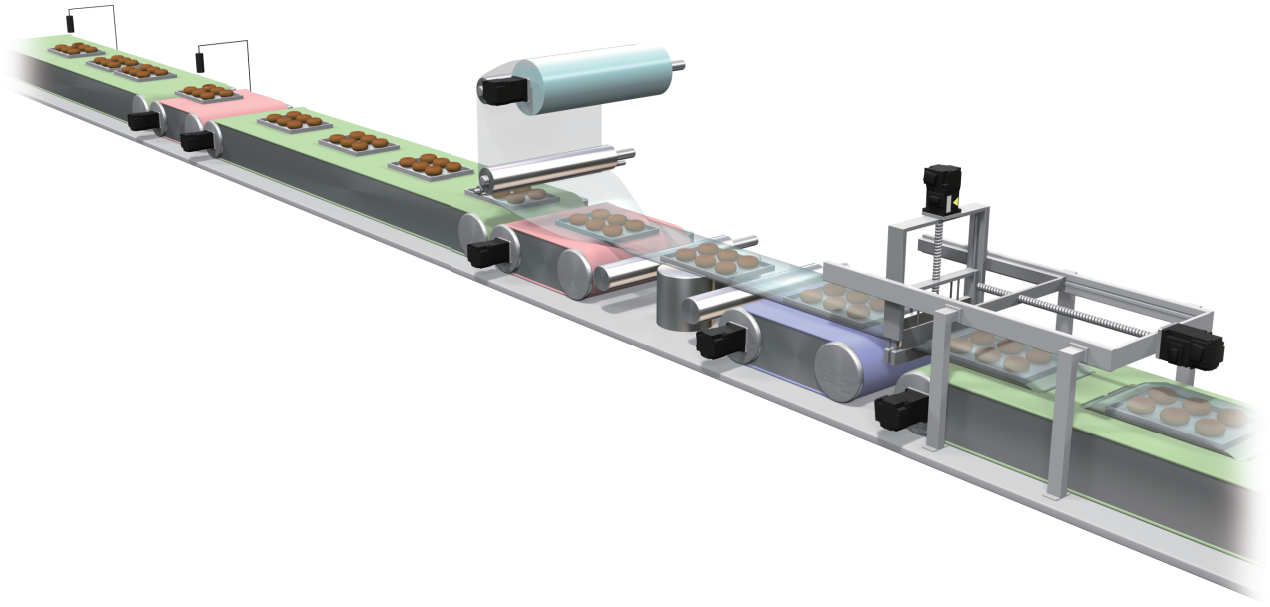
MITSUBISHI ELECTRIC

FA Application Package
iQ Monozukuri PACKAGING

Instruction Manual (For MELSEC iQ-R)

- AP20-PAC002AA-MA
- AP20-PAC002AA-MB
- AP20-PAC002AA-MC
- AP20-PAC002AA-MD
- AP20-PAC002AA-ME
- AP20-PAC002AA-ML



iQ Monozukuri

SAFETY PRECAUTIONS

(Read these precautions before using this product.)

Before using this product, please read this manual and the relevant manuals carefully and pay full attention to safety to handle the product correctly.

The precautions given in this manual are concerned with this product only. Refer to the user's manual of the CPU module to use for a description of the PLC system safety precautions.

In this manual, the safety precautions are classified into two levels: "⚠WARNING" and "⚠CAUTION".

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

Under some circumstances, failure to observe the precautions given under "⚠ CAUTION" may lead to serious consequences.

Observe the precautions of both levels because they are important for personal and system safety.

Make sure that the end users read this manual and then keep the manual in a safe place for future reference.

[Design Precautions]

⚠WARNING

- Configure safety circuits external to the programmable controller to ensure that the entire system operates safely even when a fault occurs in the external power supply or the programmable controller. Failure to do so may result in an accident due to an incorrect output or malfunction.
  (1) Configure external safety circuits, such as an emergency stop circuit, protection circuit, and protective interlock circuit for forward/reverse operation or upper/lower limit positioning.
  (2) The programmable controller stops its operation upon detection of the following status, and the output status of the system will be as shown below.
    • Turned off if the overcurrent or overvoltage protection of the power supply module is activated.
    • Held or turned off according to the parameter setting if the self-diagnostic function of the CPU module detects an error such as a watchdog timer error.
  (3) Also, all outputs may be turned on if an error occurs in a part, such as an I/O control part, where the CPU module cannot detect any error. To ensure safety operation in such a case, provide a safety mechanism or a fail-safe circuit external to the programmable controller. For a fail-safe circuit example, refer to the user's manual of the CPU module to use.
  (4) Outputs may remain on or off due to a failure of a component such as a relay and transistor in an output circuit. Configure an external circuit for monitoring output signals that could cause a serious accident.
- In an output circuit, when a load current exceeding the rated current 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.
- Configure a circuit so that the programmable controller is turned on first and then the external power supply. If the external power supply is turned on first, an accident may occur due to an incorrect output or malfunction.
- For the operating status of each station after a communication failure, refer to manuals relevant to the network. Incorrect output or malfunction due to a communication failure may result in an accident.

⚠WARNING

- When connecting an external device with a CPU module or intelligent function module to modify data of a running programmable controller, configure an interlock circuit in the program to ensure that the entire system will always operate safely. For other forms of control (such as program modification, parameter change, forced output, or operating status change) of a running programmable controller, read the relevant manuals carefully and ensure that the operation is safe before proceeding. Improper operation may damage machines or cause accidents.
- Especially, when a remote programmable controller is controlled by an external device, immediate action cannot be taken if a problem occurs in the programmable controller due to a communication failure. To prevent this, configure an interlock circuit in the program, and determine corrective actions to be taken between the external device and CPU module in case of a communication failure.
- Do not write any data to the "system area" and "write-protect area" of the buffer memory in the module. Also, do not use any "use prohibited" signals as an output signal from the CPU module to each module. Doing so may cause malfunction of the programmable controller system. For the "system area", "write-protect area", and the "use prohibited" signals, refer to the user's manual for the module used.
- If a communication cable is disconnected, the network may be unstable, resulting in a communication failure of multiple stations. Configure an interlock circuit in the program to ensure that the entire system will always operate safely even if communications fail. Failure to do so may result in an accident due to an incorrect output or malfunction.
- 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.
- Configure safety circuits external to the programmable controller to ensure that the entire system operates safely even when a fault occurs in the external power supply or the programmable controller. Failure to do so may result in an accident due to an incorrect output or malfunction.
  (1) Machine home position return is controlled by two kinds of data: a home position return direction and a home position return speed. Deceleration starts when the near-point dog signal turns on. If an incorrect home position return direction is set, motion control may continue without deceleration. To prevent machine damage caused by this, configure an interlock circuit external to the programmable controller.
  (2) When the module detects an error, the motion slows down and stops or the motion suddenly stops, depending on the stop group setting in parameter. Set the parameter to meet the specifications of a positioning control system. In addition, set the home position return parameter and positioning data within the specified setting range.
  (3) Outputs may remain on or off, or become undefined due to a failure of a component such as an insulation element and transistor in an output circuit, where the module cannot detect any error. In a system that the incorrect output could cause a serious accident, configure an external circuit for monitoring output signals.
- If safety standards (ex., robot safety rules, etc.,) apply to the system using the module, servo amplifier and servomotor, make sure that the safety standards are satisfied.
- Construct a safety circuit externally of the module or servo amplifier if the abnormal operation of the module or servo amplifier differs from the safety directive operation in the system.
- Do not remove the SSCNETⅢ cable while turning on the control circuit power supply of Multiple CPU system and servo amplifier. Do not see directly the light generated from SSCNETⅢ connector of the module or servo amplifier and the end of SSCNETⅢ cable. When the light gets into eyes, you may feel something wrong with eyes. (The light source of SSCNETⅢ complies with class1 defined in JISC6802 or IEC60825-1.)

[Design Precautions]

⚠CAUTION

- Do not install the control lines or communication cables together with the main circuit lines or power cables. Keep a distance of 100 mm or more between them. Failure to do so may result in malfunction due to noise.
- During control of an inductive load such as a lamp, heater, or solenoid valve, a large current (approximately ten times greater than normal) may flow when the output is turned from off to on. Therefore, use a module that has a sufficient current rating.
- 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 the time.
- Do not power off the programmable controller or do not reset the CPU module during the setting registration. Doing so will make the data in the flash ROM undefined. The data need to be set in the buffer memory and to be written to the flash ROM again. Doing so may cause malfunction or failure of the module.
- Reset the CPU module after changing the parameters. Failure to do so may cause malfunction because the previous parameter settings remain in the module.
- When changing the operating status of the CPU module from external devices (such as remote RUN/STOP), select "Do Not Open by Program" for "Opening Method" in the module parameters. If "Open by Program" is selected, an execution of remote STOP causes the communication line to close. Consequently, the CPU module cannot reopen the communication line, and external devices cannot execute the remote RUN.

[Installation Precautions]

⚠WARNING

- Shut off the external power supply (all phases) used in the system before mounting or removing the module. Failure to do so may result in electric shock or cause the module to fail or malfunction.

[Installation Precautions]

⚠CAUTION

- Use the programmable controller in an environment that meets the general specifications in the manual "Safety Guidelines" included in the base unit. Failure to do so may result in electric shock, fire, malfunction, or damage to or deterioration of the product.
- To mount a module, place the concave part(s) located at the bottom onto the guide(s) of the base unit, and push in the module until the hook(s) located at the top snaps into place. Incorrect mounting may cause malfunction, failure, or drop of the module.
- When using the programmable controller in an environment of frequent vibrations, fix the module with a screw.
- Tighten the screws within the specified torque range. Undertightening can cause drop of the screw, short circuit, or malfunction. Overtightening can damage the screw and/or module, resulting in drop, short circuit, or malfunction.
- When using an extension cable, connect it to the extension cable connector of the base unit securely. Check the connection for looseness. Poor contact may cause incorrect input or output.
- When using an SD memory card, fully insert it into the memory card slot. Check that it is inserted completely. Poor contact may cause malfunction.
- Securely insert an extended SRAM cassette into the cassette connector of a CPU module. After insertion, close the cassette cover and check that the cassette is inserted completely. Poor contact may cause malfunction.
- Do not directly touch any conductive parts and electronic components of the module, SD memory card, extended SRAM cassette, or connector. Doing so may cause malfunction or failure of the module.

[Wiring Precautions]

⚠WARNING

- Shut off the external power supply (all phases) used in the system before installation and wiring. Failure to do so may result in electric shock or damage to the product.
- After installation and wiring, attach the included terminal cover to the module before turning it on for operation. Failure to do so may result in electric shock.

[Wiring Precautions]

⚠CAUTION

- Individually ground the FG and LG terminals of the programmable controller with a ground resistance of 100 ohm or less. Failure to do so may result in electric shock or malfunction.
- Use applicable solderless terminals and tighten them within the specified torque range. If any spade solderless terminal is used, it may be disconnected when the terminal screw comes loose, resulting in failure.
- Check the rated voltage and signal layout before wiring to the module, and connect the cables correctly. Connecting a power supply with a different voltage rating or incorrect wiring may cause fire or failure.
- Connectors for external devices or coaxial cables must be crimped or pressed with the tool specified by the manufacturer, or must be correctly soldered. Incomplete connections may cause short circuit, fire, or malfunction.
- Securely connect the connector to the module. Poor contact may cause malfunction.
- Do not install the control lines or communication cables together with the main circuit lines or power cables. Keep a distance of 100 mm or more between them. Failure to do so may result in malfunction due to noise.
- Place the cables in a duct or clamp them. If not, dangling cable may swing or inadvertently be pulled, resulting in damage to the module or cables or malfunction due to poor contact. Do not clamp the extension cables with the jacket stripped.
- Check the interface type and correctly connect the cable. Incorrect wiring (connecting the cable to an incorrect interface) may cause failure of the module and external device.
- Tighten the terminal screws or connector screws within the specified torque range. Undertightening can cause drop of the screw, short circuit, fire, or malfunction. Overtightening can damage the screw and/or module, resulting in drop, short circuit, fire, or malfunction.
- When disconnecting the cable from the module, do not pull the cable by the cable part. For the cable with connector, hold the connector part of the cable. For the cable connected to the terminal block, loosen the terminal screw. Pulling the cable connected to the module may result in malfunction or damage to the module or cable.
- Prevent foreign matter such as dust or wire chips from entering the module. Such foreign matter can cause a fire, failure, or malfunction.
- A protective film is attached to the top of the module to prevent foreign matter, such as wire chips, from entering the module during wiring. Do not remove the film during wiring. Remove it for heat dissipation before system operation.
- Mitsubishi programmable controllers must be installed in control panels. Connect the main power supply to the power supply module in the control panel through a relay terminal block. Wiring and replacement of a power supply module must be performed by qualified maintenance personnel with knowledge of protection against electric shock. For wiring, refer to the MELSEC iQ-R Module Configuration Manual.
- For Ethernet cables to be used in the system, select the ones that meet the specifications in the MELSEC iQ-R Ethernet/CC-Link IE User's Manual (Startup). If not, normal data transmission is not guaranteed.

[Startup and Maintenance Precautions]

⚠WARNING

- Do not touch any terminal while power is on. Doing so will cause electric shock or malfunction.
- Correctly connect the battery connector. Do not charge, disassemble, heat, short-circuit, solder, or throw the battery into the fire. Also, do not expose it to liquid or strong shock. Doing so may cause the battery to generate heat, explode, ignite, or leak, resulting in injury or fire.
- Shut off the external power supply (all phases) used in the system before cleaning the module or retightening the terminal screws, connector screws, or module fixing screws. Failure to do so may result in electric shock or cause the module to fail or malfunction.

[Startup and Maintenance Precautions]

⚠CAUTION

- When connecting an external device with a CPU module or intelligent function module to modify data of a running programmable controller, configure an interlock circuit in the program to ensure that the entire system will always operate safely. For other forms of control (such as program modification, parameter change, forced output, or operating status change) of a running programmable controller, read the relevant manuals carefully and ensure that the operation is safe before proceeding. Improper operation may damage machines or cause accidents.
- Especially, when a remote programmable controller is controlled by an external device, immediate action cannot be taken if a problem occurs in the programmable controller due to a communication failure. To prevent this, configure an interlock circuit in the program, and determine corrective actions to be taken between the external device and CPU module in case of a communication failure.
- Do not disassemble or modify the modules. Doing so may cause failure, malfunction, injury, or a fire.
- Use any radio communication device such as a cellular phone or PHS (Personal Handyphone System) more than 25 cm away in all directions from the programmable controller. Failure to do so may cause malfunction.
- Shut off the external power supply (all phases) used in the system before mounting or removing the module. Failure to do so can cause the module to fail or malfunction.
- Tighten the screws within the specified torque range. Undertightening can cause drop of the component or wire, short circuit, or malfunction. Overtightening can damage the screw and/or module, resulting in drop, short circuit, or malfunction.
- After the first use of the product, do not mount/remove the module to/from the base unit, and the terminal block to/from the module, and do not insert/remove the extended SRAM cassette to/from the CPU module more than 50 times (IEC 61131-2 compliant) respectively. Exceeding the limit of 50 times may cause malfunction.
- After the first use of the product, do not insert/remove the SD memory card to/from the CPU module more than 500 times. Exceeding the limit may cause malfunction.
- Do not touch the metal terminals on the back side of the SD memory card. Doing so may cause malfunction or failure.
- Do not touch the integrated circuits on the circuit board of an extended SRAM cassette. Doing so may cause malfunction or failure.
- Do not drop or apply shock to the battery to be installed in the module. Doing so may damage the battery, causing the battery fluid to leak inside the battery. If the battery is dropped or any shock is applied to it, dispose of it without using.

⚠CAUTION

- Startup and maintenance of a control panel must be performed by qualified maintenance personnel with knowledge of protection against electric shock. Lock the control panel so that only qualified maintenance personnel can operate it.
- Before handling the module, touch a conducting object such as a grounded metal to discharge the static electricity from the human body. Failure to do so may cause the module to fail or malfunction.
- Before testing the operation, set a low speed value for the speed limit parameter so that the operation can be stopped immediately upon occurrence of a hazardous condition.
- Confirm and adjust the program and each parameter before operation. Unpredictable movements may occur depending on the machine.
- When using the absolute position system function, on starting up, and when the module or absolute value motor has been replaced, always perform a home position return.
- Before starting the operation, confirm the brake function.
- Do not perform a megger test (insulation resistance measurement) during inspection.
- After maintenance and inspections are completed, confirm that the position detection of the absolute position detection function is correct.
- Lock the control panel and prevent access to those who are not certified to handle or install electric equipment.

[Operating Precautions]

⚠CAUTION

- When changing data and operating status, and modifying program of the running programmable controller from an external device such as a personal computer connected to an intelligent function module, read relevant manuals carefully and ensure the safety before operation. Incorrect change or modification may cause system malfunction, damage to the machines, or accidents.
- Do not power off the programmable controller or reset the CPU module while the setting values in the buffer memory are being written to the flash ROM in the module. Doing so will make the data in the flash ROM undefined. The data need to be set in the buffer memory and to be written to the flash ROM again. Doing so may cause malfunction or failure of the module.
- Note that when the reference axis speed is specified for interpolation operation, the speed of the partner axis (2nd, 3rd, or 4th axis) may exceed the speed limit value.
- Do not go near the machine during test operations or during operations such as teaching. Doing so may lead to injuries.

[Disposal Precautions]

⚠CAUTION

- When disposing of this product, treat it as industrial waste.
- When disposing of batteries, separate them from other wastes according to the local regulations. For details on battery regulations in EU member states, refer to the MELSEC iQ-R Module Configuration Manual.

[Transportation Precautions]

⚠CAUTION

- When transporting lithium batteries, follow the transportation regulations. For details on the regulated models, refer to the MELSEC iQ-R Module Configuration Manual.
- The halogens (such as fluorine, chlorine, bromine, and iodine), which are contained in a fumigant used for disinfection and pest control of wood packaging materials, may cause failure of the product. Prevent the entry of fumigant residues into the product or consider other methods (such as heat treatment) instead of fumigation. The disinfection and pest control measures must be applied to unprocessed raw wood.

[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.

CONTENTS

RELEVANT MANUALS

Manual name [manual number]	Description	Available form
MELSEC iQ-R Simple Motion Module User's Manual (Startup) [IB-0300245]	Specifications, procedures before operation, system configuration, wiring, and operation examples of the Simple Motion module	Print book e-Manual PDF
MELSEC iQ-R Simple Motion Module User's Manual (Application) [IB-0300247]	Functions, input/output signals, buffer memory addresses, parameter settings, programming, and troubleshooting of the Simple Motion module	Print book e-Manual PDF
MELSEC iQ-R Simple Motion Module User's Manual (Advanced Synchronous Control) [IB-0300249]	Functions and programming for the synchronous control of the Simple Motion module	Print book e-Manual PDF
MELSEC iQ-R Simple Motion Module User's Manual (Network) [IB-0300307]	Functions, parameter settings, troubleshooting, and buffer memory of CC-Link IE Field Network	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 cutter cam (central reference)	This cam specifies the synchronization section in synchronous position adjustment based on the center of the sheet.
Rotary cutter cam (front end reference)	This cam specifies the synchronization section in the synchronization starting point based on the front end of the sheet.
Rotary encoder	Refer to "Pulse generator".
Seal axis	This axis moves vertically to the line in the box motion.

Term	Description
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.
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 information for MELSEC iQ-R series) of the CPU module to be used. For how to check the manufacturing information and firmware version, refer to the following.

MELSEC iQ-R Module Configuration Manual

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

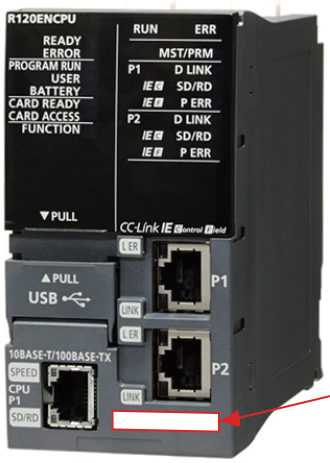
For the registration procedure, refer to the following.

Page 29 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: Above the PULL on the LED cover



Position where the seal is attached: Below the Ethernet port P2

1 OVERVIEW

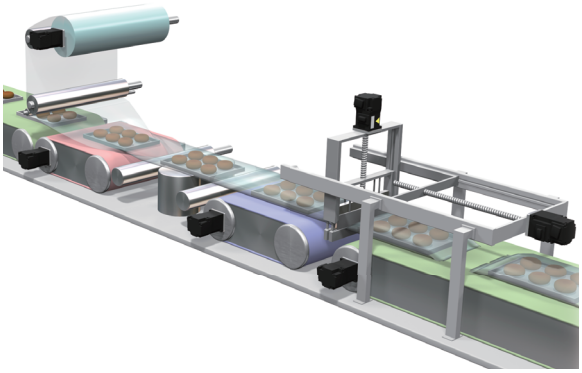
1.1 Packaging Application Package

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.

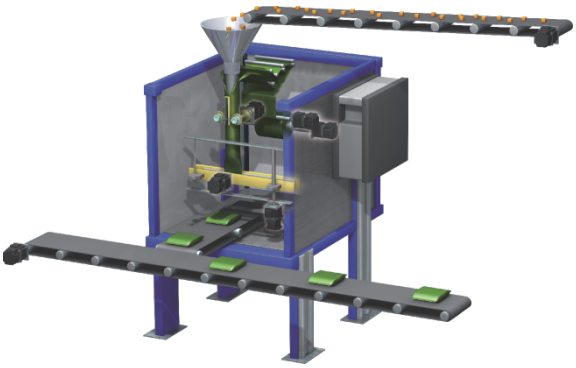
1.2 Application Examples

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

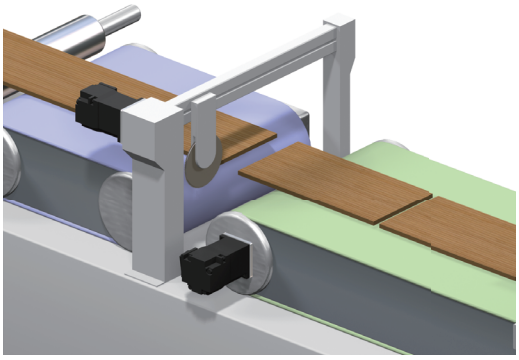
Horizontal pillow packaging machine



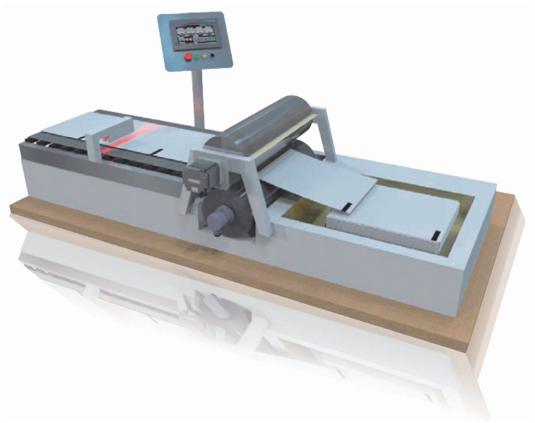
Vertical pillow packaging machine



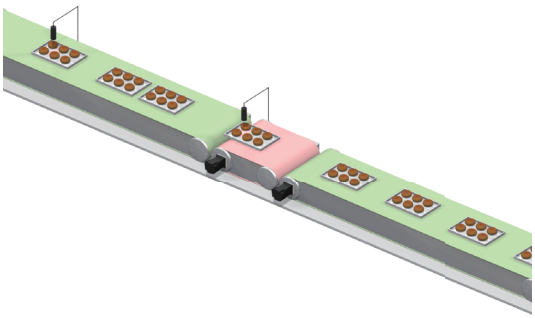
Cross-cutting machine



Rotary cutter



Conveyor line

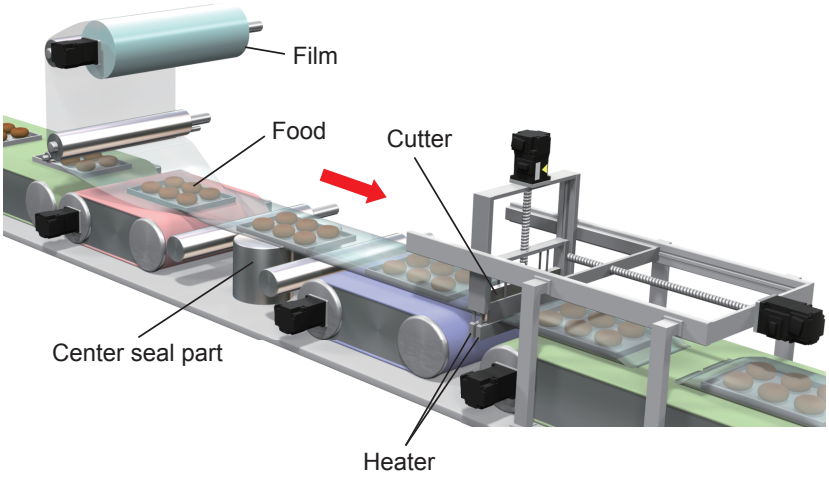


1.3 Operations of Pillow Packaging Machines

The following describes the operations of pillow packaging machines.

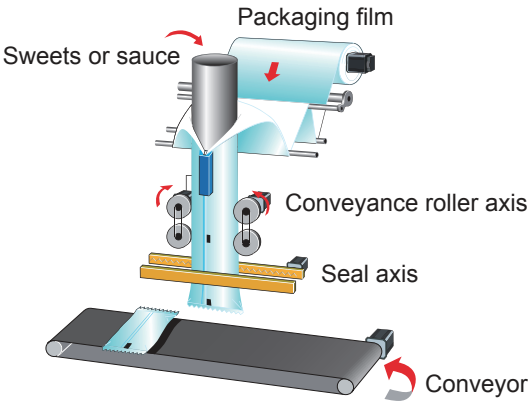
Horizontal pillow packaging machine

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.



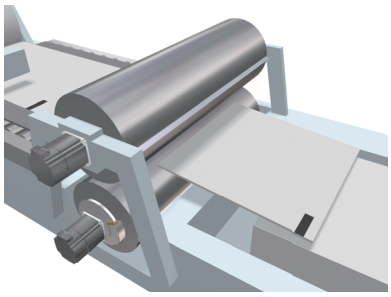
1.4 Functions of Each Packaging Machine

The following describes functions of each packaging machine.

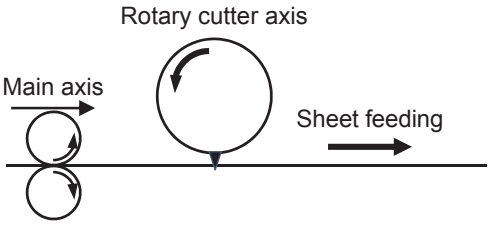
Rotary cutter

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.

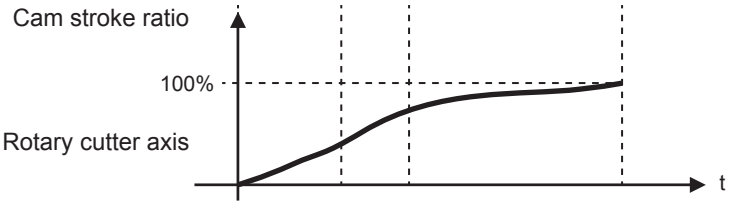
■Mechanism image



■Operation outline



■Cam pattern

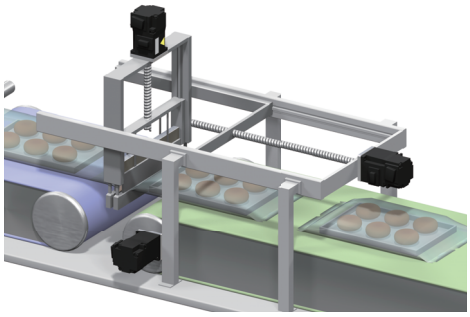


Box motion

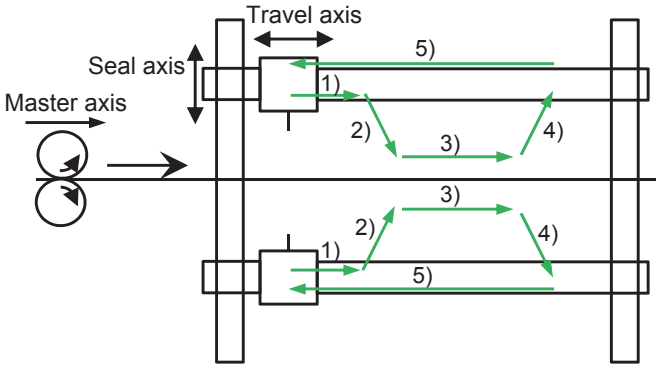
This function performs sealing and cutting with elliptical movements of two axes.
A cuter seals and cuts the sheet or film conveyed by the conveyor into the specified size at the speed synchronized with the sheet or film while moving downward and forward at the same time. After completion of cutting, the cutter moves upward and returns to the waiting point.

Section	Movement	Remarks
1)	Moving to the travel axis synchronization starting point	—
2)	Moving to the seal axis machining point (close)	Master axis - Travel axis synchronization section
3)	Sealing and cutting operation	
4)	Moving to the seal axis waiting point (open)	
5)	Moving to the travel axis waiting point	—

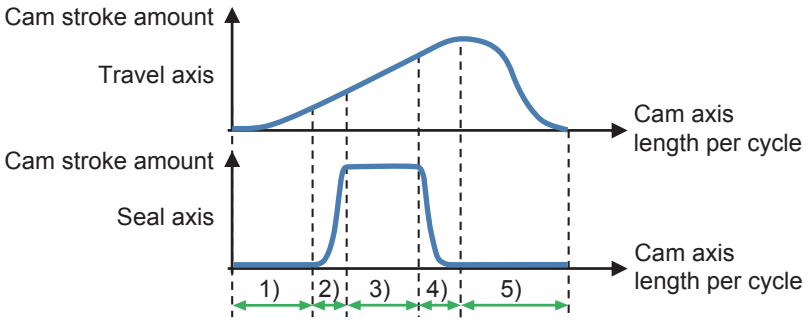
■Mechanism image



■Operation outline



■Cam pattern

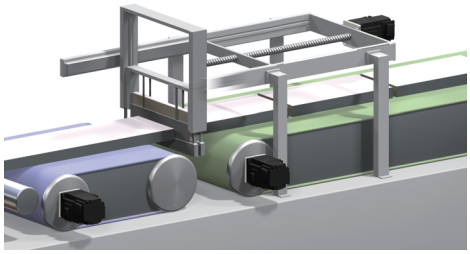


Flying shear

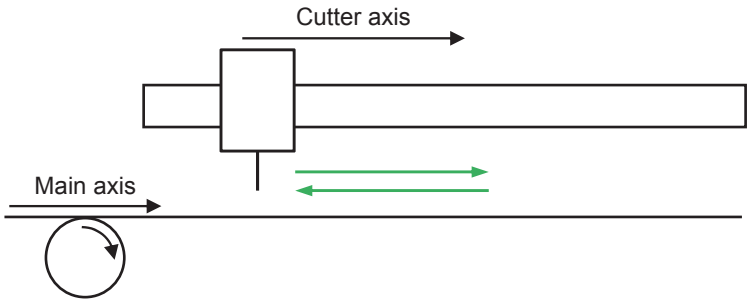
This function performs traveling cutting with one axis in synchronization with the sheet.

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

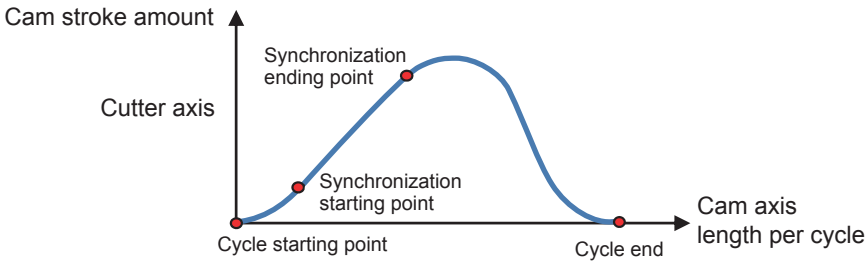
■Mechanism image



■Operation outline



■Cam pattern



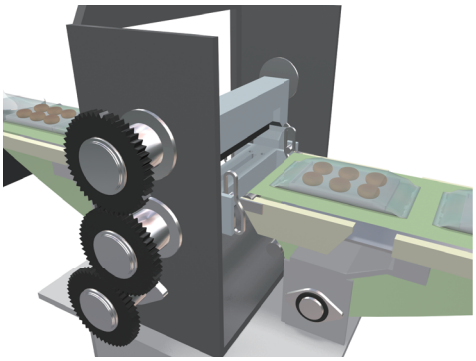
Long dwell

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

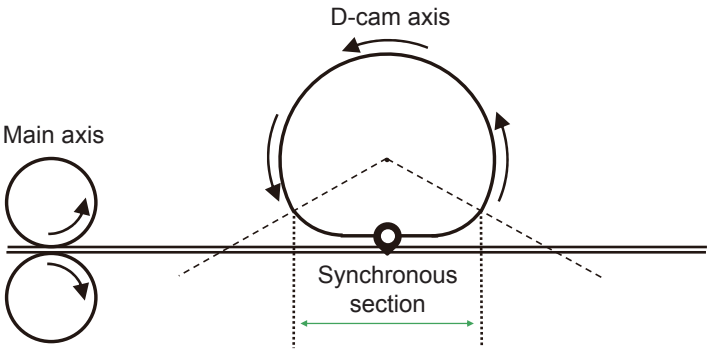
A cutter seals and cuts the sheet or film conveyed by the conveyor into the specified size while adjusting the speed. The cutter rotates at the peripheral speed synchronized with the sheet or film.

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	—

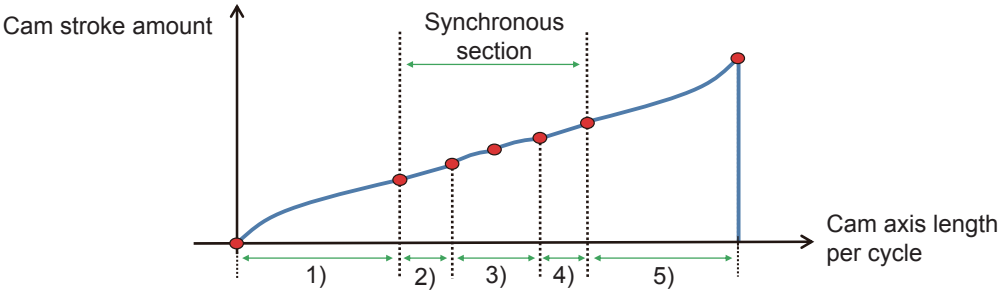
■Mechanism image



■Operation outline



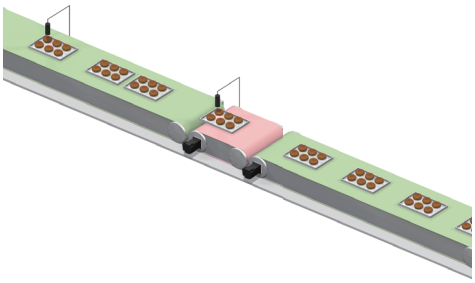
■Cam pattern

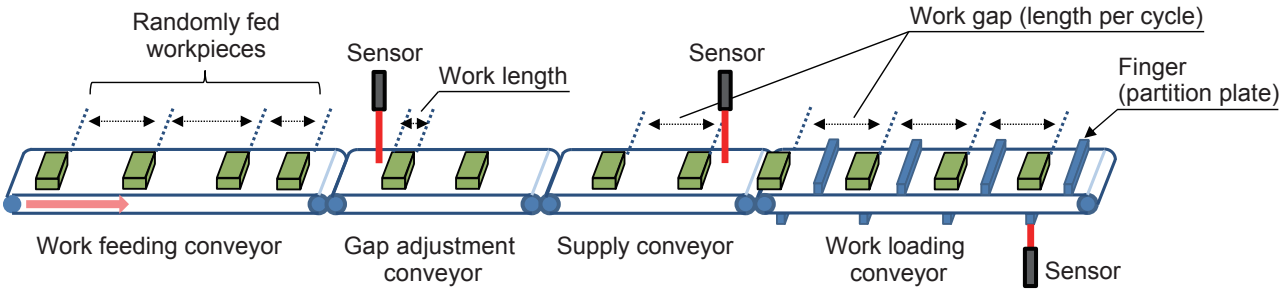


Alignment conveyor

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

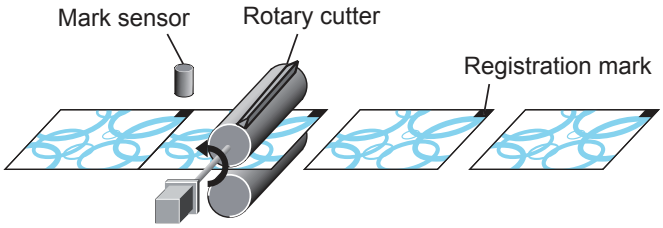
■Mechanism image





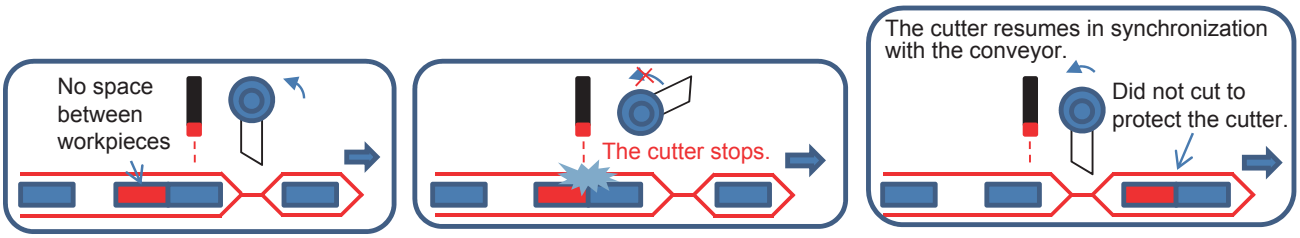
Mark compensation

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



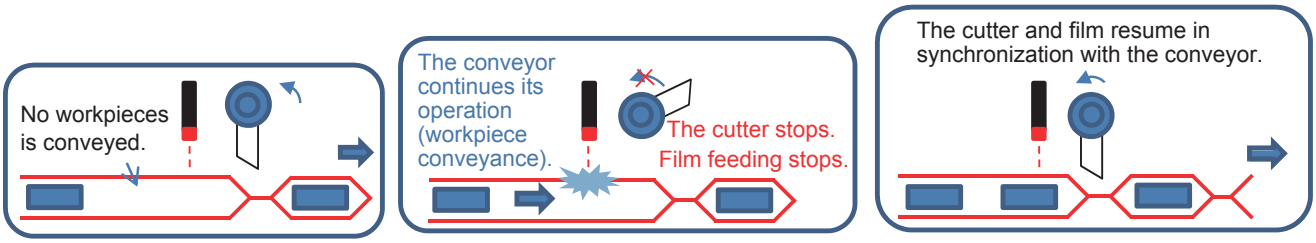
No Gap No Seal

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-R series.
Select and prepare MELSEC iQ-R power supply modules, base units, 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-PAC002AA-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 27 Files in DVD-ROM
License Key Request Instructions	1	
iQ Monozukuri seal	Number of licenses × 2*1	

*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*1	File type (Extension)	Description	Required application
Package root/ RD77MS	Manual	English	bcnb62005762eng*	PDF file (.pdf)	iQ Monozukuri PACKAGING Instruction Manual (English)	Adobe Reader
			bcnb62005762eng*	e-Manual file (.ema)		e-Manual Viewer
		Japanese	bcnb62005761*	PDF file (.pdf)	iQ Monozukuri PACKAGING Instruction Manual (Japanese)	Adobe Reader
			bcnb62005761*	e-Manual file (.ema)		e-Manual Viewer
		Simplified Chinese	bcnb62005763chn*	PDF file (.pdf)	iQ Monozukuri PACKAGING Instruction Manual (Chinese (Simplified))	Adobe Reader
			bcnb62005763chn*	e-Manual file (.ema)		e-Manual Viewer
	Lib		PAC_PackagingControl_R_****	Application library (.mslm)	FB library for packaging applications	MELSOFT GX Works3
	Project		AP20-PAC002AA-R16-77MS8_LongDwell_****	GX Works3 project file (.gx3)	Application program examples using the long dwell	MELSOFT GX Works3
			AP20-PAC002AA-R16-77MS16_BoxMotion_****	GX Works3 project file (.gx3)	Program examples using the box motion	MELSOFT GX Works3
			AP20-PAC002AA-R16-77MS16_AlignmentConveyor_****	GX Works3 project file (.gx3)	Program examples for work alignment on the conveyor	MELSOFT GX Works3
			AP20-PAC002AA-GT27nnV_****	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-PAC002AA_R16_LicWrite	GX Works3 project file (.gx3)	Programs for registering a license key to the CPU module	MELSOFT GX Works3
	—		AP20-PAC002AA	Text file (.txt)	Version information	—
Package root/ RD77GF	Manual	English	bcnb62005762eng*	PDF file (.pdf)	iQ Monozukuri PACKAGING Instruction Manual (English)	Adobe Reader
			bcnb62005762eng*	e-Manual file (.ema)		e-Manual Viewer
		Japanese	bcnb62005761*	PDF file (.pdf)	iQ Monozukuri PACKAGING Instruction Manual (Japanese)	Adobe Reader
			bcnb62005761*	e-Manual file (.ema)		e-Manual Viewer
		Simplified Chinese	bcnb62005763chn*	PDF file (.pdf)	iQ Monozukuri PACKAGING Instruction Manual (Chinese (Simplified))	Adobe Reader
			bcnb62005763chn*	e-Manual file (.ema)		e-Manual Viewer
	Lib		PAC_PackagingControl_R_****	Application library (.mslm)	FB library for packaging applications	MELSOFT GX Works3
	Project		AP20-PAC002AA-R16-77GF8_LongDwell_****	GX Works3 project file (.gx3)	Application program examples using the long dwell	MELSOFT GX Works3
			AP20-PAC002AA-R16-77GF16_BoxMotion_****	GX Works3 project file (.gx3)	Program examples using the box motion	MELSOFT GX Works3
			AP20-PAC002AA-R16-77GF16_AlignmentConveyor_****	GX Works3 project file (.gx3)	Program examples for work alignment on the conveyor	MELSOFT GX Works3
			AP20-PAC002AA-GT27nnV_****	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-PAC002AA_R16_LicWrite	GX Works3 project file (.gx3)	Programs for registering a license key to the CPU module	MELSOFT GX Works3
	—		AP20-PAC002AA	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
PLC CPU module	R**CPU, R**ENCPU Use the module with a firmware version of "25" or later.
Simple Motion module	RD77MS, RD77GF
Engineering environment (controller)	MELSOFT GX Works3 Version 1.057K or later*1
Engineering environment (GOT)	MELSOFT GT Works3 Version 1.220E or later*1

*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 204 Temporary License Registration

Items to be prepared

Item	Description
Product ID	Numbers that are described in the "License Certificate" 123-123456789
License key	Follow the "License Key Request Instructions" to get a license key. 11AA12AB13AC14AD21BA22BB23BC24BD31CA32CB33CC34CD41DA42DB43DC44DD
License key registration project (AP20-PAC002AA _R16_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-PAC002AA_R16_LicWrite.gx3)

Copy the license key registration project (AP20-PAC002AA_R16_LicWrite.gx3) in the supplied DVD to a folder on the personal computer, then open the file.

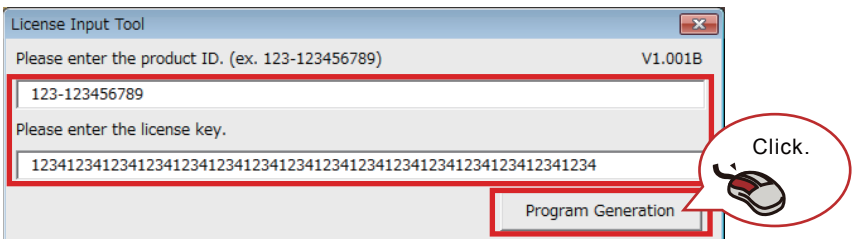
The project is created for the R16CPU. When using a model other than R16CPU, change the model.

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

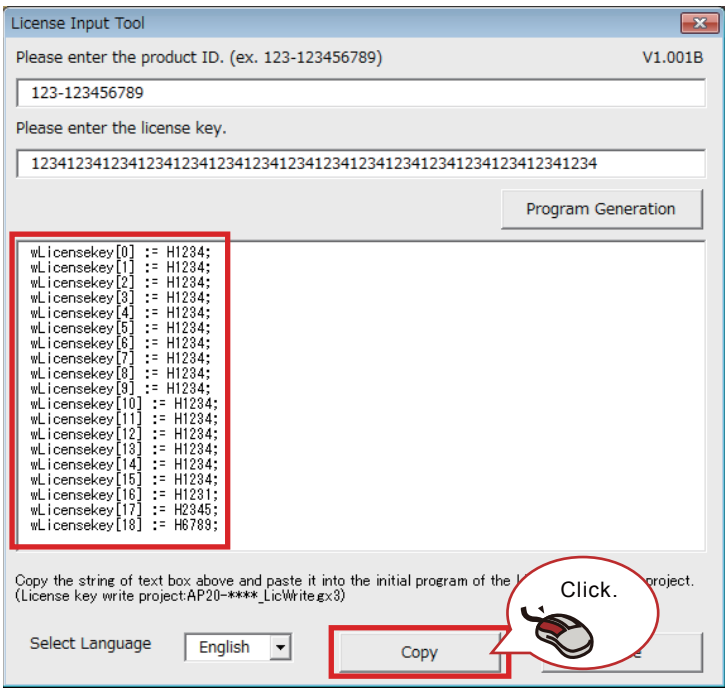
2. Preparing the program using the license key registration support tool

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

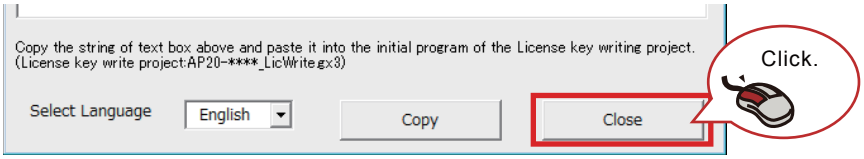
- Copy the license key registration support tool (LicRegSupport.xlsm) in the supplied DVD to a folder in the personal computer, and open the file. When the file is read-only, clear the read-only status. Enable the macro if it is disabled.
- Input the product ID and license key, and press the [Program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

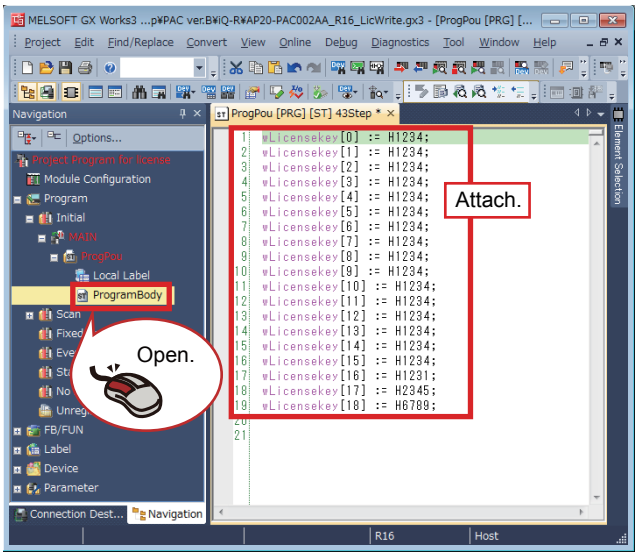
Set the license key to the license key label (wLicensekey) of the initial program.

■ 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.

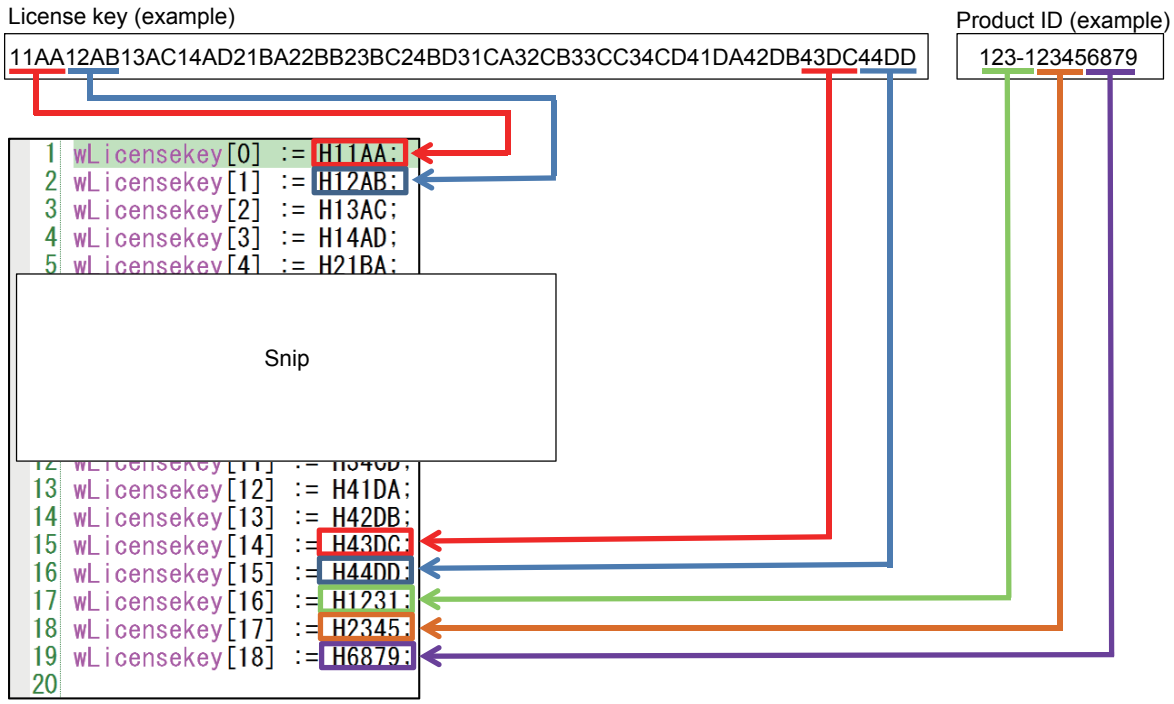
Select all of the existing ST program and paste the copied program in the initial program.



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.

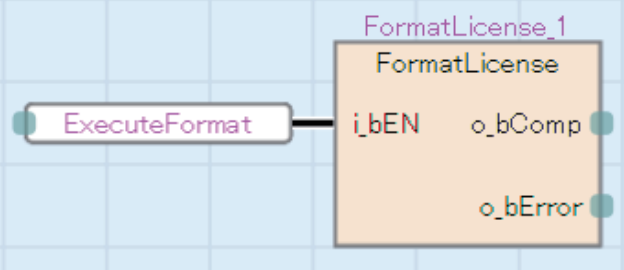
- Select "Convert" → "Rebuild All" from the menu and convert all the program created in step 3. When an error occurs, check the details and correct the program.
- Select "Online" → "Write to PLC" from the menu and write all the program to the PLC CPU module.
- Set the PLC CPU module to the RUN state 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.

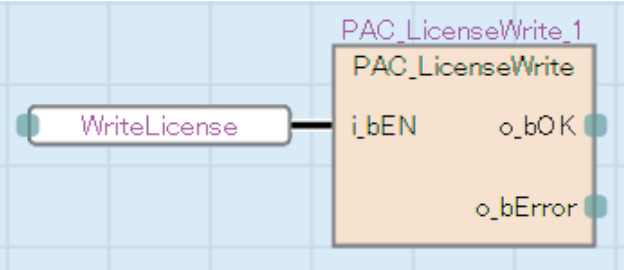
■ Formatting the license key registration area

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 33 Troubleshooting)
When Normal operation (o_bOK) turns on, the license key registration is completed. Turn off the execution flag (WriteLicense).

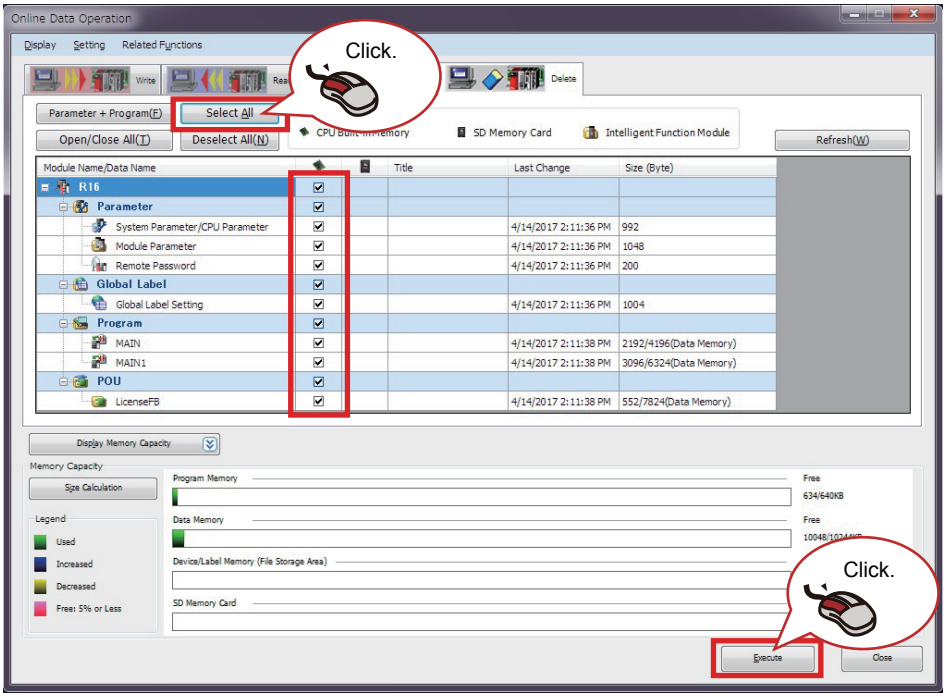


5. Deleting the license key registration program

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.	• The license key registration area has never been formatted. • The license key outside the range of the memory was trying to be written.	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.	• The PLC CPU module is not in the RUN state. • "Macro type" is not specified for "FB type" of the license key registration FB.	• Set the PLC CPU module to the RUN state. • Specify "Macro type" for "FB type" of the license key registration FB.

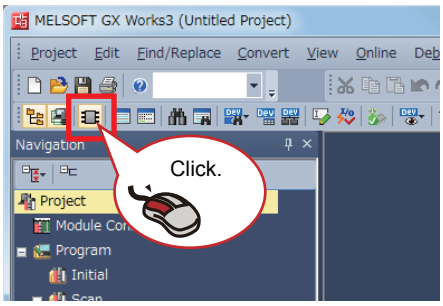
Precautions

- 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".

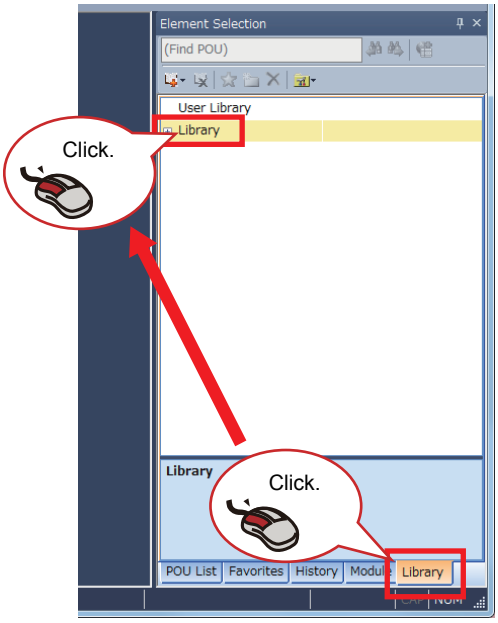
2.2 Registering the FB Library

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 47 FB LIBRARY".

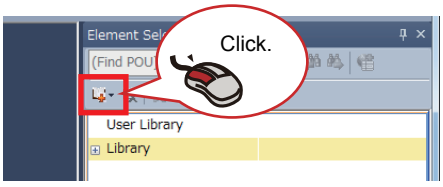
1. Copy the library file (*.mslm) in the supplied DVD to anywhere in a personal computer.
2. Start GX Works3, select "Project" → "New", and click the [Element Selection] icon.



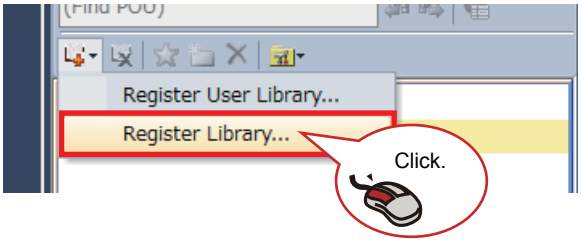
3. The Element Selection window appears. Click the Library tag and select the library.

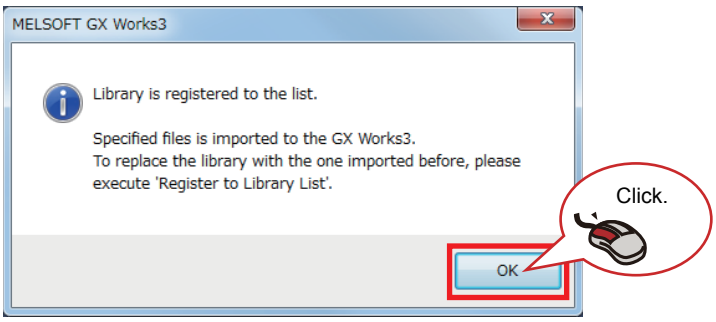


4. Click the [Register to Library List] icon.



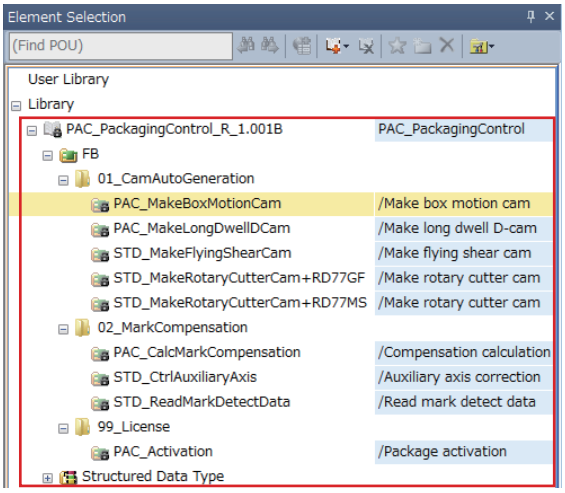
5. Click [Register Library].



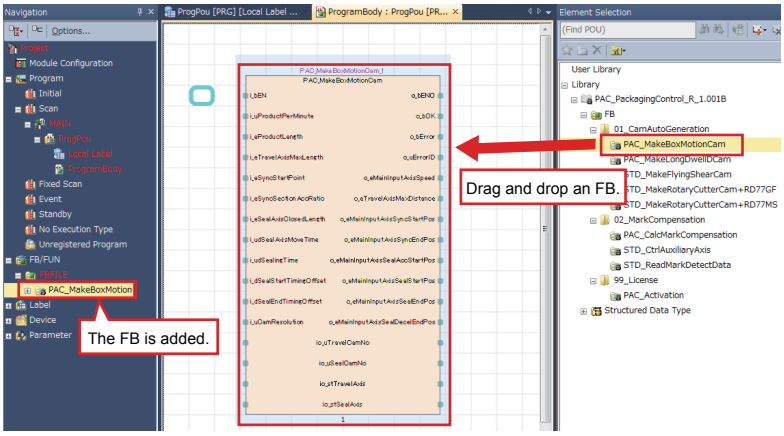


6. The dialog box shown on the left appears. Click the [OK] button.

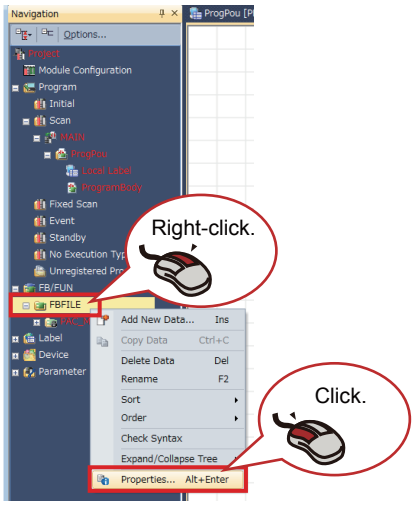
7. The "Register Library to Library List" window appears. Select the library file (*.mslm) copied in the personal computer and click the [Open] button.



8. Imported FBs are displayed in the Element Selection window.

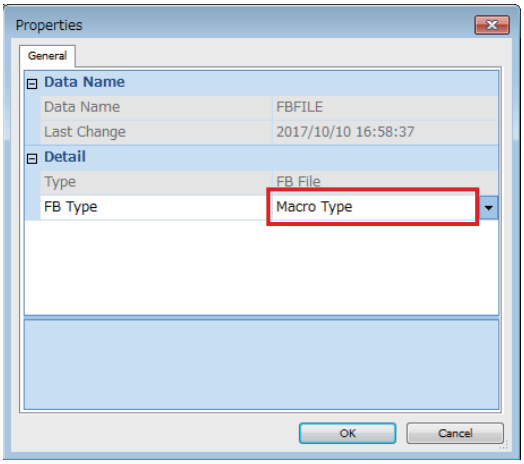


9. Select the FB to be used from the Element Selection window, and drag and drop it into the work window. The FB is added in the Navigation window.



10. 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 Upgrading the Library Version

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.

Replacement when updating a project of version 1.004E or earlier to 1.005F or later

Library change	Replacement method
Change the data type of the variables AxisNo. and StartIO in the AXIS_REF structure to word [unsigned].	Change the variable data type of I/O No. and axis No. to word [unsigned]. Correct the data type error in the type conversion instruction so that the data type matches.

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.

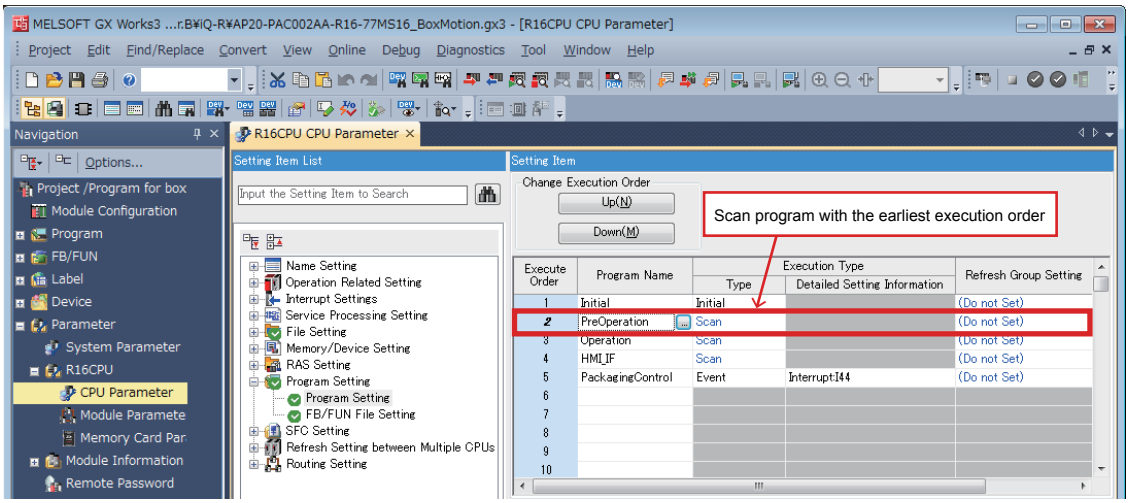
Place it at the front of the user-created GX Works3 project scan program.

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

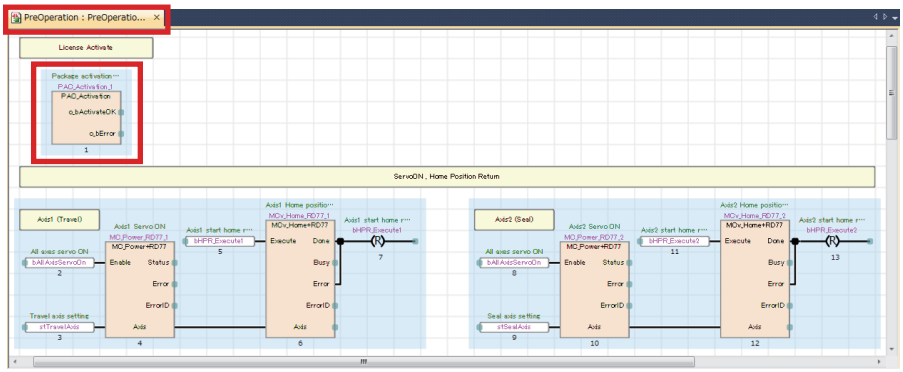
The license certification FB does not operate correctly in non-scan programs.

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

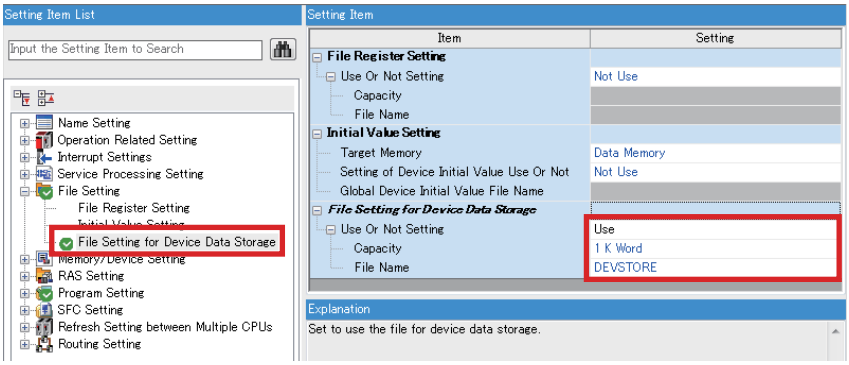


CPU parameter setting of the user program

Select "Parameter" → CPU module → "CPU Parameter" in the Navigation window to open the setting item window.
Select "File Setting" — "File Setting for Device Data Storage" in the CPU parameter window.
Set "Use Or Not Setting" to "Use".

Precautions

- This package uses addresses 0 to 1023 (1K word) of the data storage file (DEVSTORE.QST). When using the device data storage file, set the file to 2K words or more and use the address 1024 or later.
- If data is accidentally written to the addresses 0 to 1023 of the data storage file, license information may be lost. In this case, register the license again.
- In this package program example, "access from external devices" is enabled in the global label. After writing the program example to the CPU module, reset the memory when disabling "access from external devices". If the memory has been reset, registration information of all registered license keys will be lost. Register the licenses again.



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 29 Registering a License Key)
	The expiration date of the temporary license (two months) passed.	Get and register the license key. (☞ Page 29 Registering a License Key)
The CPU module outputs the error code (2840H) and stops.	"Not Use" is set to "File Setting for Device Data Storage".	Set "File Setting for Device Data Storage" to "Use" in the CPU parameter and write the CPU parameter. (☞ Page 38 Certifying the License Key)
The CPU module outputs the error code (3100H) and stops.	The firmware version of the PLC CPU module is not "25" or later.	Update the firmware version of the PLC CPU module to "25" 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)

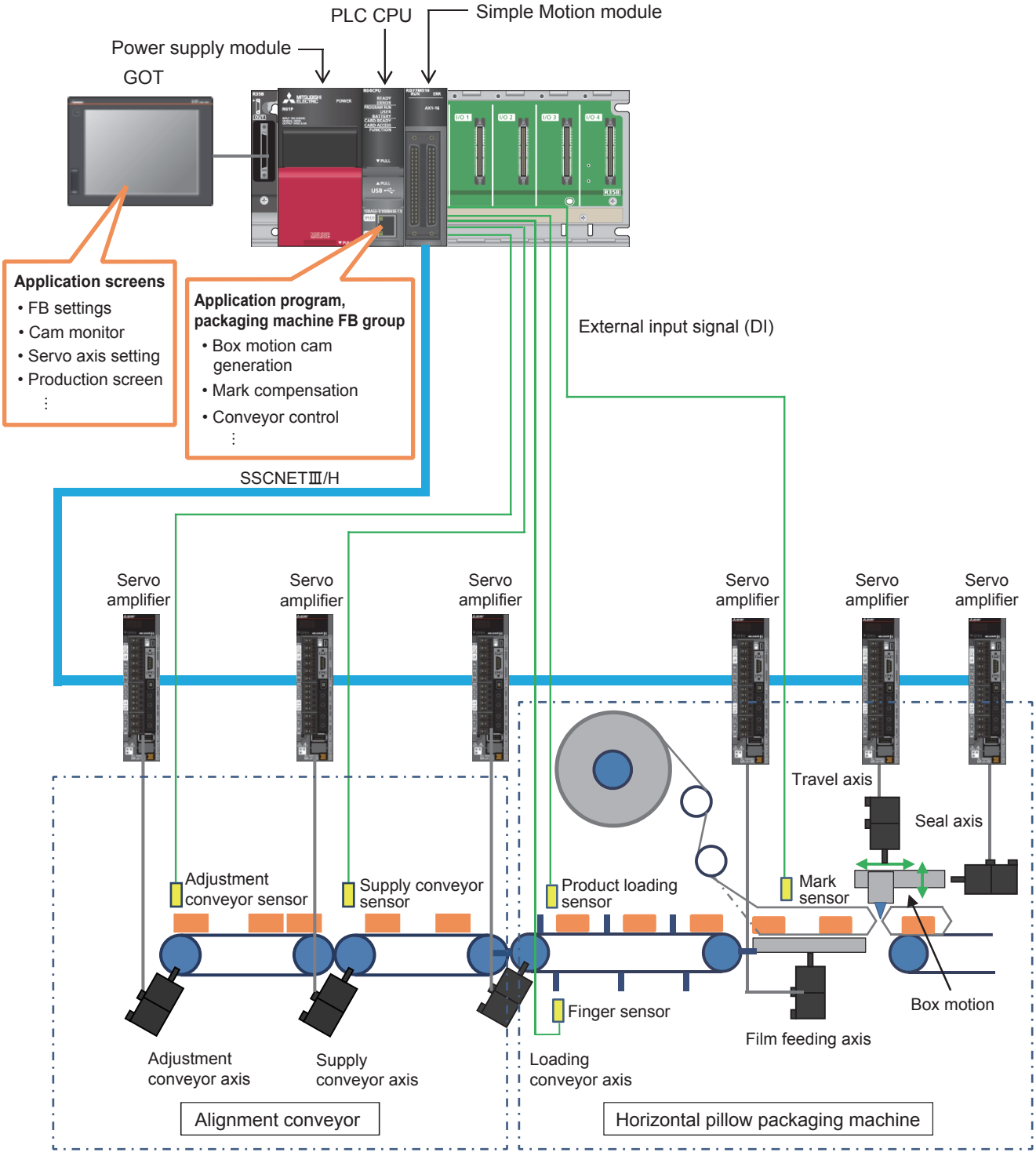
No specific operation is required. Refer to the manual of the module to replace the module.

3 SYSTEM CONSTRUCTION

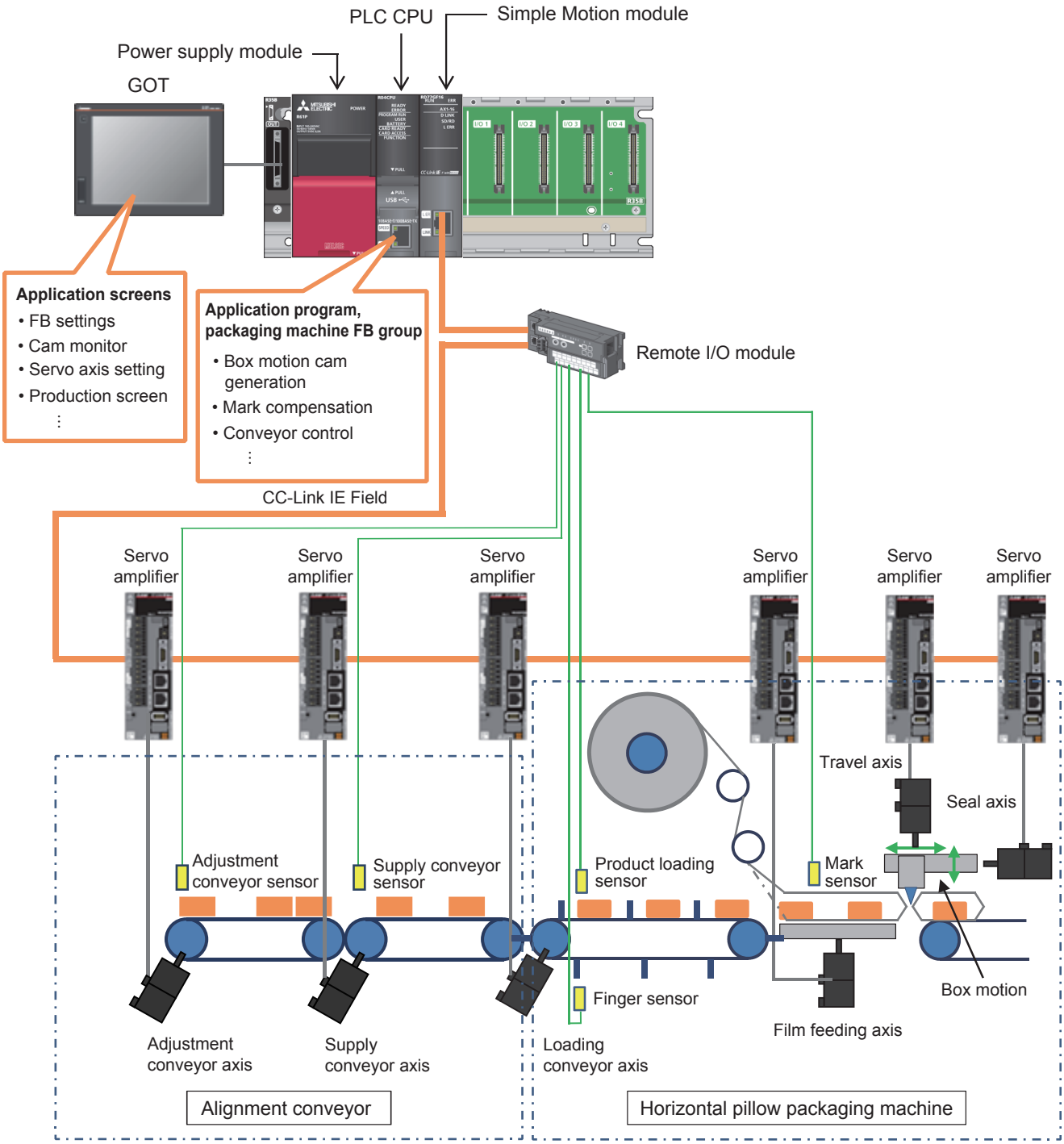
3.1 System Configuration Example

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

System configuration example when using RD77MS



System configuration example when using RD77GF



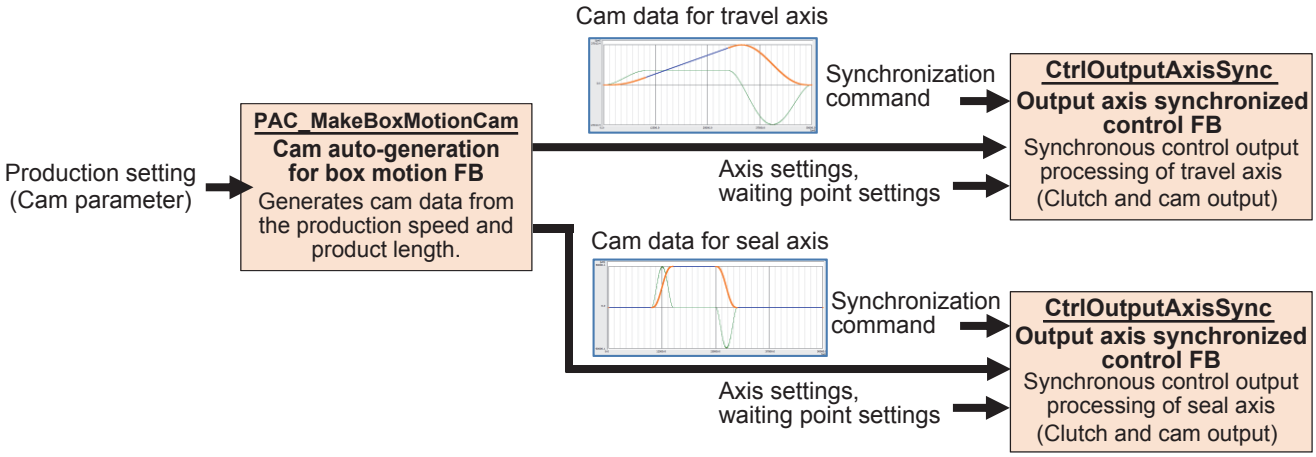
3.2 Control Overview

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.

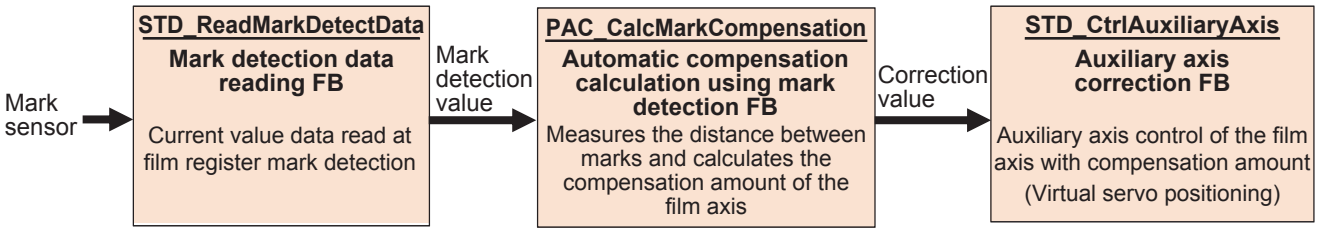
Box motion control (travel axis, seal axis)

Cam patterns for two axis (one for the travel axis, the other one for the seal axis) are generated by inputting production settings such as the production speed and product length in the box motion cam generation FB.



Mark compensation control

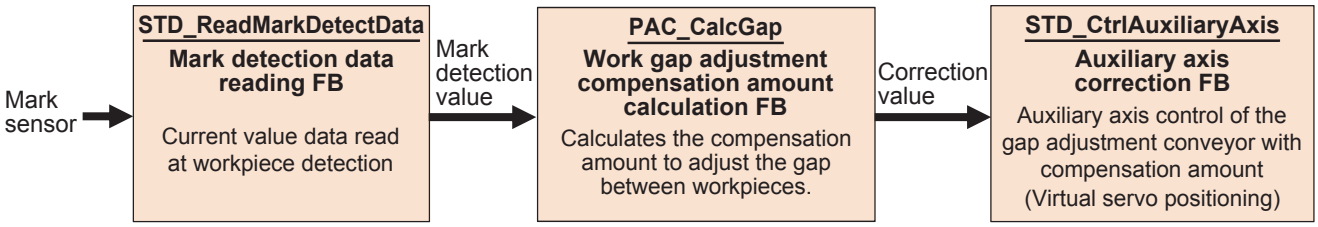
A difference between the command value and the mark pitch calculated from the current value of the film axis at mark detection is output as a compensation value.



Alignment conveyor control

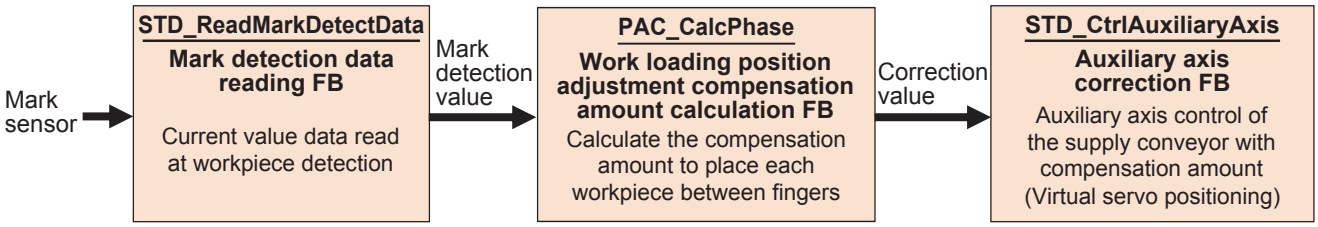
■Gap adjustment control

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

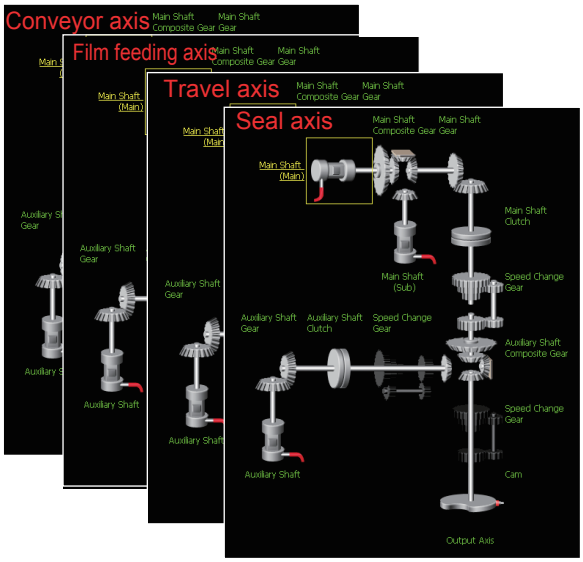
The deviation is calculated between the position of workpiece detected on the supply conveyor and the finger position of the loading conveyor to output the compensation amount so that each workpiece aligned (between fingers) on the upstream conveyor is placed between fingers of the loading conveyor.



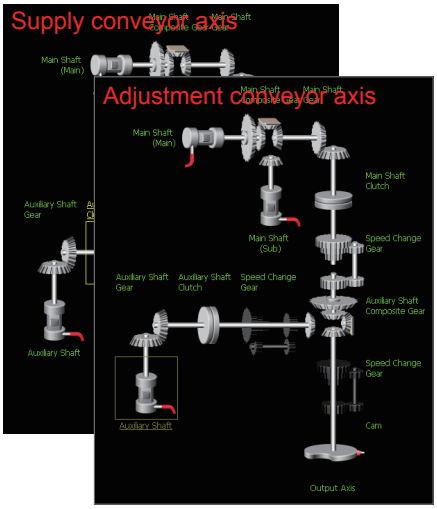
Configuration example of advanced synchronous control

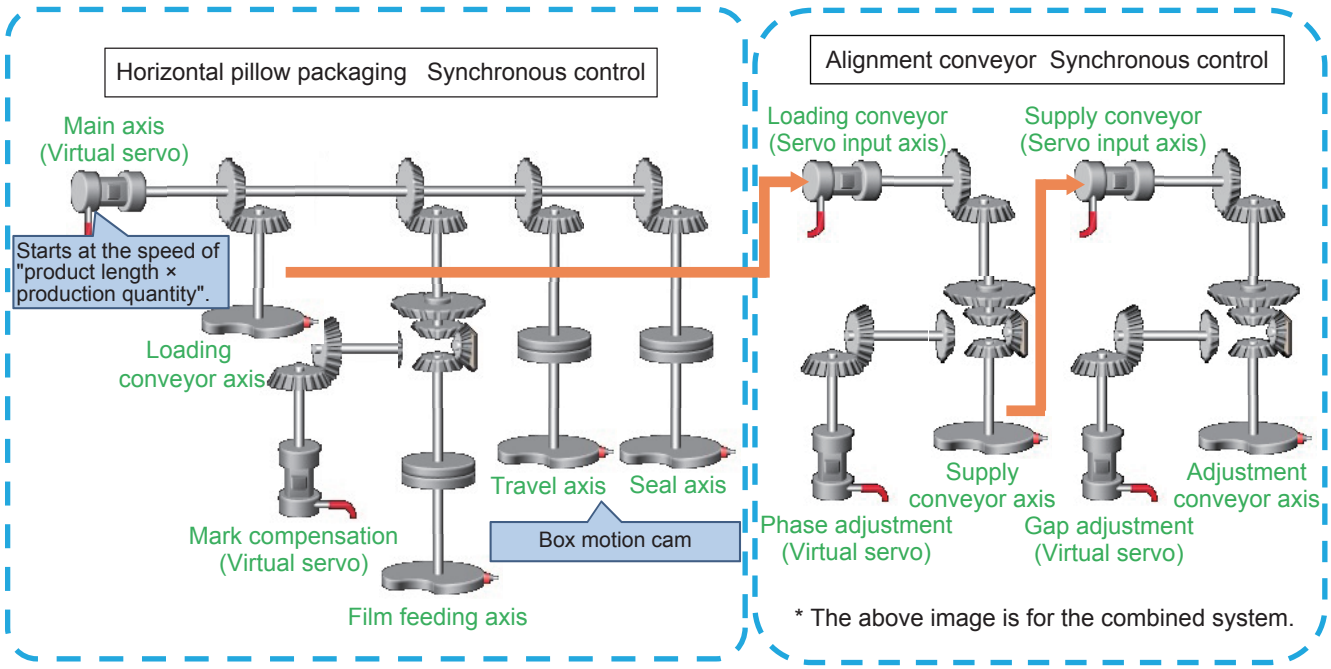
The following shows a configuration example of advanced synchronous control with the Simple Motion module for controlling the horizontal pillow packaging machine with the library provided with this application package.

Horizontal pillow packaging
Each axis synchronous control setting



Alignment conveyor
Each axis synchronous control setting





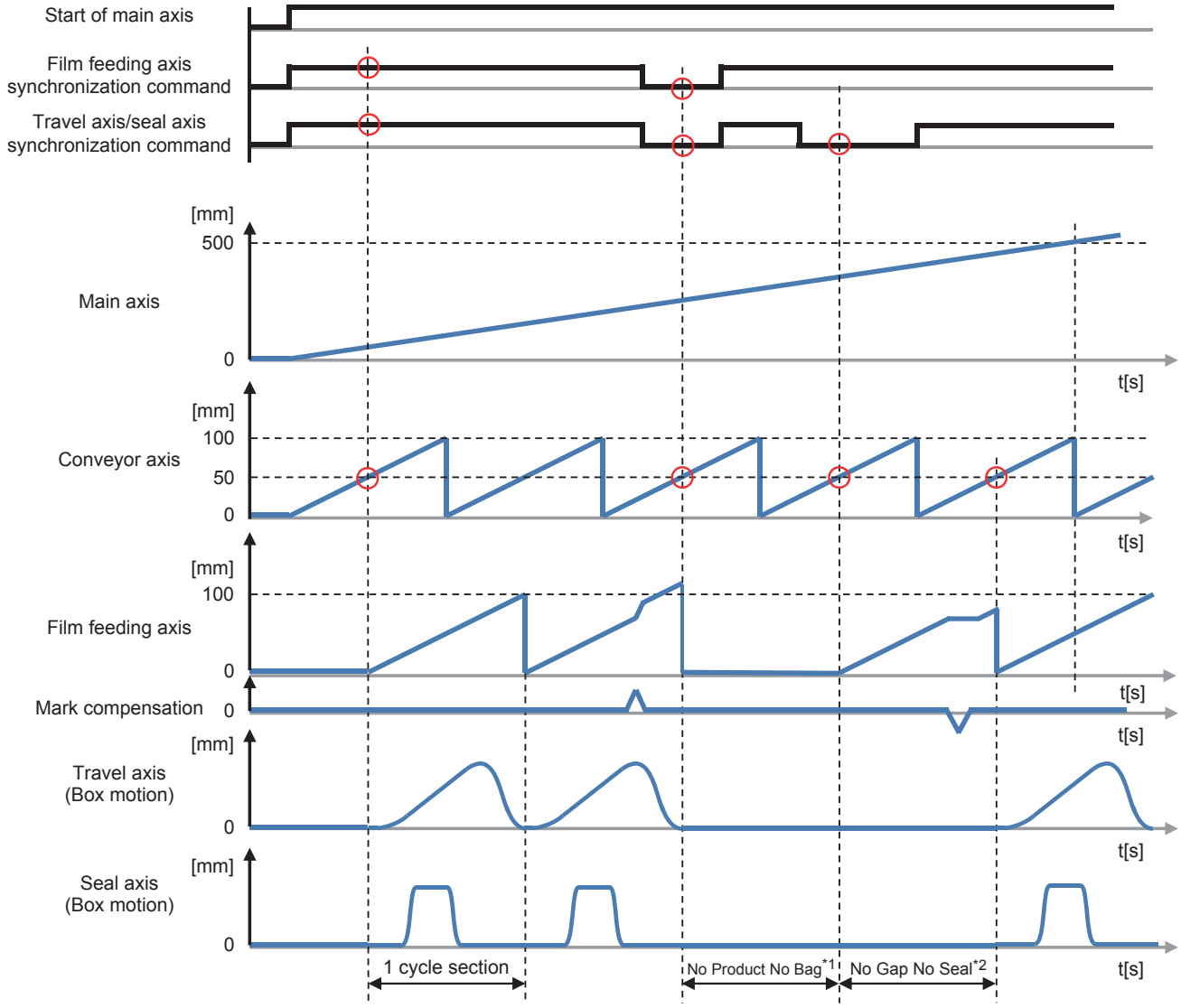
Synchronous control operation image

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
- Travel axis waiting point: 50 mm
- Seal axis waiting point: 50 mm



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

*2 When spaces between workpieces are too narrow, this function stops the travel axis and seal 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_R).

No.	Item	FB name	Description	Cutting and sealing control				Mark compensation	Alignment conveyor		Reference
				Rotary cutter	Box motion	Flying shear	Long dwell		Gap adjustment	Loading position adjustment	
01	Cam auto-generation	STD_MakeRotaryCutterCam+RD77MS	Cam auto-generation for rotary cutter	◎	—	—	—	—	—	—	Page 57
		STD_MakeRotaryCutterCam+RD77GF							—	—	Page 61
		PAC_MakeBoxMotionCam	Cam auto-generation for box motion	—	◎	—	—	—	—	—	Page 65
		STD_MakeFlyingShearCam	Cam auto-generation for flying shear	—	—	◎	—	—	—	—	Page 71
		PAC_MakeLongDwellDCam	Cam auto-generation for D-cam	—	—	—	◎	—	—	—	Page 77
02	Mark compensation	STD_ReadMarkDetectData	Mark detection data reading	—	—	—	—	◎	◎	◎	Page 82
		PAC_CalcMarkCompensation	Auto deviation compensation calculation with mark detection	—	—	—	—	◎	—	—	Page 86
		STD_CtrlAuxiliaryAxis	Auxiliary axis correction	—	—	—	—	◎	◎	◎	Page 90
03	Alignment conveyor	PAC_CalcGap	Work gap adjustment compensation amount calculation	—	—	—	—	—	◎	—	Page 94
		PAC_CalcPhase	Work loading position adjustment compensation amount calculation	—	—	—	—	—	—	◎	Page 99
99	Activation	PAC_Activation	License activation	◎	◎	◎	◎	◎	◎	◎	Page 38

◎: FB required for control

Version history

The following table shows the version history of the FB library (PAC_PackagingControl_R).

Version	Description
1.000A	First edition
1.001B	• STD_MakeRotaryCutterCam+RD77GF (Cam auto-generation for rotary cutter (central reference)) is added. • PAC_MakeLongDwellDCam (Cam auto-generation for D-cam) is added. • The subroutine type is supported for the compile method of FB library. • PAC_Activation (License activation) is added.
1.002C	• PAC_CalcGap (Work gap adjustment compensation amount calculation) is added. • PAC_CalcPhase (Work loading position adjustment compensation amount calculation) is added. • The input label specification of STD_CtrlAuxiliaryAxis (Auxiliary axis correction) is changed.
1.003D	PAC_Activation (License activation) has supported the temporary license.
1.004E	The following FBs are modified. • PAC_CalcMarkCompensation (Automatic compensation calculation using mark detection)
1.005F	The data type of AXIS_REF structure in the following FBs have been changed. • STD_MakeRotaryCutterCam+RD77MS • STD_MakeRotaryCutterCam+RD77GF • PAC_MakeBoxMotionCam • STD_MakeFlyingShearCam • PAC_MakeLongDwellDCam • STD_ReadMarkDetectData • PAC_CalcMarkCompensation • STD_CtrlAuxiliaryAxis • PAC_CalcGap • PAC_CalcPhase

Restrictions and precautions common to all FBs

- The number of FB steps in a program varies depending on the CPU model to be used and I/O definitions.
- These FBs use the index register Z9. When using interrupt programs, do not use this index register in the interrupt programs.
- When combining macro and subroutine types in the program, use the R**CPU or R**ENCPU with a firmware version of "26" or later.

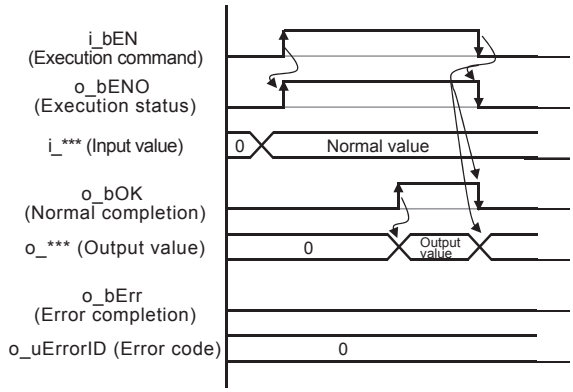
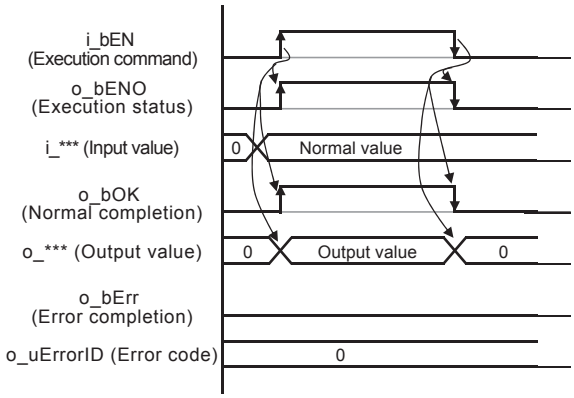
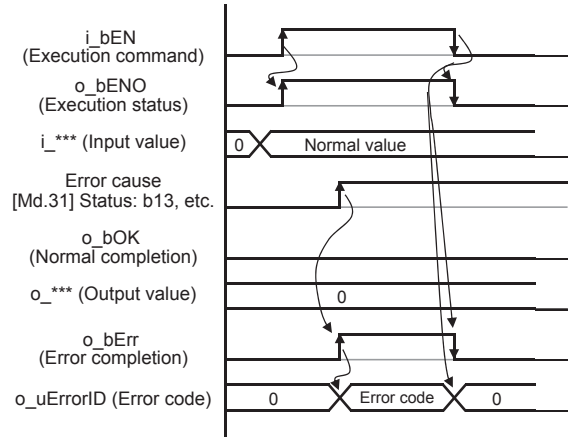
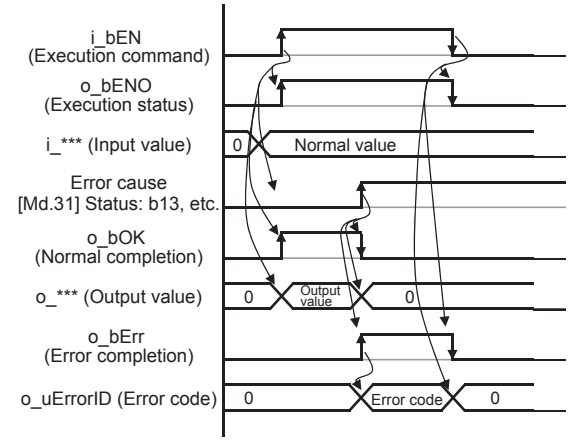
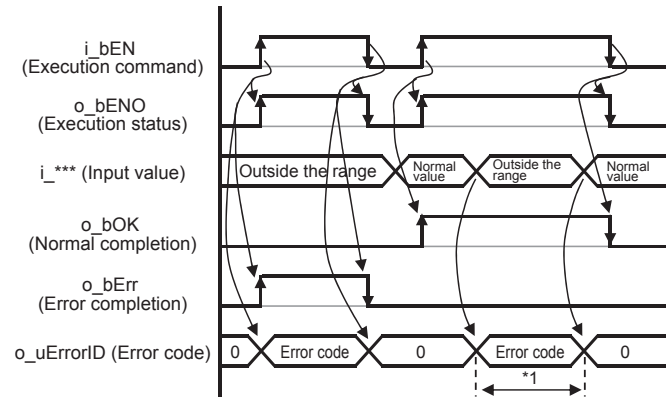
Point

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

☞ Page 57 Details of the FB Library

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 57 Details of the FB Library".

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

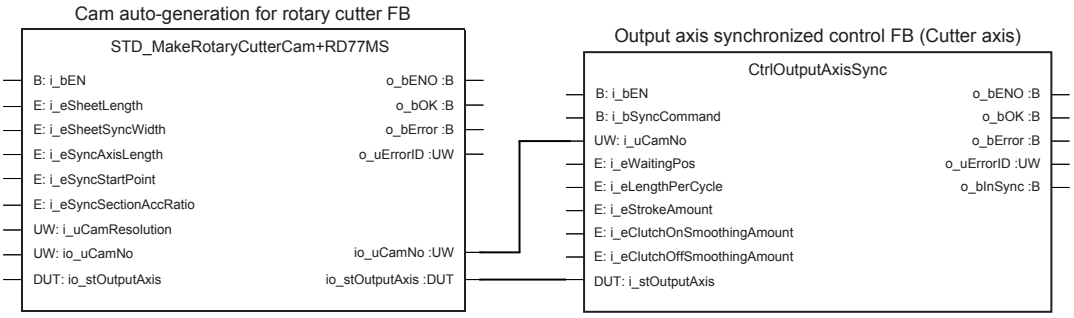
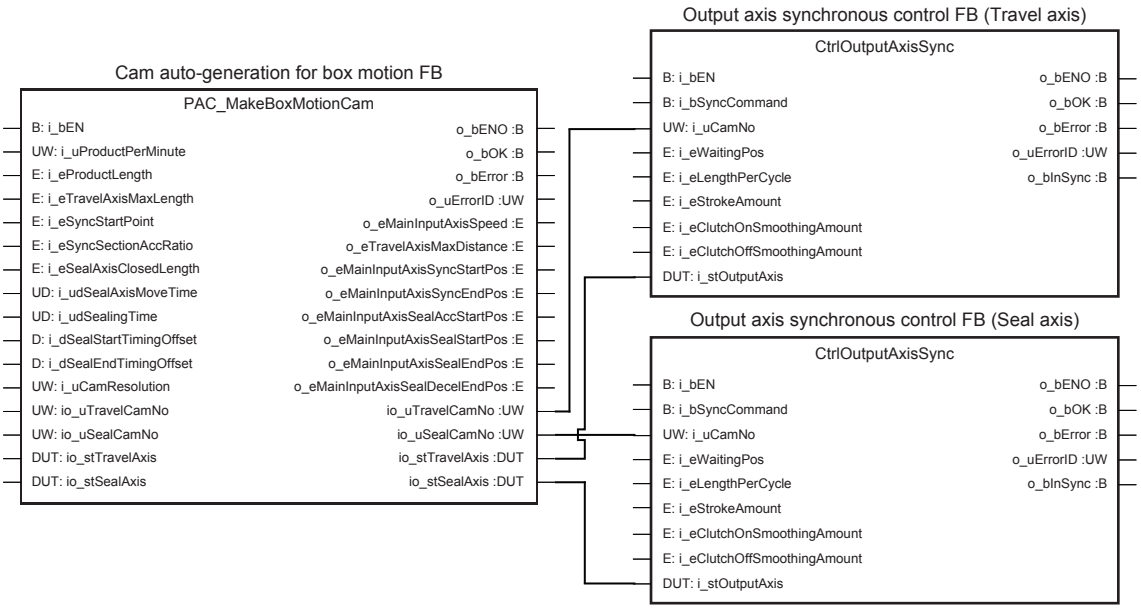
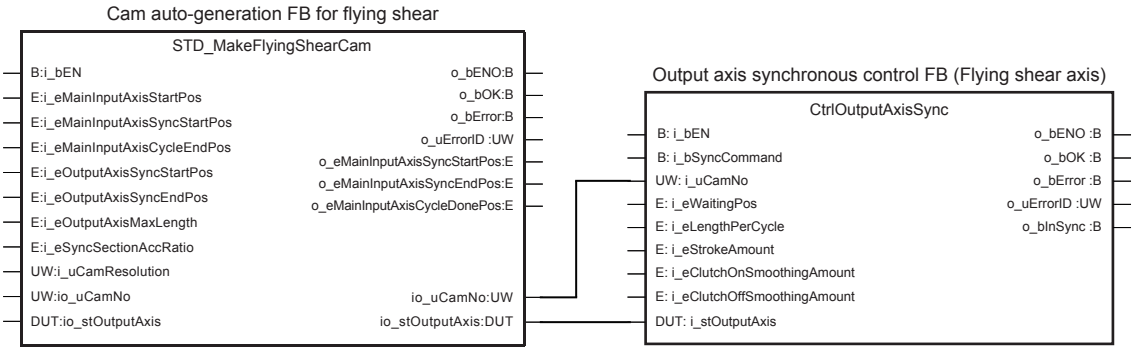
*1 When a value outside the range is input during normal operation, an error code is output but the previous operation continues. After that, when a normal value is input, the error code is cleared.

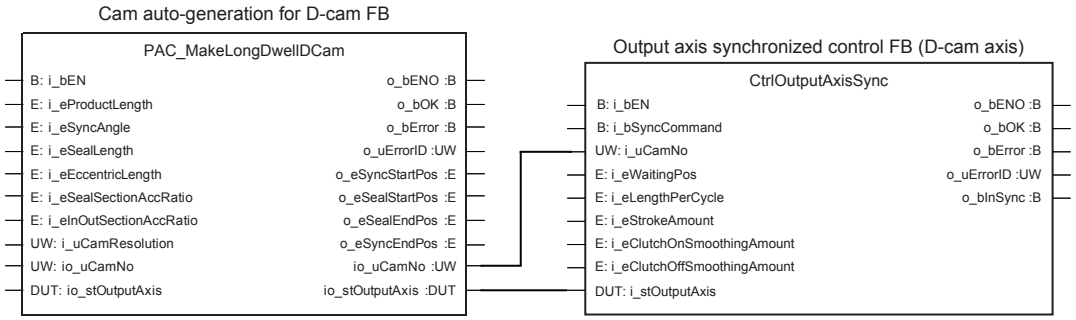
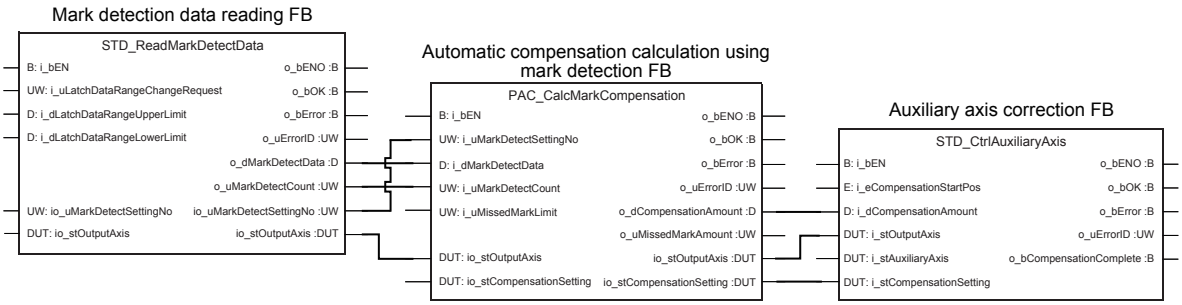
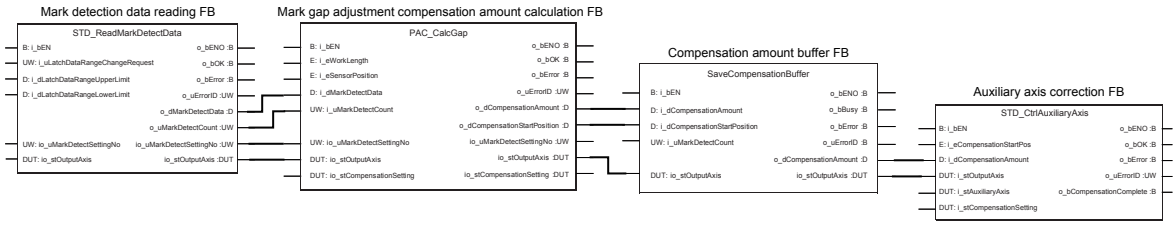
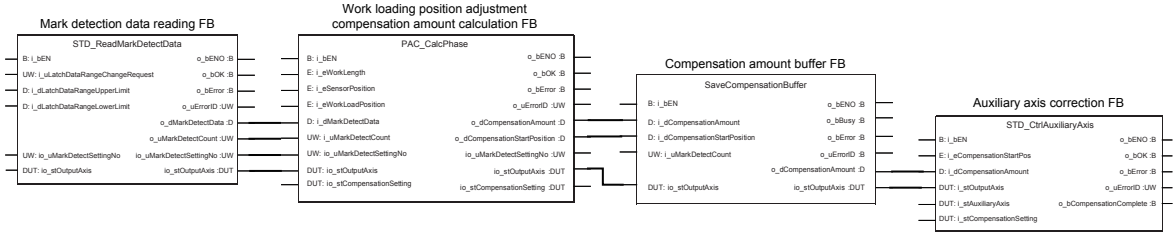
Combination of FBs

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 57 Details of the FB Library".

For connection examples and operation timing of FBs, refer to "Page 104 APPLICATION PROGRAM EXAMPLE".

Mechanism	Combination of FBs
Rotary cutter	• The cam auto-generation FB for rotary cutter generates cam data. • The generated cam data is used for starting the synchronous control in the output axis synchronous control FB to drive the cutter axis.[*1] 
Box motion	• The cam auto-generation for box motion FB for box motion generates cam data of the travel axis and seal axis. • The generated cam data is used for starting the synchronous control in the output axis synchronous control FB to drive the travel axis and seal axis.[*1] 
Flying shear	• The cam auto-generation FB for flying shear generates cam data. • 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] 

Mechanism	Combination of FBs
Long dwell D-cam	• The cam auto-generation for D-cam FB generates cam data. • 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 
Mark compensation	• The mark detection data read FB reads mark detection data from the Simple Motion module. • The auto deviation compensation calculation FB with mark detection automatically calculates the compensation amount from the read mark detection data. • 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. 
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.*2 • 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.*2 • 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 104 APPLICATION PROGRAM EXAMPLE

*2 For details of the compensation amount buffer FB, refer to the following.
☞ Page 104 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-R 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 Fetch cycle: At power supply ON	△
Synchronous encoder axis parameter		Pr.320	Synchronous encoder axis type Fetch cycle: At power supply ON	△
		Pr.321	Synchronous encoder axis unit setting Fetch cycle: At power supply ON	△
		Pr.324	Synchronous encoder axis length per cycle Fetch cycle: At power supply ON	△
Synchronous parameter	Main axis	Pr.400	Main input axis No. Fetch cycle: At start of synchronous control	△
		Pr.402	Composite main shaft gear Fetch cycle: Operation cycle	△
		Pr.403	Main shaft gear: Numerator Fetch cycle: At start of synchronous control	△
		Pr.404	Main shaft gear: Denominator Fetch cycle: At start of synchronous control	△
	Auxiliary axis	Pr.418	Auxiliary shaft axis No. Fetch cycle: At start of synchronous control	○ (i_stAuxiliaryAxis)
		Pr.419	Composite auxiliary shaft gear Fetch cycle: Operation cycle	◎ (0011H)
		Pr.420	Auxiliary shaft gear: Numerator Fetch cycle: At start of synchronous control	◎ (1)
		Pr.421	Auxiliary shaft gear: Denominator Fetch cycle: At start of synchronous control	◎ (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-R Simple Motion Module User's Manual (Advanced Synchronous Control)

Memory area		Control data No.	Name	Setting method 1) STD_MakeRotaryCutterCam (Cam auto-generation for rotary cutter) 2) PAC_MakeBoxMotionCam (Cam auto-generation for box motion) 3) STD_MakeFlyingShearCam (Cam auto-generation for flying shear) 4) PAC_MakeLongDwellDCam (Cam auto-generation for D-cam) 5) STD_CtrlAuxiliaryAxis (Auxiliary axis correction)				
				1)	2)	3)	4)	5)
Synchronous control system control data		Cd.380	Synchronous control start Fetch cycle: Operation cycle	—	—	—	—	△
Cam operation control data	Cam data operation	Cd.600	Cam data operation request Fetch cycle: Main cycle	—	◎	◎	◎	—
		Cd.601	Operation cam No. Fetch cycle: At requesting cam data operation	—	◎	◎	◎	—
		Cd.602	Cam data first position Fetch cycle: At requesting cam data operation	—	◎	◎	◎	—
		Cd.603	Number of cam data operation points Fetch cycle: At requesting cam data operation	—	◎	◎	◎	—
		Cd.604	Cam data format Fetch cycle: At requesting cam data operation Refresh cycle: At completing cam data operation	—	◎	◎	◎	—
		Cd.605	Cam resolution/ coordinate number Fetch cycle: At requesting cam data operation Refresh cycle: At completing cam data operation	—	◎	◎	◎	—
		Cd.606	Cam data starting point Fetch cycle: At requesting cam data operation Refresh cycle: At completing cam data operation	—	◎	◎	◎	—
		Cd.607	Cam data value Fetch cycle: At requesting cam data operation Refresh cycle: At completing cam data operation	—	◎	◎	◎	—

Memory area		Control data No.	Name	Setting method 1) STD_MakeRotaryCutterCam (Cam auto-generation for rotary cutter) 2) PAC_MakeBoxMotionCam (Cam auto-generation for box motion) 3) STD_MakeFlyingShearCam (Cam auto-generation for flying shear) 4) PAC_MakeLongDwellDCam (Cam auto-generation for D-cam) 5) STD_CtrlAuxiliaryAxis (Auxiliary axis correction)				
				1)	2)	3)	4)	5)
Cam operation control data	Cam auto-generation	Cd.608	Cam auto-generation request Fetch cycle: Main cycle	◎	—	—	—	—
		Cd.609	Cam auto-generation cam No. Fetch cycle: At requesting cam auto-generation	◎	—	—	—	—
		Cd.610	Cam auto-generation type Fetch cycle: At requesting cam auto-generation	◎	—	—	—	—
		Cd.611	Cam auto-generation data Fetch cycle: At requesting cam auto-generation	◎	—	—	—	—

◎: 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 of control data, refer to the following.

MELSEC iQ-R 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 [RD77MS] Fetch cycle: At writing to buffer memory	△
	Pr.95	External command signal selection [RD77MS] Fetch cycle: At the rising edge of PLC READY signal [Y0]	△
Mark detection setting	Pr.800	Mark detection signal setting [RD77MS] Fetch cycle: At power supply ON	△
	Pr.801	Mark detection signal compensation time Fetch cycle: At power supply ON or the rising edge of PLC READY signal [Y0]	△
	Pr.802	Mark detection data type Fetch cycle: At power supply ON	△
	Pr.803	Mark detection data axis No. Fetch cycle: At power supply ON	△
	Pr.804	Mark detection data buffer memory No. Fetch cycle: At power supply ON	△
	Pr.805	Latch data range upper limit value Fetch cycle: At power supply ON, the rising edge of PLC READY signal [Y0], or latch data range change request	○ (i_dLatchDataRangeUpperLimit)
	Pr.806	Latch data range lower limit value Fetch cycle: At power supply ON, the rising edge of PLC READY signal [Y0], or latch data range change request	○ (i_dLatchDataRangeLowerLimit)
	Pr.807	Mark detection mode setting Fetch cycle: At power supply ON or the rising edge of PLC READY signal [Y0]	△ (0: Available, other than 0: Not available)
	Pr.808	Mark detection signal link device type [RD77GF] Fetch cycle: At power supply ON	△
	Pr.809	Mark detection signal link device number [RD77GF] Fetch cycle: At power supply ON	△
	Pr.810	Mark detection signal link device bit specification [RD77GF] Fetch cycle: At power supply ON	△
	Pr.811	Mark detection signal detection direction setting [RD77GF] Fetch cycle: At power supply ON	△

○: 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-R 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-R 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 ConpensationSetting)
Da.4	Deceleration time No.	○ (i_st ConpensationSetting)
Da.6	Positioning address/movement amount	○ (i_dCompensationAmount)
Da.8	Command speed	○ (i_st ConpensationSetting)
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	△
Da.27	M code ON signal output timing	△
Da.28	ABS direction in degrees	△

◎: Set with FBs (setting value)
○: Set with labels (label name)
△: Set by users as needed

4.2 Details of the FB Library

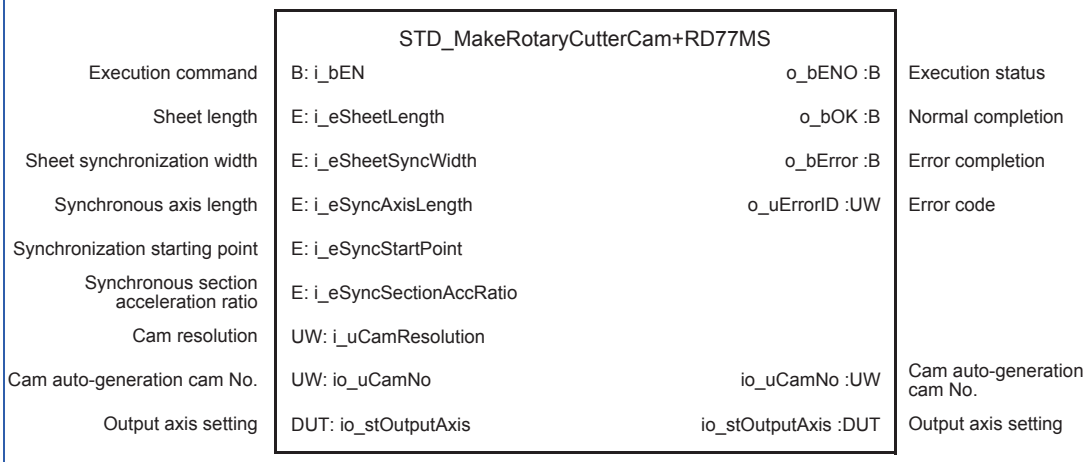
This section describes the details of each FB.

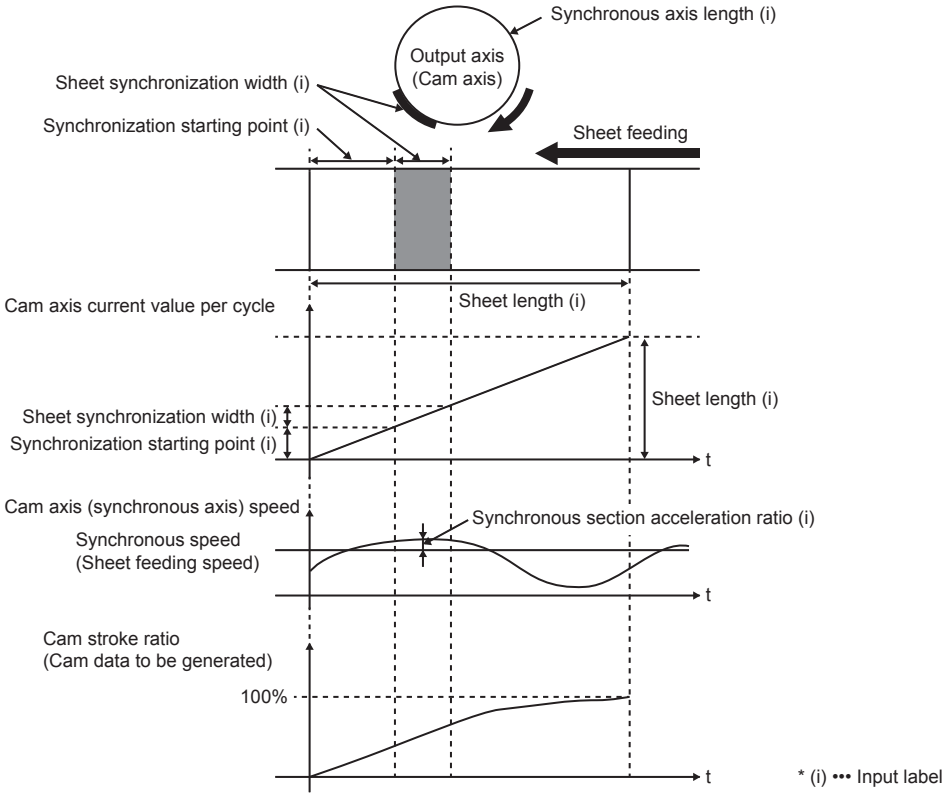
STD_MakeRotaryCutterCam (Cam auto-generation for rotary cutter (front end reference))

Name

STD_MakeRotaryCutterCam+RD77MS

Function overview

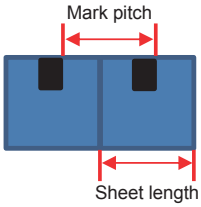
Item	Description		
Function overview	This FB automatically generates cam data for rotary cutter (front end reference).		
Symbol			
Applicable hardware and software	Applicable module	RD77MS	
	Applicable CPU	MELSEC iQ-R series	
	Engineering software	GX Works3	
Number of steps	947 steps		
FB dependence	—		

Item	Description
Function description	This FB automatically generates cam data for driving the rotary cutter (front end reference). • Turning on i_bEN (Execution command) starts generating cam data based on the set data. • When the cam generation is normally completed, o_bOK (Normal completion) turns on.  • i_eSyncSectionAccRatio (Synchronous section speed acceleration ratio) changes the speed in the synchronous section. • If a warning related to the cam data operation occurs in the Simple Motion module during cam generation, an error (ErrorID: 2203H) is stored. • If an error has occurred in the FB, Error turns on and the error code is stored in ErrorID. • For details of error codes, refer to "Page 198 List of Error Codes".
Restrictions and precautions	• If a value other than 0 to 3 has been set in "[Pr.1] Unit setting", this FB is executed with the unit [mm]. • The cam to be automatically generated is in the stroke ratio data format. • The cam data to be automatically generated will be saved in the cam open area. • If i_bEN (Execution command) turns off during cam generation, the cam may not be normally generated. • 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. • 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. • 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 • Use the FB CtrlOutputAxisSync or create a user program for the operation of the cutter axis.
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-R Simple Motion Module User's Manual (Advanced Synchronous Control)

Labels

■Input labels

Name	Label name	Data type	Read timing*1	Setting range	Initial value	Description
Execution command	i_bEN	Bit	⎍	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.	200.0	Set the sheet length. Set this value for the cam axis length per cycle.  • 0.01 ≤ Sheet length ≤ 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.	50.0	Set the length of the section where the output axis is synchronized with the sheet. • 0.01 ≤ Sheet synchronization width < 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.	200.0	Set the cycle length of the output axis (rotary cutter). • 0.01 ≤ Synchronous axis length ≤ 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.	50.0	Set the synchronization starting point of the output axis to the sheet. • 0.00 ≤ Synchronization starting point < 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 ≤ Synchronous section acceleration ratio ≤ 50.00 [%]	0.00	Set this item when the fine adjustment of the synchronous speed in the synchronous section is required. Synchronous section speed = Synchronous speed × (100% + Synchronous section acceleration ratio)
Cam resolution	i_uCamResolution	Word [Unsigned]	↑	256/512/1024/2048/4096/8192/16384/32768	256	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	Initial value	Description
Cam auto-generation cam No.	io_uCamNo	Word [Unsigned]	↑	1 ≤ Cam auto-generation cam No. ≤ 256	1	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	Initial value	Description
Axis number	AxisNo	Word [Unsigned]	↑	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.
Start I/O number	StartIO	Word [Unsigned]	↑	0H ≤ Start I/O number ≤ FEH	0	Installation address of the Simple Motion module (Upper three digits of four digits (hexadecimal))

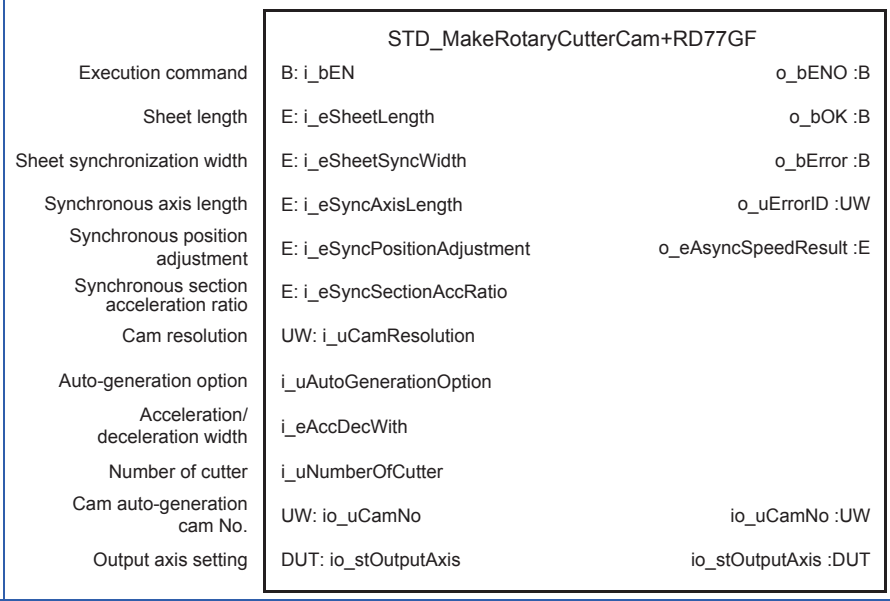
*1 ⎍: Always, ↑: When the FB is started (cannot be changed)

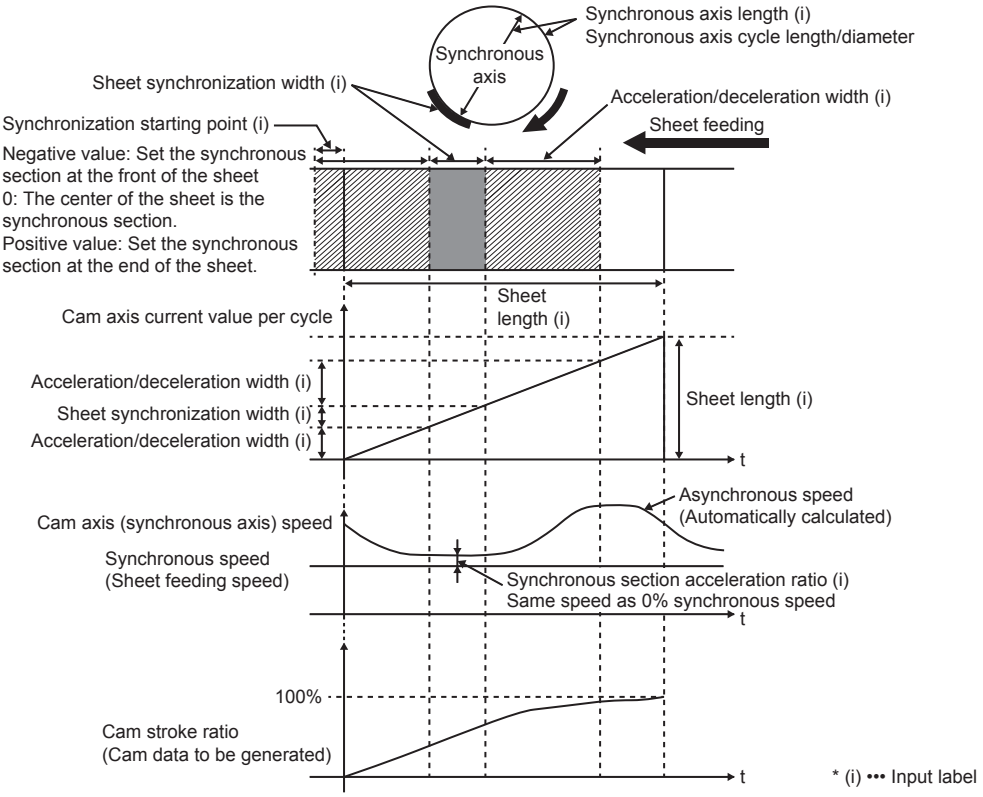
STD_MakeRotaryCutterCam (Cam auto-generation for rotary cutter (central reference))

Name

STD_MakeRotaryCutterCam+RD77GF

Function details

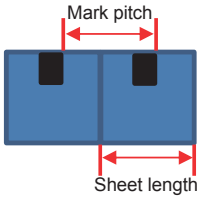
Item	Description		
Function overview	This FB automatically generates cam data (central reference) for rotary cutter.		
Symbol			
Applicable hardware and software	Applicable module	RD77GF	
	Applicable CPU	MELSEC iQ-R series	
	Engineering software	GX Works3	
Number of steps	1135 steps		
FB dependence	—		

Item	Description
Function description	This FB automatically generates cam data for driving the rotary cutter (central reference). • Turning on i_bEN (Execution command) starts generating cam data based on the set data. • When the cam generation is normally completed, o_bOK (Normal completion) turns on.  • i_eSyncSectionAccRatio (Synchronous section speed acceleration ratio) changes the speed in the synchronous section. • If a warning related to the cam data operation occurs in the Simple Motion module during cam generation, an error (ErrorID: 2203H) is stored. • If an error has occurred in the FB, Error turns on and an error code is stored in ErrorID. • For details of error codes, refer to "Page 198 List of Error Codes".
Restrictions and precautions	• If a value other than 0 to 3 has been set in "[Pr.1] Unit setting", this FB is executed with the unit [mm]. • The cam to be automatically generated is in the stroke ratio data format. • The cam data to be automatically generated will be saved in the cam open area. • If i_bEN (Execution command) turns off during cam generation, the cam may not be normally generated. • 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. • 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. • 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 • Use the FB CtrlOutputAxisSync or create a user program for the operation of the cutter axis.
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-R Simple Motion Module User's Manual (Advanced Synchronous Control)

Labels

■Input labels

Name	Label name	Data type	Read timing*1	Setting range	Initial value	Description
Execution command	i_bEN	Bit	⎍	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.	200.0	Set the sheet length. Set this value for the cam axis length per cycle.  • 0.01 ≤ Sheet length ≤ 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.	50.0	Set the length of the section where the output axis is synchronized with the sheet. • 0.01 ≤ Sheet synchronization width < Sheet length • 0.01 ≤ Sheet synchronization width < Synchronous axis length/Number of cutter [(Optional) Same unit (with two digits after the decimal point (fixed))]
Synchronous axis length	i_eSyncAxisLength	Single precision real number	↑	Refer to the description.	200.0	Set the cycle length of the output axis (rotary cutter). If the auto-generation option is set to diameter, the calculation is "circumference = set value × π". If the auto-generation option is set to circumference, the calculation is "circumference = set value". • 0.01 ≤ Circumference ≤ 10000.00 [(Optional) Same unit (with two digits after the decimal point (fixed))]
Synchronous position adjustment	i_eSyncPositionAdjustment	Single precision real number	↑	Refer to the description.	0.0	Set the position adjustment of the synchronous section of the sheet and output axis. • Absolute value of synchronous position adjustment ≤ Half of the sheet length Negative value: Set the synchronous section at the front of the sheet. 0: The center of the sheet is the synchronous section. Positive value: Set synchronous section to back end of sheet.
Synchronous section acceleration ratio	i_eSyncSectionAccRatio	Single precision real number	↑	-50.00 ≤ Synchronous section acceleration ratio ≤ 50.00 [%]	0.00	Set this item when the fine adjustment of the synchronous speed in the synchronous section is required. Synchronous section speed = Synchronous speed × (100% + Synchronous section acceleration ratio)
Cam resolution	i_uCamResolution	Word [Unsigned]	↑	256/512/1024/2048/4096/8192/16384/32768	256	Set the cam resolution of the cam to be generated.
Auto-generation option	i_uAutoGenerationOption	Word [Unsigned]	↑	0 ≤ Auto-generation option ≤ 3	3	• Bit 0: Acceleration/deceleration method 0: Trapezoidal acceleration/deceleration 1: S-curve acceleration/deceleration • Bit 1: Synchronous axis length setting 0: Diameter 1: Circumference

Name	Label name	Data type	Read timing*1	Setting range	Initial value	Description
Acceleration/ deceleration width	i_eAccDecWidth	Single precision real number	↑	Refer to the description.	25	Set the sheet width (one side) of the acceleration/deceleration area. • 2 × Acceleration/deceleration width ≤ Sheet length - Sheet synchronization width When a negative value is set, the acceleration/deceleration width is calculated to become the maximum value.
Number of cutter	i_uNumberOfCutter	Word [Unsigned]	↑	1 ≤ Number of cutter ≤ 256	1	Set the number of rotary cutters.

*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.
Asynchronous speed result	o_eAsyncSpeedResult	Single precision real number	○	When cam auto-generation is normal, the asynchronous speed is stored as a ratio of synchronous speed. [multiplier]

*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	Initial value	Description
Cam auto-generation cam No.	io_uCamNo	Word [Unsigned]	↑	1 ≤ Cam auto-generation cam No. ≤ 256	1	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	Initial value	Description
Axis No.	AxisNo	Word [Unsigned]	↑	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.
Start I/O number	StartIO	Word [Unsigned]	↑	0H ≤ Start I/O number ≤ FEH	0	Installation address of the Simple Motion module (Upper three digits of four digits (hexadecimal))

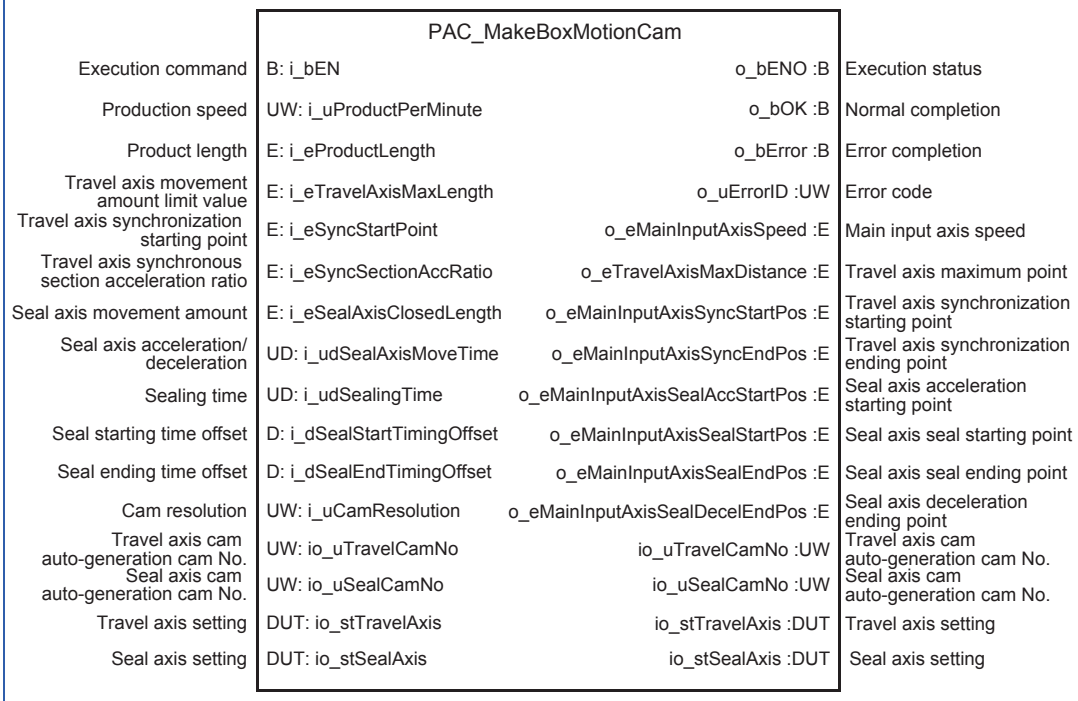
*1 ⎕: Always, ↑: When the FB is started (cannot be changed)

PAC_MakeBoxMotionCam (Cam auto-generation for box motion)

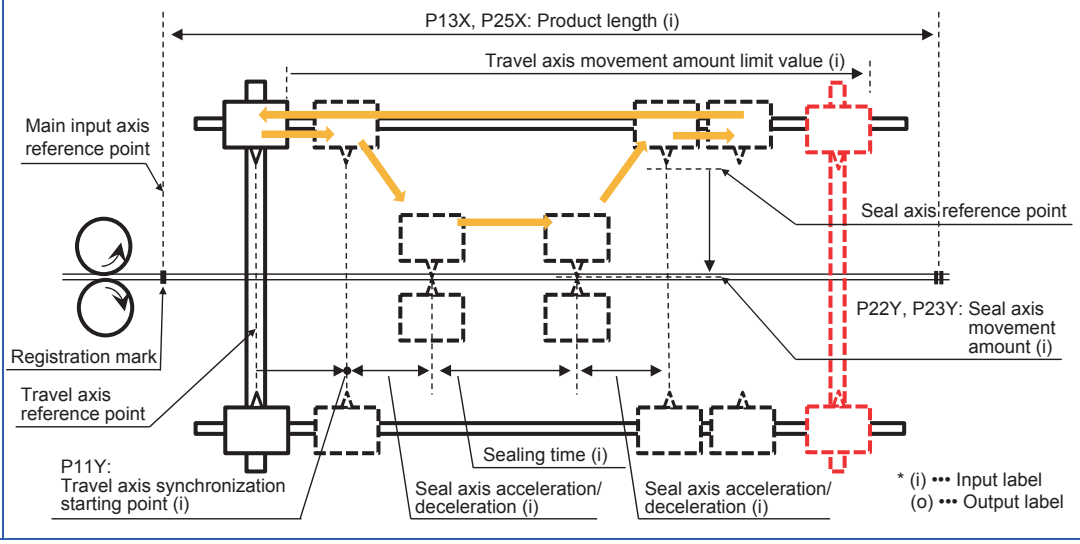
Name

PAC_MakeBoxMotionCam

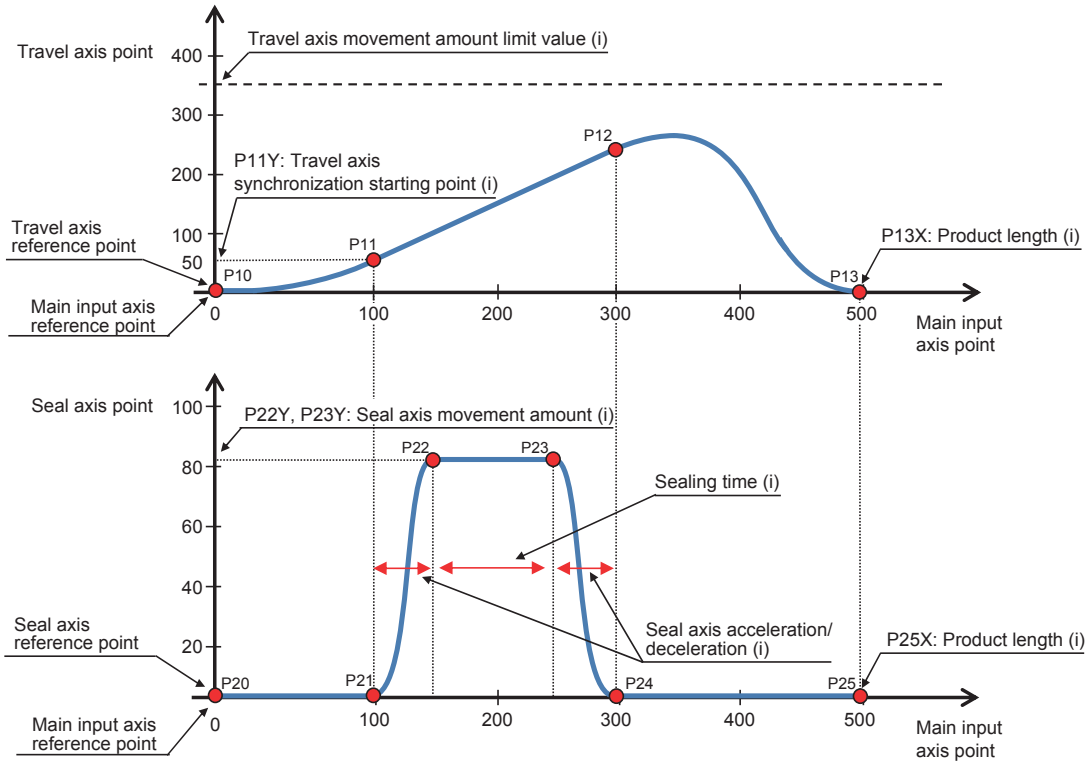
Function overview

Item	Description
Function overview	This FB automatically generates two cams of the travel axis and seal axis required for the box motion mechanism.
Symbol	
Applicable hardware and software	Applicable module: RD77MS, RD77GF
	Applicable CPU: MELSEC iQ-R series
	Engineering software: GX Works3
Number of steps	3644 steps
FB dependence	—
Function description	This FB automatically generates two cams (for the travel axis and seal axis) for the box motion mechanism that is driven by two servo axes.

• Turning on i_bEN (Execution command) starts generating cam data based on the set data.



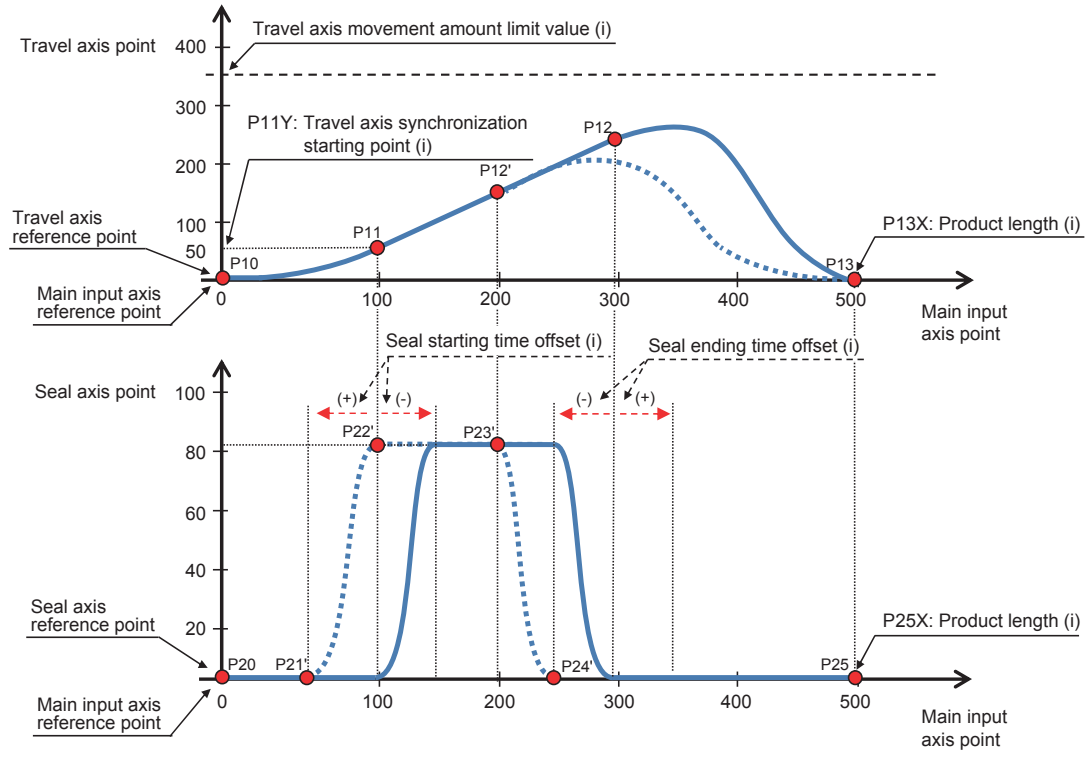
Item	Description
Function description	■Cam pattern to be generated



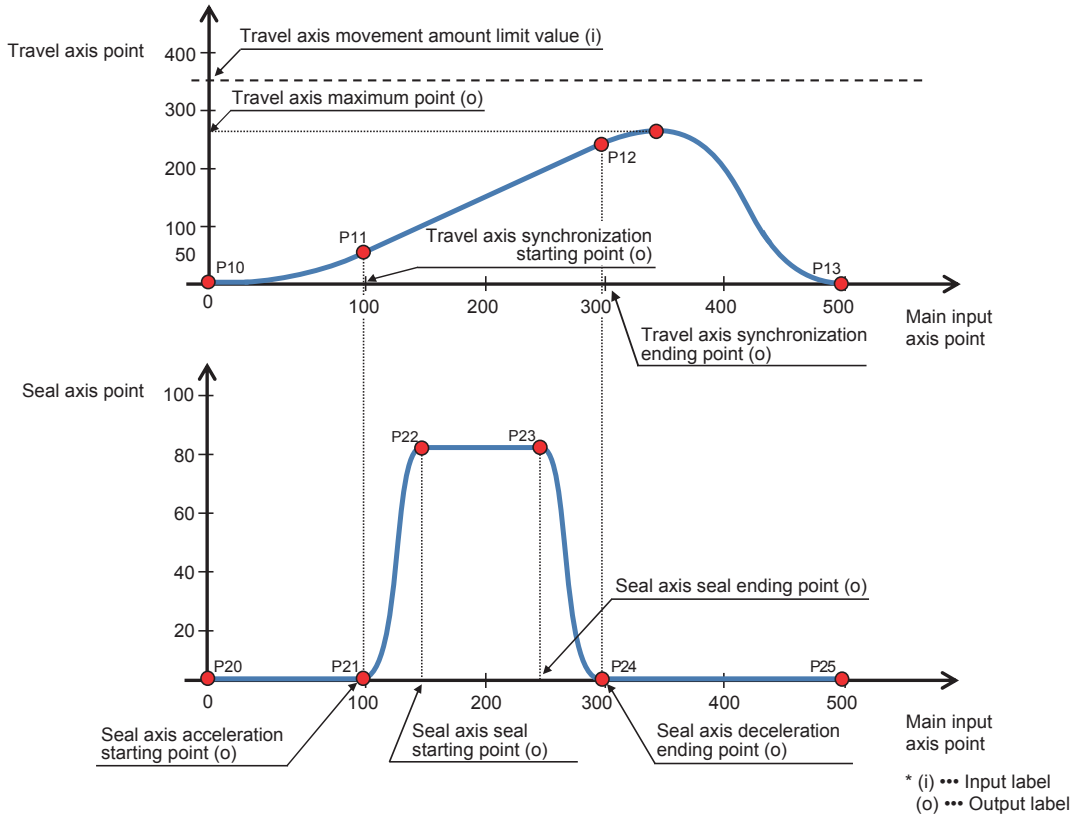
* (i) ••• Input label

- By setting i_dSealStartTimingOffset (Seal starting time offset), the sealing start position (P21X) and the synchronization starting point (P11X) can be shifted. A positive (negative) value set for i_dSealStartTimingOffset moves the seal axis cam pattern in parallel to the left (right) by the set value and increases/decreases the travel axis cam pattern synchronous section (P11X to P12X) by the set value after the comparison with the patterns before change.
- By setting i_dSealEndTimingOffset (Seal ending time offset), the sealing end position (P24X) and the synchronization ending point (P12X) can be shifted. A positive (negative) value set for i_dSealEndTimingOffset increases/decreases the travel axis cam pattern synchronous section (P11X to P12X) by the set value. (Set the absolute value of the seal axis start/end offset not to exceed the value of i_udSealAxisMoveTime (Seal axis acceleration/deceleration).)

■Cam pattern to be generated [with seal axis offset]



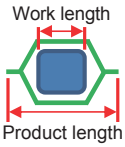
* (i) ••• Input label

Item	Description
Function description	• After the cam generation is normally completed and the following output data is updated, o_bOK (Normal completion) turns on. "o_eMainInputAxisSpeed (Main input axis speed)" "o_eTravelAxisMaxDistance (Travel axis maximum point)" "o_eMainInputAxisSyncStartPos (Travel axis synchronization starting point)" "o_eMainInputAxisSyncEndPos (Travel axis synchronization ending point)" "o_eMainInputAxisSealAccStartPos (Seal axis acceleration starting point)" "o_eMainInputAxisSealStartPos (Seal axis seal starting point)" "o_eMainInputAxisSealEndPos (Seal axis seal ending point)" "o_eMainInputAxisSealDecelEndPos (Seal axis deceleration ending point)" 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.  * (i) ••• Input label (o) ••• Output label • i_eSyncSectionAccRatio (Synchronous section speed acceleration ratio) changes the speed in the synchronous section. • If the calculated cam stroke amount of the travel axis exceeds the value of i_eTravelAxisMaxLength (Travel axis movement amount limit value), an error (ErrorID: 2115H) will be stored and the cam with i_eTravelAxisMaxLength at the top will be generated again. • If the unit set in "[Pr.1] Unit setting" differs between the travel axis and seal axis, the operation continues but an error (ErrorID: 2135H) is stored. • If a warning related to the cam data operation occurs in the Simple Motion module during cam generation, an error (ErrorID: 2203H) is stored. • 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. • If an error has occurred in the FB, Error turns on and the error code is stored in ErrorID. • For details of error codes, refer to "Page 198 List of Error Codes".
Restrictions and precautions	• If a value other than 0 to 3 has been set in "[Pr.1] Unit setting", this FB is executed with the unit [mm]. • The cam to be automatically generated is in the coordinate data format. • The cam data that has been automatically generated is saved in the cam storage area. • If i_bEN (Execution command) turns off during cam generation, the cam may not be normally generated. • 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. • 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. • 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 • Use the FB CtrlOutputAxisSync or create a user program for the operation of the travel axis and seal axis.
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-R Simple Motion Module User's Manual (Advanced Synchronous Control)

Labels

■Input labels

Name	Label name	Data type	Read timing*1	Setting range	Initial value	Description
Execution command	i_bEN	Bit	⎍	On, off	—	On: The FB is activated. Off: The FB is not activated.
Production speed	i_uProductPerMinute	Word [Unsigned]	↑	0 < Production speed ≤ 10000 [products/min]	60	Set the production speed [products/min].
Product length	i_eProductLength	Single precision real number	↑	Refer to the description.	500.0	Set the product length.  • 0.1 ≤ Product length ≤ 100000.0 [mm] • 0.01 ≤ Product length ≤ 10000.00 [inch] • 0.01 ≤ Product length ≤ 10000.00 [degree] • 1 ≤ Product length ≤ 9999999 [pulse] [The unit setting depends on the axis No. setting value in the travel axis setting.]
Travel axis movement amount limit value	i_eTravelAxisMaxLength	Single precision real number	↑	Refer to the description.	350.0	Set the movement amount limit value of the travel axis. If the calculated stroke amount exceeds this setting, the cam with this setting at the top will be generated again. • 0.1 ≤ Travel axis movement amount limit value ≤ 100000.0 [mm] • 0.01 ≤ Travel axis movement amount limit value ≤ 10000.00 [inch] • 0.01 ≤ Travel axis movement amount limit value ≤ 10000.00 [degree] • 1 ≤ Travel axis movement amount limit value ≤ 9999999 [pulse] [The unit setting depends on the axis No. setting value in the travel axis setting.]
Travel axis synchronization starting point	i_eSyncStartPoint	Single precision real number	↑	Refer to the description.	50.0	Set the synchronization starting point of the travel axis. • 0.1 ≤ Travel axis synchronization starting point ≤ 100000.0 [mm] • 0.01 ≤ Travel axis synchronization starting point ≤ 10000.00 [inch] • 0.01 ≤ Travel axis synchronization starting point ≤ 10000.00 [degree] • 1 ≤ Travel axis synchronization starting point ≤ 9999999 [pulse] [The unit setting depends on the axis No. setting value in the travel axis setting.]
Travel axis synchronous section acceleration ratio	i_eSyncSectionAccRatio	Single precision real number	↑	-50.00 ≤ Synchronous section acceleration ratio ≤ 50.00 [%]	0.0	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)
Seal axis movement amount	i_eSealAxisClosedLength	Single precision real number	↑	Refer to the description.	80.0	Set the movement amount (stroke amount) of the seal axis. • 0.1 ≤ Seal axis movement amount ≤ 100000.0 [mm] • 0.01 ≤ Seal axis movement amount ≤ 10000.00 [inch] • 0.01 ≤ Seal axis movement amount ≤ 10000.00 [degree] • 1 ≤ Seal axis movement amount ≤ 9999999 [pulse] [The unit setting depends on the axis No. setting value in the seal axis setting.]

Name	Label name	Data type	Read timing*1	Setting range	Initial value	Description
Seal axis acceleration/ deceleration	i_udSealAxisMoveTime	Double word [Unsigned]	↑	0 < Seal axis acceleration/deceleration ≤ 5000 [ms]	100	Set the acceleration/deceleration at opening/ closing of the seal axis.
Sealing time	i_udSealingTime	Double word [Unsigned]	↑	0 < Sealing length ≤ 30000 [ms]	200	Set the sealing time.
Seal starting time offset	i_dSealStartTimingOffset	Double word [Signed]	↑	|Seal starting time offset| ≤ Seal axis acceleration/ deceleration [ms]	0	Set the offset amount of the timing to start sealing.
Seal ending time offset	i_dSealEndTimingOffset	Double word [Signed]	↑	|Seal ending time offset| ≤ Seal axis acceleration/ deceleration [ms]	0	Set the offset amount of the timing to end sealing.
Cam resolution	i_uCamResolution	Word [Unsigned]	↑	6 ≤ Cam resolution ≤ 2048	256	Set the cam resolution (Number of coordinates) of the cam to be generated. (Set the resolution common to the travel axis and seal axis.)

*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.
Main input axis speed	o_eMainInputAxisSpeed	Single precision real number	○	The calculated main input axis speed is stored. [The unit setting depends on the axis No. setting value in the travel axis setting.]
Travel axis maximum point	o_eTravelAxisMaxDistance	Single precision real number	○	The calculated maximum point of the travel axis is stored. [The unit setting depends on the axis No. setting value in the travel axis setting.]
Travel axis synchronization starting point	o_eMainInputAxisSyncStartPos	Single precision real number	○	The main input axis point at the start of synchronization is stored. [The unit setting depends on the axis No. setting value in the travel axis setting.]
Travel axis 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 travel axis setting.]
Seal axis acceleration starting point	o_eMainInputAxisSealAccStartPos	Single precision real number	○	The main input axis point at the start of the seal axis operation is stored. [The unit setting depends on the axis No. setting value in the seal axis setting.]
Seal axis seal starting point	o_eMainInputAxisSealStartPos	Single precision real number	○	The main input axis point at the start of the seal axis sealing is stored. [The unit setting depends on the axis No. setting value in the seal axis setting.]
Seal axis seal ending point	o_eMainInputAxisSealEndPos	Single precision real number	○	The main input axis point at the end of the seal axis sealing is stored. [The unit setting depends on the axis No. setting value in the seal axis setting.]
Seal axis deceleration ending point	o_eMainInputAxisSealDecelEndPos	Single precision real number	○	The main input axis point at the end of the seal axis operation is stored. [The unit setting depends on the axis No. setting value in the seal 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	Initial value	Description
Travel axis cam auto-generation cam No.	io_uTravelCamNo	Word [Unsigned]	↑	1 ≤ Travel axis cam auto-generation cam No. ≤ 256	1	Set the cam No. to be automatically generated for the travel axis.
Seal axis cam auto-generation cam No.	io_uSealCamNo	Word [Unsigned]	↑	1 ≤ Seal axis cam auto-generation cam No. ≤ 256	2	Set the cam No. to be automatically generated for the seal axis.
Travel axis setting	io_stTravelAxis	AXIS_REF	—	—	—	Refer to the travel axis setting below.
Seal axis setting	io_stSealAxis	AXIS_REF	—	—	—	Refer to the seal axis setting below.

Travel axis setting (AXIS_REF structure)

Name	Label name	Data type	Read timing*1	Setting range	Initial value	Description
Axis number	AxisNo	Word [Unsigned]	↑	1 ≤ Axis No. ≤ maximum number of axes of the module used	—	Set the axis No. of the output axis used for the travel axis. This FB uses the unit set in "[Pr.1] Unit setting" of the axis No.
Start I/O number	StartIO	Word [Unsigned]	↑	0H ≤ Start I/O number ≤ FEH	0	Installation address of the Simple Motion module (Upper three digits of four digits (hexadecimal))

Seal axis setting (AXIS_REF structure)

Name	Label name	Data type	Read timing*1	Setting range	Initial value	Description
Axis number	AxisNo	Word [Unsigned]	↑	1 ≤ Axis No. ≤ maximum number of axes of the module used	—	Set the axis No. of the output axis used for the seal axis. This FB uses the unit set in "[Pr.1] Unit setting" of the axis No.

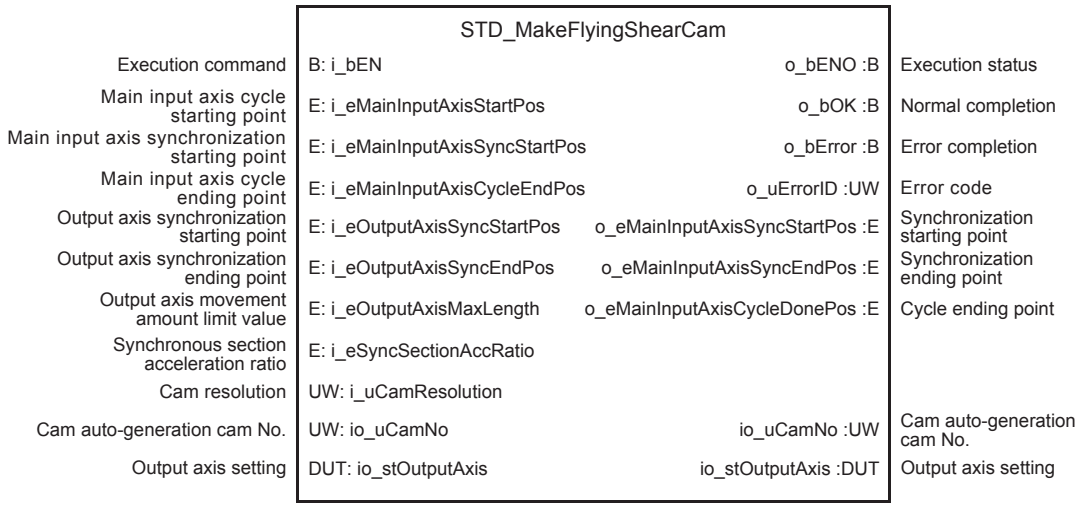
*1 ⎍: Always, ↑: When the FB is started (cannot be changed)

STD_MakeFlyingShearCam (Cam auto-generation for flying shear)

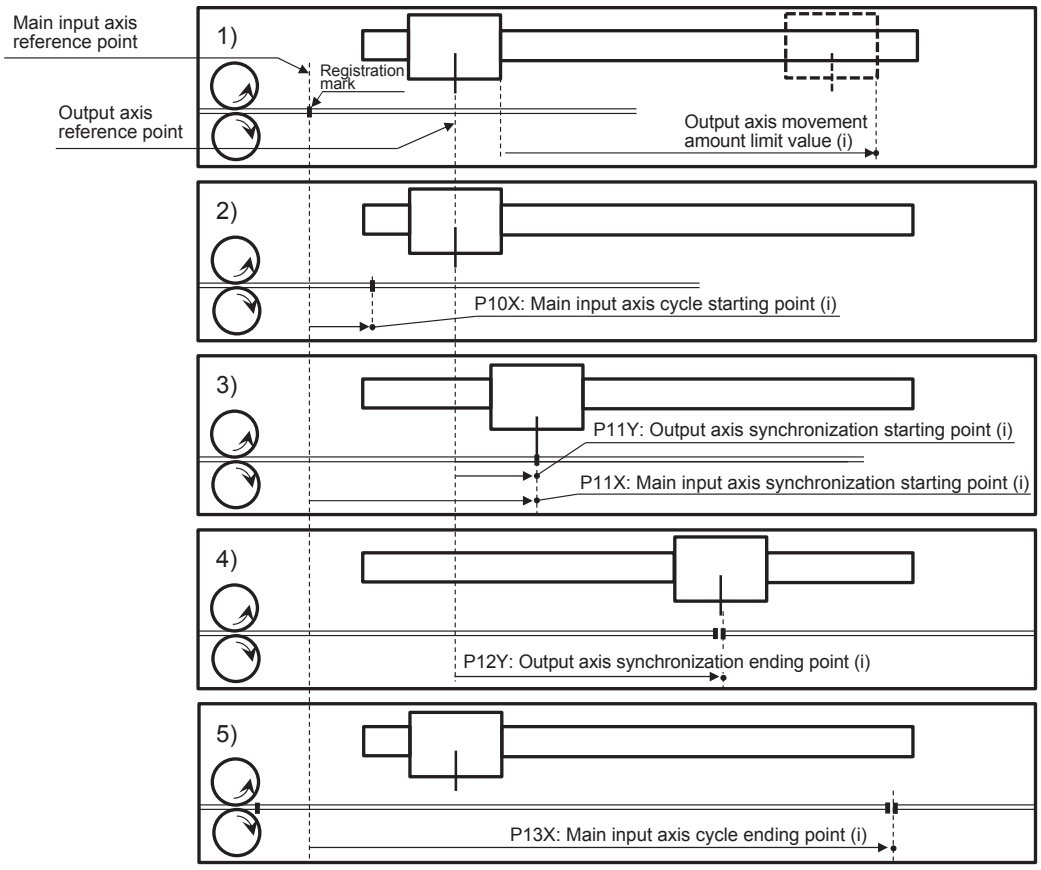
Name

STD_MakeFlyingShearCam

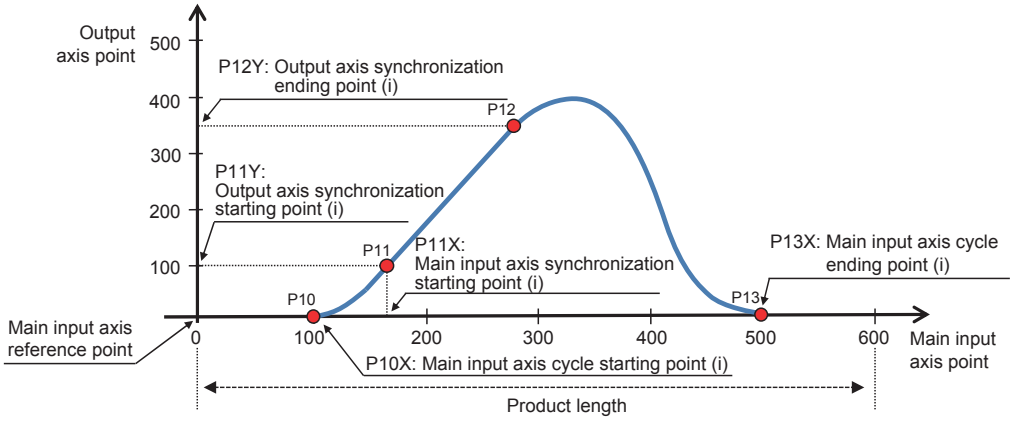
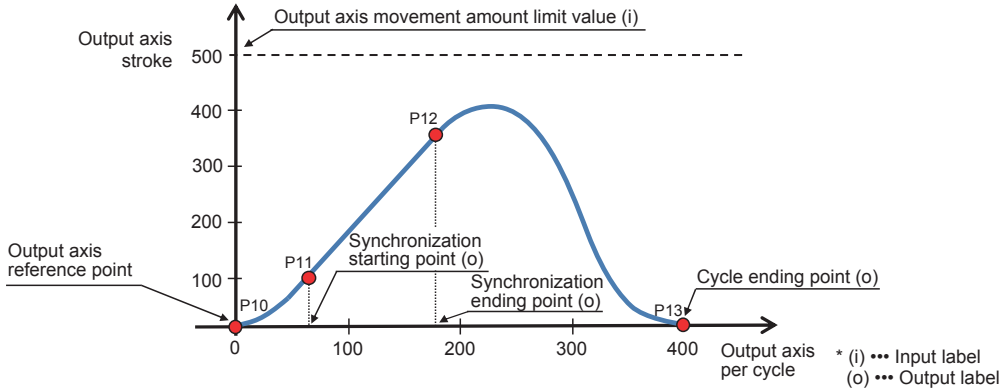
Function overview

Item	Description	
Function overview	This FB automatically generates cam for flying shear.	
Symbol		
Applicable hardware and software	Applicable module	RD77MS, RD77GF
	Applicable CPU	MELSEC iQ-R series
	Engineering software	GX Works3
Number of steps	2449 steps	
FB dependence	—	

Item	Description
Function description	This FB automatically generates cam for driving the flying shear. • Turning on i_bEN (Execution command) starts generating cam data based on the set data. • Calculate the main input axis length per cycle as the product length. • 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.*1



* (i) ••• Input label

Item	Description
Function description	• The cam pattern to be generated is a reciprocated cam pattern. • After the cam generation is normally completed and the following output data is updated, o_bOK (Normal completion) turns on. "o_eMainInputAxisSyncStartPos (Synchronization starting point)" "o_eMainInputAxisSyncEndPos (Synchronization ending point)" "o_eMainInputAxisCycleDonePos (Cycle ending point)" 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.   • When performing the synchronous control with the FB CtrlOutputAxisSync, set the main input axis cycle starting point for i_eWaitingPos (Waiting point). • 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.*2 • i_eSyncSectionAccRatio (Synchronous section speed acceleration ratio) changes the speed in the synchronous section. • If a warning related to the cam data operation occurs in the Simple Motion module during cam generation, an error (ErrorID: 2203H) is stored. • 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. • If an error has occurred in the FB, Error turns on and the error code is stored in ErrorID. • For details of error codes, refer to "Page 198 List of Error Codes".
Restrictions and precautions	• If a value other than 0 to 3 has been set in "[Pr.1] Unit setting", this FB is executed with the unit [mm]. • The cam to be automatically generated is in the coordinate data format. • The cam data that has been automatically generated is saved in the cam storage area. • If i_bEN (Execution command) turns off during cam generation, the cam may not be normally generated. • 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. • 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. • 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.*3 • Use the FB CtrlOutputAxisSync or create a user program for the operation of the flying shear axis.
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-R Simple Motion Module User's Manual (Advanced Synchronous Control)

Labels

■Input labels

Name	Label name	Data type	Read timing*1	Setting range	Initial value	Description
Execution command	i_bEN	Bit	⎍	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.	200.0	Set the main input axis point where the one cycle operation starts. • 0.0 ≤ Main input axis cycle starting point ≤ 100000.0 [mm] • 0.00 ≤ Main input axis cycle starting point ≤ 10000.00 [inch] • 0.00 ≤ Main input axis cycle starting point ≤ 10000.00 [degree] • 0 ≤ Main input axis cycle starting point ≤ 9999999 [pulse] [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.	300.0	Set the main input axis point at the start of the synchronous section. • 0.1 ≤ Main input axis synchronization starting point ≤ 100000.0 [mm] • 0.01 ≤ Main input axis synchronization starting point ≤ 10000.00 [inch] • 0.01 ≤ Main input axis synchronization starting point ≤ 10000.00 [degree] • 1 ≤ Main input axis synchronization starting point ≤ 9999999 [pulse] [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.	900.0	Set the end point of the main input axis 1 cycle. • 0.1 ≤ Main input axis cycle ending point ≤ 100000.0 [mm] • 0.01 ≤ Main input axis cycle ending point ≤ 10000.00 [inch] • 0.01 ≤ Main input axis cycle ending point ≤10000.00 [degree] • 1 ≤ Main input axis cycle ending point ≤ 9999999 [pulse] [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.	50.0	Set the output axis point at the start of the synchronous section. • 0.1 ≤ Output axis synchronization starting point ≤ 100000.0 [mm] • 0.01 ≤ Output axis synchronization starting point ≤ 10000.00 [inch] • 0.01 ≤ Output axis synchronization starting point ≤ 10000.00 [degree] • 1 ≤ Output axis synchronization starting point ≤ 9999999 [pulse] [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.	350.0	Set the output axis point at the end of the synchronous section. • 0.1 ≤ Output axis synchronization ending point ≤ 100000.0 [mm] • 0.01 ≤ Output axis synchronization ending point ≤ 10000.00 [inch] • 0.01 ≤ Output axis synchronization ending point ≤ 10000.00 [degree] • 1 ≤ Output axis synchronization ending point ≤ 9999999 [pulse] [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	Initial value	Description
Output axis movement amount limit value	i_eOutputAxisMaxLength	Single precision real number	↑	Refer to the description.	0.0	Set the movement amount limit value of the output axis. "0" = Limit value invalid, other than "0" = Limit value valid • 0.1 ≤ Output axis movement amount limit value ≤ 100000.0 [mm] • 0.01 ≤ Output axis movement amount limit value ≤ 10000.00 [inch] • 0.01 ≤ Output axis movement amount limit value ≤ 10000.00 [degree] • 1 ≤ Output axis movement amount limit value ≤ 9999999 [pulse] [The unit setting depends on the axis No. setting value in the output axis setting.]
Synchronous section acceleration ratio	i_eSyncSectionAccRatio	Single precision real number	↑	-50.00 ≤ Synchronous section acceleration ratio ≤ 50.00 [%]	0.00	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)
Cam resolution	i_uCamResolution	Word [Unsigned]	↑	5 ≤ Cam resolution ≤ 2048	256	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	Initial value	Description
Cam auto-generation cam No.	io_uCamNo	Word [Unsigned]	↑	1 ≤ Cam auto-generation cam No. ≤ 256	1	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	Initial value	Description
Axis number	AxisNo	Word [Unsigned]	↑	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.
Start I/O number	StartIO	Word [Unsigned]	↑	0H ≤ Start I/O number ≤ FEH	0	Installation address of the Simple Motion module (Upper three digits of four digits (hexadecimal))

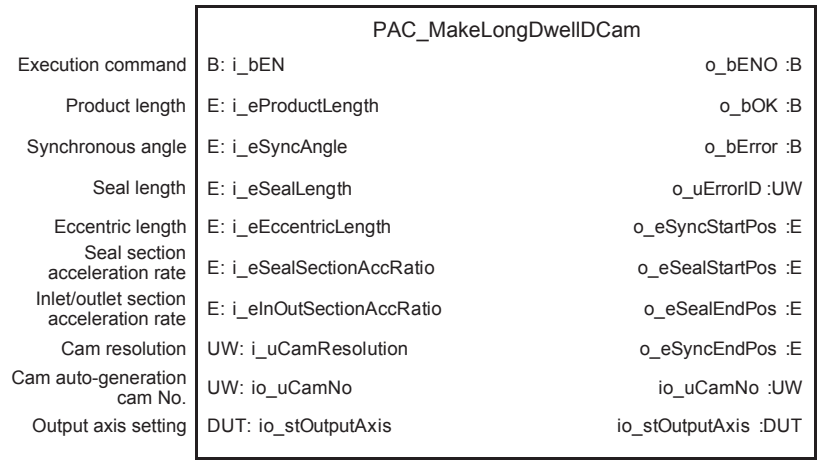
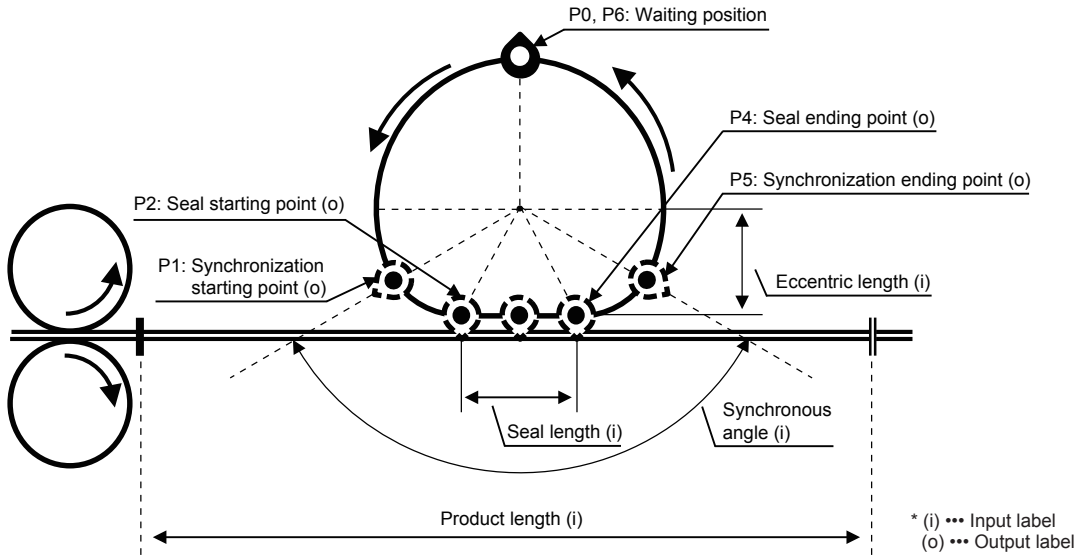
*1 ⎍: Always, ↑: When the FB is started (cannot be changed)

PAC_MakeLongDwellDCam (Cam auto-generation for D-cam)

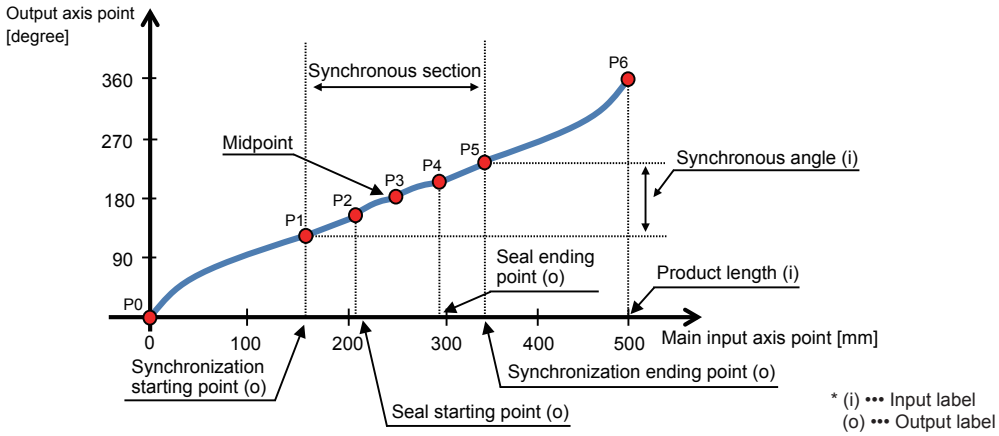
Name

PAC_MakeLongDwellDCam

Function details

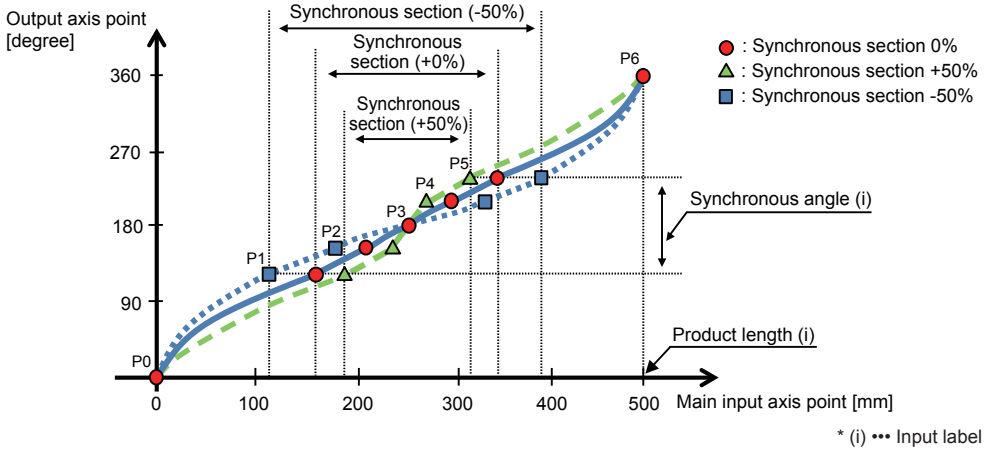
Item	Description
Function overview	This FB automatically generates a cam pattern for the long dwell.
Symbol	
Applicable hardware and software	Applicable module: RD77MS, RD77GF Applicable CPU: MELSEC iQ-R series Engineering software: GX Works3
Number of steps	5613 steps
FB dependence	—
Function description	This FB automatically generates a cam pattern for the long dwell mechanism (D-cam axis) increases the sealing time. • Turning on i_bEN (Execution command) starts generating cam data based on the set data. • In calculation, one cycle length of the main input axis is the product length. • The cam pattern is generated so that the D-cam axis rotates once (360 degree) per product length (1 cycle length) [mm]. 

Item	Description
Function description	■Cam pattern to be generated

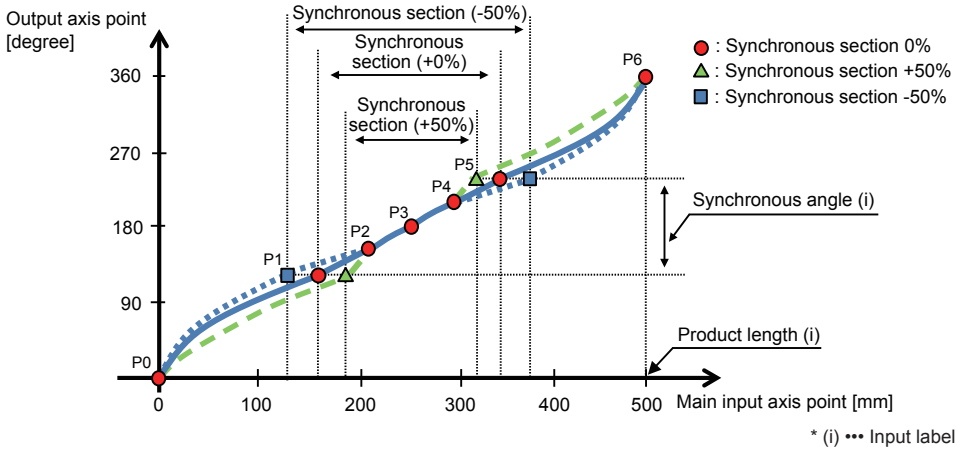


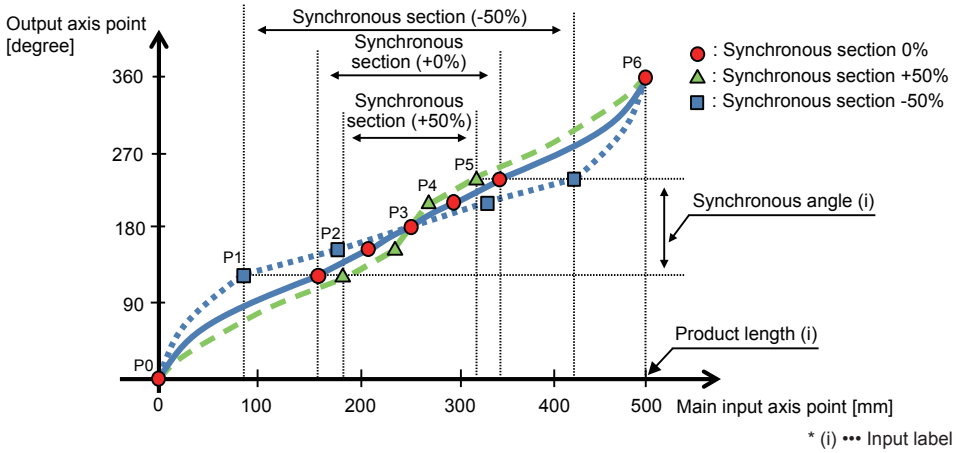
• i_eSealSectionAccRatio (Seal section acceleration rate) changes the speed in the sealing section.
• i_eInOutSectionAccRatio (Inlet/outlet section acceleration rate) changes the speed in the entrance/exit section.

■Cam pattern when only i_eSealSectionAccRatio (Seal section acceleration rate) is set



■Cam pattern when only i_eInOutSectionAccRatio (Inlet/outlet section acceleration rate) is set

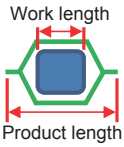


Item	Description
Function description	■Cam pattern when both i_eSealSectionAccRatio and i_eInOutSectionAccRatio are set  • After the cam generation is normally completed and the output label is updated, o_bOK (Normal completion) turns on. • If a warning related to the cam data operation occurs in the Simple Motion module during cam generation, an error (ErrorID: 2203H) is stored. • 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. • If an error has occurred in the FB, Error turns on and an error code is stored in ErrorID. • For details of error codes, refer to "Page 198 List of Error Codes".
Restrictions and precautions	• The cam to be automatically generated is in the coordinate data format. • The cam data that has been automatically generated is saved in the cam storage area. • If i_bEN (Execution command) turns off during cam generation, the cam may not be normally generated. • 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. • 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. • 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 • Use the FB CtrlOutputAxisSync or create a user program for the operation of the D-cam axis. • The number of FB steps in a program varies depending on the CPU model to be used and I/O definitions.
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-R Simple Motion Module User's Manual (Advanced Synchronous Control)

Labels

■Input labels

Name	Label name	Data type	Read timing*1	Setting range	Initial value	Description
Execution command	i_bEN	Bit	⎍	On, off	—	On: The FB is activated. Off: The FB is not activated.
Product length	i_eProductLength	Single precision real number	↑	0.1 ≤ Product length ≤ 100000.0 [mm]	500.0	Set the product length. 
Synchronous angle	i_eSyncAngle	Single precision real number	↑	0.1 ≤ Synchronous angle ≤ 180.0 [degree]	100.0	Set the angle including the seal section and inlet/outlet section.
Seal length	i_eSealLength	Single precision real number	↑	0.1 ≤ Seal length ≤ 100000.0 [mm]	100.0	Set the seal section length.
Eccentric length	i_eEccentricLength	Single precision real number	↑	0.1 ≤ Eccentric length ≤ 100000.0 [mm]	100.0	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 ≤ Seal section acceleration rate ≤ 50.0 [%]	0.0	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_eInOutSectionAccRatio	Single precision real number	↑	-50.0 ≤ Inlet/outlet section acceleration rate ≤ 50.0 [%]	0.0	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 ≤ Cam resolution ≤ 1024	256	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	Initial value	Description
Cam auto-generation cam No.	io_uCamNo	Word [Unsigned]	↑	1 ≤ Cam auto-generation cam No. ≤ 256	1	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	Initial value	Description
Axis No.	AxisNo	Word [Unsigned]	↑	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.
Start I/O number	StartIO	Word [Unsigned]	↑	0H ≤ Start I/O number ≤ FEH	0	Installation address of the Simple Motion module (Upper three digits of four digits (hexadecimal))

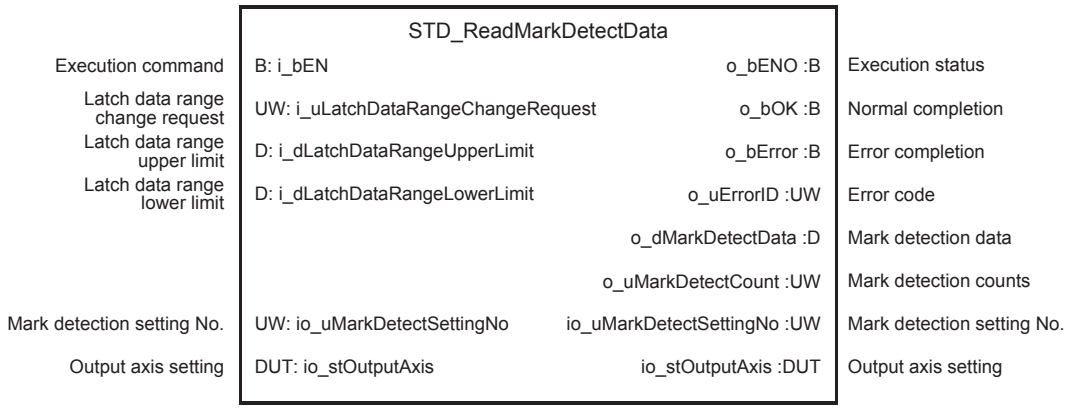
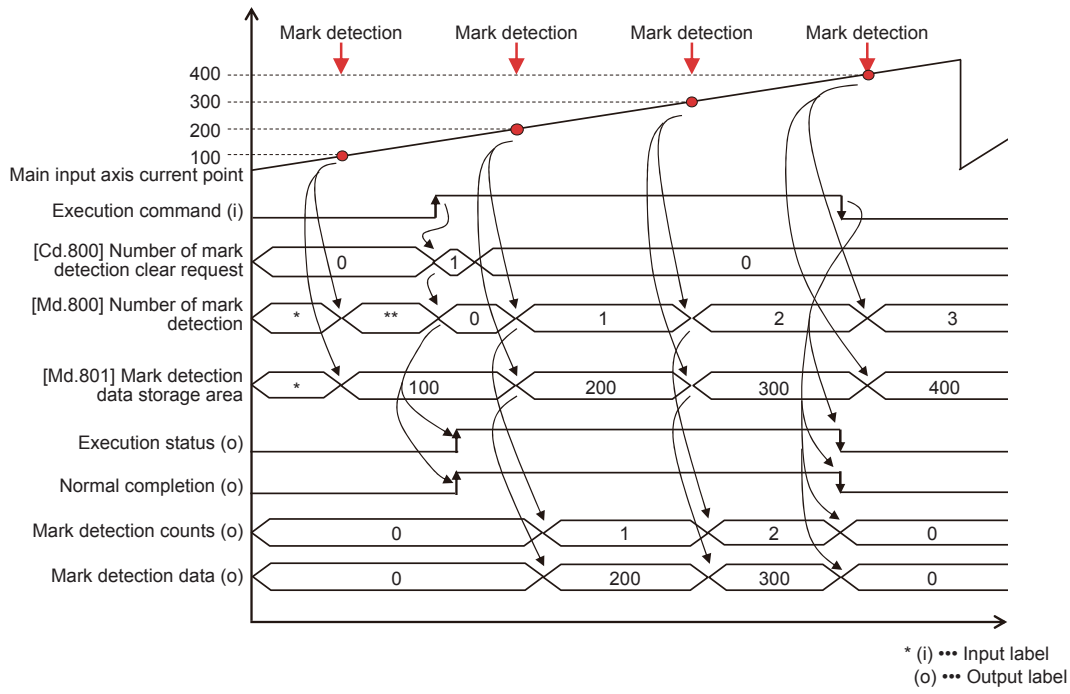
*1 ⎍: Always, ↑: When the FB is started (cannot be changed)

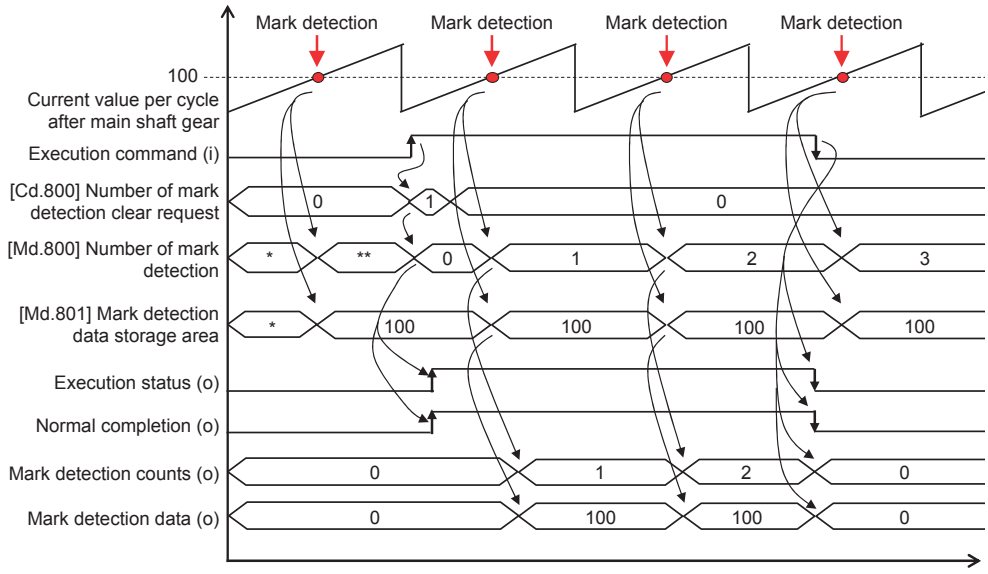
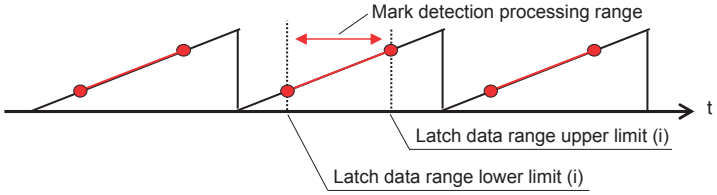
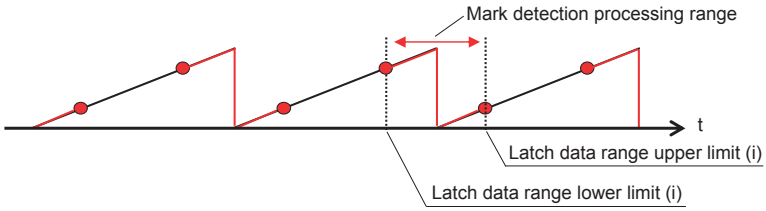
STD_ReadMarkDetectData (Mark detection data reading)

Name

STD_ReadMarkDetectData

Function overview

Item	Description	
Function overview	This FB reads mark detection data.	
Symbol		
Applicable hardware and software	Applicable module	RD77MS, RD77GF
	Applicable CPU	MELSEC iQ-R series
	Engineering software	GX Works3
Number of steps	671 steps	
FB dependence	—	
Function description	This FB reads mark detection data. • 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. • While i_bEN (Execution command) is on, o_dMarkDetectData (Mark detection data) and o_dMarkDetectCount (Mark detection counts) are updated at every scan. ■ Main input axis current point and current feed value 	

Item	Description
Function description	■ Current value per cycle  * (i) ••• Input label (o) ••• Output label • By setting i_dLatchDataRangeUpperLimit (Latch data range upper limit) and i_dLatchDataRangeLowerLimit (Latch data range lower limit) and turning on i_uLatchDataRangeChangeRequest (Latch data range change request), mark detection is performed when the data at mark detection is within the range. ■ 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. ■ 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".  * (i) ••• Input label ■ 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".  * (i) ••• Input label • If an error has occurred in the FB, Error turns on and the error code is stored in ErrorID. • For details of error codes, refer to "Page 198 List of Error Codes".
Restrictions and precautions	• 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. • If a value other than 0 to 3 has been set in "[Pr.1] Unit setting", this FB is executed with the unit [mm]. • 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. "[Pr.800] to [Pr.804], [Pr.807] (0: Available, other than 0: Not available), [Pr.95], [Pr.42], [Cd.8]" • Since control data ([Cd.800], [Cd.802]) is set in this FB, do not use user programs to set or change the data.*1 • This FB reads the mark detection data stored in the Simple Motion module.
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-R Simple Motion Module User's Manual (Application)

Labels

■Input labels

Name	Label name	Data type	Read timing*1	Setting range	Initial value	Description
Execution command	i_bEN	Bit	⎍	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]	⎍	0 ≤ Latch data range change request ≤ 2	0	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 ≤ Latch data range upper limit ≤ 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)	0	Set a valid upper limit value as latch data at mark detection.
Latch data range lower limit value	i_dLatchDataRangeLowerLimit	Double word [Signed]		-2147483648 ≤ Latch data range lower limit ≤ 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)	0	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 ≤ Mark detection data ≤ 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 ≤ Mark detection counts ≤ 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	Initial value	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	Initial value	Description
Axis number	AxisNo	Word [Unsigned]	↑	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.
Start I/O number	StartIO	Word [Unsigned]	↑	0H ≤ Start I/O number ≤ FEH	0	Installation address of the Simple Motion module (Upper three digits of four digits (hexadecimal))

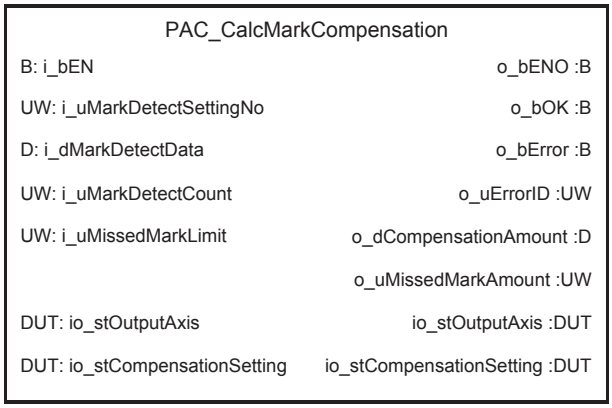
*1 ⎍: Always, ↑: When the FB is started (cannot be changed)

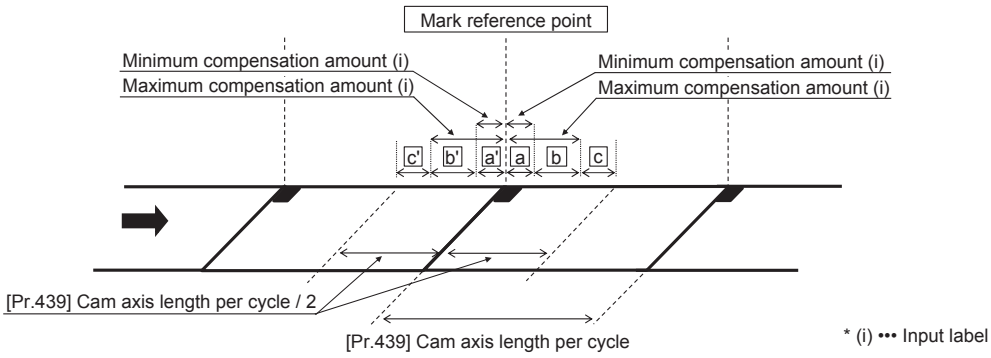
PAC_CalcMarkCompensation (Automatic compensation calculation using mark detection)

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		
Applicable hardware and software	Applicable module	RD77MS, RD77GF
	Applicable CPU	MELSEC iQ-R series
	Engineering software	GX Works3
Number of steps	1683 steps	
FB dependence	—	

Item	Description
Function description	• Turning on i_bEN (Execution command) normally starts the FB and turns on o_bOK (Normal completion). • 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). • For i_dMarkDetectData (Mark detection data), set the real current value ([Pr.802] = 2). • 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. • 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. — 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). — 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 • Set MinTolerance (Minimum compensation amount) and MaxTolerance (Maximum compensation amount) to satisfy the following formula. $\text{MinTolerance (Minimum compensation amount)} < \text{MaxTolerance (Maximum compensation amount)} < \frac{\text{[Pr.439] Cam axis length per cycle}}{2}$  ■ 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. ■ Mark detection points: Area b and b' o_dCompensationAmount (Compensation amount): The calculated compensation amount is output. The cumulative compensation amount is reset. ■ 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. • 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. • Use output values of STD_ReadMarkDetectData for i_dMarkDetectData (Mark detection data) and i_uMarkDetectCount (Mark detection counts). • 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 box motion axis, use o_dCompensationAmount (Compensation amount) in reverse. • If an error has occurred in the FB, Error turns on and the error code is stored in ErrorID. • For details of error codes, refer to "Page 198 List of Error Codes".

Item	Description
Restrictions and precautions	• Execute this FB in a fixed cycle. (Motion calculation cycle event task (I44: Inter-module synchronization) is recommended.) • If a value other than 0 to 3 has been set in "[Pr.1] Unit setting", this FB is executed with the unit [mm]. • When using this FB, construct a system in which "[Md.101] Real current value" operates in the increasing direction. • 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)
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	Initial value	Description
Execution command	i_bEN	Bit	⎍	On, off	—	On: The FB is activated. Off: The FB is not activated.
Mark detection setting No.	i_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.
Mark detection data	i_dMarkDetectData	Double word [Signed]	⎍	-2147483648 ≤ Mark detection data ≤ 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)	0	Enter o_dMarkDetectData (Mark detection data) of the FB STD_ReadMarkDetectData.
Mark detection counts	i_uMarkDetectCount	Word [Unsigned]	⎍	0 ≤ Mark detection counts ≤ 65535 [times] (Ring counter)	0	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]	⎍	0 ≤ Mark undetected permissible counts ≤ 100 [times]	0	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*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 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 ≤ Compensation amount ≤ 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]	—*2	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*1	Setting range	Initial value	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*1	Setting range	Initial value	Description
Axis number	AxisNo	Word [Unsigned]	↑	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.
Start I/O number	StartIO	Word [Unsigned]	↑	0H ≤ Start I/O number ≤ FEH	0	Installation address of the Simple Motion module (Upper three digits of four digits (hexadecimal))

Compensation control setting (PAC_COMPENSATION_REF structure)

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

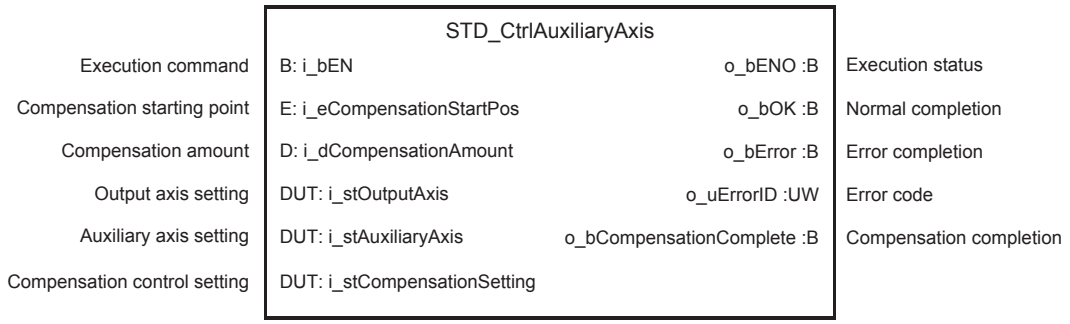
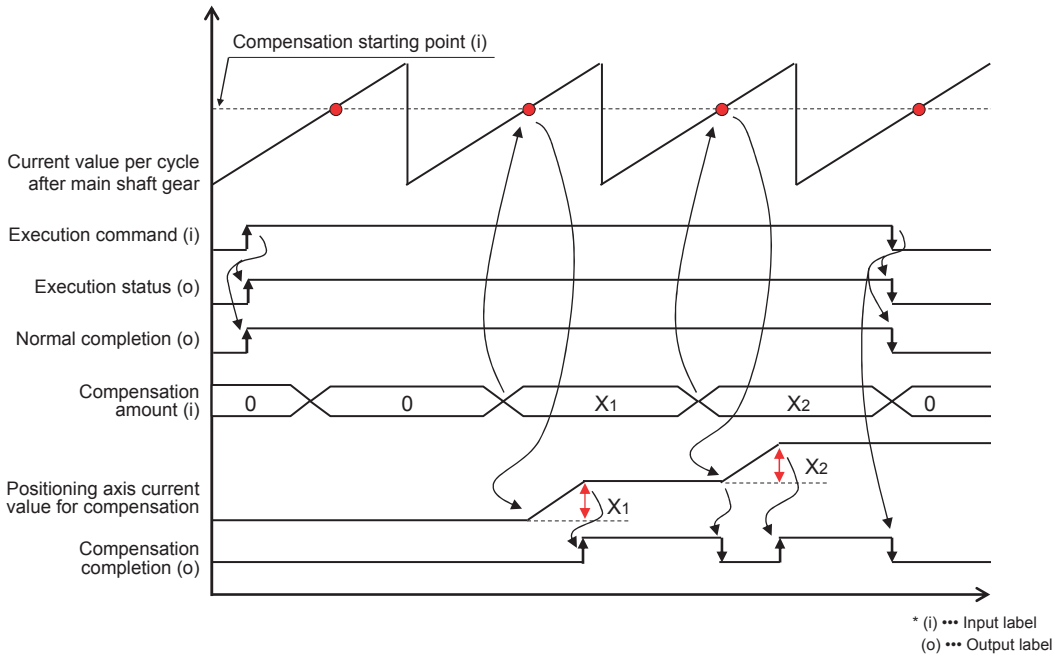
*1 ⎍: Always, ↑: When the FB is started (cannot be changed)

STD_CtrlAuxiliaryAxis (Auxiliary axis correction)

Name

STD_CtrlAuxiliaryAxis

Function overview

Item	Description	
Function overview	This FB performs positioning by compensation amount.	
Symbol		
Applicable hardware and software	Applicable module	RD77MS, RD77GF
	Applicable CPU	MELSEC iQ-R series
	Engineering software	GX Works3
Number of steps	2267 steps	
FB dependence	—	
Function description	This FB performs positioning of the auxiliary axis and compensates the output axis. • Turning on i_bEN (Execution command) normally starts the FB and turns on o_bOK (Normal completion). • 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. • 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. • o_bCompensationComplete (Compensation completion) turns on at completion of positioning of the auxiliary axis. ■If a positive value is set for the compensation starting point  * (i) ••• Input label (o) ••• Output label • 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. • If an error has occurred in the FB, Error turns on and the error code is stored in ErrorID. • For details of error codes, refer to "Page 198 List of Error Codes".	

Item	Description
Restrictions and precautions	• 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. • If parameters have been set as below, this FB is executed with the unit [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 800 + maximum number of module axes (synchronous encoder) • 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 • 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. • 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. • 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. • 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. • For the following settings, use user programs as required. "[Da.9], [Da.10], [Da.27], [Da.28]" • Set i_eCompensationStartPos (Compensation starting point) not to overlap the synchronous section to avoid the compensation operation from being performed at sealing. • 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.
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-R Simple Motion Module User's Manual (Advanced Synchronous Control)

Labels

■Input labels

Name	Label name	Data type	Read timing*1	Setting range	Initial value	Description
Execution command	i_bEN	Bit	⎍	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.	0.0	The compensation starts when the main input axis point per cycle reaches the set value. • 0.0 ≤ Compensation starting point < Cam axis length per cycle [mm] • 0.00 ≤ Compensation starting point < Cam axis length per cycle [inch] • 0.00 ≤ Compensation starting point < Cam axis length per cycle [degree] • 0 ≤ Compensation starting point < Cam axis length per cycle [pulse] [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]	⎍	-2147483648 ≤ Compensation amount ≤ 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)	0	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	Initial value	Description
Axis number	AxisNo	Word [Unsigned]	↑	1 ≤ Axis No. ≤ 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.
Start I/O number	StartIO	Word [Unsigned]	↑	0H ≤ Start I/O number ≤ FEH	0	Installation address of the Simple Motion module (Upper three digits of four digits (hexadecimal))

Auxiliary axis setting (AXIS_REF structure)

Name	Label name	Data type	Read timing*1	Setting range	Initial value	Description
Axis number	AxisNo	Word [Unsigned]	↑	1 ≤ Axis No. ≤ maximum number of axes of the module used	—	Set the axis No. of the auxiliary axis used for mark compensation. The unit setting of the axis is the unit of labels used by the auxiliary axis.

Compensation control setting (PAC_COMPENSATION_REF structure)

Name	Label name	Data type	Read timing*1	Setting range	Initial value	Description
Positioning data No.	uPointTableNo	Word [Unsigned]	↑	1 ≤ Positioning data No. ≤ 100	1	Set the positioning data No. for performing the compensation operation.
Compensation axis speed	eCompensationSpeed	Single precision real number	↑	Refer to the description.	1000.0	Set the positioning speed for compensation. Set the speed added/subtracted to/from the line speed in this setting. • mm: 0.01 ≤ Compensation axis speed ≤ 20000000.00 [mm/min] • inch: 0.001 ≤ Compensation axis speed ≤ 2000000.000 [inch/min] • degree: 0.001 ≤ Compensation axis speed ≤ 2000000.000 [degree/min] • pulse: 1 ≤ Compensation axis speed ≤ 1000000000 [pulse/s] [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 ≤ Compensation acceleration ≤ 3	0	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 ≤ Compensation deceleration ≤ 3	0	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.

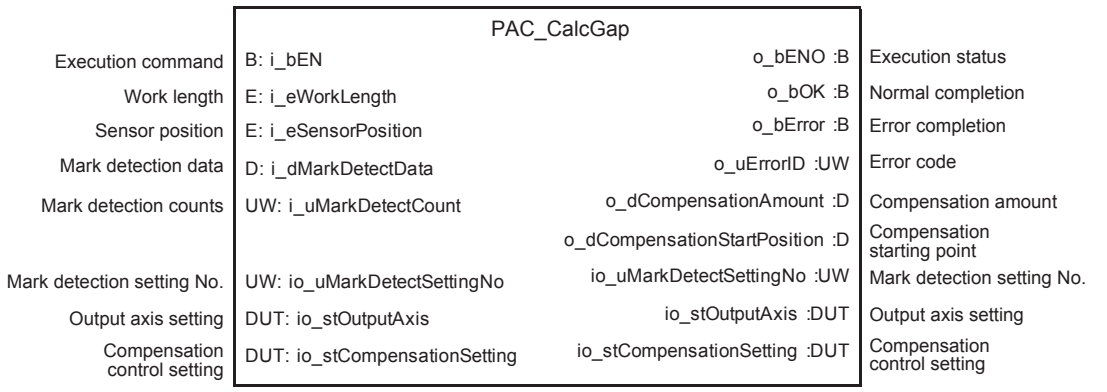
*1 ○: The value will be held after the FB stops. —: The value will be cleared after the FB stops.

PAC_CalcGap (Work gap adjustment compensation amount calculation)

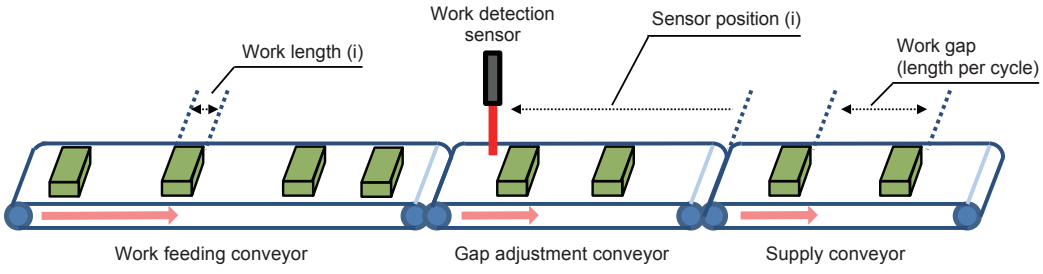
Name

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		
Applicable hardware and software	Applicable module	RD77MS, RD77GF
	Applicable CPU	MELSEC iQ-R series
	Engineering software	GX Works3
Number of steps	1332 steps	
FB dependence	—	

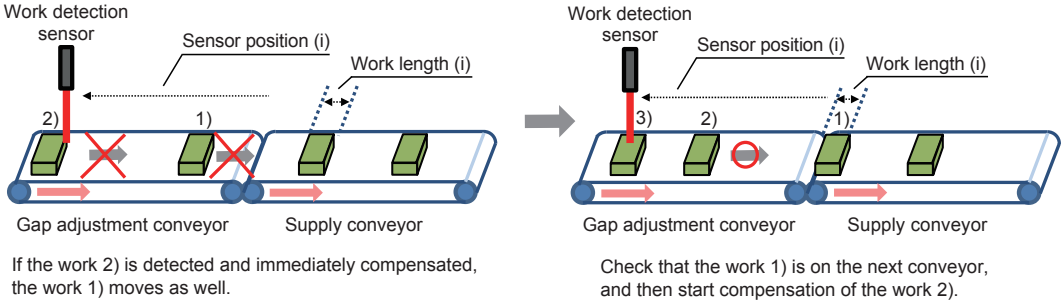
Item	Description
Function description	As the following shows, this FB outputs compensation amounts to align the workpieces fed from the work feeding conveyor at irregular intervals into equal intervals (length per cycle) by using the gap adjustment conveyor which is synchronized with the supply conveyor and the sensor attached above the gap adjustment conveyor. ■Outline diagram (gap adjustment)



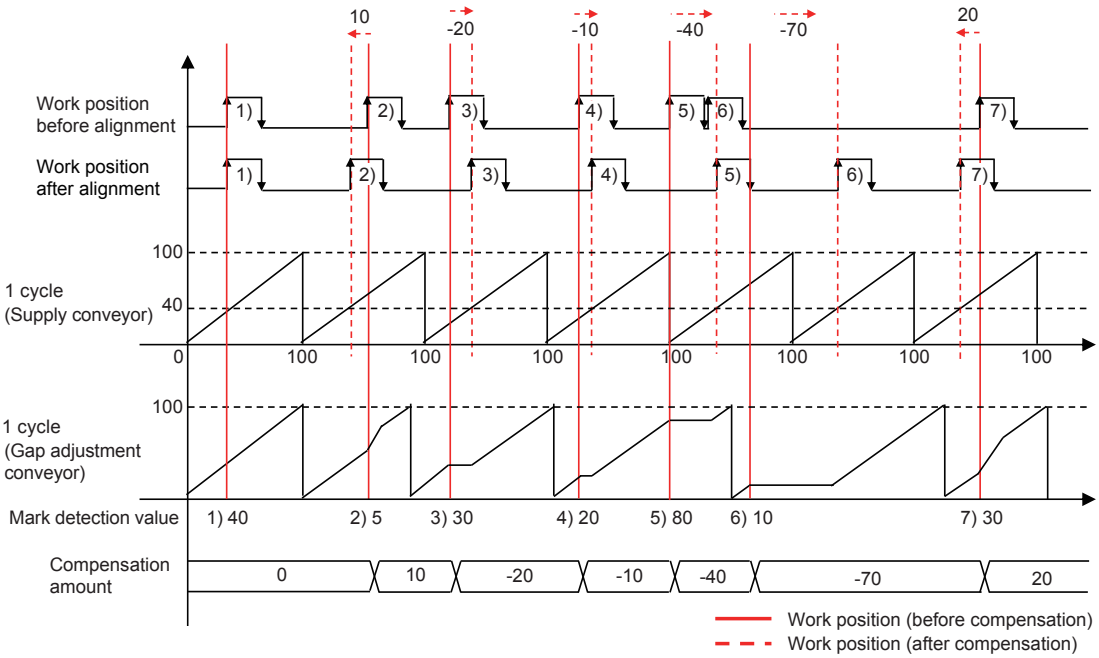
* (i)···Input label

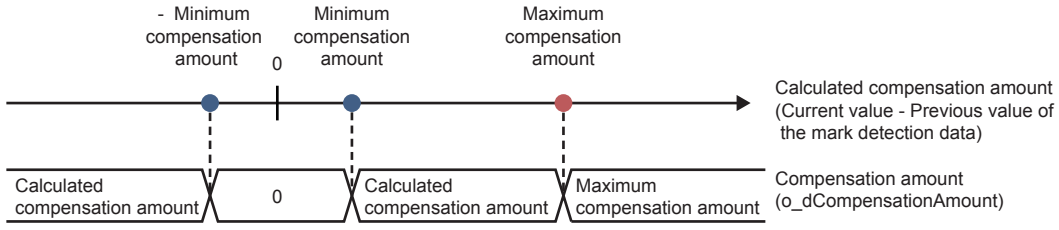
- Turning on i_bEN (Execution command) normally starts the FB and turns on o_bOK (Normal completion).
- "[Md.407] Cam axis current value per cycle" of the axis (gap adjustment conveyor) specified with the output axis setting at the first mark detection is set as a reference point. After that, the compensation 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).
- The compensation amount is not calculated at the first detection of the work. It is calculated at the second i_uMarkDetection (Mark detection data) or later.
- i_dMarkDetectData (Mark detection data) uses the cam axis current value per cycle (when [Pr.802] is set to 11 or 12).
- 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).

■Compensation starting point concept



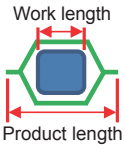
* (i)···Input label



Item	Description
Function description	• This FB performs the following compensation using MaxTolerance (maximum compensation amount) and MinTolerance (minimum compensation amount) according to the calculated compensation amount. ■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) ■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. ■For the calculated compensation amount (negative value) The calculated compensation amount is output as the compensation amount as is.  • Depending on the space between workpieces coveyed 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. • If an error has occurred in the FB, Error turns on and the error code is stored in ErrorID. • For details of error codes, refer to "Page 198 List of Error Codes".
Restrictions and precautions	• Set 0 (mm) or 1 (inch) in the main input axis. If a value outside the range is set, an error (ErrorID: 214DH) occurs. • To use this FB, configure a system in which "[Md.407] Cam axis current value per cycle" moves in the increment direction. • 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 ≤ 214748.3647 [mm] or 21474.83647 [inch] • 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.
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	Initial value	Description
Execution command	i_bEN	Bit	⎍	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.	40.0	Set the work length.  • 0.1 ≤ Work length ≤ 100000.0 [mm] • 0.01 ≤ Work length ≤ 10000.00 [inch] [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.	240.0	Set the distance between the sensor of the gap adjustment conveyor that detects the workpiece and conveyor end. • 0.1 ≤ Sensor position ≤ 100000.0 [mm] • 0.01 ≤ Sensor position ≤ 10000.00 [inch] [The unit setting depends on the setting value of the main input axis.]
Mark detection data	i_dMarkDetectData	Double word [Signed]	⎍	-2147483648 ≤ Mark detection data ≤ 2147483647 [The unit setting depends on the axis No. setting value of the output axis setting.] (10^{-4} mm, 10^{-5} inch)	0	Enter STD_ReadMarkDetectDataFB of o_dMarkDetectData (Mark detection data).

Name	Label name	Data type	Read timing*1	Setting range	Initial value	Description
Mark detection counts	i_uMarkDetectCount	Word [Unsigned]	⎍	0 ≤ Mark detection counts ≤ 65535 [times] (Ring counter)	0	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 ≤ Compensation amount ≤ 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 ≤ Compensation starting point ≤ 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	Initial value	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*1	Setting range	Initial value	Description
Axis No.	AxisNo	Word [Unsigned]	↑	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.
Start I/O number	StartIO	Word [Unsigned]	↑	0H ≤ Start I/O number≤ FEH	—	Installation address of the Simple Motion module (Upper three digits of four digits (hexadecimal))

Compensation control setting (PAC_COMPENSATION_REF structure)

Name	Label name	Data type	Read timing*1	Setting range	Initial value	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.

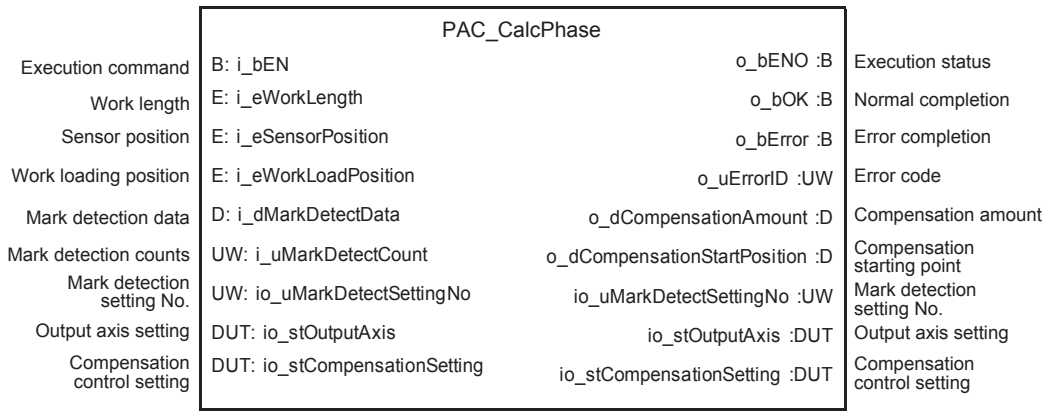
*1 ⎍: Always, ↑: When the FB is started (cannot be changed)

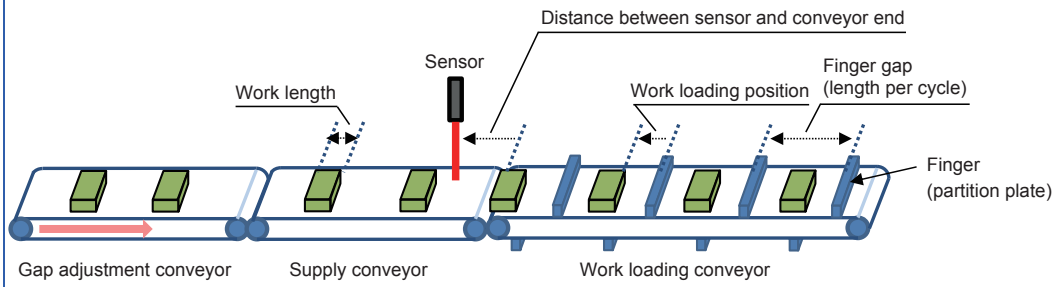
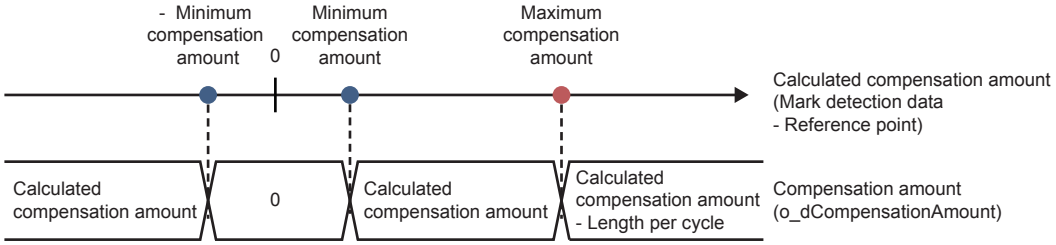
PAC_CalcPhase (Work loading position adjustment compensation amount calculation)

Name

PAC_CalcPhase

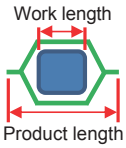
Function details

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		
Applicable hardware and software	Applicable module	RD77MS, RD77GF
	Applicable CPU	MELSEC iQ-R series
	Engineering software	GX Works3
Number of steps	1488 steps	
FB dependence	—	

Item	Description
Function description	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. ■Outline diagram  • Turning on i_bEN (Execution command) normally starts the FB and turns on o_bOK (Normal completion). • During the work detection, the compensation amount is calculated from "[Md.407] Cam axis current value per cycle" of the loading conveyor and the i_eWorkLoadPosition (Work loading position) and outputted. • 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). • i_dMarkDetectData (Mark detection data) uses the cam axis current value per cycle (when [Pr.802] is set to 11 or 12). • i_eWorkLoadPosition (Work loading position) shows the loading position from the edge of the finger. • This FB performs the following compensation using MaxTolerance (maximum compensation amount) and MinTolerance (minimum compensation amount) according to the calculated compensation amount. ■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) ■When the calculated compensation amount (positive value) is larger than the value in MaxTolerance (Maximum compensation amount) The length per cycle is subtracted from o_dCompensationAmount (Compensation amount) and the workpiece is loaded between the fingers of the next cycle. A maximum compensation amount exceeded error (ErrorID: 2123H) is stored. ■For the calculated compensation amount (negative value) The calculated compensation amount is output as the compensation amount as is.  • 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. • If an error has occurred in the FB, Error turns on and the error code is stored in ErrorID. • For details of error codes, refer to "Page 198 List of Error Codes".
Restrictions and precautions	• Set 0 (mm) or 1 (inch) in the main input axis. If a value outside the range is set, an error (ErrorID: 214DH) occurs. • To use this FB, configure a system in which "[Md.407] Cam axis current value per cycle" moves in the increment direction. • 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 ≤ 214748.3647 [mm] or 21474.83647 [inch] • 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. • Adjust the work intervals using PAC_CalcGap (Work gap adjustment compensation amount calculation) FB so that each workpiece is within the length per cycle on the supply conveyor. • Set "[Pr.439] Cam axis length per cycle" of the supply conveyor and loading conveyor to the same value.
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	Initial value	Description
Execution command	i_bEN	Bit	⎍	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.	40.0	Set the work length.  • 0.1 ≤ Work length ≤ 100000.0 [mm] • 0.01 ≤ Work length ≤ 10000.00 [inch] [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.	240.0	Set the distance between the sensor that detects the workpiece on the supply conveyor and the conveyor end. • 0.1 ≤ Sensor position ≤ 100000.0 [mm] • 0.01 ≤ Sensor position ≤ 10000.00 [inch] [The unit setting depends on the setting value of the main input axis.]
Work loading position	i_eWorkLoadPosition	Single precision real number	↑	0.0 ≤ Work loading position < "[Pr.439] Cam axis length per cycle"	0.0	Set the distance between the finger edge and work edge on the loading conveyor.
Mark detection data	i_dMarkDetectData	Double word [Signed]	⎍	-2147483648 ≤ Mark detection data ≤ 2147483647 [The unit setting depends on the axis No. setting value of the output axis setting.] (10^{-4} mm, 10^{-5} inch)	0	Enter STD_ReadMarkDetectDataFB of o_dMarkDetectData (Mark detection data).
Mark detection counts	i_uMarkDetectCount	Word [Unsigned]	⎍	0 ≤ Mark detection counts ≤ 65535 [times] (Ring counter)	0	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 ≤ Compensation amount ≤ 2147483647 [The unit setting depends on the axis No. setting value of the output axis setting.] (10^{-4} mm, 10^{-5} inch)

Name	Label name	Data type	Value to be held*1	Description
Compensation starting point	o_dCompensationStartPosition	Double word [Signed]	—	The calculated compensation starting point is stored. Data range: -2147483648 ≤ Compensation starting point ≤ 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	Initial value	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*1	Setting range	Initial value	Description
Axis No.	AxisNo	Word [Unsigned]	↑	1 ≤ Axis No. ≤ 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.
Start I/O number	StartIO	Word [Unsigned]	↑	0H ≤ Start I/O number ≤ FEH	—	Installation address of the Simple Motion module (Upper three digits of four digits (hexadecimal))

Compensation control setting (PAC_COMPENSATION_REF structure)

Name	Label name	Data type	Read timing*1	Setting range	Initial value	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, "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 [Unsigned]	Axis number
Start I/O number	StartIO	Word [Unsigned]	Installation address of the Simple Motion module (Upper three digits of four digits (hexadecimal))

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. • mm: 0.01 ≤ Compensation axis speed ≤ 20000000.00 [mm/min] • inch: 0.001 ≤ Compensation axis speed ≤ 2000000.000 [inch/min] • degree: 0.001 ≤ Compensation axis speed ≤ 2000000.000 [degree/min] • pulse: 1 ≤ Compensation axis speed ≤ 1000000000 [pulse/s] [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
Box motion	SSCNETⅢ/H	AP20-PAC002AA-R16-77MS16_BoxMotion_****.gx3*1	Page 105 Box Motion
	CC-Link IE Field	AP20-PAC002AA-R16-77GF16_BoxMotion_****.gx3*1	
Long dwell	SSCNETⅢ/H	AP20-PAC002AA-R16-77MS8_LongDwell_****.gx3*1	Page 122 Long Dwell
	CC-Link IE Field	AP20-PAC002AA-R16-77GF8_LongDwell_****.gx3*1	
Alignment conveyor	SSCNETⅢ/H	AP20-PAC002AA-R16-77MS16_AlignmentConveyor_****.gx3*1	Page 138 Alignment Conveyor
	CC-Link IE Field	AP20-PAC002AA-R16-77GF16_AlignmentConveyor_****.gx3*1	

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

Precautions

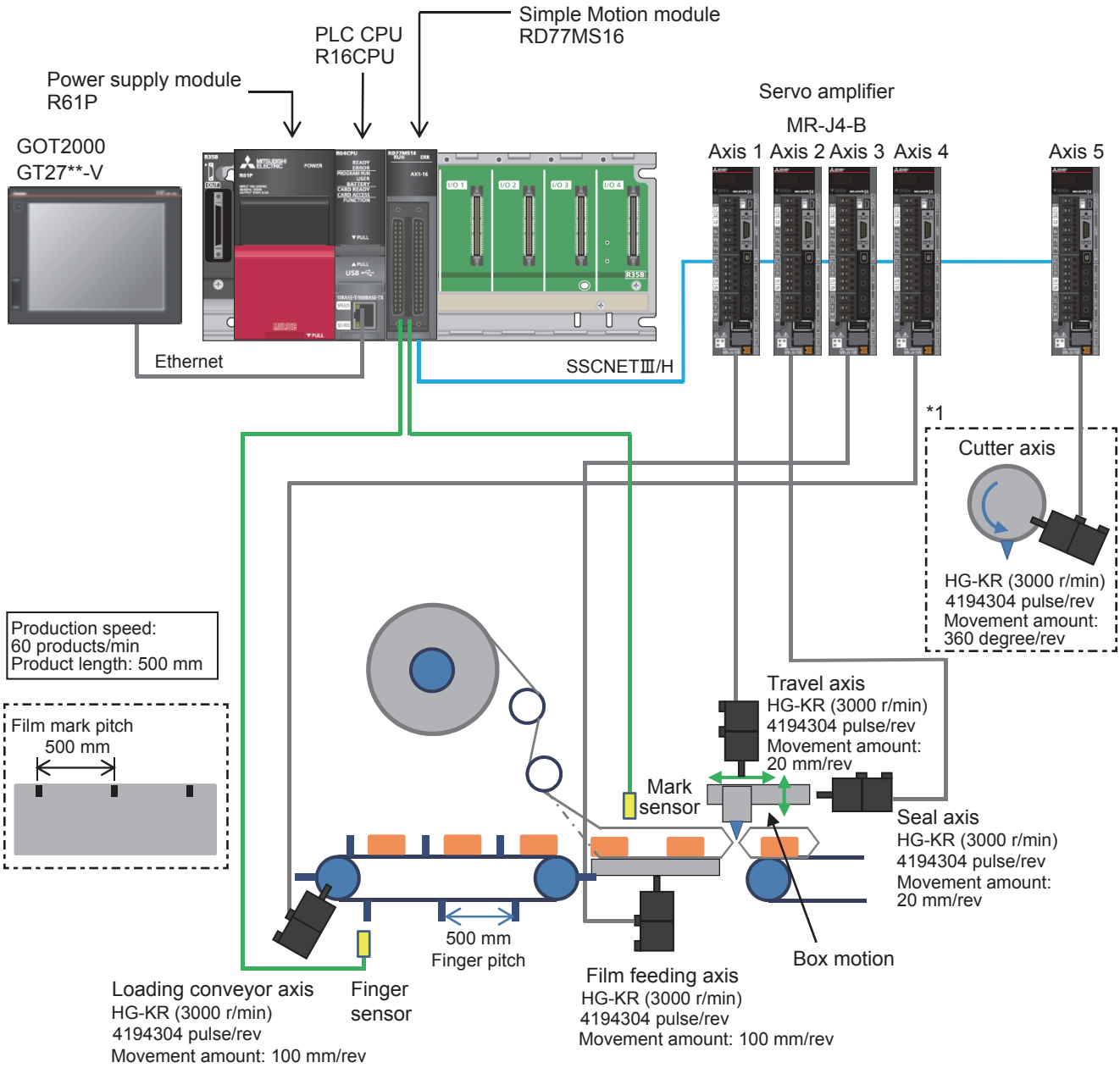
- To utilize this program for an actual system, sufficiently confirm that the program will not cause system control problems on user's own responsibility. Examine the positions where interlock conditions are required in a target system and add them.
- When the Simple Motion module detects an error or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

5.1 Box Motion

This section describes the system configuration and program specifications of the program example of a horizontal pillow packaging machine when using the box motion mechanism.

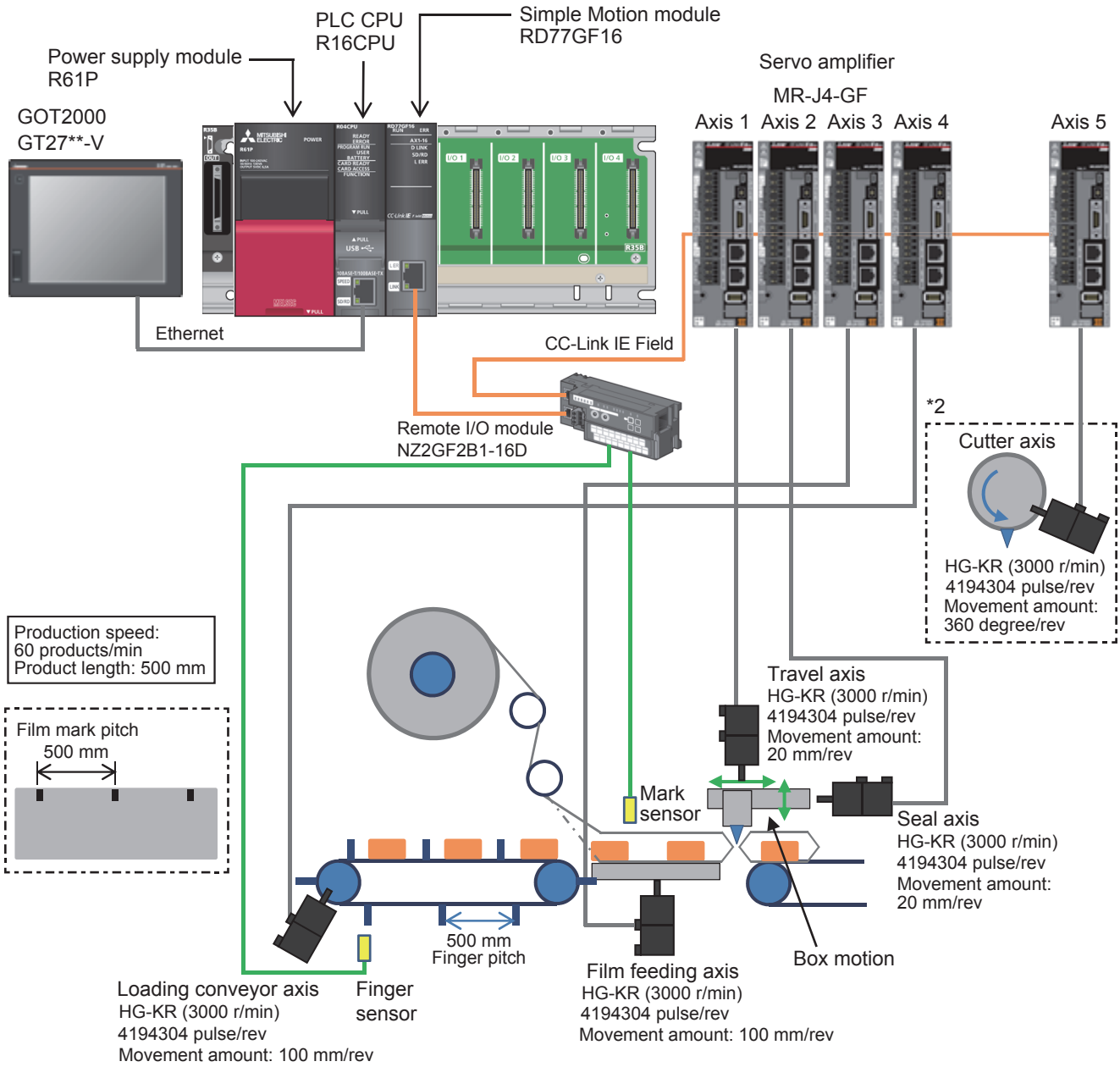
System configuration

- AP20-PAC002AA-R16-77MS16_Box Motion_****.gx3 (SSCNETⅢ/H)



*1 The end seal part has been configured with the box motion. This application package also includes programs to generate cam patterns for using the rotary cutter.

• AP20-PAC002AA-R16-77GF16_BoxMotion_****.gx3 (CC-Link IE Field Network)



*2 The end seal part has been configured with the box motion. This application package also includes programs to generate cam patterns for using the rotary cutter.

Control specifications

Item	Travel axis (Box motion)	Seal axis (Box motion)	Film axis	Conveyor axis	Cutter axis (Rotary cutter)
Axis No.	1	2	3	4	5
Unit setting	0: mm	0: mm	0: mm	0: mm	2: degree
Home position return	Data setting method	Data setting method	Data setting method	Data setting method	Data setting method
Auxiliary axis No.	—	—	13 (Virtual)	14 (Virtual)	—
Cam No.	1	2	0 (Straight line)	0 (Straight line)	3
Clutch	Address	Address	Address	Address	Address

Item	Main axis 1	Main axis 2
Axis No.	7 (Virtual)	8 (Virtual)
Unit setting	2: degree	0: mm

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	• License activation • Preparing operation (Servo ON/OFF) • Home position return	Scan	FBD
Operation	• Reset error • JOG operation • Cam generation • Cam data reading • Synchronous control start • Operation start/stop	Scan	FBD
PackagingControl	• Mark compensation • Initial phase adjustment • No Product No Bag/No Gap No Seal	Event (I44)	FBD
HMI_IF	Touch panel I/O processing	Scan	ST

FB

The following table lists the FBs used in this program.

■PAC_PackagingControl_R

AP20-PAC002AA-R16-77MS16_BoxMotion_****.gx3

Item	FB name	Description	Execution type*1	Program
Activation	PAC_Activation	License activation	Macro type	PreOperation
Cam auto-generation	STD_MakeRotaryCutterCam+RD77MS	Cam auto-generation for rotary cutter (front end reference)	Macro type	Operation
	PAC_MakeBoxMotionCam	Cam auto-generation for box motion	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-R Programming Manual (Program Design)

AP20-PAC002AA-R16-77GF16_BoxMotion_****.gx3

Item	FB name	Description	Execution type*1	Program
Activation	PAC_Activation	License activation	Macro type	PreOperation
Cam auto-generation	STD_MakeRotaryCutterCam+RD77GF	Cam auto-generation for rotary cutter (central reference)	Macro type	Operation
	PAC_MakeBoxMotionCam	Cam auto-generation for box motion	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-R Programming Manual (Program Design)

■PLCopen Motion Control

PLCopen Motion Control FB library can be downloaded from the Mitsubishi Electric FA site.

FB name	Description	Execution type*1	Program
MC_Power+RD77	Operation possible (PLCopen Motion Control FB)	Macro type	PreOperation
MCv_Home+RD77	Home position return (PLCopen Motion Control FB)	Macro type	PreOperation
MC_Reset+RD77	Axis error reset (PLCopen Motion Control FB)	Macro type	PreOperation
MCv_Jog+RD77	JOG operation (PLCopen Motion Control FB)	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-R Programming Manual (Program Design)

■Example Prg Control (Application program control)

FB name	Description	Execution type*1	Program
CtrlOutputAxisSync	Output axis synchronization control	Macro type	PackagingControl
ReadCamData	Cam data reading	Macro type	PreOperation

*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-R Programming Manual (Program Design)

Devices to be used

AP20-PAC002AA-R16-77GF16_BoxMotion_****.gx3

In this program example, a link device is used for the interface between the PLC CPU and remote I/O module (NZ2GF2B1-16D). The device range is shown below.

Item	Symbol	Point	Range
Link relay	B	16	0 to F

Parameter

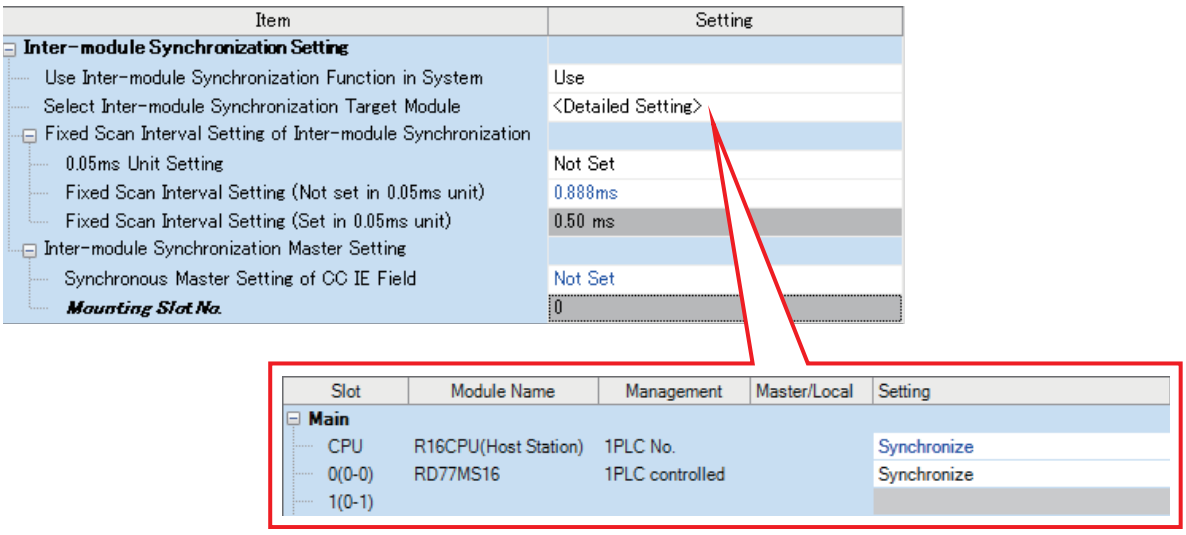
Refer to the project for parameter setting details.

System parameter

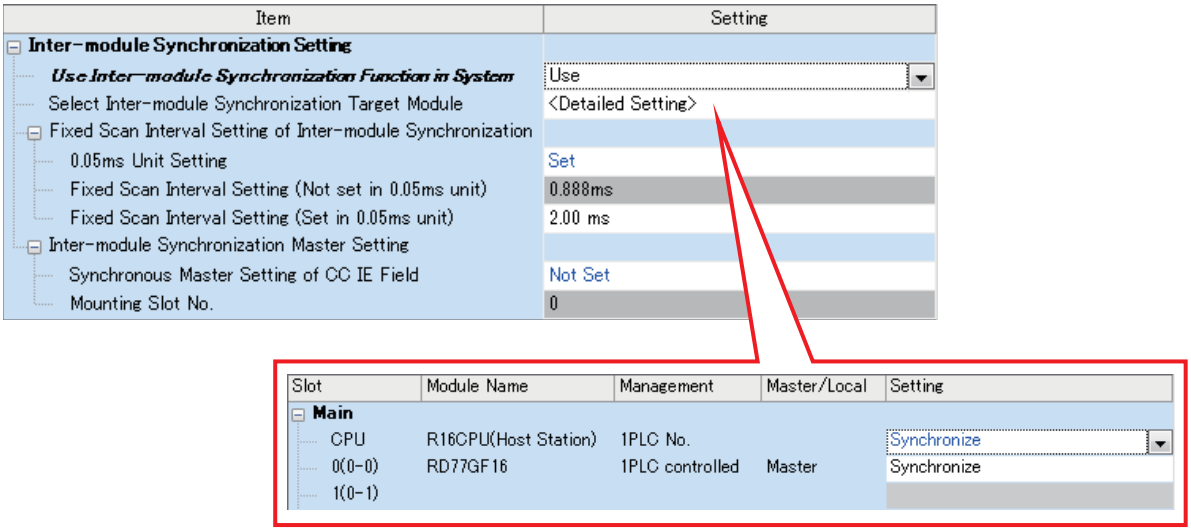
To perform the control in synchronization with the calculation cycle of the Simple Motion module, use the inter-module synchronization function.

Set the interval of the fixed cycle depending on the calculation cycle of the system.

■For RD77MS



■For RD77GF



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.82] Forced stop valid/invalid selection	Disabled
"[Pr.116] FLS signal selection" input type	Disabled
"[Pr.117] RLS signal selection" input type	Disabled
"[Pr.118] DOG signal selection" input type	Disabled
"[Pr.119] STOP signal selection" input type	Disabled

Servo parameter

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

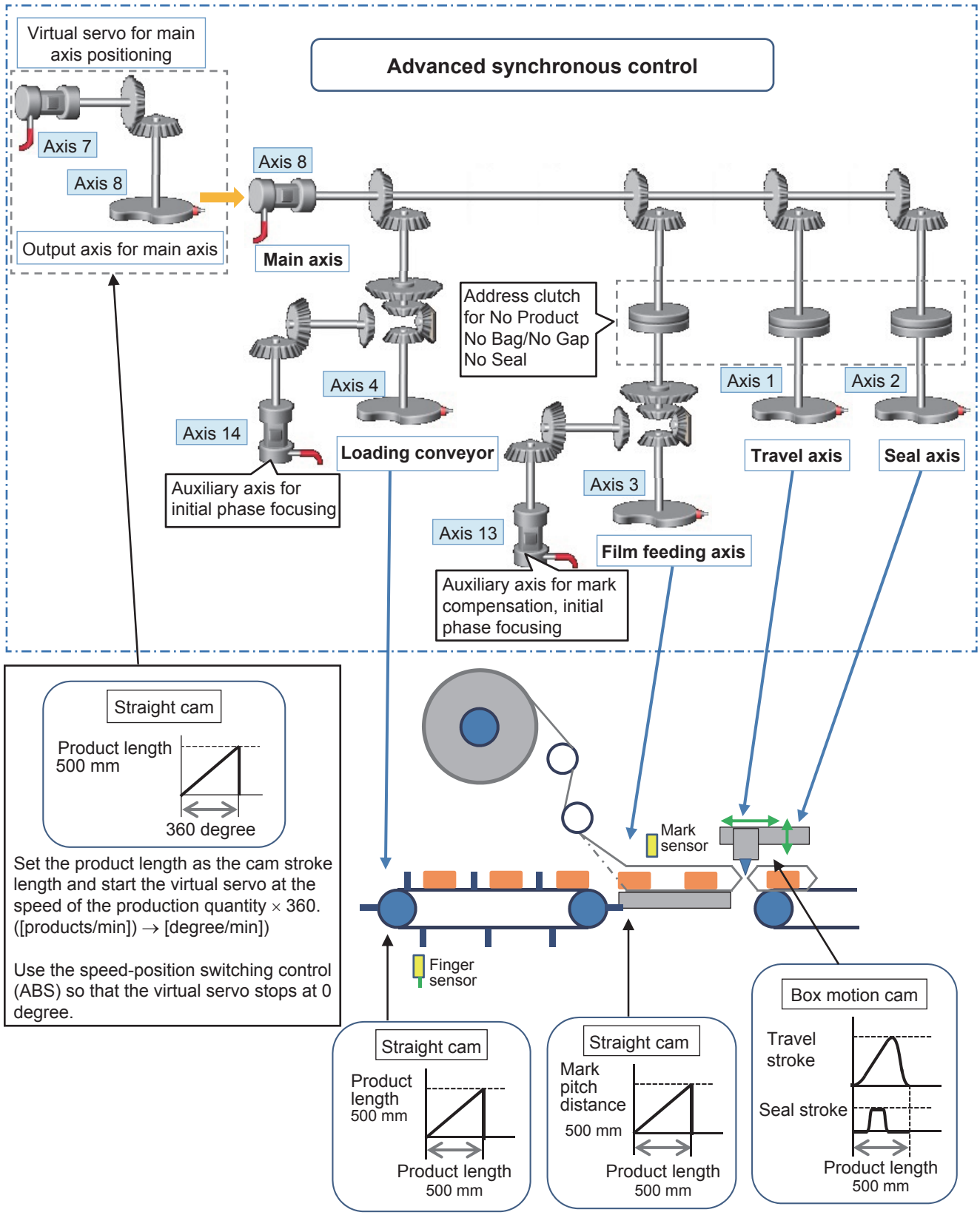
Set the parameters for safety measures depending on the intended use.

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
PD41: Function selection D-4 [MR-J4-GF]	Sensor input method selection 1: Input from controller

Synchronous control image

The synchronization control image set in the box motion program example is shown below.

■Synchronous control (whole image)



Program processing

Initial (Initial parameter setting)

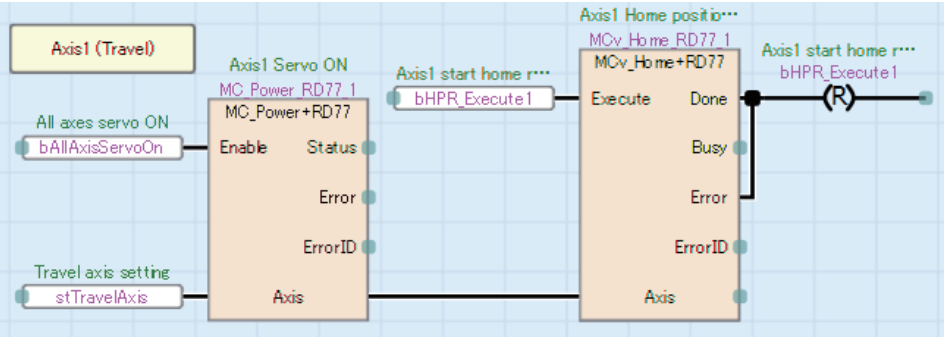
Set each variable's initial value and constants.

- Production information parameter
- Main axis control parameter
- Box motion cam generation parameter
- Film axis parameter
- Mark compensation parameter
- Conveyor axis parameter
- Rotary cutter cam generation parameter
- Cam monitor screen parameter

PreOperation

■Each axis servo ON, home position return

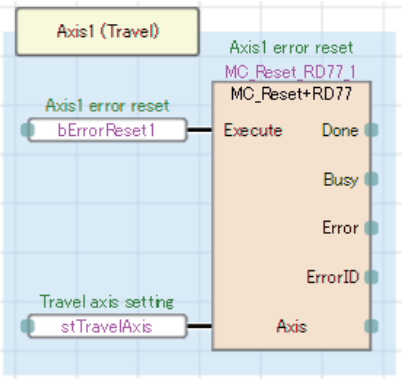
Perform servo ON and home position return with the switches in the servo axis setting screen displayed on the GOT.



Operation

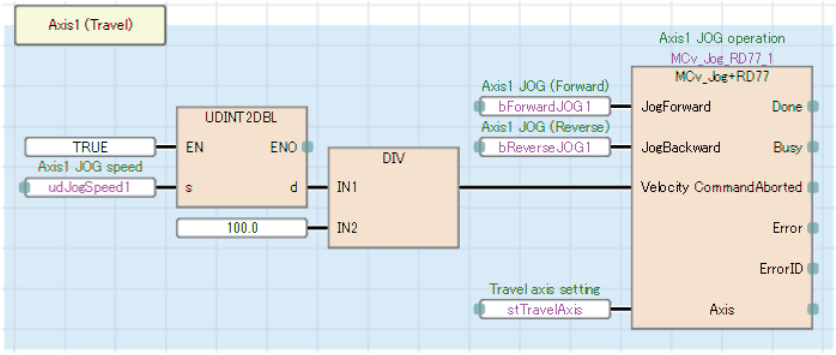
■Error reset processing

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



■JOG operation processing

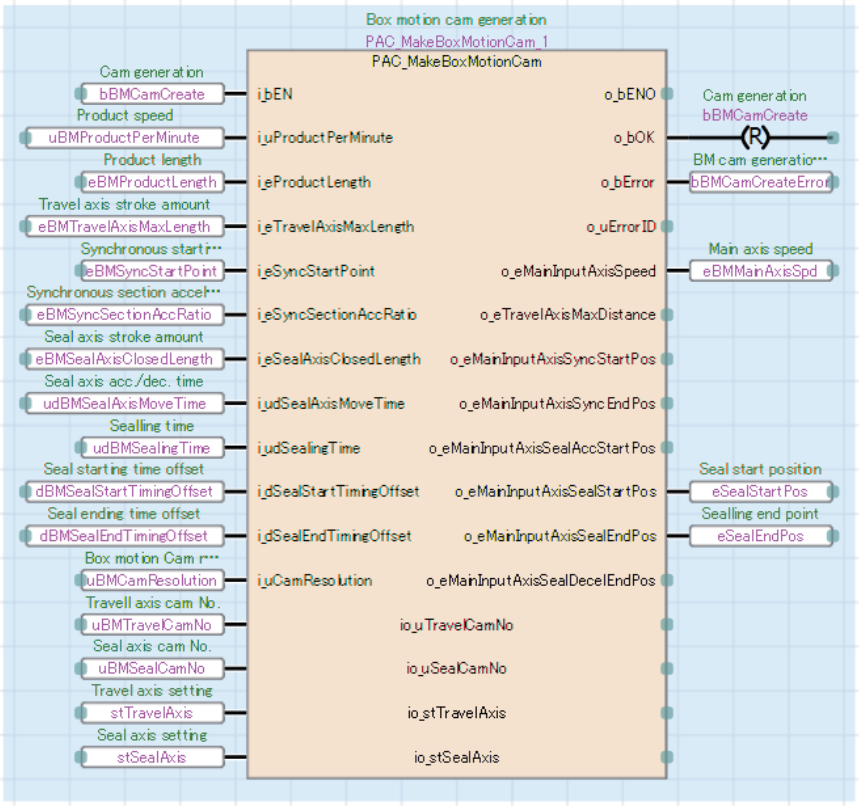
Specify the JOG speed and start JOG operation (forward/reverse) using the switches in the servo axis setting screen displayed on the GOT.



■Cam data generation

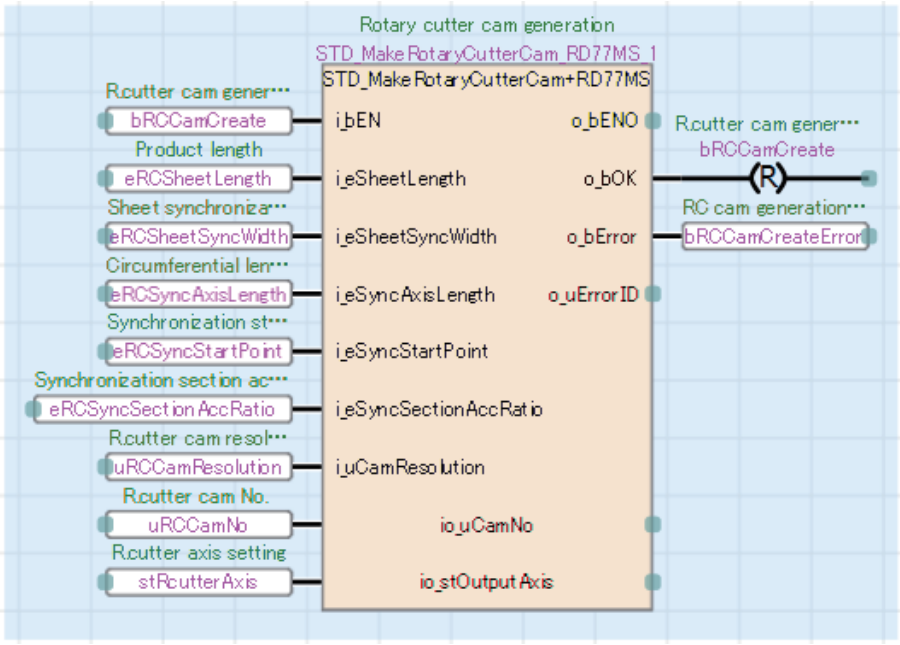
Cam data is generated according to the values set in the box motion screen and rotary cutter screen displayed on the GOT.

- Box motion

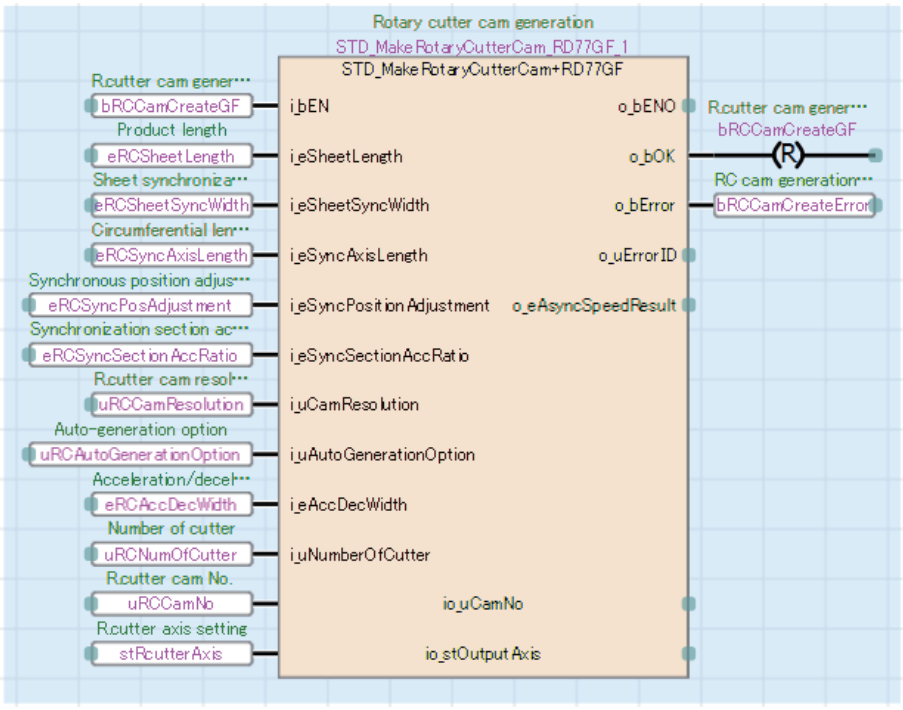


• Rotary cutter

AP20-PAC002AA-R16-77MS16_BoxMotion_****.gx3

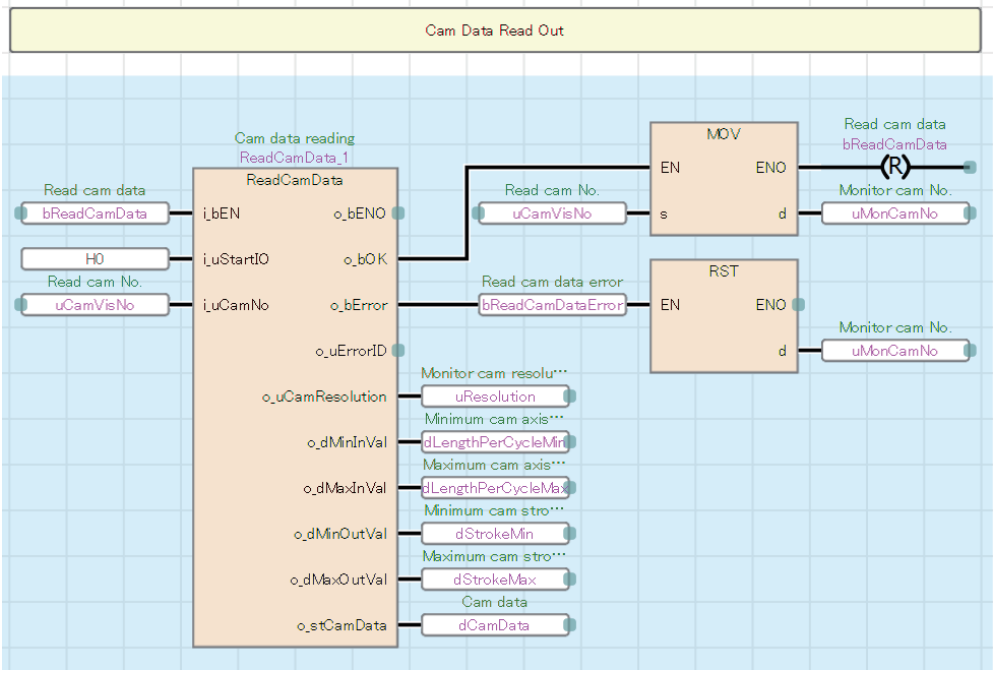


AP20-PAC002AA-R16-77GF16_BoxMotion_****.gx3



■Reading data for displaying cam data

Read the cam data of the box motion for the cam monitor screen displayed on the GOT.

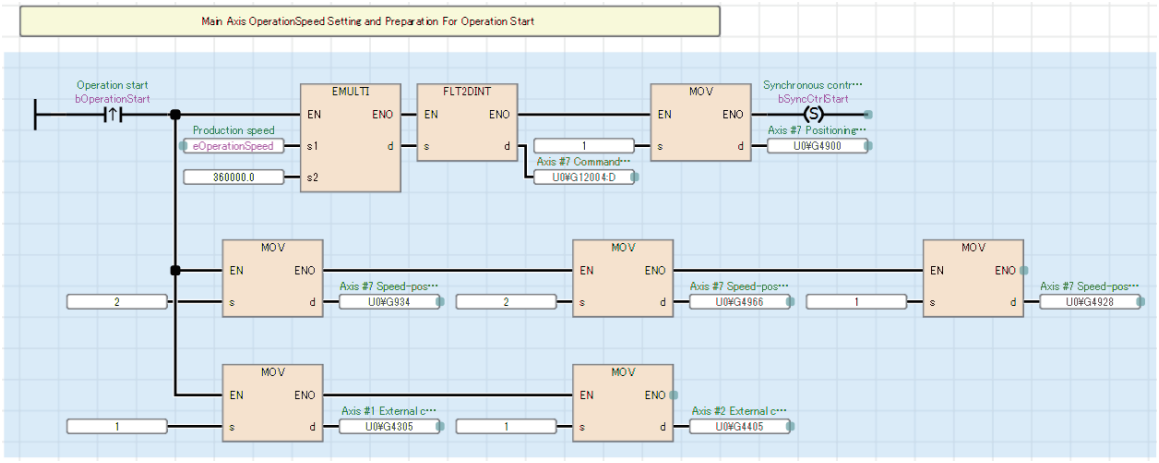


■Production start preparation

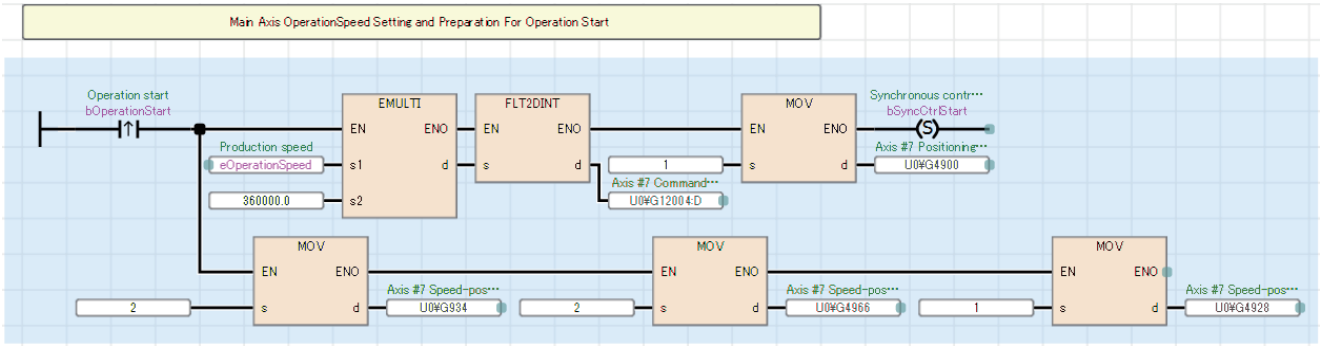
Set the command velocity of the virtual servo for main axis positioning and start positioning No. using the [Start] switch in the production screen displayed on the GOT.

Set the speed-position switching control.

• AP20-PAC002AA-R16-77MS16_BoxMotion_****.gx3



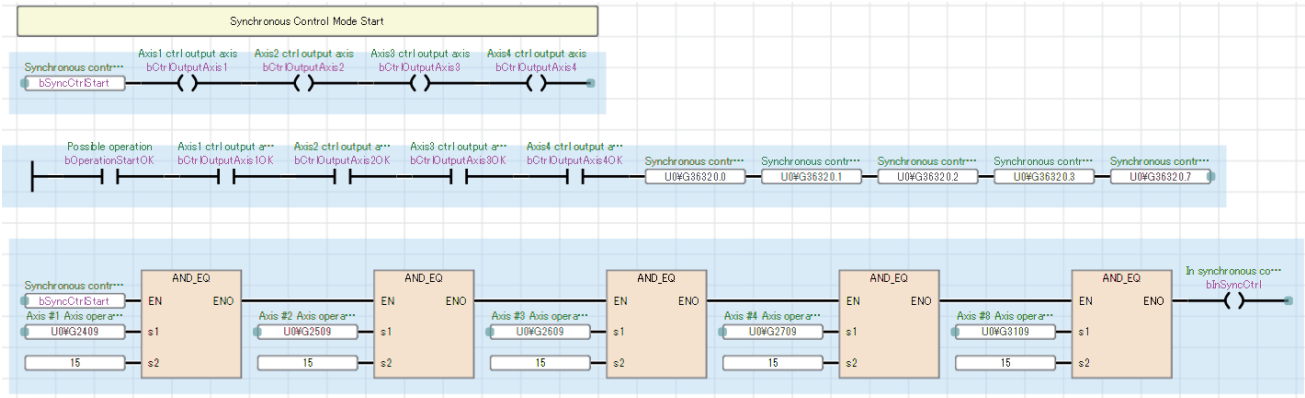
• AP20-PAC002AA-R16-77GF16_BoxMotion_****.gx3



■Synchronous control start

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

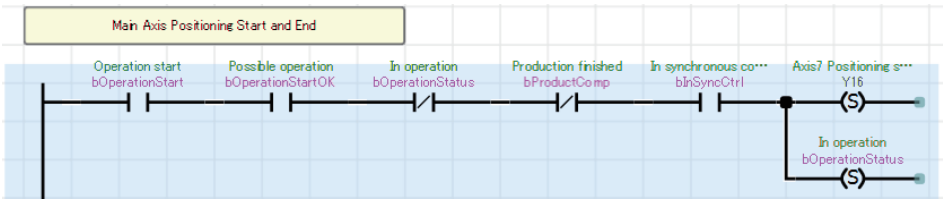
Start synchronous control of all axes once the output axis is prepared and monitors the process during synchronous control.



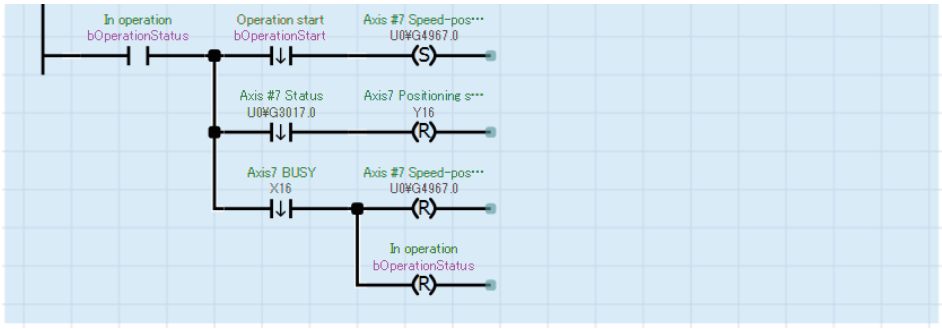
■Start of main axis

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

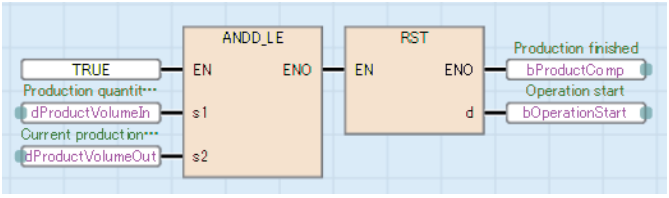
In operation lamp will be activated.



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

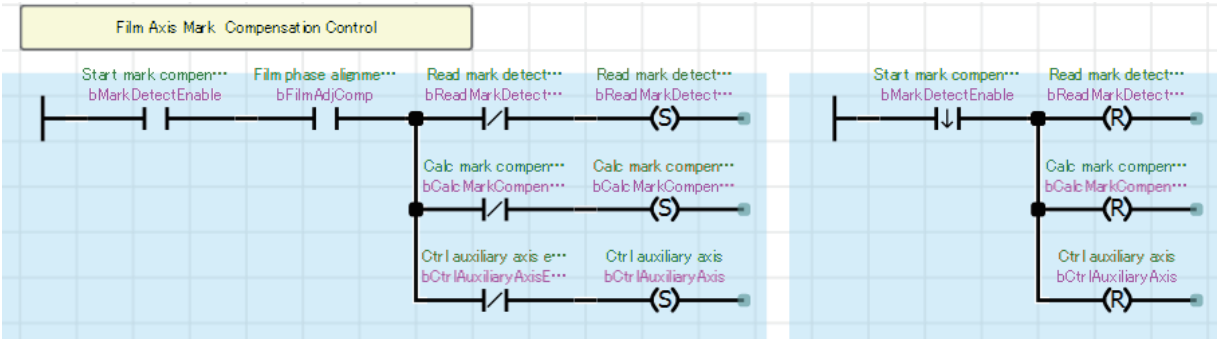


Operation stops when production ends.



■Start mark compensation

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

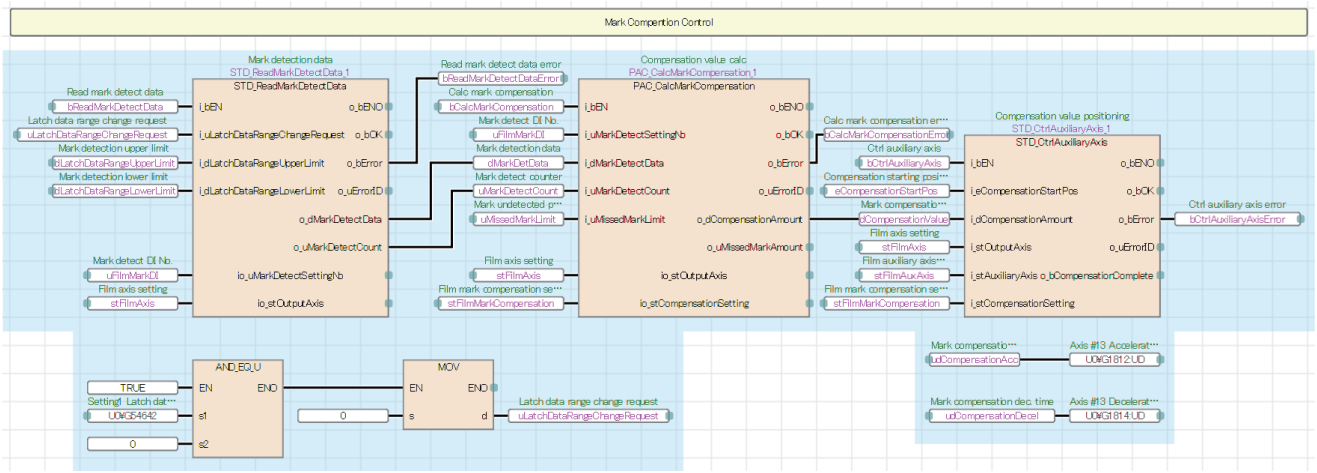


■Mark compensation

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.

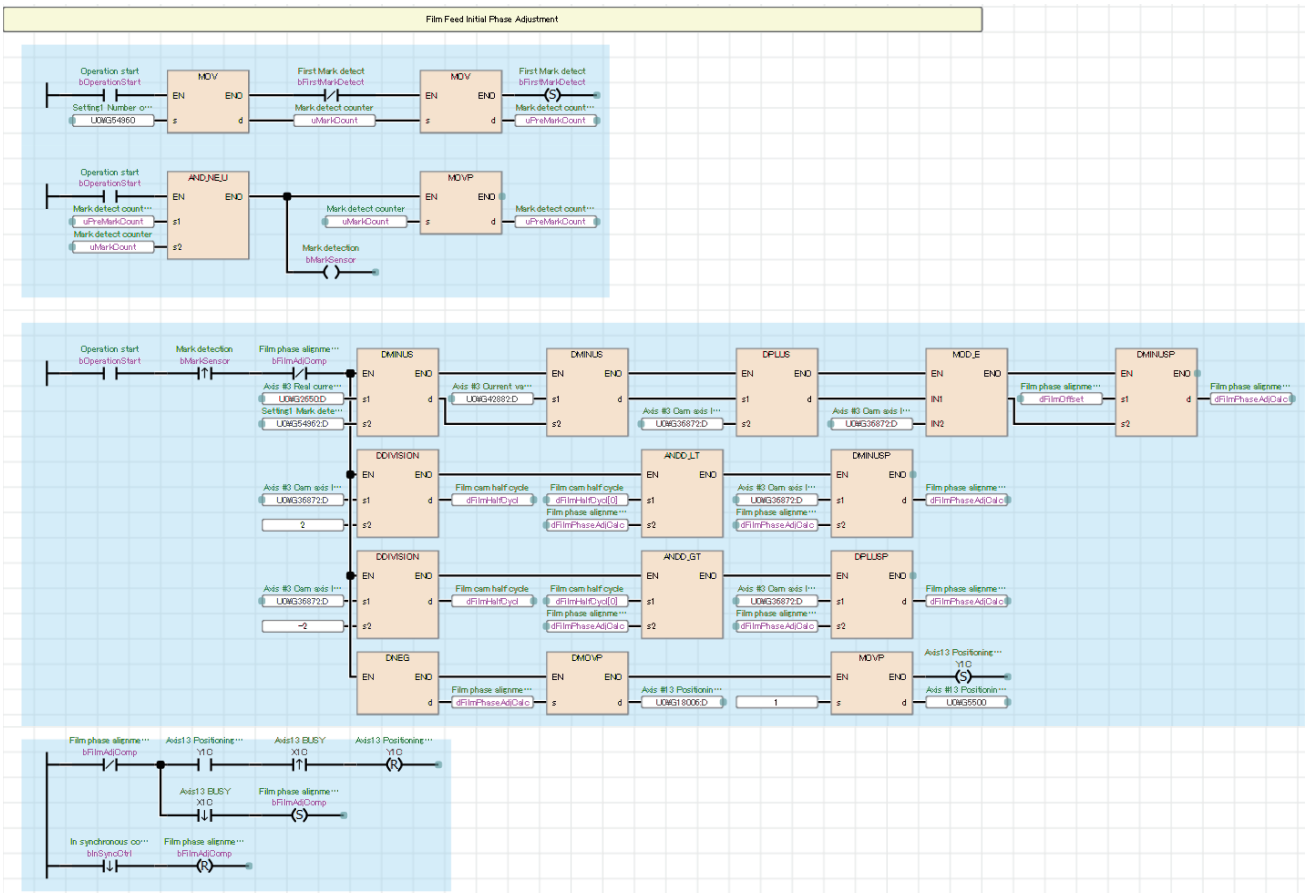
The acceleration and deceleration time of the auxiliary axis setting are stored in buffer memory.



■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.).

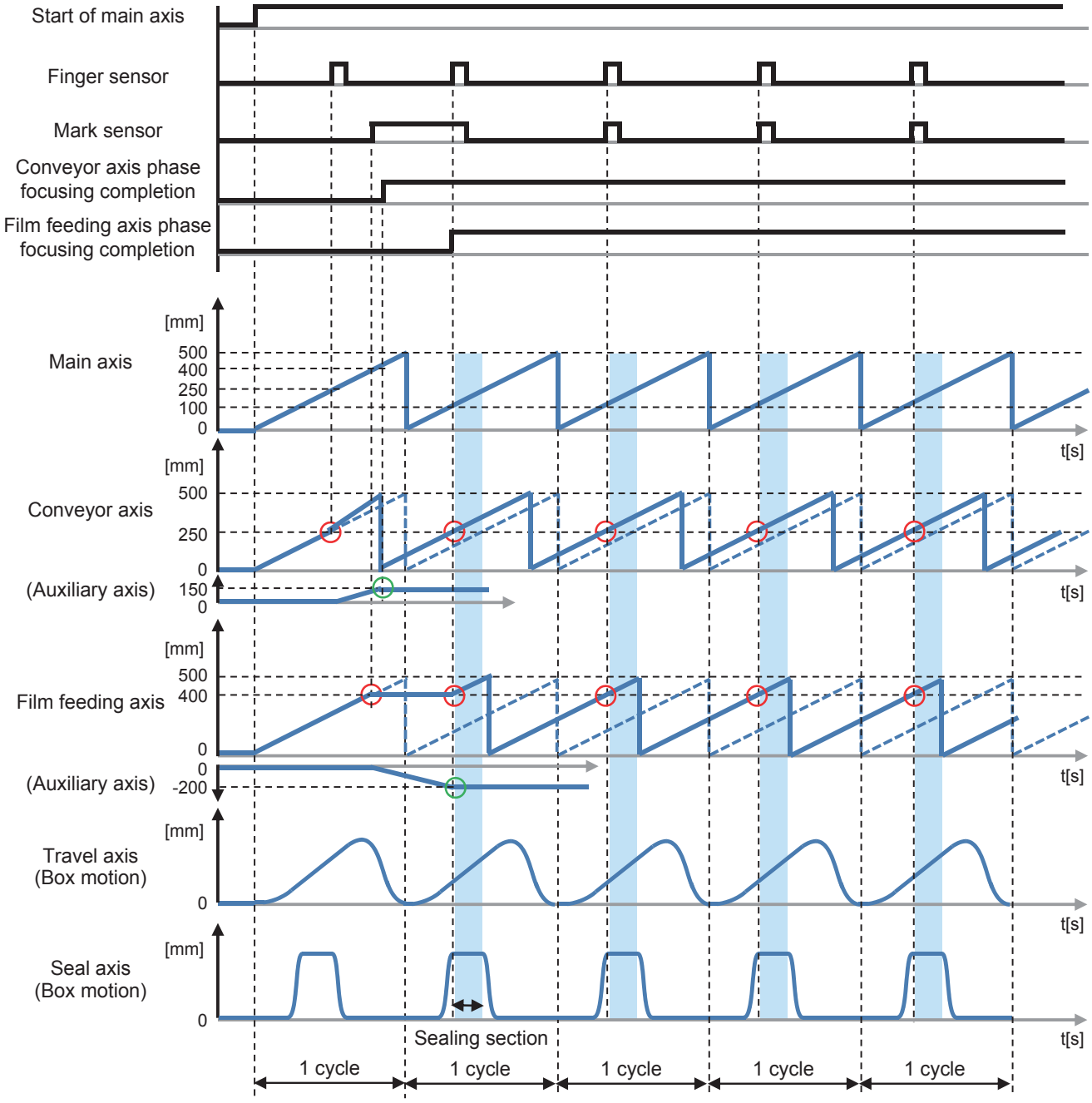
Run the travel axis and seal axis in the same phase as the main axis.



Timing for phase focusing

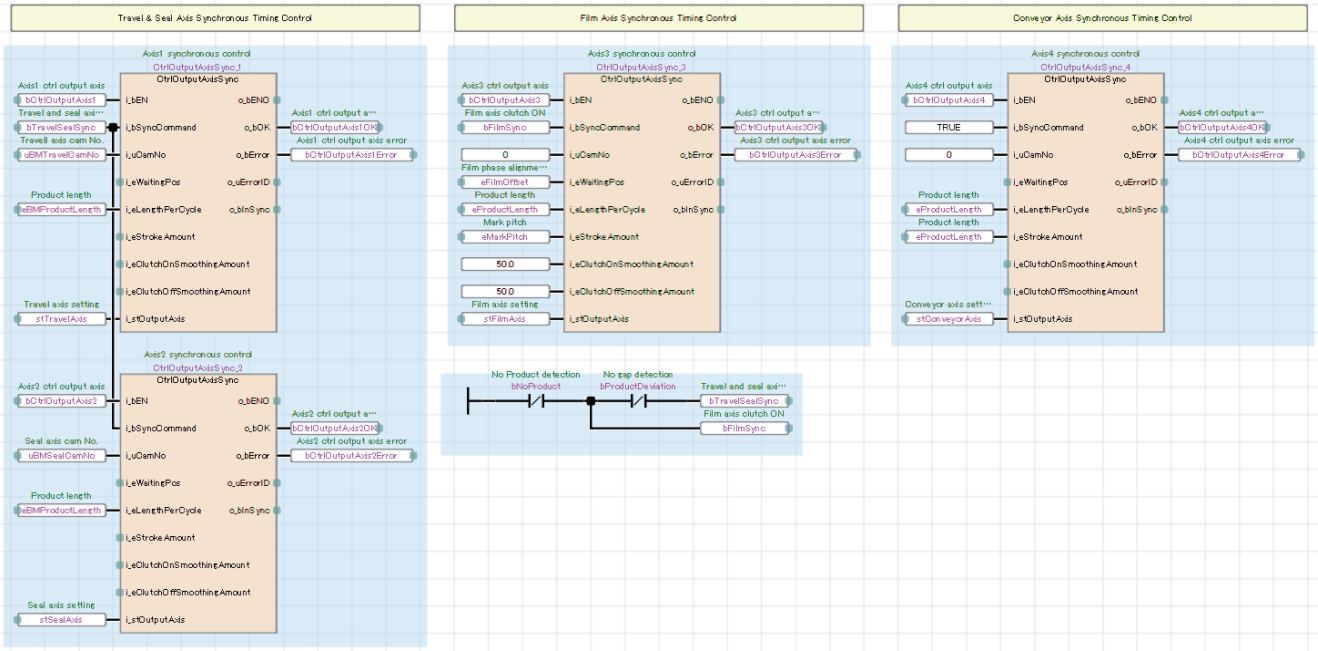
Adjust the phases of the conveyor and film feeding so that the finger point and film mark point on the conveyor match with the offset point (sealing starting point) of the main axis per cycle when the main axis is started.

- 1 cycle length (product length): 500 mm
- Offset point per cycle (sealing starting point): 100 mm
- Finger point: One cycle detection point at startup (conveyor) 250 mm → Compensation amount 250 mm - 100 mm = 150 mm
- Mark detection point: One cycle detection point at startup (film feeding) 400 mm → Compensation amount 400 mm - 100 mm = 300 mm → 300 mm - 500 mm = -200 mm

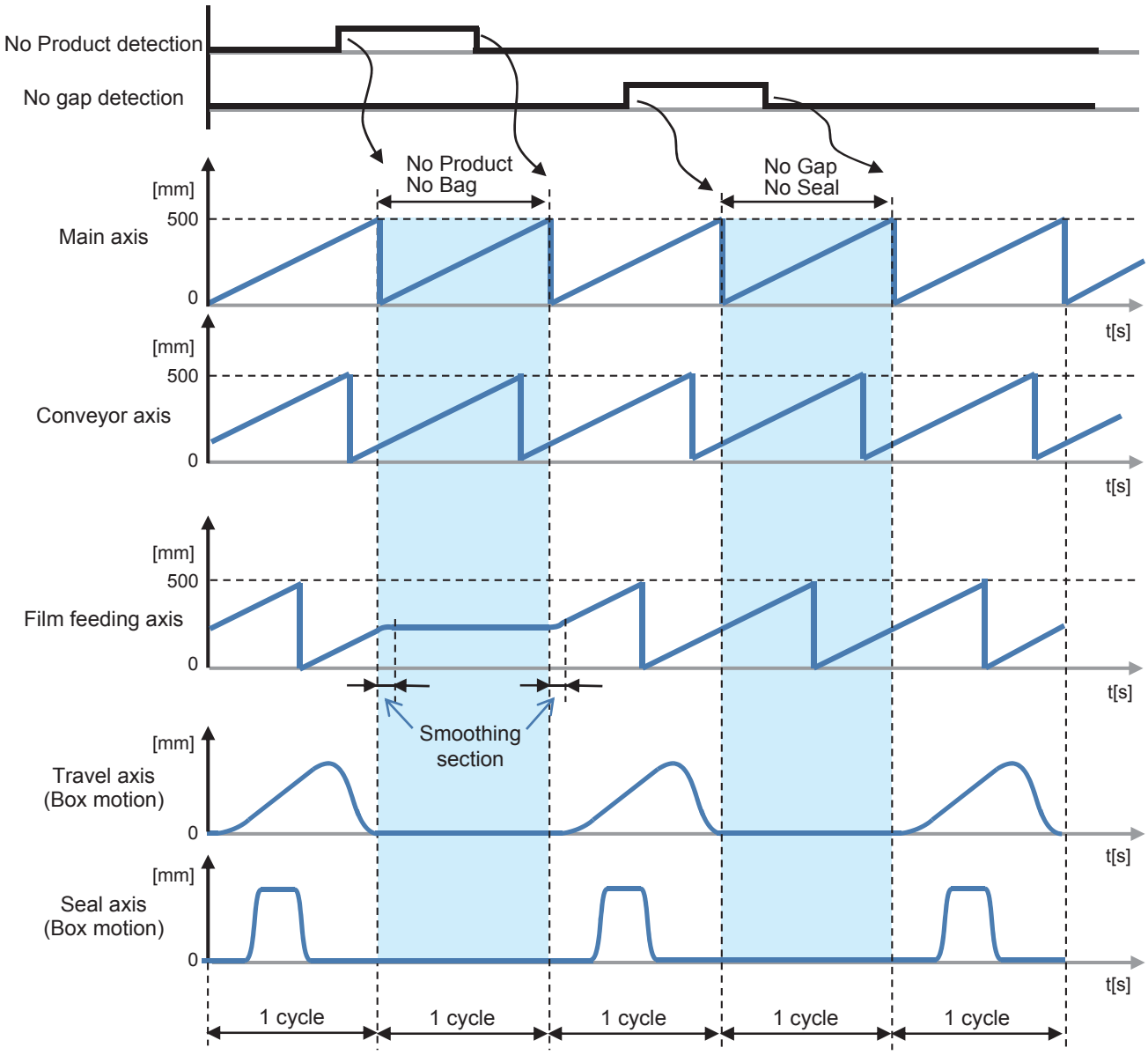


■No Product No Bag/No Gap No Seal processing

This processing turns off the clutches of the travel axis, seal 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 processing for displaying the GOT screen is performed.

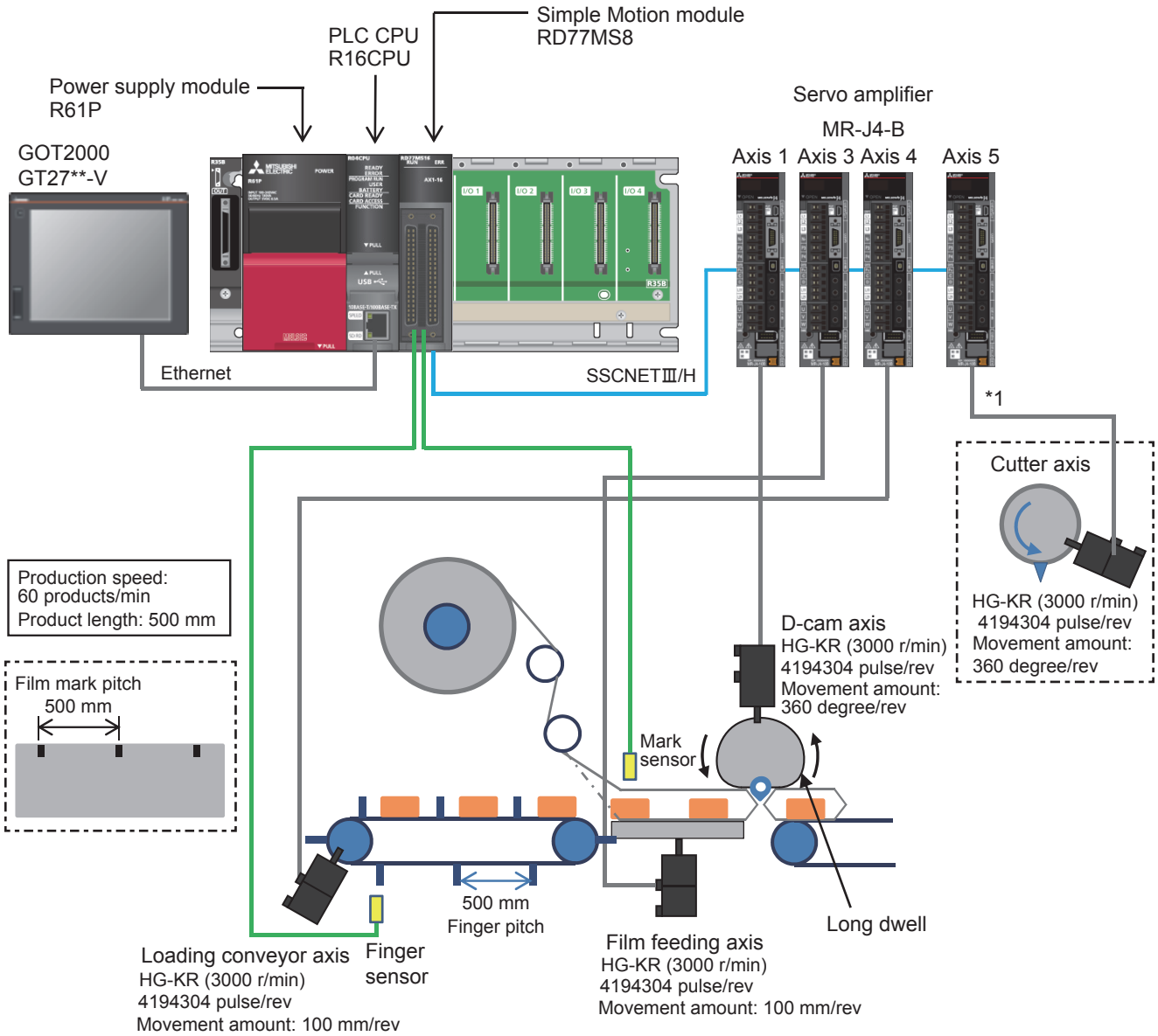
- Axis status monitor and lamp display
- Axis error reset processing
- FB error monitor
- FB error reset processing
- Production information setting and monitor

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.

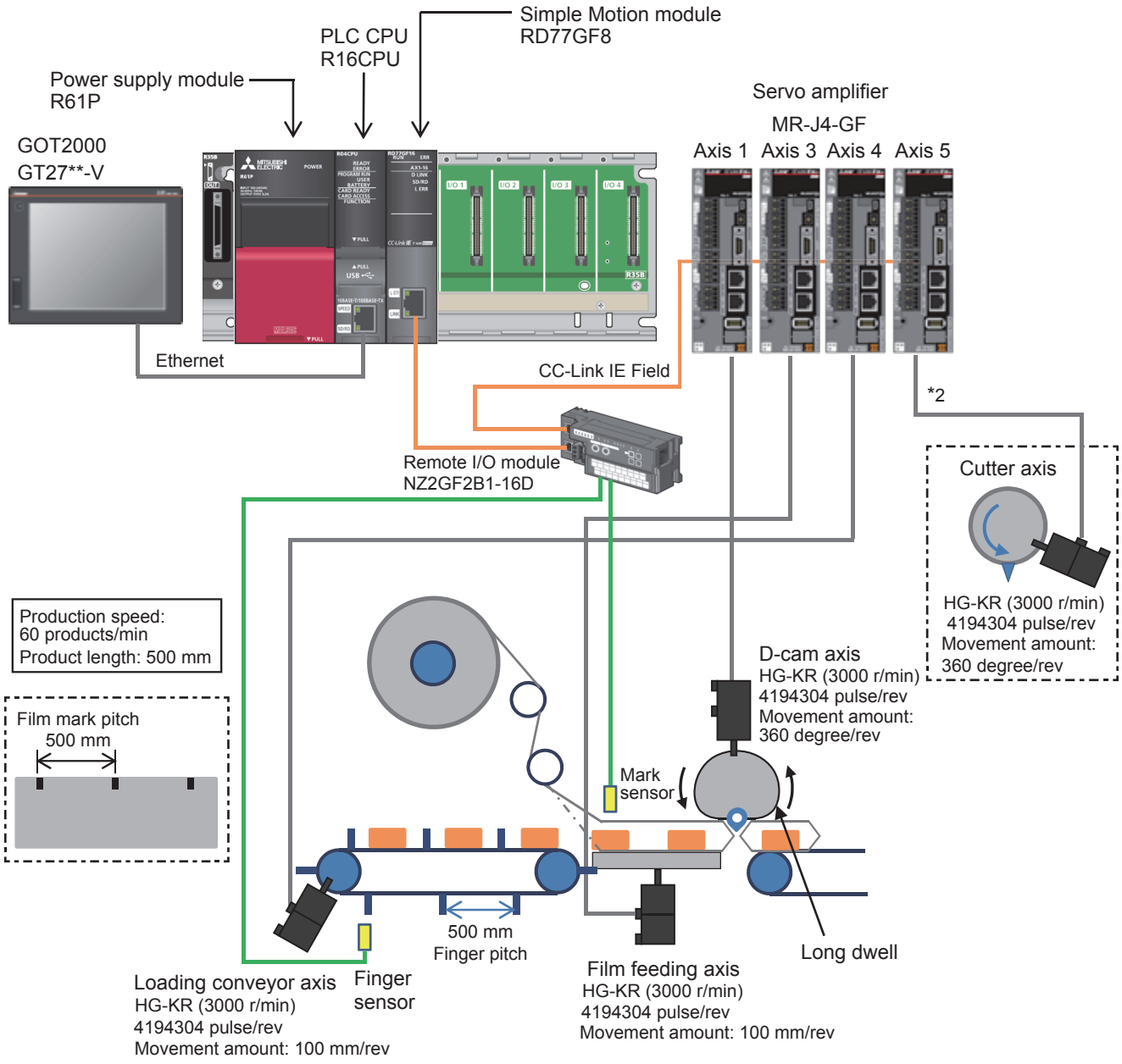
System configuration

- AP20-PAC002AA-R16-77MS8_LongDwell_****.gx3 (SSCNETⅢ/H)



*1 The end seal part has been configured with the long dwell. This application package also includes programs to generate cam patterns for using the rotary cutter.

• AP20-PAC002AA-R16-77GF8_LongDwell_****.gx3 (CC-Link IE Field Network)



*2 The end seal part has been configured with the long dwell. This application package also includes programs to generate cam patterns for using the rotary cutter.

Control specifications

Item	D-cam axis (Long dwell)	Film axis	Conveyor axis	Cutter axis (Rotary cutter)
Axis No.	1	3	4	5
Unit setting	2: degree	0: mm	0: mm	2: degree
Home position return	Data setting method	Data setting method	Data setting method	Data setting method
Auxiliary axis No.	—	7 (Virtual)	8 (Virtual)	—
Cam No.	1	0 (Straight line)	0 (Straight line)	3
Clutch	Address	Address	Address	Address

Item	Main axis 1	Main axis 2
Axis No.	2 (Virtual)	6 (Virtual)
Unit setting	2: degree	0: mm

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	• License activation • Preparing operation (Servo ON/OFF) • Home position return	Scan	FBD
Operation	• Reset error • JOG operation • Cam generation • Cam data reading • Synchronous control start • Operation start/stop	Scan	FBD
PackagingControl	• Mark compensation • Initial phase adjustment • No Product No Bag/No Gap No Seal	Event (I44)	FBD
HMI_IF	Touch panel I/O processing	Scan	ST

FB

The following table lists the FBs used in this program.

■PAC_PackagingControl_R

AP20-PAC002AA-R16-77MS8_LongDwell_****.gx3

Item	FB name	Description	Execution type*1	Program
Activation	PAC_Activation	License activation	Macro type	PreOperation
Cam auto-generation	STD_MakeRotaryCutterCam+RD77MS	Cam auto-generation for rotary cutter (front end reference)	Macro type	Operation
	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-R Programming Manual (Program Design)

AP20-PAC002AA-R16-77GF8_LongDwell_****.gx3

Item	FB name	Description	Execution type*1	Program
Activation	PAC_Activation	License activation	Macro type	PreOperation
Cam auto-generation	STD_MakeRotaryCutterCam+RD77GF	Cam auto-generation for rotary cutter (central reference)	Macro type	Operation
	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-R Programming Manual (Program Design)

■PLCopen Motion Control

PLCopen Motion Control FB library can be downloaded from the Mitsubishi Electric FA site.

FB name	Description	Execution type*1	Program
MC_Power+RD77	Operation possible (PLCopen Motion Control FB)	Macro type	PreOperation
MCv_Home+RD77	Home position return (PLCopen Motion Control FB)	Macro type	PreOperation
MC_Reset+RD77	Axis error reset (PLCopen Motion Control FB)	Macro type	Operation
MCv_Jog+RD77	JOG operation (PLCopen Motion Control FB)	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-R Programming Manual (Program Design)

■Example Prg Control (Application program control)

FB name	Description	Execution type*1	Program
CtrlOutputAxisSync	Output axis synchronization control	Macro type	PackagingControl
ReadCamData	Cam data reading	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-R Programming Manual (Program Design)

Devices to be used

AP20-PAC002AA-R16-77GF8_LongDwell_****.gx3

In this program example, a link device is used for the interface between the PLC CPU and remote I/O module (NZ2GF2B1-16D). The device range is shown below.

Item	Symbol	Point	Range
Link relay	B	16	0 to F

Parameter

Refer to the project for parameter setting details.

System parameter

For system parameter setting details, refer to the following.

☞ Page 198 List of Error Codes

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.82] Forced stop valid/invalid selection	Disabled
"[Pr.116] FLS signal selection" input type	Disabled
"[Pr.117] RLS signal selection" input type	Disabled
"[Pr.118] DOG signal selection" input type	Disabled
"[Pr.119] STOP signal selection" input type	Disabled

Servo parameter

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

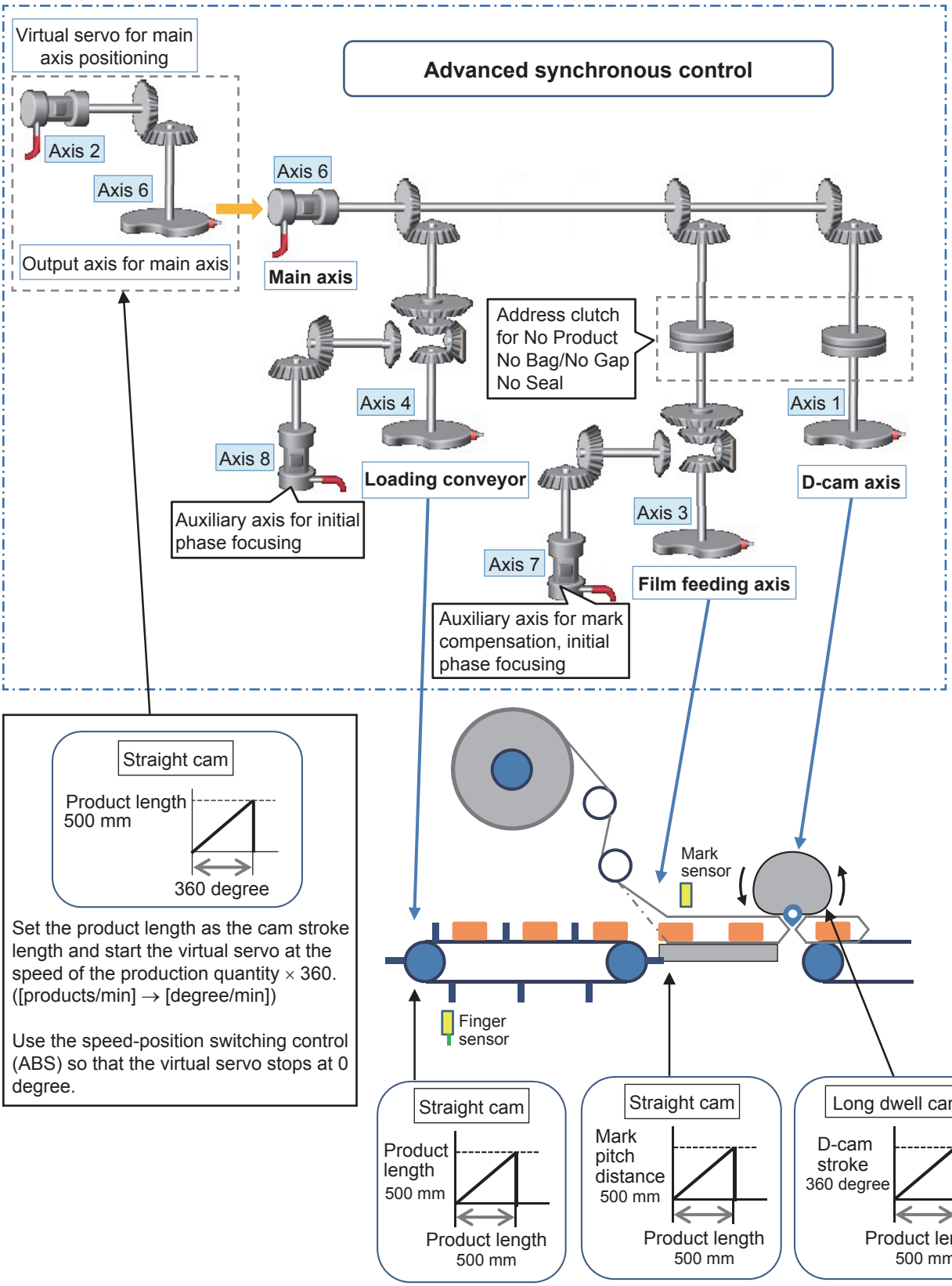
Set the parameters for safety measures depending on the intended use.

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
PD41: Function selection D-4 [MR-J4-GF]	Sensor input method selection 1: Input from controller

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)

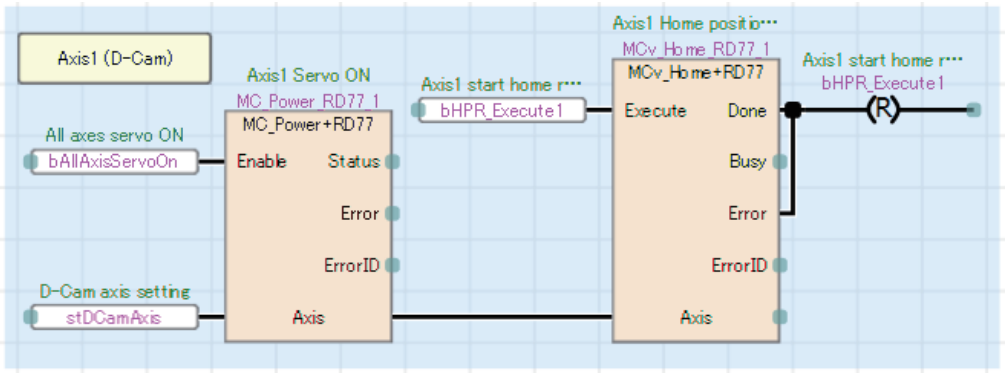
Set each variable's initial value and constants.

- Production information parameter
- Main axis control parameter
- Long dwell D-cam generation parameter
- Film axis parameter
- Mark compensation parameter
- Conveyor axis parameter
- Rotary cutter cam generation parameter
- Cam monitor screen parameter

PreOperation

■Each axis servo ON, home position return

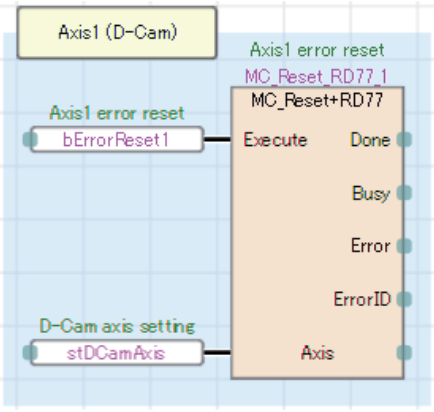
Perform servo ON and home position return with the switches in the servo axis setting screen displayed on the GOT.



Operation

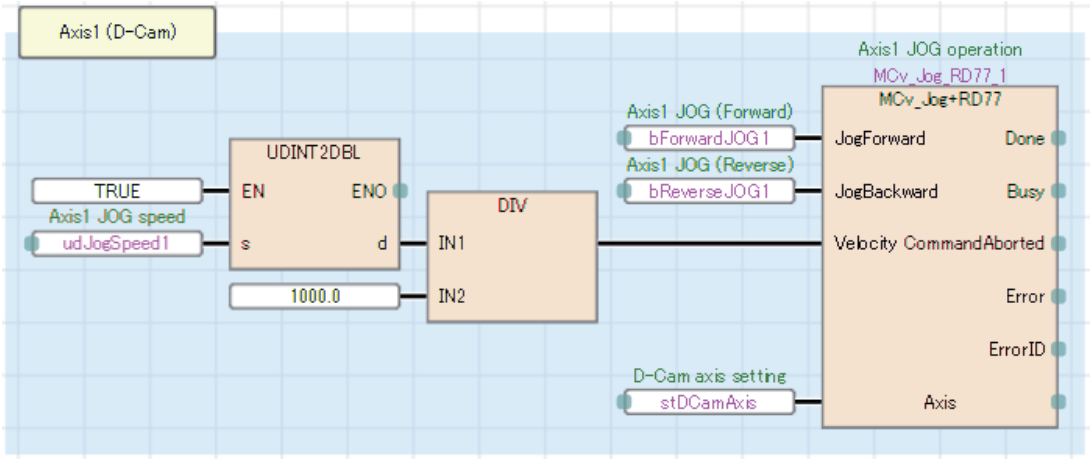
■Error reset processing

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



■JOG operation processing

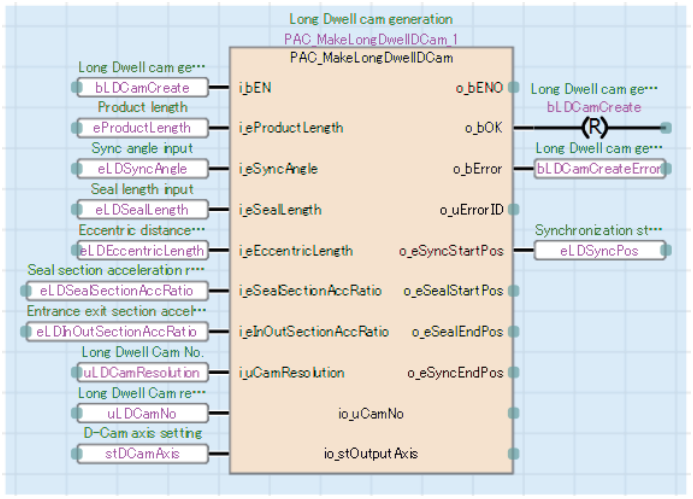
Specify the JOG speed and start JOG operation (forward/reverse) using the switches in the servo axis setting screen displayed on the GOT.



■Cam data generation

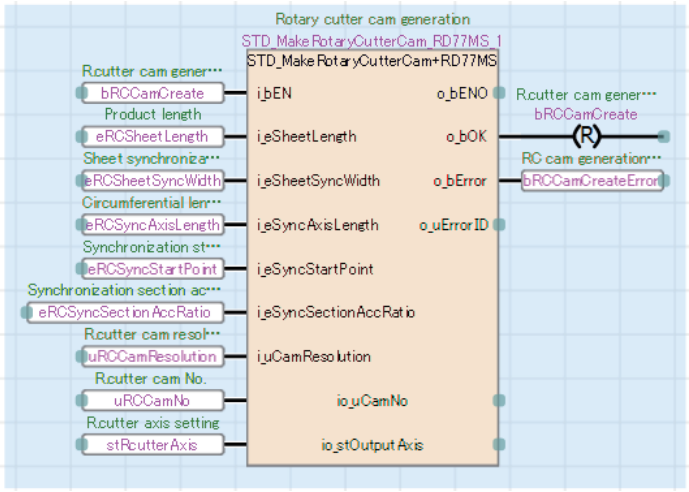
Cam data is generated according to the values set in the long dwell and rotary cutter screen displayed on the GOT.

- Long dwell

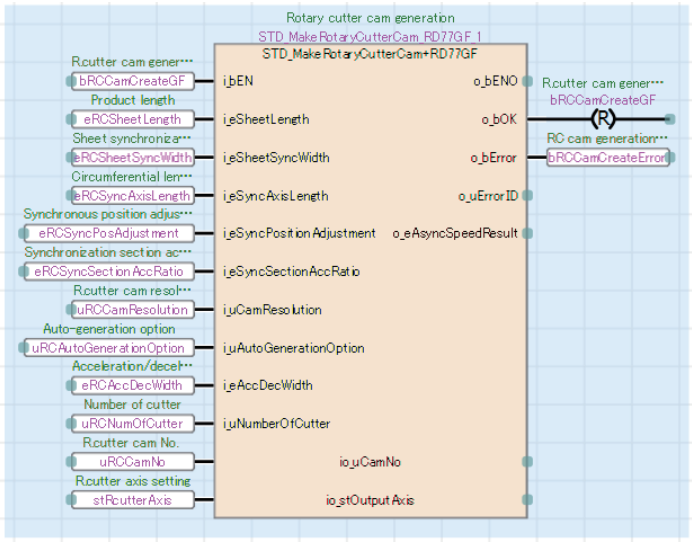


• Rotary cutter

AP20-PAC002AA-R16-77MS8_LongDwell_****.gx3

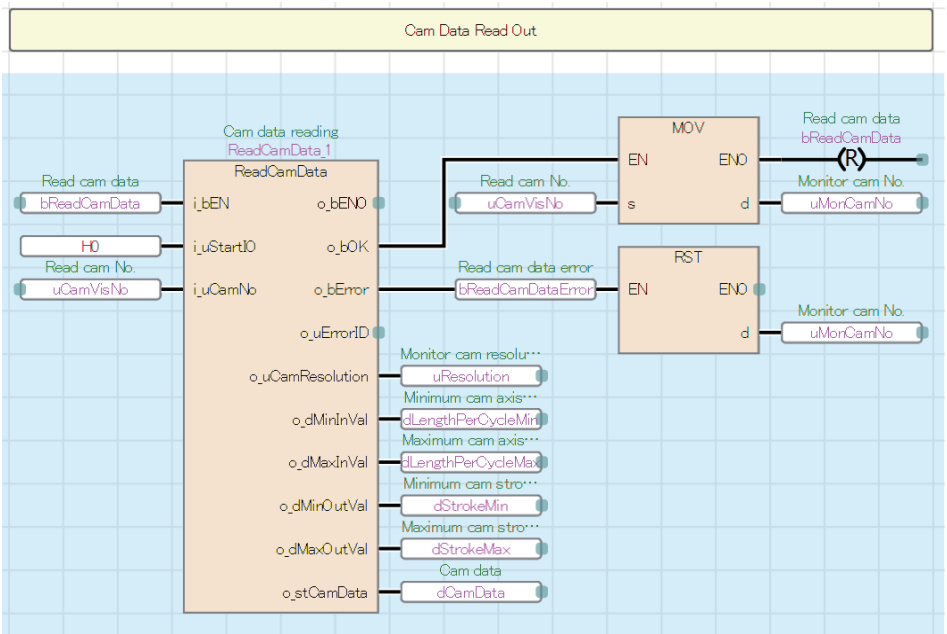


AP20-PAC002AA-R16-77GF8_LongDwell_****.gx3



■Reading data for displaying cam data

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

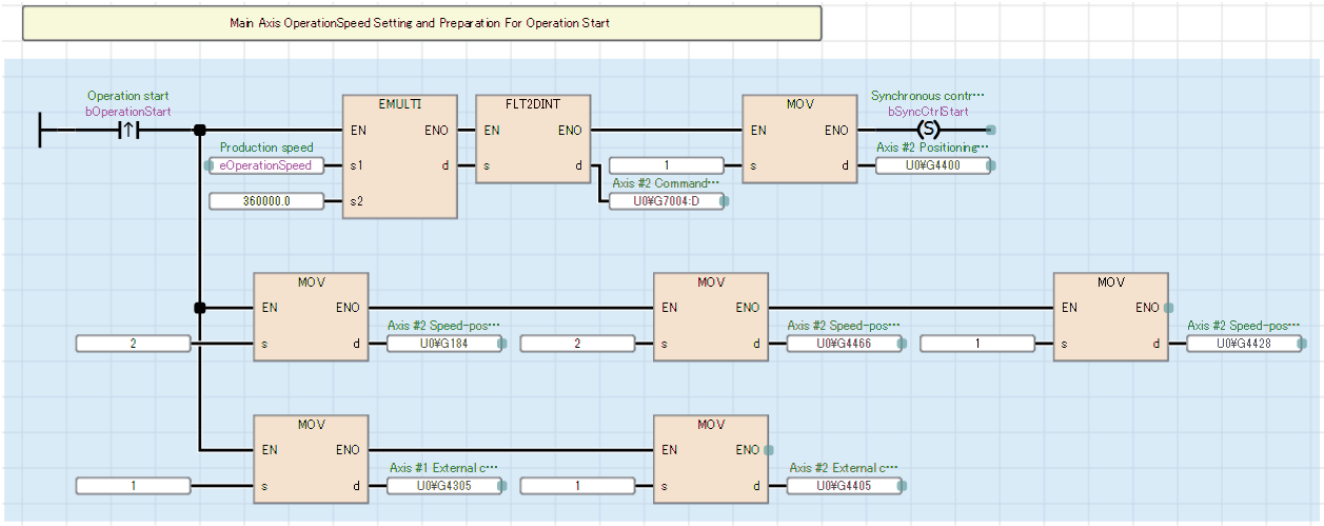


■Production start preparation

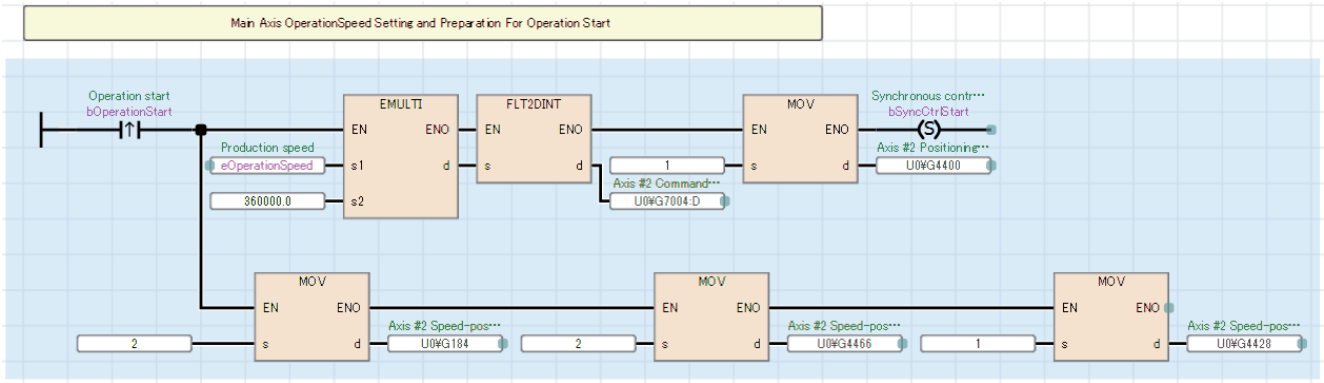
Set the command velocity of the virtual servo for main axis positioning and start positioning No. using the [Start] switch in the production screen displayed on the GOT.

Set the speed-position switching control.

• AP20-PAC002AA-R16-77MS8_LongDwell_****.gx3



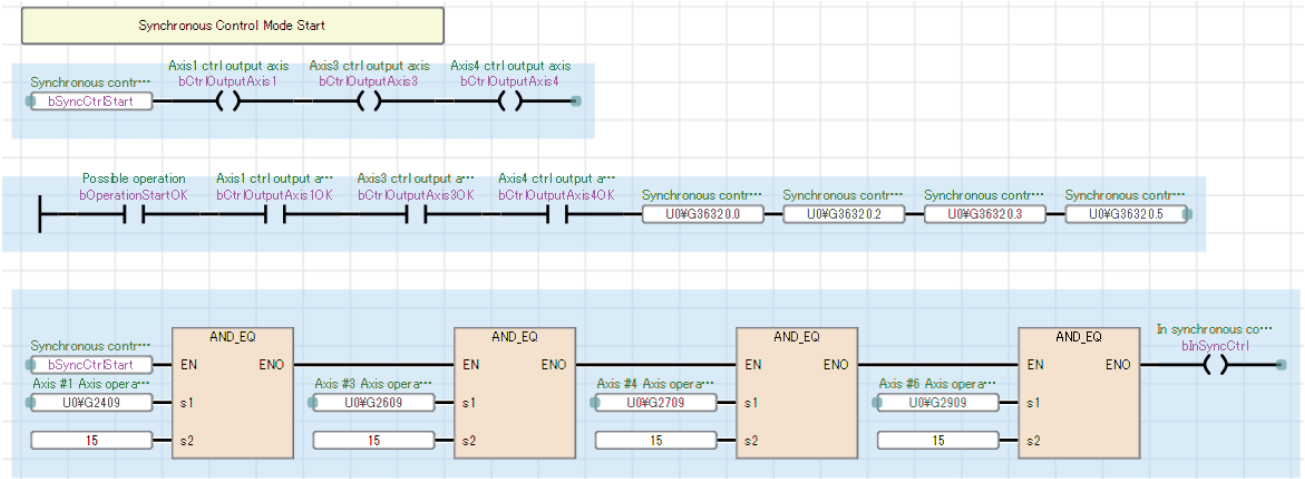
• AP20-PAC002AA-R16-77GF8_LongDwell_****.gx3



■Synchronous control start

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

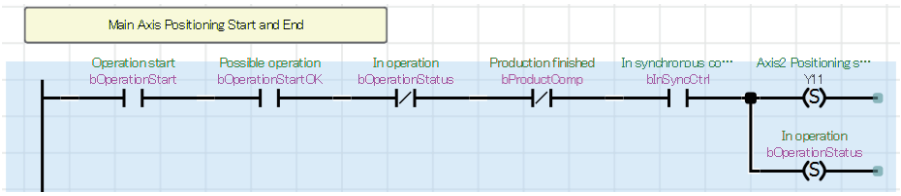
Start synchronous control of all axes once the output axis is prepared and monitors the process during synchronous control.



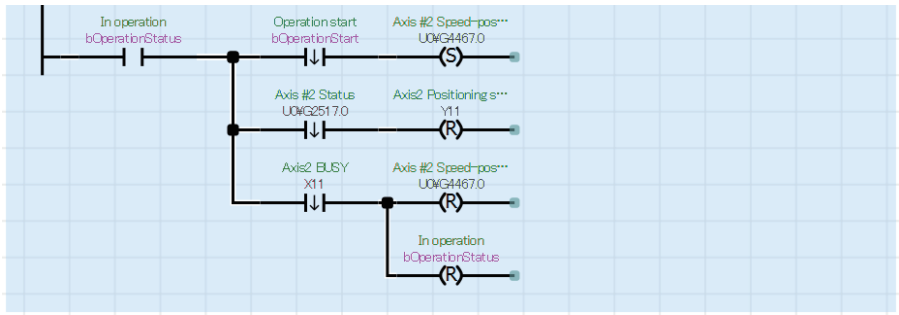
■Start of main axis

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

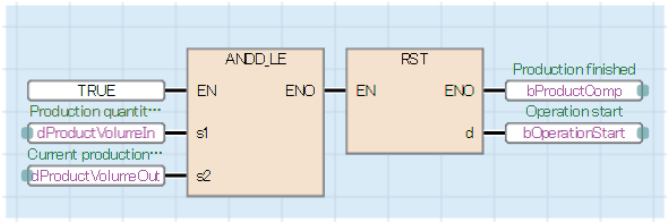
In operation lamp will be activated.



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

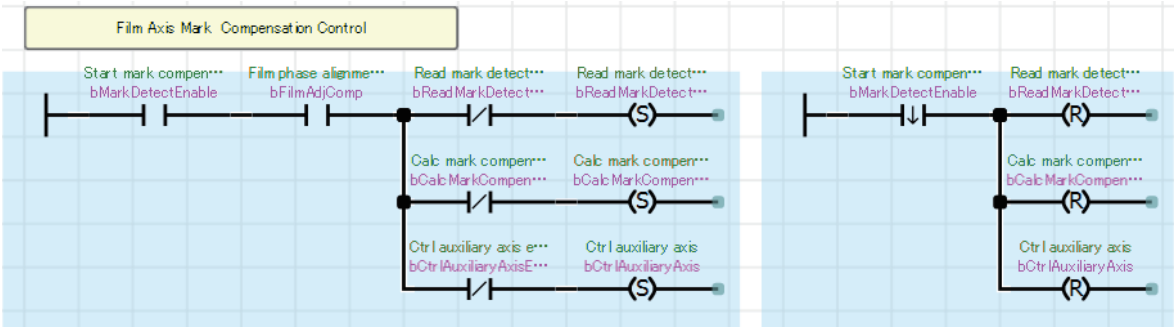


Operation stops when production ends.



■Start mark compensation

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



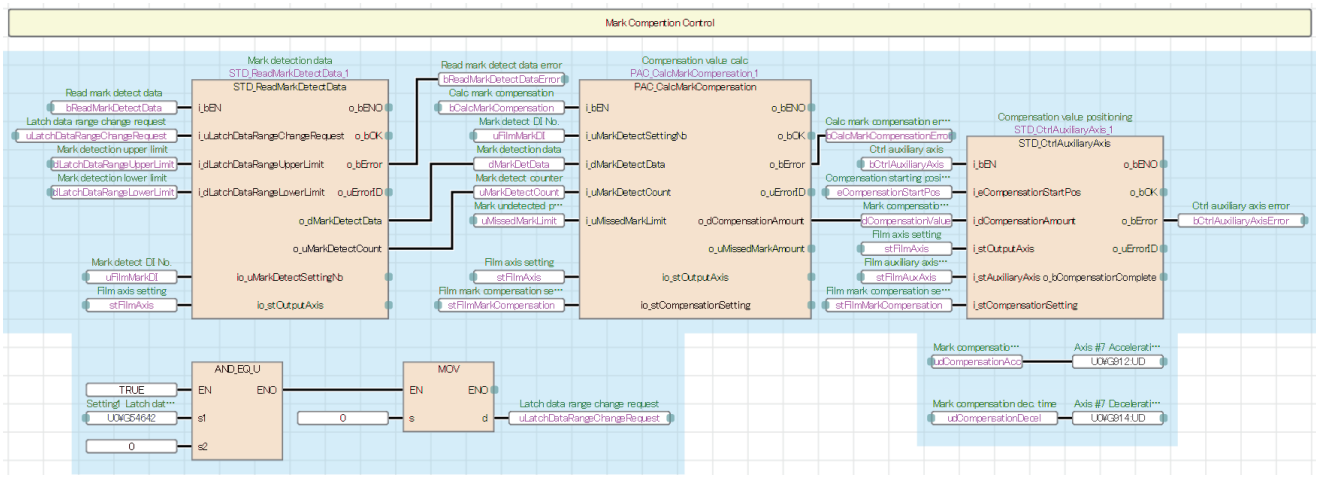
PackagingControl

■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.

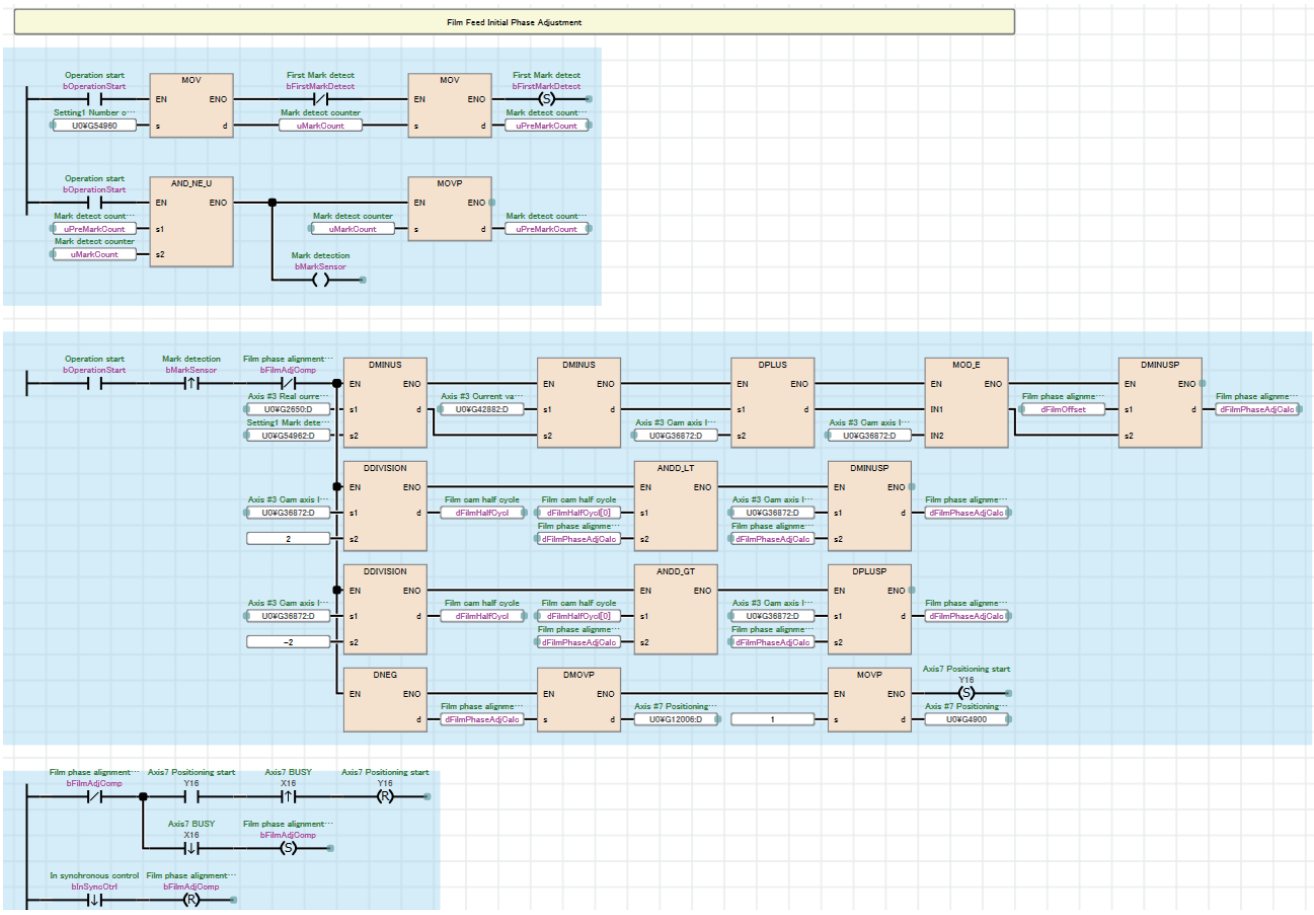
The acceleration and deceleration time of the auxiliary axis setting are stored in buffer memory.



■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.)

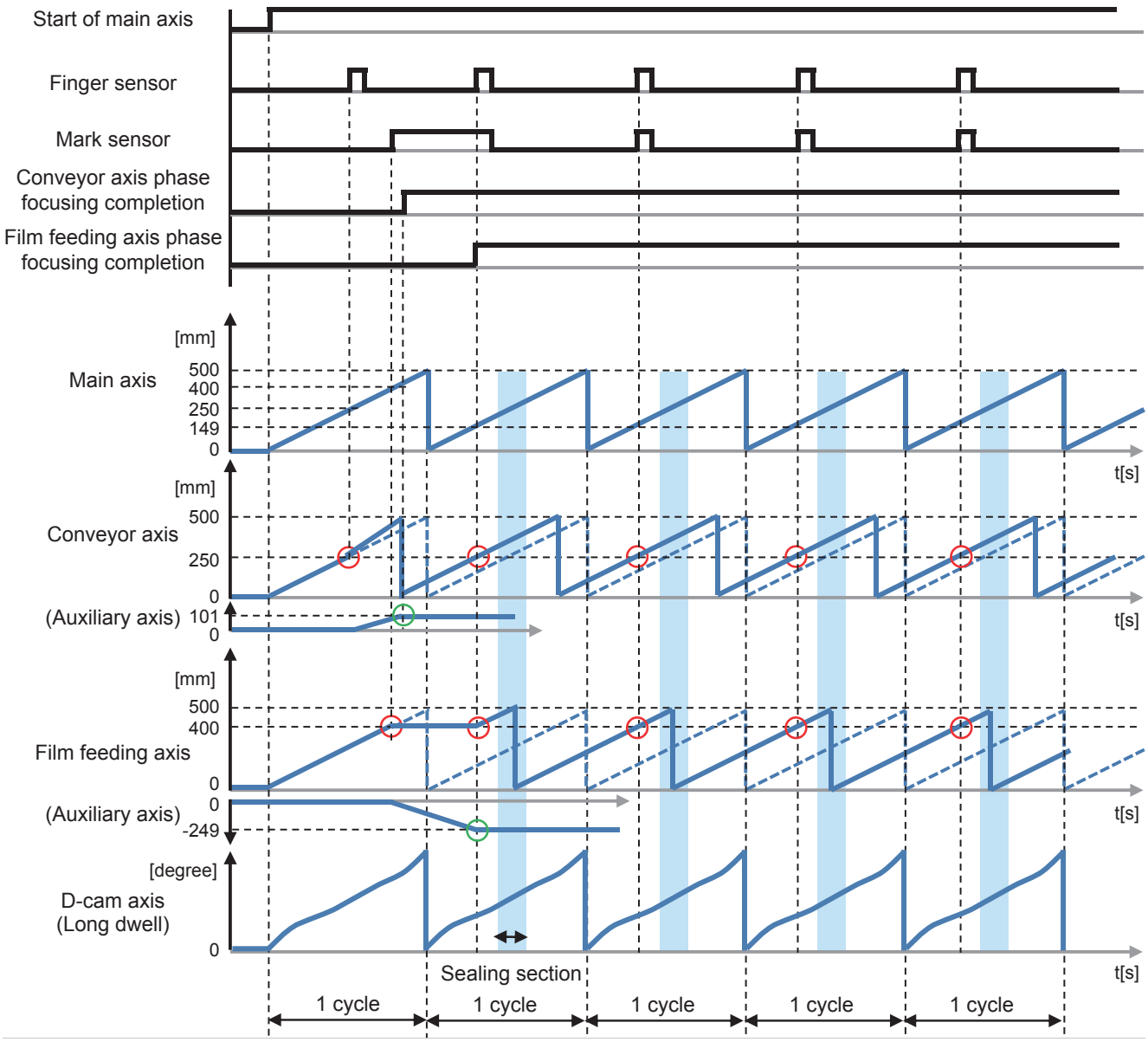
Run the D-cam axis in the same phase as the main axis.



Timing for phase focusing

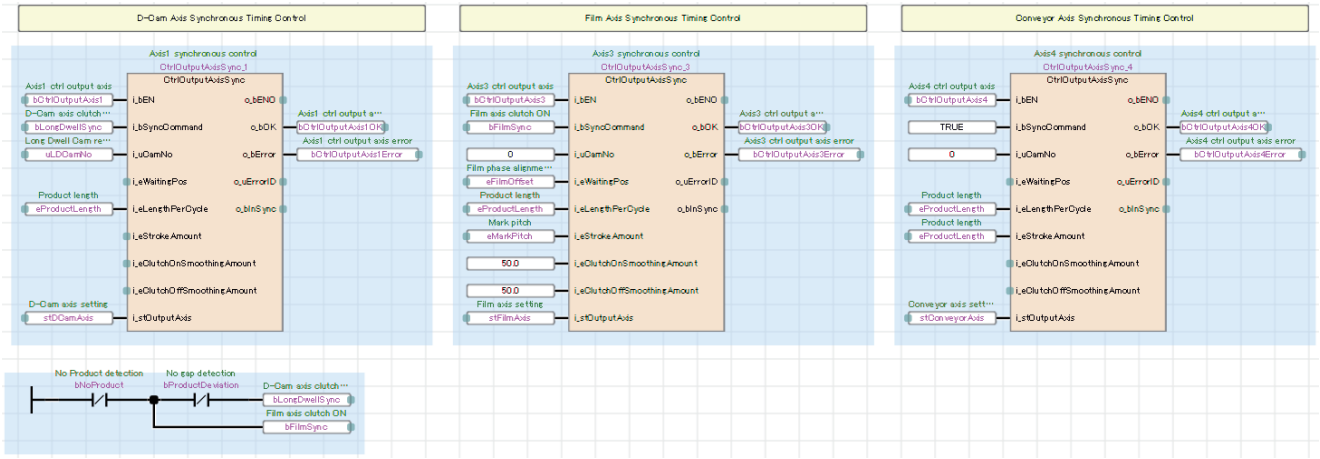
Adjust the phases of the conveyor and film feeding so that the finger point and film mark point on the conveyor match with the offset point (synchronization starting point) of the main axis per cycle when the main axis is started.

- 1 cycle length (product length): 500 mm
- Offset point per cycle (synchronization starting point): 149mm
- Finger point: One cycle detection point at startup (conveyor) 250 mm → Compensation amount 250 mm - 149mm = 101mm
- Mark detection point: One cycle detection point at startup (film feeding) 400 mm → Compensation amount 400 mm - 149mm = 251mm → 251mm - 500 mm = -249mm

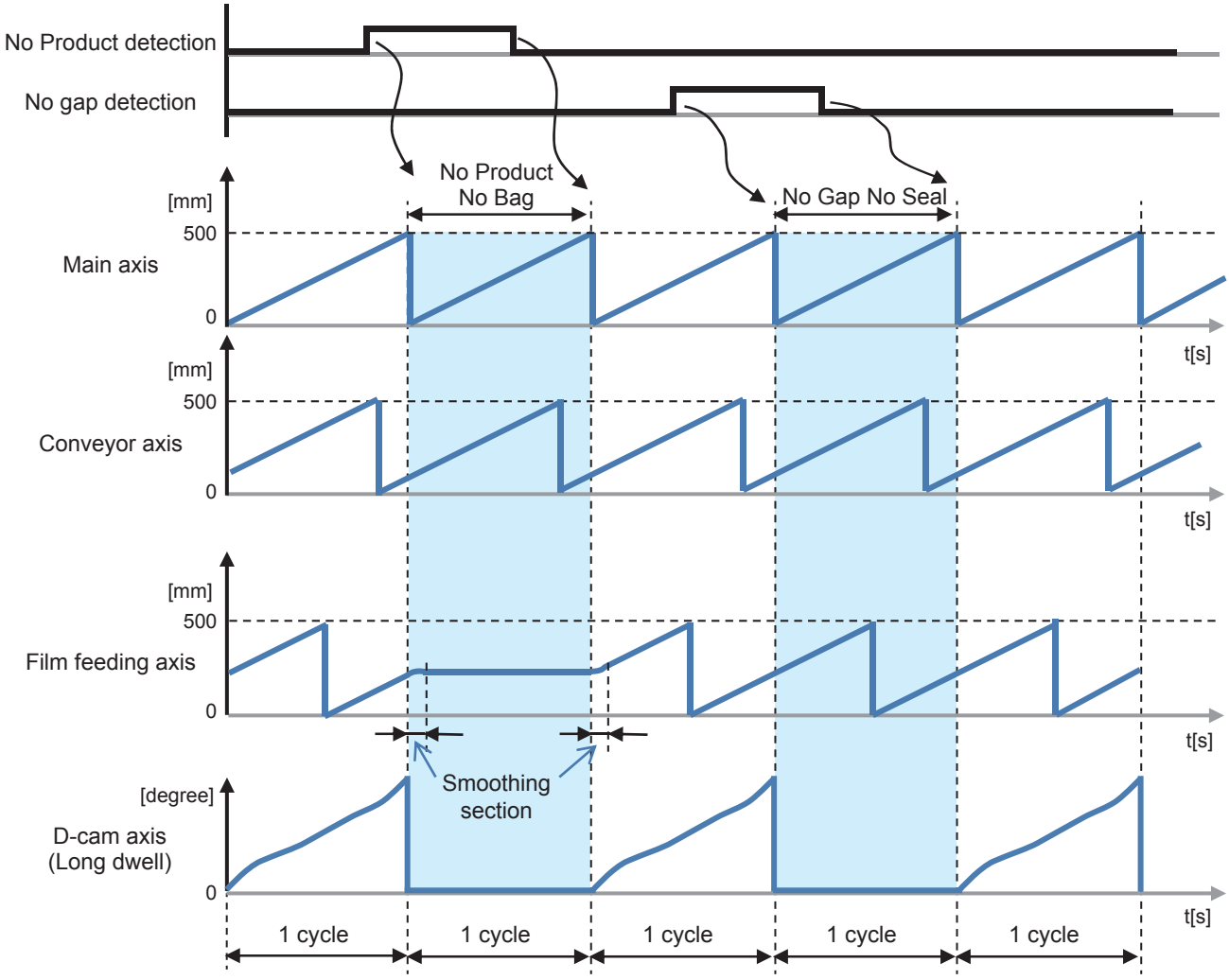


■No Product No Bag/No Gap No Seal processing

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 processing for displaying the GOT screen is performed.

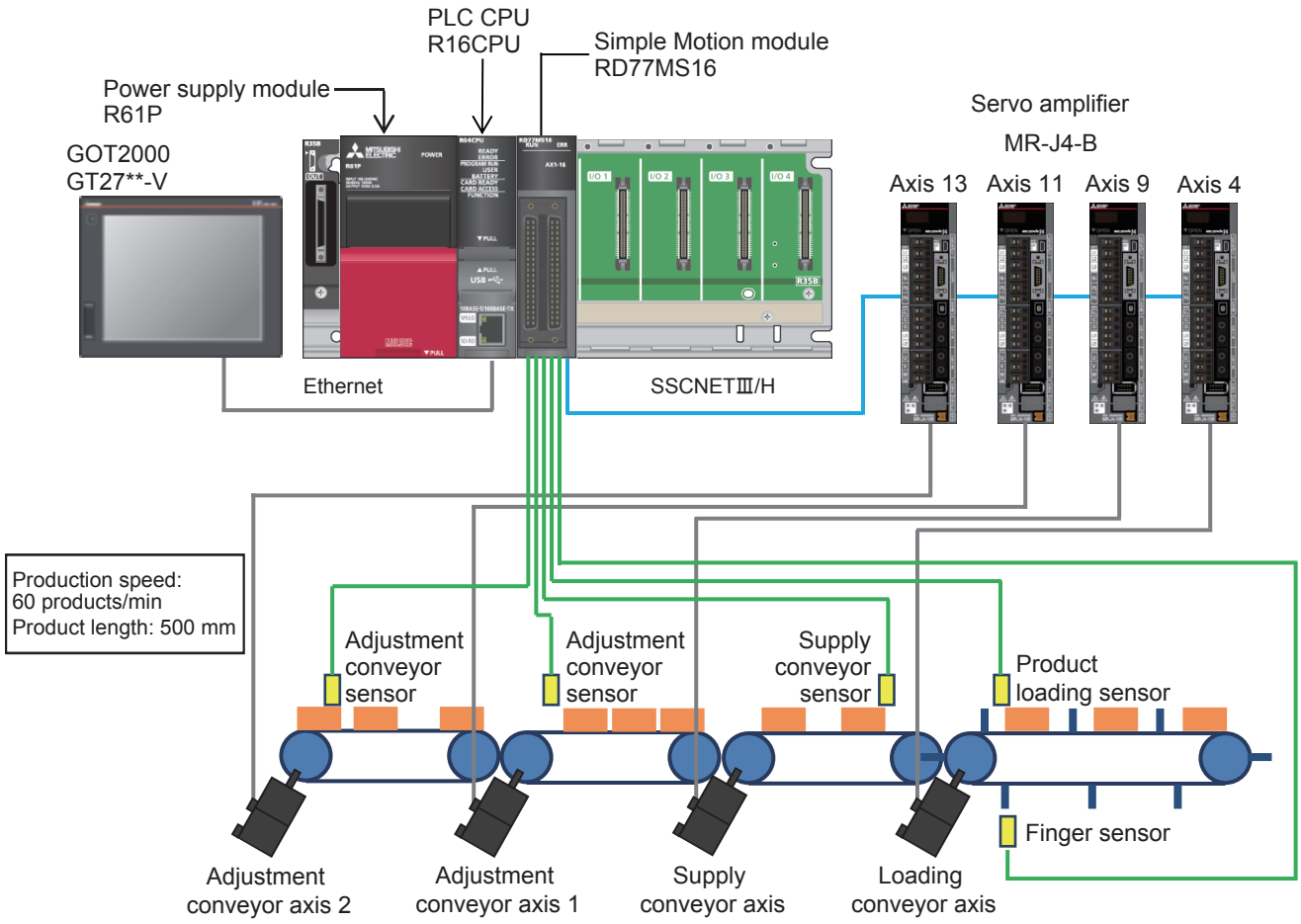
- Axis status monitor and lamp display
- Axis error reset processing
- FB error monitor
- FB error reset processing
- Production information setting and monitor

5.3 Alignment Conveyor

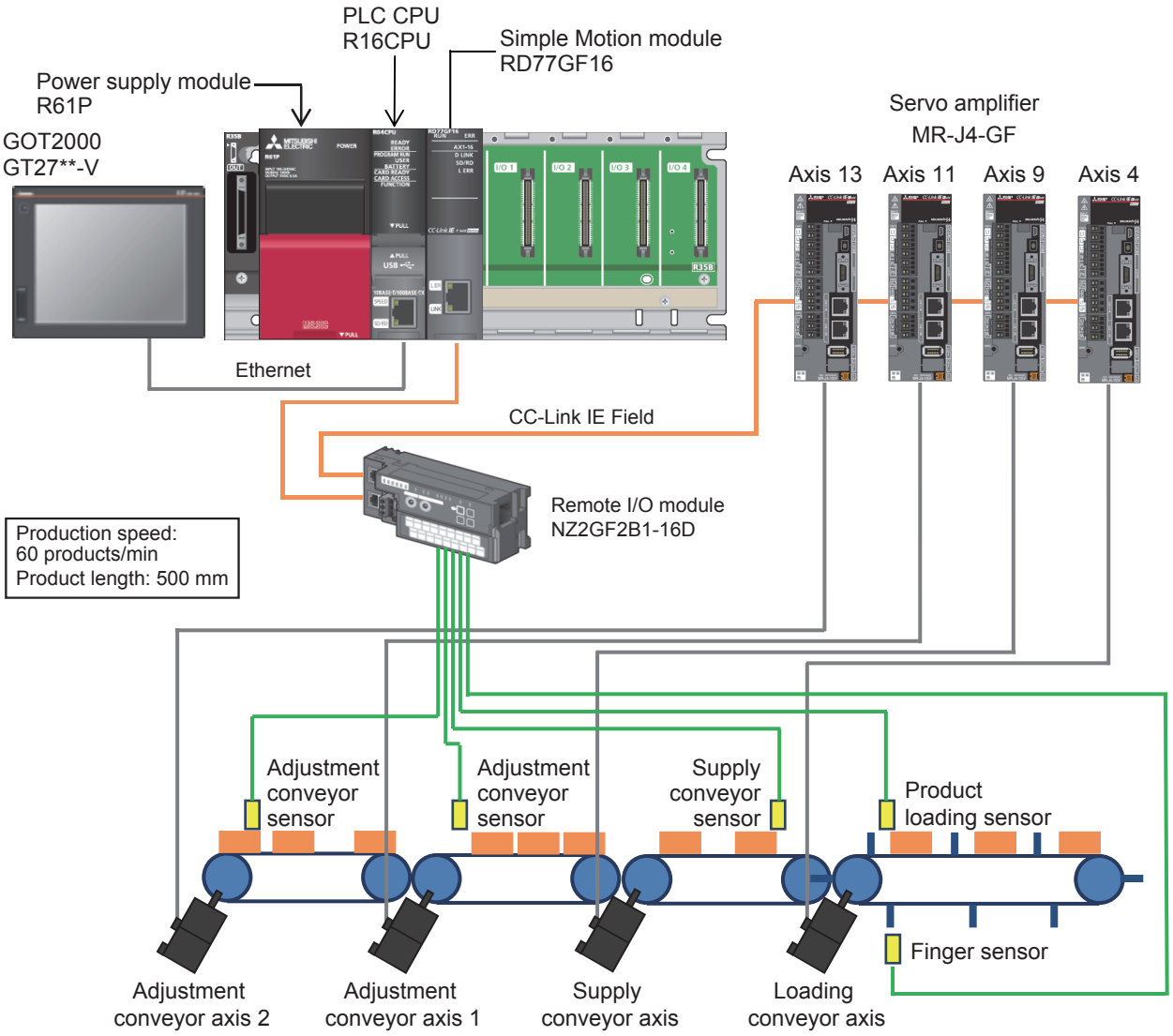
This section describes the system configuration and program specifications of the program example for the alignment conveyor.

System configuration

- AP20-PAC002AA-R16-77MS16_AlignmentConveyor_****.gx3 (SSCNETⅢ/H)



• AP20-PAC002AA-R16-77GF16_AlignmentConveyor_****.gx3 (CC-Link IE Field Network)



Control specifications

Item	Work loading conveyor axis	Supply conveyor axis	Gap adjustment conveyor axis 1	Gap adjustment conveyor axis 2
Axis No.	4	9	11	13
Unit setting	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.	—	10 (Virtual)	12 (Virtual)	14 (Virtual)
Cam No.	—	0 (Straight line)	0 (Straight line)	0 (Straight line)
Clutch	—	Lock-up clutch	Lock-up clutch	Lock-up clutch

Item	Main axis 1	Main axis 2
Axis No.	7 (Virtual)	8 (Virtual)
Unit setting	2: degree	0: mm

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	• License activation • Preparing operation (Servo ON/OFF) • Home position return	Scan	FBD
Operation	• Error reset • JOG operation • Synchronous control start • Operation start/stop	Scan	FBD
ConveyorControl	• Work gap adjustment • Work loading position adjustment	Scan	FBD
HMI_IF	Touch panel I/O processing	Scan	ST

FB

The following tables list the FBs used in this program.

■PAC_PackagingControl_R

AP20-PAC002AA-R16-77MS16_AlignmentConveyor

AP20-PAC002AA-R16-77GF16_AlignmentConveyor

Item	FB name	Description	Execution type*1	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-R Programming Manual (Program Design)

■PLCopen Motion Control

PLCopen Motion Control FB library can be downloaded from the Mitsubishi Electric FA site.

FB name	Description	Execution type*1	Program
MC_Power+RD77	Operation possible (PLCopen Motion Control FB)	Subroutine type	PreOperation
MCv_Home+RD77	Home position return (PLCopen Motion Control FB)	Subroutine type	PreOperation
MC_Reset+RD77	Axis error reset (PLCopen Motion Control FB)	Subroutine type	Operation
MCv_Jog+RD77	JOG operation (PLCopen Motion Control FB)	Subroutine 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-R Programming Manual (Program Design)

■Example Prg Control (Application program control)

FB name	Description	Execution type*1	Program
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-R Programming Manual (Program Design)

Parameter

Refer to the project for parameter setting details.

System parameter

The system parameter setting is not changed 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.82] Forced stop valid/invalid selection	Disabled
"[Pr.116] FLS signal selection" input type	Disabled
"[Pr.117] RLS signal selection" input type	Disabled
"[Pr.118] DOG signal selection" input type	Disabled
"[Pr.119] STOP signal selection" input type	Disabled

Servo parameter

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

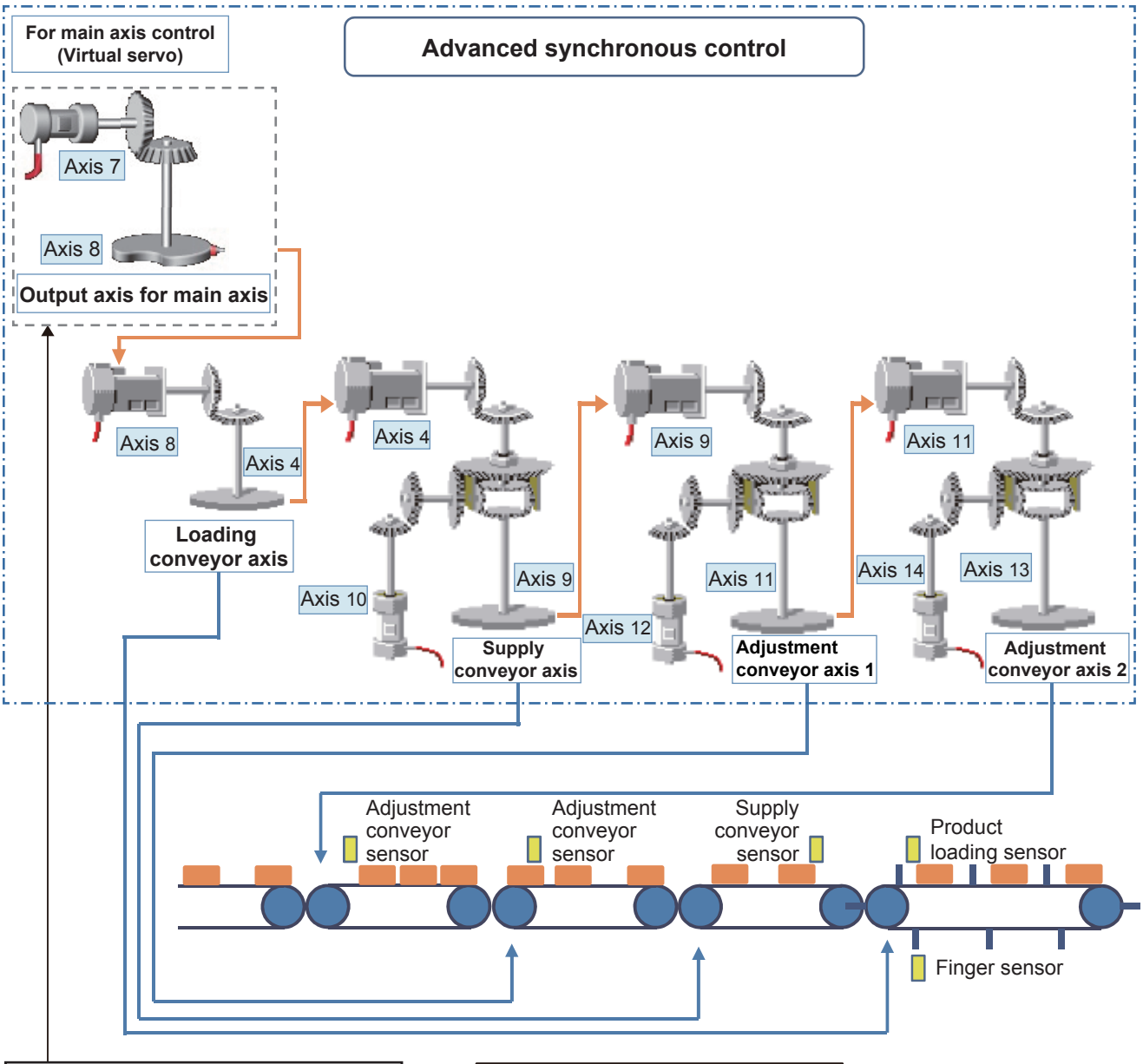
Set the parameters for safety measures depending on the intended use.

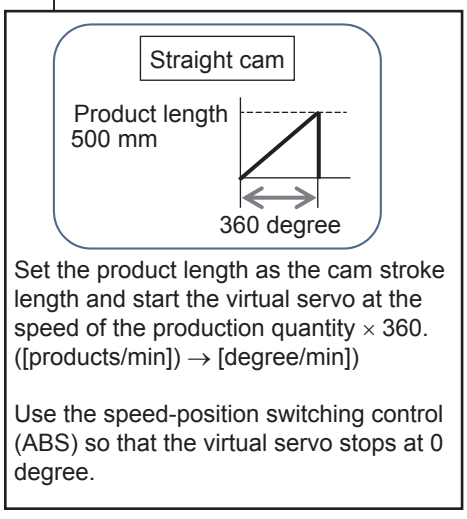
Parameter	Settings
PA04: Function selection A-1	Servo forced stop invalid selection 1: Invalid
PC17: Function selection C-4 [MR-J4-B]	Origin set condition selection 1: Servo motor Z phase passage not required after power on
PD41: Function selection D-4 [MR-J4-GF]	Sensor input method selection 1: Input from controller

Synchronous control image

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

■Synchronous control (whole image)

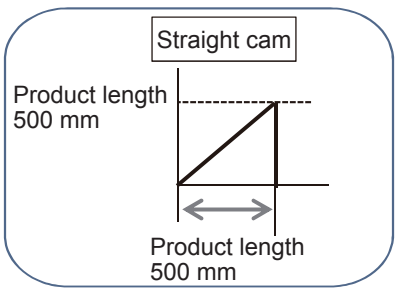




Set the product length as the cam stroke length and start the virtual servo at the speed of the production quantity × 360. ([products/min]) → [degree/min])

Use the speed-position switching control (ABS) so that the virtual servo stops at 0 degree.

Output axis cam pattern



All output axis cam patterns of conveyors are the same.

Program processing

Initial (Initial parameter setting)

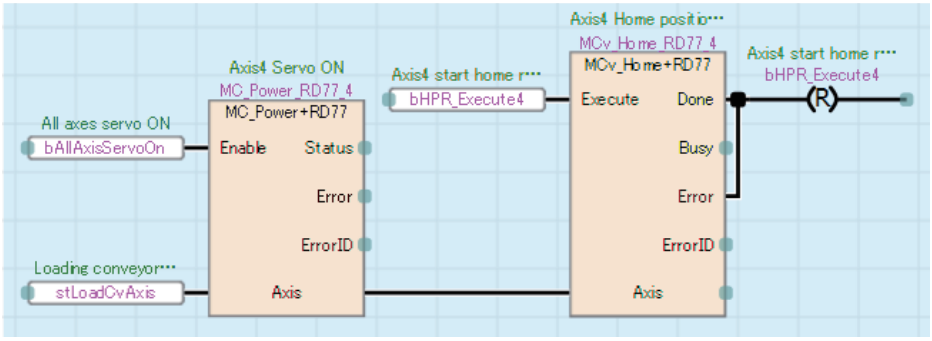
Set each variable's initial values and constants.

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

PreOperation

■Each axis servo ON, home position return

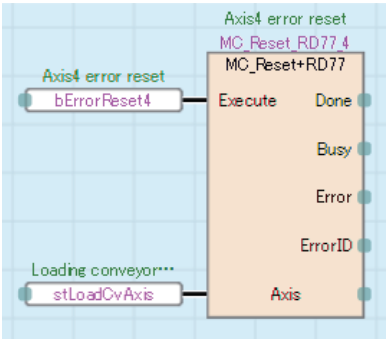
Perform servo ON and home position return with the switches in the servo axis setting screen displayed on the GOT.



Operation

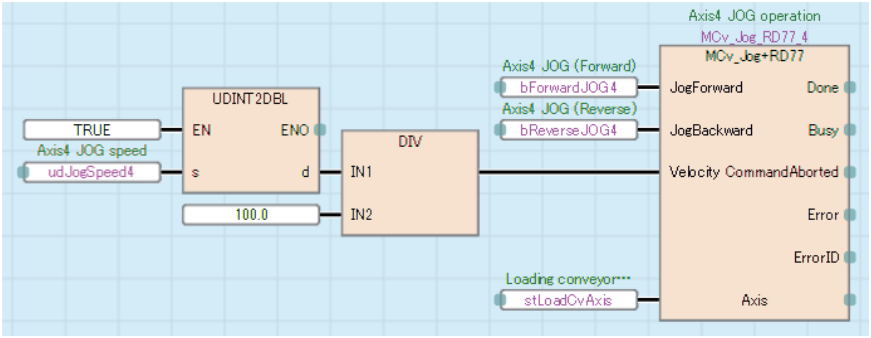
■Error reset processing

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



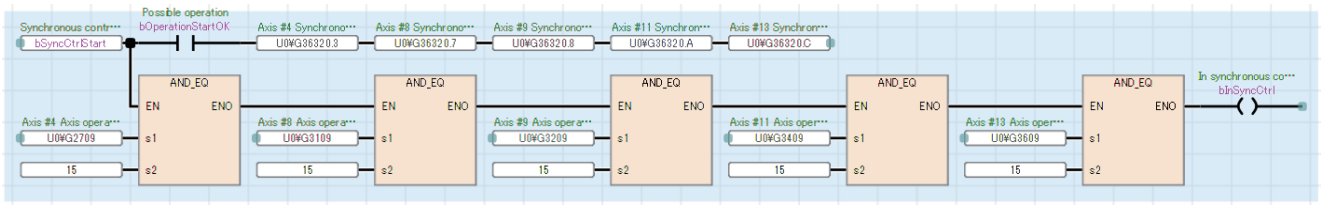
■JOG operation processing

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.

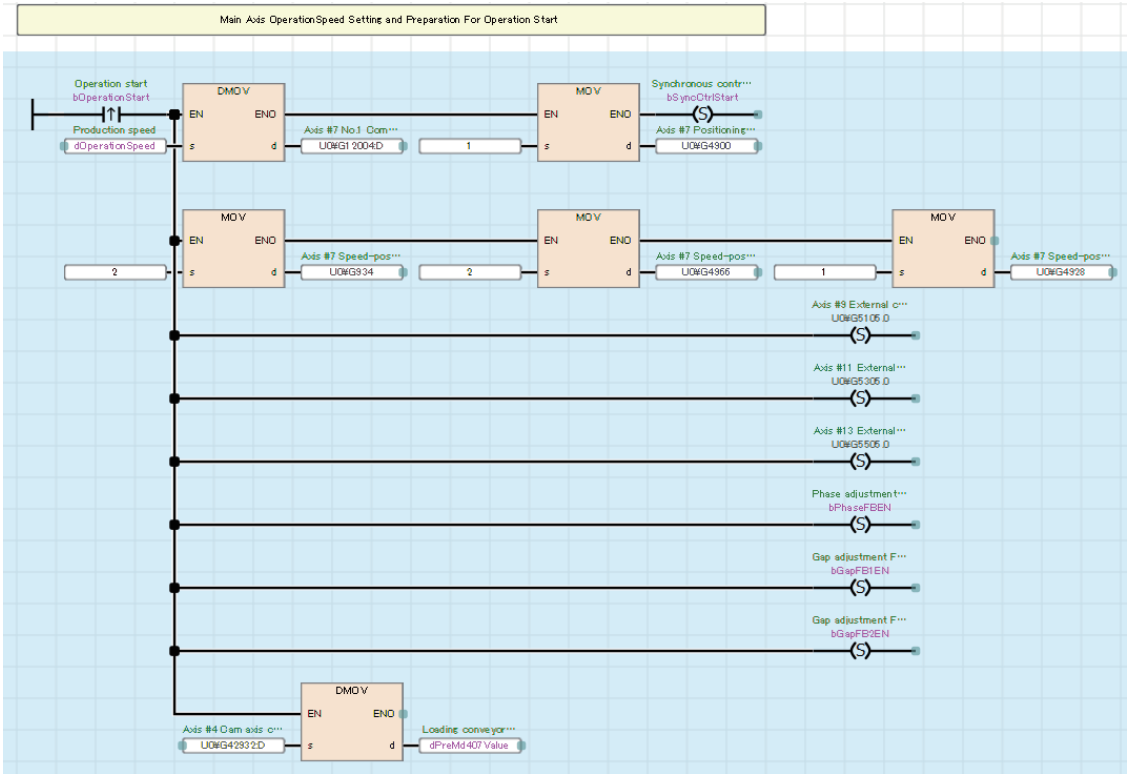


■Production start preparation

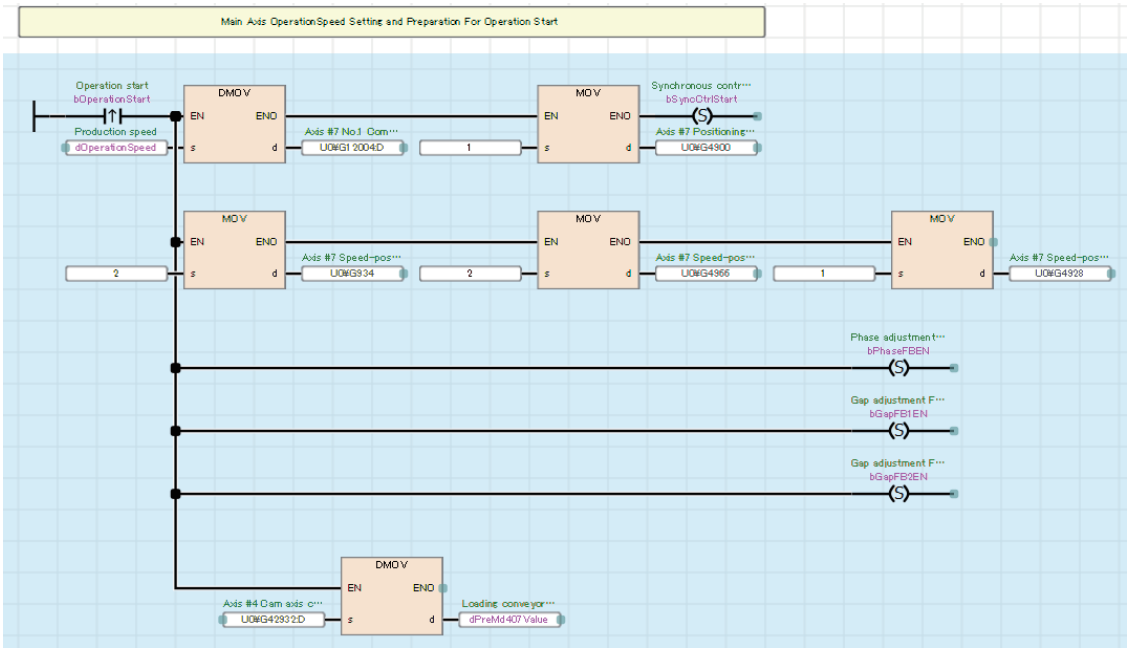
Set the command velocity of the virtual servo for main axis positioning and start positioning No. using the [Start] switch in the production screen displayed on the GOT.

• AP20-PAC002AA-R16-77MS16_AlignmentConveyor_****.gx3

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



• AP20-PAC002AA-R16-77GF16_AlignmentConveyor_****.gx3

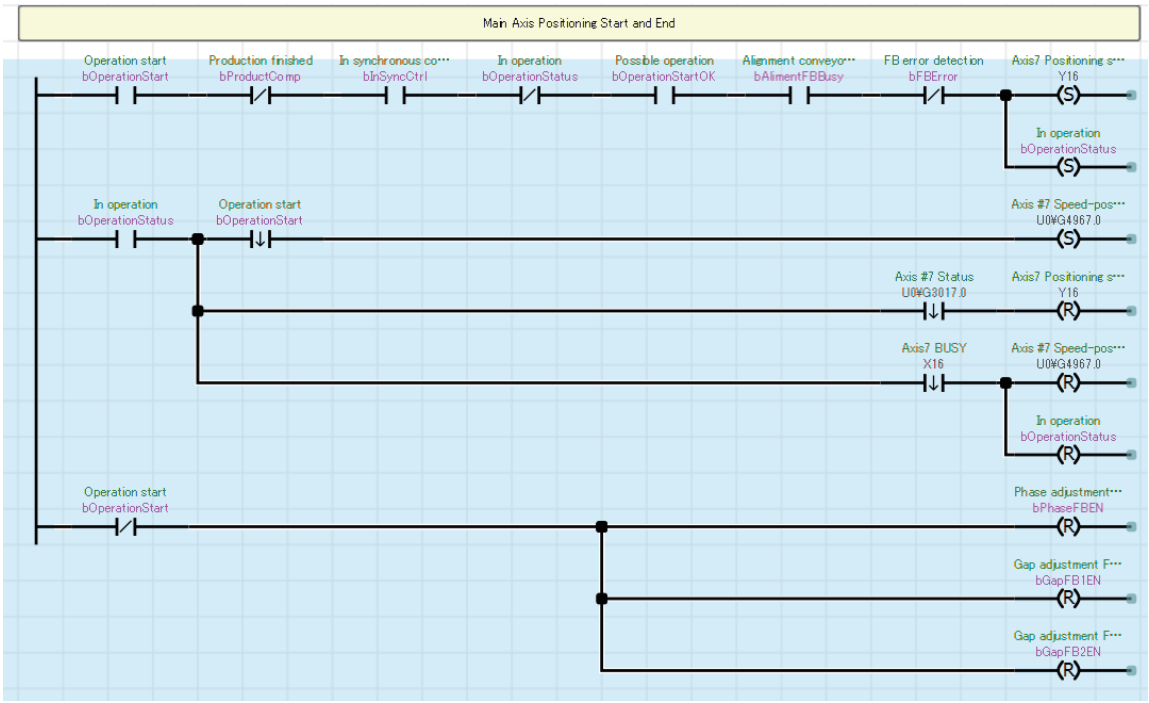


■Start of main axis

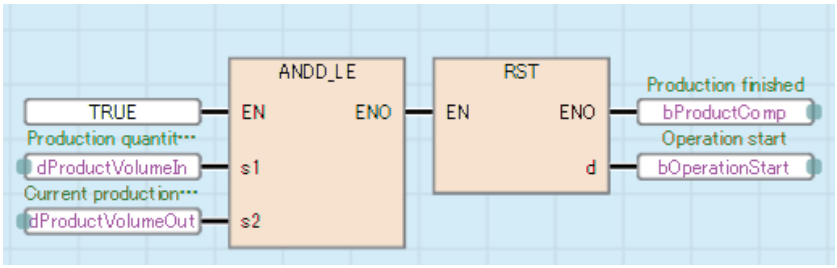
Check that the output axis has been switched to synchronous control and that no error occurs in the alignment conveyor FBs, and start speed control of the virtual servo for main axis positioning.

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.

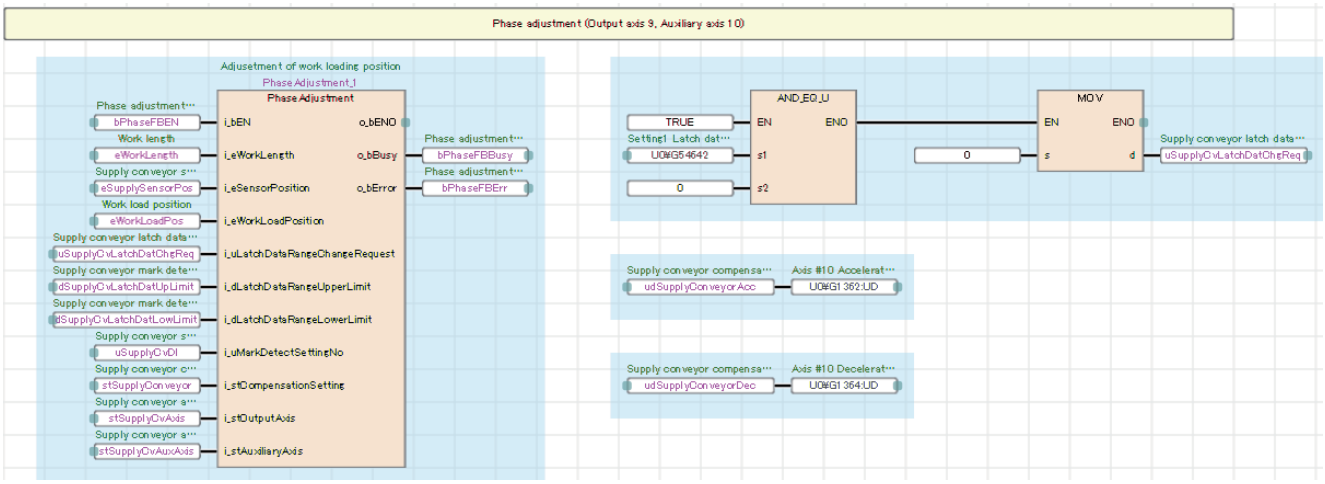


■Work loading position adjustment

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.

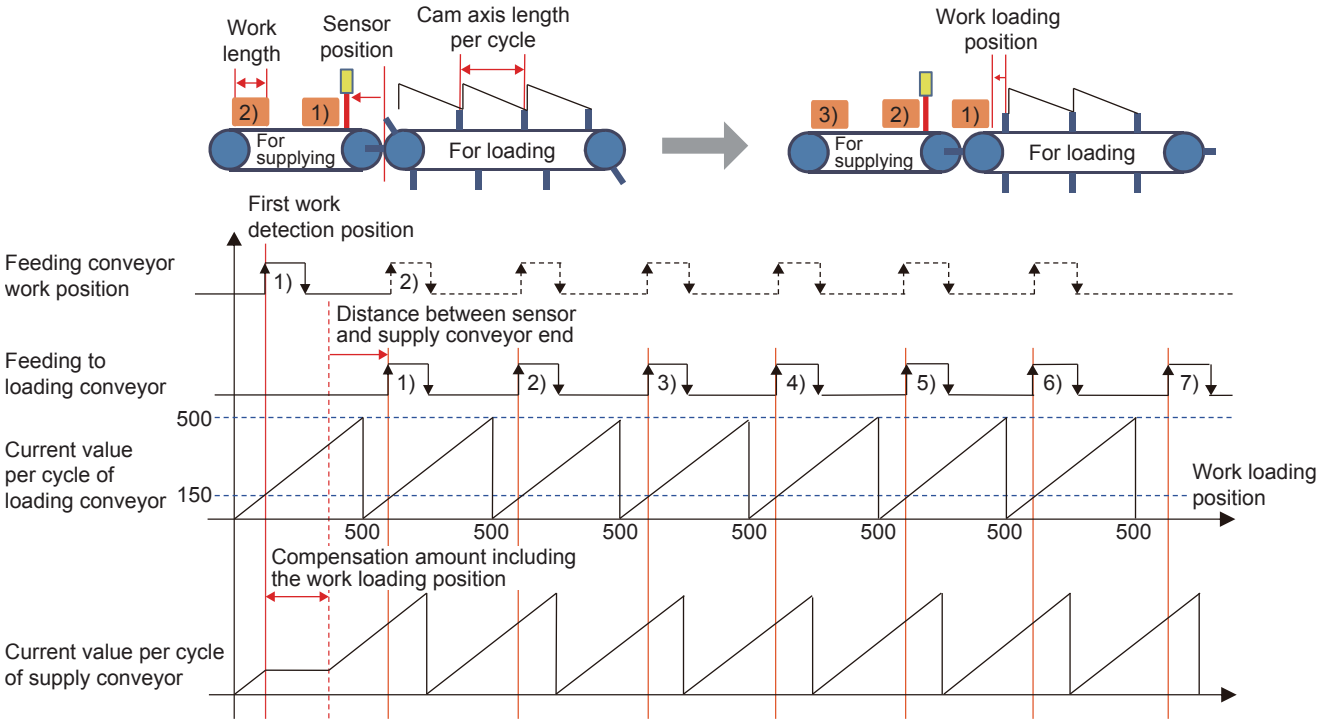
The mark detection range can be changed by using the change request switch in the mark compensation screen displayed on the GOT.

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.

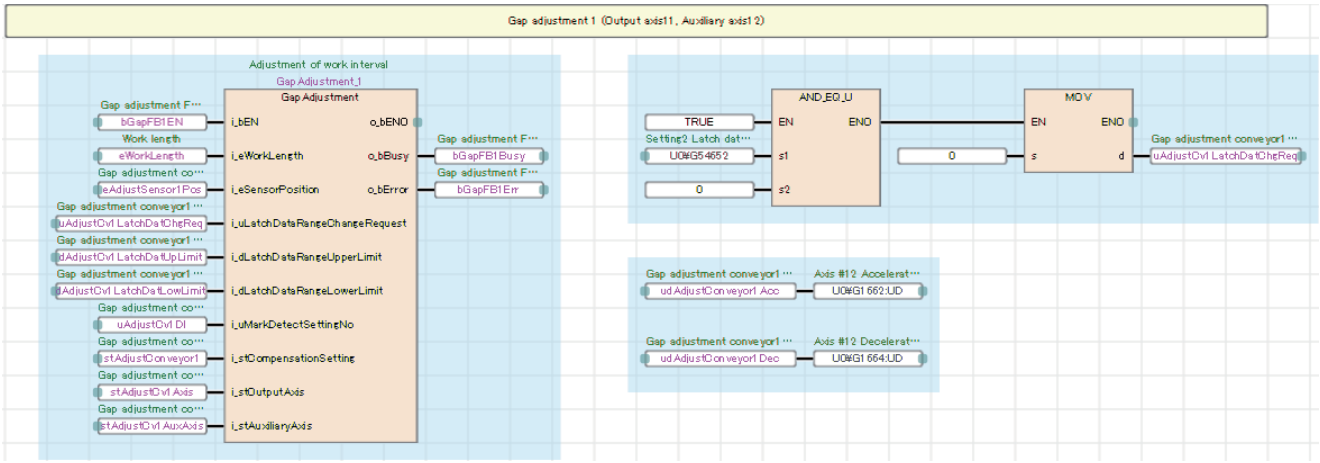


■Work gap adjustment

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

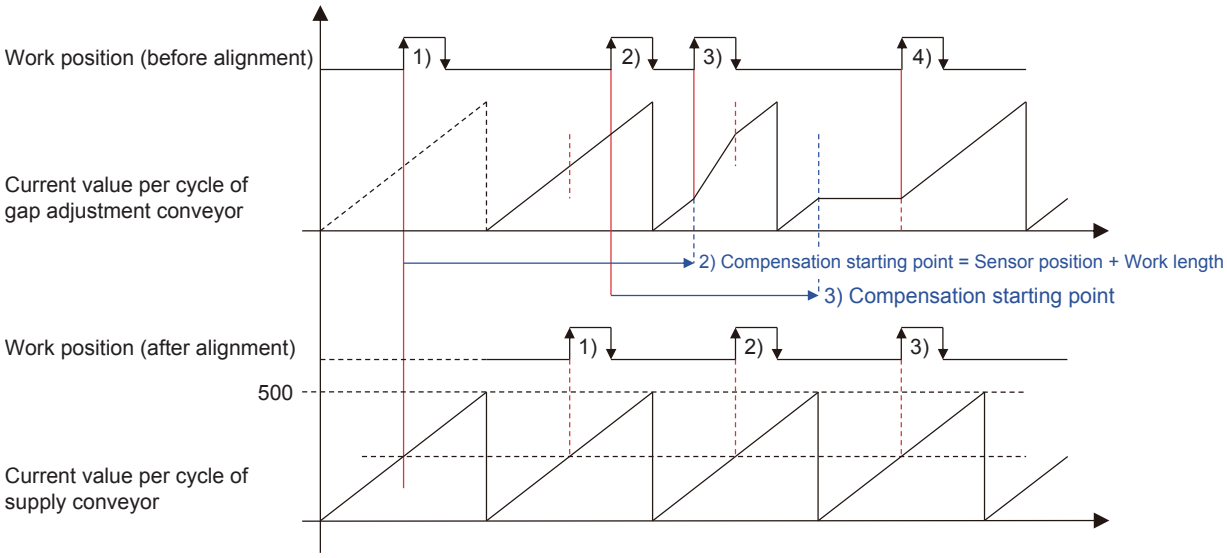
The mark detection range can be changed by using the change request switch in the mark compensation screen displayed on the GOT.

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



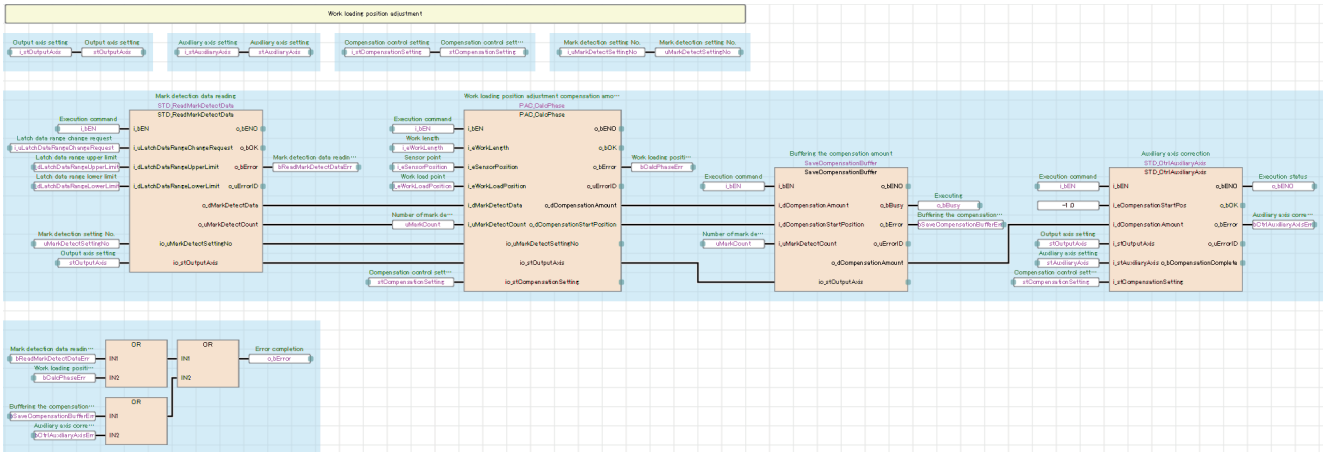
• Operation outline

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.

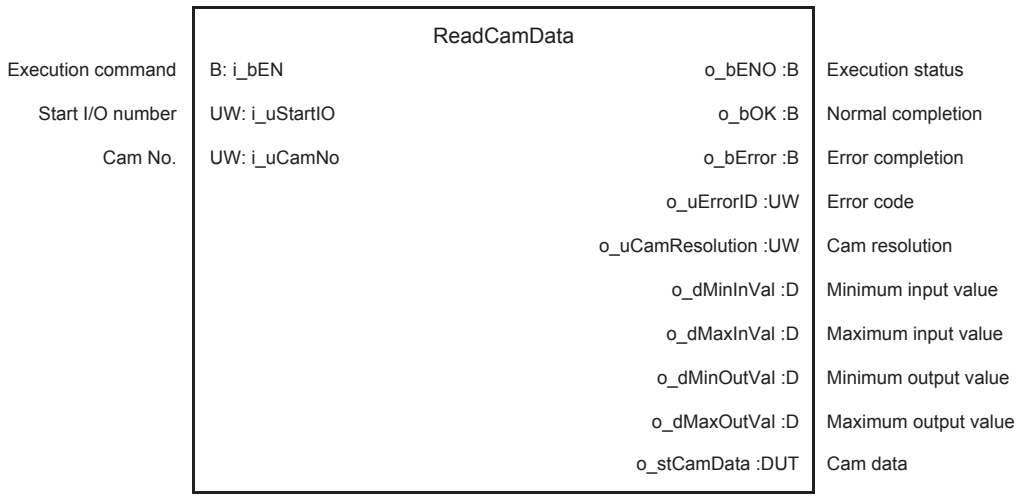
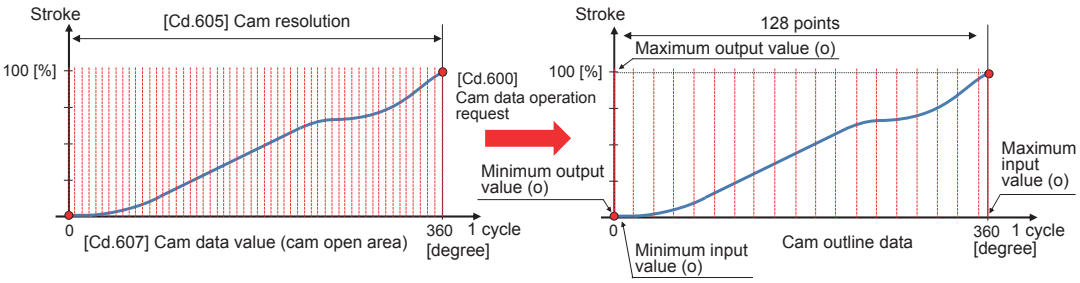
5.4 Application Program Control FBs

ReadCamData (Cam data reading)

Name

ReadCamData

Function overview

Item	Description	
Function overview	This FB reads cam data so that the cam outline of the cam No. specified from the Simple Motion module can be recognized.	
Symbol		
Applicable hardware and software	Applicable module	RD77MS, RD77GF
	Applicable CPU	MELSEC iQ-R series
	Engineering software	GX Works3
Number of steps	1421 steps	
FB dependence	—	
Function description	This FB reads the cam data to be displayed on the application screen example of the GOT (cam monitor screen) from the Simple Motion module. • Turning on i_bEN (Execution command) starts reading of cam data of a specified i_uCamNo (Cam No.). • This FB reads cam data in the cam open area using "[Cd.600] Cam data operation request" of the Simple Motion module and reads "[Cd.605] Cam resolution" and "[Cd.607] Cam data value" (128 points) in the read cam data.  • After reading of cam data is completed and the output label is updated, o_bOK (Normal completion) turns on. • If an error has occurred in the FB, Error turns on and an error code is stored in ErrorID. • For details of error codes, refer to "Page 198 List of Error Codes".	
Restrictions and precautions	This FB uses the index register Z18 to Z19. When using interrupt programs, do not use this index register in the interrupt programs.	
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	Initial value	Description
Execution command	i_bEN	Bit	⎍	On, off	—	On: The FB is activated. Off: The FB is not activated.
Start I/O number	i_uStartIO	Word [Unsigned]	↑	0H ≤ Start I/O number ≤ FEH	0	Installation address of the Simple Motion module (Upper three digits of four digits (hexadecimal))
Cam No.	i_uCamNo	Word [Unsigned]	↑	1 ≤ Cam No. ≤ 256	1	Set the cam No. to read 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: Execution command is on. Off: Execution command is off.
Normal completion	o_bOK	Bit	—	On: Reading of cam data has been completed and the output data has been updated normally. Off: The operation of the FB has not been 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 length per cycle) is stored.
Maximum input value	o_dMaxInVal	Double word [Signed]	○	The maximum value of the cam data input value (Cam axis length per cycle) 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 cam data below.

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 length per cycle) is stored.
		[1]		○	The second point of the input value (Cam axis length per cycle) is stored.
		⋮		○	⋮
		[127]		○	The 128th point of the input value (Cam axis length per cycle) 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.

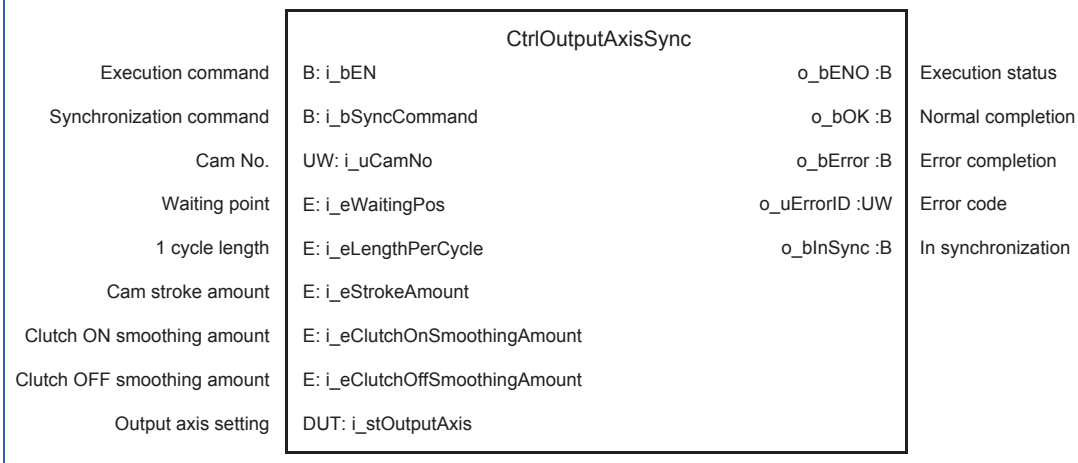
*1 ○: The value will be held after the FB stops. —: The value will be cleared after the FB stops.

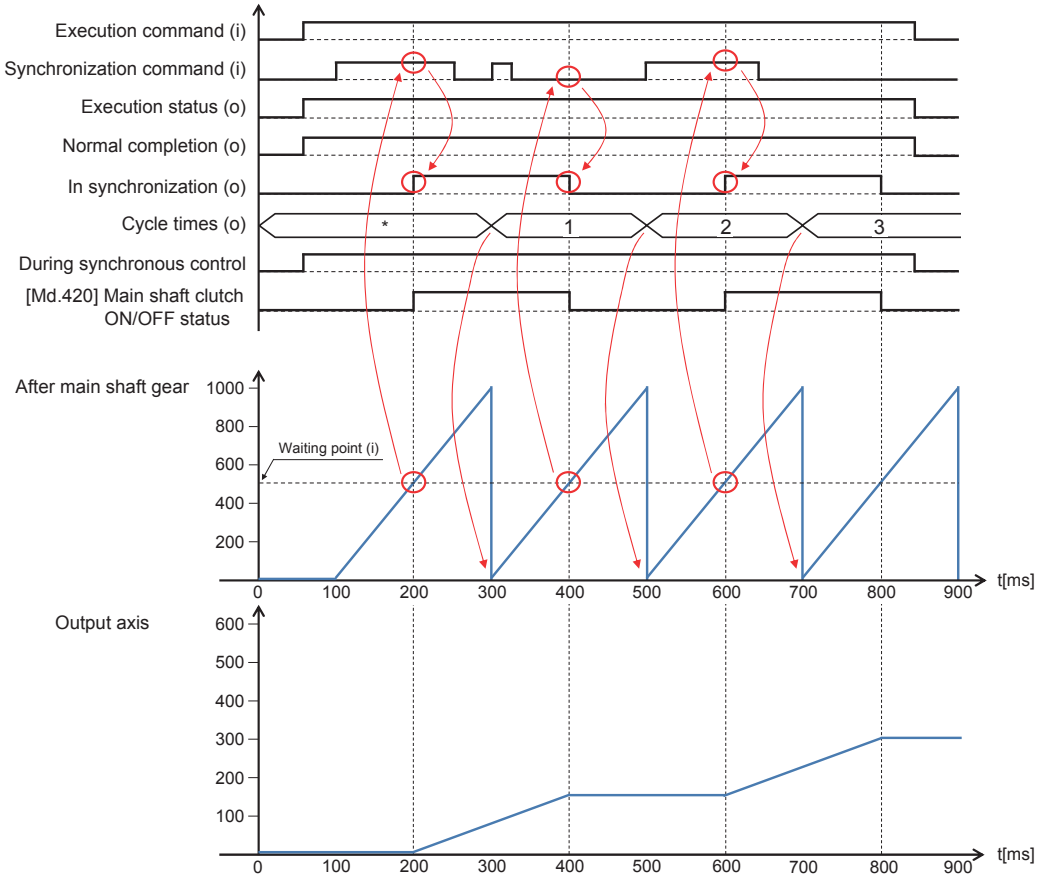
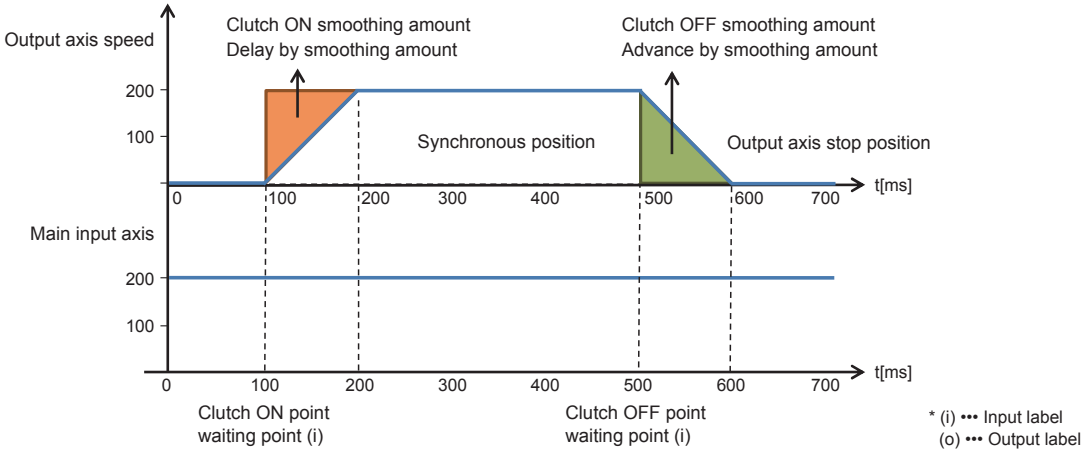
CtrlOutputAxisSync (Output axis synchronization control)

Name

CtrlOutputAxisSync

Function overview

Item	Description		
Function overview	This FB controls the output axis synchronized with the master axis.		
Symbol			
Applicable hardware and software	Applicable module	RD77MS, RD77GF	
	Applicable CPU	MELSEC iQ-R series	
	Engineering software	GX Works3	
Number of steps	1581 steps		
FB dependence	—		

Item	Description
Function description	This FB controls the output axis by synchronizing the cam created by the cam generation FB with the main input axis. • When the current value of the main input axis per cycle is equal to the value of i_eWaitingPos (Waiting point) and i_bSyncCommand (Synchronization command) is on, the clutch turns on from i_eWaitingPos (Waiting point). • When the current value of the main input axis per cycle is equal to the value of i_eWaitingPos (Waiting point) and i_bSyncCommand (Synchronization command) is off, the clutch turns off from i_eWaitingPos (Waiting point). • The output axis movement amount delays from the main input axis movement amount by i_eClutchOnSmoothingAmount (Clutch ON smoothing amount) and moves by i_eClutchOffSmoothingAmount (Clutch OFF smoothing amount). Change the waiting point as needed. • When the clutch turns on during synchronous control, o_bInSync (In synchronization) turns on. ■ Sample data Cam axis current value per cycle: 1000 Cam stroke amount: 200 Cam type: Straight cam  ■ Clutch ON/OFF timing  • If an error has occurred in the FB, Error turns on and an error code is stored in ErrorID. • For details of error codes, refer to "Page 198 List of Error Codes".

Item	Description
Restrictions and precautions	• Execute this FB in the Simple Motion calculation cycle event task (I44: Inter-module synchronization). • If parameters has been set as below, this FB is executed with the unit [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": 1 to the maximum number of module axes (servo input axis), other than 801 to 800 + maximum number of module axes (synchronous encoder) • 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] • 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]" • To use synchronous parameters in a machanism, set synchronous encoder axis control data ([Cd.320] to [Cd.325]) by users. • 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 • This FB use the slippage method (Linear: Input value follow up) as the clutch smoothing method ([Pr.411] = 5). • Create "[Cd.380] Synchronous control start" with user programs.*1 • When Execution command turns off while o_bInSync (In synchronization) is on, the FB turns off the output of o_bInSync while holding the on state of the clutch. • Set i_eWaitingPos (Waiting point) not to overlap the synchronous section of the main input axis and output axis.
Compiling method	Macro type, subroutine type
FB operation type	Real-time execution

*1 For details of the synchronous control parameters and control data, refer to the following.
MELSEC iQ-R Simple Motion Module User's Manual (Advanced Synchronous Control)

Labels

■Input labels

Name	Label name	Data type	Read timing*1	Setting range	Initial value	Description
Execution command	i_bEN	Bit	⎍	On, off	—	On: The FB is activated. Off: The FB is not activated.
Synchronization command	i_bSyncCommand	Bit	⎍	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	1	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	⎍	Refer to the description.	0.0	Set the point where the address clutch turns on or off to the current value per cycle after main shaft gear. • 0.0 ≤ Waiting point ≤ 100000.0 [mm] • 0.00 ≤ Waiting point ≤ 10000.00 [inch] • 0.00 ≤ Waiting point ≤ 10000.00 [degree] • 0 ≤ Waiting point ≤ 9999999 [pulse] [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.	200.0	Set the 1 cycle length of the cam axis. • 0.1 ≤ 1 cycle length ≤ 100000.0 [mm] • 0.01 ≤ 1 cycle length ≤ 10000.00 [inch] • 0.01 ≤ 1 cycle length ≤ 10000.00 [degree] • 1 ≤ 1 cycle length ≤ 9999999 [pulse] [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	Initial value	Description
Cam stroke amount	i_eStrokeAmount	Single precision real number	↑	Refer to the description.	200.0	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.) • 0.1 ≤ Cam stroke amount ≤ 100000.0 [mm] • 0.01 ≤ Cam stroke amount ≤ 10000.00 [inch] • 0.01 ≤ Cam stroke amount ≤ 10000.00 [degree] • 1 ≤ Cam stroke amount ≤ 9999999 [pulse] [The unit setting depends on the axis No. setting value in the output axis setting.]
Clutch ON smoothing amount	i_eClutchOnSmoothingAmount	Single precision real number	↑	Refer to the description.	0.0	Set the smoothing amount when the clutch is on. • 0.0 ≤ Clutch ON smoothing amount ≤ 100000.0 [mm] • 0.00 ≤ Clutch ON smoothing amount ≤ 10000.00 [inch] • 0.00 ≤ Clutch ON smoothing amount ≤ 10000.00 [degree] • 0 ≤ Clutch ON smoothing amount ≤ 9999999 [pulse] [The unit setting depends on the axis No. setting value in the output axis setting.]
Clutch OFF smoothing amount	i_eClutchOffSmoothingAmount	Single precision real number	↑	Refer to the description.	0.0	Set the smoothing amount when the clutch is off. • 0.0 ≤ Clutch OFF smoothing amount ≤ 100000.0 [mm] • 0.00 ≤ Clutch OFF smoothing amount ≤ 10000.00 [inch] • 0.00 ≤ Clutch OFF smoothing amount ≤10000.00 [degree] • 0 ≤ Clutch OFF smoothing amount ≤ 9999999 [pulse] [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	Initial value	Description
Axis number	AxisNo	Word [Unsigned]	↑	1 ≤ Axis No. ≤ 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.
Start I/O number	StartIO	Word [Unsigned]	↑	0H ≤ Start I/O number ≤ FEH	0	Installation address of the Simple Motion module (Upper three digits of four digits (hexadecimal))

*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.

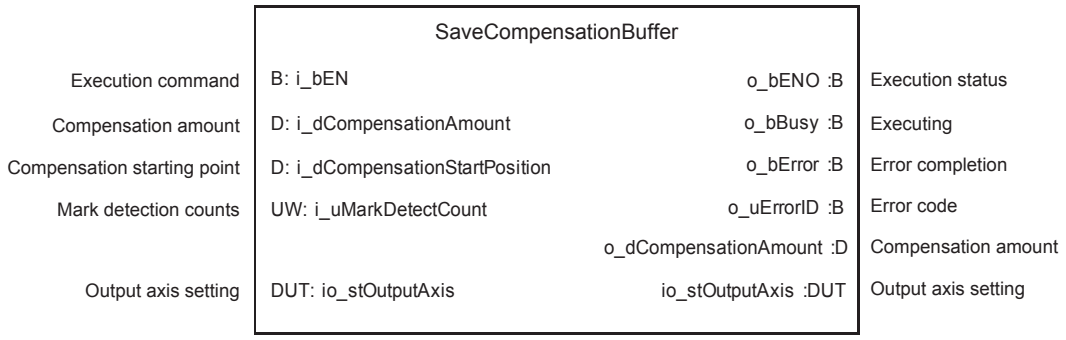
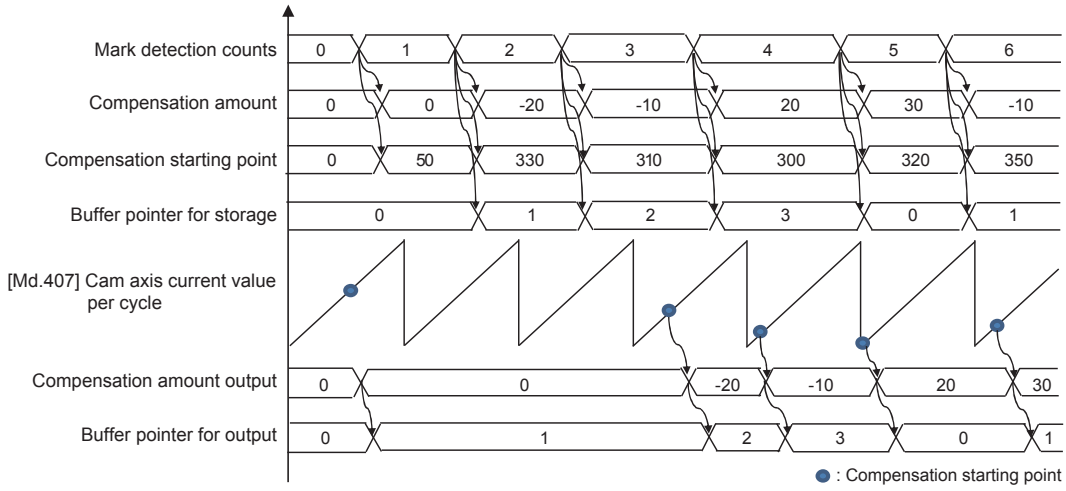
*1 ○: The value will be held after the FB stops. —: The value will be cleared after the FB stops.

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	
Applicable hardware and software	Applicable module: RD77MS, RD77GF Applicable CPU: MELSEC iQ-R series Engineering software: GX Works3
Number of steps	837 steps
FB dependence	—
Function description	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. • 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. • 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. ■Operation when the maximum storage number is 4  • If an error has occurred in the FB, Error turns on and the error code is stored in ErrorID. • Refer to "Page 198 List of Error Codes" for details of error codes.
Restrictions and precautions	• 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 dBufferNum (maximum storage number) in the program. • Adjust the maximum storage number using the maximum number of workpieces to be loaded on a single conveyor as reference.
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	Initial value	Description
Execution command	i_bEN	Bit	⎍	ON, OFF	—	ON: The FB is activated. OFF: The FB is not activated.
Compensation amount	i_dCompensationAmount	Double word [Signed]	⎍	-2147483648 ≤ Compensation amount ≤ 2147483647	0	Enter the output value from the compensation amount calculation FB (PAC_CalcGap or PAC_CalcPhase).
Compensation starting point	i_dCompensationStartPosition	Double word [Signed]	⎍		0	
Mark detection counts	i_uMarkDetectCount	Word [Unsigned]	⎍	0 ≤ Mark detection counts ≤ 65535 [times] (Ring counter)	0	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.
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 ≤ Compensation amount ≤ 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 ○: 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	Initial value	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	Initial value	Description
Axis No.	AxisNo	Word [Unsigned]	↑	1 ≤ Axis No. ≤ 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.
Start I/O number	StartIO	Word [Unsigned]	↑	0H ≤ Start I/O number ≤ FEH	—	Installation address of the Simple Motion module (Upper three digits of four digits (hexadecimal))

Buffer data (BufferData structure)

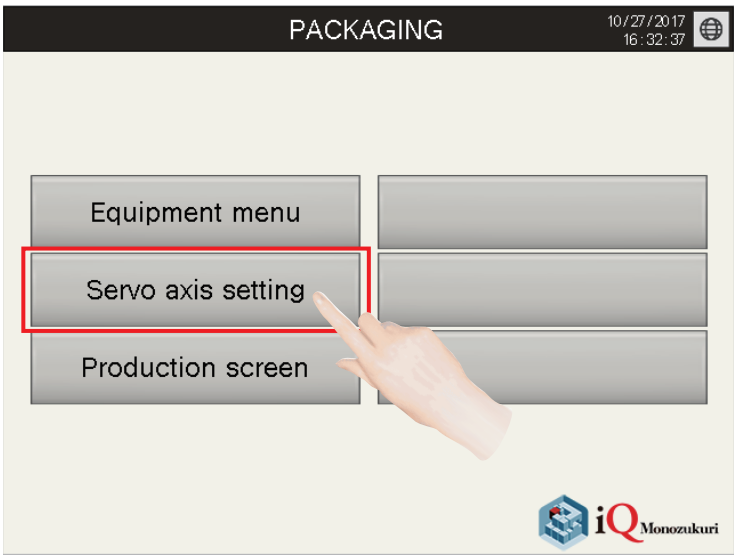
Name	Label name	Data type	Value to be held*2	Description
Compensation amount	dCompensationAmount	Double word [Signed]	○	The value of i_dCompensationAmount is stored.
Compensation starting point	dCompensationStartPosition	Double word [Signed]	○	The value of i_dCompensationStartPosition is converted into 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.

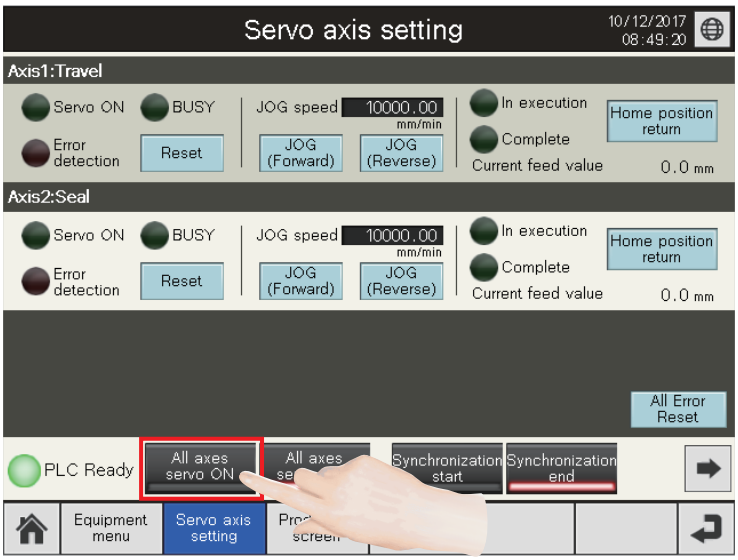
5.5 Application Program Example: Operation Procedure

Start the operation with the following procedure.

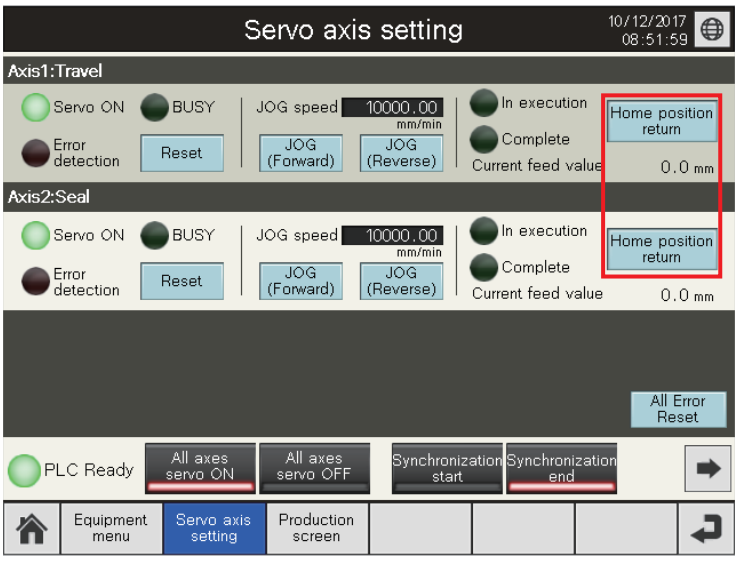
(For the function details of windows, refer to "Page 162 GOT APPLICATION SCREEN EXAMPLES".)



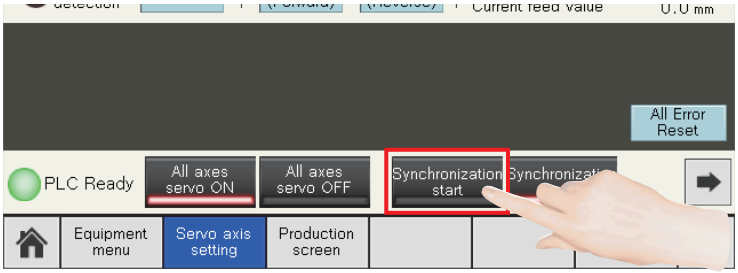
1. Write project data to the PLC CPU and GOT and start the system. Touch [Servo axis setting] to display the servo axis setting screen.



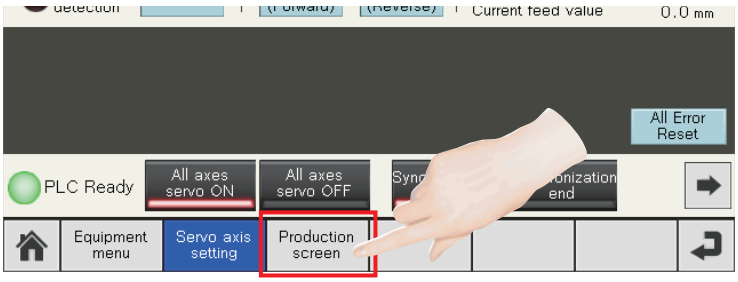
2. Touch the [All axes servo ON] switch. All axes are in the servo-on status.



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

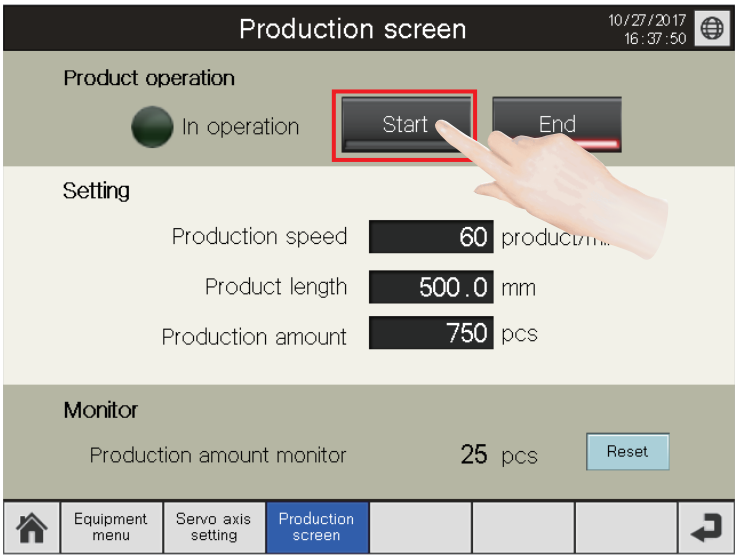


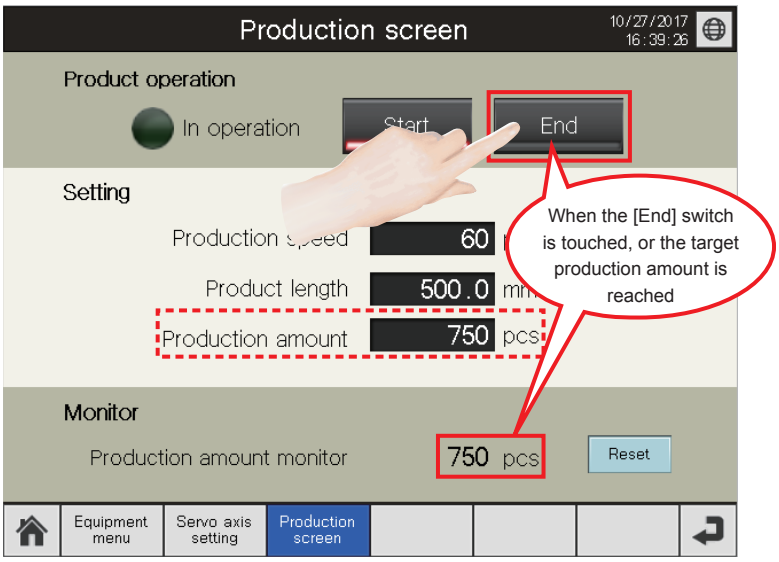
4. Touch the [Synchronization start] switch. Turning on the synchronization start switch turns each axis to the synchronous control mode. (Caution: Generate a came in the equipment menu before turning the [Synchronization start] switch ON. Cam generation is not required for the alignment conveyor project.)



5. Switch the screen to the production screen. (Precautions: In the project for the alignment conveyor, the product length is set to the length per cycle as default. Even if the product length is changed, the set value is ignored. 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: For the box motion, the travel axis and seal axis stop at the waiting position. For the long dwell, the D-cam axis stops at the waiting position. For the alignment conveyor, the conveyor axis stops immediately.)

6 GOT APPLICATION SCREEN EXAMPLES

Precautions

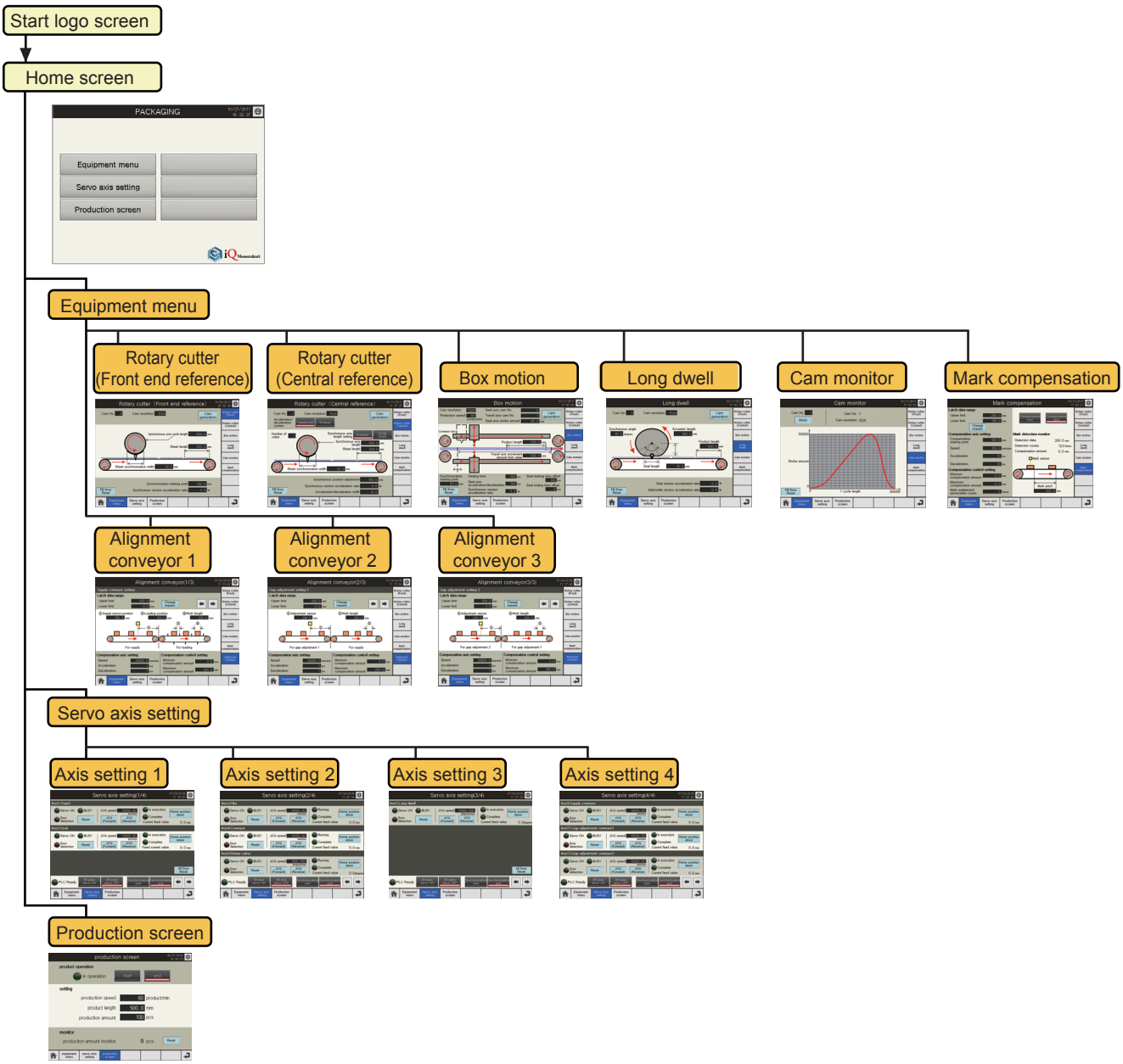
- To utilize these screen examples for an actual system, sufficiently confirm that the screens will not cause system control problems on user's own responsibility. Examine the positions where interlock conditions are required in a target system and add them.
- When the Simple Motion module detects an 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 170 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 170 Operation to be performed when the GOT is started for the first time".
- For the screen transition common in all screens, refer to "Page 164 Screen transition (Common)".



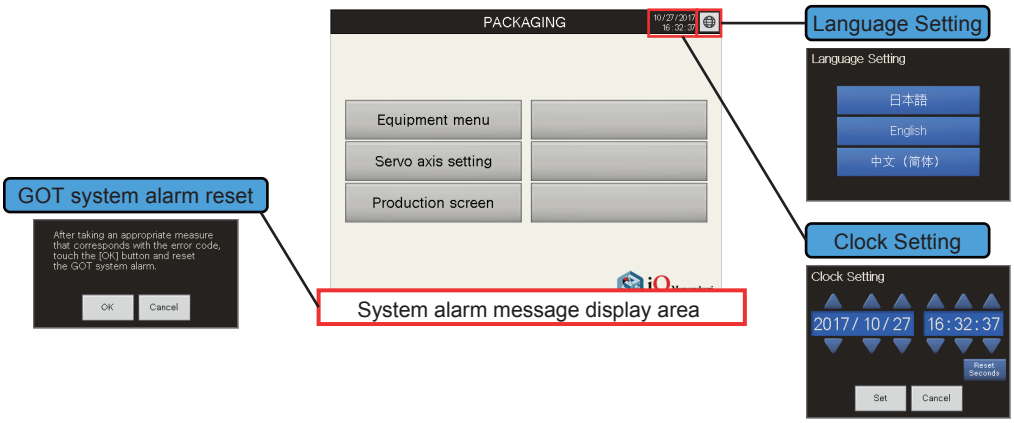
Point

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)

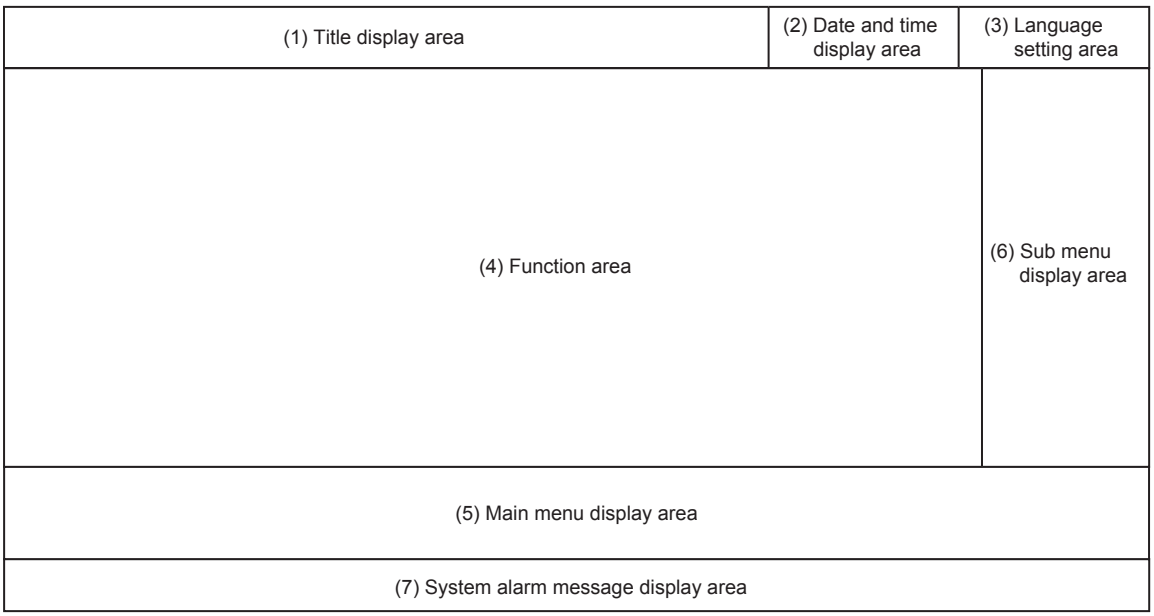
The following shows the screen transition common in all screens.

- 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.
- When a GOT system alarm has occurred, touching the system alarm message display area that is to be displayed at the bottom of the screen displays the GOT system alarm reset 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 167 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 170 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 169 Language Setting window screen".

(4) Function area

Displays the screen of each function.

For details, refer to "Page 171 Base Screen".

(5) Main menu display area

Displays the screen transition switches to display each main screen.

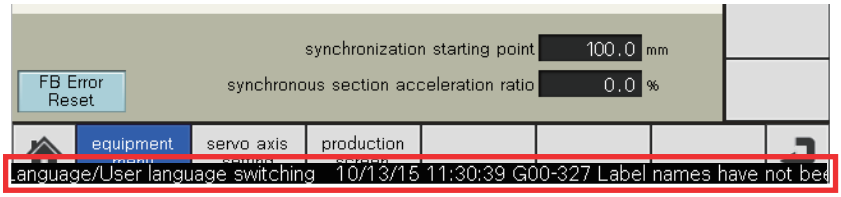
For details of the main menu switches, refer to "Page 167 Main menu".

(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 168 Sub menu".

(7) System alarm message display area



When a GOT system alarm occurs, a system alarm is displayed overlapping the bottom of the screen that is being displayed.

For details of the GOT system alarms, refer to "Page 168 GOT system alarm".

6.3 Description of Common Items

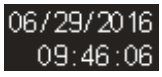
Descriptions of character colors

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 10000 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 170 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 169 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.

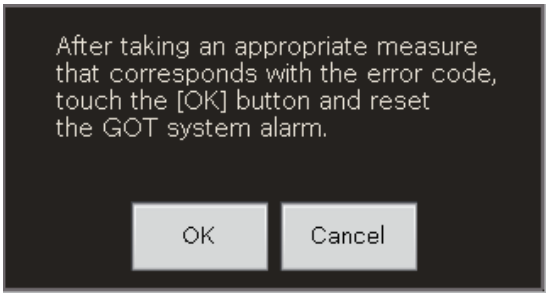
Switch	Description
	Touch this switch to jump to each screen. When a switch other than the one of the screen being displayed is touched, the switch color changes to blue and the screen of the touched switch is displayed.

GOT system alarm

If a GOT system alarm has occurred, a system alarm message is popped up at the bottom of the screen as follows. The system alarm message is displayed running from right to left of the screen at a low speed in the order of the occurrence date and time, comment, and detailed information.

The GOT system alarm message is displayed in the language set in the Language Setting window screen. However, if no PLC CPU has been connected or the PLC CPU is off when the GOT is started, a GOT system alarm message is displayed in English.

When a system alarm has occurred, touching the system alarm message display area displays the GOT system alarm reset window screen.



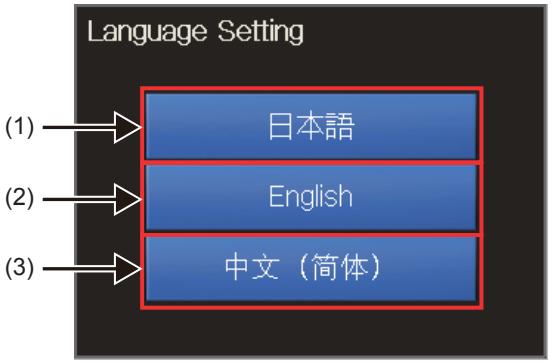
- Touch the [OK] switch when you reset the system alarm. The system alarm that cannot be reset is not cleared even though the [OK] switch is touched.
- Touch the [Cancel] switch when you do not reset the system alarm.
- Even though the main screen is switched while the GOT system alarm reset window screen is being displayed, the GOT system alarm reset window screen is not closed but still displayed.

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.

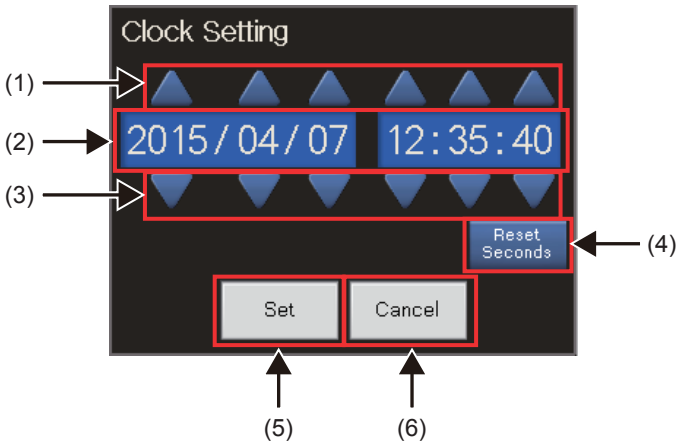
(3) Touch this switch to switch the language to Chinese (Simplified).

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. At that time, a GOT system alarm occurs and "Clock data input out of range" is displayed in the system alarm message display area.

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 169 Language Setting window screen".

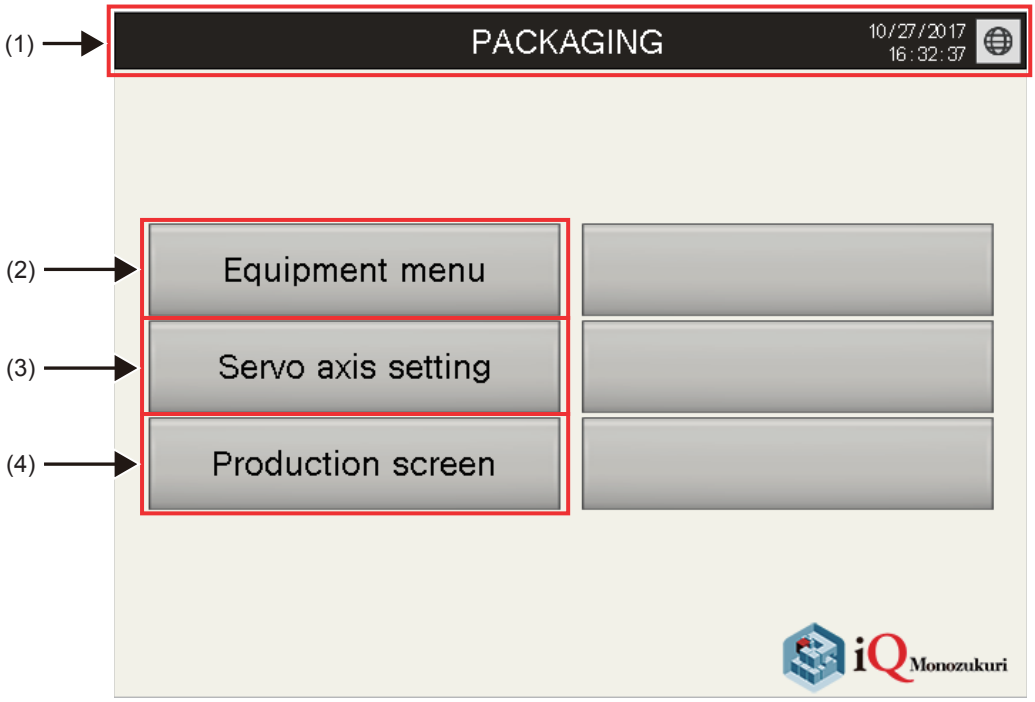
6.5 Base Screen

The following table lists base screens.

Screen No.	Screen title	Description	Reference
30000	Home	Home screen	Page 172
30050	Header	Title bar	Page 167
30051	Footer	Main menu	Page 167
30061	Sub menu 1	Sub menu	Page 168
30100	Rotary cutter(Front end)	Rotary cutter (Front end reference) screen	Page 173
30101	Rotary cutter(Central)	Rotary cutter (Central reference) screen	Page 175
30110	Box motion	Box motion screen	Page 177
30111	Long dwell	Long dwell screen	Page 180
30120	Cam monitor	Cam monitor screen	Page 182
30130	Mark compensation	Mark compensation screen	Page 183
30140	Alignment conveyor 1	Alignment conveyor 1	Page 186
30141	Alignment conveyor 2	Alignment conveyor 2	Page 186
30142	Alignment conveyor 3	Alignment conveyor 3	Page 186
30200	Servo axis setting 1	Servo axis setting 1 screen	Page 190
30201	Servo axis setting 2	Servo axis setting 2 screen	Page 190
30202	Servo axis setting 3	Servo axis setting 3 screen	Page 190
30203	Servo axis setting 4	Servo axis setting 4 screen	Page 190
30300	Production screen	Production screen	Page 194

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 (Front end reference)" screen.

(3) Servo axis setting switch

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

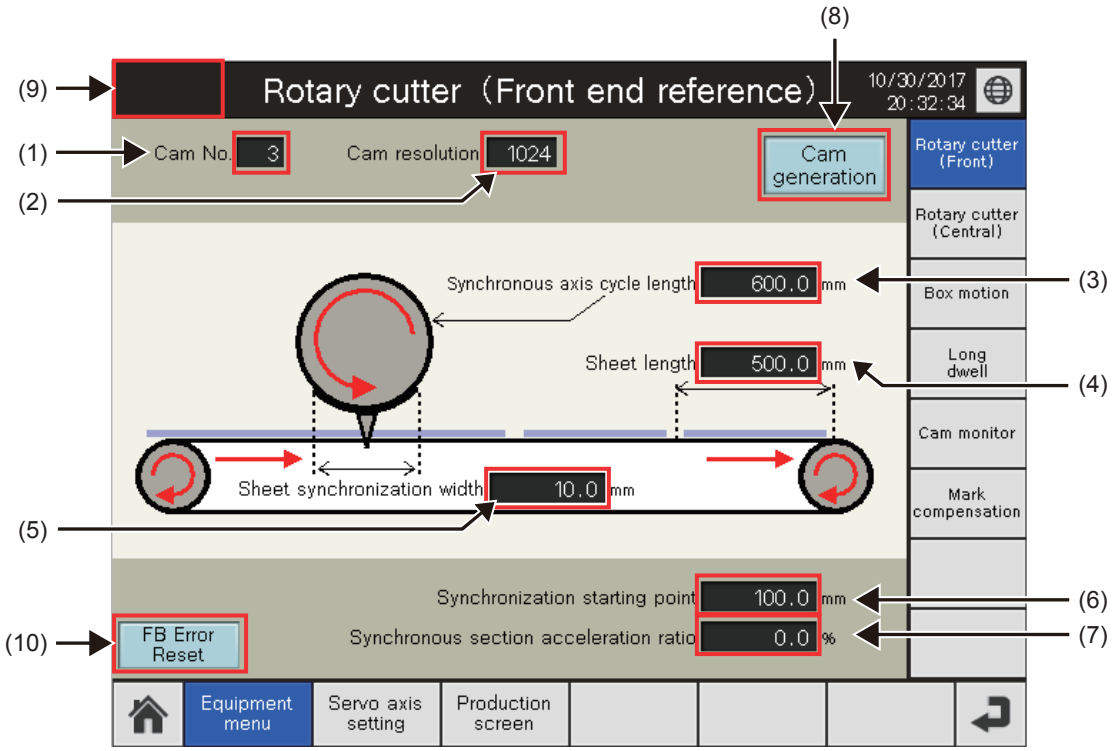
(4) Production screen switch

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

Equipment menu Rotary cutter (Front end reference) screen

Set parameters to generate cam patterns for the rotary cutter (front end reference).

Only Simple Motion module RD77MS is compatible with the rotary cutter (front end reference).



Rotary cutter (Front end reference) cam setting

(1) Cam No.

Sets the number of the cam to be generated for the rotary cutter (front end reference).

(2) Cam resolution

Sets the cam resolution to be generated for the rotary cutter (front end reference).

(3) Synchronous axis cycle length

Set the cycle length of the rotary cutter (front end reference).

(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 (Front end reference) 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

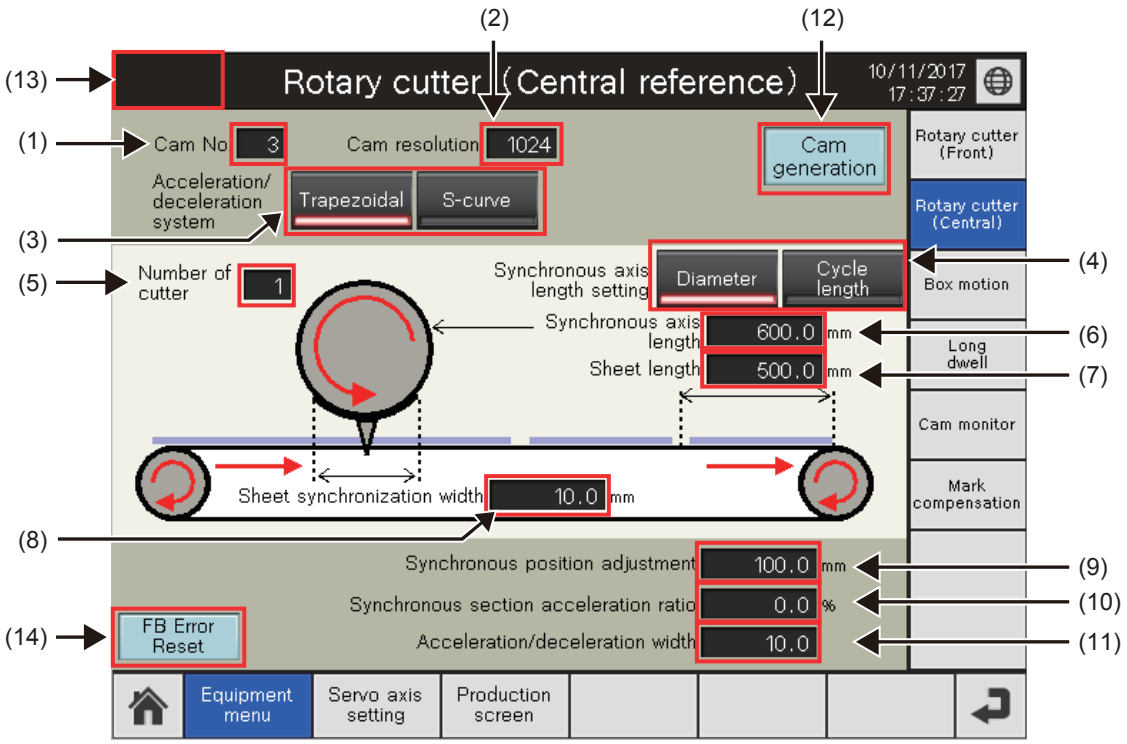
Touching this switch resets function block errors.

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

Equipment menu Rotary cutter (Central reference) screen

Set parameters to generate cam patterns for the rotary cutter (central reference).

Only Simple Motion module RD77GF is compatible with the rotary cutter (central reference).



Rotary cutter (Central reference) cam setting

(1) Cam No.

Set the number of the cam to be generated for the rotary cutter (central reference).

(2) Cam resolution

Set the cam resolution to be generated for the rotary cutter (central reference).

(3) Acceleration/deceleration system

Set the acceleration/deceleration system.

(4) Synchronous axis length setting

Set whether or not to generate the cam with the synchronous axis length in diameter/circumference.

(5) Number of cutter

Set the number of rotary cutters.

(6) Synchronous axis length

Set the axis length of the rotary cutter.

(7) Sheet length

Set the sheet length (cutting length).

(8) Sheet synchronization width

Set the synchronization length of the sheet.

(9) Synchronous position adjustment

Set the position adjustment of the synchronization start section.

Negative value: Set the synchronous section at the front of the sheet.

0: The center of the sheet is the synchronous section.

Positive value: Set the synchronous section at the end of the sheet.

(10) 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)"

(11) Acceleration/deceleration width

Set the sheet width (one side) of the acceleration/deceleration area.

Rotary cutter (Central reference) cam generation

(12) Cam generation switch

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

(13) Function block error display

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

(14) FB error reset

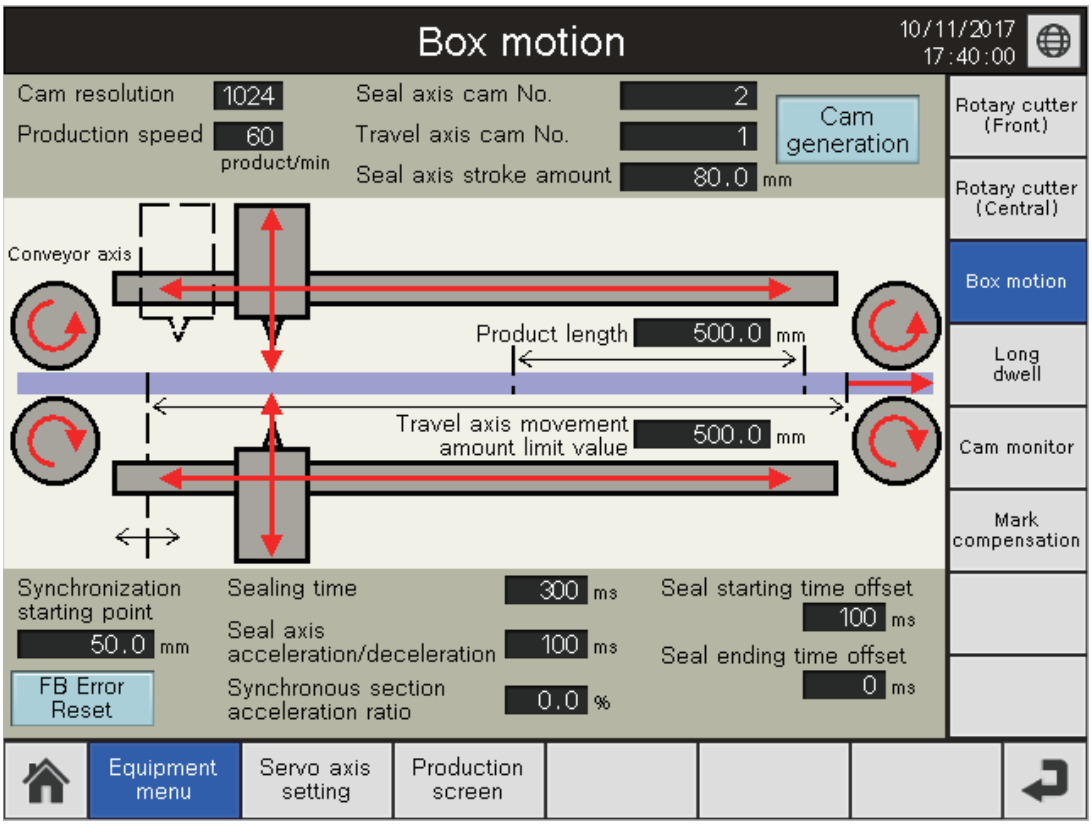
Touching this switch resets function block errors.

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

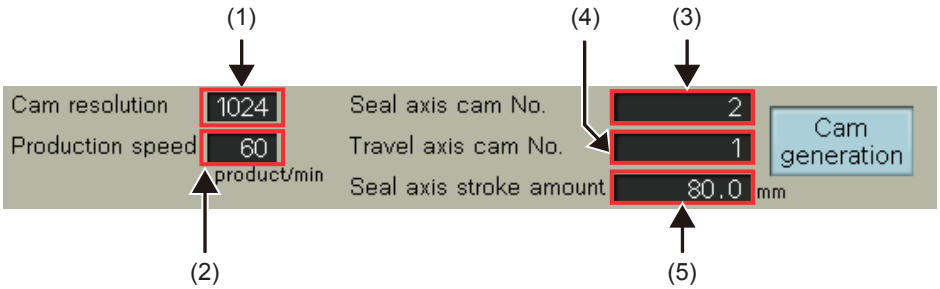
Equipment menu Box motion screen

Set parameters to generate cam patterns for the box motion.

This screen can be used in the box motion project.



Box motion cam setting



(1) Cam resolution

Set the resolution of the cam to be generated for the box motion.

(2) Production speed

Set the production speed.

(3) Seal axis cam No.

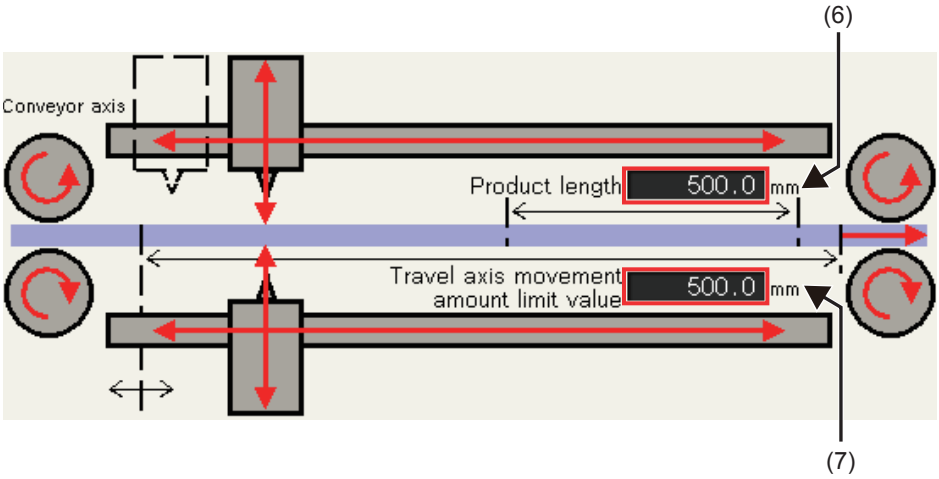
Set the number of the cam to be generated for (opening/closing) the seal axis in the box motion.

(4) Travel axis cam No.

Set the number of the cam to be generated for (traveling) the travel axis in the box motion.

(5) Seal axis stroke amount

Set the stroke amount of the seal axis.

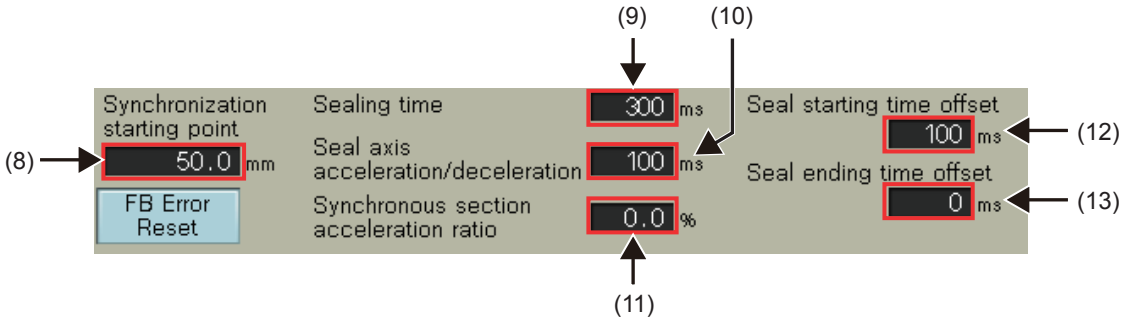


(6) Product length

Set the product length.

(7) Travel axis movement amount limit value

Set the movement amount limit value of the travel axis.



(8) Synchronization starting point

Set the synchronization starting point of the travel axis.

(9) Sealing time

Set the sealing time.

(10) Seal axis acceleration/deceleration

Set the acceleration/deceleration at opening/closing of the seal axis.

(11) Synchronous section acceleration ratio

Set the acceleration ratio of the synchronous speed of the travel axis.

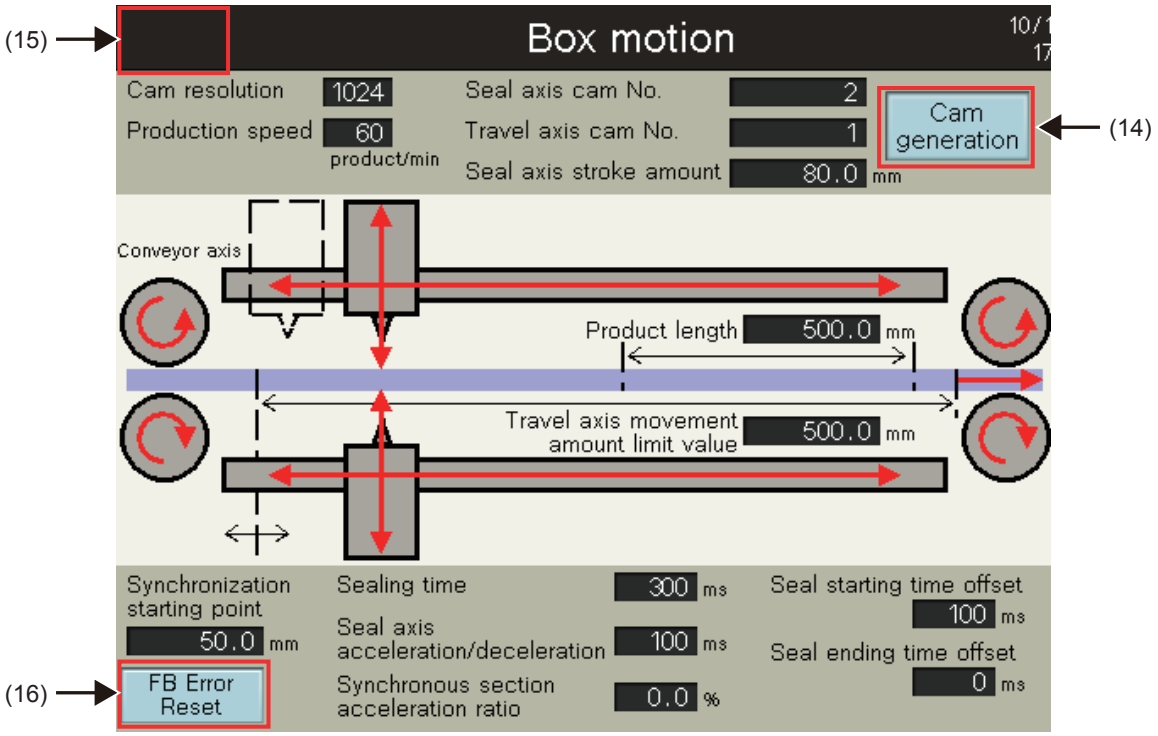
(12) Seal starting time offset

Set the offset amount of the timing to start sealing (synchronization start).

(13) Seal ending time offset

Set the offset amount of timing to end sealing (synchronization end).

Box motion cam generation



(14) Cam generation switch

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

(15) Function block error display

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

(16) FB Error Reset

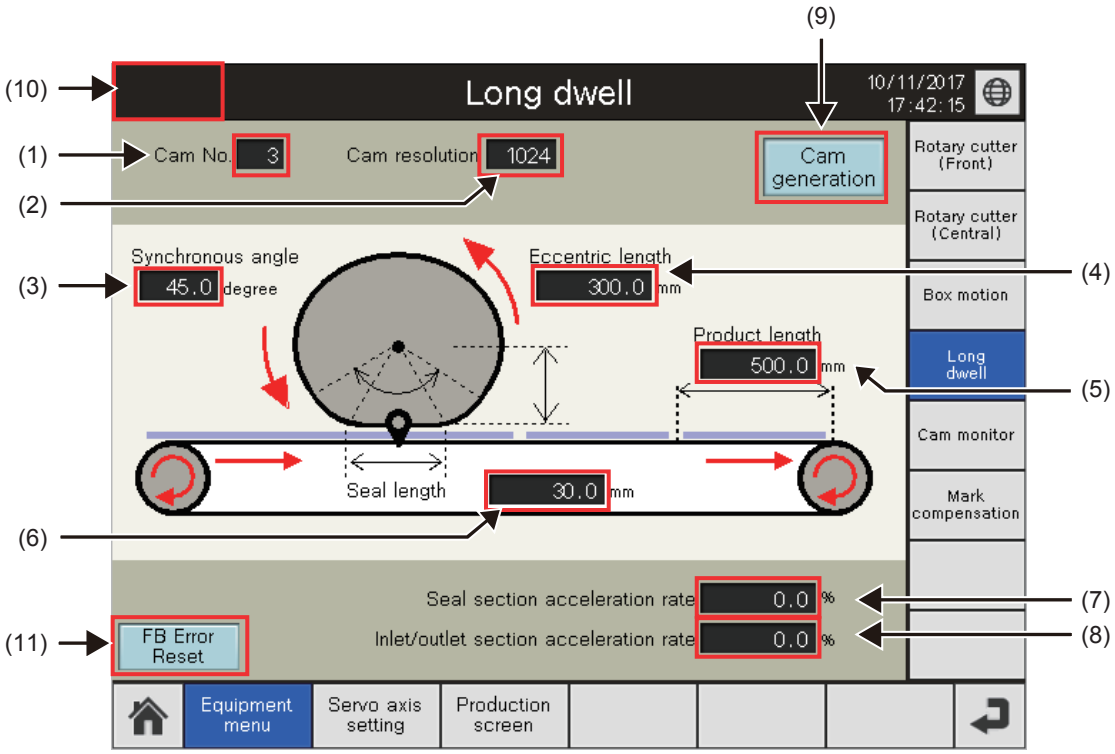
Touching this switch resets function block errors.

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.

This screen can be used in the long dwell project.



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

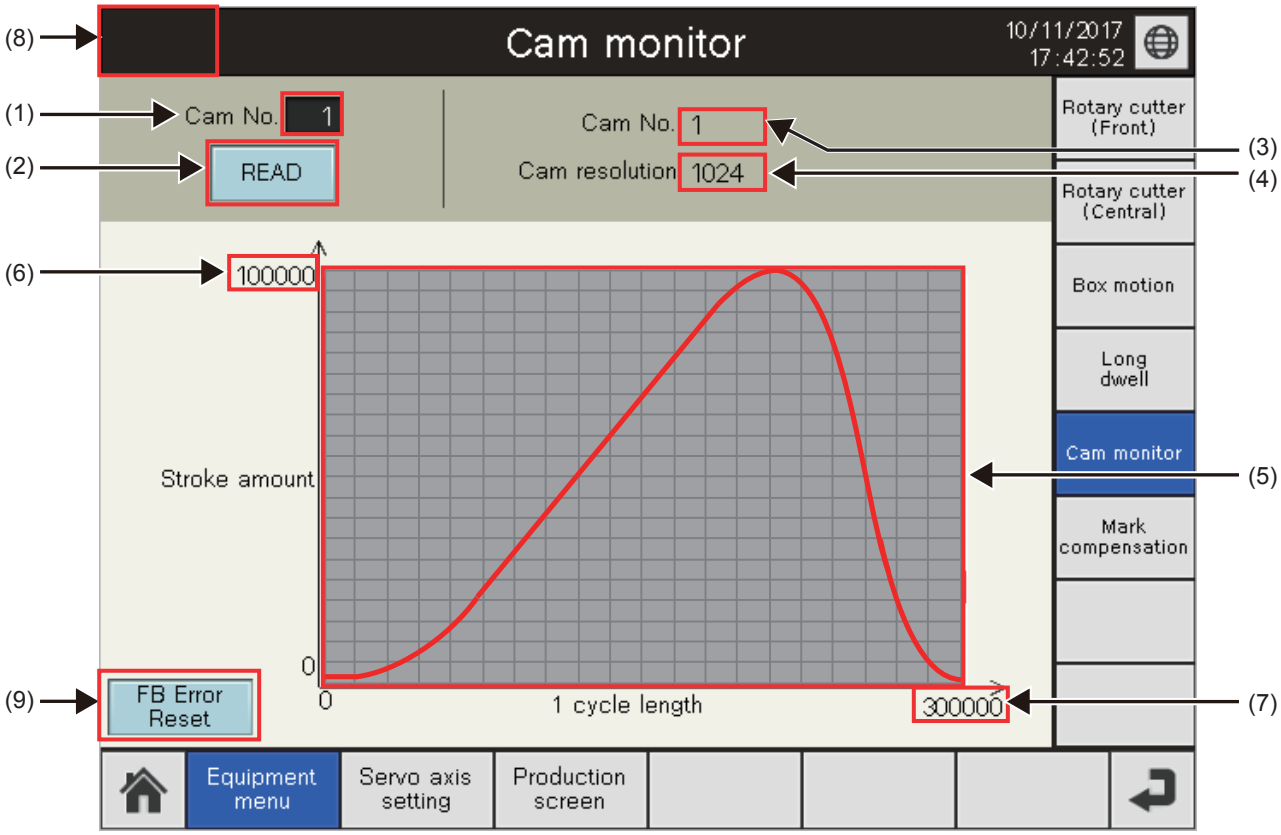
(11) FB error reset

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

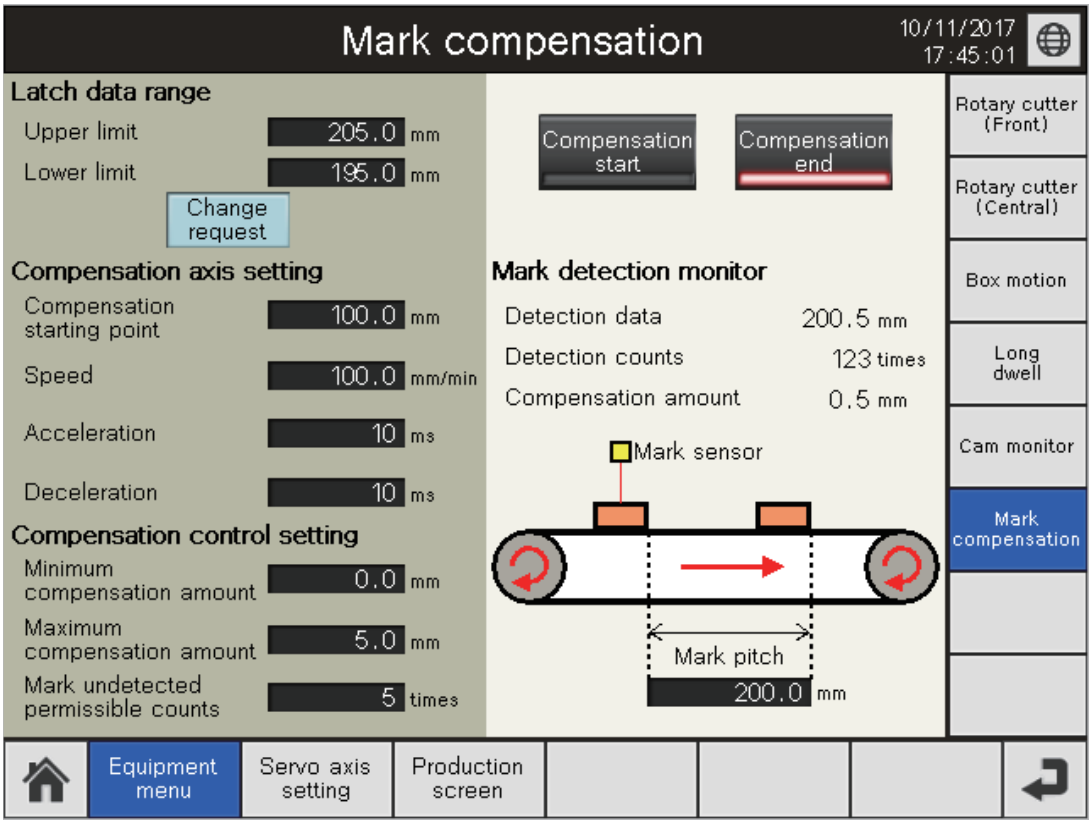
(9) FB Error Reset

Touching this switch resets function block errors.

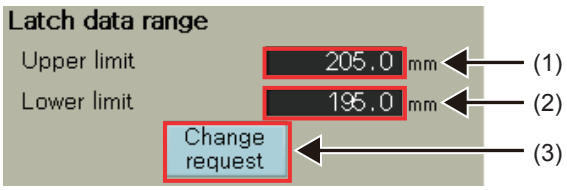
When an error occurs in CtrlOutputAxisSync (Output axis synchronized control), synchronization control is released via a reset operation.

Equipment menu Mark compensation screen

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



Latch data range



(1) Upper limit

Set the upper limit value of the mark detection range.

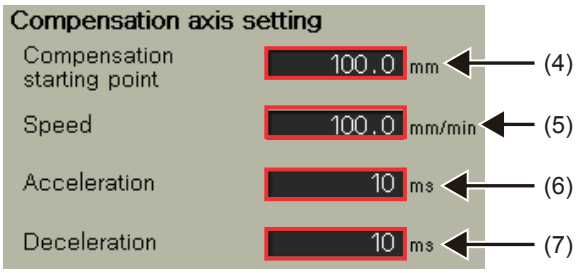
(2) Lower limit

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.

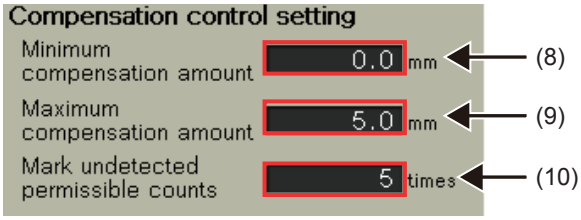
(6) Acceleration

Set the positioning acceleration time at compensation.

(7) Deceleration

Set the positioning deceleration time at compensation.

Compensation control setting



(8) Minimum compensation amount

Set the lower limit value of the compensation range.

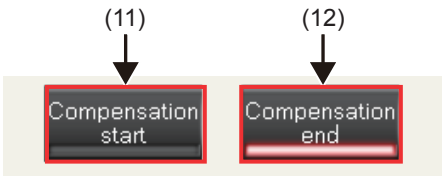
(9) Maximum compensation amount

Set the upper limit value of the compensation range.

(10) Mark undetected permissible counts

Set the permissible value of the mark undetected counts.

Compensation start/Compensation end



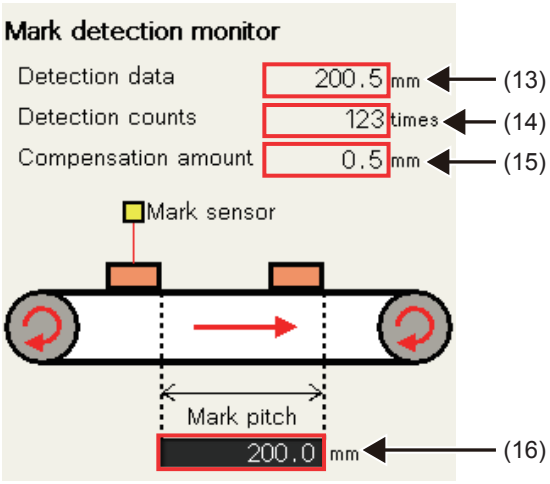
(11) Compensation start switch

Touching this switch starts the mark compensation control.

(12) Compensation end switch

Touching this switch stops the mark compensation control.

Mark detection monitor



(13) Detection data

Latch data at mark detection

(14) Detection counts

Counts of mark detections

(15) Compensation amount

Compensation amount calculated from the mark detection data

(16) Mark pitch

Set the distance between marks.

Error display

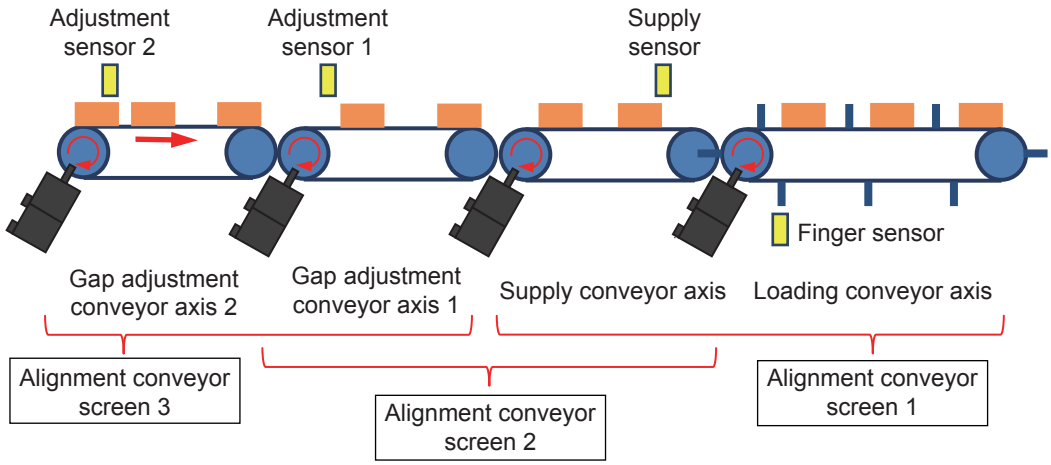
(17) Function block error display

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

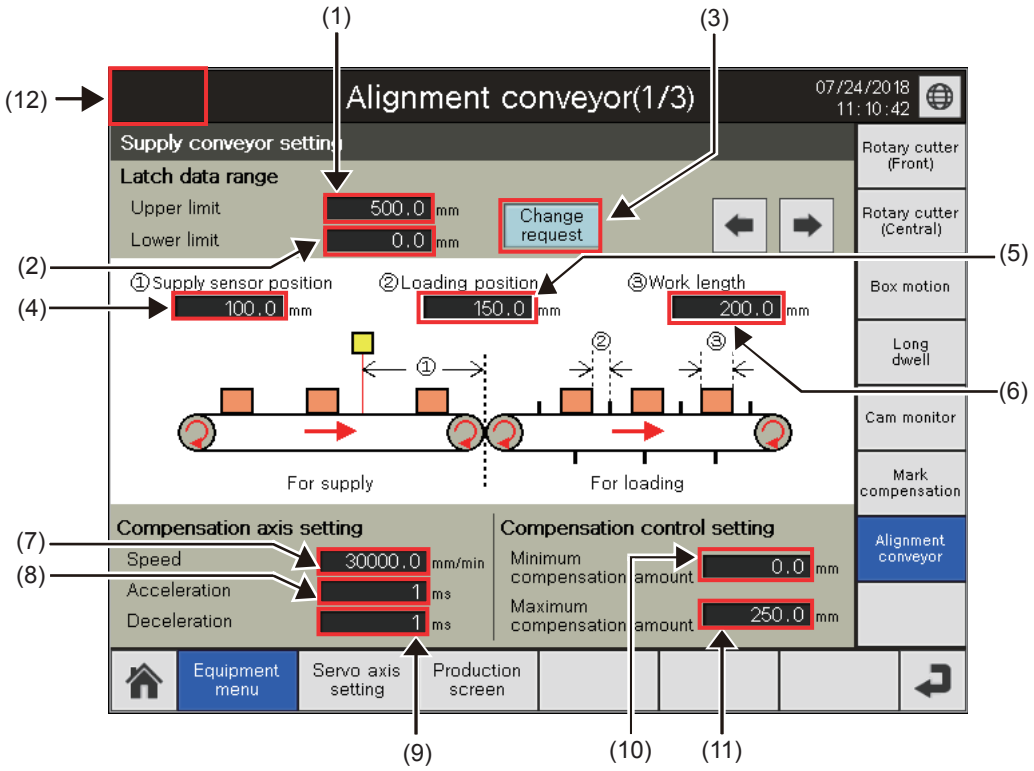
Equipment menu Alignment conveyor screen

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>



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.

Equipment setting

(4) 1) Supply sensor position

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

(5) 2) Loading position

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

(6) 3) Work length

Set the work length.

Compensation axis setting

(7) Speed

Set the speed at compensation.

(8) Acceleration

Set the acceleration time at compensation.

(9) Deceleration

Set the deceleration time at compensation.

Compensation control setting

(10) Minimum compensation amount

Set the minimum value of the compensation amount at compensation.

(11) Maximum compensation amount

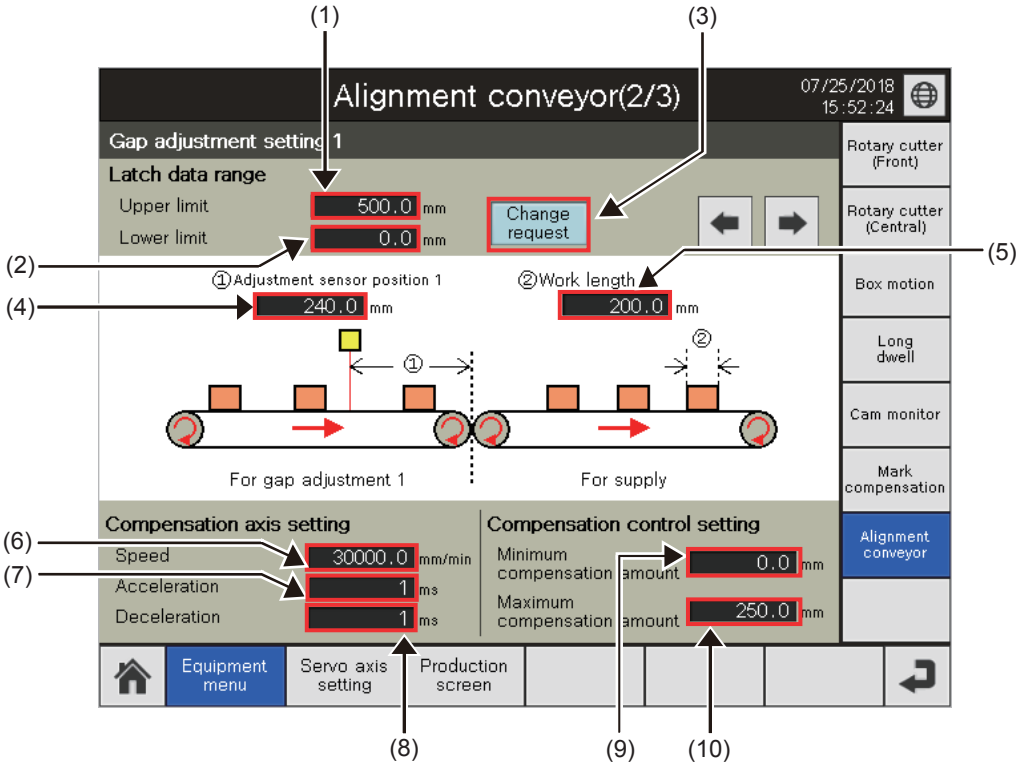
Set the maximum value of the compensation amount at compensation.

Error display

(12) Function block error display

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

<Alignment conveyor screen 2>



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.

Equipment setting

(4) 1) Adjustment sensor position

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

(5) 2) Work length

Set the work length.

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

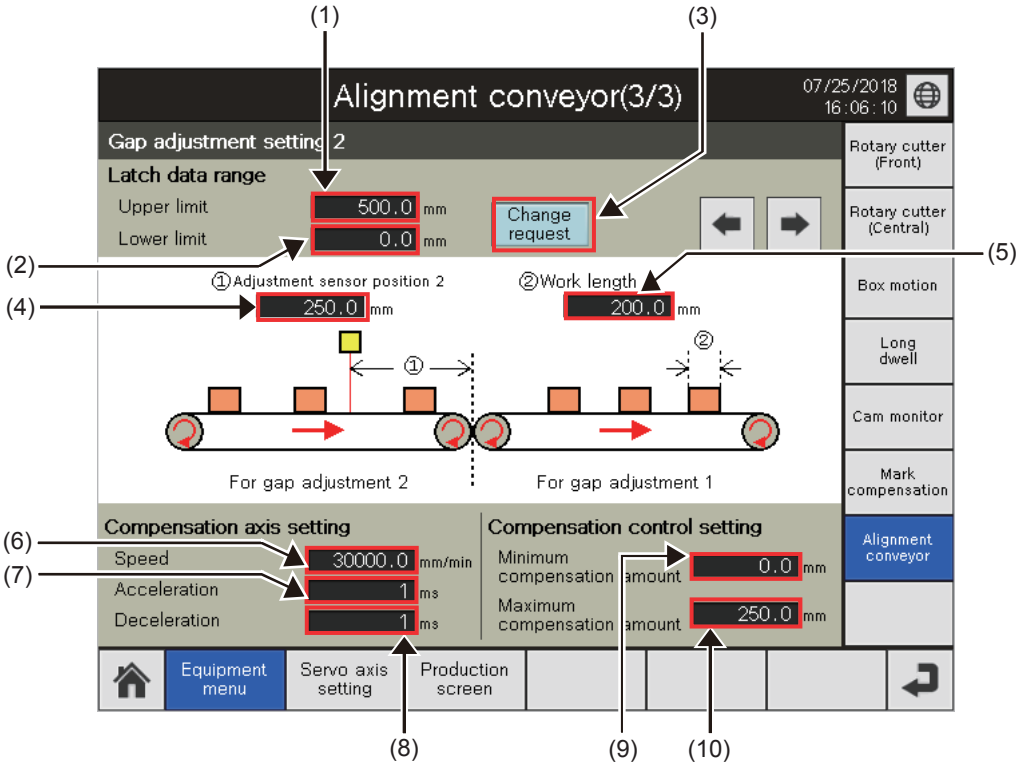
(9) Minimum compensation amount

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>



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.

Equipment setting

(4) 1) Adjustment sensor position

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

(5) 2) Work length

Set the work length.

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.

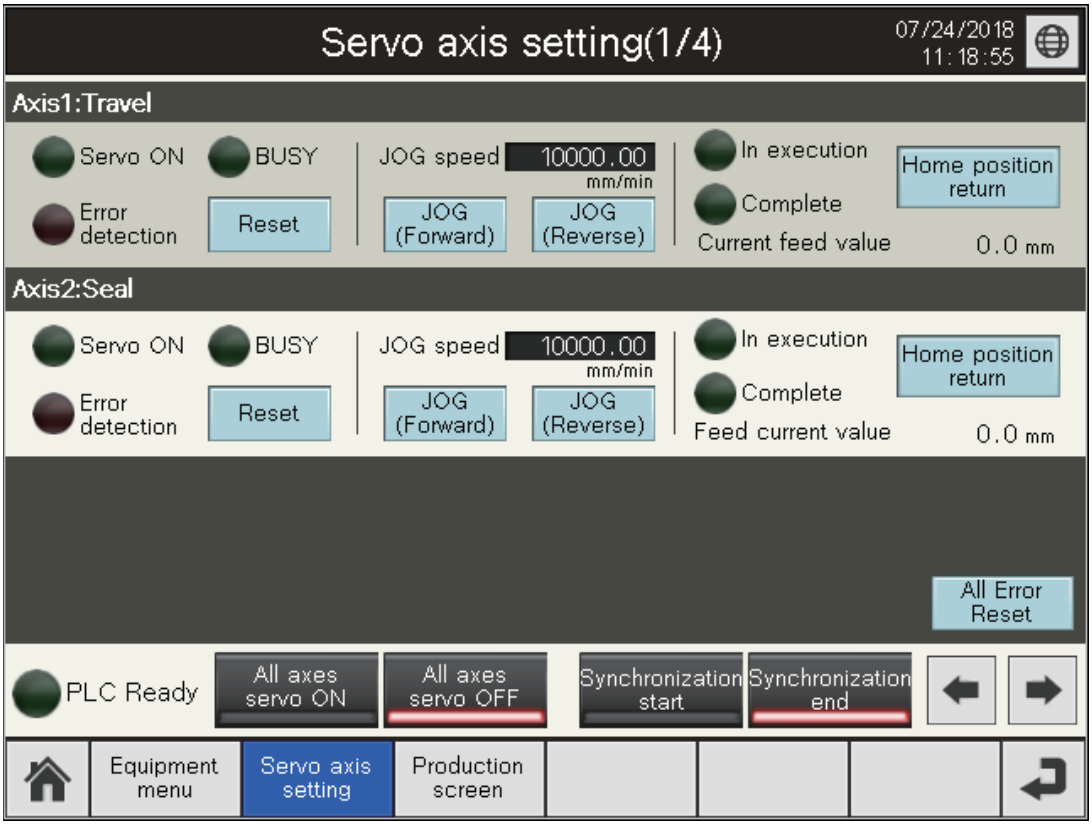
(10) Maximum compensation amount

Set the maximum value of the compensation amount at compensation.

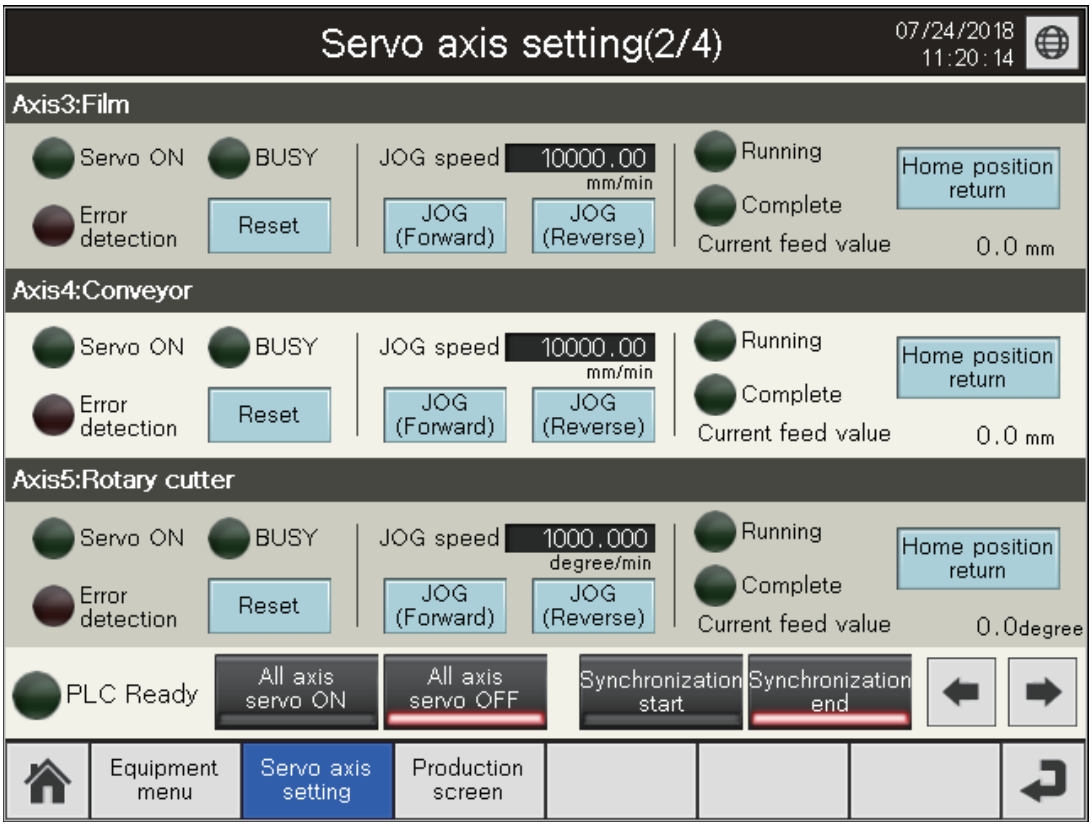
Servo axis setting screen

On this screen, users can start JOG operation and home position return and reset errors of each servo axis.
When using box motion, select servo axis setting screen 1 and 2, and when using long dwell, select servo axis setting screen 2 and 3.

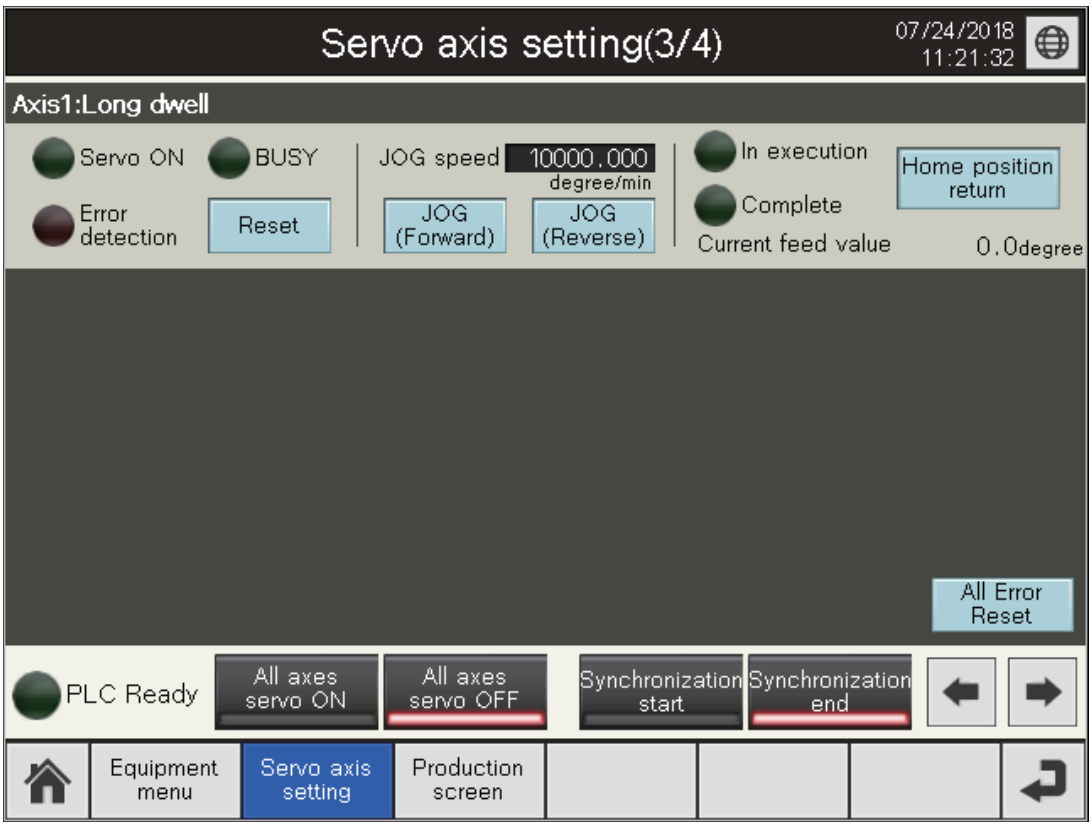
<Servo axis setting screen 1>



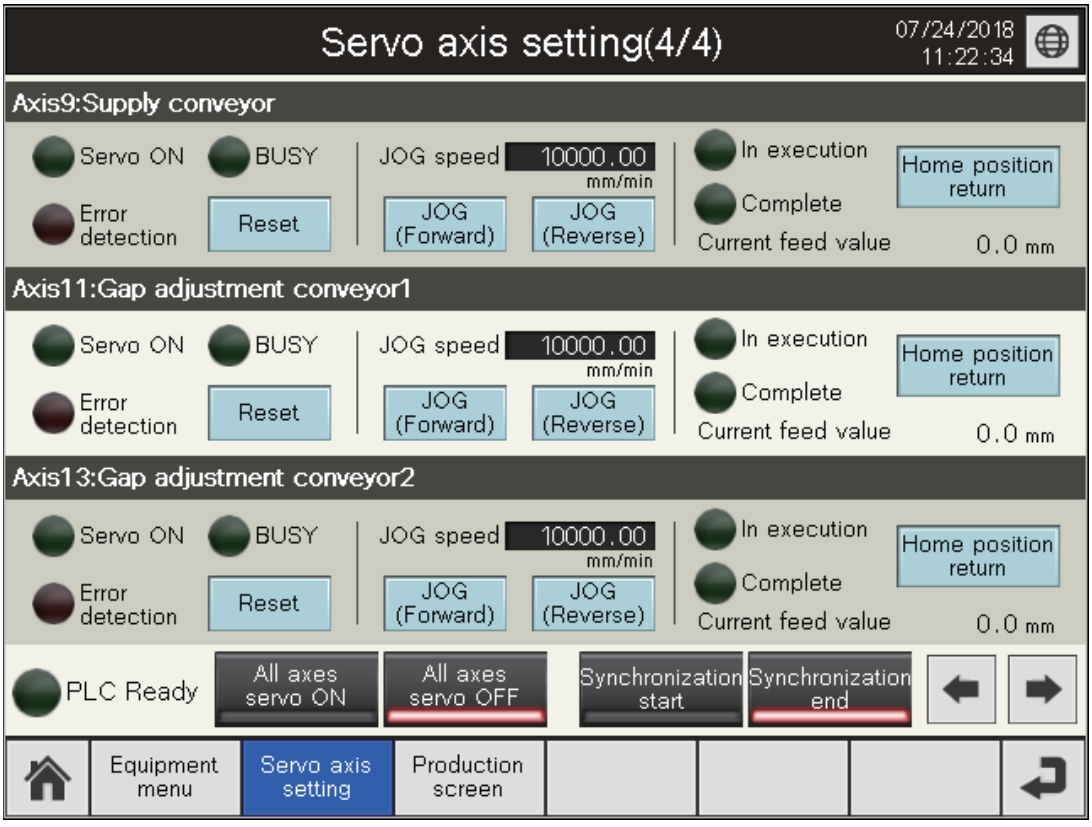
<Servo axis setting screen 2>



<Servo axis setting screen 3>



<Servo axis setting screen 4>

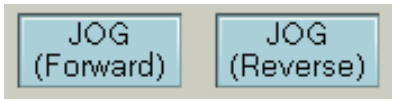


Each axis servo setting

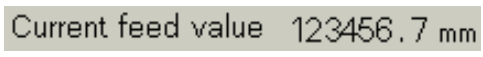
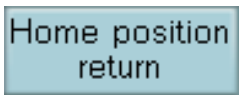
■Servo state

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

■JOG operation

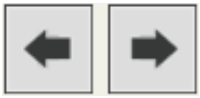
Display	Description
	[JOG speed setting] Set the JOG operation speed.
	[JOG operation switch] • JOG (Forward) On: JOG operation (forward run) starts. • JOG (Reverse) On: JOG operation (reverse run) starts.

■Home position return

Display	Description
	[Home position return in execution lamp] When the home position return is in execution: On When the home position return has stopped: Off
	[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 monitor] Current feed value
	[Home position return switch] On: The home position return starts.

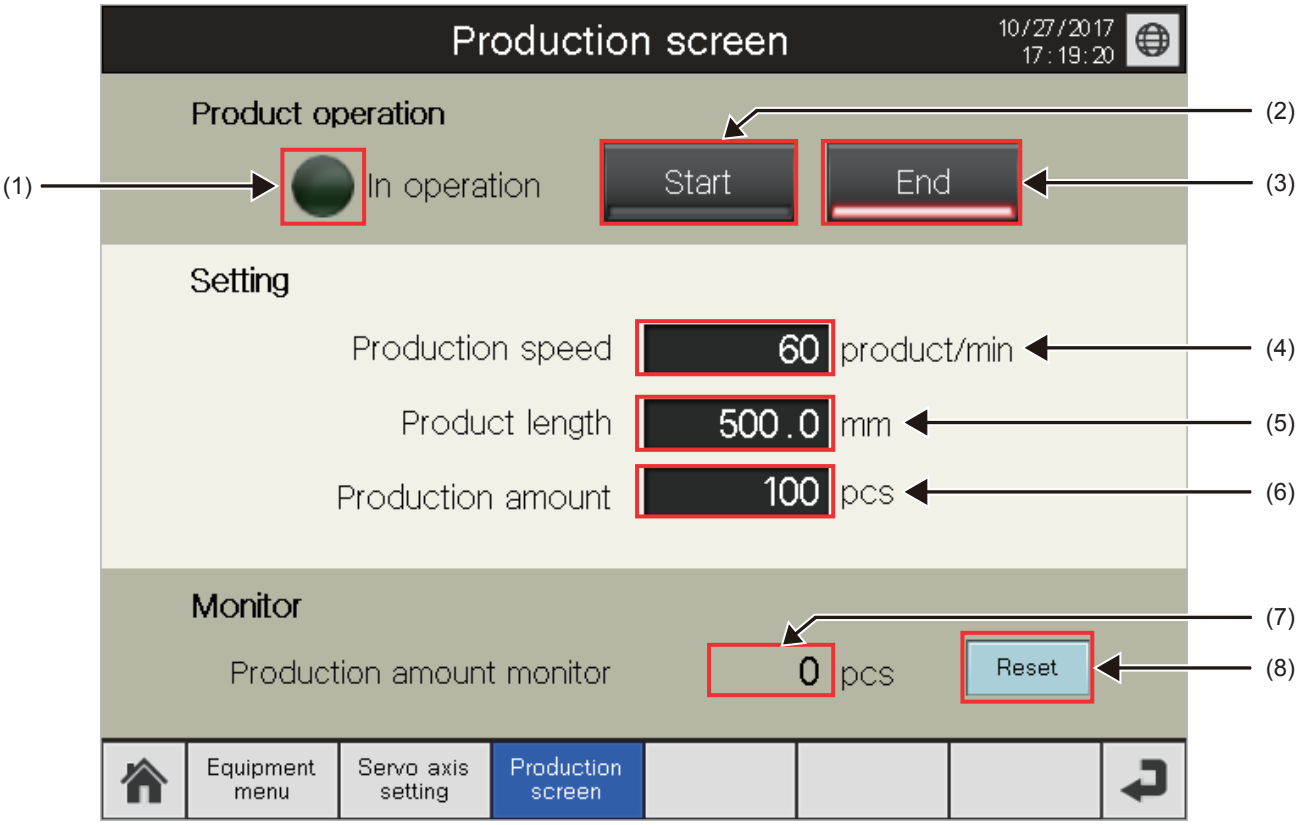
■All axes servo setting

Display	Description
	[PLC Ready indicator lamp] When PLC Ready is on: On When PLC Ready is off: 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.
	[Synchronization start/end switch] • Synchronization start On: Synchronous control start is on. • Synchronization end On: Synchronous control start is off.

Display	Description
	[Servo axis setting screen transition switches] Switches to the setting screen of the axis assigned in system configuration.
	[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.
In the project for the alignment conveyor, the product length is set to the length per cycle as default. Even if the product length is changed, the set value is ignored.
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).

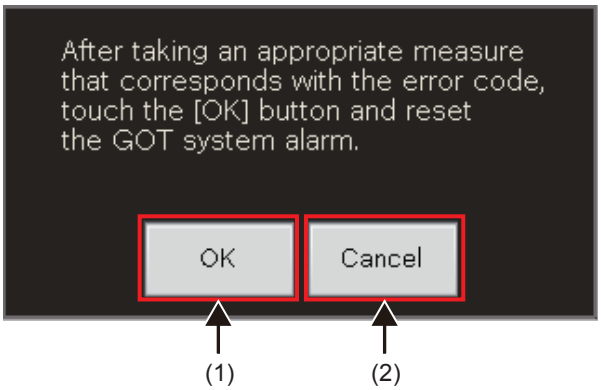
6.6 Window Screen

The following table lists window screens.

Screen No.	Screen title	Description	Reference
30000	GOT System Alarm Reset	GOT system alarm reset window screen	Page 196
30001	Language Setting	Language Setting window screen	Page 169
30002	Clock Setting	Clock Setting window screen	Page 170
30010	Key Window (Dec)	Numerical input [Decimal key window]	Page 166

GOT system alarm reset window screen

Resets a GOT system alarm.



When a GOT system alarm has occurred, touching the system alarm message display area (bottom of the screen) displays this screen.

Touching the [OK] switch resets the system alarm and closes the window screen.

Touching the [Cancel] switch closes the window screen without resetting the system alarm.

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 GOT devices

Type	Device number	Use
Bit	GB40	Always ON
Bit	GB30001	Clock Setting window display script (Initial setting (clock setting)) trigger
Bit	GS512.b0	Time change information
Bit	GD30031.b13	System signal 1-1 GOT error reset signal
Word	GD30000	Base screen switching device
Word	GD30001	Overlap window screen 1 switching device
Word	GD30004	Overlap window screen 2 switching device
Word	GD30016	Superimposed window 1 switching device
Word	GD30018	Dialog window screen switching device
Word	GD30031	System signal 1-1
Word	GD30041	System signal 2-1
Word	GD30060 to GD30065	Date and time adjustment switch
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.

ErrID		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.	
2105H	8453	A value outside the range has been set as the travel axis cam No.	
2106H	8454	A value outside the range has been set as the seal axis cam No.	
2107H	8455	A single value has been set as both the travel axis cam No. and seal axis 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.	
210EH	8462	A value outside the range has been set as the production speed.	
210FH	8463	A value outside the range has been set as the product length.	
2110H	8464	A value outside the range has been set as the travel axis movement amount limit value.	
2111H	8465	A value outside the range has been set as the seal axis movement amount.	
2112H	8466	A value outside the range has been set as the sealing time.	
2113H	8467	A value outside the range has been set as the seal axis acceleration/deceleration.	
2114H	8468	A value outside the range has been set as the seal time offset.	
2115H	8469	The calculated cam stroke amount for the travel axis has exceeded the travel axis movement amount limit value.	Although the cam data at occurrence of this warning can be used, ensure the safety before operation.

ErrID		Description	Corrective action
HEX	DEC		
2116H	8470	A value outside the range has been set as the main input axis cycle starting point.	Check the setting and execute the FB again.
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.
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".	
212FH	8495	A value outside the range has been set as the travel axis No.	
2130H	8496	A value outside the range has been set as the seal axis No.	
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.	
2134H	8500	A single value has been set as both the travel axis No. and seal axis No.	
2135H	8501	The value set in "[Pr.1] Unit setting" of the travel axis and the value set in "[Pr.1] Unit setting" of the seal 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".
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 radius.	
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 radius and set a smaller sealing angle to satisfy the following conditional expression. • i_eSyncAngle ≥ 2 * atan(i_eSealLength / (2 * i_eEccentricRadius))
2147H	8519	The synchronization length exceeded the product length.	Increase the product length or review the D-cam parameter.

ErrID		Description	Corrective action
HEX	DEC		
214AH	8522	A value outside the range has been set for the sensor position.	Check the setting 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".	
2150H	8528	A value outside the range has been set as the synchronous section position adjustment.	
2151H	8529	A value outside the range is set as the auto-generation option.	
2152H	8530	A value outside the range has been set as the acceleration/ deceleration width.	
2153H	8531	A value outside the range has been set as the number of cutters.	
2154H	8532	The FB in use is different.	Use an FB that is compatible with the Simple Motion used.

FB library: Error

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

ErrID		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 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.
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. • Output axis synchronization starting point • Output axis synchronization ending point • Output axis movement amount limit value • Main input axis synchronization starting point
2201H	8705	The value of the mark undetected counts has exceeded the mark undetected permissible counts.	• Check the mark status. • Check for a sensor failure or disconnection.
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.
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".
2206H	8710	The seal starting time offset value has exceeded the travel axis synchronization starting point value.	Set a smaller value as the seal starting time offset value or a lager value as the travel axis synchronization starting point to satisfy the following conditional expression. • i_dSealStartTimingOffset × {i_uProductPerMinute/(60 × 1000) × i_eProductLength} < i_eSyncStartPoint × 2

ErrID		Description	Corrective action
HEX	DEC		
2207H	8711	The value converted into the travel axis from the travel axis synchronization ending point has exceeded the travel axis movement amount limit value.	Adjust the following parameters to satisfy the following two conditional expressions. 1) Set a larger value as the travel axis movement amount limit value. 2) Set a smaller value as the travel axis synchronization starting point. 3) Set a smaller value as the synchronous section. a) Set a smaller value as the travel axis synchronous section acceleration ratio. b) Shorten the seal axis acceleration/deceleration. c) Shorten the sealing time. d) Set a smaller value as the product length. e) Set a smaller value as the production speed. • i_eSyncStartPoint < i_eTravelAxisMaxLength • i_eSyncStartPoint + {i_udSealingTime + i_udSealAxisMoveTime × 2} × {i_uProductPerMinute/(60 × 1000) × i_eProductLength} × (1 + i_eSyncSectionAccRatio/100) < i_eTravelAxisMaxLength
2208H	8712	The seal axis deceleration ending point has exceeded the product length.	Adjust the following parameters to satisfy the following conditional expression. 1) Set a smaller value as the synchronous section. a) Shorten the seal axis acceleration/deceleration. b) Shorten the sealing time. c) Set a smaller value as the production speed. 2) Set a larger value as the product length. 3) Set a smaller negative value or a positive value as the seal starting time offset. 4) Set a smaller negative value or a positive value as the seal ending time offset. • i_eSyncStartPoint × 2 + {i_udSealingTime + i_udSealAxisMoveTime × 2} × {i_uProductPerMinute/(60 × 1000) × i_eProductLength} < i_eProductLength
2209H	8713	A value larger than the number of coordinates of the cam data generated for the box motion 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 ≤ {i_eProductLength - (i_udSealingTime + i_udSealAxisMoveTime × 2) × (i_uProductPerMinute/(60 × 1000) × i_eProductLength)} × UCC*1 • i_uCamResolution ≤ {(i_udSealAxisMoveTime × 2) × (i_uProductPerMinute/(60 × 1000) × i_eProductLength)} × UCC*1
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
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 < {i_eMainInputAxisCycleEndPos - i_eMainInputAxisStartPos - (i_eOutputAxisSyncEndPos - i_eOutputAxisSyncStartPos)/(1 + i_eSyncSectionAccRatio/100)} × UCC*1
F000H	61440	The module set in the start I/O number setting is not the iQ Monozukuri-compatible Simple Motion module.	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 is set for the start I/O number.	Check the setting and execute the FB again.

ErrID		Description	Corrective action
HEX	DEC		
F003H	61443	The module set in the start I/O 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.

ErrID		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 has been set as the start I/O 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.

ErrID		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.

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.

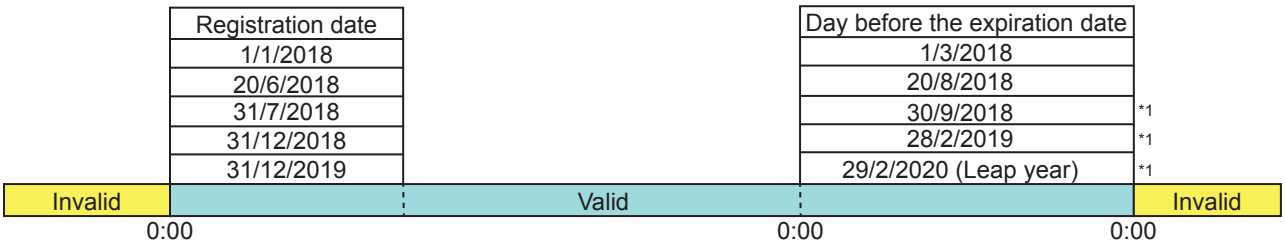
Function		Version	Reference
The standard Simple Motion module can be used by registering a license key.		Version 1.001B or later	Page 29 SETTING AND PROCEDURE BEFORE OPERATION
FB	STD_MakeRotaryCutterCam+RD77GF is added.		Page 57 Details of the FB Library Page 104 APPLICATION PROGRAM EXAMPLE
	PAC_MakeLongDwellDCam is added.		
The subroutine type is supported for the compile method of FB library.			Page 57 Details of the FB Library
FB	PAC_CalcGap is added.	Version 1.002C or later	Page 57 Details of the FB Library
	PAC_CalcPhase is added.		Page 104 APPLICATION PROGRAM EXAMPLE
FB	Invalid (-1) for the input label "Compensation starting point" of STD_CtrlAuxiliaryAxis has been added.		Page 57 Details of the FB Library
A temporary license is available before a license key is obtained.		Version 1.003D or later	Page 29 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 57 Details of the FB Library
The data type of the AXIS_REF structure member (label) is changed.*1		Version 1.005F or later	Page 57 Details of the FB Library

*1 When updating a project of version 1.004E or earlier to 1.005F or later, replace the project.
For details, refer to the following.
☞ Page 37 Upgrading the Library Version

A

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).



*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-PAC002AA_R16_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-PAC002AA_R16_LicWrite.gx3) in the supplied DVD to a folder on the personal computer, then open the file.

The project is created for the R16CPU. When using a model other than R16CPU, 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.

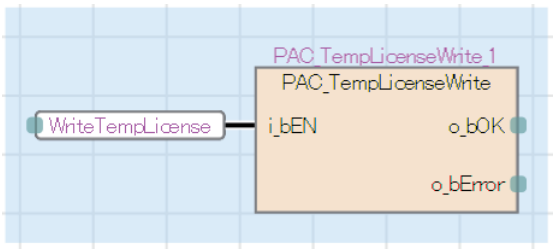
Point

- 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 206 Troubleshooting)

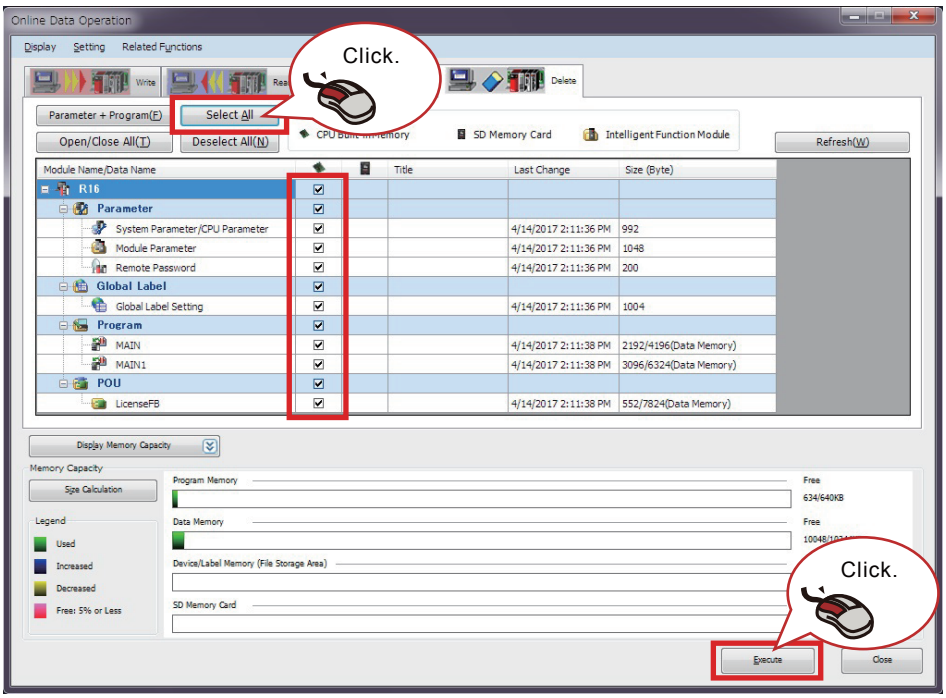
When Normal operation (o_bOK) turns on, the license key registration is completed. Turn off the execution flag (WriteTempLicense).



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.	• The license key registration area has never been formatted. • The license key outside the range of the memory was about to be written.	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.	<When the temporary license is valid> Continue to use the temporary license. <When the temporary license is expired> Get a license and register the license key by using "PAC_LicenseWrite".
After "PAC_TempLicenseWrite" is executed, neither Normal completion (o_bOK) nor Error completion (o_bError) turns on.	• The PLC CPU module is not in the RUN state. • "Macro type" is not specified for "FB type" of the license key registration FB.	• Set the PLC CPU module to the RUN state. • Specify "Macro type" for "FB type" of the license key registration FB.

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

INSTRUCTION INDEX

MEMO

REVISIONS

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

Revision date	*Manual number	Description
July 2016	BCN-B62005-762-A	First edition
November 2017	BCN-B62005-762-B	■Added models RD77GF ■Added functions Standard Simple Motion modules are available by license key registration, FBs are added (Cam auto-generation for rotary cutter (central reference), Cam auto-generation for D-cam) and program examples are added (long dwell). ■Added or modified parts RELEVANT MANUALS, TERMS, REQUESTING AND REGISTERING A LICENSE KEY, Section 1.4, 1.5, 1.6, 1.7, Chapter 2, Section 2.1, 2.2, 2.4, 3.1, 3.2, 4.1, 4.2, Chapter 5, Section 5.1, 5.2, 5.3, 5.4, Chapter 6, Section 6.1, 6.3, 6.4, 6.5, 6.7, Appendix 1, 2, TRADEMARKS
August 2018	BCN-B62005-762-C	■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). ■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, Appendix 1, 2
October 2018	BCN-B62005-762-D	■Added functions A temporary license is available before a license key is obtained. ■Added or modified parts TERMS, Section 2.1, 2.3, 2.4, 4.1, 6.5, Appendix 2, 3
July 2019	BCN-B62005-762-E	■Added or modified parts Section 1.7, 2.1, 4.1, 4.2, 5.1, 5.2, Appendix 2
September 2019	BCN-B62005-762-F	■Added or modified parts Section 1.7, 2.3, 4.1, 4.2, 4.3, 5.1, 5.2, 5.4, Appendix 2

WARRANTY

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-B62005-762-F(1909)

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