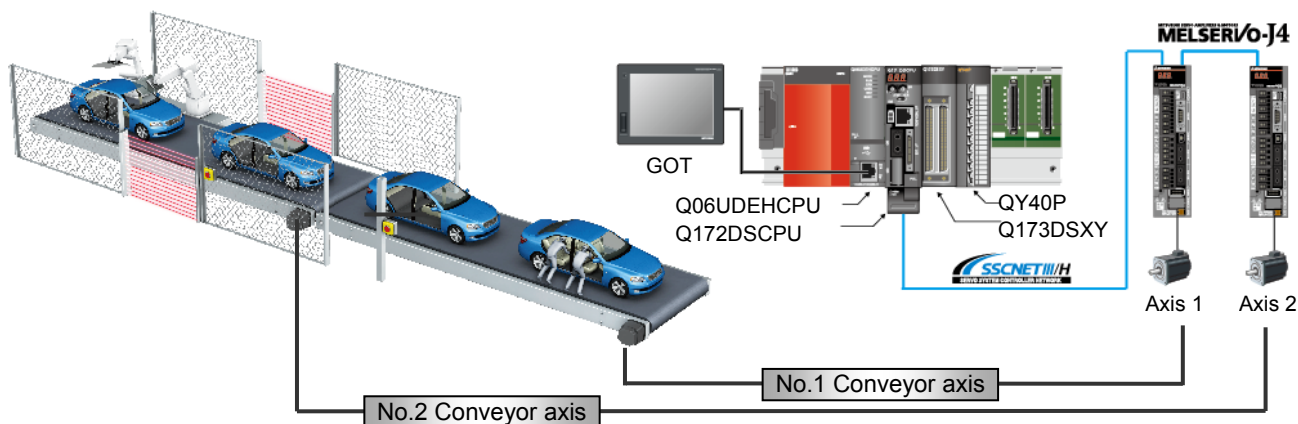


# Conveyor System Utilizing Safety Observation Function

## [System Configuration]



## [Mitsubishi solution]

Motion CPU: Q172DSCPU

PLC CPU: Q06UDEHCPU

Main base: Q35DB

Engineering environment: MELSOFT MT Works2 (Motion), MELSOFT GX Works2 (PLC), MELSOFT GT Works3 (GOT)

Motion CPU operating system software: SW8DNC-SV22QL

Safety signal module: Q173DSXY

GOT: GT16\*\*-V

Output module: QY40P

Servo amplifier: MR-J4-B

Servo motor: HG-SR

## [Operation description]

Our Motion Controllers have obtained the European Safety Standard "EN ISO13849-1: 2008 Category 3 PLd" Certification. To demonstrate, the included sample program uses the safety observation function, which allows for safety control to be utilized in shutting off power to hazardous machine driven parts, via emergency stop, light curtain, etc. inputs.

## [Control points]

Point1: Through redundant use of safety signals (emergency stop, light curtains, power shut off signals, etc.), the Motion CPU and PLC CPU compare, with each other, the received safety signals, and are able to monitor the correlation between the two signals.

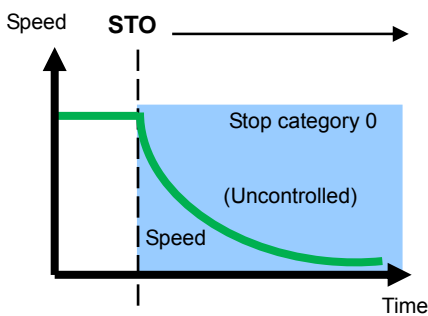
Point2: Since PLC program based safety circuits can be freely created by the user, addition and adjustment of circuits becomes easy. Also, since both regular motion control and safety control can be done on the same shared base rack, a compact system configuration can be realized.

Point3: Using the speed observation function, speed monitoring can be carried out at a user set speed (safety speed), which takes into account the safety level of the machine. Even when doing work (machine maintenance, initial setup, etc.) on the part of the machine portion under safety surveillance, the machine can still be in safety monitoring status without having to purposely cut the power to the moving portions.

Point4: The machine can be stopped according to any of the Stop Categories (listed below) suitable for the application. Based on type of safety stop during Servo ON, the axis sync status can be held when the safe stop is applied. Therefore, operation can be quickly resumed (from the held sync point), allowing for improved safety in combination with improved production.

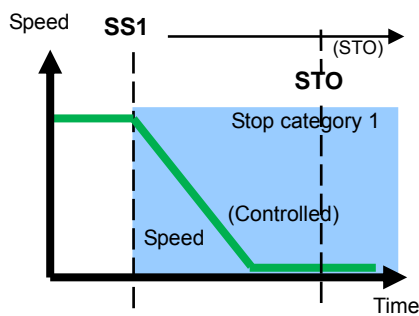
### Stop category 0

Stopping where Driving Power Source is Immediately Cut  
"Uncontrolled (Free Running) Stop"



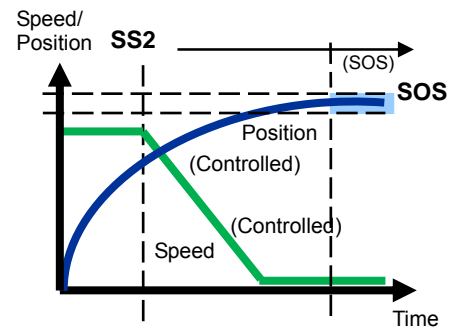
### Stop category 1

Driving Power is supplied until complete stop. After, power source is cut, and then stop.  
"Controlled Stop"



### Stop category 2

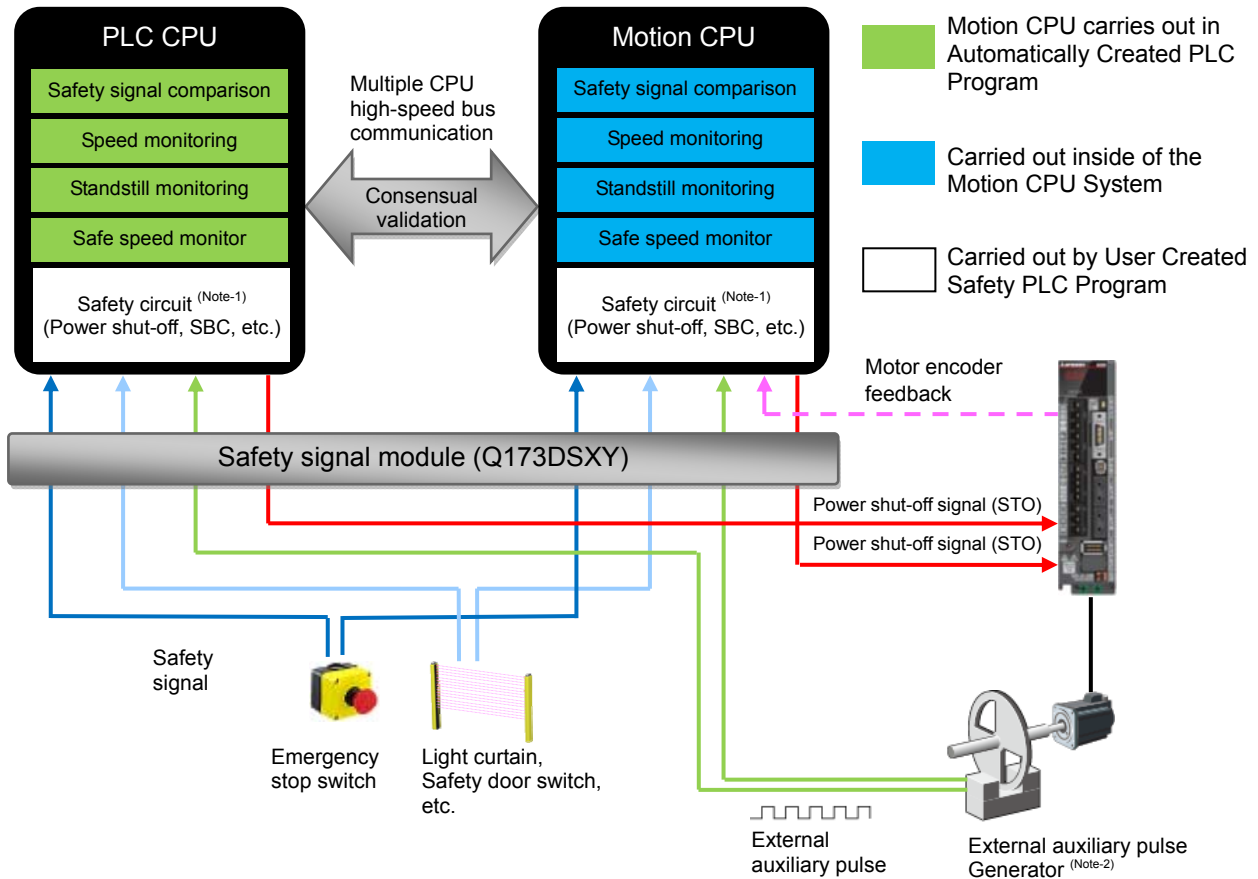
Stopping where Driving Power is Still Continuously Supplied  
"Controlled Stop"



Safety Category IEC/EN 61800-5-2

Item	Safety function name	Description
STO	Safe torque off	Energy shut-off to servo motor
SS1	Safely stop 1	Energy shut-off to servo motor after control stop
SS2	Safely stop 2	Control stop without shut-off
SOS	Safely operating stop	Standstill monitoring
SLS	Safely-limited speed	Speed monitoring
SSM	Safe Speed Monitor	Output signal for servo motor at specified speed
SBC	Safe Break Control	Safety break control

## [Safety Observation Function configuration]



(Note-1): The safety circuit is created using GX Works2, where the same sequential programming logic is written to the PLC CPU and the Motion CPU.

(Note-2): Separate from the motor encoder, make sure prepare the external encoder, or the rotation detection pulse signals used with proximity sensors or general photo-optic sensor.

### ⚠ Cautions

- When diverting the sample program to the actual system, be sure to verify that there are no problems with control in the system.
- Add interlock conditions in the target system where considered necessary.
- This sample program was created to describe the safety monitoring function. If you apply this sample program to the actual system, safety will not be collateral. Also about the programs used for safety observation function, execute the design and verification along safety life cycle (V model).

**[GOT Sample screen]**

[GOT: Controller Setting]

Manufacturer: MITSUBISHI

Controller Type: MELSEC-QnU/DC, Q17nD/M/NC/DR, CRnD-700

I/F: Standard I/F(Ethernet): Multi

Driver: Ethernet(MELSEC), Q17nNC, CRnD-700

Property	Value
GOT NET No.	1
GOT PLC No.	1
GOT IP Address	192.168.3.18
IP Label	
Subnet Mask	255.255.255.0
Default Gateway	0.0.0.0
Ethernet Download Port No.	5014
GOT Communication Port No.	5001
Retry(Times)	3
Startup Time(Sec)	3
Timeout Time(Sec)	3
Delay Time(x10ms)	0

When using the safety speed monitoring function, do not connect the GOT to the bus. If connected to a bus, the speed monitoring may not operate normally.

[GOT Home screen]

MITSUBISHI ELECTRIC MELSERVO-J4 Solutions  
Changes for the Better Conveyor System Utilizing Safety Observation Function

Conveyor System Utilizing Safety Observation Function

Japanese  
English

Home Main Safety Parameters

Language Selection

Screen Selection

[GOT Main Screen]

**Conveyor Switch**  
When ON is pressed, both Conveyor 1 and 2 will start to move. When ON is pressed again, they will come to a stop.

**Current Speed Monitor**  
Displays each axes current speed.

**Amp. Status Lamps**  
Status of various signals and the different safety monitoring functions are displayed.

**Encoder Check Switch**  
Has the machine operate at small oscillation for checking the encoder during standstill monitoring.

**JOG Operation Switch**  
Operates the JOG operation on each axis in the forward or reverse direction.

**Conveyor System Utilizing Safety Observation Function**

**Conveyor Start** OFF

**Error Reset** OFF

**Current speed**  
Conveyor1: 0 mm/min  
Conveyor2: 0 mm/min

**Shut-off signal (STO)**

**Error Status**

**Safety observation error**

**Speed Monitoring**

**Standstill Monitoring**

**Encoder check request**

**JOG Speed** 0 mm/min

**JOG**  
CV1 FWD CV1 REV CV2 FWD CV2 REV

**Encoder check** OFF

**Home** **Main** **Safety Parameters**

[GOT: Safety Parameters]

Compare and verify the set values with the screen displayed values.

**MITSUBISHI ELECTRIC MELSERVO-J4 Solutions**  
Conveyor System Utilizing Safety Observation Function

Safety signal comparison  
Safety Signal Mismatch Allowance Time 0.0[s]

Speed monitoring parameter

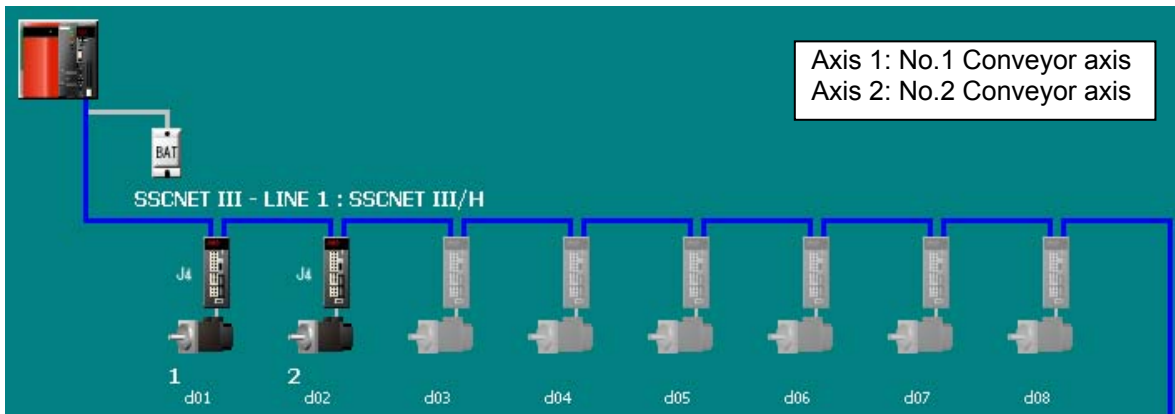
Item	Block No.1	Block No.2	Unit
Speed Monitor Axis No.	0	0	-
Speed Monitoring Error Detection	0	0	[ms]
Axis Unit Setting	mm	mm	-
Number of Pulses per Motor Rotation	0	0	[pulse]
Travel Value per Motor Rotation	0	0	[ $\times 10^{-1}$ $\mu$ m]
Motor Encoder Resolution	0	0	[pulse]
Number of Pulses per Aux. Pulse Rotation	0	0	[pulse]
Travel Value per Aux. Pulse Rotation	0	0	[ $\times 10^{-1}$ $\mu$ m]
Safety Speed	0	0	[ $\times 10^{-2}$ mm/min]
Safety Motor Speed	0	0	[ $\times 10^{-1}$ r/min]
Allowance value of position deviation	0	0	[ $\times 10^{-1}$ $\mu$ m]
Allowance Speed Deviation Value	0	0	[ $\times 10^{-2}$ mm/min]
SSM Hysteresis Width	0	0	[ $\times 10^{-2}$ mm/min]
SSM Output Y Device Number	0	0	-
Auxiliary Pulse Input X Device Number	0	0	-

**Home** **Main** **Safety Parameters**

(Note): Sample screen as default are set for English environment. When using Japanese environment, it's possible to switch to Japanese for GOT monitoring data in GT Designer 3 Language change the preview column from [2] to [1].

## [Motion CPU Parameter Setting]

### (1) System Settings



### (2) Basic Settings

Basic Setting

Base Setting | Multiple CPU Setting | System Basic Setting | **SSCNET Setting** | CPU Name Setting | Built-in Eth...

Operation Cycle: 0.8ms

Operation at STO:  
 M2000 is turned ON and setting.  
 M2000 is turned OFF and setting.

Error Setting on Servo Warning:  
 Output Error  
 Not Output Error

Error Check:  
 Perform Battery Check

Forced Stop:  
 Nothing  X(PX)  M  
 M 20 ( 0 to 8191 )

	Sym.	Device Range	Latch(1) Start	Latch(1) End	Latch(2) Start	Latch(2) End
Internal Relay	M	0 to 8191				
Link Relay	B	0 to 1FFF				
Annunciator	F	0 to 2047				
Data Register	D	0 to 8191				
Link Register	W	0 to 1FFF				

Latch(1): It is possible to clear using the remote operation (latch clear).

Latch(2): It is possible to clear using the remote operation (latch clear).

OK Cancel

When using the safety observation function, we recommend setting the Motion CPU operation cycle time to 0.8 ms or higher. If a value less than 0.8 ms is set, an operation cycle over error might occur.

When a safety observation error occurs, in order to have to all of the axes undergo an emergency stop, allocate the internal relay (M20) in this setting so when the Safety Observation Error (SM57) turns ON, M20 will turn OFF.

### (3) Safety Signal Comparison Parameters

The Number of Safety Signal Module  CPU Serial Number  CPU Write Time

Item	Safety Signal Module 1	Safety Signal Module 2	Safety Signal Module 3
<b>Safety Signal Comparison</b>	<b>Set the data to execute the safety signal comparison.</b>		
Safety Signal Unmatch Allowance Time	10[x0.1sec]	-	-
<b>Start Device No.</b>	<b>Set the start device No.</b>		
PLC CPU Side	0200	-	-
Motion CPU Side	0200	-	-
Station No.	1	-	-
<b>Multiple CPU Shared Device</b>	<b>Set the multiple CPU shared device for safety signal reference.</b>		
<b>Set Address</b>	<b>Set the set address.</b>		
No.1	10000	-	-
No.2	10000	-	-
<b>Start Address</b>	<b>Set the start address. (This address is set automatically by the set ...</b>		
No.1	U3E0#G10000	-	-
No.2	U3E1#G10000	-	-
<b>Last Address</b>	<b>Set the last address. (This address is set automatically by the set a...</b>		
No.1	U3E0#G10199	-	-
No.2	U3E1#G11399	-	-

Item	Description
The number of safety signal module	Set the number of safety signal modules to be installed. When "0" is set, the safety signal comparison function is not executed.
Safety signal mismatch allowance time	Set the allowance time for absorbing signal input time difference and signal reading time difference for each CPU. When "0" is set, a mismatch allowance time is 0.1[s].
Start device No.	Set the start device number of safety signal module to the both of PLC CPU and Motion CPU. - Match the start device number to I/O assignment by PLC parameter in PLC CPU. - Set the start device number using different I/O number of the other Motion control modules and output device of limit output data in Motion CPU.
Station No.	Match the station number setting of safety signal module with this station number.
Multiple CPU shared device	This shared device area is used to exchange information for the safety monitoring between the PLC CPU and Motion CPU. Set this device within the range of a user setting area in each multiple CPU high-speed transmission area. <Number of occupied points> - Only safety signal comparison function use. PLC CPU side : 50 points Motion CPU side : 50 points - Safety signal comparison function and speed monitoring function use. PLC CPU side : 200 points, Motion CPU side : 1400 points

#### (4) Speed Monitoring Parameters

Item	Block No. 1	Block No. 2
<b>Speed Monitoring</b>	<b>Set the data to execute the speed monitoring.</b>	
Speed Monitoring Axis No.	1	
Speed Monitoring Error Detection Time	50[x10msec]	50[x10msec]
Axis Unit Setting	0:mm	0:mm
Number of Pulses per Motor Revolution	4194304[PLS]	4194304[PLS]
Movement Amount per Motor Revolution	10000.0[μm]	10000.0[μm]
Motor Encoder Resolution	4194304[PLS]	4194304[PLS]
Number of Pulses per External Sensor Rotation	1[PLS]	1[PLS]
Travel Value per External Sensor Rotation	10000.0[μm]	10000.0[μm]
Safety Speed	5000.00[mm/min]	0.00[mm/min]
Safety Motor Speed	500.0[rpm]	0.0[rpm]
Allowance Value of Position Deviation	6000.0[μm]	6000.0[μm]
Allowance Value of Speed Deviation	10.00[mm/min]	10.00[mm/min]
SSM Hysteresis Width	1.00[mm/min]	1.00[mm/min]
SSM Output Y Device No.	021E	021F
External Sensor Input X Device No.	0218	0218
Speed Monitoring I/O Device No.	0300	0302

Two kinds of speed monitoring (5000 mm/min or less) and the standstill monitoring (0 mm/min) parameters are set.

Item	Description
Speed Monitor Axis No.	Set the axis No. which performs the speed monitor. When 0 is set, the corresponding block is unused.
Speed Monitoring Error Detection Time	Set the detection time to detect that the motor speed during the speed monitoring (while the speed monitoring is permitted) exceeds the safe rotation speed.
Axis Unit Setting	Select the unit of the axis which performs the speed monitor. This setting should be as the servo data setting.
Number of Pulses per Motor Rotation	Set the feedback pulse per motor rotation which is determined by machine systems of the axis which performs the speed monitor. This setting should be the same as the servo data setting value.
Travel Value per Motor Rotation	Set the machine travel value per motor rotation which is determined by machine systems of the axis which performs the speed monitor. This setting should be the same as the servo data setting value.
Motor Encoder Resolution	Set the number of pulses per rotation of an encoder used in the axis which performs the speed monitor.
Number of Pulses per Auxiliary Pulse Rotation	Set the number of pulses per rotation by an input of auxiliary pulse mechanically connected to the axis which performs the speed monitor.
Travel Value per Auxiliary Pulse Rotation	Set the travel value corresponding to one rotation by an input of auxiliary pulse mechanically connected to the axis which performs the speed monitor.
Safety Speed	Set the safety speed (upper limit speed while the speed monitor is permitted) of the axis which performs the speed monitor as the speed converted to the machine system.
Safety Motor Speed	Set the safety speed (upper limit speed while the speed monitor is permitted) of the axis which performs the speed monitor as the motor speed.
Allowance value of position deviation	Set the allowance value for the difference between the position command value and the feedback position (position deviation value) while the speed monitor of the axis which performs the speed monitor is permitted.
Allowance Speed Deviation Value	Set the allowance value for the difference between the speed command value and the feedback speed (speed deviation value) while the speed monitor of the axis which performs the speed monitor is permitted. As a general guideline, set allowance value of speed deviation to 90% of the safety speed.
SSM Hysteresis Width	Set the hysteresis width (speed width) for outputting safe speed monitor signals (SSM signals) when Speed monitoring function is performed.
SSM Output Y Device Number	Set the PLC CPU side device number of the safety signal module which assigns safe speed monitor signals (SSM signals) when Speed monitoring function is performed. When SSM signals are not required, set FFFF. As for the device number on Motion CPU side, the number that corresponds to the set device number on PLC CPU side is assigned.
External Sensor Input X Device Number	Set the PLC CPU side device No. (occupies two points) of the safety signal module which inputs pulses of the pulse output system connected mechanically to the servo axis which performs the speed monitor.
Speed Monitoring I/O Device Number	Set Motion CPU side device number of the flags (occupies two points for each X/Y) about the speed monitoring function. - Y (set device number): Speed monitoring function request signal - X (set device number): Speed monitoring function enable signal - Y (set device number + 1): Small oscillation request signal - X (set device number + 1): Small oscillation execute signal



(5) Servo Data Settings

Item	Axis1[Conveyor1]	Axis2[Conveyor2]
<b>Fixed Parameter</b>	<b>Set the fixed parameters for each axis ...</b>	
Unit Setting	0:mm	0:mm
Number of Pulses/Rev.	4194304[PLS]	4194304[PLS]
Travel Value/Rev.	10000.0[μm]	10000.0[μm]
Backlash Compensation	0.0[μm]	0.0[μm]
Upper Stroke Limit	0.0[μm]	0.0[μm]
Lower Stroke Limit	0.0[μm]	0.0[μm]
Command In-position	10.0[μm]	10.0[μm]
Sp. Ctrl. 10x Mult. for Deg.	-	-
<b>JOG Operation Data</b>	<b>Set the data to execute the JOG operati...</b>	
JOG Speed Limit Value	30000.00[mm/min]	30000.00[mm/min]
Parameter Block Setting	1	1

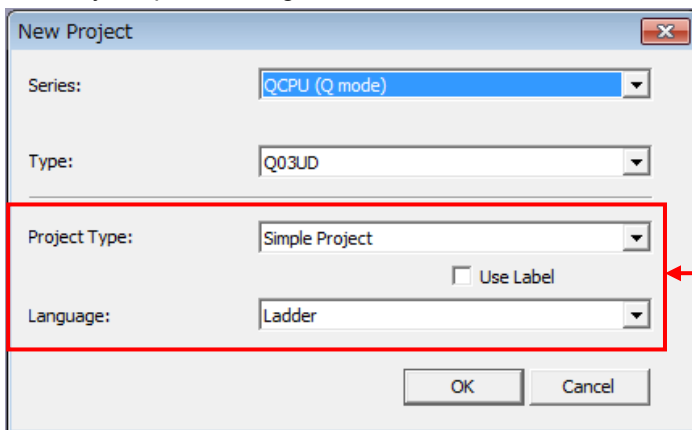
Travel value per motor revolution:  
10[mm]

(6) Parameter Blocks

Item	Block No. 1
<b>Parameter Block</b>	<b>Set the data such as th</b>
Interpolation Control Unit	0:mm
Speed Limit Value	30000.00[mm/min]
Acceleration Time	500[ms]
Deceleration Time	500[ms]
Rapid Stop Deceleration Time	100[ms]
S-curve Ratio	0[%]
Torque Limit Value	300[%]
Deceleration Process on STOP	0:Deceleration Stop
Allowable Error Range for Circular Interpolation	10.0[μm]
Bias Speed at Start	0.00[mm/min]
Acceleration/Deceleration System	0:Trapezoid/S-curve
<b>Advanced S-curve Acceleration/Decelerat...</b>	<b>Set the data of advance</b>

**[Motion CPU Safety Sequence Program Settings]**

A Safety Sequence Program of the Motion CPU is created through usage with the PLC Software GX Works 2.



Set the PLC type "Q03UD" and program type "Ladder".  
(Note):The sequence program processing function of Motion CPU is not equivalent with Q03UDCPU. The program size, the used device and the sequence instruction, etc. are limited.  
Refer to the Q173D(S)CPU/Q172D(S)CPU Motion controller Programming Manual (Safety Observation).

(Note): Do not change PLC parameter from default setting, and do not write PLC parameter to the Motion CPU.

(Note): Communication between Motion CPU and GX Works2 can be executed by setting "1" to rotary switch (SW2) at the front side of Motion CPU.

		GX Works2	MT Works2
SW2	Set to "other than 1"	×	○
	Set to "1"	○	×

○: Communication enabled, ×: Communication disabled

## [PLC Parameter Settings]

### (1) I/O Assignment Settings

I/O Assignment(\*1)

No.	Slot	Type	Model Name	Points	Start XY
0	PLC	PLC No. 1	Q06UDEHCPU		3E00
1	PLC	PLC No. 2	Q172DSCPU		3E10
2	1(*-1)	I/O Mix	Q173DSXY	32Points	0200
3	2(*-2)				
4	3(*-3)				
5	4(*-4)				
6	5(*-5)				
7	6(*-6)				

Assigning the I/O address is not necessary as the CPU does it automatically. Leaving this setting blank will not cause an error to occur.

When setting the Safety Signal Module, select "32 points" of "I/O Mix", and the set the safety signal module's data start device number.

Slot	Type	Model Name	Error Time Output Mode	PLC Operation Mode at H/W Error	I/O Response Time	Control PLC(*1)
0	PLC	PLC No. 1				
1	PLC	PLC No. 2				
2	1(*-1)	I/O Mix	Clear		10ms	PLC No. 1
3	2(*-2)					PLC No. 1
4	3(*-3)					PLC No. 1
5	4(*-4)					PLC No. 1

The detailed settings of the Safety Signal Module are set as shown above.  
 (Note): When the "Error Time Output Module" is not set to "Clear", a "safety observation error" will occur when the power supply is turned on, or if the operation continues for non-stop 24 hours.

### (2) Program Setting

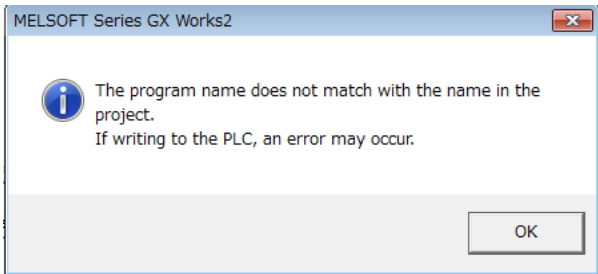
Program

- Safety

	Program Name	Execute Type	Fixed Scan Interval	In Unit
1	SAFETY	Scan		
2	SSU_CMP	Scan		
3	SLS_CMP	Scan		
4				
5				
6				
7				
8				
9				

User Safety Sequence Program (Included Sample Program)

[Motion CPU Auto-creation Sequence Program]  
 SSU\_CMP: Safety Signal Comparison Sequence Program  
 SLS\_CMP: Safety Speed (SLS) Observation Sequence Program  
 (Note): Since a program name is specified that isn't in the project, when this setting screen is closed, the following message appears. However, since the program is being sent from the Motion CPU, there is no error. Please select OK to close the screen.



### (3) PLC System Setting

Timer Limit Setting

Low Speed 100 ms (1ms--1000ms)

High Speed 10.00 ms (0.01ms--100ms)

RUN-PAUSE Contacts

RUN X (X0--X1FFF)

PAUSE X (X0--X1FFF)

Common Pointer No. P After (0--4095)

Points Occupied by Empty Slot (\*1) 16 Points

System Interrupt Setting

Interrupt Counter Star

Fixed Scan Interval

Do not change from the default value (10.00ms).

P0 to P19 are used as local pointers for the Safety Observation Sequence programs. If using a common pointer, use pointer P20 or higher. If the pointers P0 to P19 are used, the PLC CPU will stop due to self-diagnosis error.

### (4) Multiple CPU Setting

No. of PLC (\*1) 2 Count

Online Module Change(\*1)

Enable Online Module Change with Another PLC.

When the online module change is enabled with another PLC, I/O status outside the group cannot be taken.

Host Station

No Specification

I/O Sharing When Using Multiple CPUs (\*1)

All CPUs Can Read All Inputs

All CPUs Can Read All Outputs

Operation Mode (\*1)

Error Operation Mode at the Stop of PLC

All station stop by stop error of PLC1

All station stop by stop error of PLC2

All station stop by stop error of PLC3

All station stop by stop error of PLC4

Multiple CPU Synchronous Startup Setting(\*1)

Target PLC

No.1

No.2

No.3

No.4

Multiple CPU High Speed Transmission Area Setting

Communication Area Setting (Refresh Setting)

Use Multiple CPU High Speed Transmission

PLC	CPU Specific Send Range (*1)						
	Points(K)	I/O No.	Points	Start	End	Points	Auto Refresh Setting
PLC No.1	7	U3E0	7168	G10000	G17167	0	Refresh
PLC No.2	7	U3E1	7168	G10000	G17167	0	Refresh
PLC No.3							
PLC No.4							

Total 14K Points  Advanced Setting(\*1) Assignment Confirmation

The total number of points is up to 14K.

Set auto refresh setting if it is needed( No Setting / Already Set )

(\*1)Setting should be set as same when using multiple CPU. Import Multiple CPU Parameter

This enables the Multiple CPU Synchronous Startup Setting between the Motion and PLC CPUs.

**[Sample program configuration]**

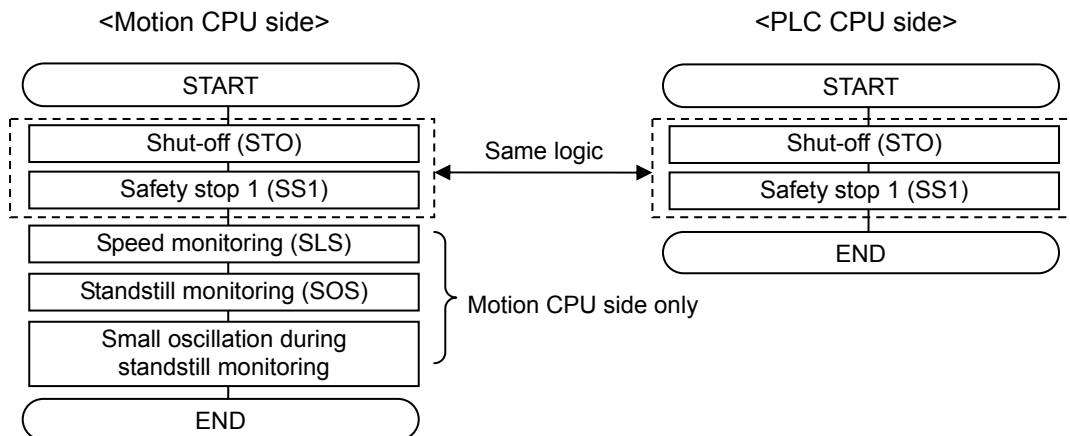
File name	Description	Model	Engineering environment
Vol7_Safety_Motion.mtw	- Motion control program - Safety comparison parameter	Q172DSCPU	MELSOFT MT Works2
Vol7_Safety_Motion.gxw	Motion CPU side Safety sequence program		MELSOFT GX Works2
Vol7_Safety_PLC.gxw	PLC CPU side Safety sequence program	Q06UDEHCPU	
Vol7_Safety_GOT.GTW	GOT monitoring data	GT16**-V (640x480)	MELSOFT GT Works3

**[Devices used in this program]**

 Safety I/O signal

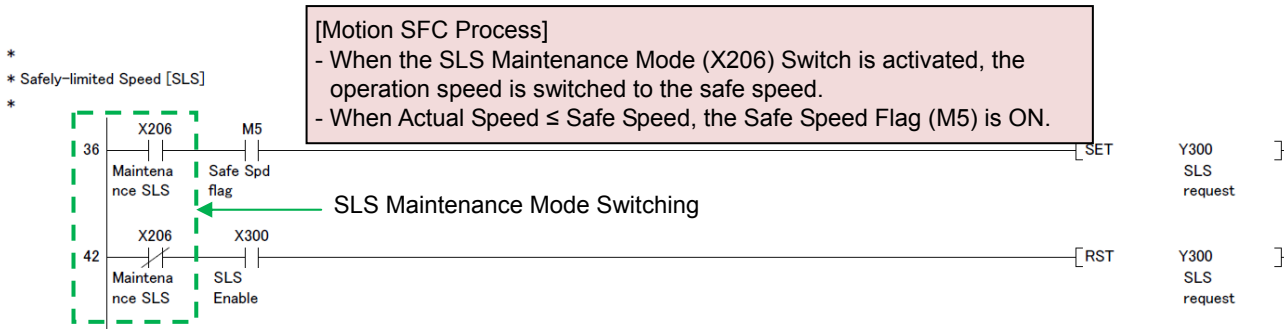
Device No.	Content	Device No.	Content
X200	Power ON switch	M0	Power ON switch trailing edge
X201	Emergency stop switch 1	M1	During speed/standstill
X202	Emergency stop switch 2	M5	Safety speed flag
X203	Light curtain	M10	SS1 stop flag
X204	Safety door switch	M20	Emergency stop input
X205	Safety stop 1 switch	M21	Servo program cancel
X206	SLS maintenance mode switch	T0	STO/SS1 stop delay timer
X207	SOS maintenance mode switch	T1	SOS/SS2 stop delay timer
X20A	Shut-off signal (system control)	C0	Standstill Monitoring time counter
X218	External encoder A-phase	B0	Conveyor start (GOT)
X219	External encoder B-phase	B1	Home position return
Y20B	Shut-off (STO)	B2	Error reset (GOT)
Y20C	Door lock open	B6	Error lamp (GOT)
X300	Speed monitoring enabled flag	B11	No.1 Conveyor axis JOG forward (GOT)
X302	Standstill monitoring enabled flag	B12	No.1 Conveyor axis JOG backward (GOT)
X303	Small oscillation executing flag	B13	No.2 Conveyor axis JOG forward (GOT)
Y300	Speed monitoring request flag	B14	No.2 Conveyor axis JOG backward (GOT)
Y302	Standstill monitoring request flag	W0	No.1 Conveyor axis JOG speed setting (GOT): [mm/min]
Y303	Small oscillation request flag	W1	No.2 Conveyor axis JOG speed setting (GOT): [mm/min]
		W2	No.1 Conveyor axis JOG speed setting (GOT): [mm/min]
		W3	No.2 Conveyor axis JOG speed setting (GOT): [mm/min]
		W10	No.1 Conveyor axis Speed monitoring (GOT): [mm/min]
		W11	No.2 Conveyor axis Speed monitoring (GOT): [mm/min]
		W12	No.1 Conveyor axis Speed monitoring (GOT): [mm/min]
		W13	No.2 Conveyor axis Speed monitoring (GOT): [mm/min]

**[Sample safety sequence program configuration]**

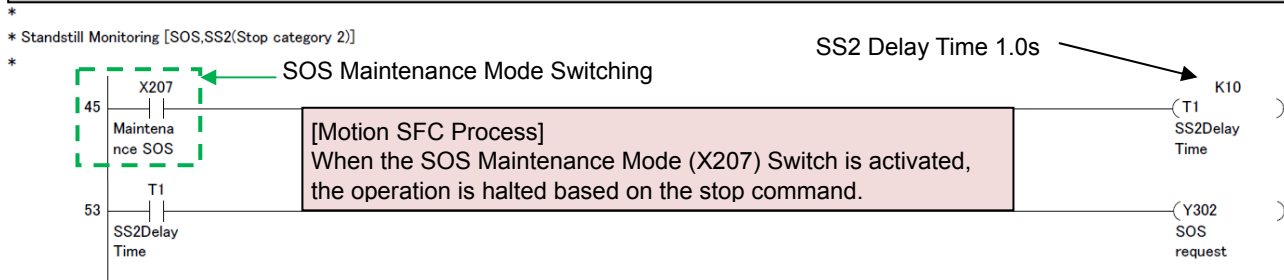




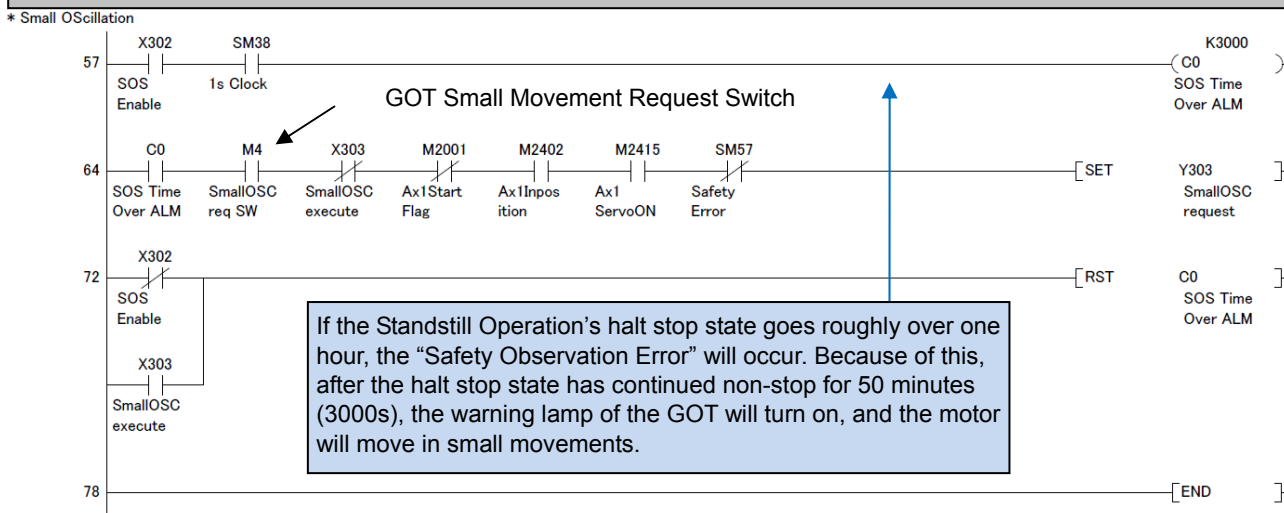
Speed Monitoring (SLS): Activates the Speed Monitoring from the SLS maintenance mode switch (X206).



Standstill Monitoring (SOS): Activates the Standstill Monitoring based on the SOS stop switch.



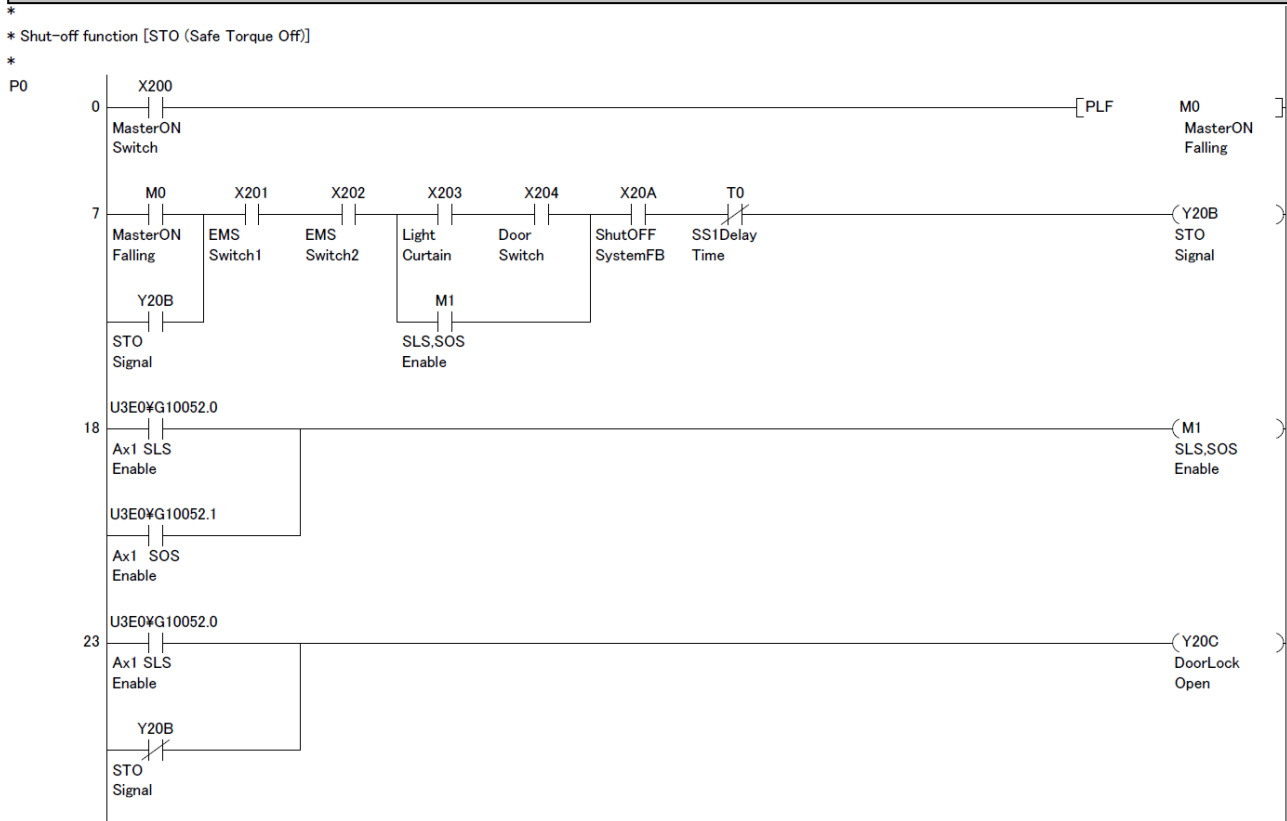
Small oscillation during Stand-still monitoring (Encoder Consistency Check): Small movements from GOT switches.



## [Sample safety sequence program (PLC CPU side)]

The following program logic is the same as that of the Motion CPU side program logic. Therefore, for an explanation about the following circuit program, please refer to the previous Motion CPU side related section.

### Shut-off Function (STO): Turns the STO signal (Y20B) ON from the Power ON Switch.



### Safety Stop 1 (SS1): Decelerates the motor according to the set delay time when the power is shut-off.

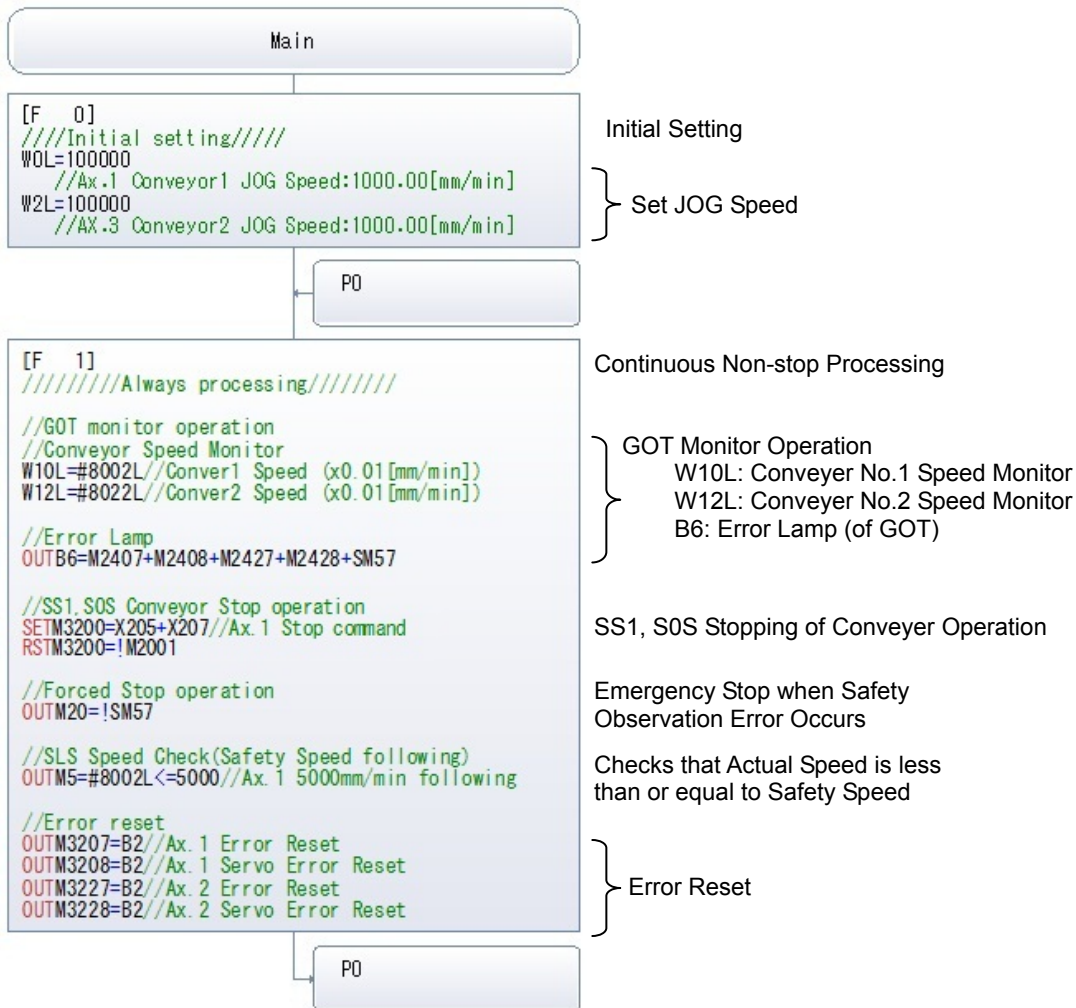


## [Content of Motion SFC sample programs]

Program configuration

No.	Program Name	Automatic Start	Execution Task	Operation Summary
0	Main	Yes	Normal	Main process
1	Motion Control	Yes	Normal	Motion control
2	Home Position	No	Normal	Home position return
3	JOG operation	No	Normal	JOG operation
4	Conveyor Start	No	Normal	Conveyor Start
5	Safe Speed Chg	Yes	Normal	Safe speed change

(1) No.0 Main: Main Process Normal Task [Automatic start]  
Sets initial data and continuously executes the process.





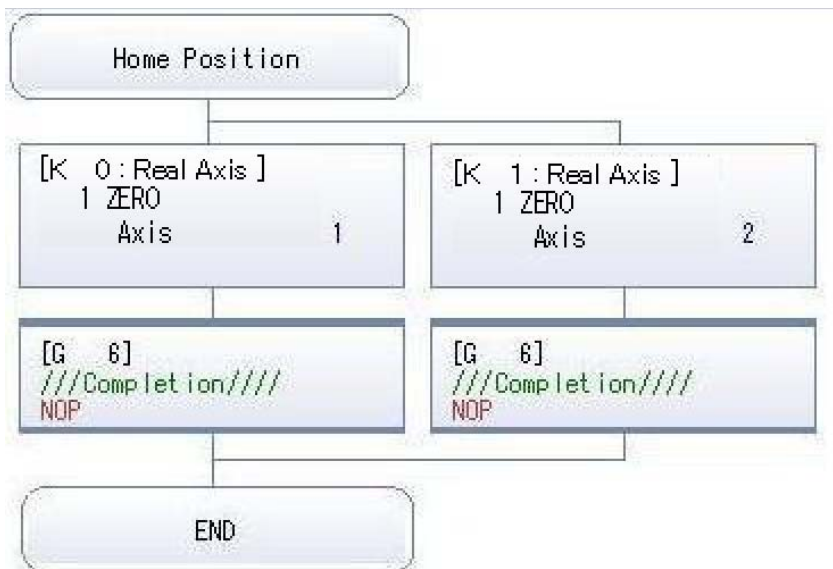
(2) No.1 Motion control: Normal Task [Automatic Start]

Each separate motion program operation will begin according to which button is pressed on the GOT.

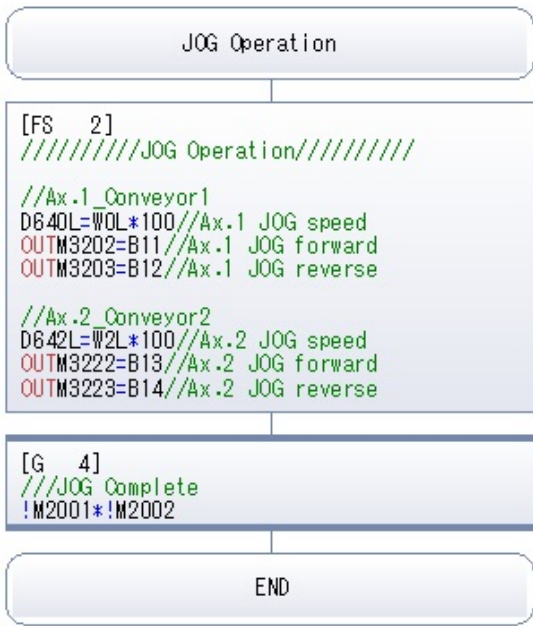


(3) No.2 Home Position: Normal Task

Each axis has their home position return program started.



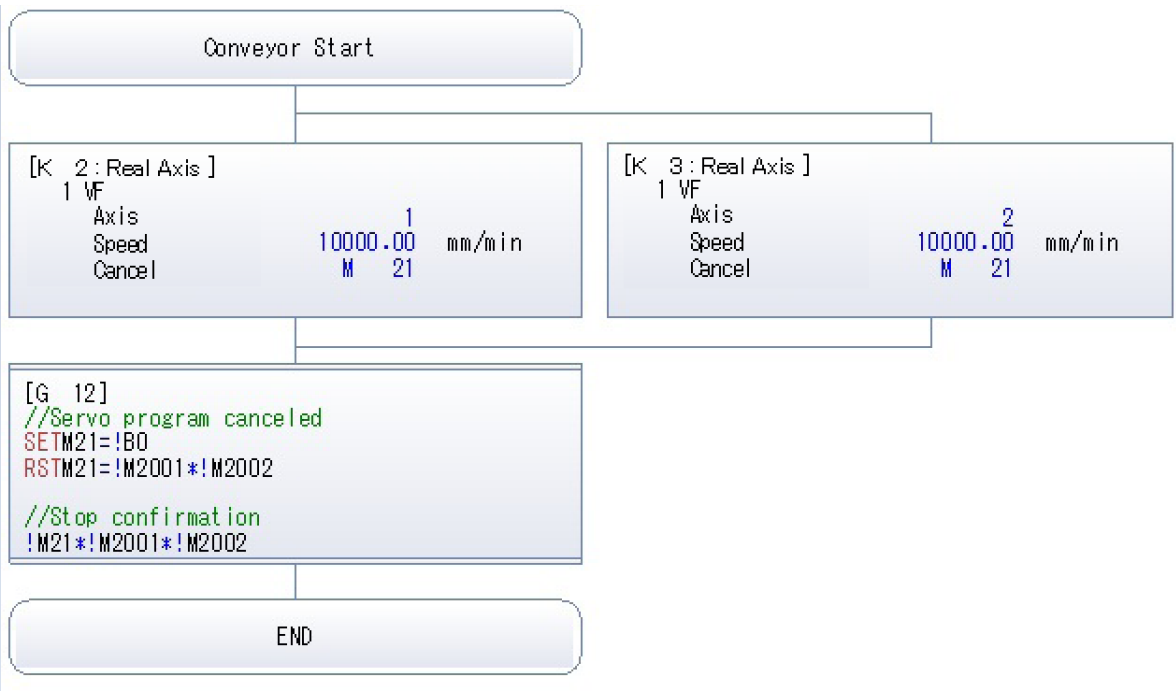
(4) No.3 JOG Operation: Normal Task  
 Each axis has their JOG operation started.



While the JOG switches on the GOT are ON, the corresponding JOG commands bits will turn on.

- <GOT>
- WOL : Conveyer Axis No.1 JOG Speed Setting
  - W2L : Conveyer Axis No.2 JOG Speed Setting
  - B11 : Conveyer Axis No.1 JOG Forward
  - B12 : Conveyer Axis No.1 JOG Reverse
  - B13 : Conveyer Axis No.2 JOG Forward
  - B14 : Conveyer Axis No.2 JOG Reverse

(5) No.4 Conveyor start: Normal Task  
 Conveyers No.1 and No.2 operate at a speed of 10000mm/min, and stop when Start Switch (Bit B0) on the GOT is turned off.



(6) No.5 Safe Speed Chg: Safe Speed Change Normal Task

The Safe Speed is changed based on the Speed Observation Start Request (GOT Maintenance Switch).

