/O labels

Name	Label name	Data type	Read timing <sup>*1</sup>	Setting range	Description
Output axis setting	io_stOutputAxis	AXIS_REF	—	—	Refer to the output axis setting below.
Compensation control setting	io_stCompensationSetting	PAC_COMPENSATION_REF	—	—	Refer to the compensation control setting below.

### Output axis setting (AXIS\_REF structure)

Name	Label name	Data type	Read timing <sup>*1</sup>	Setting range	Description
Axis number	AxisNo	Word [Signed]	↑	$1 \leq \text{Axis No.} \leq$ maximum number of axes of the module used	Set the axis No. of the output axis used for mark compensation. This FB uses the unit setting of the main input axis corresponding to the output axis.
Unit number	StartIO	Word [Signed]	↑	$1H \leq \text{Unit number} \leq$ 10H	Simple Motion unit number

### Compensation control setting (PAC\_COMPENSATION\_REF structure)

Name	Label name	Data type	Read timing <sup>*1</sup>	Setting range	Description
Minimum compensation amount	eMinTolerance	Single precision real number	↑	$0.0 \leq \text{Minimum compensation amount} <$ Maximum compensation amount $<$ "[Pr.439] Cam axis length per cycle / 2"	Set the lower limit value of the compensation range with an absolute value.
Maximum compensation amount	eMaxTolerance	Single precision real number	↑		Set the upper limit value of the compensation range with an absolute value.

\*1 □: Always, ↑: When the FB is started (cannot be changed)

# STD\_CtrlAuxiliaryAxis (Auxiliary axis correction)

## Name

STD\_CtrlAuxiliaryAxis

## Function overview

Item	Description																									
Function overview	This FB performs positioning by compensation amount.																									
Symbol	<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;"> <p style="text-align: center; margin: 0;">STD_CtrlAuxiliaryAxis</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">Execution command</td> <td style="width: 40%;">B: i_bEN</td> <td style="width: 20%;">o_bENO :B</td> <td style="width: 10%;">Execution status</td> </tr> <tr> <td>Compensation starting point</td> <td>E: i_eCompensationStartPos</td> <td>o_bOK :B</td> <td>Normal completion</td> </tr> <tr> <td>Compensation amount</td> <td>D: i_dCompensationAmount</td> <td>o_bError :B</td> <td>Error completion</td> </tr> <tr> <td>Output axis setting</td> <td>DUT: i_stOutputAxis</td> <td>o_uErrorID :UW</td> <td>Error code</td> </tr> <tr> <td>Auxiliary axis setting</td> <td>DUT: i_stAuxiliaryAxis</td> <td>o_bCompensationComplete :B</td> <td>Compensation completion</td> </tr> <tr> <td>Compensation control setting</td> <td colspan="3">DUT: i_stCompensationSetting</td> </tr> </table> </div>		Execution command	B: i_bEN	o_bENO :B	Execution status	Compensation starting point	E: i_eCompensationStartPos	o_bOK :B	Normal completion	Compensation amount	D: i_dCompensationAmount	o_bError :B	Error completion	Output axis setting	DUT: i_stOutputAxis	o_uErrorID :UW	Error code	Auxiliary axis setting	DUT: i_stAuxiliaryAxis	o_bCompensationComplete :B	Compensation completion	Compensation control setting	DUT: i_stCompensationSetting		
Execution command	B: i_bEN	o_bENO :B	Execution status																							
Compensation starting point	E: i_eCompensationStartPos	o_bOK :B	Normal completion																							
Compensation amount	D: i_dCompensationAmount	o_bError :B	Error completion																							
Output axis setting	DUT: i_stOutputAxis	o_uErrorID :UW	Error code																							
Auxiliary axis setting	DUT: i_stAuxiliaryAxis	o_bCompensationComplete :B	Compensation completion																							
Compensation control setting	DUT: i_stCompensationSetting																									
Applicable hardware and software	Applicable module	FX5-40SSC-S, FX5-80SSC-S																								
	Applicable CPU	MELSEC iQ-F series																								
	Engineering software	GX Works3																								
Number of steps	5348 steps																									
FB dependence	—																									
Function description	<p>This FB performs positioning of the auxiliary axis and compensates the output axis.</p> <ul style="list-style-type: none"> <li>Turning on i_bEN (Execution command) normally starts the FB and turns on o_bOK (Normal completion).</li> <li>If a positive value is set in i_eCompensationStartPos (Compensation starting point), the input of i_dCompensationAmount (Compensation amount) changes and compensating operation starts when "[Md.401] Current value per cycle after main shaft gear" passes the compensation starting point.</li> <li>If -1 is set in i_eCompensationStartPos (Compensation starting point), the compensation starting point is disabled and compensating operation starts when i_dCompensationAmount (Compensation amount) changes. When the compensation amount changes during auxiliary axis control, the compensation amount is ignored. The compensation amount which is input after the ongoing positioning completion will be fetched.</li> <li>o_bCompensationComplete (Compensation completion) turns on at completion of positioning of the auxiliary axis.</li> </ul> <p>■ If a positive value is set for the compensation starting point</p> <p style="text-align: right;">* (i) ... Input label (o) ... Output label</p>																									
	<ul style="list-style-type: none"> <li>If the unit set in "[Pr.1] Unit setting" differs between the main input axis and auxiliary axis corresponding to the output axis, the operation continues but an error (ErrorID: 2136H) is stored.</li> <li>If an error has occurred in the FB, Error turns on and the error code is stored in ErrorID.</li> <li>For details of error codes, refer to "Page 181 List of Error Codes".</li> </ul>																									

Item	Description
Restrictions and precautions	<ul style="list-style-type: none"> <li>• If a series of processing (from operation processing to compensation completion) is not completed until the next mark detection, execute this FB in the fixed cycle execution type.</li> <li>• If parameters have been set as below, this FB is executed with the unit [mm].</li> </ul> <p>"[Pr.1] Unit setting": Other than 0 to 3</p> <p>"[Pr.300] Servo input axis type": Other than 1 to 4</p> <p>Control unit of "[Pr.321] Synchronous encoder axis unit setting": Other than 0 to 3</p> <p>"[Pr.400] Main input axis type": Other than 1 to the maximum number of module axes (servo input axis), 201 to 200 + maximum number of module axes (command generation axis), and 801 to 804 (synchronous encoder)</p> <ul style="list-style-type: none"> <li>• Since synchronous parameters ([Pr.400] to [Pr.437]) such as "auxiliary shaft module" used in the synchronous control are set in this FB, input label, or structure, do not use user programs to set or change the parameters.*1</li> <li>• Since the positioning signal of the auxiliary axis specified with the axis No. in the auxiliary axis setting is used in this FB, do not use user programs to set or change them.</li> <li>• If the rotation direction of the main input axis and auxiliary axis are different and the compensation speed of the auxiliary axis exceeds the main input axis speed, the output axis may reverse.</li> <li>• This FB sets a compensation amount ([Da.6] Positioning address/movement amount), compensation axis speed ([Da.8] Command speed), compensation acceleration ([Da.3] Acceleration time No.), and compensation deceleration ([Da.4] Deceleration time No.) for the positioning data No. set with input labels.</li> <li>• Since "[Da.1] Operation pattern" and "[Da.2] Control method" are set in this FB, do not use user programs to set or change them.</li> <li>• For the following settings, use user programs as required.</li> </ul> <p>"[Da.9], [Da.10], [Da.27], [Da.28]"</p> <ul style="list-style-type: none"> <li>• Set i_eCompensationStartPos (Compensation starting point) not to overlap the synchronous section to avoid the compensation operation from being performed at sealing.</li> <li>• Set the time equal to or longer than the execution cycle (scan time) of this FB for "[Pr.40] Positioning complete signal output time" (initial value: 300[ms]) of the auxiliary axis. Otherwise, o_bCompensationComplete (Compensation completion) does not turn on.</li> <li>• When the command generation axis is specified as the main axis or auxiliary axis, the command generation axis parameter and command generation axis positioning data are used. Do not operate the following control data during FB execution.</li> </ul> <p>"[Cd.300] Command generation axis parameter No. designation"</p> <p>"[Cd.301] Command generation axis parameter setting value"</p> <p>"[Cd.302] Command generation axis parameter control request"</p> <p>"[Cd.303] Command generation axis positioning data No. designation"</p> <p>"[Cd.304] Command generation axis positioning data designation"</p> <p>"[Cd.305] Command generation axis positioning data setting value"</p> <p>"[Cd.306] Command generation axis positioning data control request"</p> <ul style="list-style-type: none"> <li>• When the command generation axis is specified as the auxiliary axis, positioning start of the auxiliary axis may delay after the compensation starting point is passed. The delay amount varies depending on the execution cycle (scan time) and motion operation cycle of this FB. Check operation on the actual machine, and set the compensation starting point.</li> </ul>
Compiling method	Macro type, subroutine type
FB operation type	Real-time execution

\*1 For details of synchronous control parameters, refer to the following.

 MELSEC iQ-F FX5 Simple Motion Module User's Manual (Advanced Synchronous Control)

## Labels

### Input labels

Name	Label name	Data type	Read timing*1	Setting range	Description
Execution command	i_bEN	Bit	<input type="checkbox"/>	On, off	On: The FB is activated and the compensation operation is available. Off: The FB is not activated.
Compensation starting point	i_eCompensationStartPos	Single precision real number	↑	Refer to the description.	The compensation starts when the main input axis point per cycle reaches the set value. <ul style="list-style-type: none"> <li>• <math>0.0 \leq \text{Compensation starting point} &lt; \text{Cam axis length per cycle}</math> [mm]</li> <li>• <math>0.00 \leq \text{Compensation starting point} &lt; \text{Cam axis length per cycle}</math> [inch]</li> <li>• <math>0.00 \leq \text{Compensation starting point} &lt; \text{Cam axis length per cycle}</math> [degree]</li> <li>• <math>0 \leq \text{Compensation starting point} &lt; \text{Cam axis length per cycle}</math> [pulse]</li> </ul> [The unit setting depends on the setting value of the main input axis.] -1: Compensation starts when the compensation amount changes.
Compensation amount	i_dCompensationAmount	Double word [Signed]	<input type="checkbox"/>	$-2147483648 \leq \text{Compensation amount} \leq 2147483647$ [The unit setting depends on the axis No. setting value in the auxiliary axis setting.] ( $10^{-4}$ mm, $10^{-5}$ inch, $10^{-5}$ degree, pulse)	Input the compensation amount.
Output axis setting	i_stOutputAxis	AXIS_REF	—	—	Refer to the output axis setting below.
Auxiliary axis setting	i_stAuxiliaryAxis	AXIS_REF	—	—	Refer to the auxiliary axis setting below.
Compensation control setting	i_stCompensationSetting	PAC_COMPENSATION_REF	—	—	Refer to the compensation control setting below.

#### Output axis setting (AXIS\_REF structure)

Name	Label name	Data type	Read timing*1	Setting range	Description
Axis number	AxisNo	Word [Signed]	↑	$1 \leq \text{Axis No.} \leq$ maximum number of axes of the module used	Set the axis No. of the output axis used for mark compensation. The unit setting of the main input axis that drives the output axis is also used by the compensation starting point.
Unit number	StartIO	Word [Signed]	↑	$1H \leq \text{Unit number} \leq 10H$	Simple Motion unit number

#### Auxiliary axis setting (AXIS\_REF structure)

Name	Label name	Data type	Read timing*1	Setting range	Description
Axis number	AxisNo	Word [Signed]	↑	$201 \leq \text{Axis No.} \leq 200 +$ maximum number of command generation axes of the module used	Set the axis No. of the auxiliary axis used for mark compensation. The unit setting of the axis is used for the unit of the label used by the auxiliary axis.

## Compensation control setting (PAC\_COMPENSATION\_REF structure)

Name	Label name	Data type	Read timing*1	Setting range	Description
Positioning data No.	uPointTableNo	Word [Unsigned]	↑	1 ≤ Positioning data No. ≤ 100	Set the positioning data No. for performing the compensation operation.
Compensation axis speed	eCompensationSpeed	Single precision real number	↑	Refer to the description.	Set the positioning speed for compensation. Set the speed added/subtracted to/from the line speed in this setting. <ul style="list-style-type: none"> <li>• mm: <math>0.01 \leq \text{Compensation axis speed} \leq 20000000.00</math> [mm/min]</li> <li>• inch: <math>0.001 \leq \text{Compensation axis speed} \leq 2000000.000</math> [inch/min]</li> <li>• degree: <math>0.001 \leq \text{Compensation axis speed} \leq 2000000.000</math> [degree/min]</li> <li>• pulse: <math>1 \leq \text{Compensation axis speed} \leq 100000000</math> [pulse/s]</li> </ul> [The unit setting depends on the axis No. setting value in the auxiliary axis setting.] If the set speed is 8 digits or more (the number of significant figures of the single precision real number is 7 digits), round off the eighth digits of the value.
Compensation acceleration	uCompensationAcc	Word [Unsigned]	↑	$0 \leq \text{Compensation acceleration} \leq 3$	Set the positioning acceleration for compensation. 0: [Pr.9] Acceleration time 0 1: [Pr.25] Acceleration time 1 2: [Pr.26] Acceleration time 2 3: [Pr.27] Acceleration time 3
Compensation deceleration	uCompensationDecel	Word [Unsigned]	↑	$0 \leq \text{Compensation deceleration} \leq 3$	Set the positioning deceleration for compensation. 0: [Pr.10] Deceleration time 0 1: [Pr.28] Deceleration time 1 2: [Pr.29] Deceleration time 2 3: [Pr.30] Deceleration time 3

\*1 □: Always, ↑: When the FB is started (cannot be changed)

**Output labels**

Name	Label name	Data type	Value to be held*1	Description
Execution status	o_bENO	Bit	—	On: Execution command is on. Off: Execution command is off.
Normal completion	o_bOK	Bit	—	This label indicates that the FB has normally started.
Error completion	o_bError	Bit	—	On: An error has occurred in the FB. Off: No error has occurred.
Error code	o_uErrorID	Word [Unsigned]	—	The error code of the error that has occurred in the FB is stored.
Compensation completion	o_bCompensationComplete	Bit	—	This device turns on when positioning for compensation is completed.

\*1 ○: The value will be held after the FB stops. —: The value will be cleared after the FB stops.

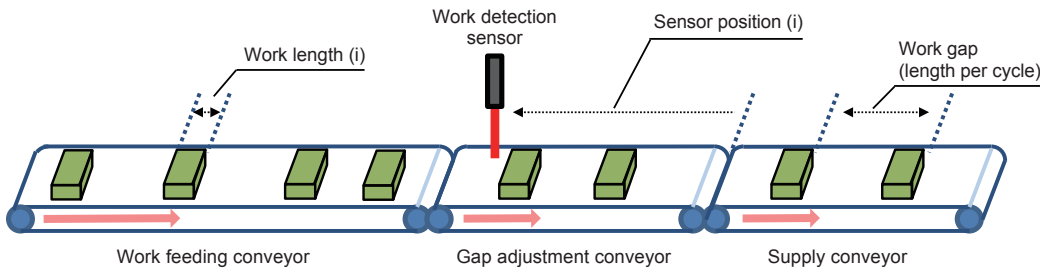
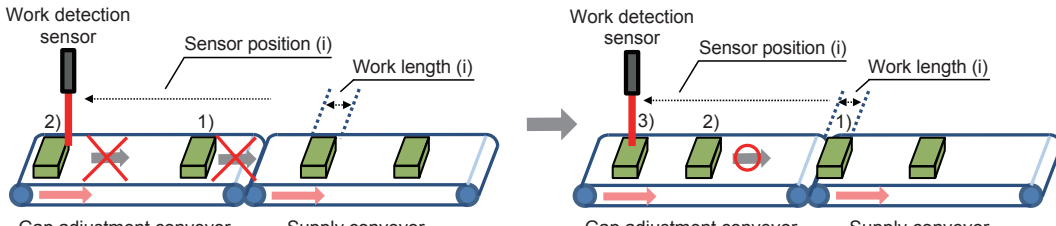
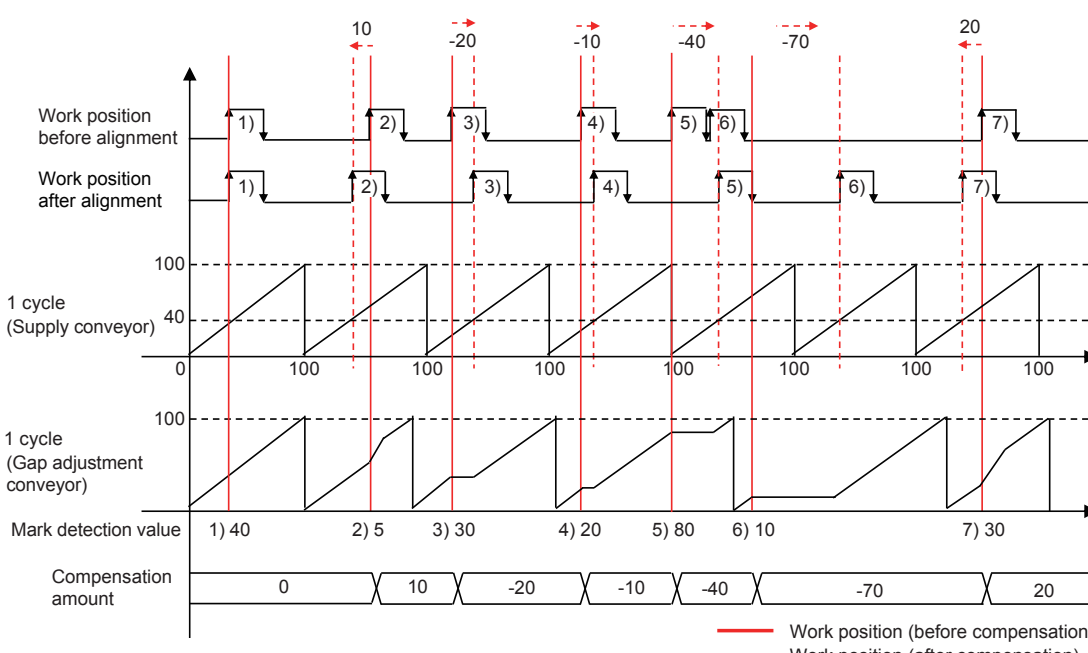
# PAC\_CalcGap (Work gap adjustment compensation amount calculation)

## Name

PAC\_CalcGap

## Function details

Item	Description																																						
Function overview	This FB detects a workpiece on the conveyor using the mark detection function of the Simple Motion module and outputs the compensation amount for adjusting the space from the workpiece ahead.																																						
Symbol	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="2" style="text-align: center;">PAC_CalcGap</th> </tr> </thead> <tbody> <tr> <td style="width: 30%;">Execution command</td> <td>B: i_bEN</td> <td style="width: 30%; text-align: right;">o_bENO :B</td> <td style="width: 40%;">Execution status</td> </tr> <tr> <td>Work length</td> <td>E: i_eWorkLength</td> <td style="text-align: right;">o_bOK :B</td> <td>Normal completion</td> </tr> <tr> <td>Sensor position</td> <td>E: i_eSensorPosition</td> <td style="text-align: right;">o_bError :B</td> <td>Error completion</td> </tr> <tr> <td>Mark detection data</td> <td>D: i_dMarkDetectData</td> <td style="text-align: right;">o_uErrorID :UW</td> <td>Error code</td> </tr> <tr> <td>Mark detection counts</td> <td>UW: i_uMarkDetectCount</td> <td style="text-align: right;">o_dCompensationAmount :D</td> <td>Compensation amount</td> </tr> <tr> <td></td> <td></td> <td style="text-align: right;">o_dCompensationStartPosition :D</td> <td>Compensation starting point</td> </tr> <tr> <td>Mark detection setting No.</td> <td>UW: io_uMarkDetectSettingNo</td> <td style="text-align: right;">io_uMarkDetectSettingNo :UW</td> <td>Mark detection setting No.</td> </tr> <tr> <td>Output axis setting</td> <td>DUT: io_stOutputAxis</td> <td style="text-align: right;">io_stOutputAxis :DUT</td> <td>Output axis setting</td> </tr> <tr> <td>Compensation control setting</td> <td>DUT: io_stCompensationSetting</td> <td style="text-align: right;">io_stCompensationSetting :DUT</td> <td>Compensation control setting</td> </tr> </tbody> </table>	PAC_CalcGap		Execution command	B: i_bEN	o_bENO :B	Execution status	Work length	E: i_eWorkLength	o_bOK :B	Normal completion	Sensor position	E: i_eSensorPosition	o_bError :B	Error completion	Mark detection data	D: i_dMarkDetectData	o_uErrorID :UW	Error code	Mark detection counts	UW: i_uMarkDetectCount	o_dCompensationAmount :D	Compensation amount			o_dCompensationStartPosition :D	Compensation starting point	Mark detection setting No.	UW: io_uMarkDetectSettingNo	io_uMarkDetectSettingNo :UW	Mark detection setting No.	Output axis setting	DUT: io_stOutputAxis	io_stOutputAxis :DUT	Output axis setting	Compensation control setting	DUT: io_stCompensationSetting	io_stCompensationSetting :DUT	Compensation control setting
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	Applicable CPU	MELSEC iQ-F series																																					
	Engineering software	GX Works3																																					
Number of steps	2235 steps																																						
FB dependence	—																																						

Item	Description
Function description	<p>As the following shows, this FB outputs compensation amounts to align the workpieces fed from the work feeding conveyor at irregular intervals into equal intervals (length per cycle) by using the gap adjustment conveyor which is synchronized with the supply conveyor and the sensor attached above the gap adjustment conveyor.</p> <p>■ Outline diagram (gap adjustment)</p>  <p style="text-align: right;">* (i)···Input label</p> <ul style="list-style-type: none"> <li>• Turning on i_bEN (Execution command) normally starts the FB and turns on o_bOK (Normal completion).</li> <li>• "[Md.407] Cam axis current value per cycle" of the axis (gap adjustment conveyor) specified with the output axis setting at the first mark detection is set as a reference point. After that, the compensation amount is calculated from the difference between the previous and current values of i_dMarkDetectData (Mark detection data) at each update of i_uMarkDetectCount (Mark detection counts).</li> <li>• The compensation amount is not calculated at the first detection of the work. It is calculated at the second i_uMarkDetect (Mark detection data) or later.</li> <li>• i_dMarkDetectData (Mark detection data) uses the cam axis current value per cycle (when [Pr.802] is set to 11 or 12).</li> <li>• o_dCompensationStartPosition (Compensation starting point) outputs the previous value of i_dMarkDetectData (Mark detection data) added by i_eWorkLength (Work length) and i_eSensorPosition (Sensor position).</li> </ul> <p>■ Compensation starting point concept</p>  <p>If the work 2) is detected and immediately compensated, the work 1) moves as well.</p> <p>Check that the work 1) is on the next conveyor, and then start compensation of the work 2).</p> <p style="text-align: right;">* (i)···Input label</p>  <p>Legend:  <span style="color: red;">—</span> Work position (before compensation)  <span style="color: red;">- - -</span> Work position (after compensation)</p>

Item	Description
Function description	<ul style="list-style-type: none"> <li>This FB performs the following compensation using MaxTolerance (maximum compensation amount) and MinTolerance (minimum compensation amount) according to the calculated compensation amount.</li> <li>■When the absolute value of the calculated compensation amount is smaller than the value in MinTolerance (Minimum compensation amount) "0" is stored in o_dCompensationAmount (Compensation amount)</li> <li>■When the calculated compensation amount (positive value) is larger than the value in MaxTolerance (Maximum compensation amount) "The value of the MaxTolerance" is stored in o_dCompensationAmount (Compensation amount), and a maximum compensation amount exceeded error (ErrorID: 2123H) is stored.</li> <li>■For the calculated compensation amount (negative value) The calculated compensation amount is output as the compensation amount as is.</li> </ul> <ul style="list-style-type: none"> <li>Depending on the space between workpieces conveyed from the work charging conveyor and the line speed, the workpieces may not be adjusted to have desired intervals on one conveyor. In that case, connect multiple gap adjustment conveyors.</li> <li>If an error has occurred in the FB, Error turns on and the error code is stored in ErrorID.</li> <li>For details of error codes, refer to "Page 181 List of Error Codes".</li> </ul>
Restrictions and precautions	<ul style="list-style-type: none"> <li>Set 0 (mm) or 1 (inch) in the main input axis. If a value outside the range is set, an error (ErrorID: 214DH) occurs.</li> <li>To use this FB, configure a system in which "[Md.407] Cam axis current value per cycle" moves in the increment direction.</li> <li>The command generation axis cannot be used as a main input axis.</li> <li>Set the work gap and the sensor position and the work length to satisfy the following formula. Work gap (length per cycle) + Sensor position + Work length <math>\leq</math> 214748.3647 [mm] or 21474.83647 [inch]</li> <li>If the mark detection data is behind the actual detection position, minimize the delay by setting the gain tuning of the servo and "[Pr.801] Mark detection signal compensation time". If the delay is long, compensation amount may not be calculated correctly.</li> </ul>
Compiling method	Macro type, subroutine type
FB operation type	Real-time execution

## Labels

### ■Input labels

Name	Label name	Data type	Read timing <sup>*1</sup>	Setting range	Description
Execution command	i_bEN	Bit	<input type="checkbox"/>	On, off	ON: The FB is activated. OFF: The FB is not activated.
Work length	i_eWorkLength	Single precision real number	↑	Refer to the description.	Set the work length. <ul style="list-style-type: none"> <li><math>0.1 \leq</math> Work length <math>\leq</math> 100000.0 [mm]</li> <li><math>0.01 \leq</math> Work length <math>\leq</math> 10000.00 [inch]</li> </ul> [The unit setting depends on the setting value of the main input axis.]
Sensor position	i_eSensorPosition	Single precision real number	↑	Refer to the description.	Set the distance between the sensor of the gap adjustment conveyor that detects the workpiece and conveyor end. <ul style="list-style-type: none"> <li><math>0.1 \leq</math> Sensor position <math>\leq</math> 100000.0 [mm]</li> <li><math>0.01 \leq</math> Sensor position <math>\leq</math> 10000.00 [inch]</li> </ul> [The unit setting depends on the setting value of the main input axis.]
Mark detection data	i_dMarkDetectData	Double word [Signed]	<input type="checkbox"/>	$-2147483648 \leq$ Mark detection data $\leq$ 2147483647 [The unit setting depends on the axis No. setting value of the output axis setting.] ( $10^{-4}$ mm, $10^{-5}$ inch)	Enter STD_ReadMarkDetectDataFB of o_dMarkDetectData (Mark detection data).



Name	Label name	Data type	Read timing <sup>*1</sup>	Setting range	Description
Mark detection counts	i_uMarkDetectCount	Word [Unsigned]	□	0 ≤ Mark detection counts ≤ 65535 [times] (Ring counter)	Enter o_uMarkDetectCount (Mark detection counts) of STD_ReadMarkDetectDataFB. A compensation amount is calculated at updating this data.

\*1 □: Always, ↑: When the FB is started (cannot be changed)

## Output labels

Name	Label name	Data type	Value to be held <sup>*1</sup>	Description
Execution status	o_bENO	Bit	—	ON: Execution command is on. OFF: Execution command is off.
Normal completion	o_bOK	Bit	—	Indicates that the FB has normally started.
Error completion	o_bError	Bit	—	ON: An error has occurred in the FB. OFF: No error has occurred.
Error code	o_uErrorID	Word [Unsigned]	—	The error code of the error that has occurred in the FB is stored.
Compensation amount	o_dCompensationAmount	Double word [Signed]	—	The calculated compensation amount is stored. If the absolute value of the compensation amount is smaller than the minimum compensation amount, "0" is output. If it exceeds the maximum compensation amount, "Maximum compensation amount" is output. Data range: $-2147483648 \leq \text{Compensation amount} \leq 2147483647$ [The unit setting depends on the axis No. setting value of the output axis setting.] ( $10^{-4}$ mm, $10^{-5}$ inch)
Compensation starting point	o_dCompensationStartPosition	Double word [Signed]	—	The calculated compensation starting point is stored. Data range: $-2147483648 \leq \text{Compensation starting point} \leq 2147483647$ [The unit setting depends on the axis No. setting value of the output axis setting.] ( $10^{-4}$ mm, $10^{-5}$ inch)

\*1 ○: The value is held after the FB stops. —: The value is cleared after the FB stops.

## I/O labels

Name	Label name	Data type	Read timing <sup>*1</sup>	Setting range	Description
Mark detection setting No.	io_uMarkDetectSettingNo	Word [Unsigned]	↑	1 ≤ Mark detection setting No. ≤ Maximum number of mark detection settings of the module used	Set the reference No. of mark detection data.
Output axis setting	io_stOutputAxis	AXIS_REF	—	—	Refer to the output axis setting below.
Compensation control setting	io_stCompensationSetting	PAC_COMPENSATION_REF	—	—	Refer to compensation control setting below.

### Output axis setting (AXIS\_REF structure)

Name	Label name	Data type	Read timing <sup>*1</sup>	Setting range	Description
Axis No.	AxisNo	Word [Signed]	↑	1 ≤ Axis No. ≤ Maximum number of axes of the module used	Set the axis No. of the output axis (gap adjustment conveyor) used for the mark compensation processing. The unit setting of the main input axis corresponding to the output axis is used in this FB.
Module number	StartIO	Word [Signed]	↑	1H ≤ Module number ≤ 10H	Simple Motion module number

Compensation control setting (PAC\_COMPENSATION\_REF structure)

Name	Label name	Data type	Read timing*1	Setting range	Description
Minimum compensation amount	eMinTolerance	Single precision real number	↑	0.0 ≤ Minimum compensation amount < Maximum compensation amount ≤ "[Pr.439] Cam axis length per cycle"	Set the lower limit value of the compensation range. If the compensation amount absolute value is smaller than this setting, "0" is stored in the compensation amount.
Maximum compensation amount	eMaxTolerance	Single precision real number	↑		Set the upper limit value of the compensation range. If the compensation amount is larger than this setting, "this setting value" is stored.

\*1 □: Always, ↑: When the FB is started (cannot be changed)

# PAC\_CalcPhase (Work loading position adjustment compensation amount calculation)

## Name

PAC\_CalcPhase


## Function details

Item	Description																																						
Function overview	This FB detects a workpiece on the conveyor by using the mark detection function of the Simple Motion module and outputs the compensation amount of the phase difference (deviation) with the loading conveyor.																																						
Symbol	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="2" style="text-align: center;">PAC_CalcPhase</th> </tr> </thead> <tbody> <tr> <td style="width: 30%;">Execution command</td> <td>B: i_bEN</td> <td style="width: 30%; text-align: right;">o_bENO :B</td> <td style="width: 40%;">Execution status</td> </tr> <tr> <td style="padding-left: 20px;">Work length</td> <td>E: i_eWorkLength</td> <td style="text-align: right;">o_bOK :B</td> <td>Normal completion</td> </tr> <tr> <td style="padding-left: 20px;">Sensor position</td> <td>E: i_eSensorPosition</td> <td style="text-align: right;">o_bError :B</td> <td>Error completion</td> </tr> <tr> <td style="padding-left: 20px;">Work loading position</td> <td>E: i_eWorkLoadPosition</td> <td style="text-align: right;">o_uErrorID :UW</td> <td>Error code</td> </tr> <tr> <td style="padding-left: 20px;">Mark detection data</td> <td>D: i_dMarkDetectData</td> <td style="text-align: right;">o_dCompensationAmount :D</td> <td>Compensation amount</td> </tr> <tr> <td style="padding-left: 20px;">Mark detection counts</td> <td>UW: i_uMarkDetectCount</td> <td style="text-align: right;">o_dCompensationStartPosition :D</td> <td>Compensation starting point</td> </tr> <tr> <td style="padding-left: 40px;">Mark detection setting No.</td> <td>UW: io_uMarkDetectSettingNo</td> <td style="text-align: right;">io_uMarkDetectSettingNo :UW</td> <td>Mark detection setting No.</td> </tr> <tr> <td style="padding-left: 20px;">Output axis setting</td> <td>DUT: io_stOutputAxis</td> <td style="text-align: right;">io_stOutputAxis :DUT</td> <td>Output axis setting</td> </tr> <tr> <td style="padding-left: 20px;">Compensation control setting</td> <td>DUT: io_stCompensationSetting</td> <td style="text-align: right;">io_stCompensationSetting :DUT</td> <td>Compensation control setting</td> </tr> </tbody> </table>	PAC_CalcPhase		Execution command	B: i_bEN	o_bENO :B	Execution status	Work length	E: i_eWorkLength	o_bOK :B	Normal completion	Sensor position	E: i_eSensorPosition	o_bError :B	Error completion	Work loading position	E: i_eWorkLoadPosition	o_uErrorID :UW	Error code	Mark detection data	D: i_dMarkDetectData	o_dCompensationAmount :D	Compensation amount	Mark detection counts	UW: i_uMarkDetectCount	o_dCompensationStartPosition :D	Compensation starting point	Mark detection setting No.	UW: io_uMarkDetectSettingNo	io_uMarkDetectSettingNo :UW	Mark detection setting No.	Output axis setting	DUT: io_stOutputAxis	io_stOutputAxis :DUT	Output axis setting	Compensation control setting	DUT: io_stCompensationSetting	io_stCompensationSetting :DUT	Compensation control setting
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	Applicable CPU	MELSEC iQ-F series																																					
	Engineering software	GX Works3																																					
Number of steps	2311 steps																																						
FB dependence	—																																						

Item	Description
Function description	<p>As the following shows, this FB outputs the compensation amount to load workpieces fed from the gap adjustment conveyor in a desired position between fingers (partition plates) by using the supply conveyor which is synchronized with the loading conveyor and the sensor attached above the supply conveyor.</p> <p>■Outline diagram</p> <ul style="list-style-type: none"> <li>Turning on <code>i_bEN</code> (Execution command) normally starts the FB and turns on <code>o_bOK</code> (Normal completion).</li> <li>During the work detection, the compensation amount is calculated from "[Md.407] Cam axis current value per cycle" of the loading conveyor and the <code>i_eWorkLoadPosition</code> (Work loading position) and outputted.</li> <li><code>o_dCompensationStartPosition</code> (Compensation starting point) outputs the previous value of <code>i_dMarkDetectData</code> (Mark detection data) added by <code>i_eWorkLength</code> (Work length) and <code>i_eSensorPosition</code> (Sensor position).</li> <li><code>i_dMarkDetectData</code> (Mark detection data) uses the cam axis current value per cycle (when [Pr.802] is set to 11 or 12).</li> <li><code>i_eWorkLoadPosition</code> (Work loading position) shows the loading position from the edge of the finger.</li> <li>This FB performs the following compensation using <code>MaxTolerance</code> (maximum compensation amount) and <code>MinTolerance</code> (minimum compensation amount) according to the calculated compensation amount.</li> </ul> <p>■When the absolute value of the calculated compensation amount is smaller than the value in <code>MinTolerance</code> (Minimum compensation amount)  "0" is stored in <code>o_dCompensationAmount</code> (Compensation amount)</p> <p>■When the calculated compensation amount (positive value) is larger than the value in <code>MaxTolerance</code> (Maximum compensation amount)  The length per cycle is subtracted from <code>o_dCompensationAmount</code> (Compensation amount) and the workpiece is loaded between the fingers of the next cycle. A maximum compensation amount exceeded error (ErrorID: 2123H) is stored.</p> <p>■For the calculated compensation amount (negative value)  The calculated compensation amount is output as the compensation amount as is.</p> <ul style="list-style-type: none"> <li>The compensation amount at the first work detection is output as a negative value to a deceleration direction. The maximum compensation amount and minimum compensation amount are ignored.</li> <li>If an error has occurred in the FB, Error turns on and the error code is stored in ErrorID.</li> <li>For details of error codes, refer to "Page 181 List of Error Codes".</li> </ul>
Restrictions and precautions	<ul style="list-style-type: none"> <li>Set 0 (mm) or 1 (inch) in the main input axis. If a value outside the range is set, an error (ErrorID: 214DH) occurs.</li> <li>To use this FB, configure a system in which "[Md.407] Cam axis current value per cycle" moves in the increment direction.</li> <li>The command generation axis cannot be used as a main input axis.</li> <li>Set the work gap and the sensor position and the work length to satisfy the following formula. Work gap (length per cycle) + Sensor position + Work length <math>\leq</math> 214748.3647 [mm] or 21474.83647 [inch]</li> <li>If the mark detection data is behind the actual detection position, minimize the delay by setting the gain tuning of the servo and "[Pr.801] Mark detection signal compensation time". If the delay is long, compensation amount may not be calculated correctly.</li> <li>Adjust the work intervals using <code>PAC_CalcGap</code> (Work gap adjustment compensation amount calculation) FB so that each workpiece is within the length per cycle on the supply conveyor.</li> <li>Set "[Pr.439] Cam axis length per cycle" of the supply conveyor and loading conveyor to the same value.</li> </ul>
Compiling method	Macro type, subroutine type
FB operation type	Real-time execution

## Labels

### Input labels

Name	Label name	Data type	Read timing*1	Setting range	Description
Execution command	i_bEN	Bit	<input type="checkbox"/>	On, off	ON: The FB is activated. OFF: The FB is not activated.
Work length	i_eWorkLength	Single precision real number	↑	Refer to the description.	Set the work length.  <ul style="list-style-type: none"> <li>• <math>0.1 \leq \text{Work length} \leq 100000.0</math> [mm]</li> <li>• <math>0.01 \leq \text{Work length} \leq 10000.00</math> [inch]</li> </ul> [The unit setting depends on the setting value of the main input axis.]
Sensor position	i_eSensorPosition	Single precision real number	↑	Refer to the description.	Set the distance between the sensor that detects the workpiece on the supply conveyor and the conveyor end. <ul style="list-style-type: none"> <li>• <math>0.1 \leq \text{Sensor position} \leq 100000.0</math> [mm]</li> <li>• <math>0.01 \leq \text{Sensor position} \leq 10000.00</math> [inch]</li> </ul> [The unit setting depends on the setting value of the main input axis.]
Work loading position	i_eWorkLoadPosition	Single precision real number	↑	$0.0 \leq \text{Work loading position} < \text{[Pr.439] Cam axis length per cycle}$	Set the distance between the finger edge and work edge on the loading conveyor.
Mark detection data	i_dMarkDetectData	Double word [Signed]	<input type="checkbox"/>	$-2147483648 \leq \text{Mark detection data} \leq 2147483647$ [The unit setting depends on the axis No. setting value of the output axis setting.] ( $10^{-4}$ mm, $10^{-5}$ inch)	Enter STD_ReadMarkDetectDataFB of o_dMarkDetectData (Mark detection data).
Mark detection counts	i_uMarkDetectCount	Word [Unsigned]	<input type="checkbox"/>	$0 \leq \text{Mark detection counts} \leq 65535$ [times] (Ring counter)	Enter o_uMarkDetectCount (Mark detection counts) of STD_ReadMarkDetectDataFB. A compensation amount is calculated at updating this data.

\*1 : Always, ↑: When the FB is started (cannot be changed)

### Output labels

Name	Label name	Data type	Value to be held*1	Description
Execution status	o_bENO	Bit	—	ON: Execution command is on. OFF: Execution command is off.
Normal completion	o_bOK	Bit	—	Indicates that the FB has normally started.
Error completion	o_bError	Bit	—	ON: An error has occurred in the FB. OFF: No error has occurred.
Error code	o_uErrorID	Word [Unsigned]	—	The error code of the error that has occurred in the FB is stored.
Compensation amount	o_dCompensationAmount	Double word [Signed]	—	The calculated compensation amount is stored. If the absolute value of the compensation amount is smaller than the minimum compensation amount, "0" is output. If it exceeds the maximum compensation amount, "Maximum compensation amount" is output. Data range: $-2147483648 \leq \text{Compensation amount} \leq 2147483647$ [The unit setting depends on the axis No. setting value of the output axis setting.] ( $10^{-4}$ mm, $10^{-5}$ inch)
Compensation starting point	o_dCompensationStartPosition	Double word [Signed]	—	The calculated compensation starting point is stored. Data range: $-2147483648 \leq \text{Compensation starting point} \leq 2147483647$ [The unit setting depends on the axis No. setting value of the output axis setting.] ( $10^{-4}$ mm, $10^{-5}$ inch)

\*1 ○: The value is held after the FB stops. —: The value is cleared after the FB stops.

## ■ I/O labels

Name	Label name	Data type	Read timing *1	Setting range	Description
Mark detection setting No.	io_uMarkDetectSettingNo	Word [Unsigned]	↑	$1 \leq$ Mark detection setting No. $\leq$ Maximum number of mark detection settings of the module used	Set the reference No. of mark detection data.
Output axis setting	io_stOutputAxis	AXIS_REF	—	—	Refer to the output axis setting below.
Compensation control setting	io_stCompensationSetting	PAC_COMPENSATION_REF	—	—	Refer to compensation control setting below.

### Output axis setting (AXIS\_REF structure)

Name	Label name	Data type	Read timing *1	Setting range	Description
Axis No.	AxisNo	Word [Signed]	↑	$1 \leq$ Axis No. $\leq$ Maximum number of axes of the module used	Set the axis No. of the output axis (supply conveyor) used for the mark compensation processing. The unit setting of the main input axis corresponding to the output axis is used in this FB.
Module number	StartIO	Word [Signed]	↑	$1H \leq$ Module number $\leq 10H$	Simple Motion module number

### Compensation control setting (PAC\_COMPENSATION\_REF structure)

Name	Label name	Data type	Read timing *1	Setting range	Description
Minimum compensation amount	eMinTolerance	Single precision real number	↑	$0.0 \leq$ Minimum compensation amount $<$ Maximum compensation amount $\leq$ "[Pr.439] Cam axis length per cycle"	Set the lower limit value of the compensation range. If the compensation amount absolute value is smaller than this setting, "0" is stored in the compensation amount.
Maximum compensation amount	eMaxTolerance	Single precision real number	↑		Set the upper limit value of the compensation range. If the compensation amount is larger than this setting, "Calculated compensation amount - Length per cycle" is stored.

\*1 □: Always, ↑: When the FB is started (cannot be changed)

## 4.3 List of Structures

### AXIS\_REF (Axis setting)

#### Name

AXIS\_REF

#### Labels

Name	Label name	Data type	Description
Axis number	AxisNo	Word [Signed]	Axis number
Unit number	StartIO	Word [Signed]	Simple Motion unit number

### PAC\_COMPENSATION\_REF (Compensation control setting)

#### Name

PAC\_COMPENSATION\_REF

#### Labels

Name	Label name	Data type	Description
Positioning data No.	uPointTableNo	Word [Unsigned]	Set the positioning data No. for performing the compensation operation.
Compensation axis speed	eCompensationSpeed	Single precision real number	Set the positioning speed for compensation. Set the speed added/subtracted to/from the line speed in this setting. If the set speed is 8 digits or more (the number of significant figures of the single precision real number is 7 digits), round off the eighth digits of the value. <ul style="list-style-type: none"> <li>mm: <math>0.01 \leq \text{Compensation axis speed} \leq 20000000.00</math> [mm/min]</li> <li>inch: <math>0.001 \leq \text{Compensation axis speed} \leq 2000000.000</math> [inch/min]</li> <li>degree: <math>0.001 \leq \text{Compensation axis speed} \leq 2000000.000</math> [degree/min]</li> <li>pulse: <math>1 \leq \text{Compensation axis speed} \leq 1000000000</math> [pulse/s]</li> </ul> [The unit setting depends on the axis No. setting value in the auxiliary axis setting.]
Compensation acceleration	uCompensationAcc	Word [Unsigned]	Set the positioning acceleration for compensation. 0: [Pr.9] Acceleration time 0 1: [Pr.25] Acceleration time 1 2: [Pr.26] Acceleration time 2 3: [Pr.27] Acceleration time 3
Compensation deceleration	uCompensationDecel	Word [Unsigned]	Set the positioning deceleration for compensation. 0: [Pr.10] Deceleration time 0 1: [Pr.28] Deceleration time 1 2: [Pr.29] Deceleration time 2 3: [Pr.30] Deceleration time 3
Minimum compensation amount	eMinTolerance	Single precision real number	Set the minimum compensation amount with an absolute value.
Maximum compensation amount	eMaxTolerance	Single precision real number	Set the maximum compensation amount with an absolute value.

# 5 APPLICATION PROGRAM EXAMPLE

This chapter describes the program examples for the horizontal pillow packaging machine with the packaging library in this application package.

Program example	Network	Project name	Reference
Rotary cutter	SSCNETⅢ/H	AP20-PAC004AA-FX5U-40SSC_RotaryCutter_****.gx3 <sup>*1</sup>	Page 91 Rotary Cutter
Long dwell		AP20-PAC004AA-FX5U-40SSC_LongDwell_****.gx3 <sup>*1</sup>	Page 105 Long Dwell
Alignment conveyor		AP20-PAC004AA-FX5U-80SSC_AlignmentConveyor_****.gx3 <sup>*1</sup>	Page 119 Alignment Conveyor

\*1 "\*\*\*\*" indicates their versions.

## Precautions

- To utilize this program for an actual system, sufficiently confirm that the program will not cause system control problems on user's own responsibility. Examine the positions where interlock conditions are required in a target system and add them.
- When the Simple Motion module detects an error or warning in this sample program, the operation suspends control.

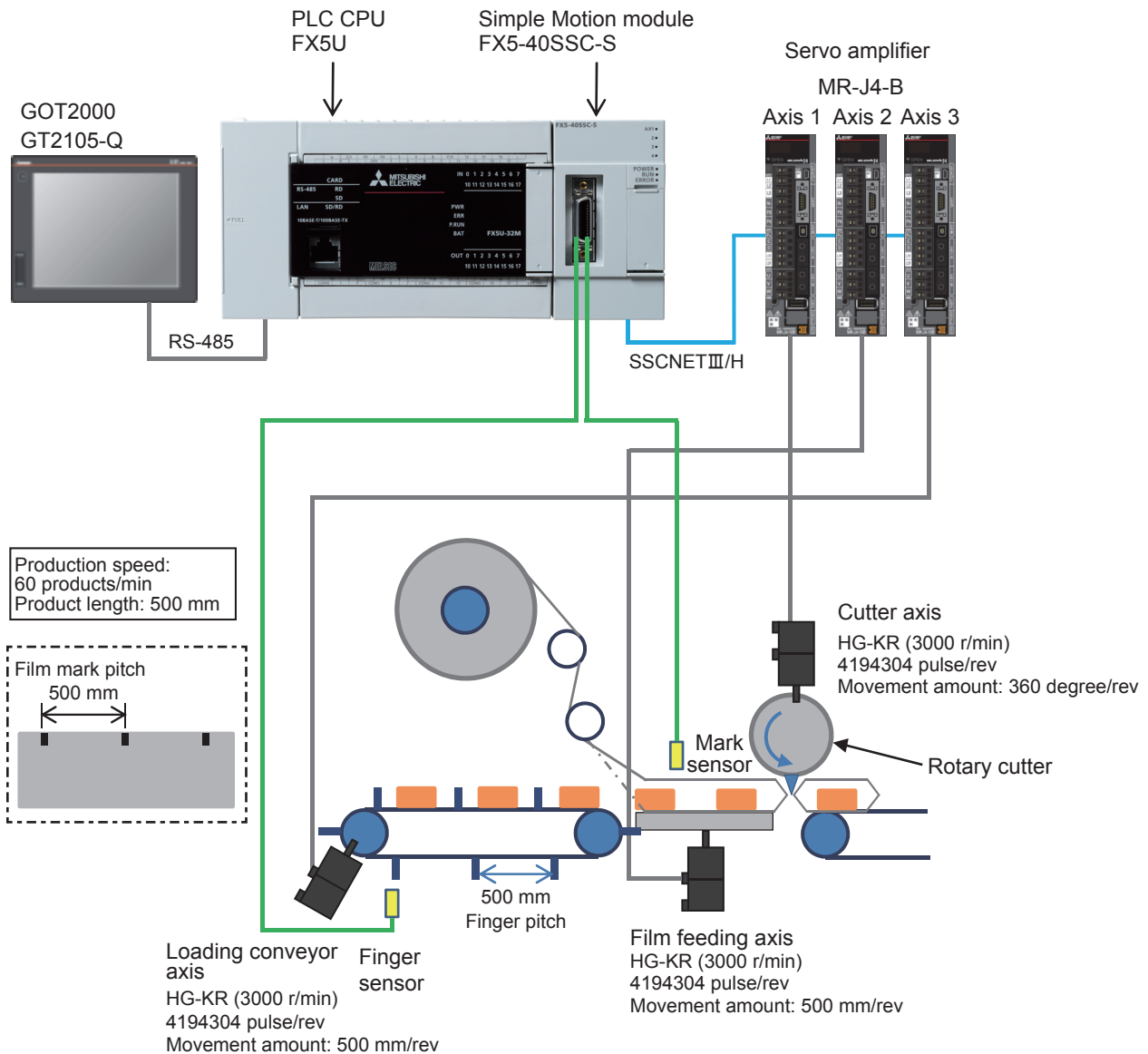


# 5.1 Rotary Cutter

This section describes the system configuration and program specifications of program examples for a horizontal pillow packaging machine using the rotary cutter mechanism.

## System configuration

### AP20-PAC004AA-FX5U-40SSC\_RotaryCutter\_\*\*\*\*.gx3 (SSCNETⅢ/H)



# Control specifications

Item	Cutter axis (Rotary cutter)	Film axis	Conveyor axis	Main axis
Axis No.	1	2	3	4
Unit setting	2: degree	0: mm	0: mm	2: degree
Home position return	Data setting method	Data setting method	Data setting method	—
Auxiliary axis No.	—	2 (Command generation axis)	3 (Command generation axis)	—
Cam No.	1	0 (Straight cam)	0 (Straight cam)	—
Clutch	Address	Address	Address	—

## Program configuration

### Language

The following languages are used in this program.

- Program comment: English
- Label comment: Japanese, English, Chinese (Simplified)

### List of programs

Program name	Description	Execution type	Describing method
Initial	Initial parameter setting	Initial	ST
PreOperation	<ul style="list-style-type: none"> <li>• License activation</li> <li>• Preparing operation (Servo ON/OFF)</li> <li>• Home position return</li> </ul>	Scan	FBD
Operation	<ul style="list-style-type: none"> <li>• Error reset</li> <li>• JOG operation</li> <li>• Cam generation</li> <li>• Cam data reading</li> <li>• Synchronous control start</li> <li>• Operation start/stop</li> </ul>	Scan	FBD
PackagingControl	<ul style="list-style-type: none"> <li>• Mark compensation</li> <li>• Initial phase adjustment</li> <li>• No Product No Bag/No Gap No Seal</li> </ul>	Fixed cycle (I31) 10ms <sup>*1</sup>	FBD
HMI_IF	Touch panel I/O processing	Scan	ST


\*1 Set the fixed cycle interval so that one or more interrupts are executed per mark detection.  
In this program, the fixed cycle interval is set on the assumption of the minimum product length (50 mm).

### FB

The following table lists the FBs used in this program.

#### ■PAC\_PackagingControl\_F

Item	FB name	Description	Execution type <sup>*1</sup>	Program
Activation	PAC_Activation	License activation	Macro type	PreOperation
Cam auto-generation	STD_MakeRotaryCutterCam	Cam auto-generation for rotary cutter	Macro type	Operation
Mark compensation	STD_ReadMarkDetectData	Mark detection data reading	Macro type	PackagingControl
	PAC_CalcMarkCompensation	Automatic compensation calculation using mark detection	Macro type	PackagingControl
	STD_CtrlAuxiliaryAxis	Auxiliary axis correction	Macro type	PackagingControl

\*1 The FB that repeats calling in the program is set to the subroutine type.  
For details of the macro type and subroutine type, refer to the following.  
 MELSEC iQ-F FX5 Programming Manual (Program Design)

## ■ Example Prg Control (Application program control)

FB name	Description	Execution type*1	Program
MotionReady	Simplemotion ready	Macro type	PreOperation
HomePositionReturn	Home position return	Subroutine type	PreOperation
CtrlOutputAxisSync	Output axis synchronization control	Subroutine type	PackagingControl
ReadStrokeCamData	Cam data reading for stroke ratio data format	Macro type	Operation

\*1 The FB that repeats calling in the program is set to the subroutine type.  
 For details of the macro type and subroutine type, refer to the following.  
 ■ MELSEC iQ-F FX5 Programming Manual (Program Design)

## Devices to be used

This program example uses a device as an interface between the PLC CPU and the GOT.

The following table lists the range of use for the device.

For details of device assignment, refer to "Page 176 List of global labels".

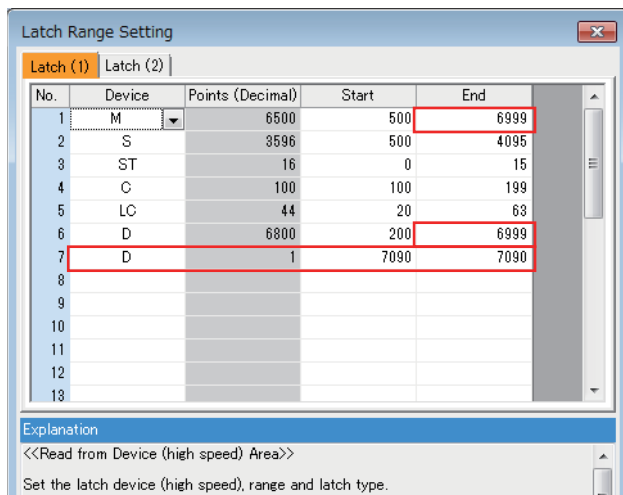
Item	Symbol	Point	Range
Internal relay	M	680	7000 to 7679
Data register	D	1000	7000 to 7999

## Parameter

For the settings of the parameter, refer to the project.

### CPU parameter

The latch range setting of the memory/device setting has been changed as follows from the initial values.



### Simple Motion parameter

In this application program example, the following parameters are disabled.

Set the parameters for safety measures depending on the intended use.

Parameter	Settings
"[Pr.22] Input signal logic selection": Lower limit	Positive logic
"[Pr.22] Input signal logic selection": Upper limit	Positive logic
"[Pr.82] Forced stop valid/invalid selection"	Disabled
"[Pr.116] FLS signal selection": Input type	Buffer memory
"[Pr.117] RLS signal selection": Input type	Buffer memory
"[Pr.118] DOG signal selection": Input type	Buffer memory

## Servo parameter

In this application program example, the servo amplifier input signal is not used.

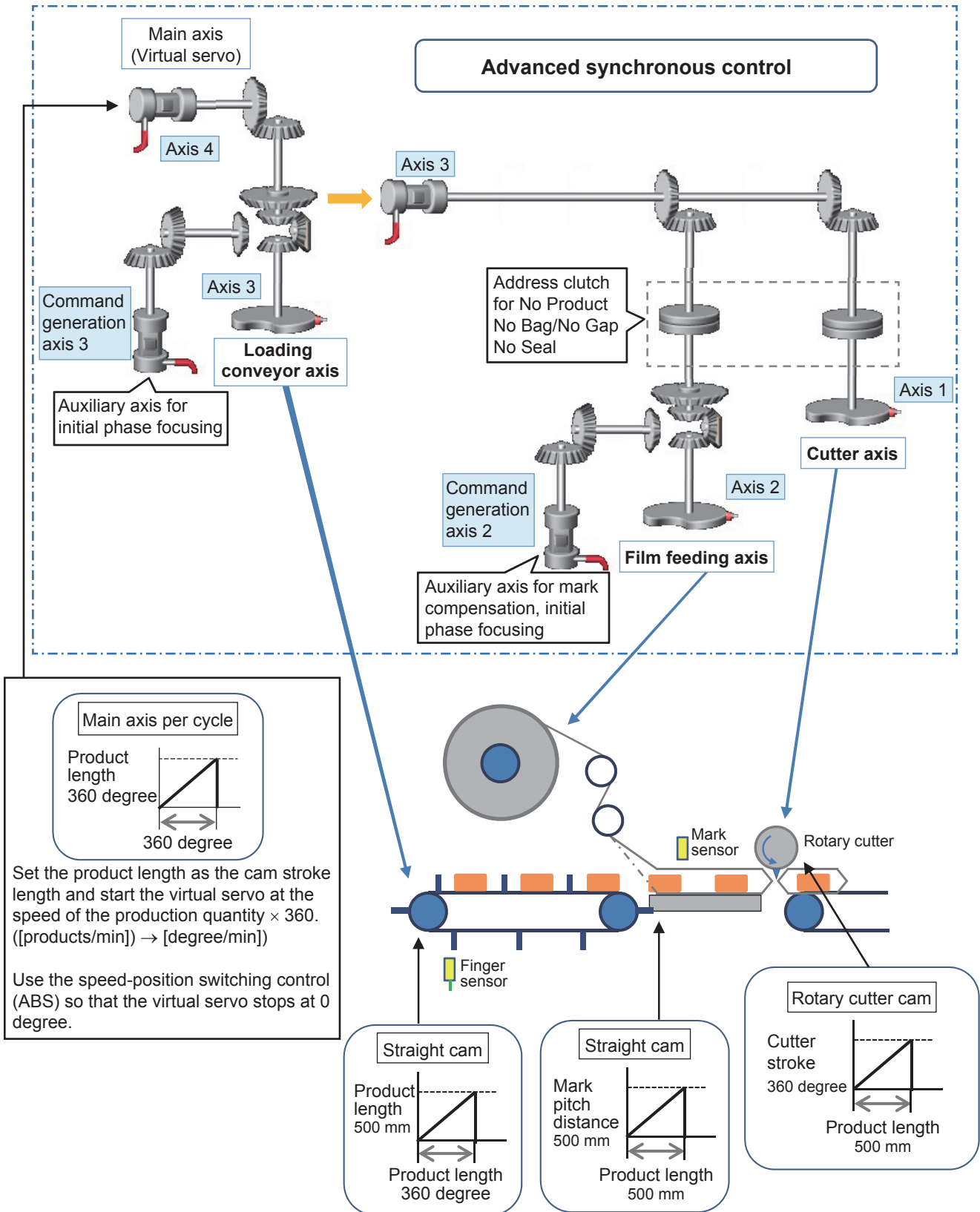
Set the parameters for safety measures depending on the intended use.

Parameter	Settings
PA04: Function selection A-1	Servo forced stop invalid selection 1: Invalid
PC17: Function selection C-4 [MR-J4-B]	Origin set condition selection 1: Servo motor Z phase passage not required after power on

## Synchronous control image

The synchronization control image set in the rotary cutter program example is shown below.

### ■ Synchronous control (whole image)



# Program processing

## Initial (Initial parameter setting)

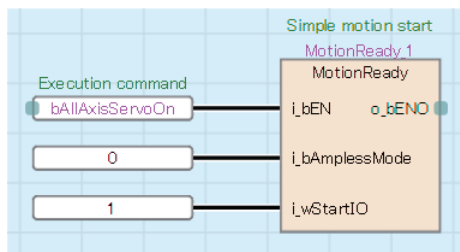
Set each variable's initial value and constants.

- Production information parameter
- Rotary cutter cam generation parameter
- Film axis parameter
- Mark compensation parameter
- Conveyor axis parameter
- Cam monitor screen parameter
- Unit conversion coefficient parameter

## PreOperation

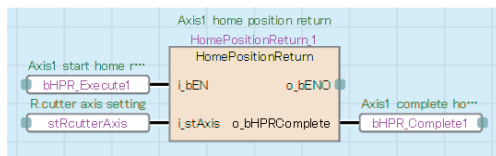
### ■All axes servo ON processing

Perform all axes servo ON with the switch of the servo axis setting on the GOT screen.



### ■Home position return

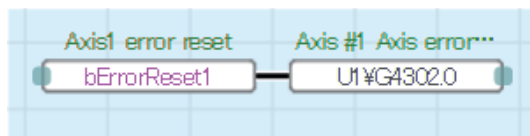
Perform home position return with the switch of the servo axis setting on the GOT screen.



## Operation

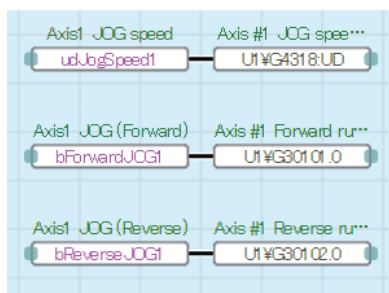
### ■Error reset processing

Perform error reset with the switch of the servo axis setting on the GOT screen.



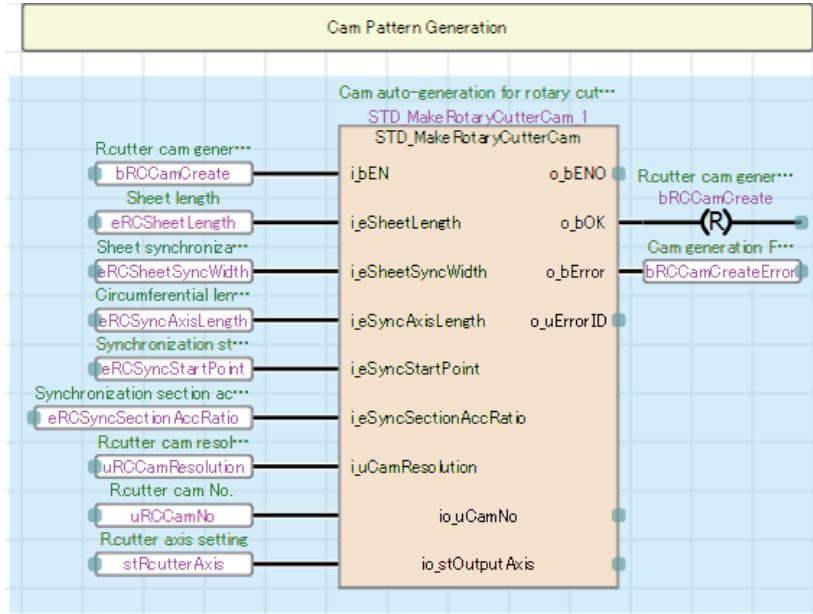
### ■JOG operation processing

Specify the JOG speed and start JOG operation (forward/reverse) using the switches in the servo axis setting screen displayed on the GOT.



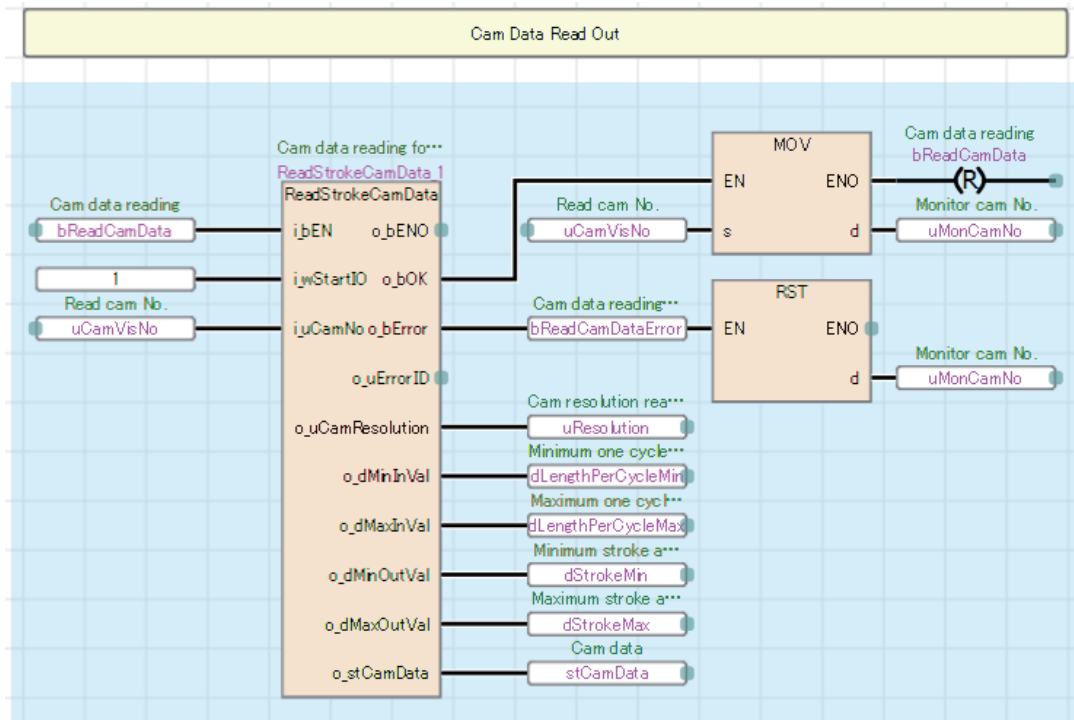
## ■Cam data generation

Cam data is generated according to the values set in the rotary cutter screen displayed on the GOT.



## ■Cam data reading

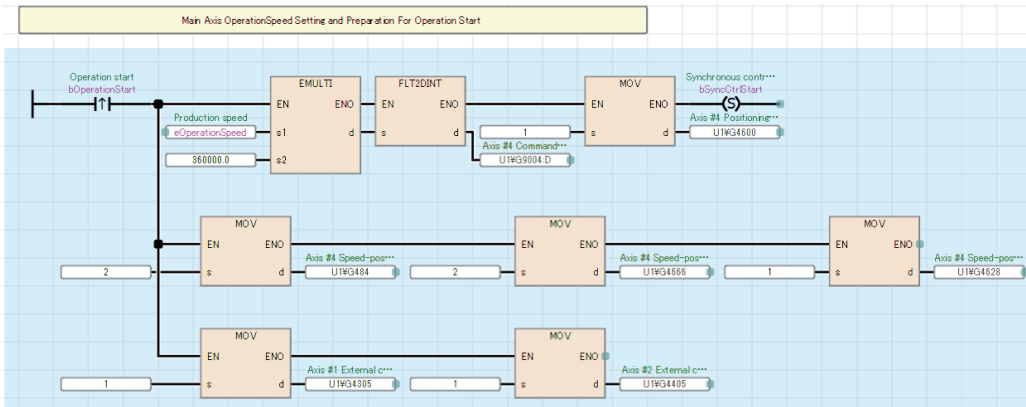
The cam data reading of the rotary cutter is performed for the cam monitor on the GOT screen.



## ■Production start preparation

Set the command velocity of the virtual servo for main axis positioning and start positioning No. using the [Start] switch in the production screen displayed on the GOT.

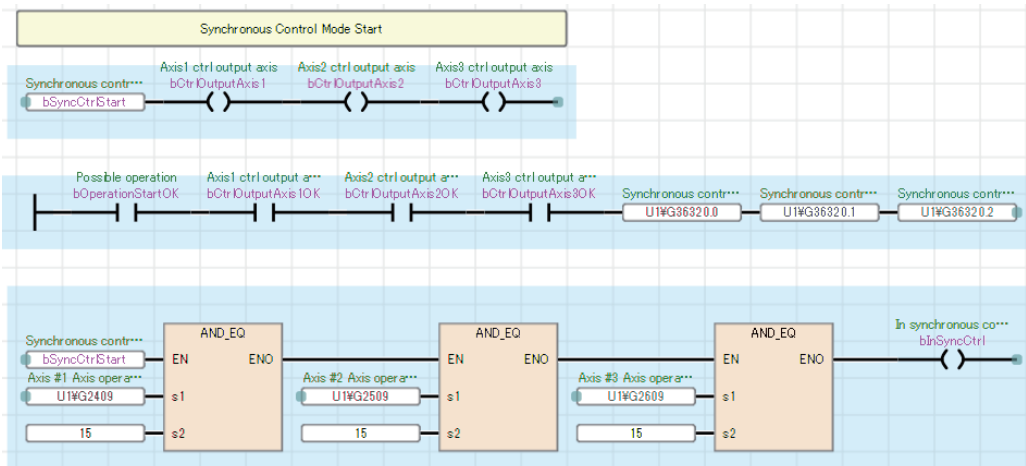
Set the speed-position switching control.



## ■Synchronous control start

Execute CtrlOutputAxisSync (Output axis synchronized control) with the [Synchronization start] switch in the servo axis setting screen displayed on the GOT.

Start synchronous control of all axes once the output axis is prepared, and monitor the process during synchronous control.

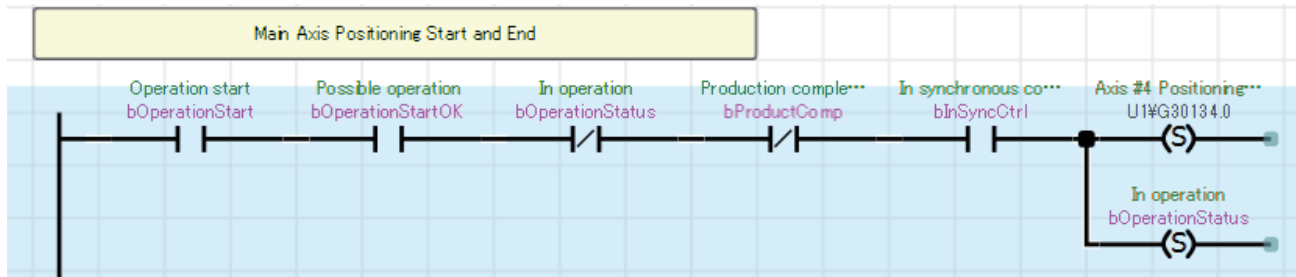




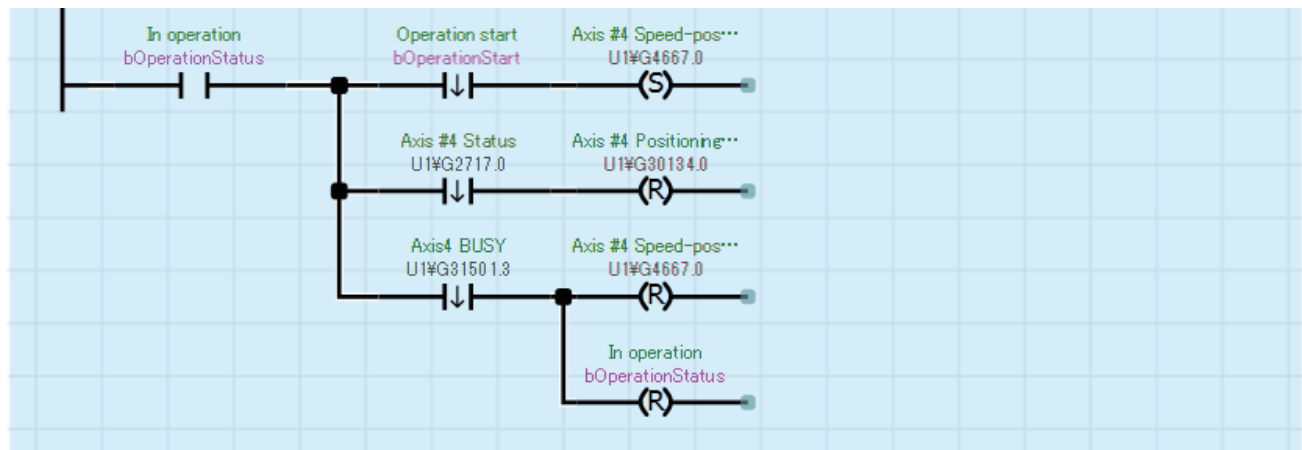
## Start of main axis

Check that each axis has been switched to synchronous control, and start speed-position switching control of the virtual servo for main axis positioning.

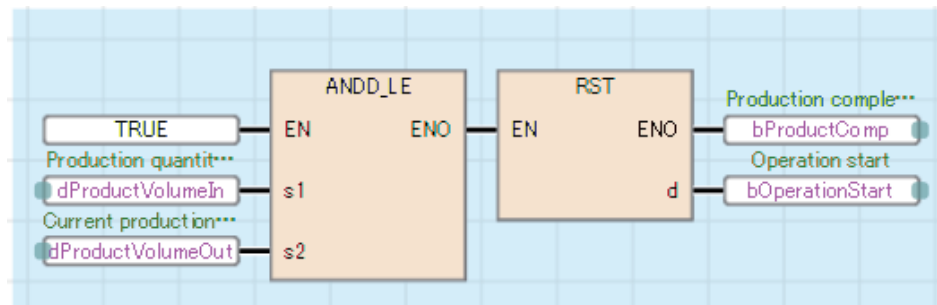
In operation lamp will be activated.



Stop operation with the [End] switch in the production screen displayed on the GOT.

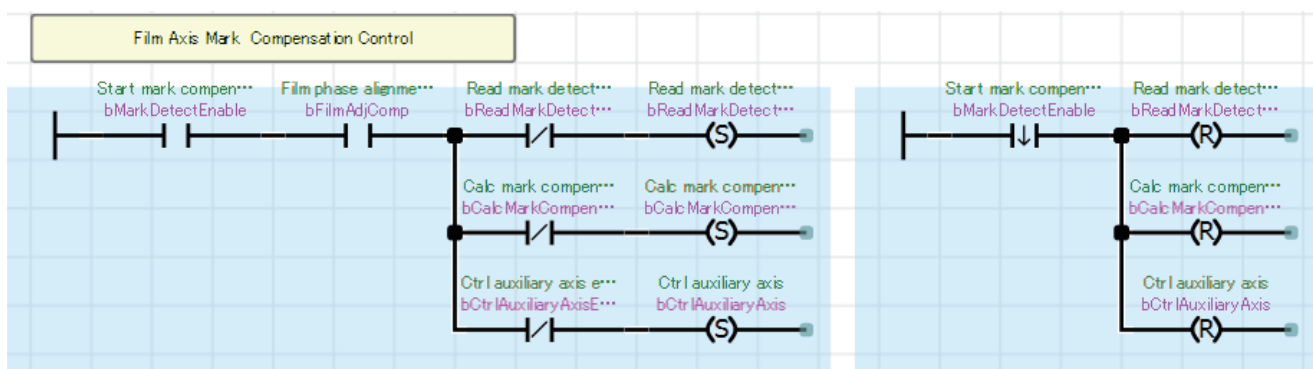


Operation stops when production ends.



## Start mark compensation

Check that film phase focusing is completed, and start mark compensation using the [Compensation start] switch in the mark compensation screen displayed on the GOT.



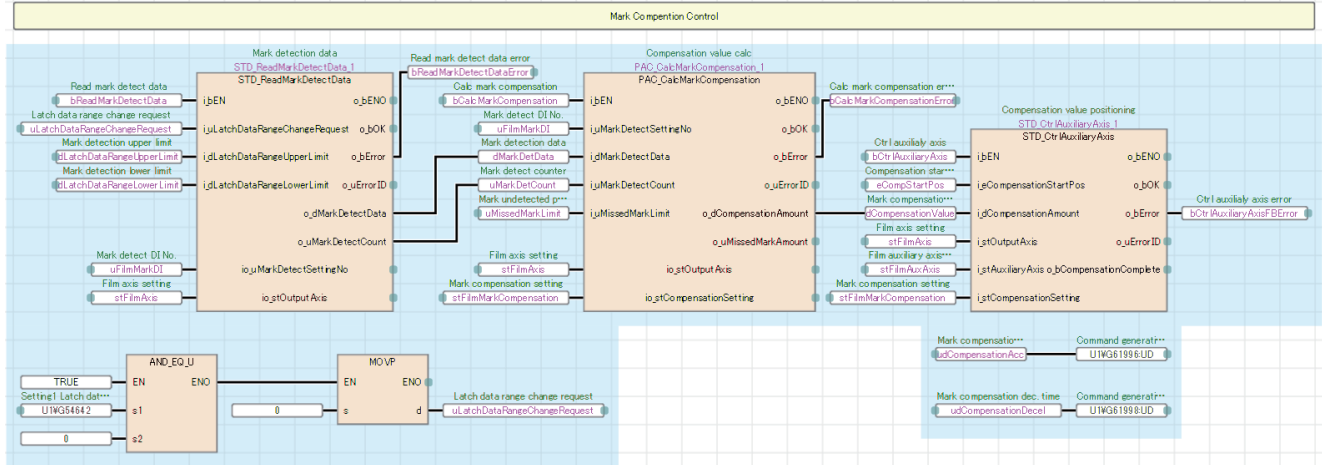
# PackagingControl

## ■Mark compensation

The amount of deviation is calculated from mark detection data of the film axis. The movement amount of the auxiliary axis is compensated by the calculated deviation amount.

The mark detection range can be changed using the [Change request] switch in the mark compensation screen displayed on the GOT.

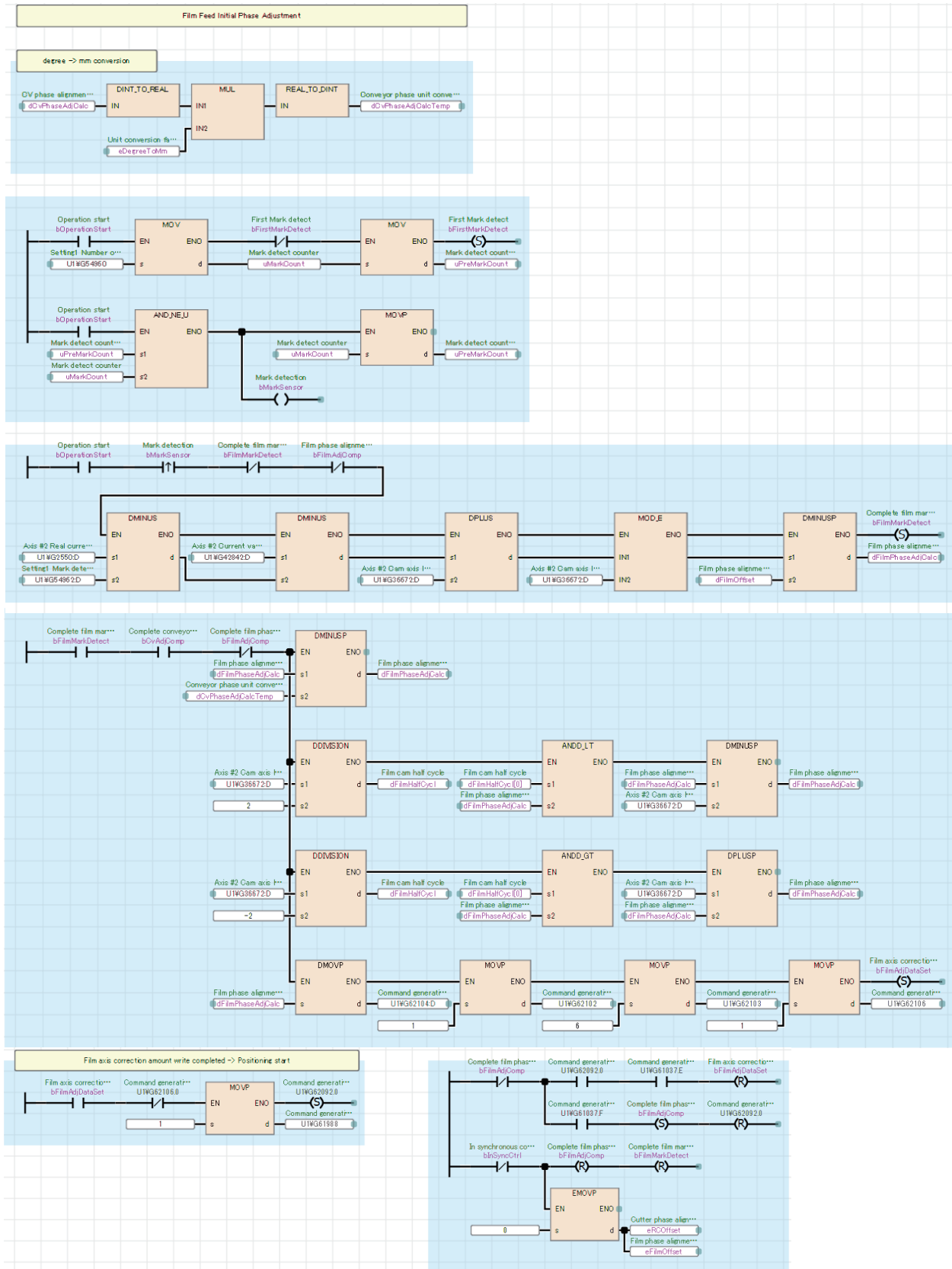
The acceleration and deceleration time of the auxiliary axis setting are stored in buffer memory.



### Phase focusing processing at startup of the operation

Adjust the phases of the film axis, conveyor axis, and main axis according to the current values at detection of each sensor when the operation is started (Refer to Timing for phase focusing).

The cutter axis operates in the same phase as the main axis.



### Timing for phase focusing

Adjust the phase of the discharge conveyor and film feeding to match the finger position or film mark position on the conveyor to the offset point (synchronization starting point) of main axis per cycle when the main axis is started. After completion of phase focusing for conveyor axis, phase focusing for film axis is performed. After completion of phase focusing, the clutch control of the cutter axis is turned on and production starts from the next cycle.

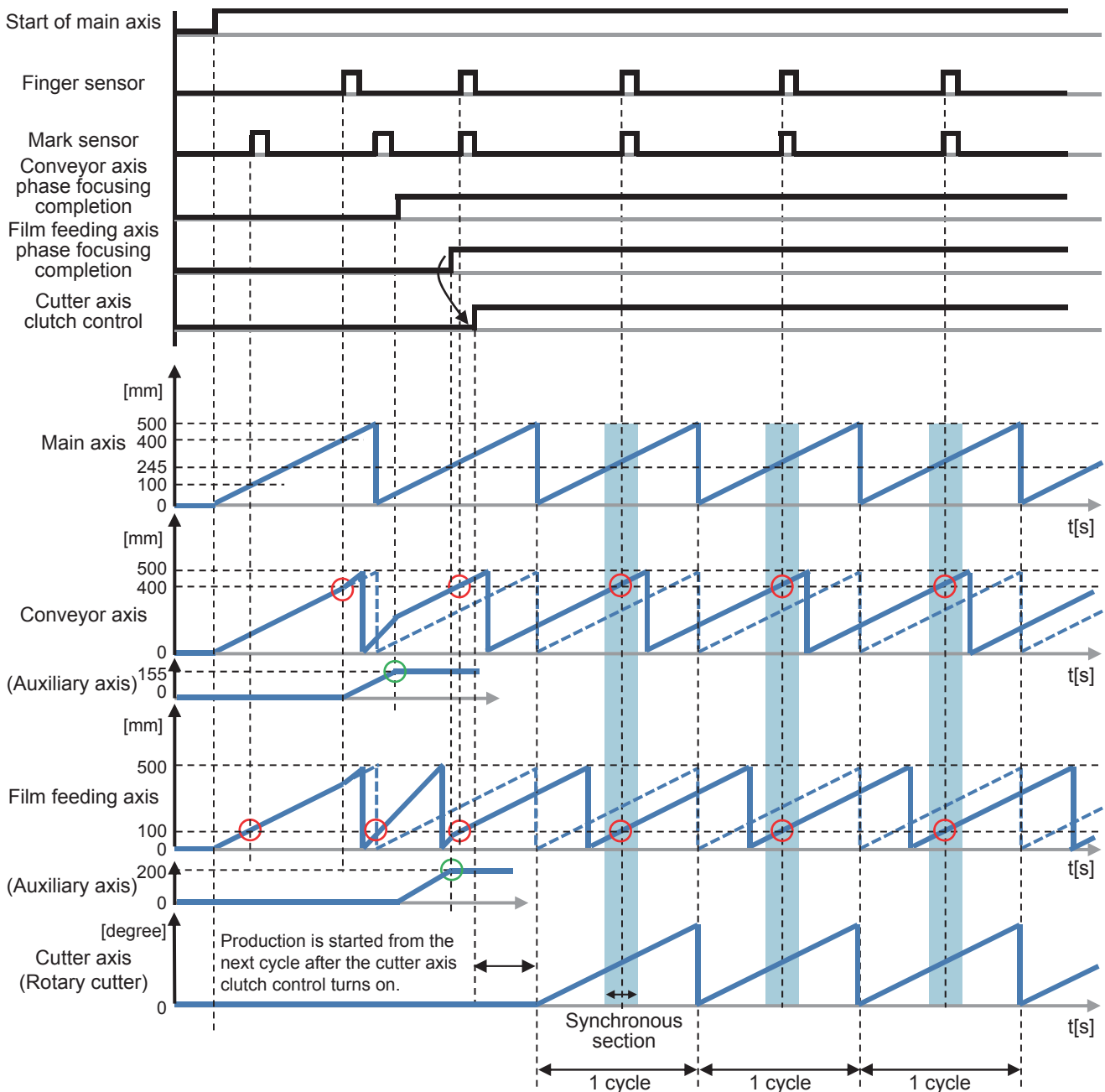
- 1 cycle length (product length): 500 mm
- Offset point per cycle (synchronization starting point): 245 mm
- Finger point: One cycle detection point at startup (conveyor) 400 mm  
→ Compensation amount  $400 \text{ mm} - 245 \text{ mm} = 155 \text{ mm}$
- Mark detection point: One cycle detection point at startup (film feeding) 100 mm  
→ Compensation amount  $100 \text{ mm} - 245 \text{ mm} = -145 \text{ mm}$

Since the main axis of the film feeding axis is the discharge conveyor axis and the compensation amount of the conveyor axis is included in the operation, get the difference from the finger compensation amount. After the conveyor axis has been compensated, the compensation of the film axis is started.

→  $-145 \text{ mm} - 155 \text{ mm} = -300 \text{ mm}$

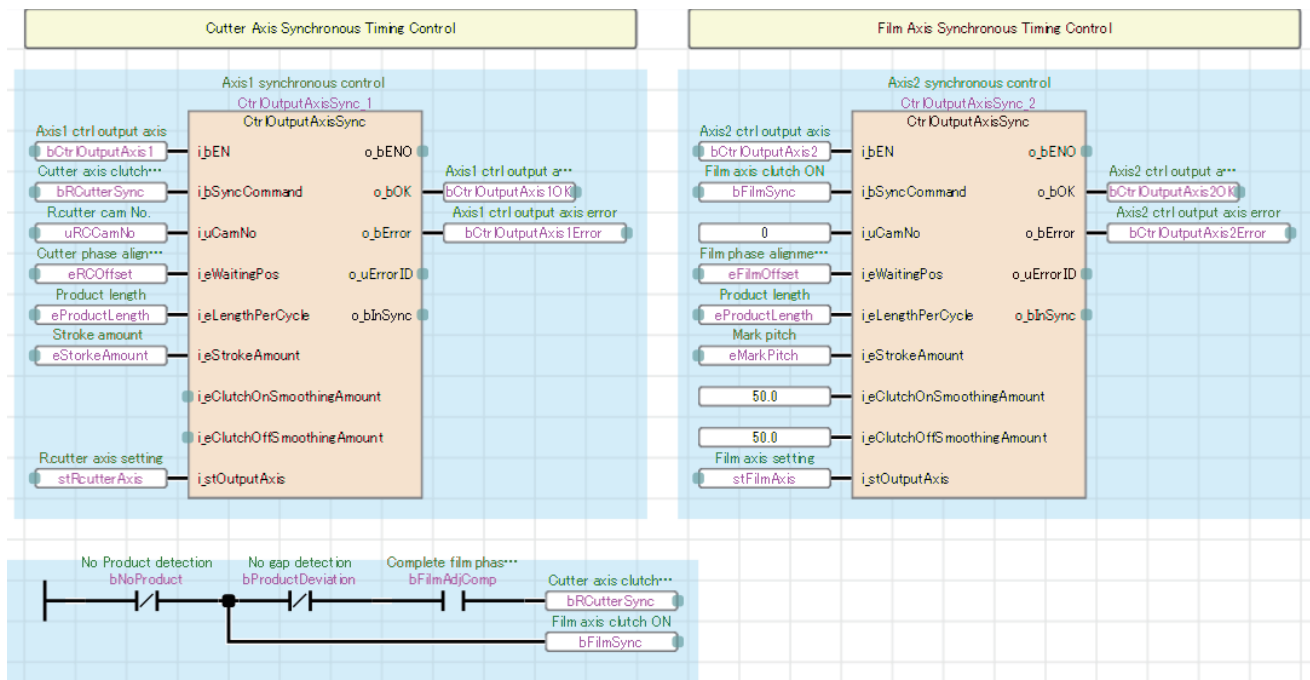
Since the compensation amount exceeds the half of 1 cycle length, the difference from 1 cycle is the compensation amount of the film feeding axis.

→  $-300 \text{ mm} + 500 \text{ mm (1 cycle)} = 200 \text{ mm}$

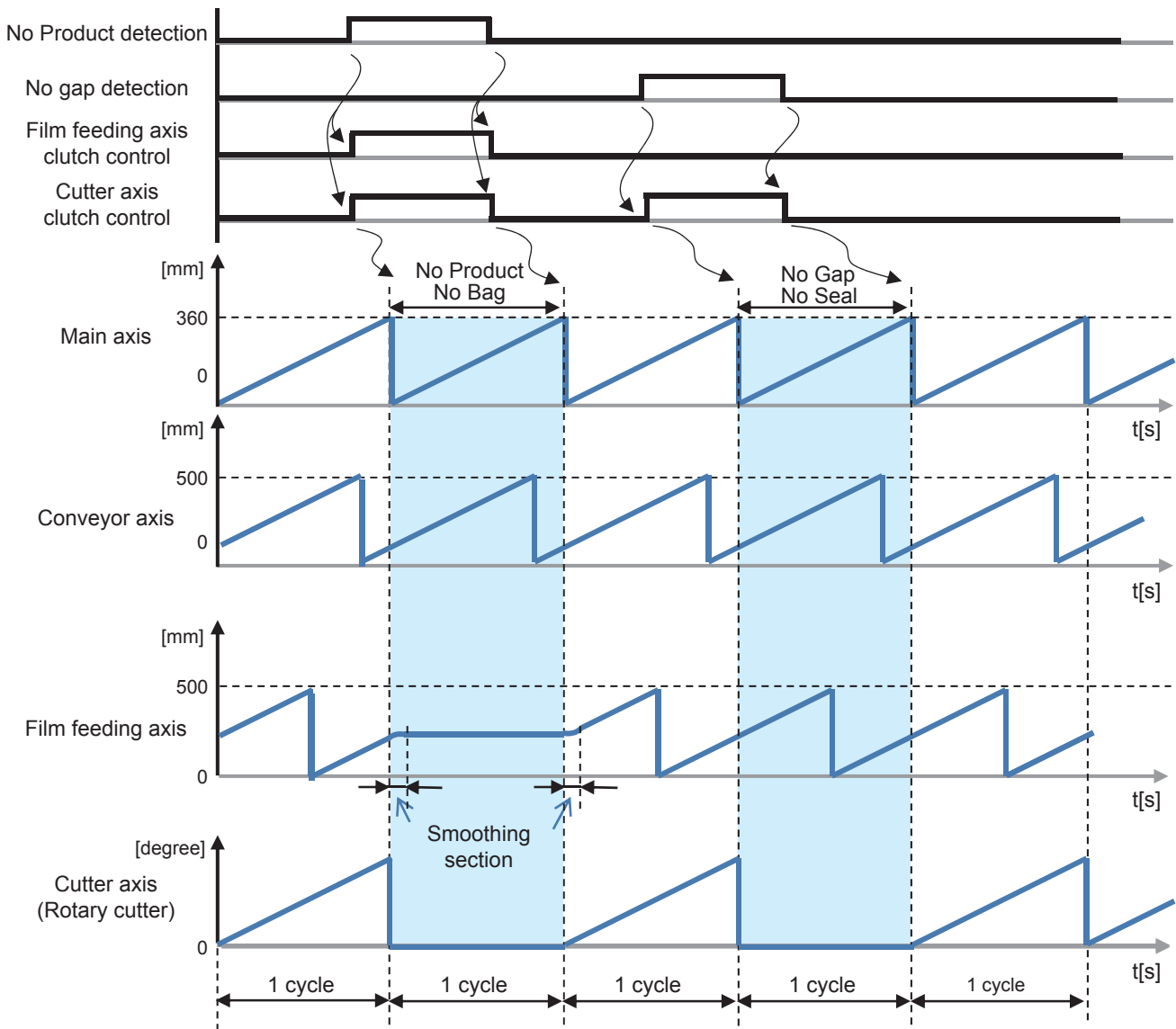


## ■No Product No Bag/No Gap No Seal processing

When workpieces are not conveyed during operation or sealing is impossible due to the deviation of workpieces, turn off the clutches of the cutter axis and film feeding axis to suspend the processing without stopping the main axis.



### Timing for No Product No Bag/No Gap No Seal



### HMI\_IF (Touch panel I/O processing)

The processing for displaying the GOT screen is performed.

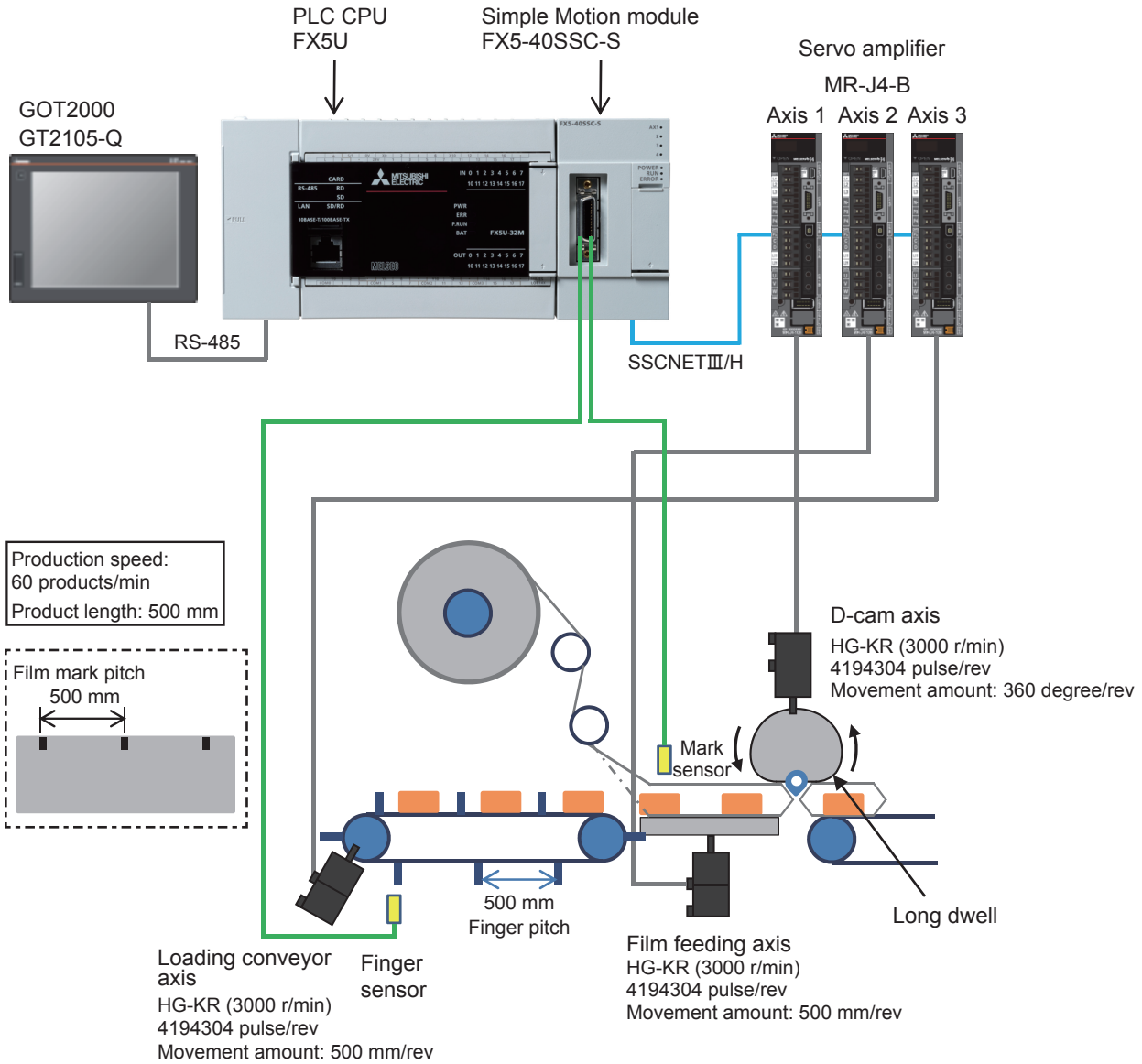
- Axis status monitor and lamp display
- Error reset processing
- FB error monitor
- Production information setting and monitor

# 5.2 Long Dwell

This section describes the system configuration and program specifications of a program example for a horizontal pillow packaging machine using the long dwell mechanism.

## System configuration

AP20-PAC004AA-FX5U-40SSC\_LongDwell\_\*\*\*\*.gx3 (SSCNETⅢ/H)



# Control specifications

Item	D-cam axis (Long dwell)	Film axis	Conveyor axis	Main axis
Axis No.	1	2	3	4 (Virtual servo)
Unit setting	2: degree	0: mm	0: mm	2: degree
Home position return	Data setting method	Data setting method	Data setting method	—
Auxiliary axis No.	—	2 (Command generation axis)	3 (Command generation axis)	—
Cam No.	1	0 (Straight cam)	0 (Straight cam)	—
Clutch	Address	Address	Address	—

## Program configuration

### Language

The following languages are used in this program.

- Program comment: English
- Label comment: Japanese, English, Chinese (Simplified)

### List of programs

Program name	Description	Execution type	Describing method
Initial	Initial parameter setting	Initial	ST
PreOperation	<ul style="list-style-type: none"> <li>• License activation</li> <li>• Preparing operation (Servo ON/OFF)</li> <li>• Home position return</li> </ul>	Scan	FBD
Operation	<ul style="list-style-type: none"> <li>• Error reset</li> <li>• JOG operation</li> <li>• Cam generation</li> <li>• Cam data reading</li> <li>• Synchronous control start</li> <li>• Operation start/stop</li> </ul>	Scan	FBD
PackagingControl	<ul style="list-style-type: none"> <li>• Mark compensation</li> <li>• Initial phase adjustment</li> <li>• No Product No Bag/No Gap No Seal</li> </ul>	Fixed cycle (I31) 10ms <sup>*1</sup>	FBD
HMI_IF	Touch panel I/O processing	Scan	ST


\*1 Set the fixed cycle interval so that one or more interrupts are executed per mark detection.  
In this program, the fixed cycle interval is set on the assumption of the minimum product length (50 mm).

### FB

The following tables list the FBs used in this program.

#### ■PAC\_PackagingControl\_F

Item	FB name	Description	Execution type <sup>*1</sup>	Program
Activation	PAC_Activation	License activation	Macro type	PreOperation
Cam auto-generation	PAC_MakeLongDwellDCam	Cam auto-generation for D-cam	Macro type	Operation
Mark compensation	STD_ReadMarkDetectData	Mark detection data reading	Macro type	PackagingControl
	PAC_CalcMarkCompensation	Automatic compensation calculation using mark detection	Macro type	PackagingControl
	STD_CtrlAuxiliaryAxis	Auxiliary axis correction	Macro type	PackagingControl

\*1 The FB that repeats calling in the program is set to the subroutine type.  
For details of the macro type and subroutine type, refer to the following.  
 MELSEC iQ-F FX5 Programming Manual (Program Design)



## ■ Example Prg Control (Application program control)

FB name	Description	Execution type*1	Program
MotionReady	Motion module ready	Macro type	PreOperation
HomePositionReturn	Home position return	Subroutine type	PreOperation
CtrlOutputAxisSync	Output axis synchronization control	Subroutine type	PackagingControl
ReadCoordinateCamData	Cam data reading for coordinate data format	Macro type	Operation

\*1 The FB that repeats calling in the program is set to the subroutine type.  
 For details of the macro type and subroutine type, refer to the following.  
 ■ MELSEC iQ-F FX5 Programming Manual (Program Design)

## Devices to be used

This program example uses a device as an interface between the PLC CPU and the GOT.  
 The device range is shown below.

For details of device assignment, refer to "Page 176 List of global labels".

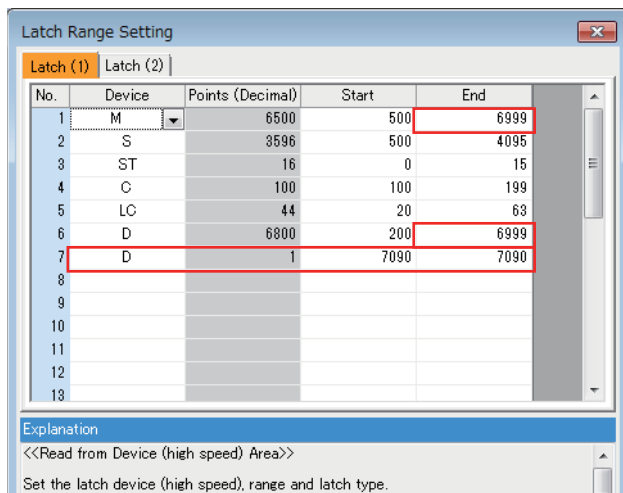
Item	Symbol	Point	Range
Internal relay	M	680	7000 to 7679
Data register	D	1000	7000 to 7999

## Parameter

Refer to the project for parameter setting details.

### CPU parameter

The latch range setting of the memory/device setting has been changed as follows from the initial values.



### Simple Motion parameter

In this application program example, the following parameters are disabled.  
 Set the parameters for safety measures depending on the intended use.

Parameter	Settings
"[Pr.22] Input signal logic selection": Lower limit	Positive logic
"[Pr.22] Input signal logic selection": Upper limit	Positive logic
"[Pr.82] Forced stop valid/invalid selection"	Disabled
"[Pr.116] FLS signal selection": Input type	Buffer memory
"[Pr.117] RLS signal selection": Input type	Buffer memory
"[Pr.118] DOG signal selection": Input type	Buffer memory

## Servo parameter

In this application program example, the servo amplifier input signal is not used.

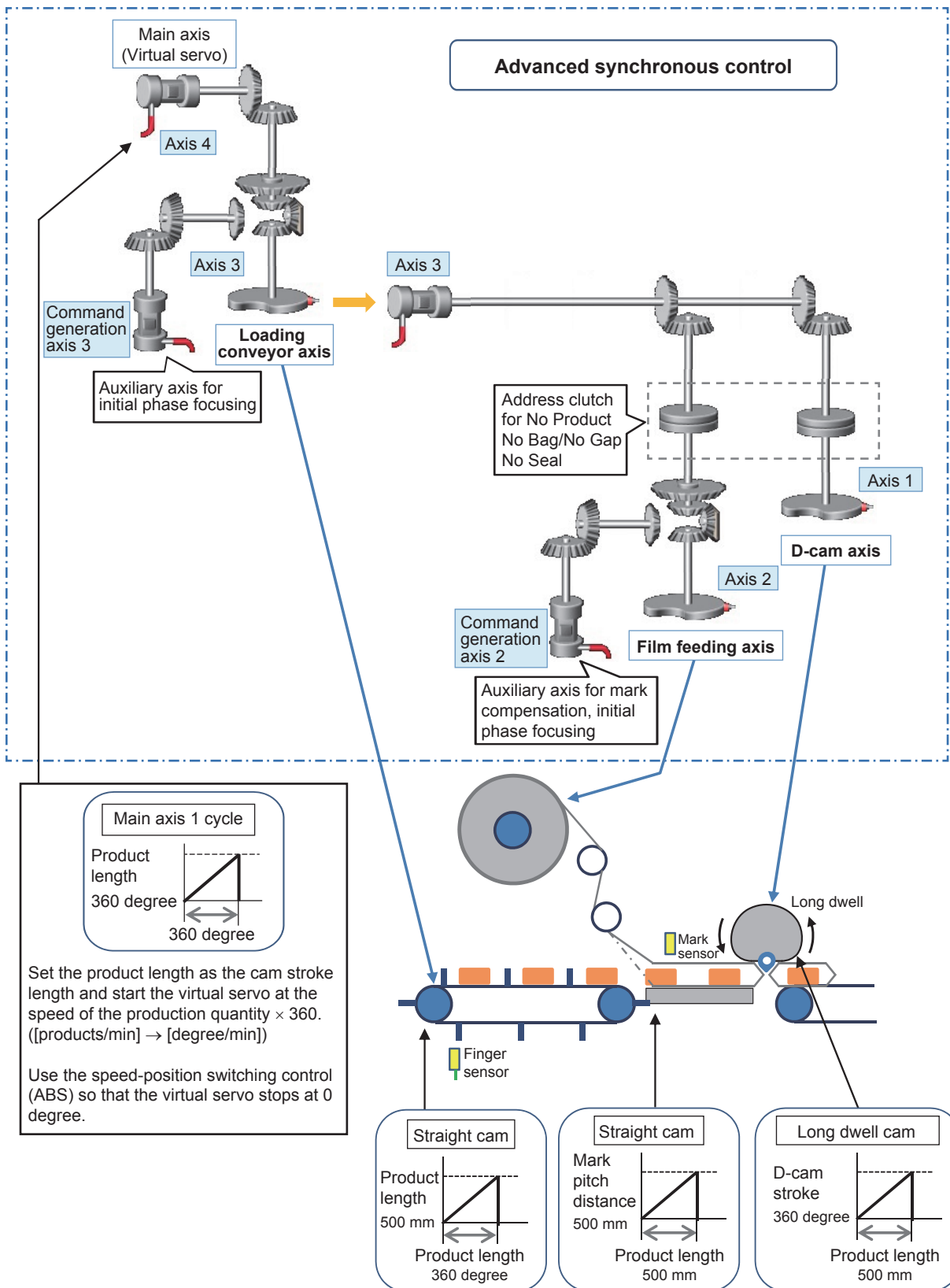
Set the parameters for safety measures depending on the intended use.

Parameter	Settings
PA04: Function selection A-1	Servo forced stop invalid selection 1: Invalid
PC17: Function selection C-4 [MR-J4-B]	Origin set condition selection 1: Servo motor Z phase passage not required after power on

## Synchronous control image

The synchronization control image set in the long dwell program example is shown below.

### ■ Synchronous control (whole image)



# Program processing

## Initial (Initial parameter setting)

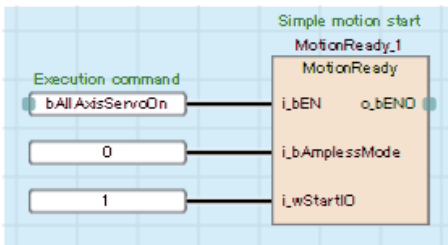
Set the initial values and constants for each variable.

- Production information parameter
- Long dwell D-cam generation parameter
- Film axis parameter
- Mark compensation parameter
- Conveyor axis parameter
- Cam monitor screen parameter
- Unit conversion coefficient parameter

## PreOperation

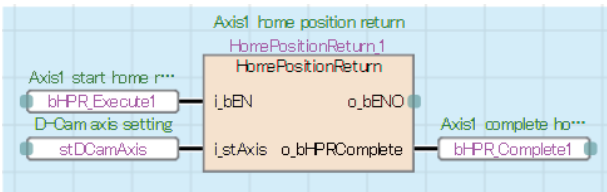
### ■All axes servo ON processing

Perform all axes servo ON with the switch of the servo axis setting on the GOT screen.



### ■Home position return

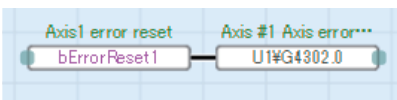
Perform home position return with the switch of the servo axis setting on the GOT screen.



## Operation

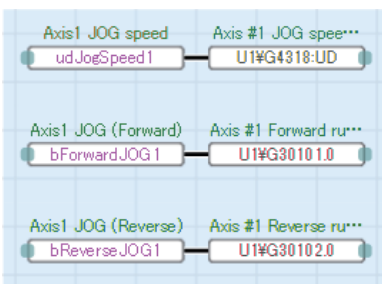
### ■Error reset processing

Perform error reset processing with the switches in the servo axis setting screen displayed on the GOT.



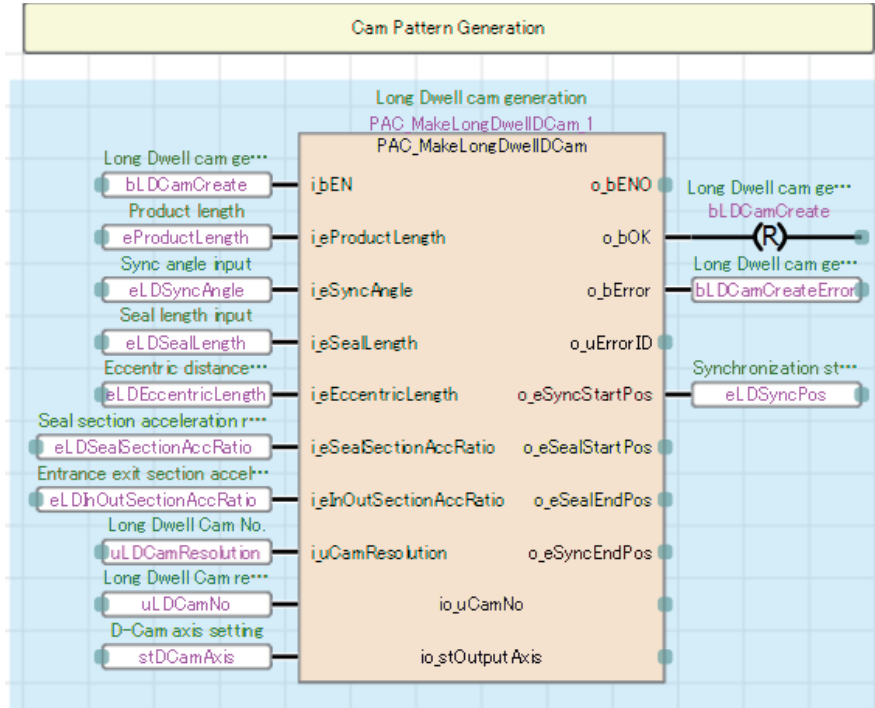
### ■JOG operation processing

Specify the JOG speed and start JOG operation (forward/reverse) using the switches in the servo axis setting screen displayed on the GOT.



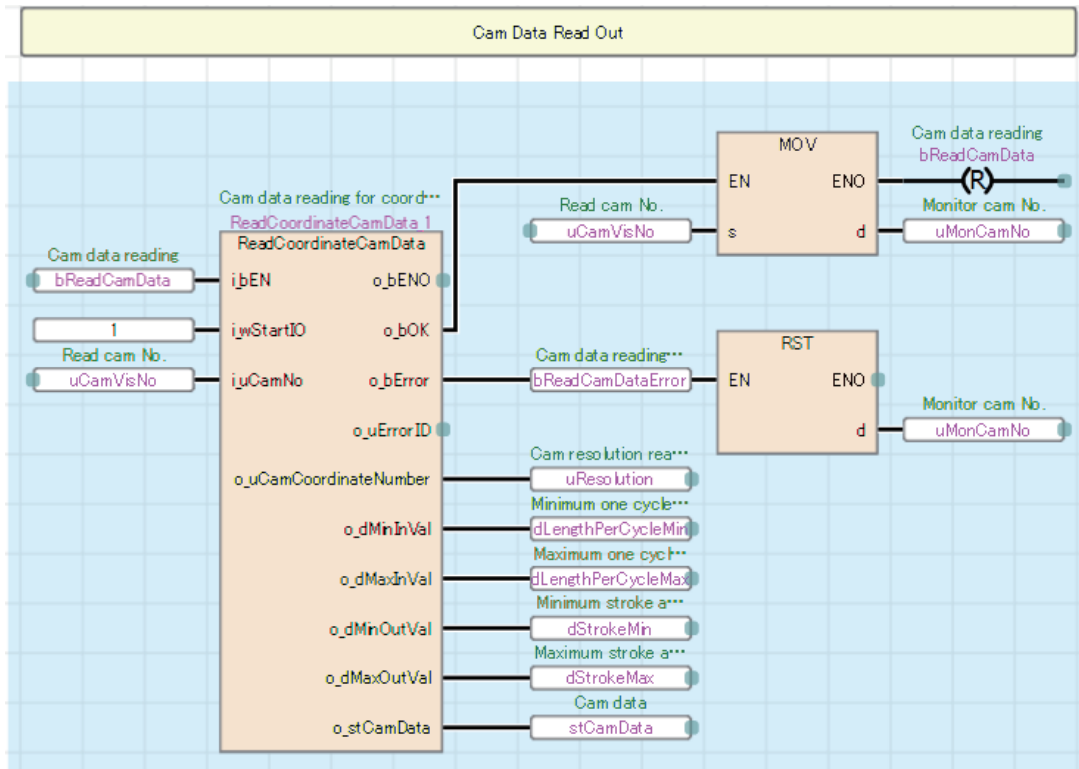
## ■ Cam data generation

Cam data is generated according to the values set in the long dwell screen displayed on the GOT.



## ■ Cam data reading

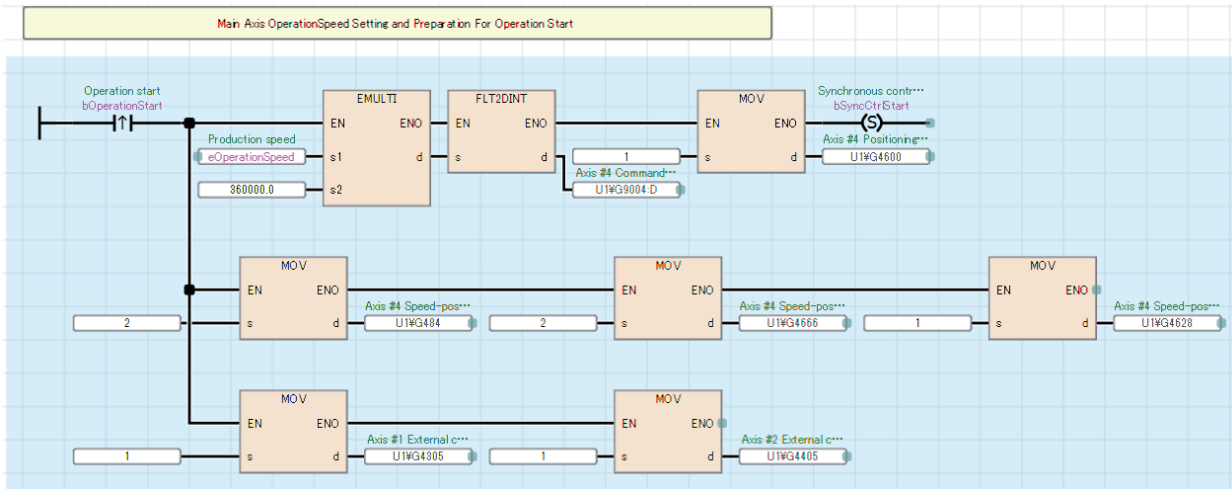
Read the cam data of the long dwell for the cam monitor screen displayed on the GOT.



## Production start preparation

Set the command velocity of the virtual servo for main axis positioning and start positioning No. using the [Start] switch in the production screen displayed on the GOT.

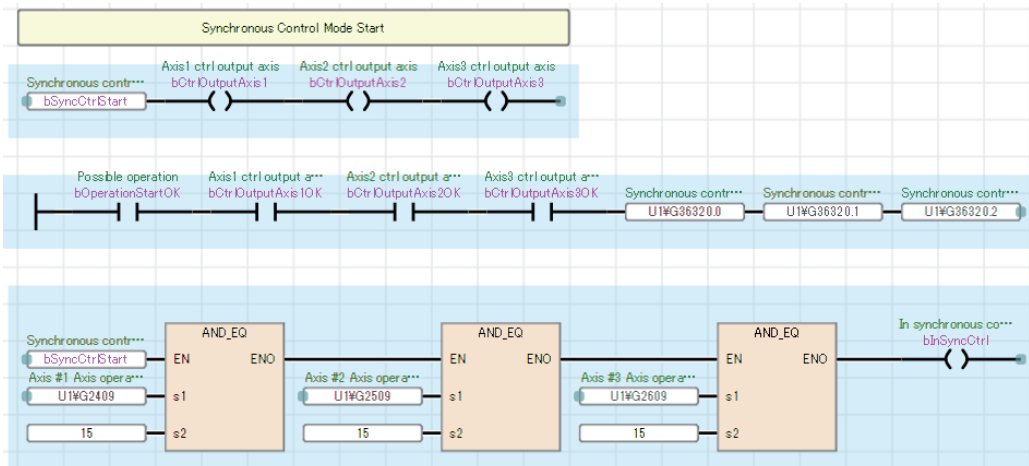
Set the speed-position switching control.



## Synchronous control start

Execute CtrlOutputAxisSync (Output axis synchronized control) with the [Synchronization start] switch in the servo axis setting screen displayed on the GOT.

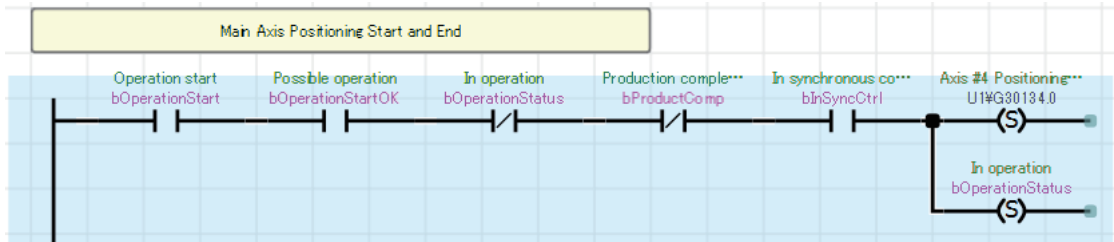
Start synchronous control of all axes once the output axis is prepared, and monitor the process during synchronous control.



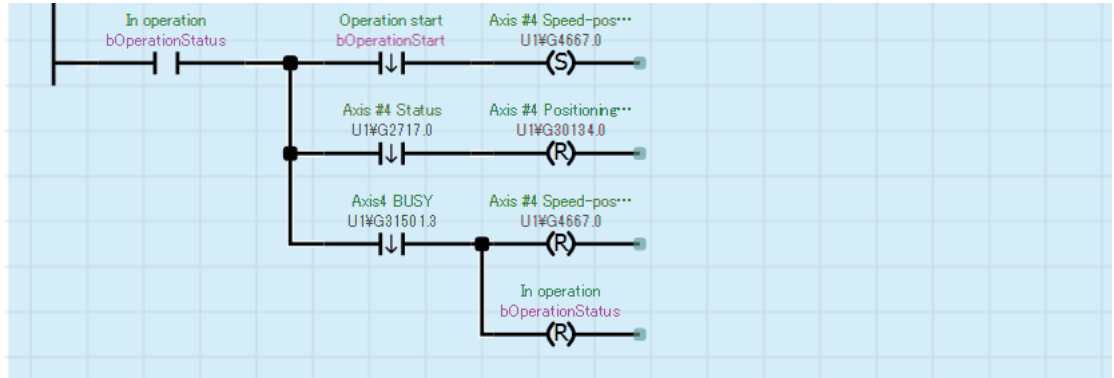
### Start of main axis

Check that each axis has been switched to synchronous control, and start speed-position switching control of the virtual servo for main axis positioning.

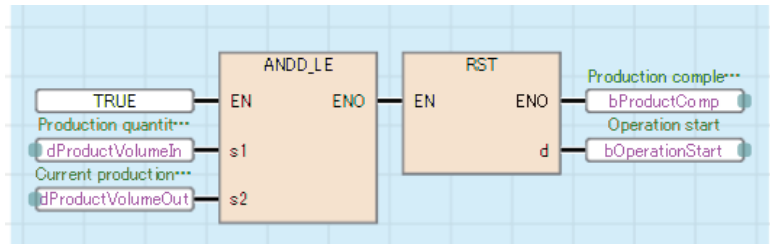
In operation lamp will be activated.



Stop operation with the [End] switch in the production screen displayed on the GOT.

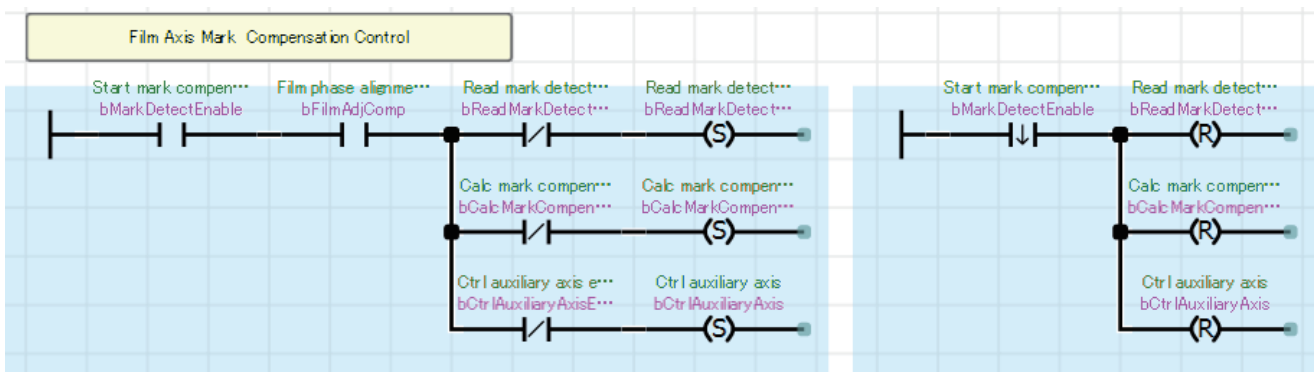


Operation stops when production ends.



### Start mark compensation

Check that film phase focusing is completed, and start mark compensation using the [Compensation start] switch in the mark compensation screen displayed on the GOT.



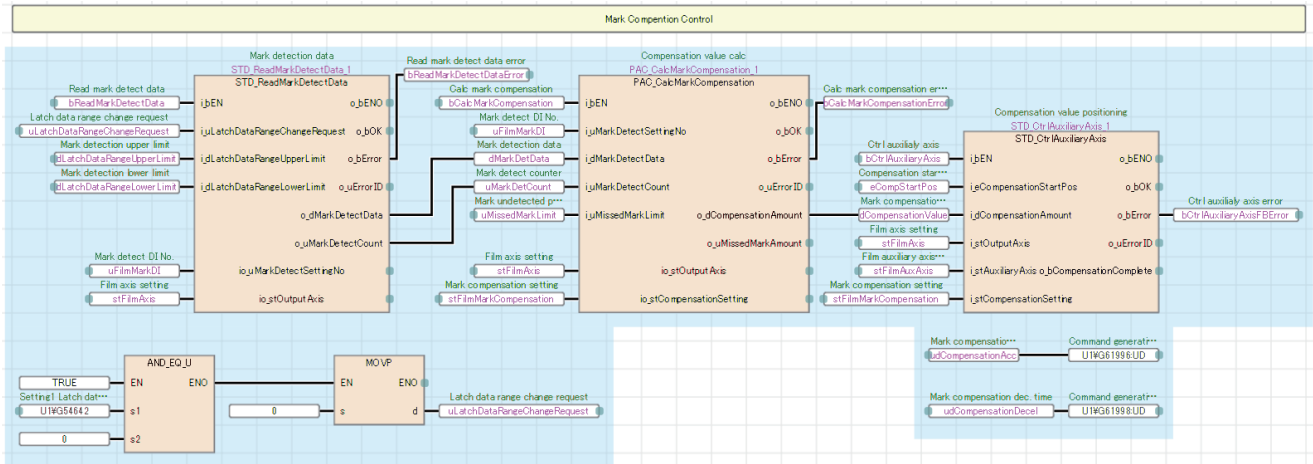
# PackagingControl

## ■Mark compensation

The amount of deviation is calculated from mark detection data of the film axis. The movement amount of the auxiliary axis is compensated by the calculated deviation amount.

The mark detection range can be changed using the [Change request] switch in the mark compensation screen displayed on the GOT.

The acceleration and deceleration time of the auxiliary axis setting are stored in buffer memory.







### Timing for phase focusing

Adjust the phases of the conveyor and film feeding so that the finger point and film mark point on the conveyor match with the offset point (synchronization starting point) of the main axis per cycle when the main axis is started. After completion of phase focusing for conveyor axis, phase focusing for film axis is performed. After completion of phase focusing, the clutch control of the cutter axis is turned on and production starts from the next cycle.

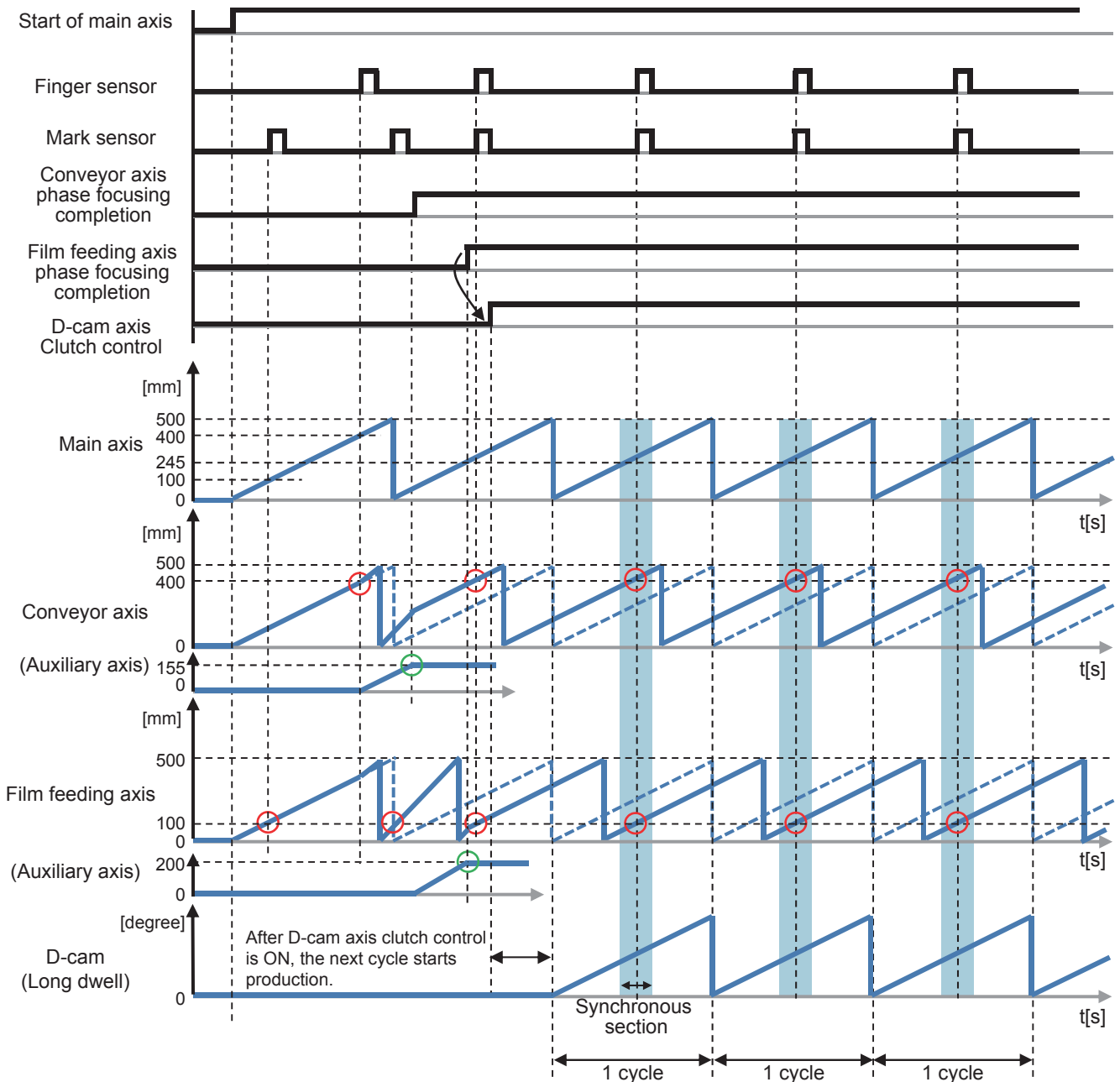
- 1 cycle length (product length): 500 mm
- Offset point per cycle (synchronization starting point): 245mm
- Finger point: One cycle detection point at startup (conveyor) 400 mm  
→ Compensation amount 400 mm - 245 mm = 155 mm
- Mark detection point: One cycle detection point at startup (film feeding) 100 mm  
→ Compensation amount 100 mm - 245 mm = -145 mm

Since the main axis of the film feeding axis is the conveyor axis, the operation includes compensation amount of the conveyor axis. Calculate the difference from the finger compensation amount. After the conveyor axis has been compensated, compensation of the film axis is started.

→ -145 mm - 155 mm = -300 mm

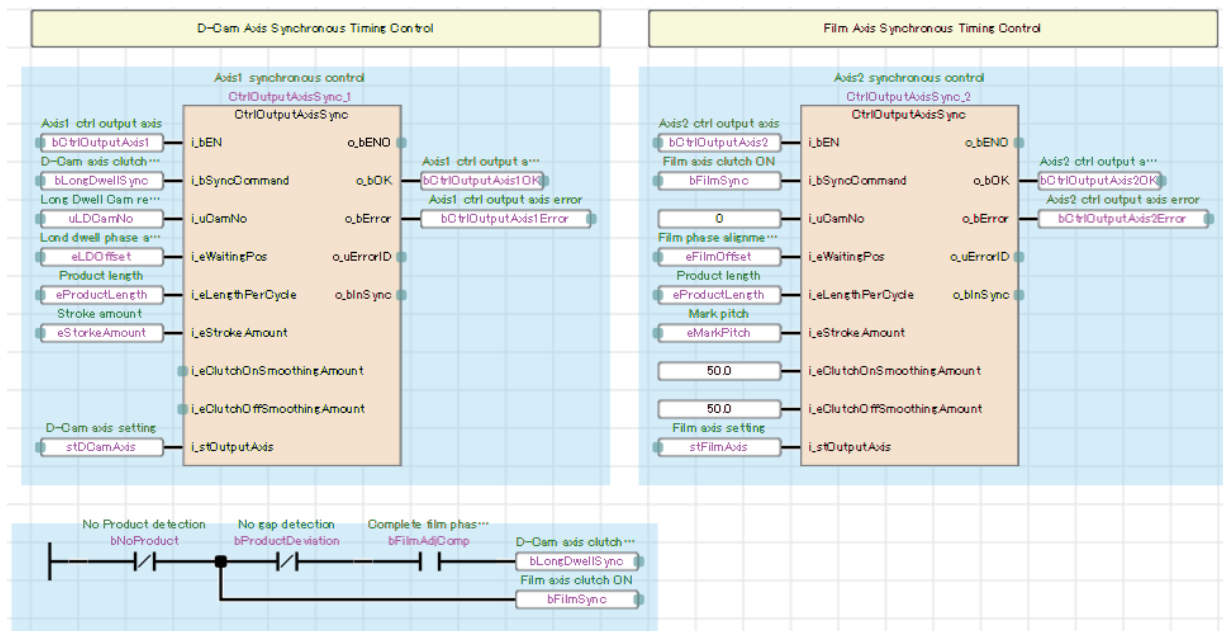
Since the compensation amount exceeds the half of 1 cycle length, the difference from 1 cycle is the compensation amount of the film feeding axis.

→ -300 mm + 500 mm (1 cycle) = 200 mm

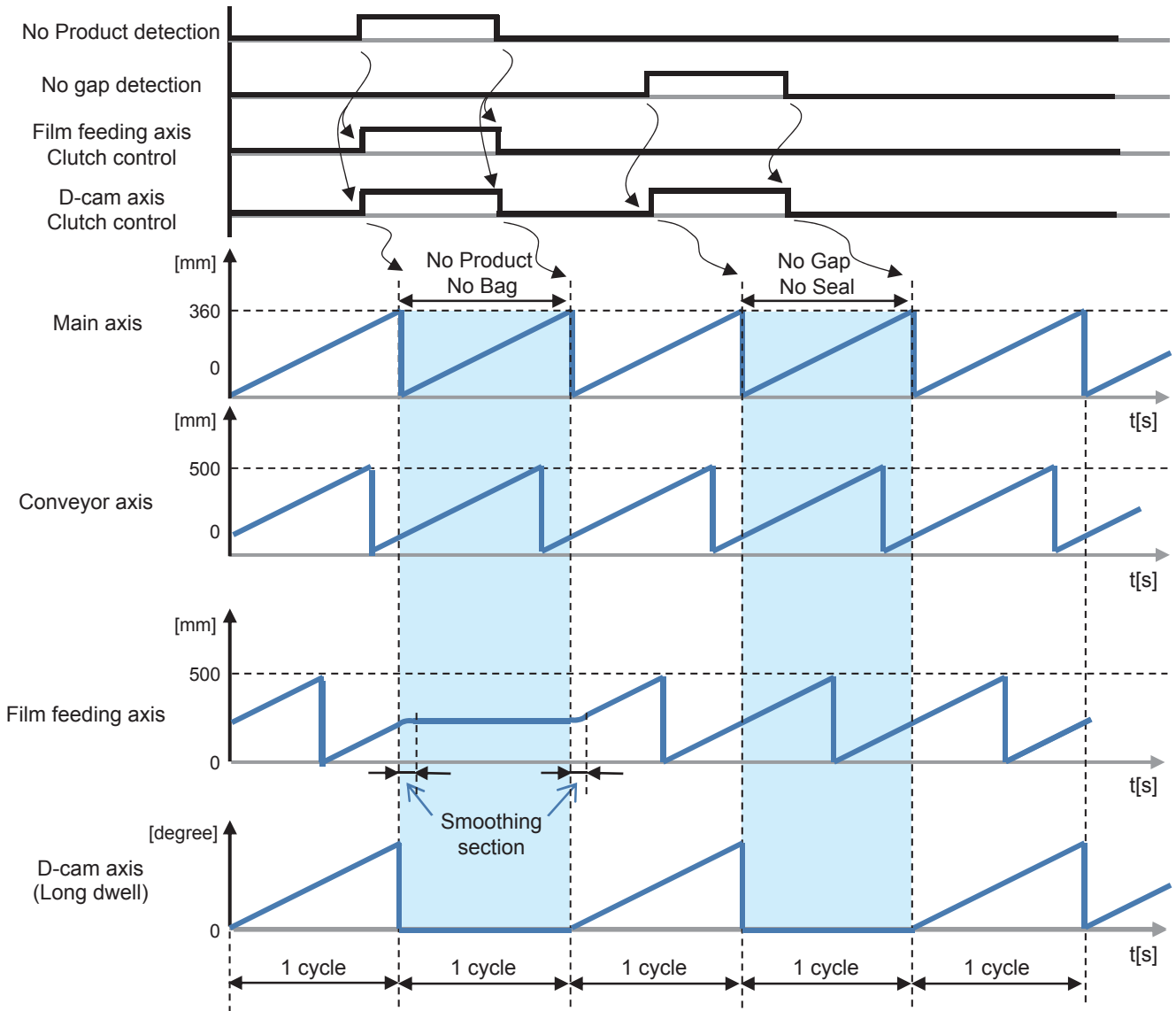


## ■ No Product No Bag/No Gap No Seal processing

This processing turns off the clutches of the D-cam axis and film feeding axis to temporarily stop them when workpieces are not conveyed during operation or workpieces cannot be sealed because their positions are incorrect.



### Timing for No Product No Bag/No Gap No Seal



### HMI\_IF (Touch panel I/O processing)

The I/O processing for displaying the GOT screen is performed.

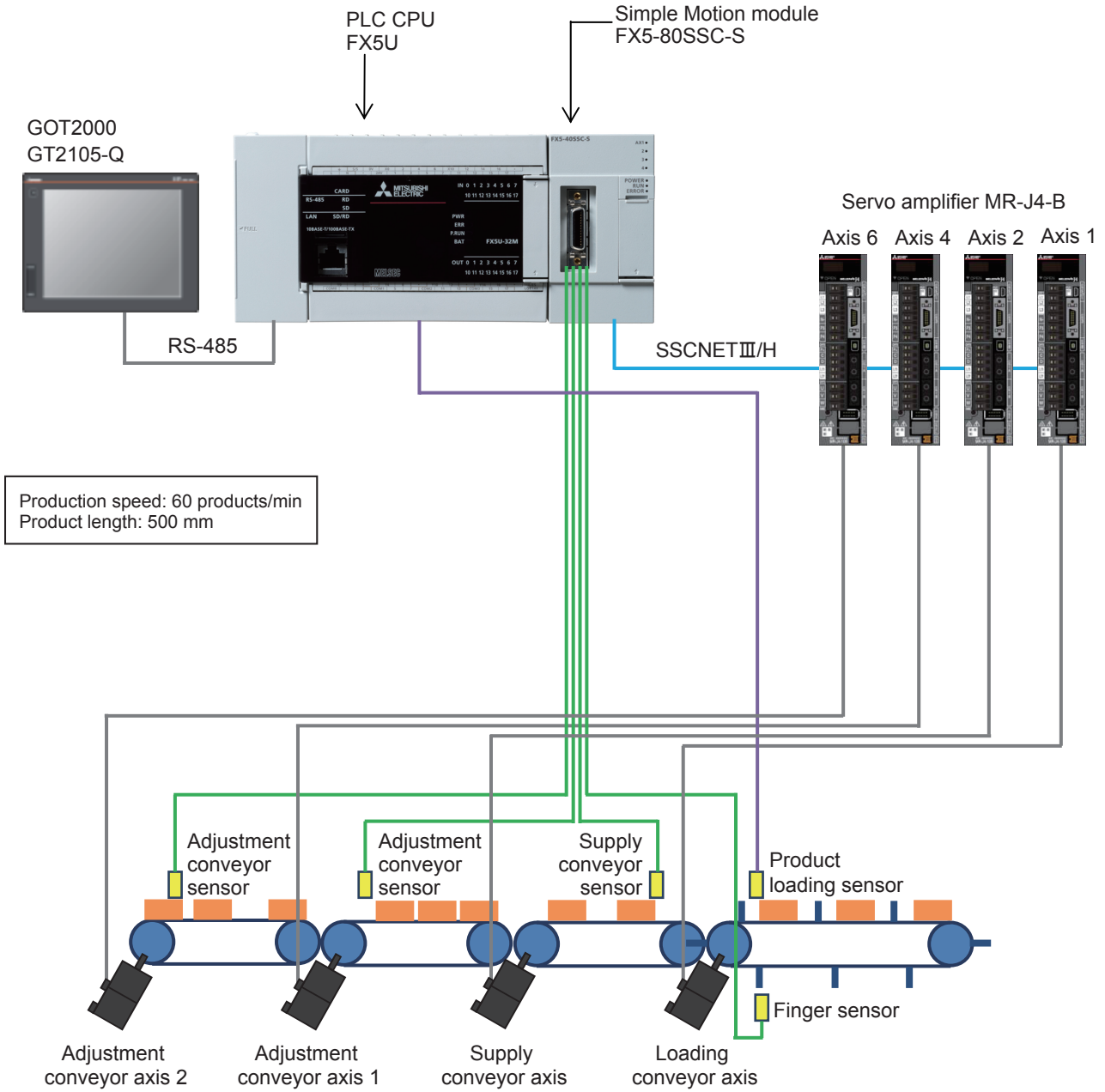
- Axis status monitor and lamp display
- Error reset processing
- FB error monitor
- Production information setting and monitor

# 5.3 Alignment Conveyor

This section describes the system configuration and program specifications of the program example for the alignment conveyor.

## System configuration

### AP20-PAC004AA-FX5U-80SSC\_AlignmentConveyor\_\*\*\*\*.gx3



## Control specifications

Item	Main axis	Work loading conveyor axis	Supply conveyor axis	Gap adjustment conveyor axis 1	Gap adjustment conveyor axis 2
Axis No.	8 (Virtual servo)	1	2	4	6
Unit setting	2: degree	0: mm	0: mm	0: mm	0: mm
Home position return	—	Data setting method	Data setting method	Data setting method	Data setting method
Auxiliary axis No.	—	—	3 (Virtual servo)	5 (Virtual servo)	7 (Virtual servo)
Cam No.	—	—	0 (Straight cam)	0 (Straight cam)	0 (Straight cam)
Clutch	—	—	Lock-up clutch	Lock-up clutch	Lock-up clutch

## Program configuration

### Language

The following languages are used in this program.

- Program comment: English
- Label comment: Japanese, English, Chinese (Simplified)

### List of programs

Program name	Description	Execution type	Describing method
Initial	Initial parameter setting	Initial	ST
PreOperation	<ul style="list-style-type: none"> <li>• License activation</li> <li>• Preparing operation (Servo ON/OFF)</li> <li>• Home position return</li> </ul>	Scan	FBD
Operation	<ul style="list-style-type: none"> <li>• Error reset</li> <li>• JOG operation</li> <li>• Synchronous control start</li> <li>• Operation start/stop</li> </ul>	Scan	FBD
ConveyorControl	<ul style="list-style-type: none"> <li>• Work gap adjustment</li> <li>• Work loading position adjustment</li> </ul>	Scan	FBD
HMI_IF	Touch panel I/O processing	Scan	ST

### FB


The following tables list the FBs used in this program.

#### ■PAC\_PackagingControl\_F

Item	FB name	Description	Execution type <sup>*1</sup>	Program
Activation	PAC_Activation	License activation	Macro type	PreOperation
Mark compensation	STD_ReadMarkDetectData	Mark detection data reading	Subroutine type	ConveyorControl
	STD_CtrlAuxiliaryAxis	Auxiliary axis correction	Subroutine type	ConveyorControl
Alignment conveyor	PAC_CalcGap	Work gap adjustment compensation amount calculation	Subroutine type	ConveyorControl
	PAC_CalcPhase	Work loading position adjustment compensation amount calculation	Subroutine type	ConveyorControl


\*1 The FB that repeats calling in the program is set to the subroutine type.

For details of the macro type and subroutine type, refer to the following.

 MELSEC iQ-F FX5 Programming Manual (Program Design)

## ■ Example Prg Control (Application program control)

FB name	Description	Execution type <sup>*1</sup>	Program
MotionReady	Simplemotion ready	Macro type	PreOperation
HomePositionReturn	Home position return	Subroutine type	PreOperation
SaveCompensationBuffer	Compensation amount buffer	Subroutine type	ConveyorControl
GapAdjustment	Work gap adjustment	Subroutine type	ConveyorControl
PhaseAdjustment	Work loading position adjustment	Macro type	ConveyorControl

\*1 The FB that repeats calling in the program is set to the subroutine type.  
For details of the macro type and subroutine type, refer to the following.  
 MELSEC iQ-F FX5 Programming Manual (Program Design)

## Devices to be used

This program example uses devices as interfaces between the PLC CPU and the GOT.

The device range is shown below.

For details of device assignment, refer to "Page 176 List of global labels".

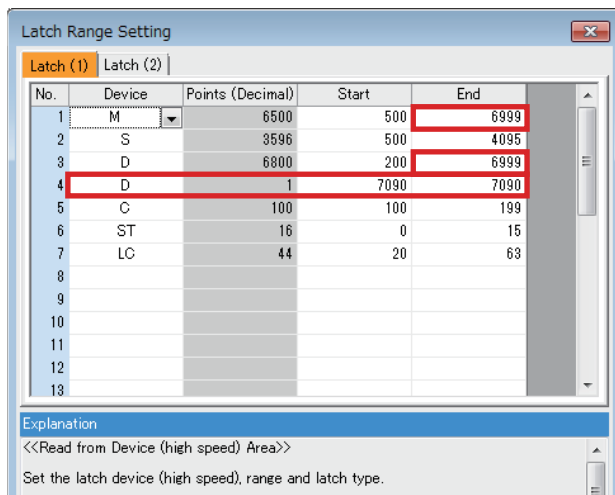
Item	Symbol	Point	Range
Internal relay	M	680	7000 to 7679
Data register	D	1000	7000 to 7999

## Parameter

Refer to the project for parameter setting details.

## CPU parameter

The latch range settings of the memory/device setting are changed from the initial values as shown below.



## Simple motion parameter

In this application program example, the following parameters are disabled.

Set the parameters for safety measures depending on the intended use.

Parameter	Settings
"[Pr.22] Input signal logic selection": Lower limit	Positive logic
"[Pr.22] Input signal logic selection": Upper limit	Positive logic
"[Pr.82] Forced stop valid/invalid selection"	Invalid
"[Pr.116] FLS signal selection": Input type	Buffer memory
"[Pr.117] RLS signal selection": Input type	Buffer memory
"[Pr.118] DOG signal selection": Input type	Buffer memory

## Servo parameter

In this application program example, the servo amplifier input signal is not used.

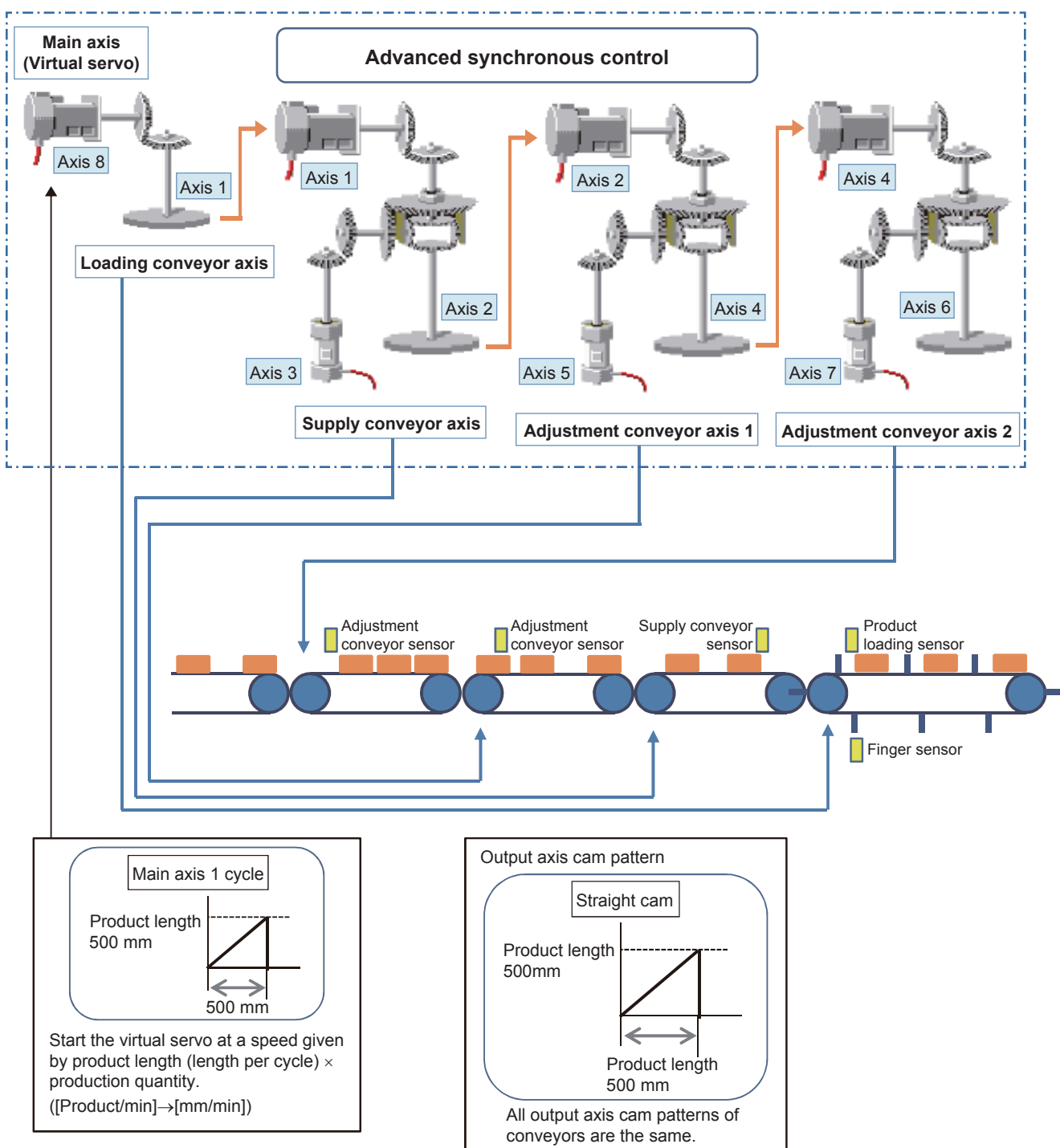
Set the parameters for safety measures depending on the intended use.

Parameter	Settings
PA04: Function selection A-1	Servo forced stop invalid selection 1: Invalid
PC17: Function selection C-4 [MR-J4-B]	Origin set condition selection 1: Servo motor Z phase passage not required after power on

## Synchronous control image

The synchronization control image set in the alignment conveyor program example is shown below.

### ■Synchronous control (whole image)





# Program processing

## Initial (Initial parameter setting)

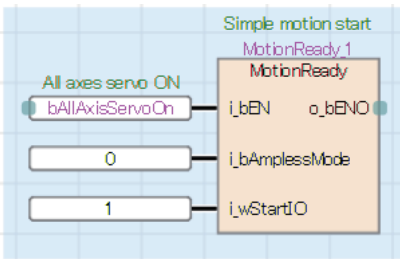
Set the initial values and constants for each variable.

- Production information parameter
- Loading conveyor axis parameter
- Supply conveyor axis parameter
- Adjustment conveyor axis parameter

## PreOperation

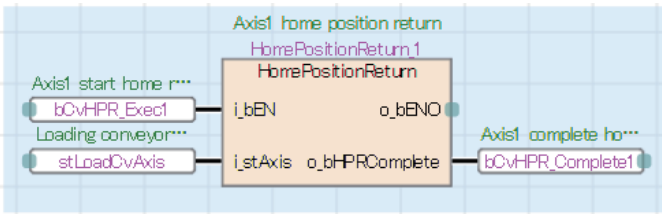
### ■All axes servo ON processing

Perform all axes servo ON with the switch in the servo axis setting screen displayed on the GOT.



### ■Home position return

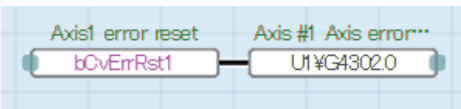
Perform home position return with the switch in the servo axis setting screen displayed on the GOT.



## Operation

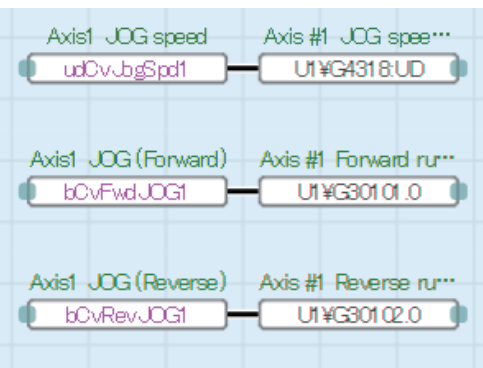
### ■Error reset processing

Perform error reset processing with the switch in the servo axis setting screen displayed on the GOT.



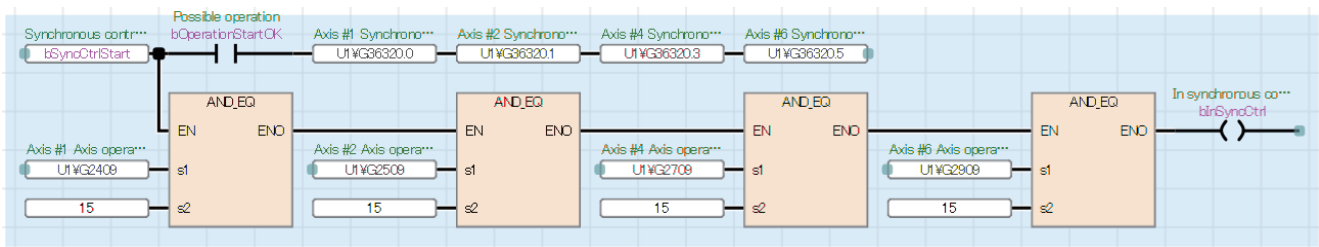
### ■JOG operation processing

Specify the JOG speed and start JOG operation (forward/reverse) using the switches in the servo axis setting screen displayed on the GOT.



## ■Synchronous control start

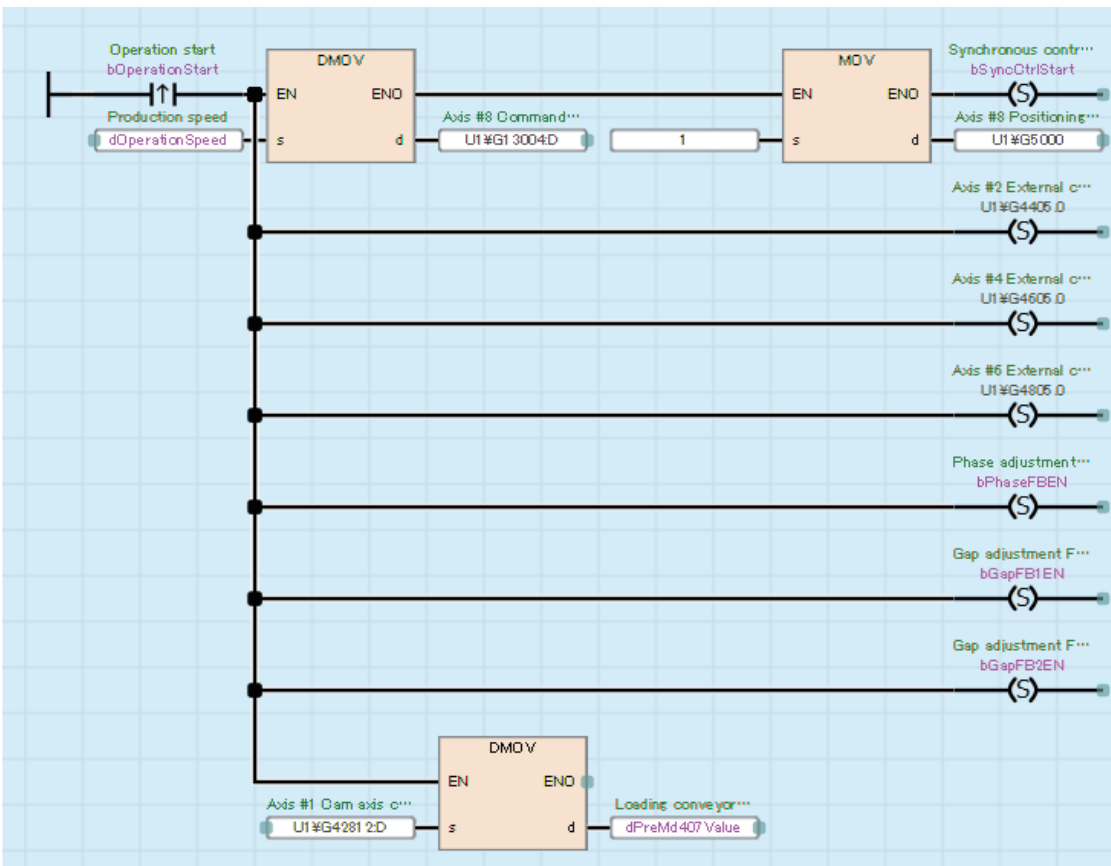
Start the synchronous control of the output axis with the [synchronization start] switch in the servo axis setting screen displayed on the GOT, and monitor the process during synchronous control.



## ■Production start preparation

Set the command velocity of the virtual servo for main axis positioning and start positioning No. using the [Start] switch in the production screen displayed on the GOT.

Validate external command signals and execute the alignment conveyor FBs (GapAdjustment, PhaseAdjustment).

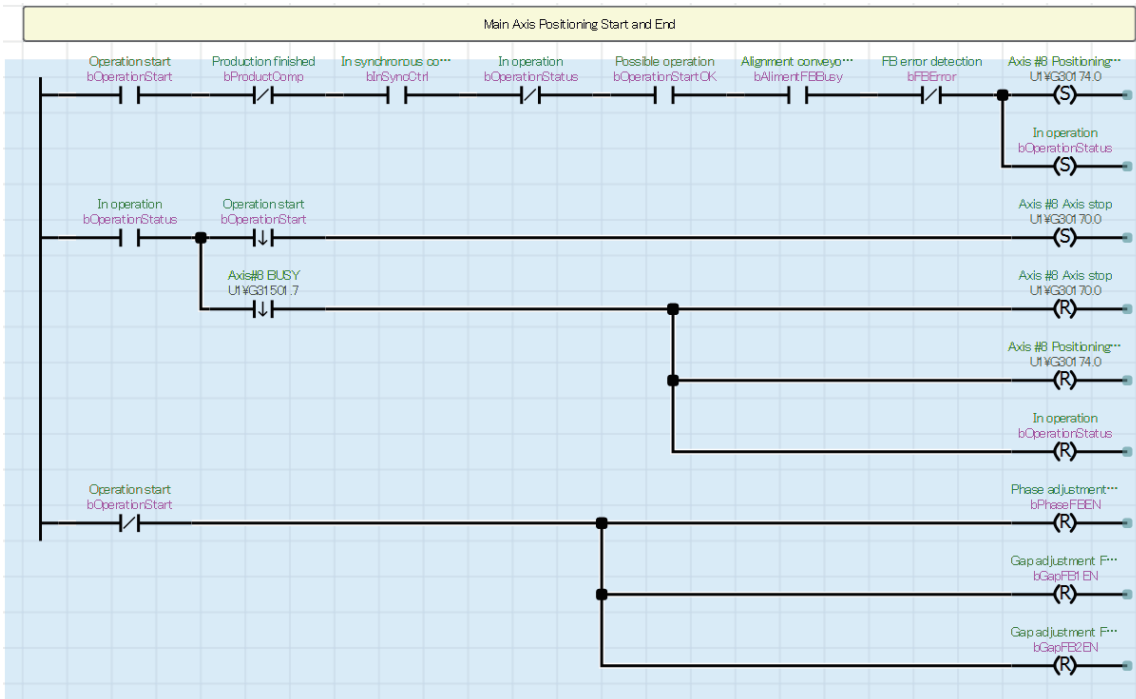


## Start of main axis

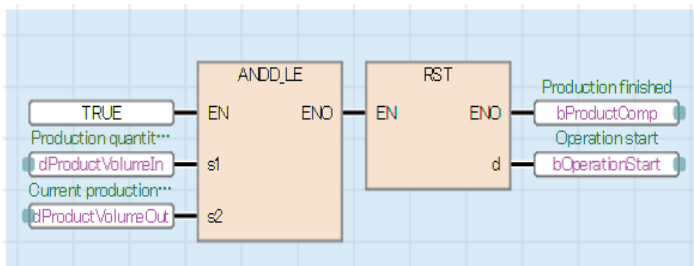
Check that the output axis has been switched to synchronous control and that no error occurs in the alignment conveyor FBs, and start speed control of the virtual servo for main axis positioning.

In operation lamp will be activated.

Stop the operation with the [End] switch in the production screen displayed on the GOT and end the alignment conveyor FBs.



Operation stops when production ends.



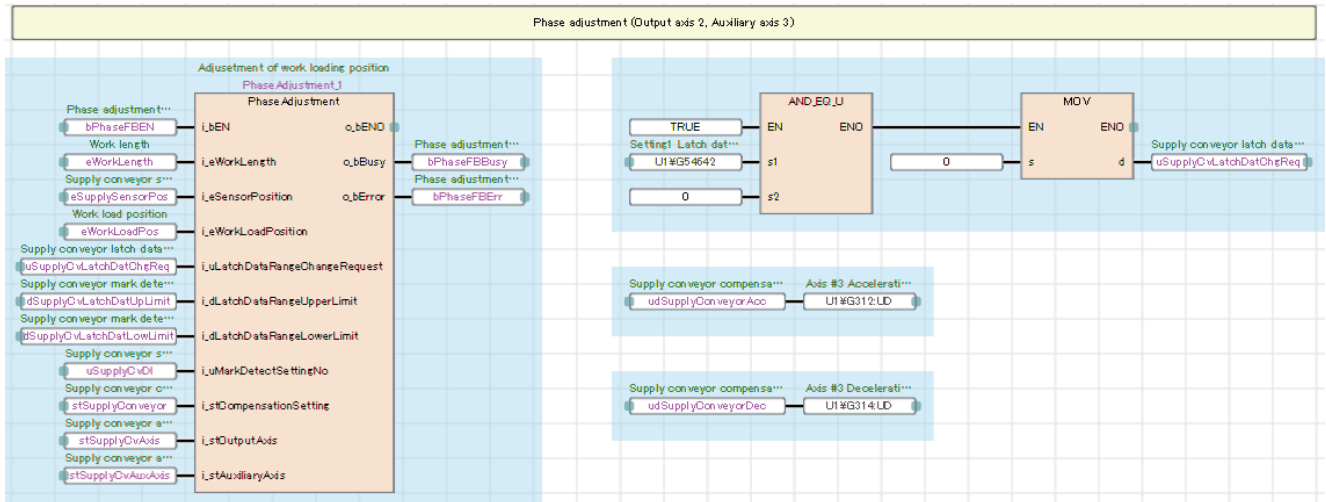
# ConveyorControl

## ■ Work loading position adjustment

Calculate the compensation amount so that the aligned workpieces are on the loading position of the loading conveyor. The movement amount of the auxiliary axis is compensated by the calculated amount.

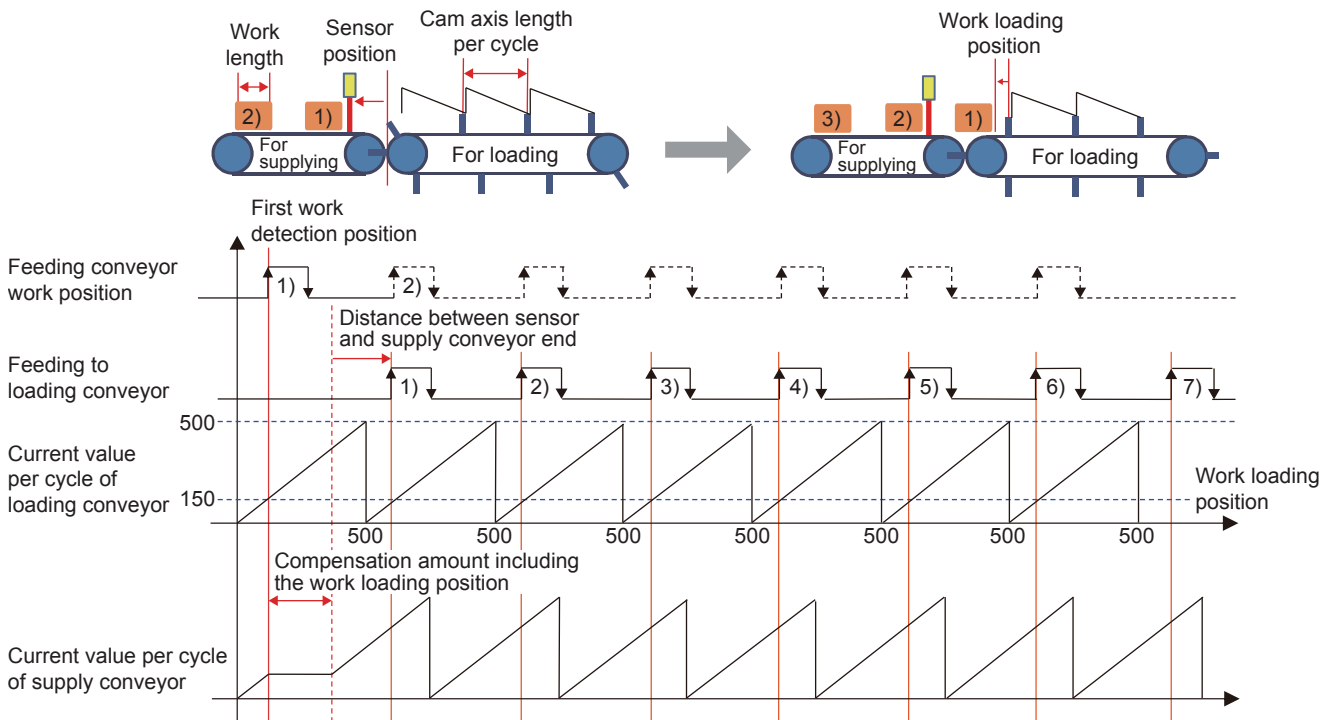
The mark detection range can be changed by using the change request switch in the mark compensation screen displayed on the GOT.

The acceleration and deceleration time of the auxiliary axis setting are stored in buffer memory.



### • Operation outline

Calculate the compensation amount by detecting the workpieces with the sensor, and compensate the supply conveyor with the auxiliary axis.

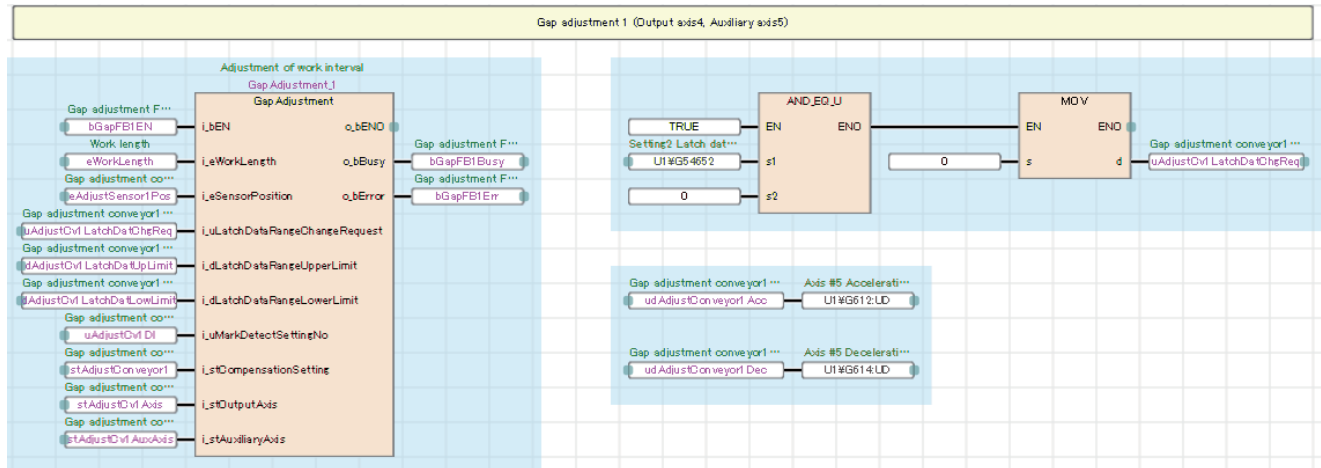


## ■ Work gap adjustment

Calculate the compensation amount so that the workpieces are equally spaced. The movement amount of the auxiliary axis is compensated with the calculated amount.

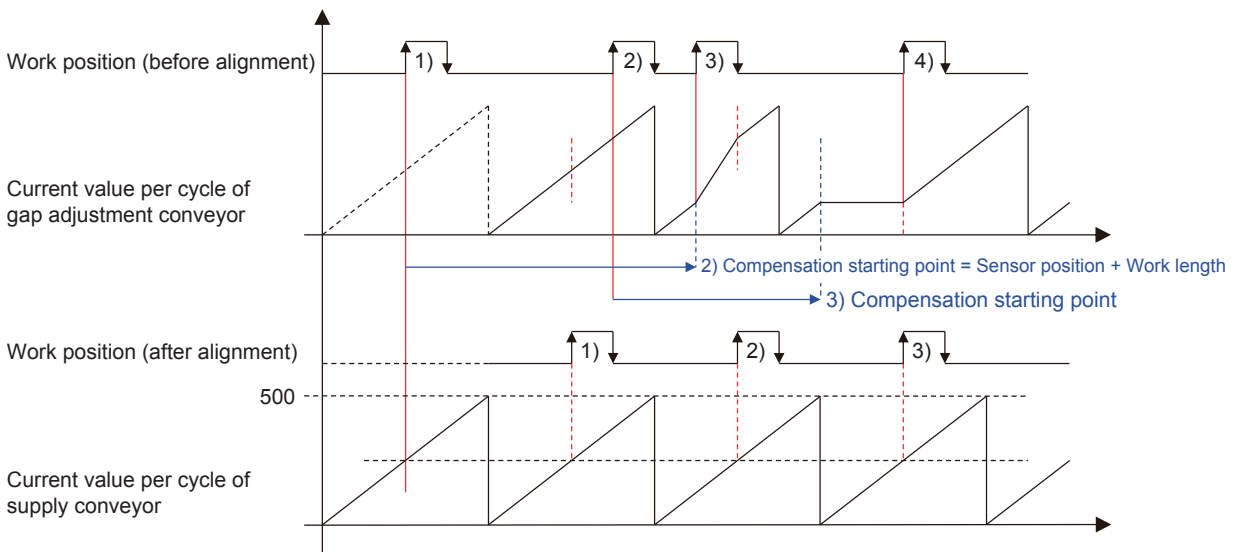
The mark detection range can be changed by using the change request switch in the mark compensation screen displayed on the GOT.

The acceleration and deceleration time of the auxiliary axis setting are stored in buffer memory.



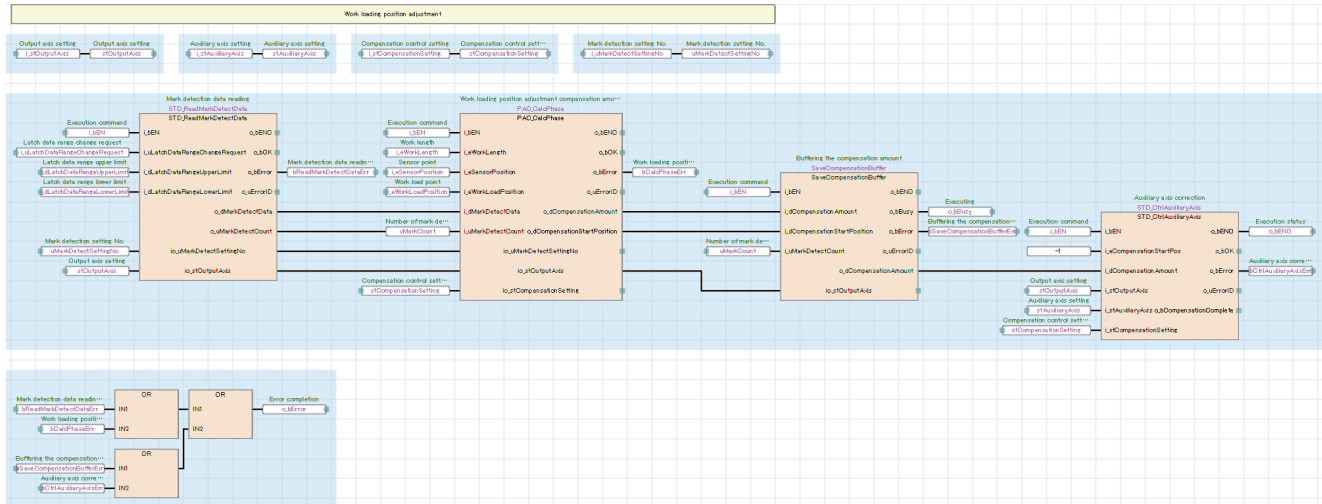
### • Operation outline

Calculate the compensation amount by detecting the workpieces with the sensor, and compensate each gap adjustment conveyor with the auxiliary axis.



### <Detailed processing>

- Acquire the mark detection data with STD\_ReadMarkDetectData, and calculate the compensation amount and compensation starting position with PAC\_CalcGap and PAC\_CalcPhase.
- The calculated compensation amount and compensation starting position are buffered with SaveCompensationBuffer, and the compensation amount is output when the compensation starting position is exceeded.
- The output compensation amount is input as the movement amount of STD\_CtrlAuxiliaryAxis, and the positioning of the auxiliary axis is performed.



## HMI\_IF (Touch panel I/O processing)

The I/O processing for displaying the GOT screen is performed.

- Axis status monitor and lamp display
- Error reset processing
- FB error monitor
- Production amount monitor

## Troubleshooting of the alignment conveyor

Error details	Cause	Corrective action
The space between workpieces is narrow after the adjustment.	Compensation does not complete by the time a workpiece is loaded on the rear conveyor due to a large compensation amount.	Adjust the maximum compensation amount so that the compensation completes by the time a workpiece is loaded on the rear conveyor. The difference between the compensation amount and maximum compensation amount will be discarded. Align the workpieces on the rear conveyors.
A workpiece is not loaded to the intended position on the loading conveyor.	Two or more workpieces are detected in one cycle of the loading conveyor.	Align the workpieces on the supply conveyor so that a workpiece is detected in one cycle of the loading conveyor.
	The next workpiece is detected before the compensation of a workpiece completes.	Adjust the space between workpieces and sensor position not to detect the next workpiece before a workpiece is detected and compensation is completed.
A workpiece touches the front workpiece. Two workpieces are loaded between fingers on the loading conveyor.	The mark detection data is significantly delayed from the cam axis current value per cycle.	If the mark detection data is delayed from the actual detection position, minimize the delay by setting the gain tuning of the servo and "[Pr.801] Mark detection signal compensation time". Set "[Pr.801] Mark detection signal compensation time" so that the mark detection data does not precede the cam axis current value per cycle.



# HomePositionReturn (Home position return)

## Name

HomePositionReturn

## Function overview

Item	Description								
Function overview	This FB performs the machine home position return of the axis specified in the home position return axis setting.								
Symbol	<div style="border: 1px solid black; padding: 10px; display: inline-block; margin: 10px;"> <div style="text-align: center; margin-bottom: 5px;">HomePositionReturn</div> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">Execution command</td> <td style="width: 30%;">B: i_bEN</td> <td style="width: 30%; text-align: right;">o_bENO :B</td> <td style="width: 10%;">Execution status</td> </tr> <tr> <td>Home position return axis setting</td> <td>B: i_stAxis</td> <td style="text-align: right;">o_bHPRComplete :B</td> <td>Home position return complete</td> </tr> </table> </div>	Execution command	B: i_bEN	o_bENO :B	Execution status	Home position return axis setting	B: i_stAxis	o_bHPRComplete :B	Home position return complete
Execution command	B: i_bEN	o_bENO :B	Execution status						
Home position return axis setting	B: i_stAxis	o_bHPRComplete :B	Home position return complete						
Applicable hardware and software	Applicable module	FX5-40SSC-S, FX5-80SSC-S							
	Applicable CPU	MELSEC iQ-F series							
	Engineering software	GX Works3							
Number of steps	310 steps								
Function description	<ul style="list-style-type: none"> <li>When Execution command (i_bEN) is turned on, "9001" is set in "[Cd.3] Positioning start No." of the axis specified in the home position return axis setting and a machine home position return is performed.</li> <li>When the home position return is completed normally, Home position return complete (o_bHPRComplete) is output.</li> </ul>								
Restrictions and precautions	<ul style="list-style-type: none"> <li>This FB uses index registers Z17 to Z19. Do not use this index register in an interrupt program.</li> <li>This FB does not include the error detection processing. Program the error detection processing separately in accordance with the required system operation.</li> <li>Axis number (AxisNo) and Unit number (StartIO) of Home position return axis setting (AXIS_REF structure) must be set before this FB is executed.</li> </ul>								
Compiling method	Macro type, subroutine type								
FB operation type	Pulsed execution (multiple scan execution type)								

## Labels

### Input labels

Name	Label name	Data type	Read timing <sup>*1</sup>	Setting range	Description
Execution command	i_bEN	Bit	<input type="checkbox"/>	ON, OFF	On: The FB is activated. Off: The FB is not activated.
Home position return axis setting	i_stAxis	AXIS_REF	—	—	Refer to the following AXIS_REF.

Home position return axis setting (AXIS\_REF structure)

Name	Label name	Data type	Read timing <sup>*1</sup>	Setting range	Description
Axis number	AxisNo	Word [Signed]	<input type="checkbox"/>	1 ≤ Axis No. ≤ maximum number of axes of the module used	Sets the axis No. that performs a home position return.
Unit number	StartIO	Word [Signed]	<input type="checkbox"/>	1H ≤ Unit number ≤ 10H	Simple Motion unit number

\*1 : Always, ↑: When the FB is started (cannot be changed)

### Output labels

Name	Label name	Data type	Value to be held <sup>*1</sup>	Description
Execution status	o_bENO	Bit	—	On: While Execution command is on Off: Execution command is off.
Home position return complete	o_bHPRComplete	Bit	○	On: Home position return complete Off: Home position return incomplete

\*1 ○: The value is held after the FB stops. —: The value is cleared after the FB stops.



# ReadStrokeCamData (Cam data reading for stroke ratio data format)

## Name

ReadStrokeCamData

## Function overview

Item	Description						
Function overview	This FB reads the cam data of stroke ratio data format so that the cam outline of the cam No. specified by the Simple Motion module is recognized.						
Symbol	<div style="border: 1px solid black; padding: 10px; margin: 10px auto; width: fit-content;"> <p style="text-align: center;">ReadStrokeCamData</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%; vertical-align: top;">                     Execution command Unit number Cam No.                 </td> <td style="width: 30%; vertical-align: top;">                     B: i_bEN W: i_wStartIO UW: i_uCamNo                 </td> <td style="width: 30%; vertical-align: top;">                     o_bENO :B o_bOK :B o_bError :B o_uErrorID :UW o_uCamResolution :UW o_dMinInVal :D o_dMaxInVal :D o_dMinOutVal :D o_dMaxOutVal :D o_stCamData :DUT                 </td> <td style="width: 10%; vertical-align: top;">                     Execution status Normal completion Error completion Error code Cam resolution Minimum input value Maximum input value Minimum output value Maximum output value Cam data                 </td> </tr> </table> </div>	Execution command Unit number Cam No.	B: i_bEN W: i_wStartIO UW: i_uCamNo	o_bENO :B o_bOK :B o_bError :B o_uErrorID :UW o_uCamResolution :UW o_dMinInVal :D o_dMaxInVal :D o_dMinOutVal :D o_dMaxOutVal :D o_stCamData :DUT	Execution status Normal completion Error completion Error code Cam resolution Minimum input value Maximum input value Minimum output value Maximum output value Cam data		
Execution command Unit number Cam No.	B: i_bEN W: i_wStartIO UW: i_uCamNo	o_bENO :B o_bOK :B o_bError :B o_uErrorID :UW o_uCamResolution :UW o_dMinInVal :D o_dMaxInVal :D o_dMinOutVal :D o_dMaxOutVal :D o_stCamData :DUT	Execution status Normal completion Error completion Error code Cam resolution Minimum input value Maximum input value Minimum output value Maximum output value Cam data				
Applicable hardware and software	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">Applicable module</td> <td>FX5-40SSC-S, FX5-80SSC-S</td> </tr> <tr> <td>Applicable CPU</td> <td>MELSEC iQ-F series</td> </tr> <tr> <td>Engineering software</td> <td>GX Works3</td> </tr> </table>	Applicable module	FX5-40SSC-S, FX5-80SSC-S	Applicable CPU	MELSEC iQ-F series	Engineering software	GX Works3
Applicable module	FX5-40SSC-S, FX5-80SSC-S						
Applicable CPU	MELSEC iQ-F series						
Engineering software	GX Works3						
Number of steps	1591 steps						
FB dependence	—						
Function description	<p>This FB reads the cam data to be displayed on the application screen example (cam monitor screen) of the GOT from the Simple Motion module.</p> <ul style="list-style-type: none"> <li>When i_bEN (Execution command) is turned on, cam data reading of the specified i_uCamNo (Cam No.) is started.</li> <li>This FB reads the cam data of stroke ratio data format from the cam open area using "[Cd.600] Cam data operation request" of the Simple Motion module and "[Cd.607] Cam data value" where "[Cd.605] Cam resolution" and 128 points are condensed from the read data.</li> </ul> <div style="text-align: center;"> </div> <ul style="list-style-type: none"> <li>When the cam data reading has been completed and the output label has been updated, o_bOK (Normal completion) turns on.</li> <li>If an error has occurred in the FB, Error is turned on and the error code is stored in ErrorID.</li> <li>For details of error codes, refer to "Page 181 List of Error Codes".</li> </ul>						
Restrictions and precautions	<ul style="list-style-type: none"> <li>This FB uses index registers Z17 to Z19. Do not use this index register in an interrupt program.</li> <li>This FB divides cam data to read it multiple times. Take either of the following measures because the scan time considerably increases when the FB is executed during production.                     <ol style="list-style-type: none"> <li>Execute the FB while production is not in progress by using an interlock not to execute the FB during production.</li> <li>To execute the FB during production, change the number of cam data to be read for each time in the FB (default: 512) to 256 or 128 depending on the scan time.</li> </ol> </li> </ul>						
Compiling method	Macro type, subroutine type						
FB operation type	Pulsed execution (multiple scan execution type)						

## Labels

### Input labels

Name	Label name	Data type	Read timing*1	Setting range	Description
Execution command	i_bEN	Bit	<input type="checkbox"/>	ON, OFF	On: The FB is activated. Off: The FB is not activated.
Unit number	i_wStartIO	Word [Signed]	↑	1H ≤ Unit number ≤ 10H	Simple Motion unit number
Cam No.	i_uCamNo	Word [Unsigned]	↑	1 ≤ Cam No. ≤ 256	Set the Cam No. to read the data. 1 to 256: Generation cam

\*1 : Always, ↑: When the FB is started (cannot be changed)

### Output labels

Name	Label name	Data type	Value to be held*1	Description
Execution status	o_bENO	Bit	—	On: While Execution command is on Off: Execution command is off.
Normal completion	o_bOK	Bit	—	On: Indicates that the cam data reading has been completed and the output data has been normally updated. Off: Indicates that the FB operation has not completed.
Error completion	o_bError	Bit	—	On: An error has occurred in the FB. Off: No error has occurred.
Error code	o_uErrorID	Word [Unsigned]	—	The error code of the error that has occurred in the FB is stored.
Cam resolution	o_uCamResolution	Word [Unsigned]	○	The cam resolution of the read cam is stored.
Minimum input value	o_dMinInVal	Double word [Signed]	○	The minimum value of the cam data input value (cam axis 1 cycle length) is stored.
Maximum input value	o_dMaxInVal	Double word [Signed]	○	The maximum value of the cam data input value (cam axis 1 cycle length) is stored.
Minimum output value	o_dMinOutVal	Double word [Signed]	○	The minimum value of the cam data output value (cam stroke amount) is stored.
Maximum output value	o_dMaxOutVal	Double word [Signed]	○	The maximum value of the cam data output value (cam stroke amount) is stored.
Cam data	o_stCamData	CamData	○	Refer to the following cam data.

#### Cam data (CamData structure)

Name	Label name	Array No.	Data type	Value to be held*1	Description
Input value (Cycle point)	d128InVal_Cycle	[0]	Double word [Signed] (0..127)	○	The first point of the input value (cam axis 1 cycle length) is stored.
		[1]		○	The second point of the input value (cam axis 1 cycle length) is stored.
		⋮		○	⋮
		[127]		○	The 128th point of the input value (cam axis 1 cycle length) is stored.
Output value (Stroke amount)	d128OutVal_Stroke	[0]	Double word [Signed] (0..127)	○	The first point of the output value (cam stroke amount) is stored.
		[1]		○	The second point of the output value (cam stroke amount) is stored.
		⋮		○	⋮
		[127]		○	The 128th point of the output value (cam stroke amount) is stored.

\*1 ○: The value is held after the FB stops. —: The value is cleared after the FB stops.

# ReadCoordinateCamData (Cam data reading for coordinate data format)

## Name

ReadCoordinateCamData

## Function overview

Item	Description																																								
Function overview	This FB reads the cam data of coordinate data format so that the cam outline of the cam No. specified by the Simple Motion module is recognized.																																								
Symbol	<div style="border: 1px solid black; padding: 10px; margin: 10px 0;"> <p style="text-align: center;">ReadCoordinateCamData</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">Execution command</td> <td style="width: 30%;">B: i_bEN</td> <td style="width: 20%;">o_bENO :B</td> <td style="width: 20%;">Execution status</td> </tr> <tr> <td>Unit number</td> <td>W: i_wStartIO</td> <td>o_bOK :B</td> <td>Normal completion</td> </tr> <tr> <td>Cam No.</td> <td>UW: i_uCamNo</td> <td>o_bError :B</td> <td>Error completion</td> </tr> <tr> <td></td> <td></td> <td>o_uErrorID :UW</td> <td>Error code</td> </tr> <tr> <td></td> <td></td> <td>o_uCamCoordinateNumber :UW</td> <td>Cam coordinate number</td> </tr> <tr> <td></td> <td></td> <td>o_dMinInVal :D</td> <td>Minimum input value</td> </tr> <tr> <td></td> <td></td> <td>o_dMaxInVal :D</td> <td>Maximum input value</td> </tr> <tr> <td></td> <td></td> <td>o_dMinOutVal :D</td> <td>Minimum output value</td> </tr> <tr> <td></td> <td></td> <td>o_dMaxOutVal :D</td> <td>Maximum output value</td> </tr> <tr> <td></td> <td></td> <td>o_stCamData :DUT</td> <td>Cam data</td> </tr> </table> </div>	Execution command	B: i_bEN	o_bENO :B	Execution status	Unit number	W: i_wStartIO	o_bOK :B	Normal completion	Cam No.	UW: i_uCamNo	o_bError :B	Error completion			o_uErrorID :UW	Error code			o_uCamCoordinateNumber :UW	Cam coordinate number			o_dMinInVal :D	Minimum input value			o_dMaxInVal :D	Maximum input value			o_dMinOutVal :D	Minimum output value			o_dMaxOutVal :D	Maximum output value			o_stCamData :DUT	Cam data
Execution command	B: i_bEN	o_bENO :B	Execution status																																						
Unit number	W: i_wStartIO	o_bOK :B	Normal completion																																						
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		o_dMaxOutVal :D	Maximum output value																																						
		o_stCamData :DUT	Cam data																																						
Applicable hardware and software	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">Applicable module</td> <td>FX5-40SSC-S, FX5-80SSC-S</td> </tr> <tr> <td>Applicable CPU</td> <td>MELSEC iQ-F series</td> </tr> <tr> <td>Engineering software</td> <td>GX Works3</td> </tr> </table>	Applicable module	FX5-40SSC-S, FX5-80SSC-S	Applicable CPU	MELSEC iQ-F series	Engineering software	GX Works3																																		
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Engineering software	GX Works3																																								
Number of steps	1723 steps																																								
FB dependence	—																																								
Function description	<p>This FB reads the cam data to be displayed on the application screen example (cam monitor screen) of the GOT from the Simple Motion module.</p> <ul style="list-style-type: none"> <li>When i_bEN (Execution command) is turned on, cam data reading of the specified i_uCamNo (Cam No.) is started.</li> <li>This FB reads the cam data of coordinate data format from the cam open area using "[Cd.600] Cam data operation request" of the Simple Motion module and "[Cd.607] Cam data value" where "[Cd.605] Coordinate number" and 128 points are condensed from the read data.</li> </ul> <div style="text-align: center;"> </div> <ul style="list-style-type: none"> <li>When the cam data reading has been completed and the output label has been updated, o_bOK (Normal completion) turns on.</li> <li>If an error has occurred in the FB, Error is turned on and the error code is stored in ErrorID.</li> <li>For details of error codes, refer to "Page 181 List of Error Codes".</li> </ul>																																								
Restrictions and precautions	<ul style="list-style-type: none"> <li>This FB uses index registers Z17 to Z19. Do not use this index register in an interrupt program.</li> <li>This FB divides cam data to read it multiple times. Take either of the following measures because the scan time considerably increases when the FB is executed during production.             <ol style="list-style-type: none"> <li>Execute the FB while production is not in progress by using an interlock not to execute the FB during production.</li> <li>To execute the FB during production, change the number of cam data to be read for each time in the FB (default: 256) to 128 depending on the scan time.</li> </ol> </li> </ul>																																								
Compiling method	Macro type, subroutine type																																								
FB operation type	Pulsed execution (multiple scan execution type)																																								

## Labels

### Input labels

Name	Label name	Data type	Read timing*1	Setting range	Description
Execution command	i_bEN	Bit	□	ON, OFF	On: The FB is activated. Off: The FB is not activated.
Unit number	i_wStartIO	Word [Signed]	↑	1H ≤ Unit number ≤ 10H	Simple Motion unit number
Cam No.	i_uCamNo	Word [Unsigned]	↑	1 ≤ Cam No. ≤ 256	Set the Cam No. to read the data. 1 to 256: Generation cam

\*1 □: Always, ↑: When the FB is started (cannot be changed)

### Output labels

Name	Label name	Data type	Value to be held*1	Description
Execution status	o_bENO	Bit	—	On: While Execution command is on Off: Execution command is off.
Normal completion	o_bOK	Bit	—	On: Indicates that the cam data reading has been completed and the output data has been normally updated. Off: Indicates that the FB operation has not completed.
Error completion	o_bError	Bit	—	On: An error has occurred in the FB. Off: No error has occurred.
Error code	o_uErrorID	Word [Unsigned]	—	The error code of the error that has occurred in the FB is stored.
Cam coordinate number	o_uCamCoordinate Number	Word [Unsigned]	○	The cam coordinate number of the read cam is stored.
Minimum input value	o_dMinInVal	Double word [Signed]	○	The minimum value of the cam data input value (cam axis 1 cycle length) is stored.
Maximum input value	o_dMaxInVal	Double word [Signed]	○	The maximum value of the cam data input value (cam axis 1 cycle length) is stored.
Minimum output value	o_dMinOutVal	Double word [Signed]	○	The minimum value of the cam data output value (cam stroke amount) is stored.
Maximum output value	o_dMaxOutVal	Double word [Signed]	○	The maximum value of the cam data output value (cam stroke amount) is stored.
Cam data	o_stCamData	CamData	○	Refer to the following cam data.

### Cam data (CamData structure)

Name	Label name	Array No.	Data type	Value to be held*1	Description
Input value (Cycle point)	d128InVal_Cycle	[0]	Double word [Signed] (0..127)	○	The first point of the input value (cam axis 1 cycle length) is stored.
		[1]		○	The second point of the input value (cam axis 1 cycle length) is stored.
		⋮		○	⋮
		[127]		○	The 128th point of the input value (cam axis 1 cycle length) is stored.
Output value (Stroke amount)	d128OutVal_Stroke	[0]	Double word [Signed] (0..127)	○	The first point of the output value (cam stroke amount) is stored.
		[1]		○	The second point of the output value (cam stroke amount) is stored.
		⋮		○	⋮
		[127]		○	The 128th point of the output value (cam stroke amount) is stored.

\*1 ○: The value is held after the FB stops. —: The value is cleared after the FB stops.

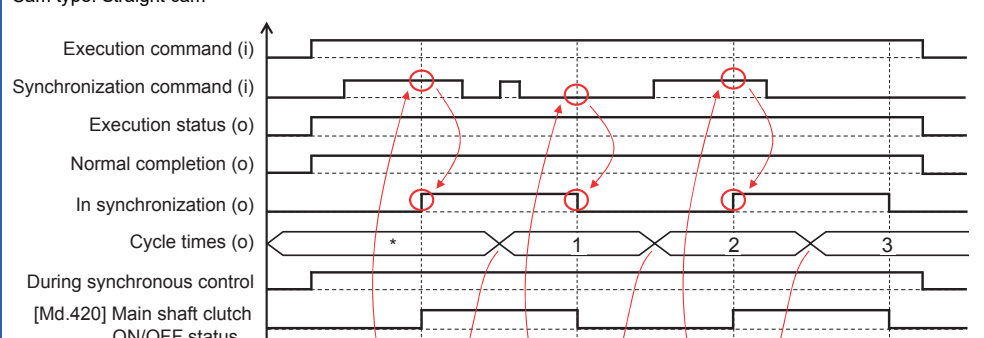
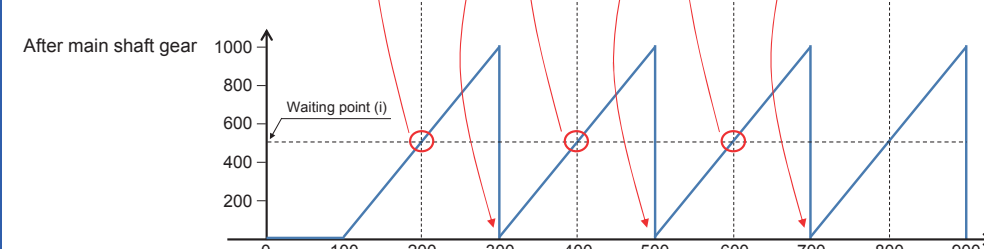
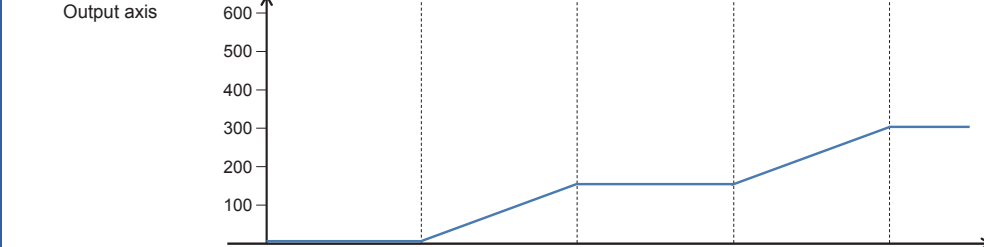
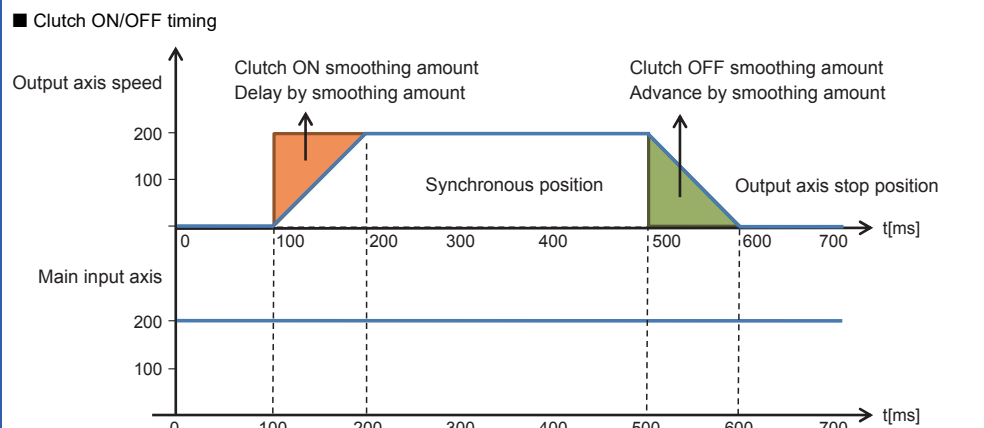
# CtrlOutputAxisSync (Output axis synchronization control)

## Name

CtrlOutputAxisSync

## Function overview


Item	Description																															
Function overview	This FB controls the output axis synchronized with the master axis.																															
Symbol	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="3" style="text-align: center;">CtrlOutputAxisSync</th> </tr> </thead> <tbody> <tr> <td style="text-align: right;">Execution command</td> <td>B: i_bEN</td> <td>o_bENO :B Execution status</td> </tr> <tr> <td style="text-align: right;">Synchronization command</td> <td>B: i_bSyncCommand</td> <td>o_bOK :B Normal completion</td> </tr> <tr> <td style="text-align: right;">Cam No.</td> <td>UW: i_uCamNo</td> <td>o_bError :B Error completion</td> </tr> <tr> <td style="text-align: right;">Waiting point</td> <td>E: i_eWaitingPos</td> <td>o_uErrorID :UW Error code</td> </tr> <tr> <td style="text-align: right;">1 cycle length</td> <td>E: i_eLengthPerCycle</td> <td>o_bInSync :B In synchronization</td> </tr> <tr> <td style="text-align: right;">Cam stroke amount</td> <td>E: i_eStrokeAmount</td> <td></td> </tr> <tr> <td style="text-align: right;">Clutch ON smoothing amount</td> <td>E: i_eClutchOnSmoothingAmount</td> <td></td> </tr> <tr> <td style="text-align: right;">Clutch OFF smoothing amount</td> <td>E: i_eClutchOffSmoothingAmount</td> <td></td> </tr> <tr> <td style="text-align: right;">Output axis setting</td> <td>DUT: i_stOutputAxis</td> <td></td> </tr> </tbody> </table>		CtrlOutputAxisSync			Execution command	B: i_bEN	o_bENO :B Execution status	Synchronization command	B: i_bSyncCommand	o_bOK :B Normal completion	Cam No.	UW: i_uCamNo	o_bError :B Error completion	Waiting point	E: i_eWaitingPos	o_uErrorID :UW Error code	1 cycle length	E: i_eLengthPerCycle	o_bInSync :B In synchronization	Cam stroke amount	E: i_eStrokeAmount		Clutch ON smoothing amount	E: i_eClutchOnSmoothingAmount		Clutch OFF smoothing amount	E: i_eClutchOffSmoothingAmount		Output axis setting	DUT: i_stOutputAxis	
CtrlOutputAxisSync																																
Execution command	B: i_bEN	o_bENO :B Execution status																														
Synchronization command	B: i_bSyncCommand	o_bOK :B Normal completion																														
Cam No.	UW: i_uCamNo	o_bError :B Error completion																														
Waiting point	E: i_eWaitingPos	o_uErrorID :UW Error code																														
1 cycle length	E: i_eLengthPerCycle	o_bInSync :B In synchronization																														
Cam stroke amount	E: i_eStrokeAmount																															
Clutch ON smoothing amount	E: i_eClutchOnSmoothingAmount																															
Clutch OFF smoothing amount	E: i_eClutchOffSmoothingAmount																															
Output axis setting	DUT: i_stOutputAxis																															
Applicable hardware and software	Applicable module	FX5-40SSC-S, FX5-80SSC-S																														
	Applicable CPU	MELSEC iQ-F series																														
	Engineering software	GX Works3																														
Number of steps	2777 steps																															
FB dependence	—																															

Item	Description
Function description	<p>This FB controls the output axis by synchronizing the cam created by the cam generation FB with the main input axis.</p> <ul style="list-style-type: none"> <li>When the current value of the main input axis per cycle is equal to the value of <i>i_eWaitingPos</i> (Waiting point) and <i>i_bSyncCommand</i> (Synchronization command) is on, the clutch turns on from <i>i_eWaitingPos</i> (Waiting point).</li> <li>When the current value of the main input axis per cycle is equal to the value of <i>i_eWaitingPos</i> (Waiting point) and <i>i_bSyncCommand</i> (Synchronization command) is off, the clutch turns off from <i>i_eWaitingPos</i> (Waiting point).</li> <li>The output axis movement amount delays from the main input axis movement amount by <i>i_eClutchOnSmoothingAmount</i> (Clutch ON smoothing amount) and moves by <i>i_eClutchOffSmoothingAmount</i> (Clutch OFF smoothing amount). Change the waiting point as needed.</li> <li>When the clutch turns on during synchronous control, <i>o_bInSync</i> (In synchronization) turns on.</li> </ul> <p>■ Sample data  Cam axis current value per cycle: 1000  Cam stroke amount: 200  Cam type: Straight cam</p>    <p>■ Clutch ON/OFF timing</p>  <p>* (i) ... Input label  (o) ... Output label</p> <ul style="list-style-type: none"> <li>If an error has occurred in the FB, Error turns on and an error code is stored in ErrorID.</li> <li>For details of error codes, refer to "Page 181 List of Error Codes".</li> </ul>

Item	Description
Restrictions and precautions	<ul style="list-style-type: none"> <li>Execute this FB in a fixed cycle execution type program.</li> <li>When the parameter is set as follows, the FB is executed in units of [mm].            "[Pr.1] Unit setting": Other than 0 to 3            "[Pr.300] Servo input axis type": Other than 1 to 4            Control unit of "[Pr.321] Synchronous encoder axis unit setting": Other than 0 to 3            "[Pr.400] Main input axis type": Other than 1 to the maximum number of module axes (servo input axis) and 801 to 804 (synchronous encoder)*1</li> <li>Set the parameters of the "input axis module" used in the synchronous control according to the machine mechanism.            Servo input axis parameters: [Pr.300] to [Pr.304]            Synchronous encoder axis parameters: [Pr.320] to [Pr.329]            Command generation axis parameter: [Pr.340] and [Pr.346]</li> <li>Since the following synchronous parameters used in the synchronous control are set in this FB, input labels, or structure, do not use user programs to set or change them.            "[Pr.405] to [Pr.407], [Pr.409], [Pr.411], [Pr.413], [Pr.414], [Pr.439] to [Pr.441]"</li> <li>To use synchronous parameters in a mechanism, set synchronous encoder axis control data ([Cd.320] to [Cd.325]) by users.</li> <li>This FB performs the main axis clutch control in the address mode and switches the on/off state of the main clutch by changing "[Pr.405] Main shaft clutch control setting".            Setting value of [Pr.405] at clutch ON: H0004            Setting value of [Pr.405] at clutch OFF: H0042</li> <li>This FB use the slippage method (Linear: Input value follow up) as the clutch smoothing method ([Pr.411] = 5).</li> <li>Create "[Cd.380] Synchronous control start" with user programs.*2</li> <li>When Execution command turns off while o_blnSync (In synchronization) is on, the FB turns off the output of o_blnSync while holding the on state of the clutch.</li> <li>Set i_eWaitingPos (Waiting point) not to overlap the synchronous section of the main input axis and output axis.</li> </ul>
Compiling method	Macro type, subroutine type
FB operation type	Real-time execution

\*1 When 201 to 208 (Command generation axis) is set, the FB is executed in units of [mm].

\*2 For details of the synchronous control parameters and control data, refer to the following.

 MELSEC iQ-F FX5 Simple Motion Module User's Manual (Advanced Synchronous Control)

## Labels

### Input labels

Name	Label name	Data type	Read timing*1	Setting range	Description
Execution command	i_bEN	Bit	<input type="checkbox"/>	On, off	On: The FB is activated. Off: The FB is not activated.
Synchronization command	i_bSyncCommand	Bit	<input type="checkbox"/>	On, off	Enable the main axis clutch control. On: The clutch turns on from the waiting point. Off: The clutch turns off to stop at the waiting point.
Cam No.	i_uCamNo	Word [Unsigned]	↑	0 ≤ Cam No. ≤ 256	Set the cam No. of the cam to be used for the output axis. 0: Straight cam 1 to 256: Generation cam
Waiting point	i_eWaitingPos	Single precision real number	<input type="checkbox"/>	Refer to the description.	Set the point where the address clutch turns on or off to the current value per cycle after main shaft gear. <ul style="list-style-type: none"> <li>0.0 ≤ Waiting point ≤ 100000.0 [mm]</li> <li>0.00 ≤ Waiting point ≤ 10000.00 [inch]</li> <li>0.00 ≤ Waiting point ≤ 10000.00 [degree]</li> <li>0 ≤ Waiting point ≤ 9999999 [pulse]</li> </ul> [The unit setting depends on the axis No. setting value in the output axis setting.]
1 cycle length	i_eLengthPerCycle	Single precision real number	↑	Refer to the description.	Set the 1 cycle length of the cam axis. <ul style="list-style-type: none"> <li>0.1 ≤ 1 cycle length ≤ 100000.0 [mm]</li> <li>0.01 ≤ 1 cycle length ≤ 10000.00 [inch]</li> <li>0.01 ≤ 1 cycle length ≤ 10000.00 [degree]</li> <li>1 ≤ 1 cycle length ≤ 9999999 [pulse]</li> </ul> [The unit setting depends on the axis No. setting value in the output axis setting.]

Name	Label name	Data type	Read timing *1	Setting range	Description
Cam stroke amount	i_eStrokeAmount	Single precision real number	↑	Refer to the description.	Set the cam stroke amount corresponding to 100% of the stroke ratio in units of the output axis for the cam control in the stroke ratio data format. (For the cam data in the coordinate data format, an output value of coordinate data will be a cam stroke position.) <ul style="list-style-type: none"> <li>• <math>0.1 \leq \text{Cam stroke amount} \leq 100000.0</math> [mm]</li> <li>• <math>0.01 \leq \text{Cam stroke amount} \leq 10000.00</math> [inch]</li> <li>• <math>0.01 \leq \text{Cam stroke amount} \leq 10000.00</math> [degree]</li> <li>• <math>1 \leq \text{Cam stroke amount} \leq 9999999</math> [pulse]</li> </ul> [The unit setting depends on the axis No. setting value in the output axis setting.]
Clutch ON smoothing amount	i_eClutchOnSmoothing Amount	Single precision real number	↑	Refer to the description.	Set the smoothing amount when the clutch is on. <ul style="list-style-type: none"> <li>• <math>0.0 \leq \text{Clutch ON smoothing amount} \leq 100000.0</math> [mm]</li> <li>• <math>0.00 \leq \text{Clutch ON smoothing amount} \leq 10000.00</math> [inch]</li> <li>• <math>0.00 \leq \text{Clutch ON smoothing amount} \leq 10000.00</math> [degree]</li> <li>• <math>0 \leq \text{Clutch ON smoothing amount} \leq 9999999</math> [pulse]</li> </ul> [The unit setting depends on the axis No. setting value in the output axis setting.]
Clutch OFF smoothing amount	i_eClutchOffSmoothing Amount	Single precision real number	↑	Refer to the description.	Set the smoothing amount when the clutch is off. <ul style="list-style-type: none"> <li>• <math>0.0 \leq \text{Clutch OFF smoothing amount} \leq 100000.0</math> [mm]</li> <li>• <math>0.00 \leq \text{Clutch OFF smoothing amount} \leq 10000.00</math> [inch]</li> <li>• <math>0.00 \leq \text{Clutch OFF smoothing amount} \leq 10000.00</math> [degree]</li> <li>• <math>0 \leq \text{Clutch OFF smoothing amount} \leq 9999999</math> [pulse]</li> </ul> [The unit setting depends on the axis No. setting value in the output axis setting.]
Output axis setting	i_stOutputAxis	AXIS_REF	—	—	Refer to the output axis setting below.

Output axis setting (AXIS\_REF structure)

Name	Label name	Data type	Read timing *1	Setting range	Description
Axis number	wAxisNo	Word [Signed]	↑	$1 \leq \text{Axis No.} \leq \text{maximum number of axes of the module used}$	Set the axis No. of the output axis. The unit setting of the main input axis that drives the output axis is also used for the 1 cycle length and the clutch ON/OFF smoothing amount. The unit setting of the set axis No. is also used for the cam stroke amount.
Unit number	i_wStartIO	Word [Signed]	↑	$1H \leq \text{Unit number} \leq 10H$	Simple Motion unit number

\*1 □: Always, ↑: When the FB is started (cannot be changed)



## ■ Output labels

Name	Label name	Data type	Value to be held*1	Description
Execution status	o_bENO	Bit	—	On: Execution command is on. Off: Execution command is off.
Normal completion	o_bOK	Bit	—	This label indicates that the FB has normally started.
Error completion	o_bError	Bit	—	On: An error has occurred in the FB. Off: No error has occurred.
Error code	o_uErrorID	Word [Unsigned]	—	The error code of the error that has occurred in the FB is stored.
In synchronization	o_bInSync	Bit	—	On: The clutch turns on during synchronous control. Off: The clutch turns off during synchronous control.

\*1 ○: The value will be held after the FB stops. —: The value will be cleared after the FB stops.

# SaveCompensationBuffer (Compensation amount buffer)

## Name

SaveCompensationBuffer

## Function details

Item	Description																																																									
Function overview	This FB stores the input compensation amount and compensation starting point temporarily, and outputs the oldest compensation amount when the axis specified with the output axis setting exceeds the compensation starting point.																																																									
Symbol	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="3" style="text-align: center;">SaveCompensationBuffer</th> </tr> </thead> <tbody> <tr> <td style="text-align: right;">Execution command</td> <td>B: i_bEN</td> <td>o_bENO :B Execution status</td> </tr> <tr> <td style="text-align: right;">Compensation amount</td> <td>D: i_dCompensationAmount</td> <td>o_bBusy :B Executing</td> </tr> <tr> <td style="text-align: right;">Compensation starting point</td> <td>D: i_dCompensationStartPosition</td> <td>o_bError :B Error completion</td> </tr> <tr> <td style="text-align: right;">Mark detection counts</td> <td>UW: i_uMarkDetectCount</td> <td>o_uErrorID :B Error code</td> </tr> <tr> <td></td> <td></td> <td>o_dCompensationAmount :D Compensation amount</td> </tr> <tr> <td style="text-align: right;">Output axis setting</td> <td>DUT: io_stOutputAxis</td> <td>io_stOutputAxis :DUT Output axis setting</td> </tr> </tbody> </table>		SaveCompensationBuffer			Execution command	B: i_bEN	o_bENO :B Execution status	Compensation amount	D: i_dCompensationAmount	o_bBusy :B Executing	Compensation starting point	D: i_dCompensationStartPosition	o_bError :B Error completion	Mark detection counts	UW: i_uMarkDetectCount	o_uErrorID :B Error code			o_dCompensationAmount :D Compensation amount	Output axis setting	DUT: io_stOutputAxis	io_stOutputAxis :DUT Output axis setting																																			
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	Engineering software	GX Works3																																																								
Number of steps	1535 steps																																																									
FB dependence	—																																																									
Function description	<p>This FB stores the input compensation amount and compensation starting point temporarily, and outputs the oldest compensation amount in the stored ones when the compensation starting point is exceeded by the axis set in the output axis setting.</p> <ul style="list-style-type: none"> <li>After i_bEN (Execution command) is turned on, i_dCompensationAmount (Compensation amount) and i_dCompensationStartPosition (Compensation starting point) when i_uMarkDetectCount (Mark detection counts) is changed is stored in the position of the buffer pointer for storing.</li> <li>When "[Md.407] Cam axis current value per cycle" exceeds the compensation starting point, the compensation amount stored in the position of the buffer pointer for storing is output.</li> </ul> <p>■ Operation when the maximum storage number is 4</p> <p>The diagram shows the following data over 6 cycles:</p> <table border="1"> <thead> <tr> <th>Mark detection counts</th> <th>Compensation amount</th> <th>Compensation starting point</th> <th>Buffer pointer for storage</th> <th>[Md.407] Cam axis current value per cycle</th> <th>Compensation amount output</th> <th>Buffer pointer for output</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>1</td> <td>0</td> <td>50</td> <td>1</td> <td>50</td> <td>0</td> <td>1</td> </tr> <tr> <td>2</td> <td>-20</td> <td>330</td> <td>2</td> <td>330</td> <td>0</td> <td>2</td> </tr> <tr> <td>3</td> <td>-10</td> <td>310</td> <td>3</td> <td>310</td> <td>-20</td> <td>3</td> </tr> <tr> <td>4</td> <td>20</td> <td>300</td> <td>3</td> <td>300</td> <td>-10</td> <td>3</td> </tr> <tr> <td>5</td> <td>30</td> <td>320</td> <td>0</td> <td>320</td> <td>20</td> <td>0</td> </tr> <tr> <td>6</td> <td>-10</td> <td>350</td> <td>1</td> <td>350</td> <td>30</td> <td>1</td> </tr> </tbody> </table> <p>● : Compensation starting point</p> <ul style="list-style-type: none"> <li>If an error has occurred in the FB, Error turns on and the error code is stored in ErrorID.</li> <li>Refer to "Page 181 List of Error Codes" for details of error codes.</li> </ul>		Mark detection counts	Compensation amount	Compensation starting point	Buffer pointer for storage	[Md.407] Cam axis current value per cycle	Compensation amount output	Buffer pointer for output	0	0	0	0	0	0	0	1	0	50	1	50	0	1	2	-20	330	2	330	0	2	3	-10	310	3	310	-20	3	4	20	300	3	300	-10	3	5	30	320	0	320	20	0	6	-10	350	1	350	30	1
Mark detection counts	Compensation amount	Compensation starting point	Buffer pointer for storage	[Md.407] Cam axis current value per cycle	Compensation amount output	Buffer pointer for output																																																				
0	0	0	0	0	0	0																																																				
1	0	50	1	50	0	1																																																				
2	-20	330	2	330	0	2																																																				
3	-10	310	3	310	-20	3																																																				
4	20	300	3	300	-10	3																																																				
5	30	320	0	320	20	0																																																				
6	-10	350	1	350	30	1																																																				
Restrictions and precautions	<ul style="list-style-type: none"> <li>To change the maximum storage number, change the number of arrangements for stnBufferData (buffer data) which is a local label of this FB and the value of uBufferNum (maximum storage number) in the program.</li> <li>Adjust the maximum storage number using the maximum number of workpieces to be loaded on a single conveyor as reference.</li> </ul>																																																									
Compiling method	Macro type, subroutine type																																																									
FB operation type	Real-time execution																																																									

## Labels

### Input labels

Name	Label name	Data type	Read timing*1	Setting range	Description
Execution command	i_bEN	Bit	$\square$	ON, OFF	ON: The FB is activated. OFF: The FB is not activated.
Compensation amount	i_dCompensationAmount	Double word [Signed]	$\square$	$-2147483648 \leq$ Compensation amount $\leq$ 2147483647	Enter the output value from the compensation amount calculation FB (PAC_CalcGap or PAC_CalcPhase).
Compensation starting point	i_dCompensationStartPosition	Double word [Signed]	$\square$		
Mark detection counts	i_uMarkDetectCount	Word [Unsigned]	$\square$	$0 \leq$ Mark detection counts $\leq$ 65535 [times] (Ring counter)	Enter o_uMarkDetectCount (Mark detection counts) of STD_ReadMarkDetectDataFB. A compensation amount is calculated at updating this data.

\*1  $\square$ : Always,  $\uparrow$ : When the FB is started (cannot be changed)

### Output labels

Name	Label name	Data type	Value to be held*1	Description
Execution status	o_bENO	Bit	—	ON: Execution command is on. OFF: Execution command is off.
Executing	o_bBusy	Bit	—	This label indicates that the FB is operating.
Error completion	o_bError	Bit	—	ON: An error has occurred in the FB. OFF: No error has occurred.
Error code	o_uErrorID	Word [Unsigned]	—	The error code of the error that has occurred in the FB is stored.
Compensation amount	o_dCompensationAmount	Double word [Signed]	—	The oldest stored compensation amount is stored. Data range: $-2147483648 \leq$ Compensation amount $\leq$ 2147483647 [The unit setting depends on the axis No. setting value of the output axis setting.] ( $10^{-4}$ mm, $10^{-5}$ inch, $10^{-5}$ degree, pulse)

\*1  $\circ$ : The value will be held after the FB stops. —: The value will be cleared after the FB stops.

### I/O labels

Name	Label name	Data type	Read timing*1	Setting range	Description
Output axis setting	io_stOutputAxis	AXIS_REF	—	—	Refer to the output axis setting below.

Output axis setting (AXIS\_REF structure)

Name	Label name	Data type	Read timing*1	Setting range	Description
Axis No.	wAxisNo	Word [Signed]	$\uparrow$	$1 \leq$ Axis No. $\leq$ Maximum number of axes of the module used	Set the axis No. of the output axis. "[Md.407] Cam axis current value per cycle" of the output axis is referred.
Module number	i_wStartIO	Word [Signed]	$\uparrow$	$1H \leq$ Module number $\leq$ 10H	Simple Motion module number

Buffer data (BufferData structure)

Name	Label name	Data type	Value to be held*2	Description
Compensation amount	dCompensationAmount	Double word [Signed]	○	The value of i_dCompensationAmount is stored.
Compensation starting point	dCompensationStartPosition	Double word [Signed]	○	The value of i_dCompensationStartPosition is converted into the value per cycle and stored.
The number of cycles until compensation	uCyclesTillCompensation	Word [Unsigned]	○	The number of cycles required until the compensation starts is calculated from the value of i_dCompensationStartPosition.
Cycle counter value	uCycleCounterValue	Word [Unsigned]	○	The cycle counter value (uCycleCounter) when the mark detection counts is changed is stored.

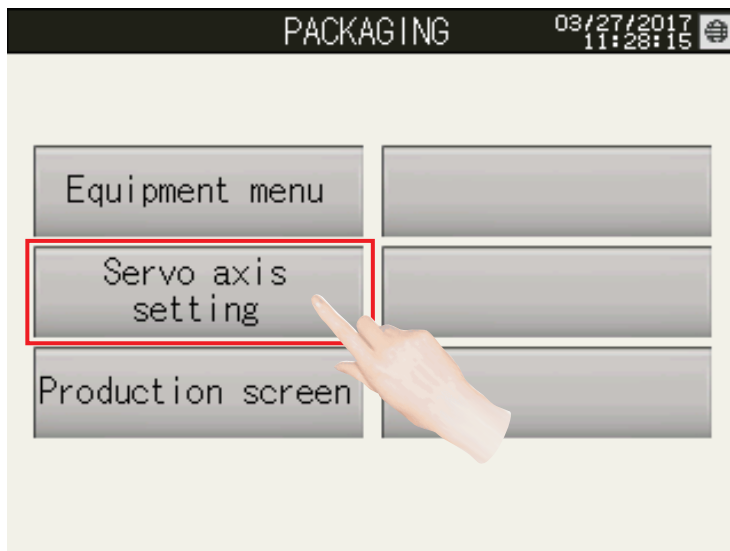
\*1 □: Always, ↑: When the FB is started (cannot be changed)

\*2 ○: The value will be held after the FB stops. —: The value will be cleared after the FB stops.

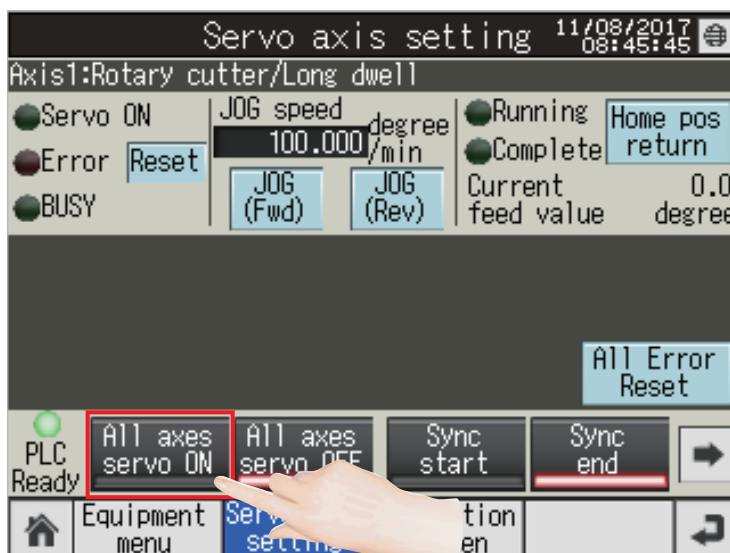
# 5.5 Application Program Example: Operation Procedure

Start the operation with the following procedure.

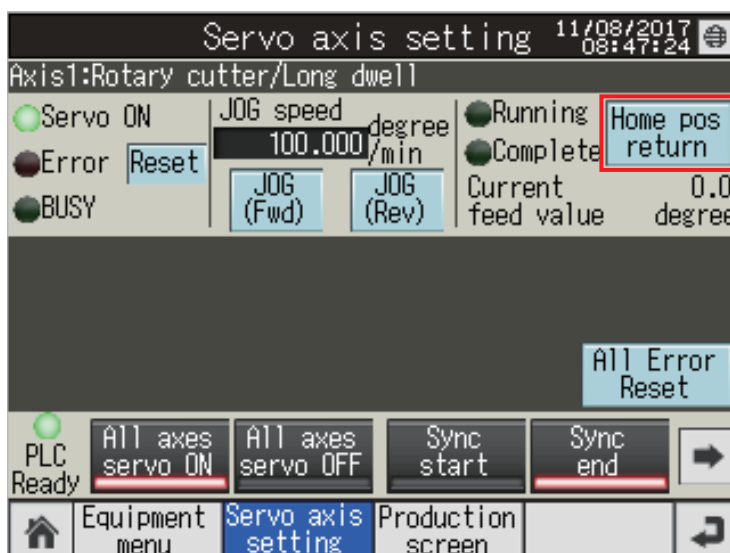
(For the function details of windows, refer to "Page 145 GOT APPLICATION SCREEN EXAMPLES".)



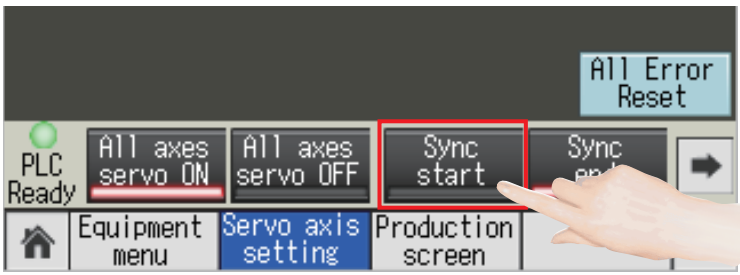
1. Write project data to the PLC CPU and GOT and start the system. Touch [Servo axis setting] to display the servo axis setting screen.



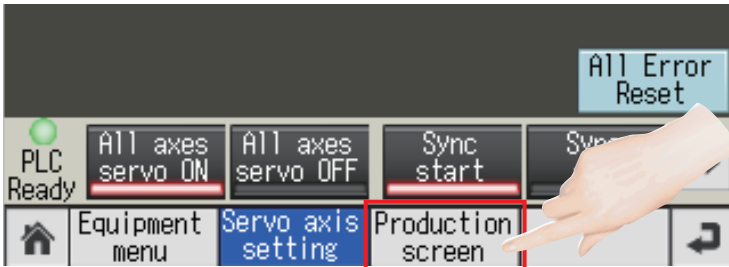
2. Touch the [All axes servo ON] switch. All axes are in the servo-on status.



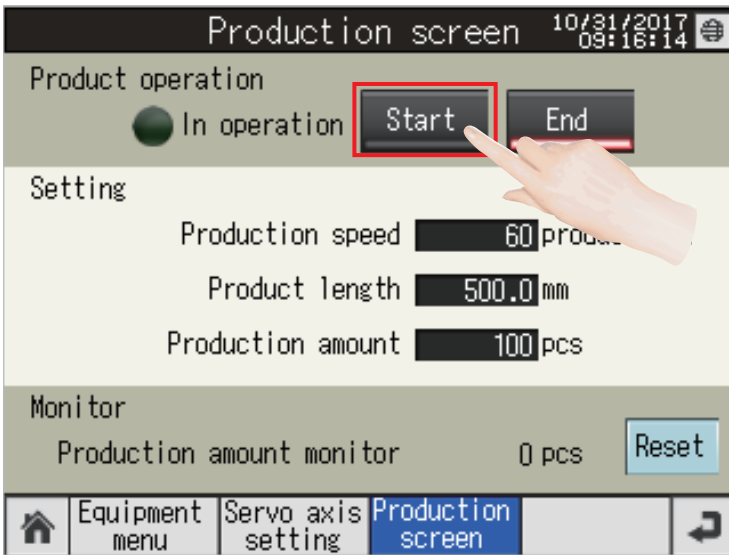
3. When this is the first startup of the system, touch the [Home pos return] switch of each axis and perform home position return operations.



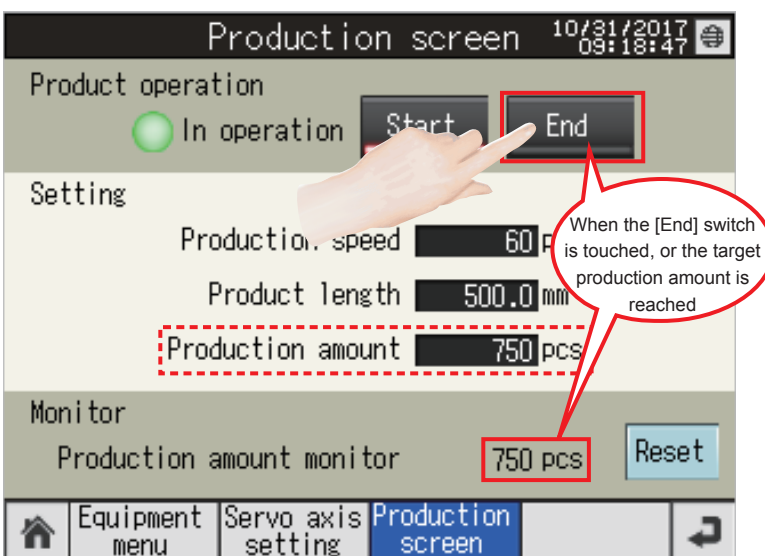
4. Touch the [Sync start] switch. Turning on the synchronization start switch turns each axis to the synchronous control mode. (Caution: Generate a came in the equipment menu before turning the [Sync start] switch ON. Cam generation is not required for the alignment conveyor project.)



5. Switch the screen to the production screen. (Precautions: Set the length per cycle for "Product length" in the alignment conveyor project. The "Production amount monitor" counts the number of updated times of the loading conveyor length per cycle, not the actual production amount.)



6. Touch the [Start] switch and start the operation at the set speed.



7. The operation stops when the [End] switch is touched or the target production amount is reached. (Cycle stop: When using the rotary cutter, the cutter axis stops at the waiting point. When using the long dwell, the D-cam axis stops at the waiting point. When using the alignment conveyor, the conveyor axis stops immediately.)

# 6 GOT APPLICATION SCREEN EXAMPLES

## Precautions

- To utilize these screen examples for an actual system, sufficiently confirm that the screens will not cause system control problems on user's own responsibility. Examine the positions where interlock conditions are required in a target system and add them.
- When the Simple Motion module detects an error or warning in this sample program, the operation suspends control.
- To use the program with unnecessary screens erased, change the screen number of the switching destination screen as necessary.
- There are slight differences in color and layout between the actual screens and the screens described in this manual.

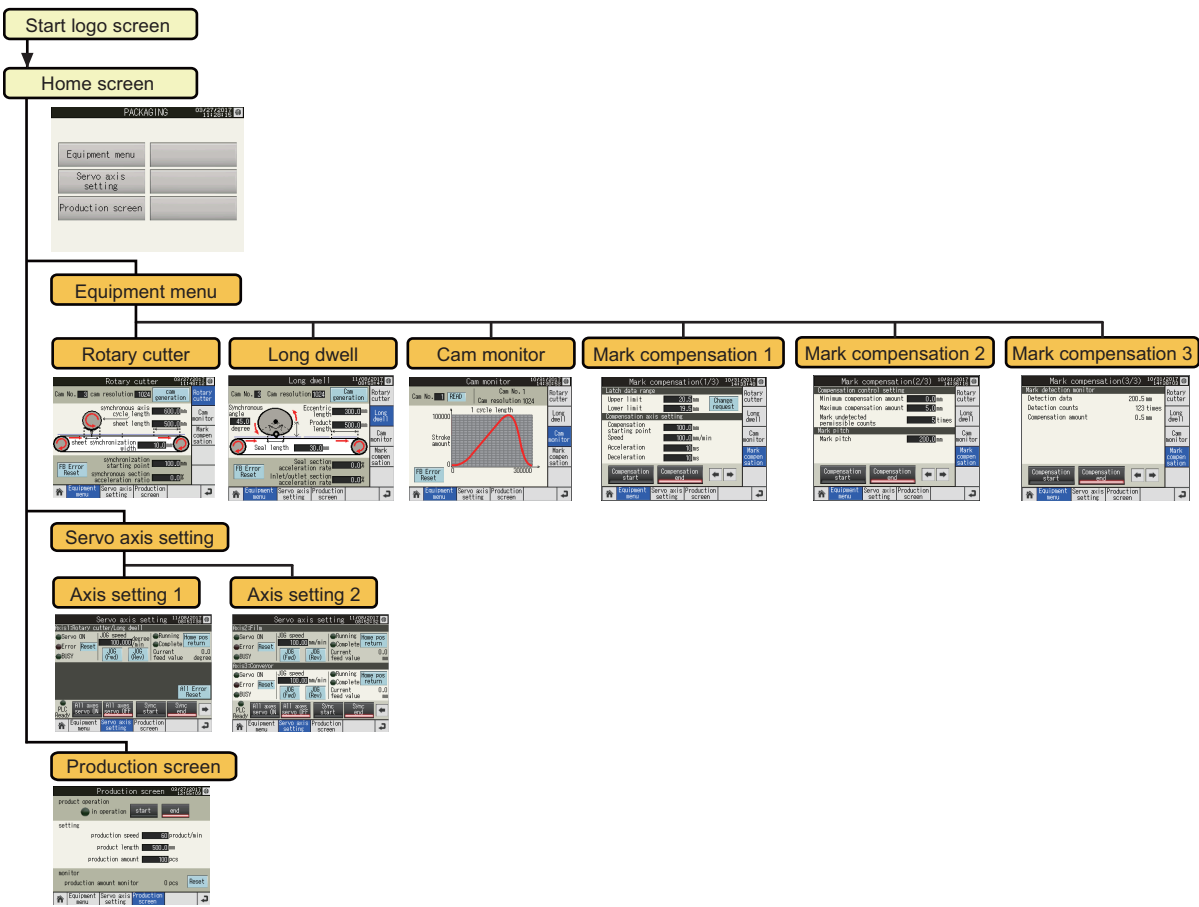
## 6.1 Screen Layout

### Screen transition (All screens)

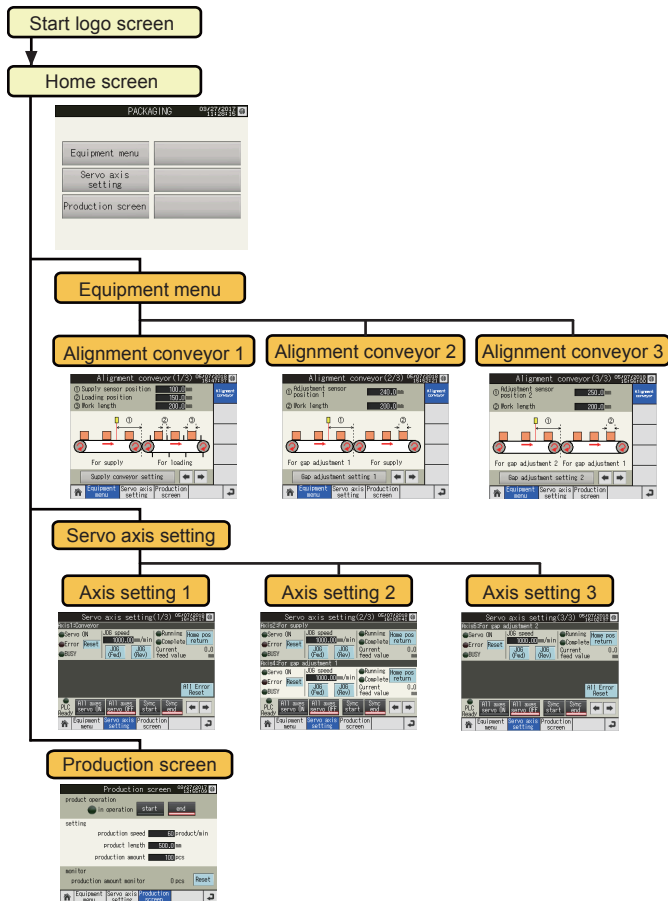
The following shows the screen transition of all screens.

- When a GOT is started, the start logo screen appears first. For details, refer to "Page 152 Start logo screen".
- After the start logo screen has appeared, the Home screen appears. However, when the GOT is started for the first time, the Language Setting window screen appears after the start logo screen has appeared. For details of the operation of when the GOT is started for the first time, refer to "Page 152 Operation to be performed when the GOT is started for the first time".
- For the screen transition common in all screens, refer to "Page 146 Screen transition (Common)".

### Rotary cutter/long dwell



# Alignment conveyor

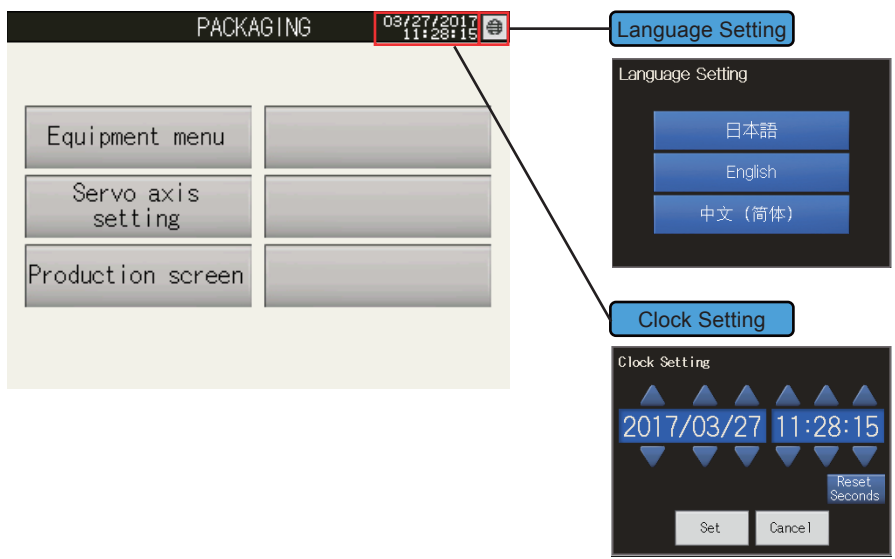


**Point** When a window screen has been displayed and the screen is switched to another main screen, the window screen will be closed and switched to the touched main screen.

## Screen transition (Common)

The following shows the screen transition common in all screens.

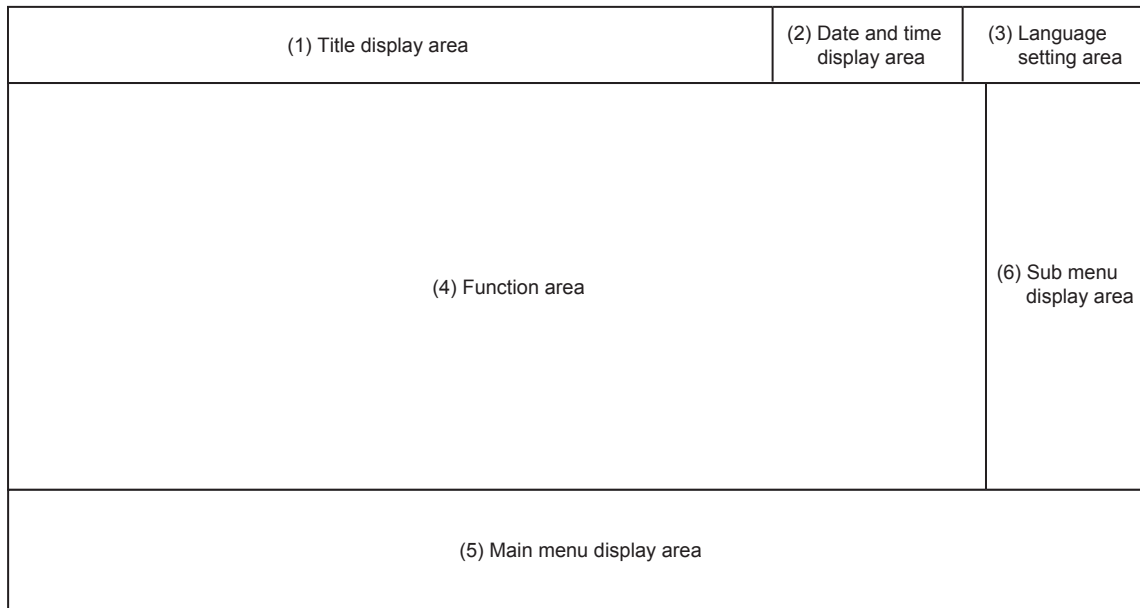
- Touching the globe mark switch displays the Language Setting window screen for language switching.
- Touching the date and time display area displays the Clock Setting window screen.





## 6.2 Basic Screen Layout

The following shows the basic layout of a main screen.



**(1) Title display area**

Displays the title bar.

For details, refer to "Page 149 Title bar".

**(2) Date and time display area**

Displays the current date (upper side) and time (lower side). Touching this display area displays the Clock Setting window screen.

For details of the Clock Setting window screen, refer to "Page 152 Clock Setting window screen".

**(3) Language setting area**

Touching the globe mark switch displays the Language Setting window screen.

For details of the Language Setting window screen, refer to "Page 151 Language Setting window screen".

**(4) Function area**

Displays the screen of each function.

For details, refer to "Page 153 Base Screen".

**(5) Main menu display area**

Displays the screen transition switches to display each main screen.

For details of the main menu switches, refer to "Page 149 Main menu".

**(6) Sub menu display area**

Displays the screen transition switches to display each sub screen.

For details of the sub menu switches, refer to "Page 150 Sub menu".

## 6.3 Description of Common Items


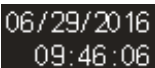
### Descriptions of character colors

The following table lists colors used for numerical values and characters displayed as setting values or current values.

Character colors	Background colors	Description	Application example
White	Black	Displays target data values. The values can be changed using the key windows to be displayed when the display area is touched.	production amount <b>10000</b> pcs
Black	—	Displays target data values. The values cannot be changed.	current feed value 1000.0 mm

### Switch

The following table lists switches used in common.

Display	Details
	Touch this switch to display the Language Setting window screen.
	Touch this switch to display the Clock Setting window screen.

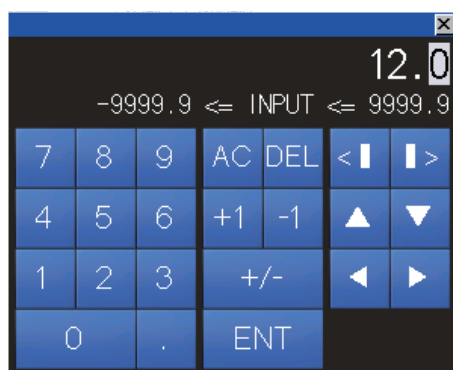
### Key window

Use the following user creation key windows for inputting numerical values.

Object	Type of key window	Window screen
Numerical value input	Decimal key window	W-30010

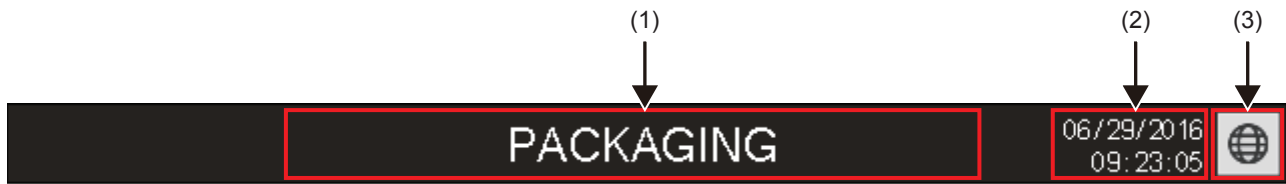
#### Numerical value input (Decimal key window)

Numerical values can be input using the numeric keypad. The input range is displayed at the bottom of the input value area.



## Title bar

The title bar is displayed as follows in all screens.

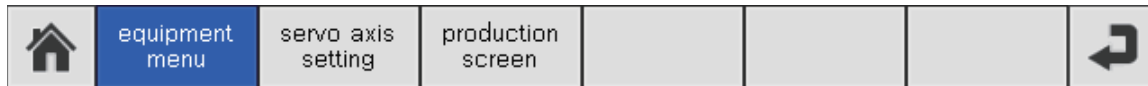


- The title of the currently-displayed screen is displayed in (1).
- The date and time are displayed in (2). When the date and time display area is touched, the Clock Setting window screen appears. On the window screen, year, month, date, hour, minute, and second can be changed. For details of the Clock Setting window screen, refer to "Page 152 Clock Setting window screen".
- Touching the globe mark switch in (3) displays the Language Setting window screen. The display language can be switched. For details of the Language Setting window screen, refer to "Page 151 Language Setting window screen".




## Main menu

Touching a switch with a main screen name jumps to the corresponding screen. The blue switch indicates the screen being displayed.

<Main menus>





<List of switches>

Switch	Description
	Touch this switch to return to the home screen.
	Touch this switch to jump to each screen. When a switch other than the one of the screen being displayed is touched, the switch color changes to blue and the screen of the touched switch is displayed.
	Touch this switch to return to the previous screen. Up to 10 previous screens are kept in the screen history.

# Sub menu

After switching to the equipment menu screen, touching a switch with a sub screen name jumps to the corresponding screen. The blue switch indicates the screen being displayed.

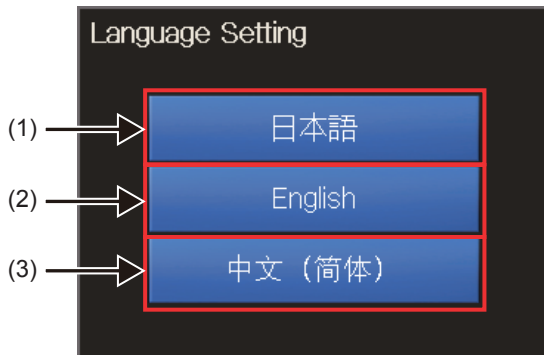
Switch	Description
Rotary cutter/long dwell 	Touch this switch to jump to each screen. When a switch other than the one of the screen being displayed is touched, the switch color changes to blue and the screen of the touched switch is displayed.
Alignment conveyor 	

## Window screens common in all screens

The following explains window screens common in all screens.

### Language Setting window screen

Switches the language displayed in the screen.



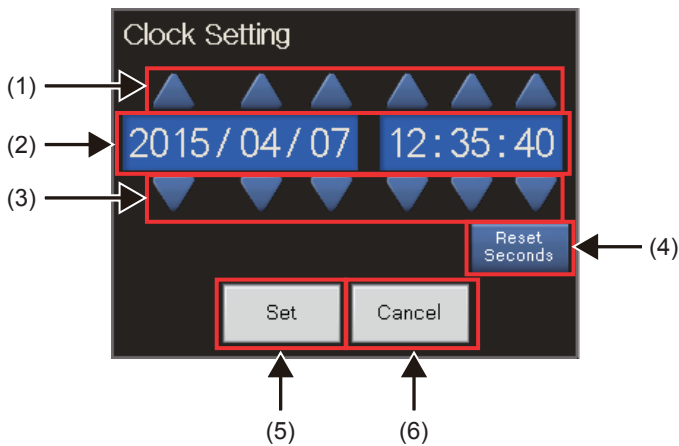
- (1) Touch this switch to switch the language to Japanese.
- (2) Touch this switch to switch the language to English.
- (3) Touch this switch to switch the language to Chinese (Simplified).

#### Point

While the Language Setting window screen is being displayed, switches in the main screen cannot be operated.

## Clock Setting window screen

Changes the current date and time.



(1) Date/time data addition switch

Touching an addition switch (year, month, date, hour, minute, second) adds one to each value.

(2) Date and time setting

Sets the date and time (year, month, date, hour, minute, and second).

The following shows the input range of each item.

- Year: 2000 to 2099, Month: 01 to 12, Date: 01 to 31
- Hour: 00 to 23, Minute: 00 to 59, Second: 00 to 59

(3) Date/time data subtraction switch

Touching a subtraction switch (year, month, date, hour, minute, and second) subtracts one from each value.

(4) 0 Set switch

Sets 0 for second.

(5) [Set] switch

Touching this switch sets the current date and time and closes the window screen.

(6) [Cancel] switch

Touching this switch closes the window screen without reflecting the set date and time.

### Point

If setting the date and time that does not exist in the date and time setting (Ex: 2015/2/30) is attempted, touching the [Set] switch closes the window screen without reflecting the set date and time.

## 6.4 When the GOT is Started

### Start logo screen

In the start logo screen that is to be displayed when the GOT is started, the iQ Monozukuri logo appears at the center of the screen.

### Operation to be performed when the GOT is started for the first time

When the GOT is started for the first time, the Language Setting window screen appears after the start logo screen has appeared. Select a language.

For details of the Language Setting window screen, refer to "Page 151 Language Setting window screen".

## 6.5 Base Screen

The following table lists base screens.

### Rotary cutter/long dwell (AP20-PAC004AA-GT2105Q.GTX)

Screen No.	Screen title	Description	Reference
30000	Home	Home screen	Page 154
30050	Header	Title bar	Page 149
30051	Footer	Main menu	—
30061	Sub menu 1	Sub menu	—
30100	Rotary cutter	Rotary cutter screen	Page 155
30101	Long dwell	Long dwell screen	Page 157
30110	Cam monitor	Cam monitor screen	Page 159
30120	Mark compensation1	Mark compensation screen 1	Page 160
30121	Mark compensation2	Mark compensation screen 2	Page 160
30122	Mark compensation3	Mark compensation screen 3	Page 160
30200	Servo axis setting1	Servo axis setting 1 screen	Page 170
30201	Servo axis setting2	Servo axis setting 2 screen	Page 170
30300	Production screen	Production screen	Page 174

### Alignment conveyor (AP20-PAC004AA-GT2105Q\_AlignmentConveyor.GTX)

Screen No.	Screen title	Description	Reference
30000	Home	Home screen	Page 154
30050	Header	Title bar	Page 149
30051	Footer	Main menu	—
30061	Sub menu 1	Sub menu	—
30130	Alignment conveyor 1	Alignment conveyor 1	Page 164
30131	Alignment conveyor 2	Alignment conveyor 2	Page 164
30132	Alignment conveyor 3	Alignment conveyor 3	Page 164
30200	Servo axis setting1	Servo axis setting 1 screen	Page 170
30201	Servo axis setting2	Servo axis setting 2 screen	Page 170
30202	Servo axis setting3	Servo axis setting 3 screen	Page 170
30300	Production screen	Production screen	Page 174

## Home screen

After the GOT is started, the Home screen appears first. Touch a switch to switch the screen to each screen.



(1) Title bar

In the Home screen, the application package name, "PACKAGING" is displayed at the center of the title bar.

(2) Equipment menu switch

Touch this switch to switch the screen to the "Rotary cutter" screen.

(3) Servo axis setting switch

Touch this switch to switch the screen to the "Servo axis setting 1" screen.

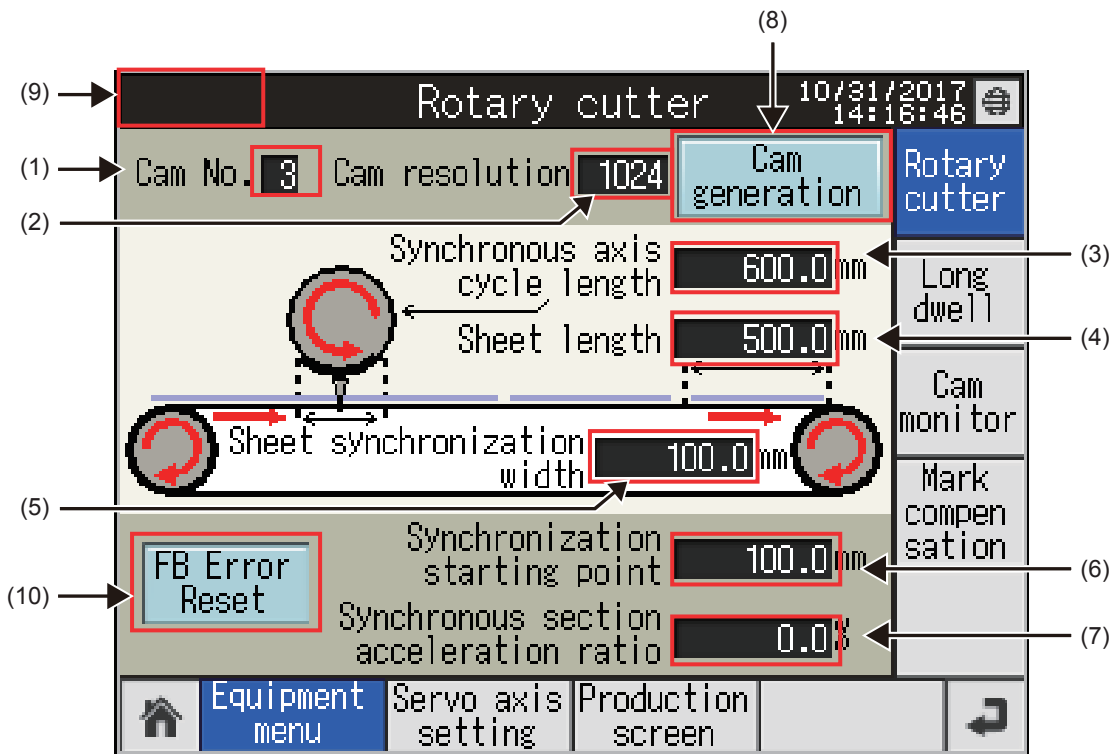
(4) Production screen switch

Touch this switch to switch the screen to the "Production screen".



## Equipment menu Rotary cutter screen

Set parameters to generate cam patterns for the rotary cutter.



### Rotary cutter cam setting

(1) Cam No.

Set the number of the cam to be generated for the rotary cutter.

(2) Cam resolution

Set the resolution of the cam to be generated for the rotary cutter.

(3) Synchronous axis cycle length

Set the cycle length of the rotary cutter.

(4) Sheet length

Set the sheet length (cutting length).

(5) Sheet synchronization width

Set the synchronization length of the sheet.

(6) Synchronization starting point

Set the length between the start of the sheet and synchronization start section.

(7) Synchronous section acceleration ratio

Set this item when the fine adjustment of the synchronous speed in the synchronous section is required.


"Synchronous section speed = Synchronous speed × (100% + Acceleration ratio)"

## Rotary cutter cam generation

(8) Cam generation switch

Touching this switch generates cam data according to the setting values on the screen.

(9) Function block error display

Display	Description
	"FB ERR" is displayed when an error has occurred in the function block.

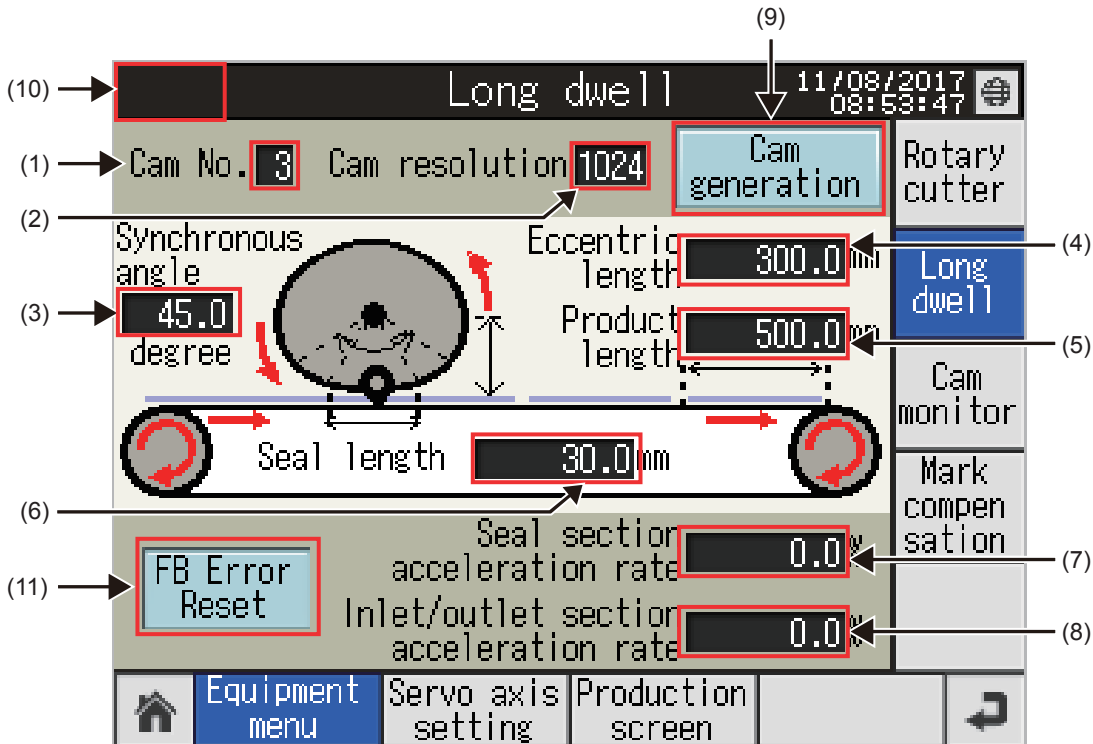
(10) FB Error Reset

Touching this switch resets function block errors.

When an error occurs in CtrlOutputAxisSync (Output axis synchronized control), synchronization control is released via a reset operation.

## Equipment menu Long dwell screen

Set parameters to generate cam patterns for the long dwell.



### Long dwell cam setting

(1) Cam No.

Set the number of the cam to be generated for the long dwell.

(2) Cam resolution

Set the resolution of the cam to be generated for the long dwell.

(3) Synchronous angle

Set the angle including the seal section and inlet/outlet section.

(4) Eccentric length

Set the distance from the center of the seal section to the center of the circle.

(5) Product length

Set the product length.

(6) Seal length

Set the seal section length.

(7) Seal section acceleration rate

Set this item when fine adjustment of the synchronous speed in the sealing section is required.

"Synchronous section speed = Synchronous speed × (100% + Acceleration ratio)"

(8) Inlet/outlet section acceleration rate

Set this item when the fine adjustment of the synchronous speed in the inlet/outlet section is required.


"Synchronous section speed = Synchronous speed × (100% + Acceleration ratio)"

## Long dwell cam generation

(9) Cam generation switch

Touching this switch generates cam data according to the setting values on the screen.

(10) Function block error display

Display	Description
 A black rectangular box with the text "FB ERR" in red, bold, sans-serif font.	"FB ERR" is displayed when an error has occurred in the function block.

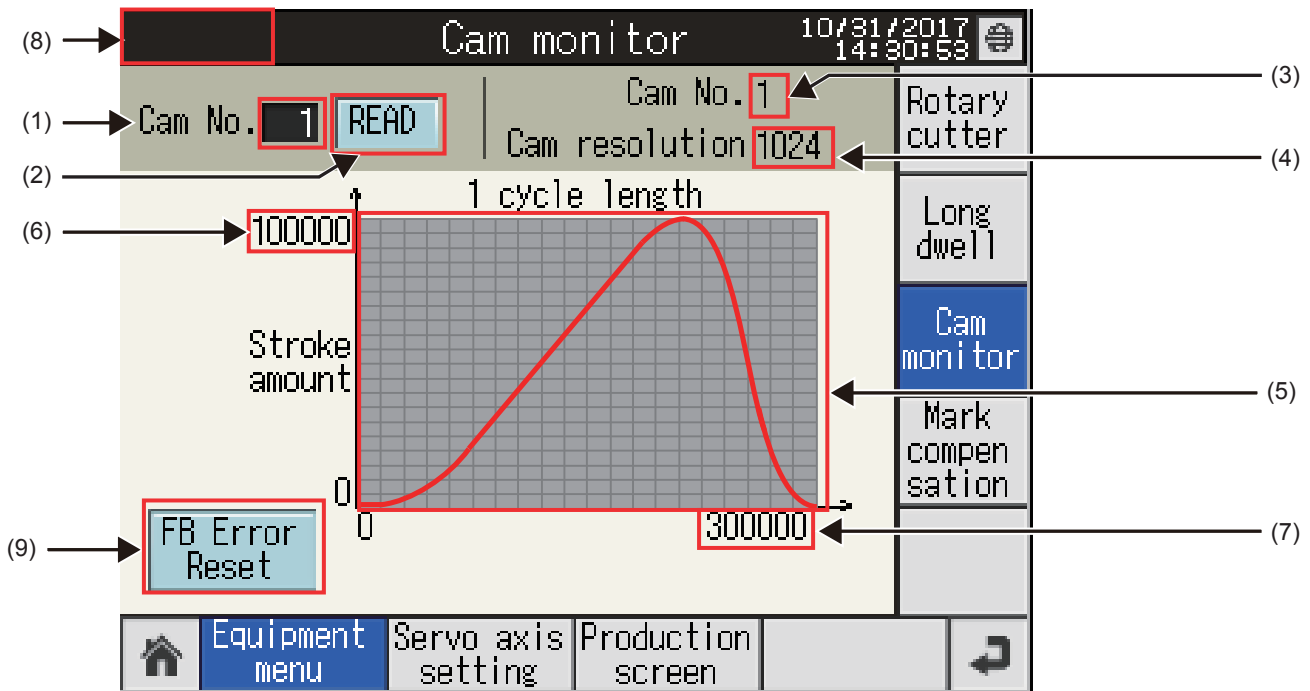
(11) FB error reset

Touching this switch resets function block errors.

When an error occurs in CtrlOutputAxisSync (Output axis synchronized control), synchronization control is released via a reset operation.

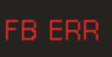
# Equipment menu Cam monitor screen

This screen displays read cam pattern of the specified cam No.



## Cam monitor

- (1) Cam No.  
Set the cam No. of the cam pattern to be monitored.
- (2) READ switch  
Touching this switch reads the cam data of the specified cam No.
- (3) Cam No.  
Cam No. of the read cam data
- (4) Cam resolution  
Cam resolution of the read cam data
- (5) Cam pattern display  
Waveform of the stroke coordinates of the read cam data
- (6) Stroke amount display  
Maximum stroke amount of the read cam data
- (7) 1 cycle length display  
1 cycle length of the read cam data
- (8) Function block error display

Display	Description
	"FB ERR" is displayed when an error has occurred in the function block.

- (9) FB Error Reset  
Touching this switch resets function block errors.  
When an error occurs in CtrlOutputAxisSync (Output axis synchronized control), synchronization control is released via a reset operation.

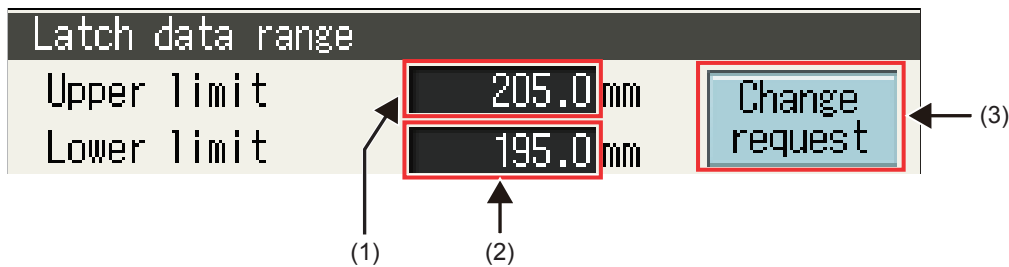
## Equipment menu Mark compensation screen

On this screen, users can set parameters, start/stop the mark compensation control, and monitor detection data.

<Mark compensation screen 1>



### Latch data range



(1) Upper limit

Set the upper limit value of the mark detection range.

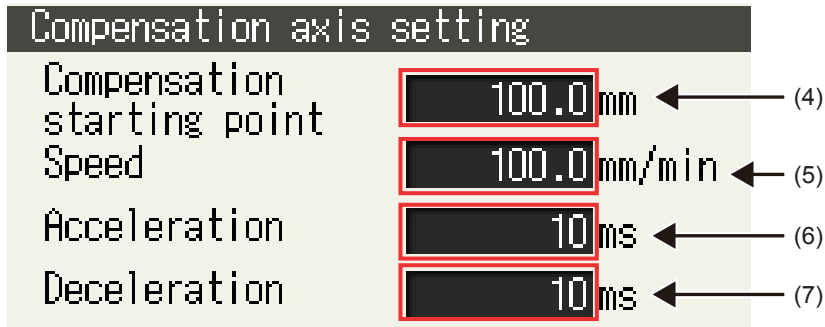
(2) Lower limit

Set the lower limit value of the mark detection range.

(3) Change request switch

Touching this switch changes the latch data range with the new setting values.

## Compensation axis setting



(4) Compensation starting point

Set the point to start the mark compensation in one cycle.

(5) Speed

Set the positioning speed at compensation.

(6) Acceleration

Set the positioning acceleration time at compensation.

(7) Deceleration

Set the positioning deceleration time at compensation.

## Compensation start/Compensation end



(8) Compensation start switch

Touching this switch starts the mark compensation control.

(9) Compensation end switch

Touching this switch stops the mark compensation control.

## Error display



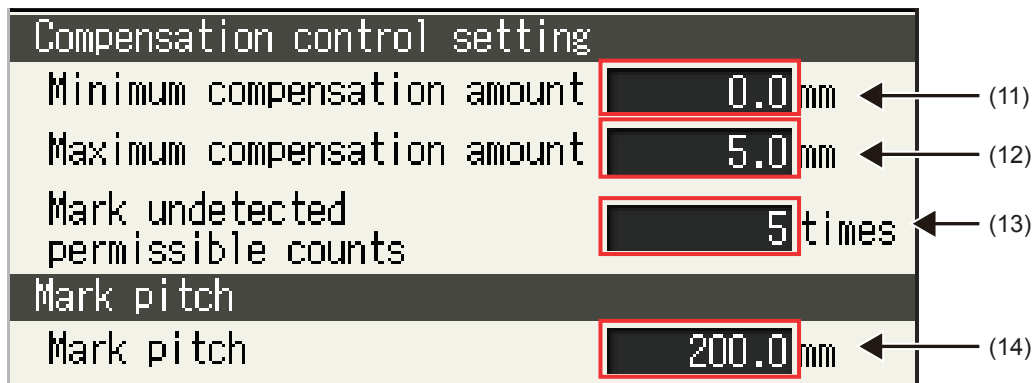
(10) Function block error display

Display	Description
FB ERR	"FB ERR" is displayed when an error has occurred in the function block.

<Mark compensation screen 2>



### Compensation control setting



(11) Minimum compensation amount

Set the lower limit value of the compensation range.

(12) Maximum compensation amount

Set the upper limit value of the compensation range.

(13) Mark undetected permissible counts

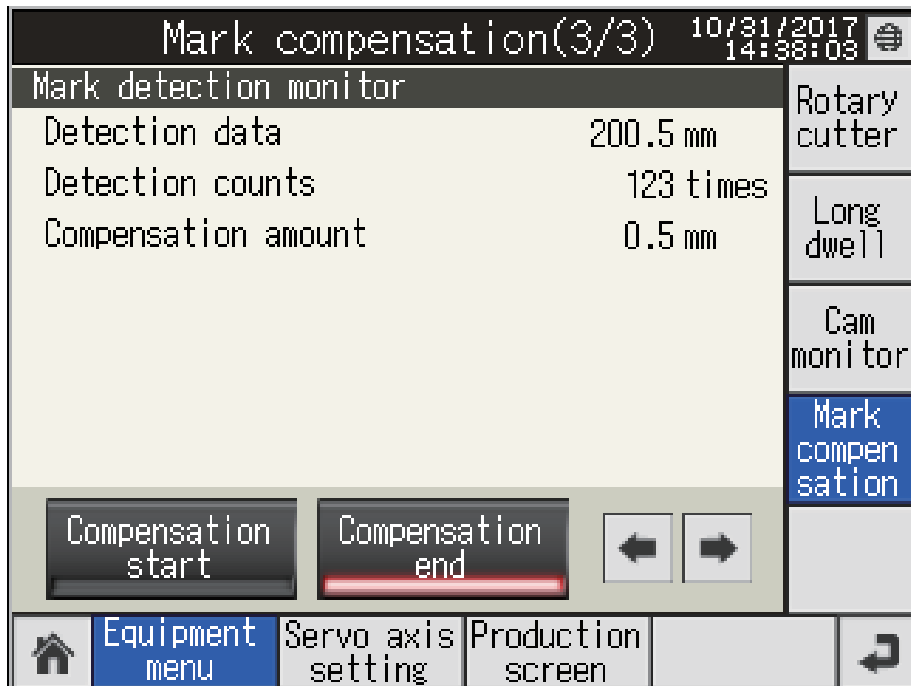
Set the permissible value of the mark undetected counts.

(14) Mark pitch

Set the distance between marks.

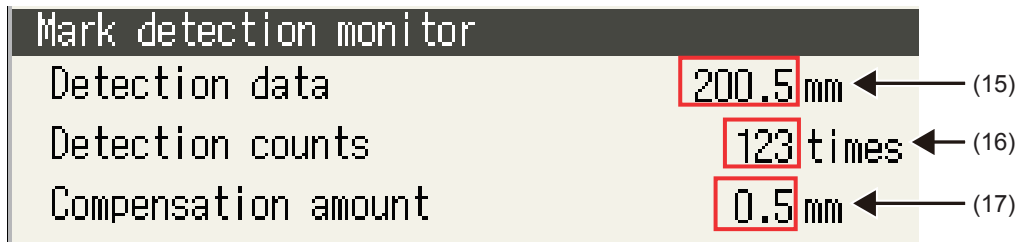


<Mark compensation screen 3>



6

### Mark detection monitor



(15) Detection data

Latch data at mark detection

(16) Detection counts

Counts of mark detections

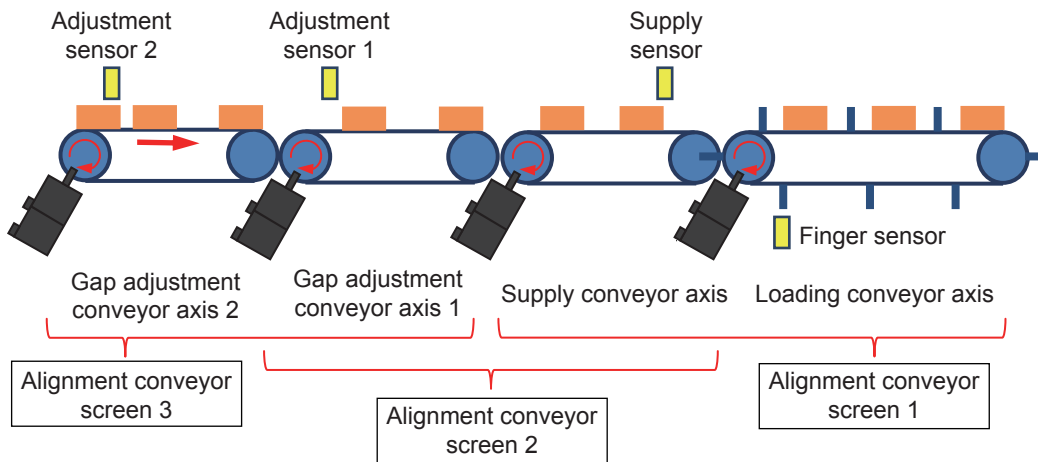
(17) Compensation amount

Compensation amount calculated from the mark detection data

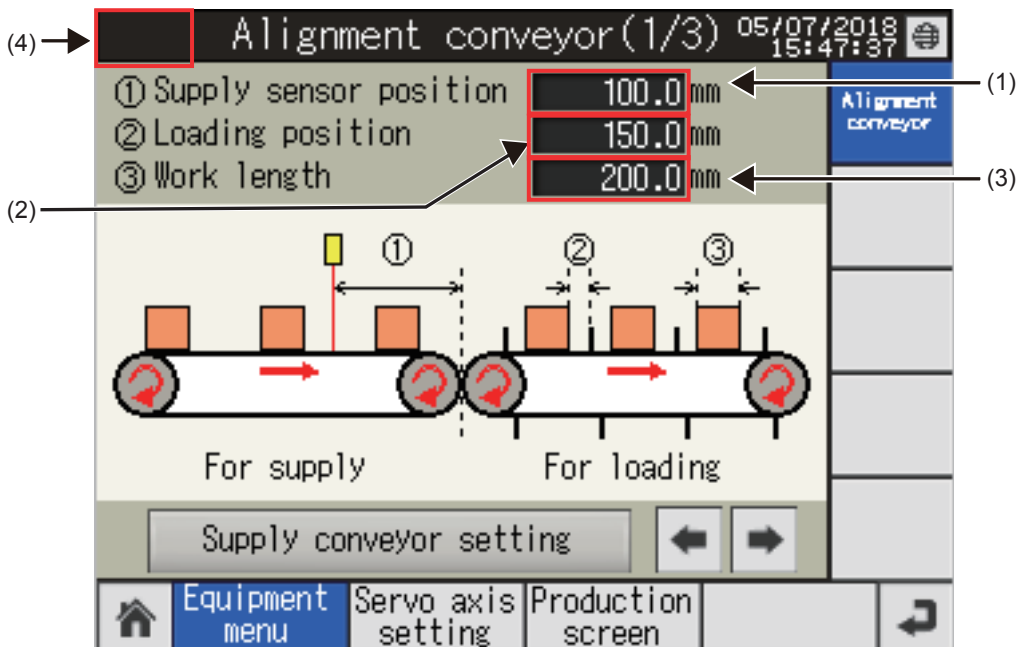
# Equipment menu Alignment conveyor screen

Set parameters of the sensor position and work length of the alignment conveyor, and the compensation control of the conveyor.

The screen settings are provided on the assumption of the following equipment configuration.



<Alignment conveyor screen 1>



## Equipment setting

(1) 1) Supply sensor position

Set the distance between the supply conveyor end and work detection sensor.

(2) 2) Loading position

Set the distance between the finger edge and work edge on the loading conveyor.

(3) 3) Work length

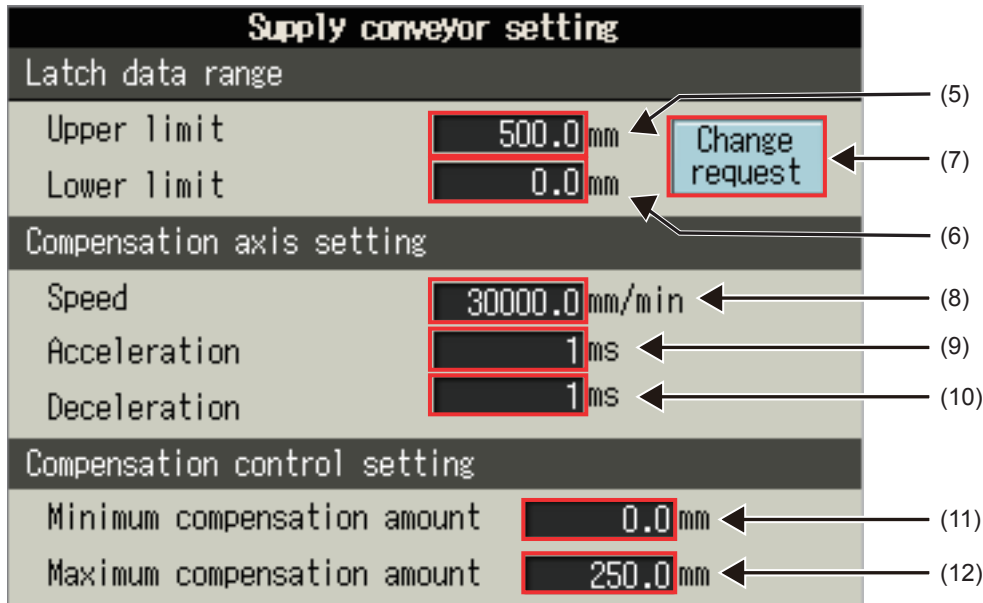
Set the work length.

## Error display

(4) Function block error display

Display	Description
	"FB ERR" is displayed when an error has occurred in the function block.

## Supply conveyor setting



### ■Latch data range

(5) Upper limit

Set the upper limit value of the mark detection range.

(6) Lower limit

Set the lower limit value of the mark detection range.

(7) Change request switch

Touching this switch changes the latch data range with the new setting values.

### ■Compensation axis setting

(8) Speed

Set the speed at compensation.

(9) Acceleration

Set the acceleration time at compensation.

(10) Deceleration

Set the deceleration time at compensation.

### ■Compensation control setting

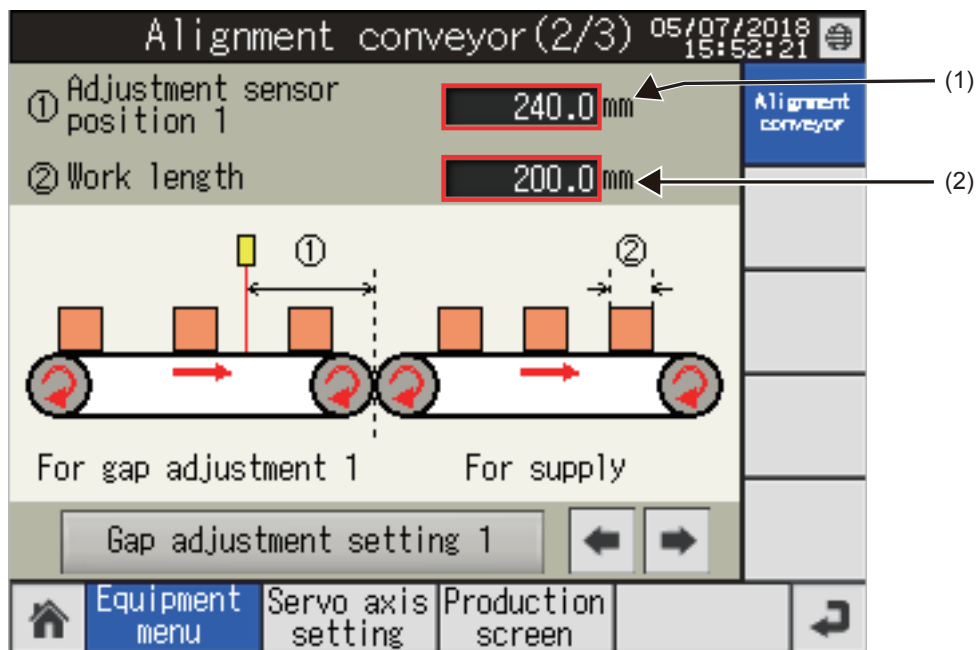
(11) Minimum compensation amount

Set the minimum value of the compensation amount at compensation.

(12) Maximum compensation amount

Set the maximum value of the compensation amount at compensation.

<Alignment conveyor screen 2>



## Equipment setting

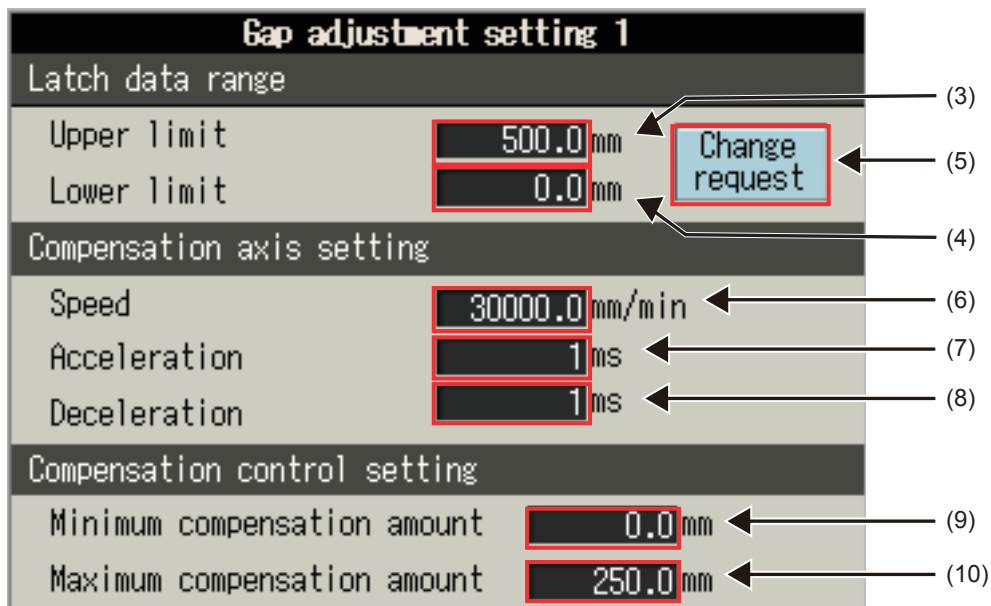
(1) 1) Adjustment sensor position

Set the distance between the gap adjustment conveyor 1 end and work detection sensor.

(2) 2) Work length

Set the work length.

## Gap adjustment conveyor 1 setting



### ■Latch data range

(3) Upper limit

Set the upper limit value of the mark detection range.

(4) Lower limit

Set the lower limit value of the mark detection range.

(5) Change request switch

Touching this switch changes the latch data range with the new setting values.

### ■Compensation axis setting

(6) Speed

Set the speed at compensation.

(7) Acceleration

Set the acceleration time at compensation.

(8) Deceleration

Set the deceleration time at compensation.

### ■Compensation control setting

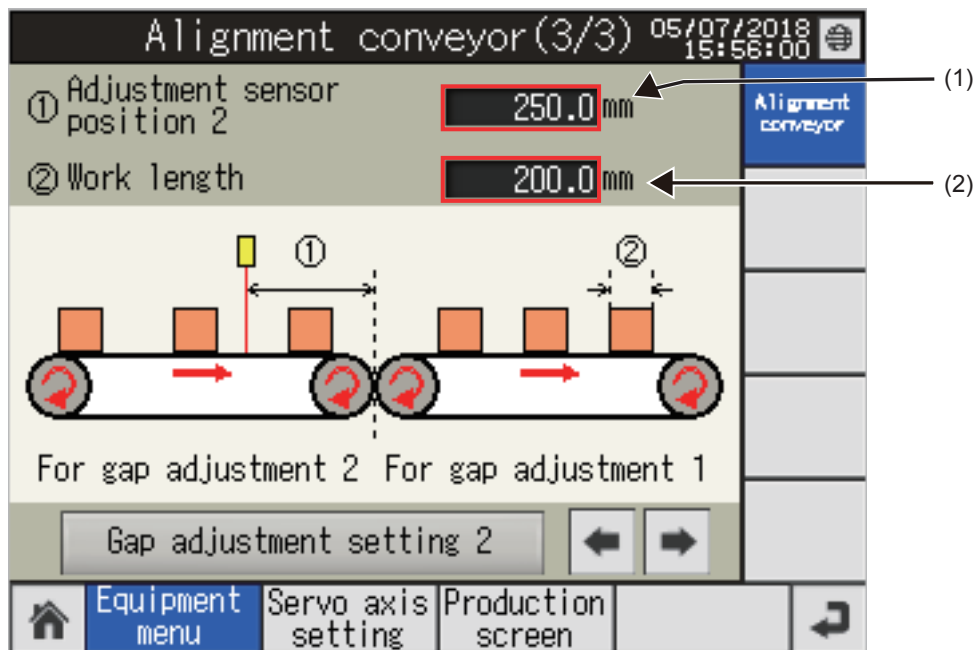
(9) Minimum compensation amount

Set the minimum value of the compensation amount at compensation.

(10) Maximum compensation amount

Set the maximum value of the compensation amount at compensation.

<Alignment conveyor screen 3>



## Equipment setting

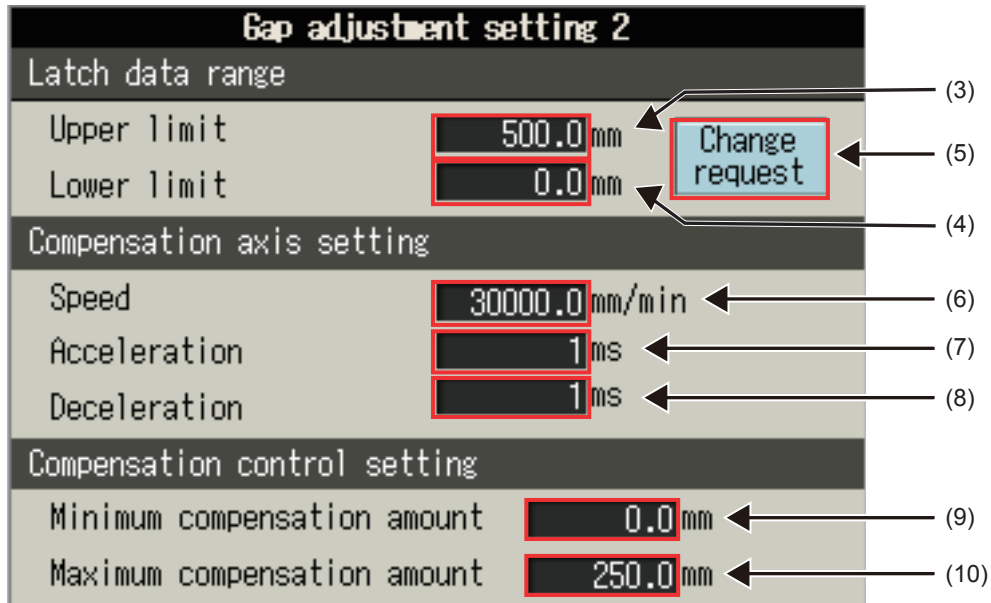
(1) 1) Adjustment sensor position

Set the distance between the gap adjustment conveyor 2 end and work detection sensor.

(2) 2) Work length

Set the work length.

## Gap adjustment conveyor 2 setting



### ■Latch data range

(3) Upper limit

Set the upper limit value of the mark detection range.

(4) Lower limit

Set the lower limit value of the mark detection range.

(5) Change request switch

Touching this switch changes the latch data range with the new setting values.

### ■Compensation axis setting

(6) Speed

Set the speed at compensation.

(7) Acceleration

Set the acceleration time at compensation.

(8) Deceleration

Set the deceleration time at compensation.

### ■Compensation control setting

(9) Minimum compensation amount

Set the minimum value of the compensation amount at compensation.

(10) Maximum compensation amount

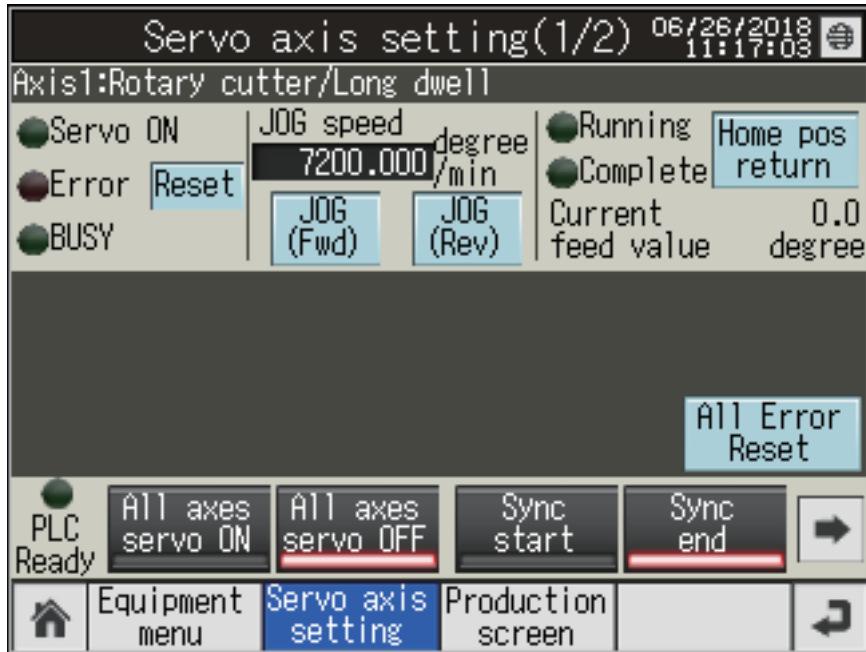
Set the maximum value of the compensation amount at compensation.

# Servo axis setting screen

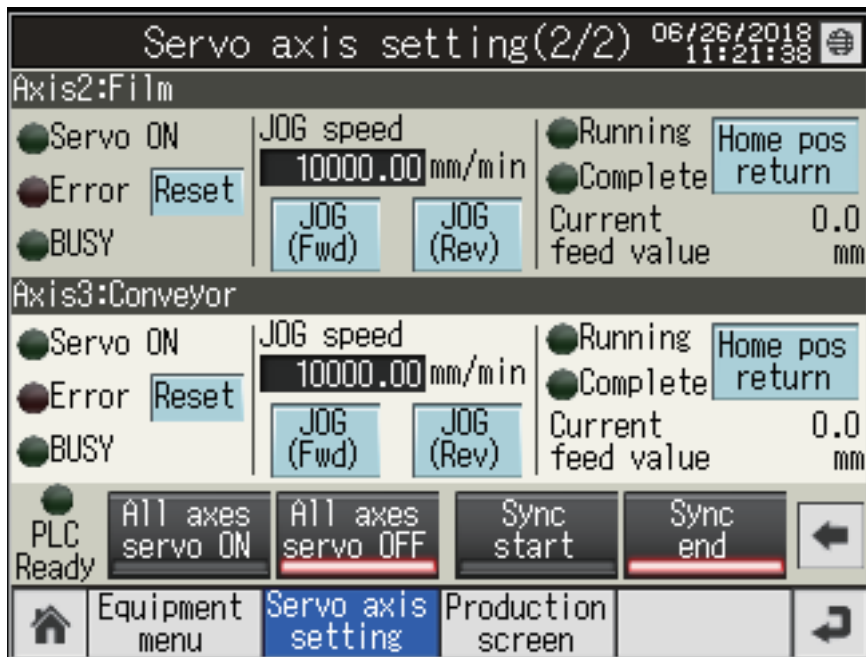
On this screen, users can start JOG operation and home position return and reset errors of each servo axis.

## Rotary cutter/long dwell

<Servo axis setting screen 1>



<Servo axis setting screen 2>





## Alignment conveyor

<Servo axis setting screen 1>

Servo axis setting(1/3) 05/07/2018 16:26:17

Axis1:Conveyor

Servo ON  
 Error   
 BUSY

JOG speed: 1000.00 mm/min

Running   
 Complete  
 Current feed value: 0.0 mm

PLC Ready

Equipment menu  Production screen

<Servo axis setting screen 2>

Servo axis setting(2/3) 05/07/2018 16:03:41

Axis2:For supply

Servo ON  
 Error   
 BUSY

JOG speed: 1000.00 mm/min

Running   
 Complete  
 Current feed value: 0.0 mm

Axis4:For gap adjustment 1

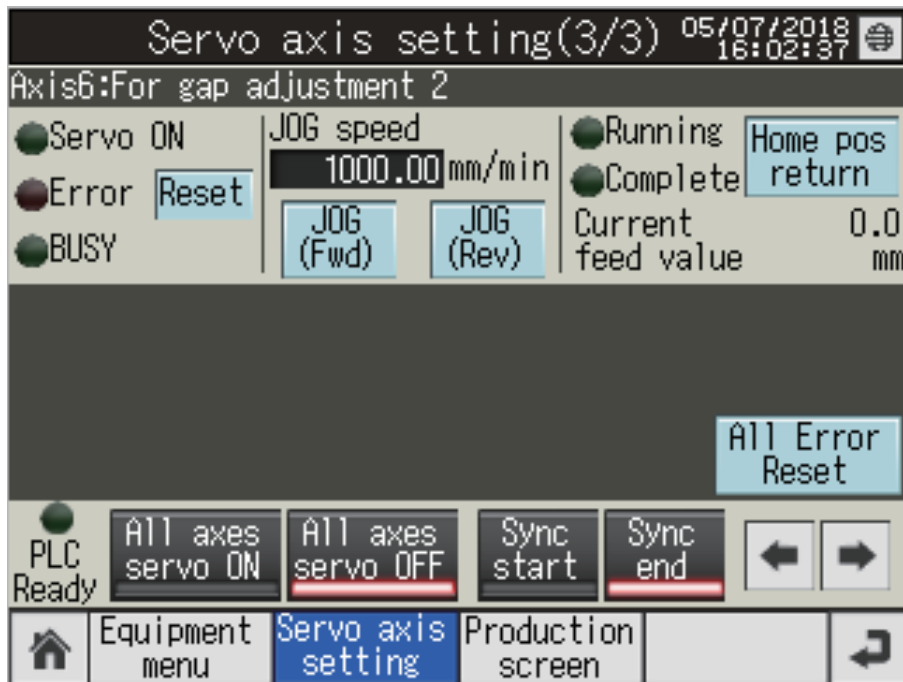
Servo ON  
 Error   
 BUSY

JOG speed: 1000.00 mm/min

Running   
 Complete  
 Current feed value: 0.0 mm

PLC Ready

Equipment menu  Production screen



## Each axis servo setting



### ■ Servo state

Display	Description
Servo ON	[Servo ON indicator lamp] Servo ON: On Servo OFF: Off
Error	[Error indicator lamp] An error or axis warning occurred: On No error or axis warning: Off
Reset	[Error reset switch] On: Errors are reset.
BUSY	[BUSY indicator lamp] Positioning control in progress: On Stopped (standby): Off




### ■ JOG operation

Display	Description
JOG speed 100.000 degree/min	[JOG speed setting] Set the JOG operation speed.
JOG (Fwd) JOG (Rev)	[JOG operation switch] • JOG (Forward) On: JOG operation (forward run) starts. • JOG (Reverse) On: JOG operation (reverse run) starts.

## ■Home position return

Display	Description
 Running	[Home position return running lamp] When the home position return is running: On When the home position return has stopped: Off
 Complete	[Home position return complete lamp] When the home position return is completed: On When the home position return is not completed: Off
Current feed value 0.0 degree	[Current feed value monitor] Current feed value
Home pos return	[Home position return switch] On: The home position return starts.

## ■All axes servo setting

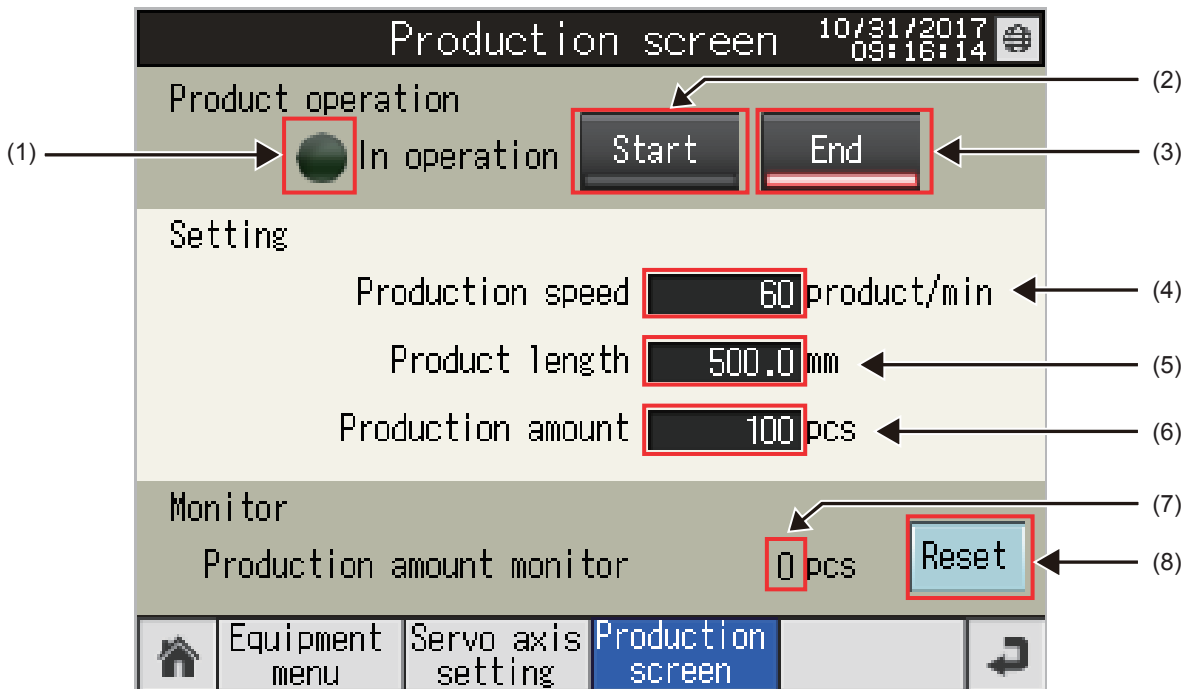
Display	Description
 PLC Ready	[PLC Ready indicator lamp] When PLC Ready is on: On When PLC Ready is off: Off
All axes servo ON All axes servo OFF	[All axes servo ON/OFF switch] • All axes servo ON On: The all axes servo ON command is on. • All axes servo OFF On: The all axes servo ON command is off.
Sync start Sync end	[Synchronization start/end switch] • Synchronization start On: Synchronous control start is on. • Synchronization end On: Synchronous control start is off.
 	[Servo axis setting screen transition switches] Switches to the setting screen of the axis assigned in system configuration.
All Error Reset	[All Error Reset switch] On: All errors are reset. When an error occurs in CtrlOutputAxisSync (Output axis synchronized control), synchronization control is released via a reset operation.

# Production screen

Set the parameters for production and start or stop the packaging machine and alignment conveyor.

Phase compensation is performed by signal input from the mark sensor. After completion of phase compensation, the production amount monitor count starts.

Set the length per cycle for product length in the alignment conveyor project. The production amount and production amount monitor increase every time the length per cycle of the loading conveyor is updated. (This is for checking the conveyor operation. The number of workpieces differs from that of the actual loaded workpieces.)



## Product operation

(1) In operation lamp

This lamp turns on when the production is in progress (while the packaging machine and alignment conveyor are running).

(2) Start switch

Touching this switch starts the packaging machine and alignment conveyor.

The alignment conveyor project starts the alignment conveyor FB by this switch operation.

(3) End switch

Touching this switch stops the packaging machine and alignment conveyor that are running.

The alignment conveyor project stops the alignment conveyor FB by this switch operation.

## Setting

(4) Production speed

Set the production speed.

(5) Product length

Set the product length (cutting size).

(6) Production amount

Set the production quantity. The operation will stop when the production amount is reached.

## Monitor

(7) Production amount monitor

Current production quantity

(8) Reset switch

Touching this switch resets the production amount monitor (clears the count to zero).

## 6.6 Window Screen

The following table lists window screens.

Screen No.	Screen title	Description	Reference
30001	Language Setting	Language Setting window screen	Page 151
30002	Clock Setting	Clock Setting window screen	Page 152
30010	Key Window (Dec)	Numerical input [Decimal key window]	Page 148
30020	Supply conveyor setting	Supply conveyor setting screen	Page 165
30021	Gap adjustment setting 1	Gap adjustment conveyor 1 setting screen	Page 167
30022	Gap adjustment setting 2	Gap adjustment conveyor 2 setting screen	Page 169

## 6.7 List of Devices to be Used

Some devices set as switches and lamps in screens may also be set in the common settings including scripts. When these devices need to be changed in a batch, using [Batch Edit] is recommended. For the details of [Batch Edit], refer to "GT Designer3 (GOT2000) Help".

### List of global labels

#### Rotary cutter/long dwell

Type	Label name	Device	Use
Bit	bPLC_Ready	M7000	PLC READY signal
Bit	bAllAxisServoOn	M7001	All axes servo ON/OFF switch
Bit	bSyncCtrlStart	M7002	Synchronous control start/end
Bit	bFBError	M7003	Function block error notification device
Bit	bAllErrReset	M7004	All error reset
Bit	bSvStatusSON1	M7010	Axis1 Servo ON signal
Bit	bSvStatusSON2	M7011	Axis2 Servo ON signal
Bit	bSvStatusSON3	M7012	Axis3 Servo ON signal
Bit	bBusy1	M7020	Axis1 BUSY signal
Bit	bBusy2	M7021	Axis2 BUSY signal
Bit	bBusy3	M7022	Axis3 BUSY signal
Bit	bAxisError1	M7030	Axis1 error/warning state
Bit	bAxisError2	M7031	Axis2 error/warning state
Bit	bAxisError3	M7032	Axis3 error/warning state
Bit	bErrorReset1	M7040	Axis1 error reset switch
Bit	bErrorReset2	M7041	Axis2 error reset switch
Bit	bErrorReset3	M7042	Axis3 error reset switch
Bit	bErrorReset4	M7043	Axis4 error reset switch
Bit	bCommandGenerationErrorReset2	M7044	Command generation axis2 error reset switch
Bit	bCommandGenerationErrorReset3	M7045	Command generation axis3 error reset switch
Bit	bForwardJOG1	M7050	Axis1 Forward JOG start switch
Bit	bForwardJOG2	M7051	Axis2 Forward JOG start switch
Bit	bForwardJOG3	M7052	Axis3 Forward JOG start switch
Bit	bReverseJOG1	M7060	Axis1 Reverse JOG start switch
Bit	bReverseJOG2	M7061	Axis2 Reverse JOG start switch
Bit	bReverseJOG3	M7062	Axis3 Reverse JOG start switch
Bit	bHPR_Execute1	M7070	Axis1 Home position return switch
Bit	bHPR_Execute2	M7071	Axis2 Home position return switch
Bit	bHPR_Execute3	M7072	Axis3 Home position return switch
Bit	bHPR_Status1	M7080	Axis1 Home position return status
Bit	bHPR_Status2	M7081	Axis2 Home position return status
Bit	bHPR_Status3	M7082	Axis3 Home position return status
Bit	bHPR_Complete1	M7090	Axis1 Home position return request flag status
Bit	bHPR_Complete2	M7091	Axis2 Home position return request flag status
Bit	bHPR_Complete3	M7092	Axis3 Home position return request flag status
Bit	bRCCamCreate	M7100	Rotary cutter cam generation switch
Bit	bReadCamData	M7101	Cam data reading switch
Bit	bLDCamCreate	M7102	Long dwell cam generation switch
Bit	bMarkDetectEnable	M7110	Compensation start/end switch
Bit	bReadMarkDetectData	M7111	Mark detection data reading switch
Bit	bCalcMarkCompensation	M7112	Mark compensation calculation switch
Bit	bCtrlAuxiliaryAxis	M7113	Auxiliary axis control switch

Type	Label name	Device	Use
Bit	bOperationStatus	M7120	Operating status of product operation
Bit	bOperationStart	M7121	Product operation start/end switch
Word [Unsigned]	uRCCamNo	D7000	Cam No. input
Word [Unsigned]	uRCCamResolution	D7001	Cam resolution input
Single precision real number	eRCSyncAxisLength	D7002	Synchronous axis cycle length input
Single precision real number	eRCSheetLength	D7004	Sheet length input
Single precision real number	eRCSheetSyncWidth	D7006	Sheet synchronization width input
Single precision real number	eRCSyncStartPoint	D7008	Synchronization starting point input
Single precision real number	eRCSyncSectionAccRatio	D7010	Synchronous section acceleration ratio input
Word [Unsigned]	uLDCamResolution	D7100	Long dwell cam resolution input
Word [Unsigned]	uLDCamNo	D7101	Long dwell cam No. input
Single precision real number	eLDSyncAngle	D7102	Synchronous angle input
Single precision real number	eLDEccentricLength	D7104	Eccentric length input
Single precision real number	eLDSealLength	D7106	Seal length input
Single precision real number	eLDSealSectionAccRatio	D7108	Seal section acceleration rate input
Single precision real number	eLDInletSectionAccRatio	D7110	Inlet/outlet section acceleration rate input
Word [Unsigned]	uMonCamNo	D7012	Monitor cam No.
Word [Unsigned]	uCamVisNo	D7020	Cam No. input/output
Word [Unsigned]	uResolution	D7021	Cam resolution output
Double word [Signed]	dStrokeMax	D7022	Stroke amount (maximum value) output
Double word [Signed]	dStrokeMin	D7024	Stroke amount (minimum value) output
Double word [Signed]	dLengthPerCycleMax	D7026	1 cycle length (maximum value) output
Double word [Signed]	dLengthPerCycleMin	D7028	1 cycle length (minimum value) output
Double word [Signed]	dLatchDataRangeUpperLimit	D7030	Upper limit value input
Double word [Signed]	dLatchDataRangeLowerLimit	D7032	Lower limit value input
Word [Unsigned]	uLatchDataRangeChangeRequest	D7034	Latch data range change request switch
Single precision real number	eCompStartPos	D7036	Compensation starting point input
Single precision real number	stFilmMarkCompensation.eCompensationSpeed	D7038	Speed input
Double word [Unsigned]	udCompensationAcc	D7040	Acceleration time input
Double word [Unsigned]	udCompensationDecel	D7042	Deceleration time input
Single precision real number	stFilmMarkCompensation.eMinTolerance	D7044	Minimum compensation amount input
Single precision real number	stFilmMarkCompensation.eMaxTolerance	D7046	Maximum compensation amount input
Word [Unsigned]	uMissedMarkLimit	D7048	Mark undetected permissible counts input
Single precision real number	eMarkPitch	D7050	Mark pitch input
Double word [Signed]	dMarkDetData	D7052	Detection data output
Word [Unsigned]	uMarkDetCount	D7054	Detection counts output
Double word [Signed]	dCompensationValue	D7056	Compensation amount output
Double word [Unsigned]	udJogSpeed1	D7060	Axis1 JOG speed input
Double word [Unsigned]	udJogSpeed2	D7062	Axis2 JOG speed input
Double word [Unsigned]	udJogSpeed3	D7064	Axis3 JOG speed input
Double word [Signed]	dCommandPosition1	D7066	Axis1 current feed value output
Double word [Signed]	dCommandPosition2	D7068	Axis2 current feed value output
Double word [Signed]	dCommandPosition3	D7070	Axis3 current feed value output
Single precision real number	eOperationSpeed	D7080	Production speed
Single precision real number	eProductLength	D7082	Product length input
Double word [Signed]	dProductVolumeIn	D7084	Production amount input
Double word [Signed]	dProductVolumeOut	D7086	Production amount output
Word [Signed]	wHMI_Language	D7090	Language switching device, system language switching device
Double word [Signed] (0..127)	stCamData.d128InVal_Cycle	D7200 to D7455	Cam data input value (Cycle point)
Double word [Signed] (0..127)	stCamData.d128OutVal_Stroke	D7500 to D7755	Cam data output value (Stroke amount)

## Alignment conveyor

Type	Label name	Device	Use
Bit	bPLC_Ready	M7000	PLC READY signal
Bit	bAllAxisServoOn	M7001	All axis servo ON/OFF switch
Bit	bSyncCtrlStart	M7002	Synchronous control start/end
Bit	bFBError	M7003	Function block error notification device
Bit	bAllErrReset	M7004	All error reset
Bit	bOperationStatus	M7120	Operating status of product operation
Bit	bOperationStart	M7121	Product operation start/end switch
Bit	bCvSvStatusSON1	M7200	Axis1 Servo ON signal
Bit	bCvSvStatusSON2	M7201	Axis2 Servo ON signal
Bit	bCvSvStatusSON4	M7203	Axis4 Servo ON signal
Bit	bCvSvStatusSON6	M7205	Axis6 Servo ON signal
Bit	bCvBusy1	M7210	Axis1 BUSY signal
Bit	bCvBusy2	M7211	Axis2 BUSY signal
Bit	bCvBusy4	M7213	Axis4 BUSY signal
Bit	bCvBusy6	M7215	Axis6 BUSY signal
Bit	bCvAxErr1	M7220	Axis1 error/warning state
Bit	bCvAxErr2	M7221	Axis2 error/warning state
Bit	bCvAxErr4	M7223	Axis4 error/warning state
Bit	bCvAxErr6	M7225	Axis6 error/warning state
Bit	bCvErrRst1	M7230	Axis1 error reset switch
Bit	bCvErrRst2	M7231	Axis2 error reset switch
Bit	bCvErrRst3	M7232	Axis3 error reset switch
Bit	bCvErrRst4	M7233	Axis4 error reset switch
Bit	bCvErrRst5	M7234	Axis5 error reset switch
Bit	bCvErrRst6	M7235	Axis6 error reset switch
Bit	bCvErrRst7	M7236	Axis7 error reset switch
Bit	bCvErrRst8	M7237	Axis8 error reset switch
Bit	bCvFwdJOG1	M7240	Axis1 Forward JOG start switch
Bit	bCvFwdJOG2	M7241	Axis2 Forward JOG start switch
Bit	bCvFwdJOG4	M7243	Axis4 Forward JOG start switch
Bit	bCvFwdJOG6	M7245	Axis6 Forward JOG start switch
Bit	bCvRevJOG1	M7250	Axis1 Reverse JOG start switch
Bit	bCvRevJOG2	M7251	Axis2 Reverse JOG start switch
Bit	bCvRevJOG4	M7253	Axis4 Reverse JOG start switch
Bit	bCvRevJOG6	M7255	Axis6 Reverse JOG start switch
Bit	bCvHPR_Exec1	M7260	Axis1 Home position return switch
Bit	bCvHPR_Exec2	M7261	Axis2 Home position return switch
Bit	bCvHPR_Exec4	M7263	Axis4 Home position return switch
Bit	bCvHPR_Exec6	M7265	Axis6 Home position return switch
Bit	bCvHPR_Status1	M7270	Axis1 Home position return status
Bit	bCvHPR_Status2	M7271	Axis2 Home position return status
Bit	bCvHPR_Status4	M7273	Axis4 Home position return status
Bit	bCvHPR_Status6	M7275	Axis6 Home position return status
Bit	bCvHPR_Complete1	M7280	Axis1 Home position return request flag status
Bit	bCvHPR_Complete2	M7281	Axis2 Home position return request flag status
Bit	bCvHPR_Complete4	M7283	Axis4 Home position return request flag status
Bit	bCvHPR_Complete6	M7285	Axis6 Home position return request flag status
Single precision real number	eOperationSpeed	D7080	Production speed
Single precision real number	eProductLength	D7082	Product length input
Double word [Signed]	dProductVolumeIn	D7084	Production amount input
Double word [Signed]	dProductVolumeOut	D7086	Production amount output



Type	Label name	Device	Use
Word [Signed]	wHMI_Language	D7090	Language switching device, system language switching device
Double word [Signed]	dSupplyCvLatchDatUpLimit	D7120	Upper limit value input
Double word [Signed]	dSupplyCvLatchDatLowLimit	D7122	Lower limit value input
Word [Unsigned]	uSupplyCvLatchDatChgReq	D7124	Latch data range change request switch
Single precision real number	stSupplyConveyor.eCompensationSpeed	D7126	Speed input
Double word [Unsigned]	udSupplyConveyorAcc	D7128	Acceleration time input
Double word [Unsigned]	udSupplyConveyorDec	D7130	Deceleration time input
Single precision real number	stSupplyConveyor.eMinTolerance	D7132	Minimum compensation amount input
Single precision real number	stSupplyConveyor.eMaxTolerance	D7134	Maximum compensation amount input
Single precision real number	eSupplySensorPos	D7136	Supply sensor position
Single precision real number	eWorkLoadPos	D7138	Loading position
Double word [Signed]	dAdjustCv1LatchDatUpLimit	D7140	Upper limit value input
Double word [Signed]	dAdjustCv1LatchDatLowLimit	D7142	Lower limit value input
Word [Unsigned]	uAdjustCv1LatchDatChgReq	D7144	Latch data range change request switch
Single precision real number	stAdjustConveyor1.eCompensationSpeed	D7146	Speed input
Double word [Unsigned]	udAdjustConveyor1Acc	D7148	Acceleration time input
Double word [Unsigned]	udAdjustConveyor1Dec	D7150	Deceleration time input
Single precision real number	stAdjustConveyor1.eMinTolerance	D7152	Minimum compensation amount input
Single precision real number	stAdjustConveyor1.eMaxTolerance	D7154	Maximum compensation amount input
Single precision real number	eAdjustSensor1Pos	D7156	Adjustment sensor position 1
Double word [Signed]	dAdjustCv2LatchDatUpLimit	D7160	Upper limit value input
Double word [Signed]	dAdjustCv2LatchDatLowLimit	D7162	Lower limit value input
Word [Unsigned]	uAdjustCv2LatchDatChgReq	D7164	Latch data range change request switch
Single precision real number	stAdjustConveyor2.eCompensationSpeed	D7166	Speed input
Double word [Unsigned]	udAdjustConveyor2Acc	D7168	Acceleration time input
Double word [Unsigned]	udAdjustConveyor2Dec	D7170	Deceleration time input
Single precision real number	stAdjustConveyor2.eMinTolerance	D7172	Minimum compensation amount input
Single precision real number	stAdjustConveyor2.eMaxTolerance	D7174	Maximum compensation amount input
Single precision real number	eAdjustSensor2Pos	D7176	Adjustment sensor position 2
Single precision real number	eWorkLength	D7178	Work length
Double word [Unsigned]	udCvJogSpd1	D7800	Axis1 JOG speed input
Double word [Unsigned]	udCvJogSpd2	D7802	Axis2 JOG speed input
Double word [Unsigned]	udCvJogSpd4	D7806	Axis4 JOG speed input
Double word [Unsigned]	udCvJogSpd6	D7810	Axis6 JOG speed input
Double word [Signed]	dCvCmdPos1	D7820	Axis1 current feed value output
Double word [Signed]	dCvCmdPos2	D7822	Axis2 current feed value output
Double word [Signed]	dCvCmdPos4	D7826	Axis4 current feed value output
Double word [Signed]	dCvCmdPos6	D7830	Axis6 current feed value output

## List of GOT devices

Type	Device number	Use
Bit	GB40	Always ON
Bit	GB1001	Clock setting window display script (Initial setting (clock setting)) trigger
Bit	GB2001	
Bit	GS512.b0	Time change information
Word	GD1060 to GD1065	Date and time adjustment switch
Word	GD2000	Base screen switching device
Word	GD2001	Overlap window screen 1 switching device
Word	GD2004	Overlap window screen 2 switching device
Word	GD2007	Superimpose window 1 switching device
Word	GD2009	Dialog window screen switching device
Word	GS513 to GS516	Time after change
Word	GS650 to GS652	Current time

# APPENDICES

## Appendix 1 List of Error Codes

### FB library Warning

When an error occurs at the startup of an FB, the FB does not operate. When an error occurs while an FB is operating, the FB continuously operates with the value before the occurrence of the error.

ErrorID		Description	Corrective action
HEX	DEC		
2100H	8448	A value outside the range has been set as the axis No.	Check the setting and execute the FB again.
2101H	8449	A value outside the range has been set as the positioning data No.	
2102H	8450	A value outside the range has been set as the speed.	
2103H	8451	A value outside the range has been set as the acceleration/ deceleration.	
2104H	8452	A value outside the range has been set as the cam No.	
2108H	8456	A value outside the range has been set as the cam resolution.	
2109H	8457	A value outside the range has been set as the seat length.	
210AH	8458	A value outside the range has been set as the sheet synchronization width.	
210BH	8459	A value outside the range has been set as the synchronous axis length.	
210CH	8460	A value outside the range has been set as the synchronization starting point.	
210DH	8461	A value outside the range has been set as the synchronous section acceleration ratio.	
2116H	8470	A value outside the range has been set as the main input axis cycle starting point.	
2117H	8471	A value outside the range has been set as the main input axis synchronization starting point.	
2118H	8472	A value outside the range has been set as the output axis synchronization starting point.	
2119H	8473	A value outside the range has been set as the output axis synchronization ending point.	
211BH	8475	A value outside the range has been set as the main input axis cycle ending point.	
211CH	8476	A value outside the range has been set as the output axis movement amount limit value.	
211DH	8477	A value outside the range has been set as the mark detection setting No.	
2121H	8481	A value outside the range has been set as the minimum compensation amount or maximum compensation amount.	
2122H	8482	A value outside the range has been set as the mark undetected permissible counts.	
2123H	8483	The calculated compensation amount is larger than the maximum compensation amount. This error code will turn off when the compensation amount to be calculated next time is smaller than the maximum compensation amount in the next cycle or later.	Check if "[Pr.439] Cam axis length per cycle" is proper.

ErrorID		Description	Corrective action
HEX	DEC		
2124H	8484	A value outside the range has been set as the compensation starting point.	Check the setting and execute the FB again.
212DH	8493	A value outside the range has been set in "[Pr.802] Mark detection data type".	
212EH	8494	A value outside the range has been set in "[Pr.807] Mark detection mode setting".	
2131H	8497	A value outside the range or 0 (invalid) has been set in "[Pr.400] Main input axis No.".	
2132H	8498	A value outside the range has been set as the output axis No.	
2133H	8499	A value outside the range has been set as the auxiliary axis No.	
2136H	8502	The value set in "[Pr.1] Unit setting" of the main input axis and the value set in "[Pr.1] Unit setting" of the auxiliary axis are not the same.	Even though this warning has occurred, the operation continues. However, ensure the safety before operation because the operation may differ from that of when both the axes have different values in "[Pr.1] Unit setting".
2140H	8512	A value outside the range has been set as the synchronous angle.	Check the setting and execute the FB again.
2141H	8513	A value outside the range has been set as the seal length.	
2142H	8514	A value outside the range has been set as the eccentric length.	
2143H	8515	A value outside the range has been set as the seal section acceleration rate.	
2144H	8516	A value outside the range has been set as the inlet/outlet section acceleration rate.	
2145H	8517	A value outside the range has been set as the number of cutters.	
2146H	8518	The sealing angle has exceeded the synchronous angle.	Set a larger synchronous angle or change the sealing length or eccentric length and set a smaller sealing angle to satisfy the following conditional expression.
2147H	8519	The synchronization length exceeded the product length.	Increase the product length or review the D-cam parameter.
214AH	8522	A value outside the range has been set for the sensor position.	Review the setting value and execute the FB again.
214BH	8523	A value outside the range is set for the workpiece length.	
214CH	8524	A value outside the range has been set for the loading position.	
214DH	8525	A value outside the range has been set in "[Pr.1] Unit setting".	

## FB library Error

When an error has occurred, an FB stops its operation.

ErrorID		Description	Corrective action
HEX	DEC		
200H	512	The FB is started while the target axis is operating.	Stop the target axis and execute the FB again.
201H	513	The target axis is not in the servo-on status.	Set the servo-on status for the target axis and execute the FB again.
202H	514	A motion error has occurred in the target axis.	Check "[Md.23] Axis error No." of the target axis to check the error details and eliminate the cause of the error. After that, execute the FB again.
205H	517	A PLC The sealing angle has exceeded the synchronous angle. error has occurred during the execution of an FB.	Check the error number (SD0) to check the error details and eliminate the cause of the error. After that, execute the FB again.
2200H	8704	The calculated cam stroke amount for the output axis has exceeded the output axis movement amount limit value.	Check the set main input axis cycle ending point in the direction of the main input axis reference point and execute the FB again. If this error still cannot be cleared, check the following input label setting values. <ul style="list-style-type: none"> <li>• Output axis synchronization starting point</li> <li>• Output axis synchronization ending point</li> <li>• Output axis movement amount limit value</li> <li>• Main input axis synchronization starting point</li> </ul>
2201H	8705	The value of the mark undetected counts has exceeded the mark undetected permissible counts.	<ul style="list-style-type: none"> <li>• Check the mark status.</li> <li>• Check for a sensor failure or disconnection.</li> </ul>
2203H	8707	A cam data operation warning has occurred at cam generation.	Check "[Md.24] Axis warning No." of the axis 1 to check the warning details and eliminate the cause of the warning. After that, execute the FB again.

ErrorID		Description	Corrective action
HEX	DEC		
2205H	8709	Another FB was activated while cam was being generated by an FB or a user program.	Before starting the FB, check that "[Cd.600] Cam data operation request" has been set to "0".
220AH	8714	The positions of the main input axis cycle starting point, main input axis synchronization starting point, and main input axis cycle ending point are not correct.	Check those values to satisfy the following conditional expression. • $i\_eMainInputAxisStartPos < i\_eMainInputAxisSyncStartPos < i\_eMainInputAxisCycleEndPos$
220BH	8715	The positions of the output axis synchronization starting point, output axis synchronization ending point, and output axis movement amount limit value are not correct.	Check those values to satisfy the following conditional expression. • $i\_eOutputAxisSyncStartPos < i\_eOutputAxisSyncEndPos < i\_eOutputAxisMaxLength$
220CH	8716	The value converted into the main input axis from the output axis synchronization ending point has exceeded the main input axis cycle ending point.	Set smaller values as the main input axis cycle starting point and the output axis synchronization ending point or a larger value as the synchronous section acceleration ratio to satisfy the following conditional expression. • $i\_eMainInputAxisSyncStartPos - i\_eMainInputAxisStartPos + (i\_eOutputAxisSyncEndPos - i\_eOutputAxisSyncStartPos) / (1 + i\_eSyncSectionAccRatio/100) < i\_eMainInputAxisCycleEndPos - i\_eMainInputAxisStartPos - 1/UCC$
220DH	8717	A value larger than the number of coordinates of the cam data generated for the flying shear has been set as the cam resolution (number of coordinates).	Set a smaller value as the cam resolution (number of coordinates) to satisfy the following conditional expression. • $i\_uCamResolution \leq \{i\_eMainInputAxisCycleEndPos - i\_eMainInputAxisStartPos - (i\_eOutputAxisSyncEndPos - i\_eOutputAxisSyncStartPos) / (1 + i\_eSyncSectionAccRatio/100)\} \times UCC^{*1} + 2$
220EH	8718	"[Cd.302] Command generation axis parameter control request" or "[Cd.306] Command generation axis positioning data control request" detects "FFFFH: Write error".	Check that a value that is not defined is set in "[Cd.300] Command generation axis parameter No. designation", "[Cd.303] Command generation axis positioning data No. designation", or "[Cd.304] Command generation axis positioning data designation" other than FB.
220FH	8719	"0: Invalid" is set in "[Pr.340] Command generation axis valid setting" of the command generation axis set for the auxiliary axis.	After changing "[Pr.340] Command generation axis valid setting" of the command generation axis set for the auxiliary axis to "1: Valid", power on the programmable controller CPU again.
F000H	61440	The module set in the unit number setting is not the Simple Motion module compatible with iQ Monozukuri.	Replace the module with the Simple Motion module for the packaging machine control FBs.
F001H	61441	The license key of the application to be used in the PLC CPU used is not authenticated.	Certify the license key of the application to be used.
F002H	61442	A value outside the range has been set as the unit number.	Check the setting and execute the FB again.
F003H	61443	The module set in the unit number setting is not the Simple Motion module.	Specify a Simple Motion module.

\*1 UCC (Unit conversion coefficient): When the unit of the product length is [mm]:  $10^4$  (= 10000), [inch] or [degree]:  $10^5$  (= 100000), [pulse]: 1



## Application program control FB Warning

When a warning occurs at the startup of an FB, the FB does not operate. When a warning occurs while an FB is operating, the FB continuously operates with the value before the occurrence of the warning.

ErrorID		Description	Corrective action
HEX	DEC		
2D00H	11520	A value outside the range has been set as the axis No.	Check the setting and execute the FB again.
2D01H	11521	A value outside the range has been set as the cam No.	
2D02H	11522	A value outside the range has been set as the waiting point.	
2D03H	11523	A value outside the range has been set as the 1 cycle length.	
2D04H	11524	A value outside the range has been set as the cam stroke amount.	
2D05H	11525	A value outside the range has been set as the clutch smoothing amount.	
2D06H	11526	A value outside the range is set for the module number.	
2D07H	11527	The number of buffers exceeded the maximum storage number.	

## Application program control FB Error

When an error has occurred, an FB stops its operation.

ErrorID		Description	Corrective action
HEX	DEC		
2DE0H	11744	The FB is started during synchronous control of the target axis.	Execute the FB again after completing the synchronous control of the target axis.
2DE1H	11745	The target axis is not in the servo-on status.	Set the servo-on status for the target axis and execute the FB again.
2DE2H	11746	A motion error has occurred in the target axis.	Check "[Md.23] Axis error No." of the target axis to check the error details and eliminate the cause of the error. After that, execute the FB again.
2DE3H	11747	A PLC CPU error has occurred during the execution of an FB.	Check the error number (SD0) to check the error details and eliminate the cause of the error. After that, execute the FB again.
2DE4H	11748	A cam data operation warning has occurred while the cam operation has been requested.	Check "[Md.24] Axis warning No." of the axis 1 to check the warning details and eliminate the cause of the warning. After that, execute the FB again.
2DE5H	11749	The cam data reading FB of the different cam data format is used.	Use the FB that matches the cam data format to be read. <ul style="list-style-type: none"> <li>• For the stroke ratio data format: ReadStrokeCamData</li> <li>• For the coordinate data format: ReadCoordinateCamData</li> </ul>

# Appendix 2 Functional Restrictions by Version

Available functions depend on the version of the application package.

The following table shows combinations of each version and function.

Function		Version	Reference
The standard Simple Motion module can be used by registering a license key.		Version 1.001B or later	Page 27 SETTING AND PROCEDURE BEFORE OPERATION
FB	PAC_MakeLongDwellDCam is added.		Page 53 Details of the FB Library Page 90 APPLICATION PROGRAM EXAMPLE
The subroutine type is supported for the compile method of FB library.			Page 53 Details of the FB Library
FB	PAC_CalcGap is added.	Version 1.002C or later	Page 53 Details of the FB Library Page 90 APPLICATION PROGRAM EXAMPLE
	PAC_CalcPhase is added.		
FB	Invalid (-1) for the input label "Compensation starting point" of STD_CtrlAuxiliaryAxis has been added.		Page 53 Details of the FB Library
A temporary license is available before a license key is obtained.		Version 1.003D or later	Page 27 SETTING AND PROCEDURE BEFORE OPERATION
FB	For i_dMarkDetectData (Mark detection data), set the real current value. • PAC_CalcMarkCompensation	Version 1.004E or later	Page 53 Details of the FB Library

# Appendix 3 Temporary License Registration

When using this application package before getting a license key, register a temporary license by following the steps below. The temporary license is valid for two months (from the registration date of the temporary license to the same day in the month after next).

Registration date	Day before the expiration date
1/1/2018	1/3/2018
20/6/2018	20/8/2018
31/7/2018	30/9/2018
31/12/2018	28/2/2019
31/12/2019	29/2/2020 (Leap year)

Invalid	Valid	Invalid
0:00	0:00	0:00

\*1 If the same day does not exist in the month after next, it is valid until the last day of the month.

## Items to be prepared

Item	Description
License key registration project (AP20-PAC004AA_FX5U_LicWrite.gx3)	A project for registering a license key to the PLC CPU module. It is included in the supplied DVD. <FB> FormatLicense (Macro type) PAC_TempLicenseWrite (Macro type)

## Clock setting of the PLC CPU module

Set the clock data (the current date and time) on "Clock Setting" of GX Works3.

For the clock setting, refer to the following.

 GX Works3 Operating Manual

## Executing the program

### 1. Executing the temporary license registration program

Copy the license key registration project (AP20-PAC004AA\_FX5U\_LicWrite.gx3) in the supplied DVD to a folder on the personal computer, then open the file.

The project is created for the FX5UCPU. When using a model other than FX5UCPU, change the model.

\* When registering a license key to multiple PLC CPU modules, register it one by one.

### 2. Writing and executing the program

Write the program to the PLC CPU module and execute it.

- Select "Online" → "Write to PLC" from the menu and write all the program to the PLC CPU module.
- Set the PLC CPU module to the RUN state and execute the scan program. Select "Program" → "Scan" in the Navigation window and open the registered program. (Program name: LicenseWrite) The scan program includes the function block (FormatLicense) for formatting the license key registration area, the function block (PAC\_LicenseWrite) for writing the license key, and the function block (PAC\_TempLicenseWrite) for writing the temporary license.

### Point

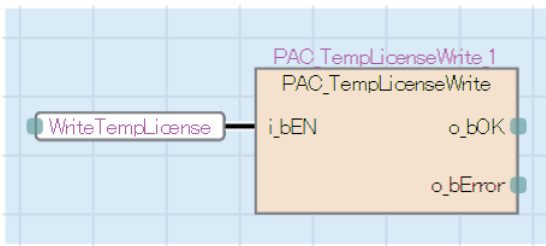
- When registering the temporary license to the PLC CPU module for the first time, format the license key registration area. Format it before registering the license key.
- When another license of iQ Monozukuri has been registered, register the license without formatting it.



### ■ Registering the temporary license

Turn on the execution flag (WriteTempLicense) of the function block (PAC\_TempLicenseWrite) in the scan program. Normal completion (o\_bOK) or Error completion (o\_bError) becomes TRUE. At the error completion, refer to Troubleshooting. (Page 187 Troubleshooting)

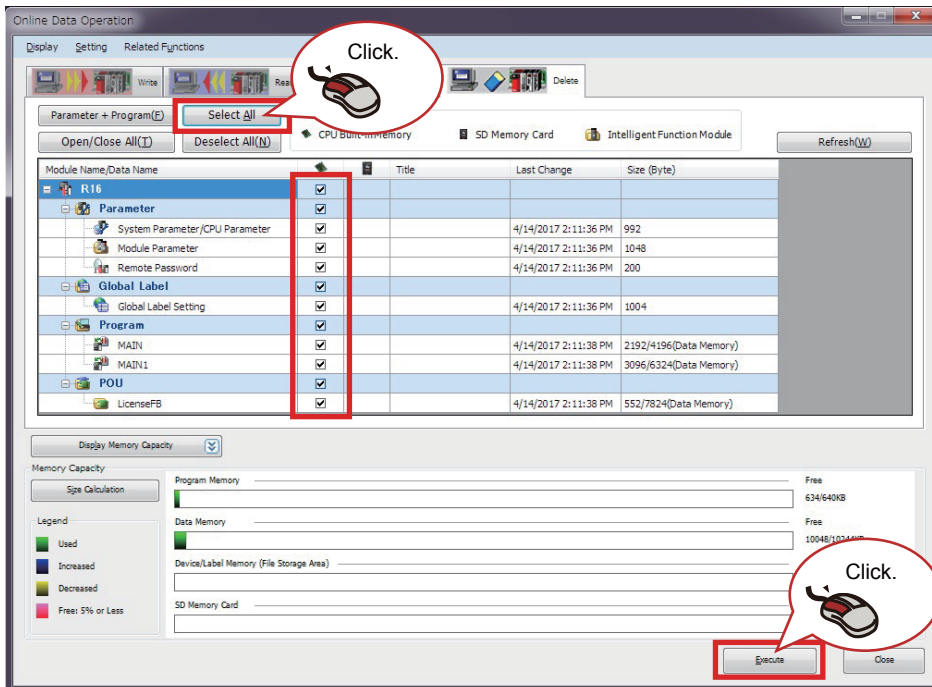
When Normal operation (o\_bOK) turns on, the license key registration is completed. Turn off the execution flag (WriteTempLicense).



### 3. Deleting the program

After the temporary license registration has been completed, delete the program in the PLC CPU module.

Select "Online" → "Delete PLC Data" from the menu and select the [Select All] button in the "Online Data Operation" window to delete the program.



## Troubleshooting

The following table lists errors that occur during the temporary license registration and corrective actions.

Error details	Cause	Corrective action
After "PAC_TempLicenseWrite" is executed, Error completion (o_bError) turns on and Normal completion (o_bOK) remains off.	<ul style="list-style-type: none"> <li>The license key registration area has never been formatted.</li> <li>The license key outside the range of the memory was about to be written.</li> </ul>	Format the license key registration area by using "FormatLicense" and register the temporary license by using "PAC_TempLicenseWrite". Using "FormatLicense" deletes other registered license keys. Register them again.
	The temporary license of the same product has already been registered.	<ul style="list-style-type: none"> <li>&lt;When the temporary license is valid&gt; Continue to use the temporary license.</li> <li>&lt;When the temporary license is expired&gt; Get a license and register the license key by using "PAC_LicenseWrite".</li> </ul>
After "PAC_TempLicenseWrite" is executed, neither Normal completion (o_bOK) nor Error completion (o_bError) turns on.	<ul style="list-style-type: none"> <li>The PLC CPU module is not in the RUN state.</li> <li>"Macro type" is not specified for "FB type" of the license key registration FB.</li> </ul>	<ul style="list-style-type: none"> <li>Set the PLC CPU module to the RUN state.</li> <li>Specify "Macro type" for "FB type" of the license key registration FB.</li> </ul>

## Precautions

- The temporary license is written to the device data storage file, and thus retained after power off.
- If the license key registration area of the device data storage file is operated with SLMP or the FTP server function, license information may be lost.
- For the license key registration FB, set "FB type" to "Macro type".

# MEMO

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A

# INSTRUCTION INDEX

---

## C

---

CtrlOutputAxisSync . . . . . 135

## H

---

HomePositionReturn . . . . . 130

## M

---

MotionReady . . . . . 129

## P

---

PAC\_CalcGap . . . . . 80

PAC\_CalcMarkCompensation . . . . . 72

PAC\_CalcPhase . . . . . 85

PAC\_MakeLongDwellDCam . . . . . 63

## R

---

ReadCoordinateCamData . . . . . 133

ReadStrokeCamData . . . . . 131

## S

---

SaveCompensationBuffer . . . . . 140

STD\_CtrlAuxiliaryAxis . . . . . 76

STD\_MakeFlyingShearCam . . . . . 57

STD\_MakeRotaryCutterCam . . . . . 53

STD\_ReadMarkDetectData . . . . . 68

# MEMO

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# REVISIONS

\* The manual number is given on the bottom left of the back cover.

Revision date	*Manual number	Description
May 2017	BCN-B62005-808-A	First edition
November 2017	BCN-B62005-808-B	<p>■ Added functions Standard Simple Motion modules are available by license key registration, an FB is added (Cam auto-generation for D-cam), and program examples are added (long dwell).</p> <p>■ Added or modified parts TERMS, REQUESTING AND REGISTERING A LICENSE KEY, Section 1.4, 1.5, 1.6, 1.7, 2.1, 2.2, 2.4, 3.2, 4.1, 4.2, Chapter 5, Section 5.1, 5.2, 5.3, 5.4, Chapter 6, Section 6.1, 6.3, 6.5, 6.7, Appendix 1, 2, TRADEMARKS</p>
July 2018	BCN-B62005-808-C	<p>■ Added functions FBs are added (Work gap adjustment compensation amount calculation, Work loading position adjustment compensation amount calculation), a program example is added (alignment conveyor), and screen examples are added (alignment conveyor).</p> <p>■ Added or modified parts TERMS, Section 1.2, 1.4, 1.6, 1.7, 3.1, 3.2, 4.1, 4.2, Chapter 5, Section, 5.1, 5.2, 5.3, 5.4, 5.5, 6.1, 6.3, 6.5, 6.6, 6.7, Appendix 1, 2</p>
October 2018	BCN-B62005-808-D	<p>■ Added functions A temporary license is available before a license key is obtained.</p> <p>■ Added or modified parts TERMS, Section 2.1, 2.3, 2.4, 4.1, 5.1, 5.2, 5.4, 6.5, Appendix 2, 3</p>
July 2019	BCN-B62005-808-E	<p>■ Added or modified parts Section 1.7, 2.1, 4.1, 4.2, 5.1, 5.2, 5.3, Appendix 2</p>

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# WARRANTY

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

(1) Software included in this product

Check "END-USER SOFTWARE LICENSE AGREEMENT" (BCN-EP2005-0001) included in this product.

(2) Hardware included as a system component of this system

Check the product warranty details of each hardware.

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BCN-B62005-808-E(1907)

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