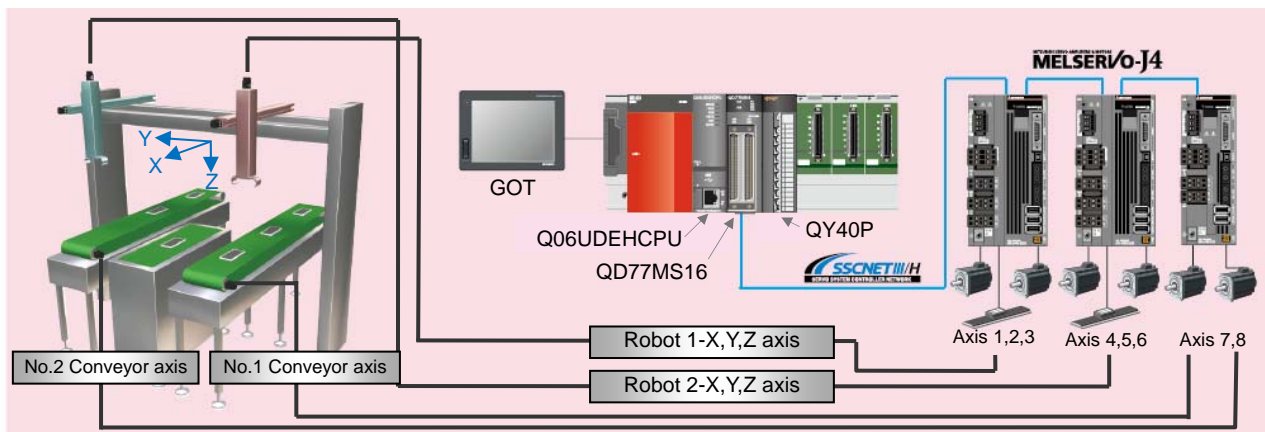


Eco-friendly Conveyors and Product Handling Equipment

[System Configuration]



[Mitsubishi solution]

PLC CPU: Q06UDEHCPU

Main base: Q35DB

Output module: QY40P

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

Simple Motion module: QD77MS16

Servo amplifier: MR-J4W3-B, MR-J4W2-B

GOT: GT165*-V

Servo motor: HG-KR

Linear servo motor: LM-H3

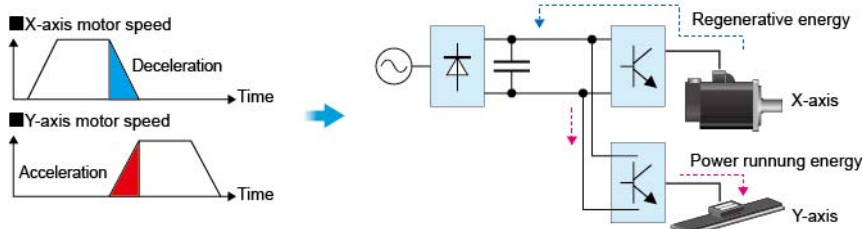
[Operation Description]

Robot 1 grabs the incoming product coming from the No.1 Conveyor, and places the work piece in the center table. Then, Robot 2 grabs the set work piece from and places it on top of the No.2 Conveyor.

[Control Points]

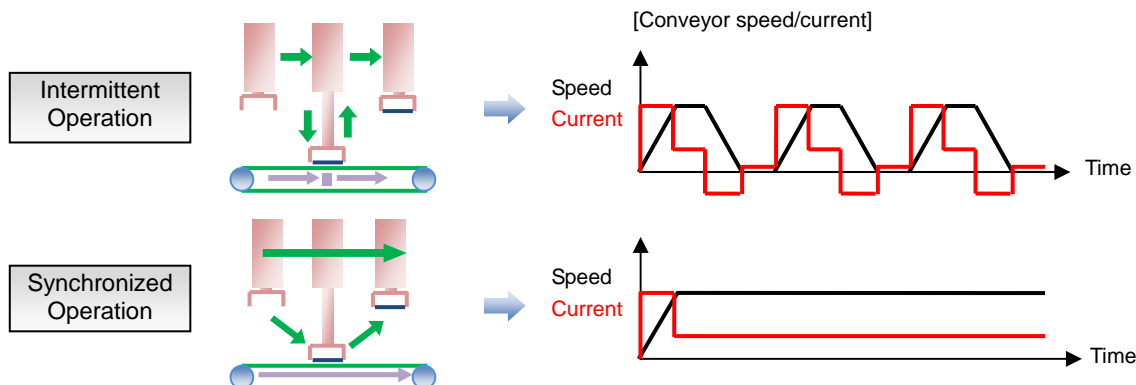
Point1: Energy saving can be achieved through usage of the multi-axis servo amplifier.

The regenerative energy gained from one axis's deceleration is used as the driving energy to accelerate another axis.

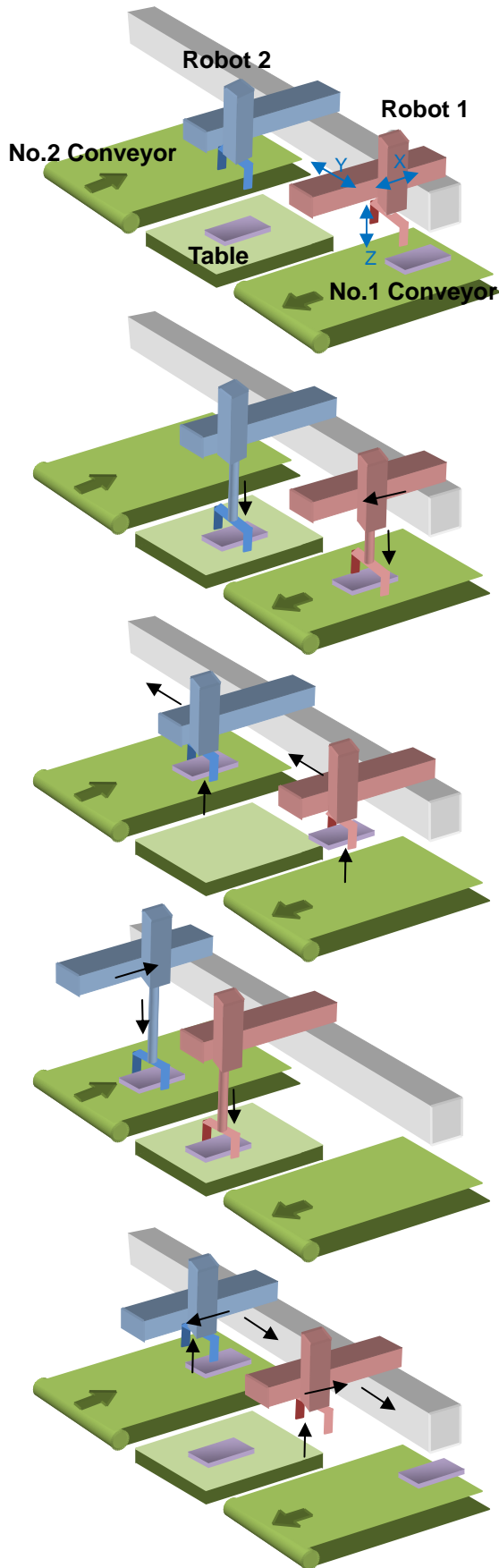


Point2: Increased knowledge in energy saving becomes possible through being able to monitor the servo amplifier's energy and power consumption in real time on the GOT screen.

Point3: Improvements in tact time reduction and energy savings are possible through synchronous control as compared with periodic control. Through synchronous control, robot and conveyor movements move in-sync to one another, allowing unnecessary intermediate stopping of the conveyers when work pieces are grabbed and placed.



[Conveyor Operation Flow]



- 1) Starting Position
 - The work piece will be sent down the No.1 Conveyor. Robot 1 and 2 are shown in their respective starting positions.



- 2) Grabbing of Work Piece
 - Robot 1, while moving forward along the X-axis at a speed synchronized to the No.1 Conveyor, will descend down the Z-axis to obtain the work piece.
 - Robot 2 will descend down the Z-axis to obtain the work piece.



- 3) Carrying of Work Piece
 - While ascending along the Z-axis, Robot 1 will move along the Y-axis toward the relay point table, and Robot 2 will move along the Y-axis towards the No.2 conveyor.



- 4) Placement of Work Piece
 - Robot 1 will descend along the Z-axis and place the work piece on the relay point table.
 - Robot 2, while moving backward along the X axis at a speed synchronized to the No.2 Conveyor, will descend down the Z-axis to place the work piece.



- 5) Return Operation
 - Robot 1 and 2 will return to their respective X/Y-axis starting positions while ascending along the Z-axis.



When the next work piece is sent down, the operation will repeat from 1).

[Using the Sample Program]

[Sample program configuration]

File name	Description	Model	Engineering environment
Vol8_Eco_PLC.gxw	Ladder program	Q06UDEHCPU	MELSOFT GX Works2
Vol8_Eco_Motion.pcw	Motion setting file	QD77MS16	
Vol8_Eco_GOT.GTW	GOT monitoring data	GT165*-V (640x480)	MELSOFT GT Works3

(Note): Equipment other than the servo amplifiers and servo motors in the system configuration (page 1) are required to operate the sample program. Remove the ladder circuit of amplifier-less operation function when connecting a servo amplifier to check the operation (page 13).

[Start-up]

1. Decompress the downloaded files to any folder in your PC.
2. Double clicking decompressed files to open the corresponding engineering tool.
3. Ladder program and GOT monitoring data as default are set for English environment. When using Japanese environment, it's possible to switch to Japanese for ladder program in GX Works2 [Tool] - > [Select Language] menu and for GOT monitoring data in GT Works3 Language change the preview column from [2] to [1].
4. Change the model settings according models to be used.
5. Write the sample program data to PLC CPU, Simple Motion and GOT.
6. After writing all the programs, reset the PLC CPU.

[Operating method]

Start operation by using the GOT touch button.

If you do not have GOT, operate the device with the appropriate touch button in GT Works3's simulator function ^(Note) or GX Works2's device test function.

(Note): When using GT Works3's simulator function, click on the "communication setup" tab of "Simulator setup" and select "USB" or "CPU(RS-232)" from the pull-down menu of "connection".



1. When you start-up the system, touch "Reset system" button on the GOT Main screen to perform home position return operation. The Home position return complete lamp turns on when operation is completed.
2. After the home position return operation is completed, press "Start Automatic" button to start the conveyor operation. Operation can be stopped at the home position by pressing "Start Automatic" button again.
3. During the Automatic Operation, when the "Forced Stop" button is pressed, the operation stops midway in cycle. When the synchronized position is offset when the stop button is pressed, the "Restartable" lamp will turn off, and the operation can't be reactivated. Therefore, move the corresponding axis to the synchronization position corresponding with the "Restart Pos." button. Confirm that the "Restartable" lamp is switched on again, and restart the operation.
4. Each axis can be operated independently by using the JOG touch buttons.

[Operation check method]

1. Start the digital oscilloscope function of Simple Motion module setting tool.
2. A trigger condition is BUSY signal of axis 9 virtual servo amplifier. By starting the axis 9 virtual servo amplifier during automatic operation, speed waveform of each axis is registered
3. Check collected waveforms with operation pattern.

⚠ Cautions

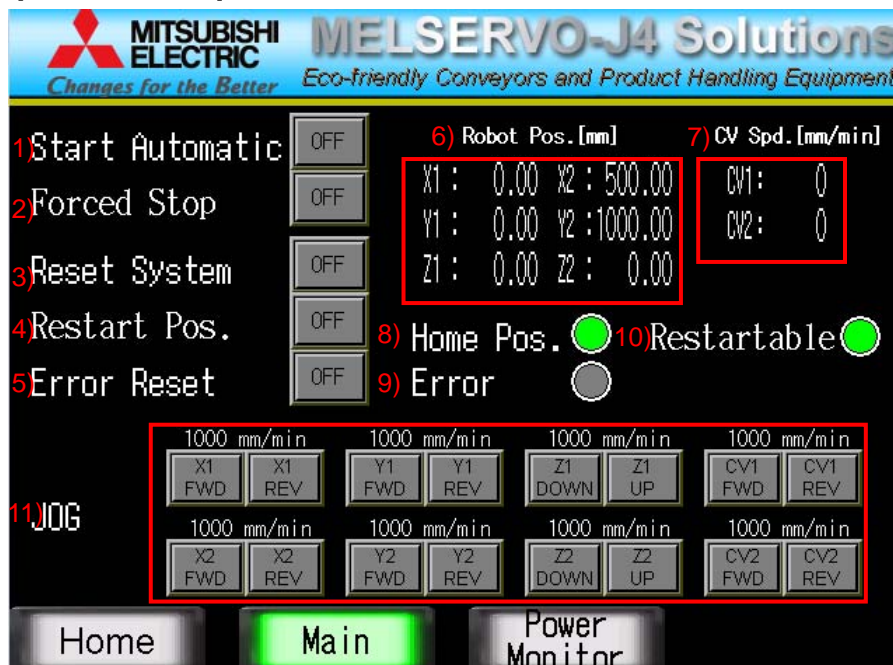
- When diverting the sample program to the actual system, be sure to verify that there are no problems with control in the system.
- Add interlock conditions in the target system where considered necessary.

[GOT Sample screen]

[GOT Home Screen]



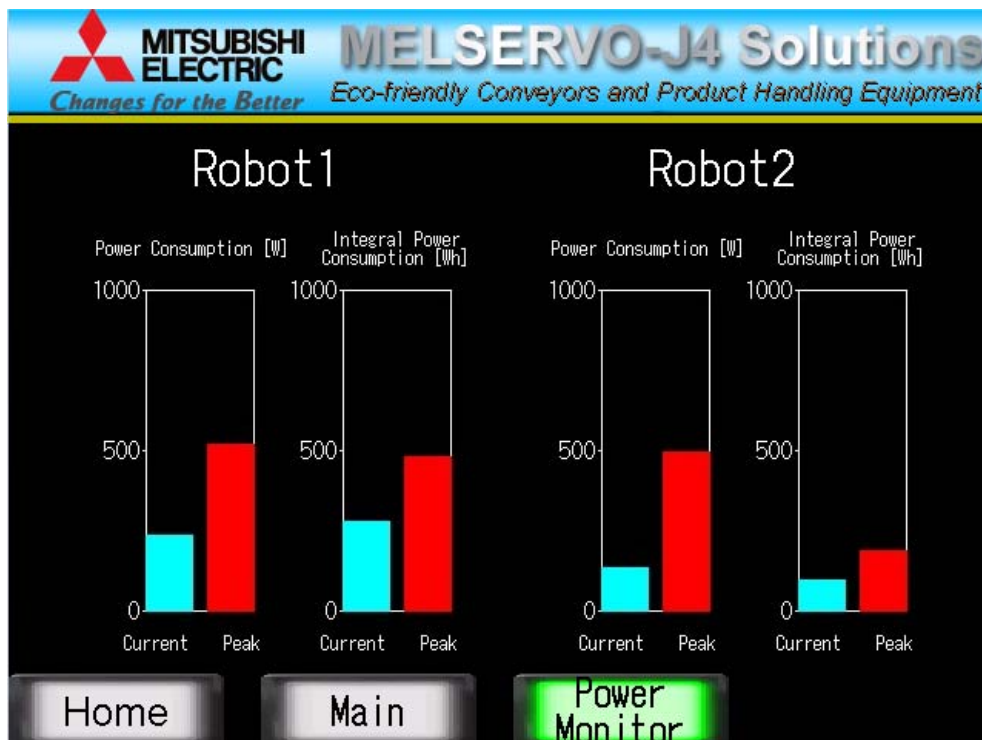
[GOT Main Screen]



	Name	Operation	Device No.
1)	Automatic operation start	Starts the transfer operation. (Refer to page 2). Stops the operation cycle when pressed again to OFF.	B0
2)	Forced stop	Instantly stops the operation (intermediate).	B3
3)	Home position return	When HPR is in the non-completion status, performs HPR on all axes. This moves all axes to the home position.	B1
4)	Restart position	Returns to the (operation restart) position where resynchronization is possible when the previous synchronized position became offset due to intermediate stopping such as the "2) forced stop".	B4
5)	Error reset	Resets all error and warnings.	B2
6)	Robot position [mm]	Monitors the Robot axes' current position.	(Note-1)
7)	Conveyer speed [mm/min]	Monitors the conveyer axes' current speed.	(Note-1)
8)	Home position	Lit when all axes are at Home position.	B5
9)	Error	Lit when an error occurs.	B6
10)	Restartable	When the robots are intermediately stopped during transfer, this lamp lights up when the robots are back in a "Restart-able" operation position.	M40
11)	JOG	Performs forward and reverse JOG for each axis.	B11 to B20

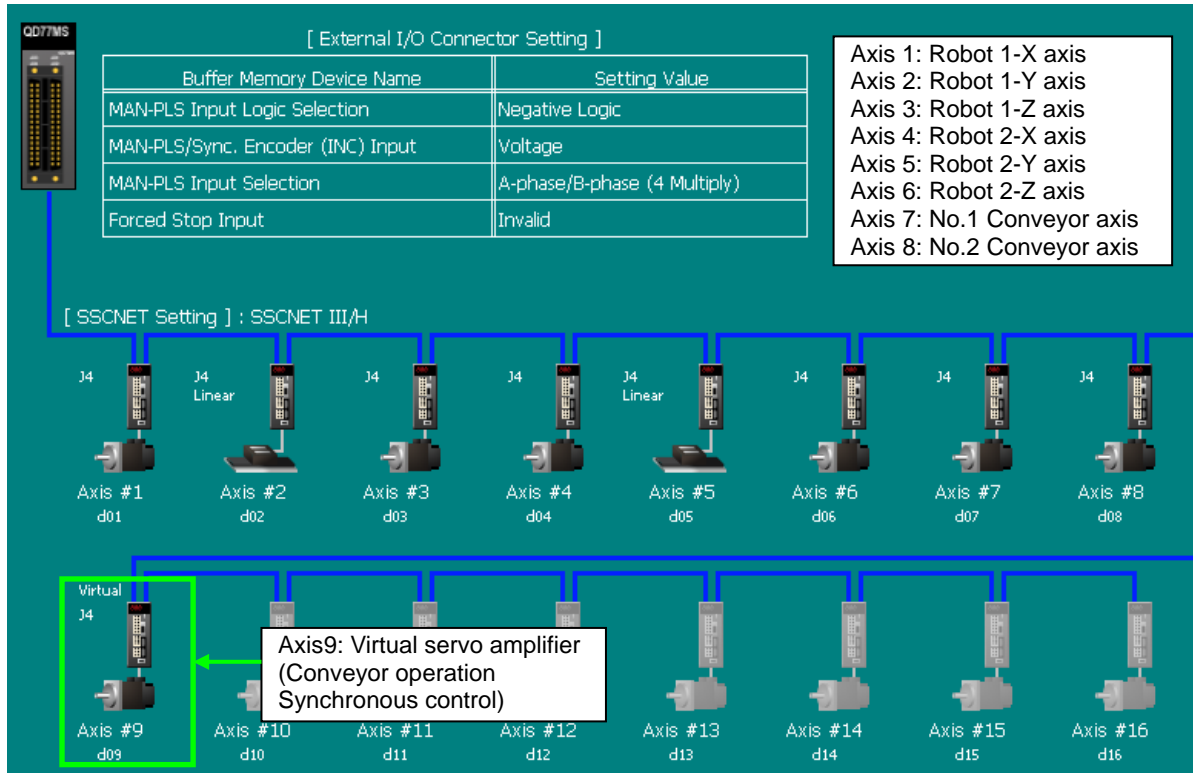
(Note-1): Simple Motion module corresponding buffer memory monitoring data

[GOT: Power Consumption Display]



[Simple Motion Settings]

[System Settings]



[Servo Data Settings]

(1) Robot 1 X,Y,Z-axis

Item	Axis #1	Axis #2	Axis #3
Basic parameters 1	Set according to the machine and applicable motor when system is started up (It will be valid according to the machine and applicable motor when system is started up.)		
Pr. 1: Unit setting	0: mm	0: mm	0: mm
Pr. 2: No. of pulses per rotation	4194304 pulse	4194304 pulse	4194304 pulse
Pr. 3: Movement amount per rotation	20000.0 μm	20000.0 μm	20000.0 μm
Pr. 4: Unit magnification	1: x1 Times	1: x1 Times	1: x1 Times
Pr. 7: Bias speed at start	0.00 mm/min	0.00 mm/min	0.00 mm/min
Basic parameters 2	Set according to the machine and applicable motor when system is started up.		
Pr. 8: Speed limit value	60000.00 mm/min	60000.00 mm/min	60000.00 mm/min
Pr. 9: Acceleration time 0	500 ms	500 ms	500 ms
Pr. 10: Deceleration time 0	500 ms	500 ms	500 ms
Detailed parameters 1	Set according to the system configuration when the system is started up. (It will be valid according to the system configuration when the system is started up.)		
Pr. 11: Backlash compensation amount	0.0 μm	0.0 μm	0.0 μm
Pr. 12: Software stroke limit upper limit value	600000.0 μm	600000.0 μm	600000.0 μm
Pr. 13: Software stroke limit lower limit value	-100000.0 μm	-100000.0 μm	-100000.0 μm
Pr. 14: Software stroke limit selection	0: Set Software Stroke Limit to Current Feed Value	0: Set Software Stroke Limit to Current Feed Value	0: Set Software Stroke Limit to Current Feed Value
OPR basic parameters	Set the values required for carrying out OPR control (This parameter become valid when the PLC REA...		
Pr. 43: OPR method	6: Data Set Method	6: Data Set Method	6: Data Set Method
Pr. 44: OPR direction	0: Forward Direction (Address Increase Direction)	0: Forward Direction (Address Increase Direction)	0: Forward Direction (Address Increase Direction)
Pr. 45: OP address	0.0 μm	0.0 μm	0.0 μm
Pr. 46: OPR speed	0.01 mm/min	0.01 mm/min	0.01 mm/min
Pr. 47: Creep speed	0.01 mm/min	0.01 mm/min	0.01 mm/min
Pr. 48: OPR retry	0: Do not retry OPR with Limit Switch	0: Do not retry OPR with Limit Switch	0: Do not retry OPR with Limit Switch
OPR detailed parameters	Set the values required for carrying out OPR control (This parameter become valid when the PLC REA...		
Expansion parameters	Set according to the system configuration when the system is started up. (This parameter become v...		
Pr. 91: Optional data monitor : Data type setting 1	23: Module Integral Power Consumption (Used Point : 2 Points)	0: No Setting	
Pr. 92: Optional data monitor : Data type setting 2	0: No Setting	0: No Setting	
Pr. 93: Optional data monitor : Data type setting 3	9: Module Power Consumption	0: No Setting	
Pr. 94: Optional data monitor : Data type setting 4	0: No Setting	0: No Setting	
Pr. 96: Operation cycle setting	1: 1.77ms		
Pr. 97: SSCNET Setting	1: SSCNET III/H		
Pr. 114: External command signal compensation valid/invalid setting	0: Invalid		

Movement amount per revolution: 20 [mm]

Monitors the servo amplifier power consumption by setting the total power consumption and power consumption with optional data monitor

(2) Robot 2 X,Y,Z-axis

Item	Axis #4	Axis #5	Axis #6
Basic parameters 1	Set according to the machine and applicable motor when system is started up (It will be valid according to the machine and applicable motor when system is started up)		
Pr. 1:Unit setting	0:mm	0:mm	0:mm
Pr. 2:No. of pulses per rotation	4194304 pulse	4194304 pulse	4194304 pulse
Pr. 3:Movement amount per rotation	20000.0 μm	20000.0 μm	20000.0 μm
Pr. 4:Unit magnification	1:x1 Times	1:x1 Times	1:x1 Times
Pr. 7:Bias speed at start	0.00 mm/min	0.00 mm/min	0.00 mm/min
Basic parameters 2	Set according to the machine and applicable motor when system is started up		
Pr. 8:Speed limit value	60000.00 mm/min	60000.00 mm/min	60000.00 mm/min
Pr. 9:Acceleration time 0	500 ms	500 ms	500 ms
Pr. 10:Deceleration time 0	500 ms	500 ms	500 ms
Detailed parameters 1	Set according to the system configuration when the system is started up		
Pr. 11:Backlash compensation amount	0.0 μm	0.0 μm	0.0 μm
Pr. 12:Software stroke limit upper limit value	600000.0 μm	1100000.0 μm	600000.0 μm
Pr. 13:Software stroke limit lower limit value	-100000.0 μm	-100000.0 μm	-100000.0 μm
Pr. 14:Software stroke limit selection	0:Set Software Stroke Limit to Current Feed Value	0:Set Software Stroke Limit to Current Feed Value	0:Set Software Stroke Limit to Current Feed Value
OPR basic parameters	Set the values required for carrying out OPR control (This parameter become valid when the PLC READY signal is received)		
Pr. 43:OPR method	6:Data Set Method	6:Data Set Method	6:Data Set Method
Pr. 44:OPR direction	0:Forward Direction (Address Increase Direction)	0:Forward Direction (Address Increase Direction)	0:Forward Direction (Address Increase Direction)
Pr. 45:OP address	500000.0 μm	500000.0 μm	0.0 μm
Pr. 46:OPR speed	0.01 mm/min	0.01 mm/min	0.01 mm/min
Pr. 47:Creep speed	0.01 mm/min	0.01 mm/min	0.01 mm/min
Pr. 48:OPR retry	0:Do not retry OPR with Limit Switch	0:Do not retry OPR with Limit Switch	0:Do not retry OPR with Limit Switch
OPR detailed parameters	Set the values required for carrying out OPR control (This parameter become valid when the PLC READY signal is received)		
Expansion parameters	Set according to the system configuration when the system is started up. (This parameter become valid when the PLC READY signal is received)		
Pr. 91:Optional data monitor : Data type setting 1	23:Module Integral Power Consumption (Used Point : 2 Points)	0:No Setting	0:No Setting
Pr. 92:Optional data monitor : Data type setting 2	0:No Setting	0:No Setting	0:No Setting
Pr. 93:Optional data monitor : Data type setting 3	9:Module Power Consumption	0:No Setting	0:No Setting
Pr. 94:Optional data monitor : Data type setting 4	0:No Setting	0:No Setting	0:No Setting
Pr. 96:Operation cycle setting	1: 1.77ms		
Pr. 97:SSCNET III/H	1:SSCNET III/H		
Pr. 114:External command signal compensation valid/invalid setting	0:Invalid		

Movement amount per motor revolution: 20[mm]

Home position address is set as automatic start position.

Monitors the servo amplifier power consumption by setting the total power consumption and power consumption with optional data monitor.

(3) No.1, 2 Conveyor axis, Virtual servo amplifier

Item	Axis #7	Axis #8	Axis #9
Basic parameters 1	Set according to the machine and applicable motor when system is started up (It will be valid according to the machine and applicable motor when system is started up)		
Pr. 1:Unit setting	0:mm	0:mm	2:degree
Pr. 2:No. of pulses per rotation	4194304 pulse	4194304 pulse	4194304 pulse
Pr. 3:Movement amount per rotation	20000.0 μm	20000.0 μm	360.00000 degree
Pr. 4:Unit magnification	1:x1 Times	1:x1 Times	1:x1 Times
Pr. 7:Bias speed at start	0.00 mm/min	0.00 mm/min	0.000 degree/min
Basic parameters 2	Set according to the machine and applicable motor when system is started up		
Pr. 8:Speed limit value	60000.00 mm/min	60000.00 mm/min	3600.000 degree/min
Pr. 9:Acceleration time 0	500 ms	500 ms	500 ms
Pr. 10:Deceleration time 0	500 ms	500 ms	500 ms
Detailed parameters 1	Set according to the system configuration when the system is started up		
Detailed parameters 2	Set according to the system configuration when the system is started up		
OPR basic parameters	Set the values required for carrying out OPR control (This parameter become valid when the PLC READY signal is received)		
Pr. 43:OPR method	6:Data Set Method	6:Data Set Method	6:Data Set Method
Pr. 44:OPR direction	0:Forward Direction (Address Increase Direction)	0:Forward Direction (Address Increase Direction)	0:Forward Direction (Address Increase Direction)
Pr. 45:OP address	0.0 μm	0.0 μm	0.00000 degree

Movement amount per motor revolution: 20[mm]

Virtual servo amplifier Movement amount per revolution: 360[degree]

[Positioning Data Settings]

(1) Positioning for Robot 1 and 2 Axis 1-6 Positioning Data

No.	Operation pattern	Control system	Acceleration time No.	Deceleration time No.	Positioning address	Command speed	Dwell time	M code
1	0:END <Positioning Comment>	01h:ABS Linear 1	0:500	0:500	0.0 μ m	60000.00 mm/min	0 ms	0

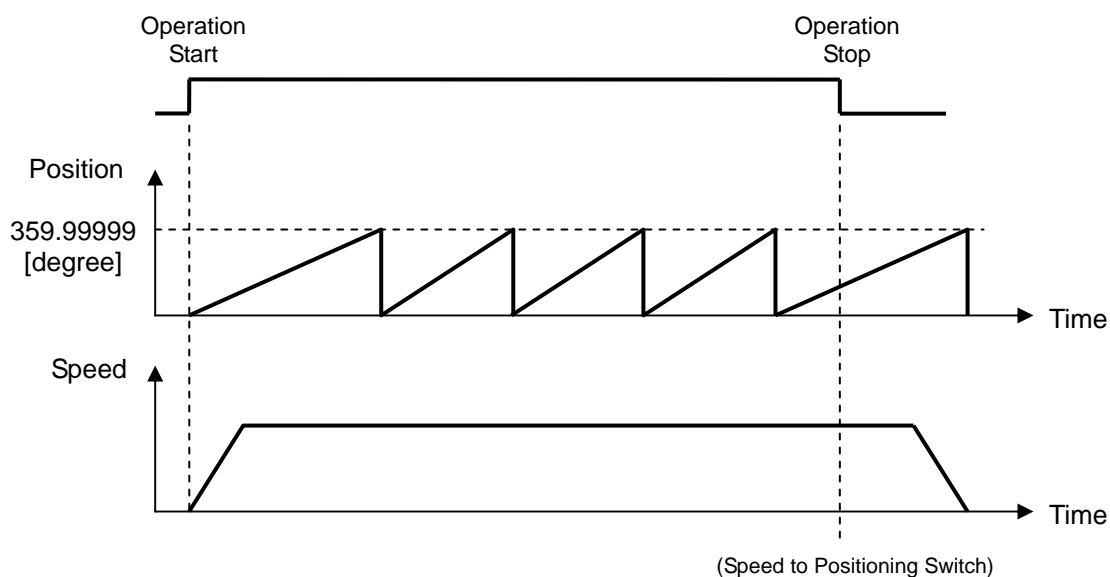
The positioning address is set inside of the ladder based on the values below.

	Robot 1			Robot 2		
	X	Y	Z	X	Y	Z
	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6
Home position return	0mm	0mm	0mm	500mm	500mm	0mm
Restart position	Cam axis current feed value					

(2) Base command creation (Synchronous control) for automatic operation Axis 9: For activating the virtual servo amplifier

No.	Operation pattern	Control system	Acceleration time No.	Deceleration time No.	Positioning address	Command speed	Dwell time	M code
1	0:END <Positioning Comment>	06h:FWD V/P	0:500	0:500	0.00000 degree	3600.000 degree/min	0 ms	0

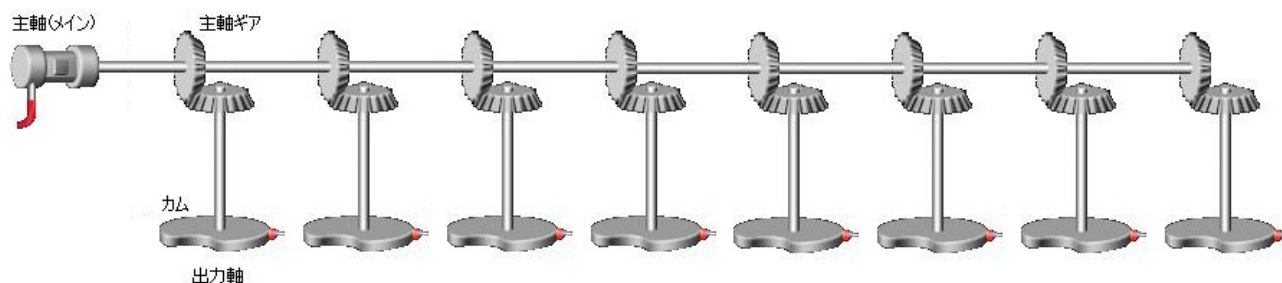
The virtual axis operation starts with speed control, and when the virtual axis operation stops, the control switches to positioning control and stops at the fixed 0[degree] position.



[Synchronous Control Parameters]

Each of the axes synchronized to the Main Input Axis (Virtual Servo Amplifier: Axis 9) operate according to their own respective cam pattern.

Main shaft	
Main input axis	
Pr.400:Type	1:Servo Input Axis
Pr.400:Axis No.	9



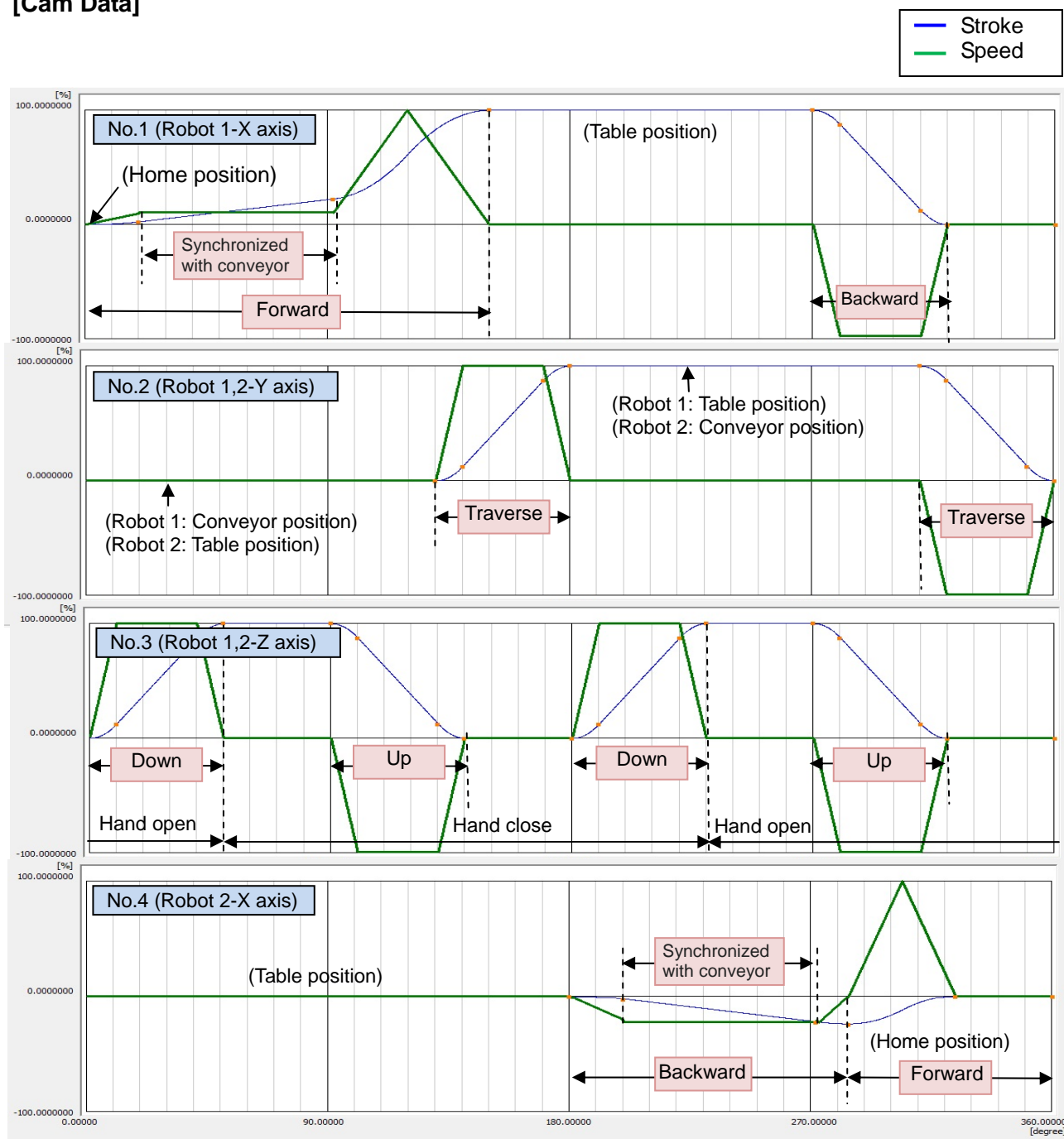
Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
Robot 1-X	Robot 1-Y	Robot 1-Z	Robot 2-X	Robot 2-Y	Robot 2-Z	No.1 Conveyor	No.1 Conveyor
Cam No.1	Cam No.2	Cam No.3	Cam No.4	Cam No.2	Cam No.3	Cam No.0	Cam No.0

Other than the Cam No. and synchronous control parameters listed below, all other setting are the same for all axes.

Output axis	
Cam axis cycle unit	
Pr.438:Unit setting selection	0:Use Unit of Main Input Axis
Pr.438:Unit	0:mm
Pr.438:Number of decimal places	0
Pr.439:Cam axis length per cycle	360.00000 degree
Pr.441:Cam stroke amount	500000.0 μm
Pr.440:Cam No.	Written Above
Pr.444:Cam axis phase compensation advance time	0 μs
Pr.445:Cam axis phase compensation time constant	10 ms
Pr.446:Synchronous control deceleration time	0 ms
Pr.447:Output axis smoothing time constant	0 ms
Synchronous control initial position parameter	
Current value per cycle after main shaft gear	
Pr.460:Setting method	2:Calculate from Input Axis
Pr.465:Initial setting value	0.00000 degree
Current value per cycle after auxiliary shaft gear	
Pr.461:Setting method	0:Previous Value
Pr.466:Initial setting value	0.00000 degree
Pr.462:Cam axis position recovery target	2:Cam Axis Current Feed Value Recovery
Cam reference position	
Pr.463:Setting method	1:Cam Reference Position (Default)
Pr.467:Initial setting value	0.0 μm
Cam axis current value per cycle	
Pr.464:Setting method	2:Current Value per Cycle after Main Shaft Gear
Pr.468:Initial setting value	0.00000 degree

No.1, 2 Conveyor
Default Settings

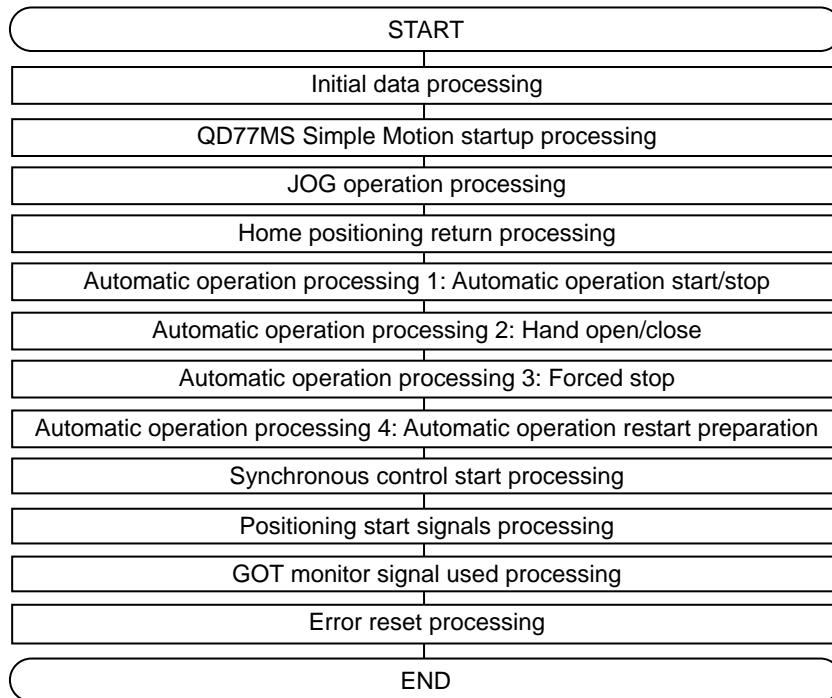
[Cam Data]



(Note): The No.1 and 2 Conveyor Axes are controlled following linear cams (Cam No. 0).

[Sample Ladder Program Configuration]

[MAIN: Scan Execution]

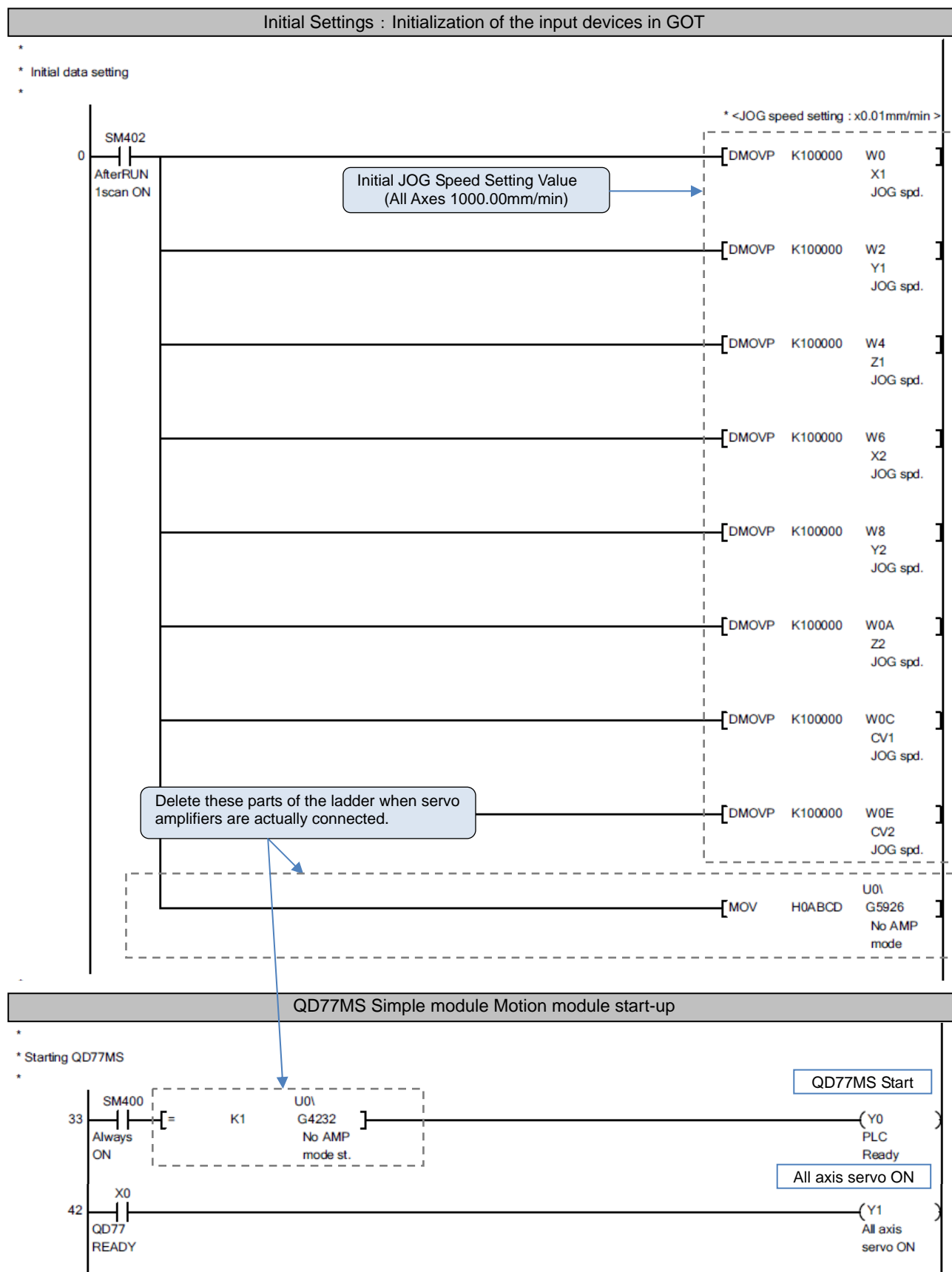


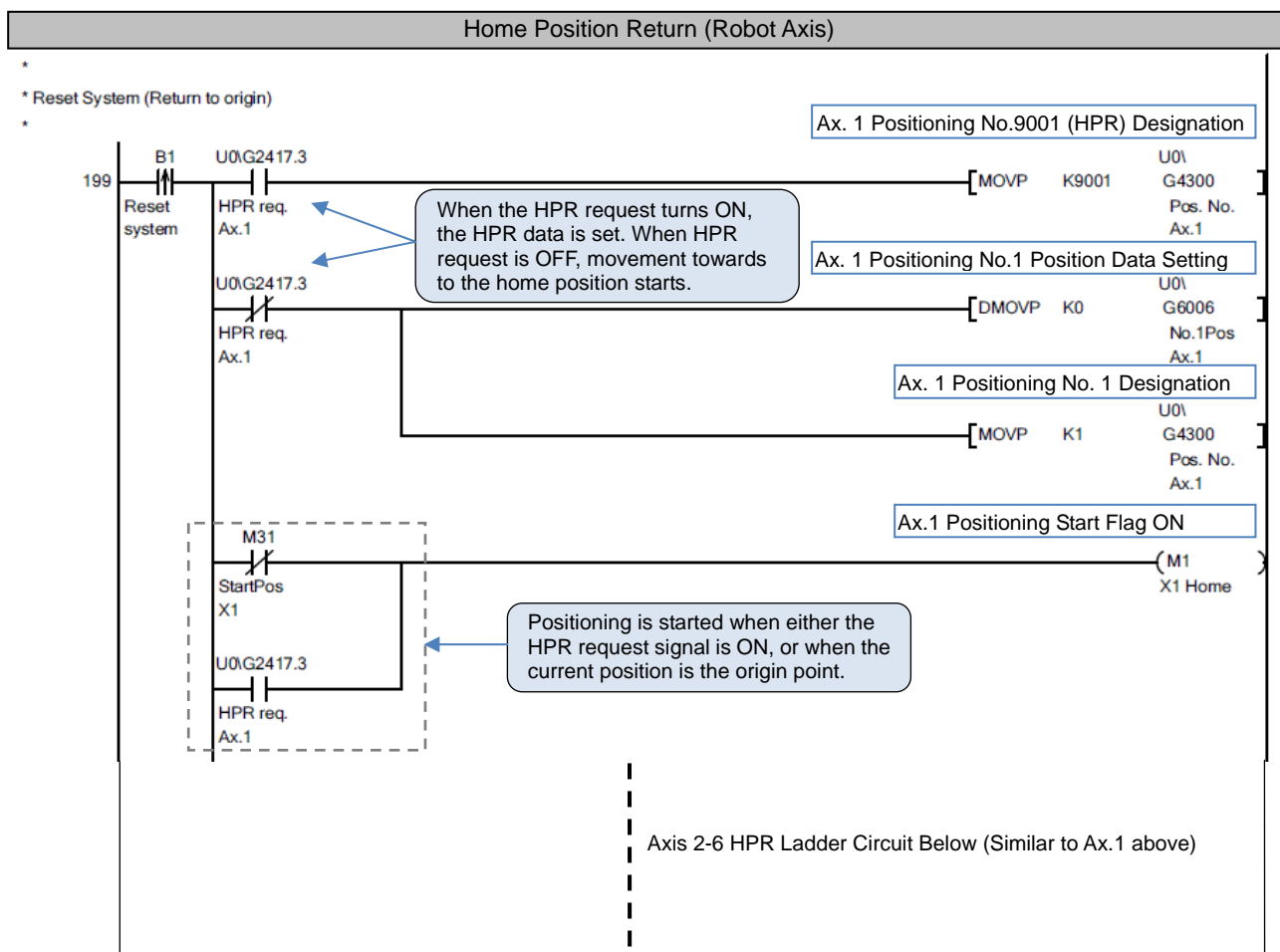
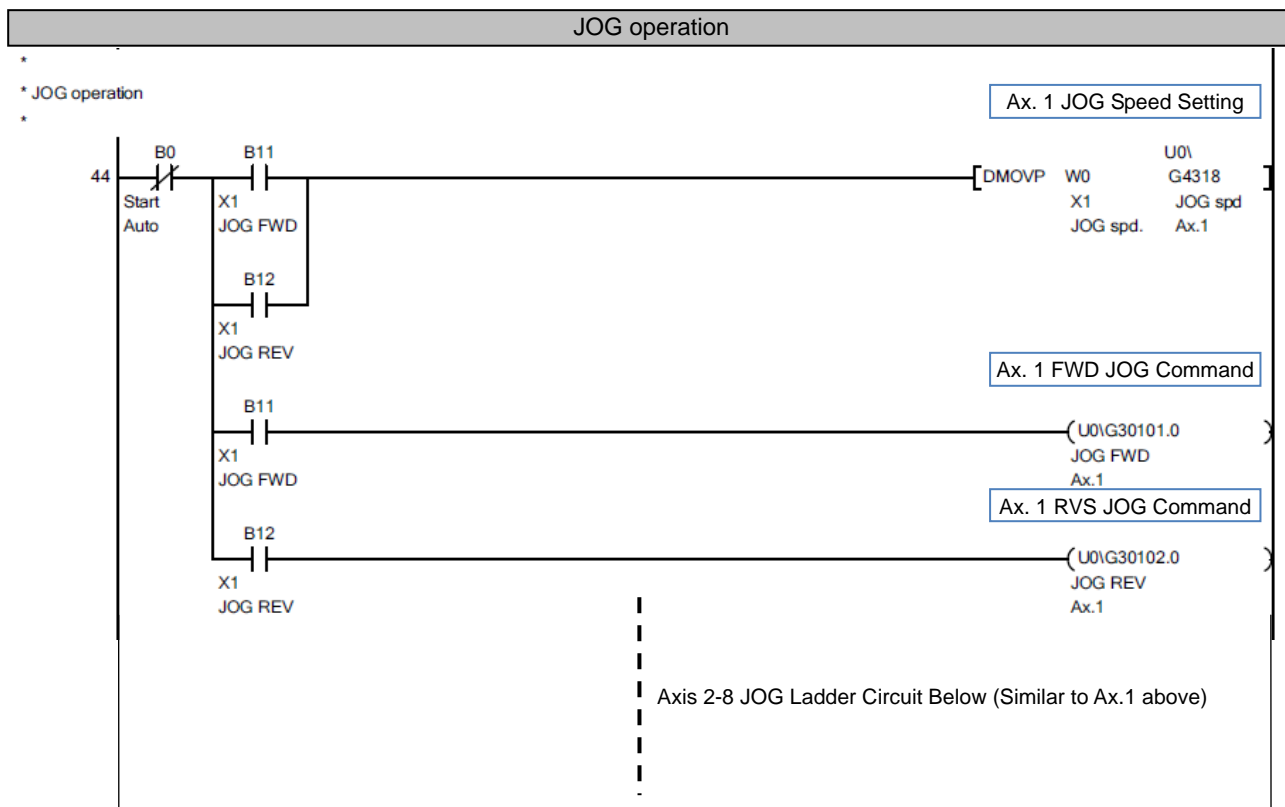
[Used Devices in this Program]

Device No.	Content	Device No.	Content
B0	Automatic operation start (GOT)	M11	Axis 1 Synchronous control mode
B1	Home position return (GOT)	M12	Axis 2 Synchronous control mode
B2	Error reset (GOT)	M13	Axis 3 Synchronous control mode
B3	Forced stop (GOT)	M14	Axis 4 Synchronous control mode
B4	Restart position (GOT)	M15	Axis 5 Synchronous control mode
B5	Home position (GOT)	M16	Axis 6 Synchronous control mode
B6	Error lamp (GOT)	M17	Axis 7 Synchronous control mode
B11	Robot 1-X Axis JOG forward (GOT)	M18	Axis 8 Synchronous control mode
B12	Robot 1-X Axis JOG reverse (GOT)	M19	All axes synchronous control mode
B13	Robot 1-Y Axis JOG forward (GOT)	M21	Automatic operation synchronous control request
B14	Robot 1-Y Axis JOG reverse (GOT)	M22	Automatic operation start
B15	Robot 1-Z Axis JOG down (GOT)	M25	Restart enable position positioning start
B16	Robot 1-Z Axis JOG up (GOT)	M30	All axes Home position
B17	Robot 2-X Axis JOG forward (GOT)	M31	Robot 1-X Axis Home position
B18	Robot 2-X Axis JOG reverse (GOT)	M32	Robot 1-Y Axis Home position
B19	Robot 2-Y Axis JOG forward (GOT)	M33	Robot 1-Z Axis Home position
B1A	Robot 2-Y Axis JOG reverse (GOT)	M34	Robot 2-X Axis Home position
B1B	Robot 2-Z Axis JOG down (GOT)	M35	Robot 2-Y Axis Home position
B1C	Robot 2-Z Axis JOG up (GOT)	M36	Robot 2-Z Axis Home position
B1D	No.1 Conveyor Axis JOG forward (GOT)	M40	All axes restart enable position
B1E	No.1 Conveyor Axis JOG reverse (GOT)	M41	Robot 1-X Axis restart enable position
B1F	No.2 Conveyor Axis JOG forward (GOT)	M42	Robot 1-Y Axis restart enable position
B20	No.2 Conveyor Axis JOG reverse (GOT)	M43	Robot 1-Z Axis restart enable position
M1	Robot 1-X Axis HPR flag	M44	Robot 2-X Axis restart enable position
M2	Robot 1-Y Axis HPR flag	M45	Robot 2-Y Axis restart enable position
M3	Robot 1-Z Axis HPR flag	M46	Robot 2-Z Axis restart enable position
M4	Robot 2-X Axis HPR flag	Y20	Robot 1 hand open/close (ON: close, OFF: open)
M5	Robot 2-Y Axis HPR flag	Y21	Robot 2 hand open/close (ON: close, OFF: open)
M6	Robot 2-Z Axis HPR flag		
M7	No.1 Conveyor HPR flag		
M8	No.2 Conveyor HPR flag		
M9	Virtual servo axis HPR flag		

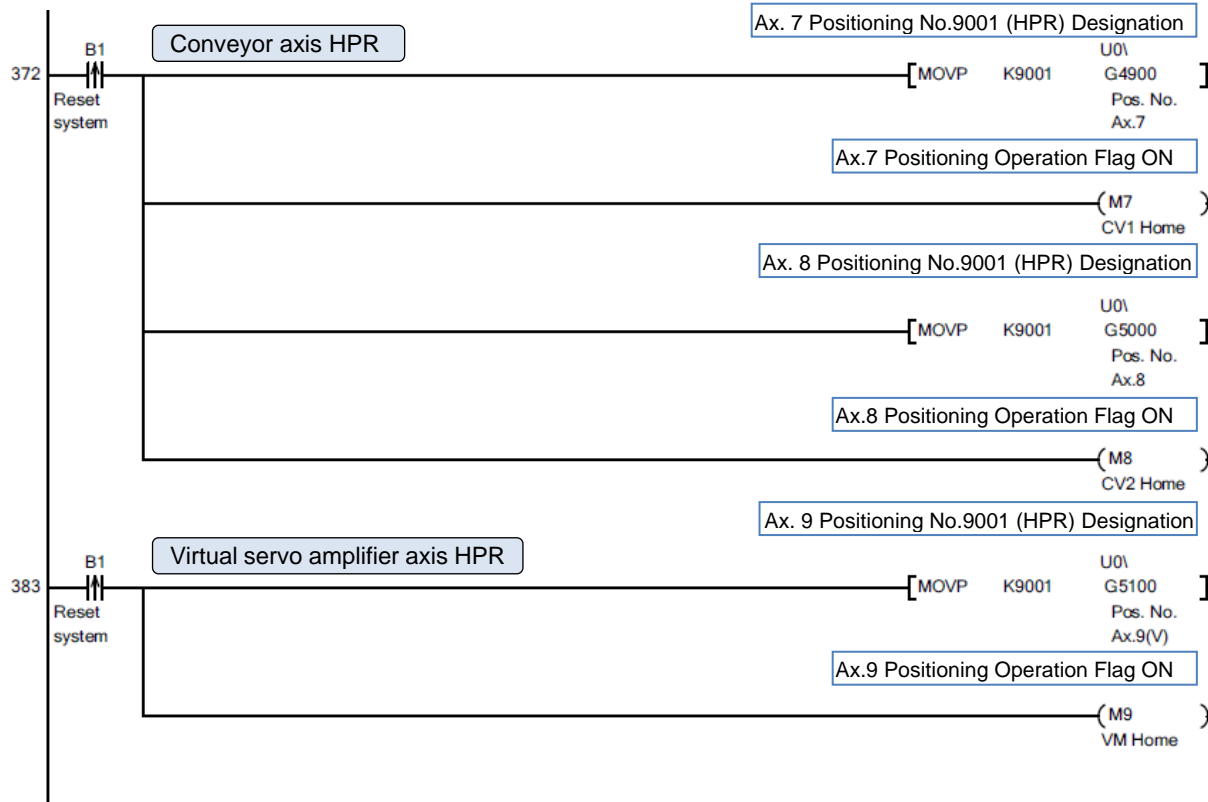
Device No.	Content	Device No.	Content
W0	Robot 1-X Axis JOG speed setting (GOT): x 0.01[mm/min]	D0	Robot 1-Z Axis
W1		D1	Cam Axis current value per cycle
W2	Robot 1-Y Axis JOG speed setting (GOT): x 0.01[mm/min]	D2	Robot 2-Z Axis
W3		D3	Cam Axis current value per cycle
W4	Robot 1-Z Axis JOG speed setting (GOT): x 0.01[mm/min]	D2000	Robot 1 power consumption [W]
W5		D2001	-
W6	Robot 2-X Axis JOG speed setting (GOT): x 0.01[mm/min]	D2002	Robot 1 total power consumption [Wh]
W7		D2003	
W8	Robot 2-Y Axis JOG speed setting (GOT): x 0.01[mm/min]	D2004	Robot 2 power consumption [W]
W9		D2005	-
WA	Robot 2-Z Axis JOG speed setting (GOT): x 0.01[mm/min]	D2006	Robot 2 total power consumption [Wh]
WB		D2007	
WC	No.1 Conveyor Axis JOG speed setting (GOT): x 0.01[mm/min]	D2008	Robot 1 power consumption peak value [Wh]
WD		D2009	-
WE	No.2 Conveyor Axis JOG speed setting (GOT): x 0.01[mm/min]	D2010	Robot 1 total power consumption peak value [Wh]
WF		D2011	
		D2012	Robot 2 power consumption peak value [Wh]
		D2013	-
		D2014	Robot 2 total power consumption peak value [Wh]
		D2015	

[Ladder program]

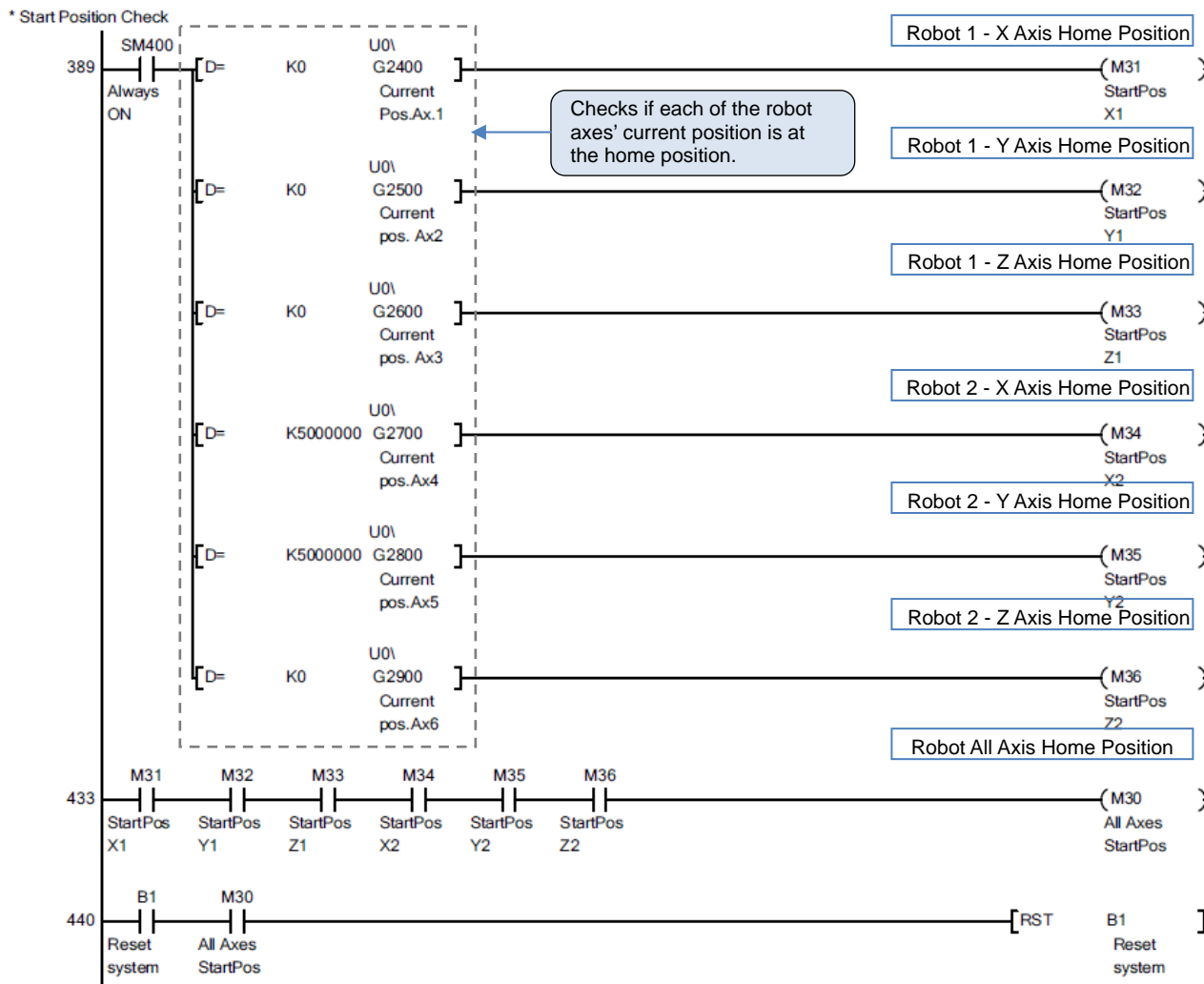




Home Position Return (Conveyor axis, Virtual servo amplifier axis)



Home Position Return (Robot home position check)



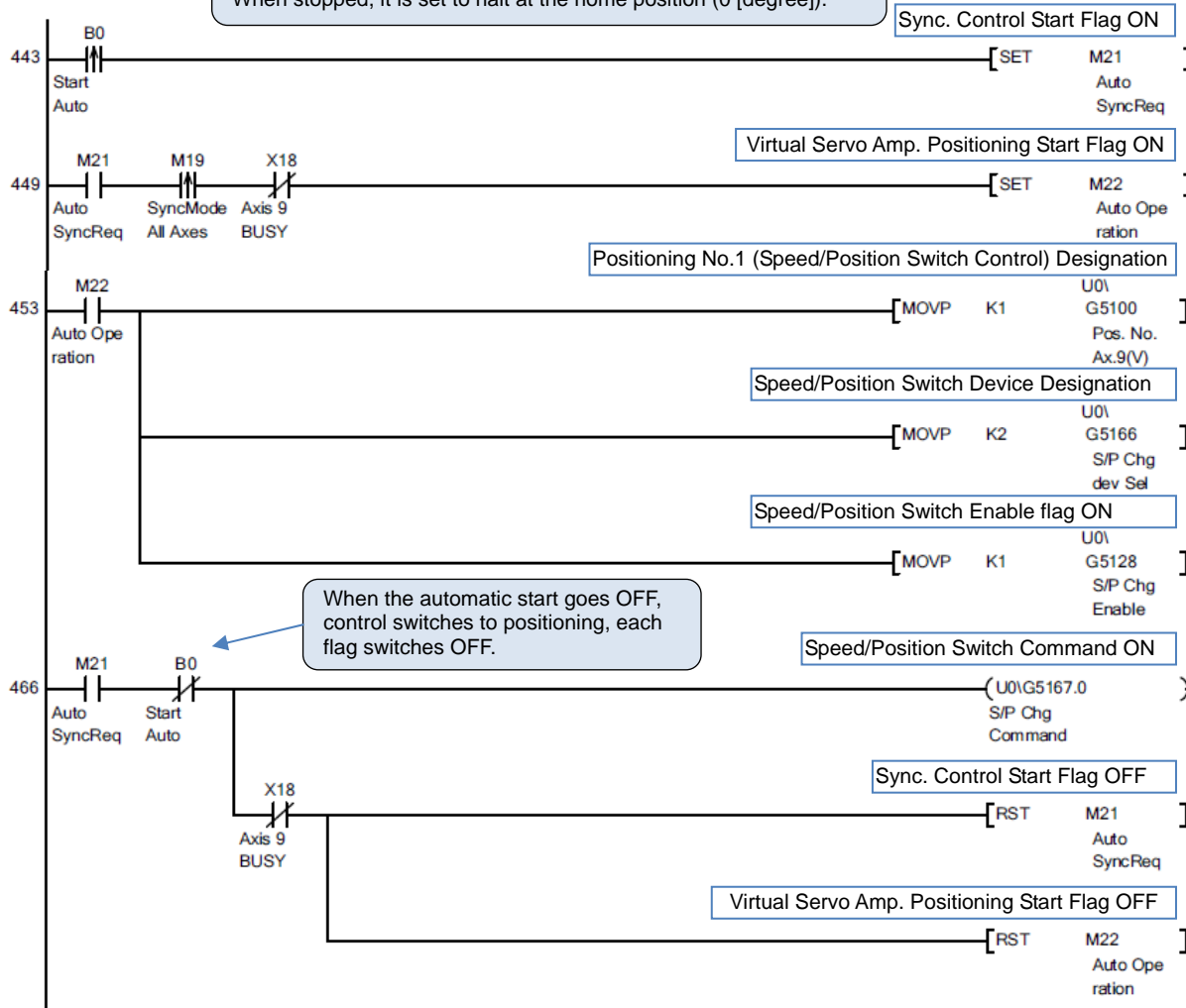
Automatic operation processing 1: Automatic operation start/stop processing

* Auto operation

* (1) Operation Start-up Process

*

After synchronous control is initialized, the speed/position switching control of the virtual servo amplifier (Ax. 9) for main shaft starts. When stopped, it is set to halt at the home position (0 [degree]).



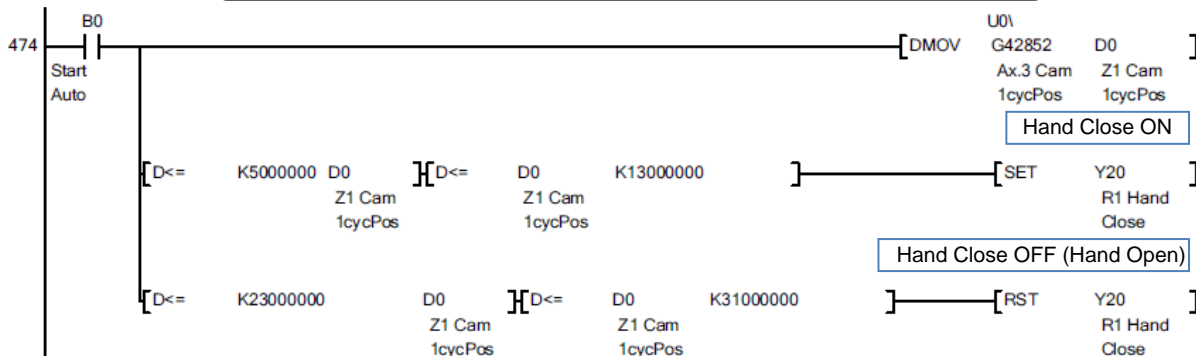
Automatic operation processing 2: Robot hand open/close processing

* Auto operation

* (2) Hand Control

*

The opening & closing control of the hand is based on the current position within 1 cam cycle of the Z axis.
(Opens at 50 [degree], closes at 230 [degrees] position within 1 cam cycle)

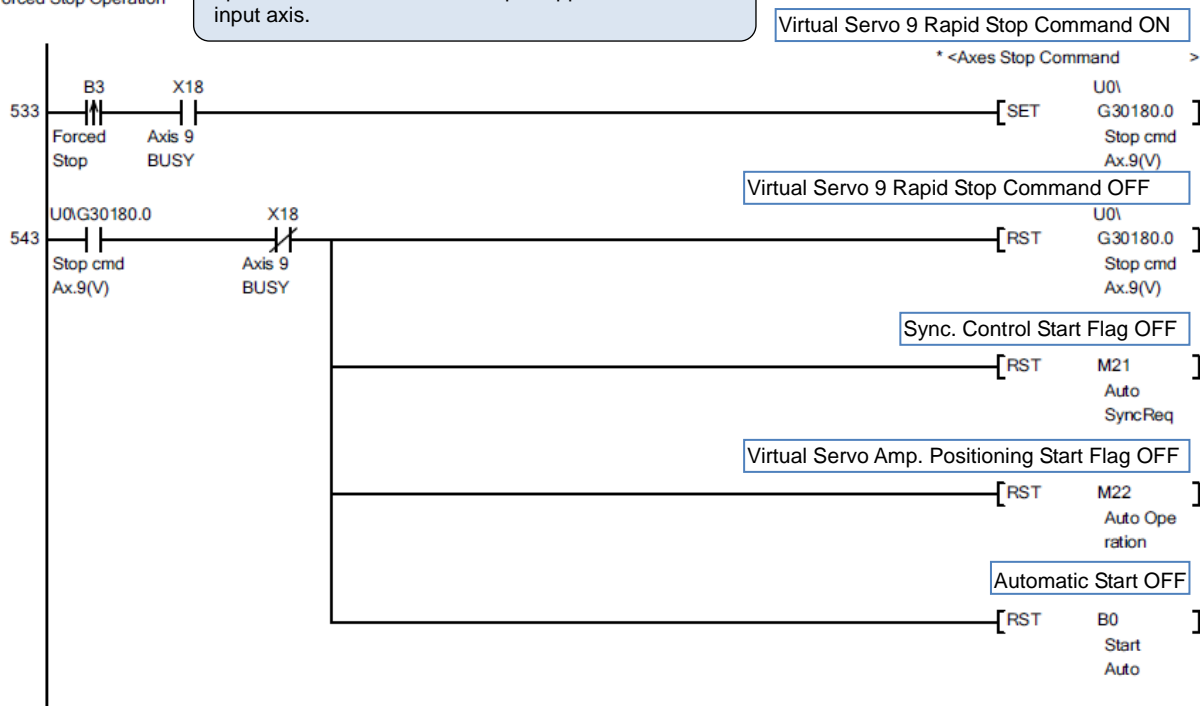


Robot2 Hand Opening/Closing Ladder Below
(Similar to Robot1 above)

Automatic operation processing 3: Forced stop processing

- * Auto operation
- * (3) Forced Stop Operation
- *

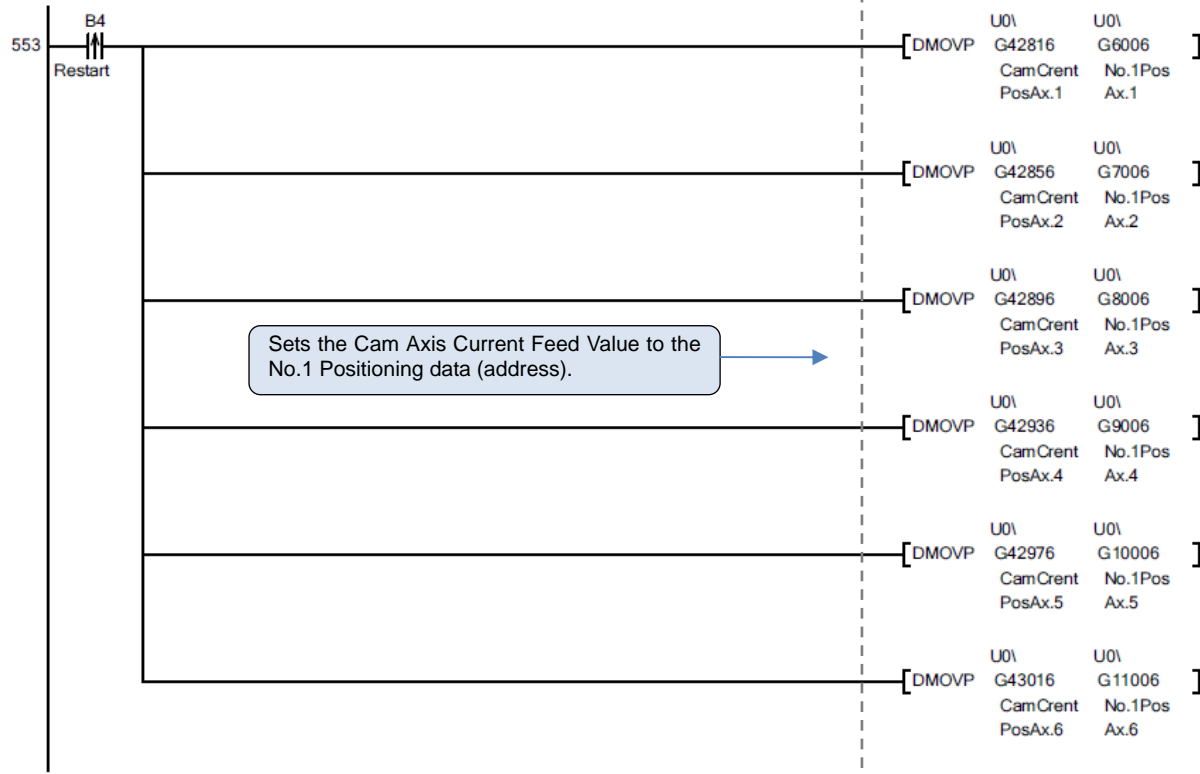
All axes will intermediately stop during automatic operation when the Forced Stop is applied to the main input axis.

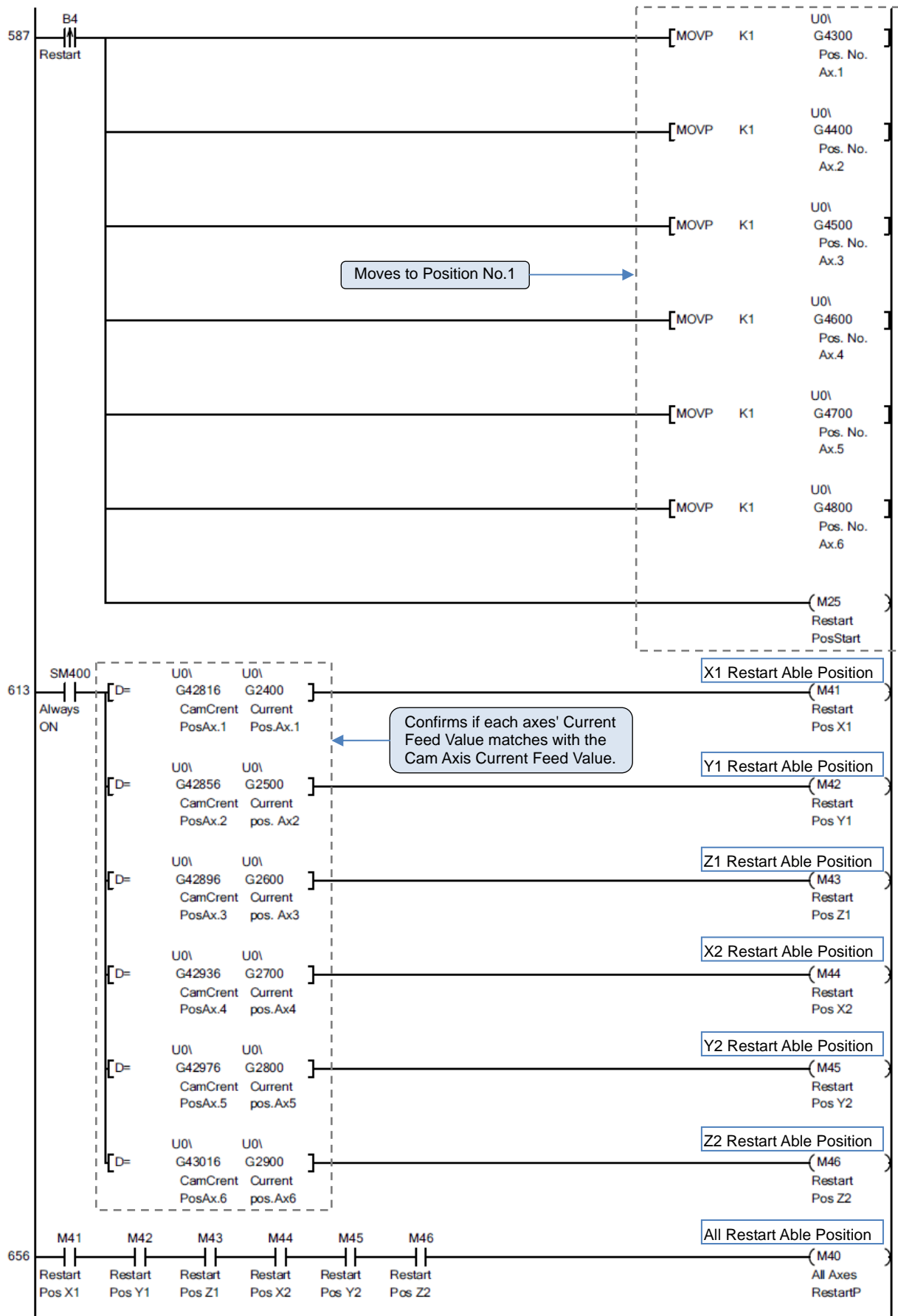


Automatic operation processing 4: Automatic operation restart preparation processing

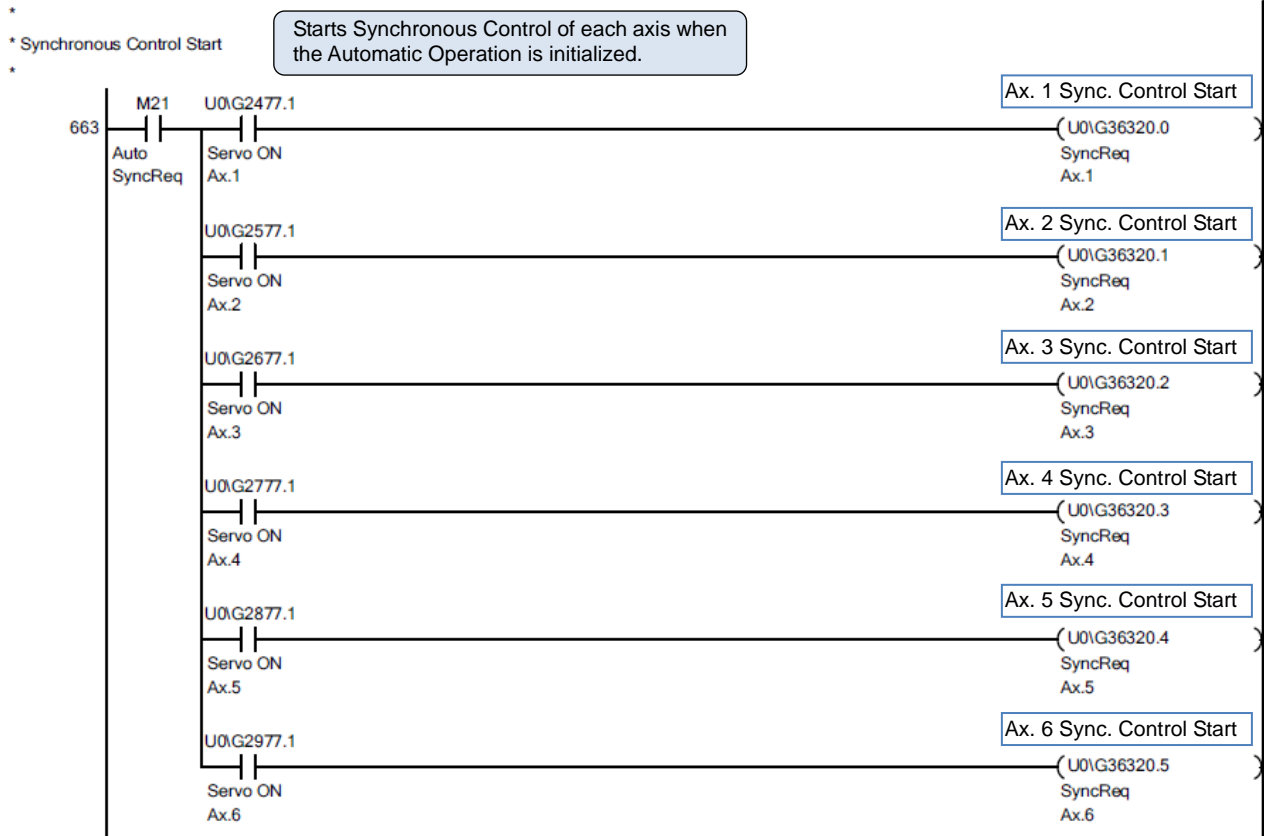
- * Auto operation
- * (4) Restart Operation
- *

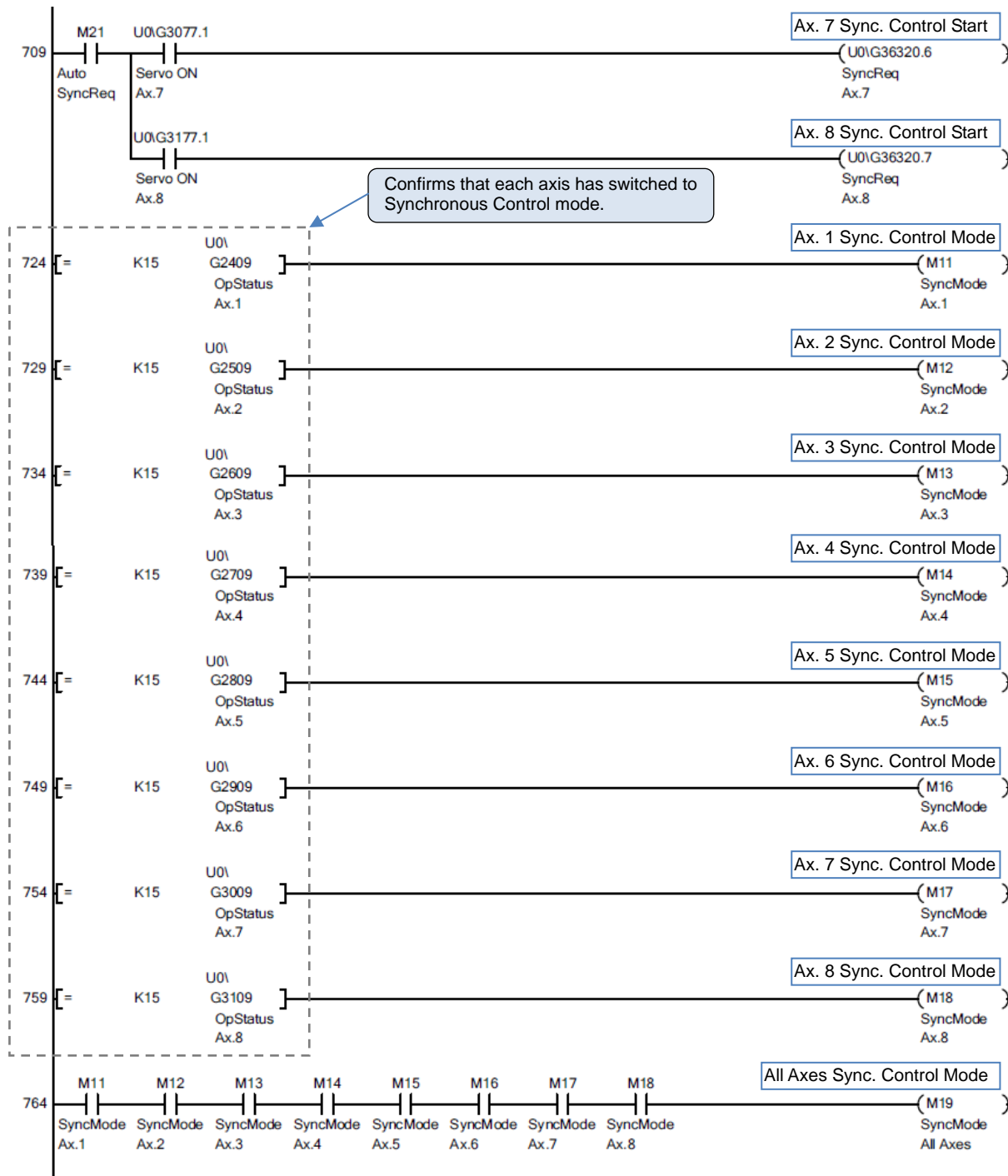
After the automatic operation is intermediately stopped, this moves the axes into the position where the synchronization operation can be restarted again.





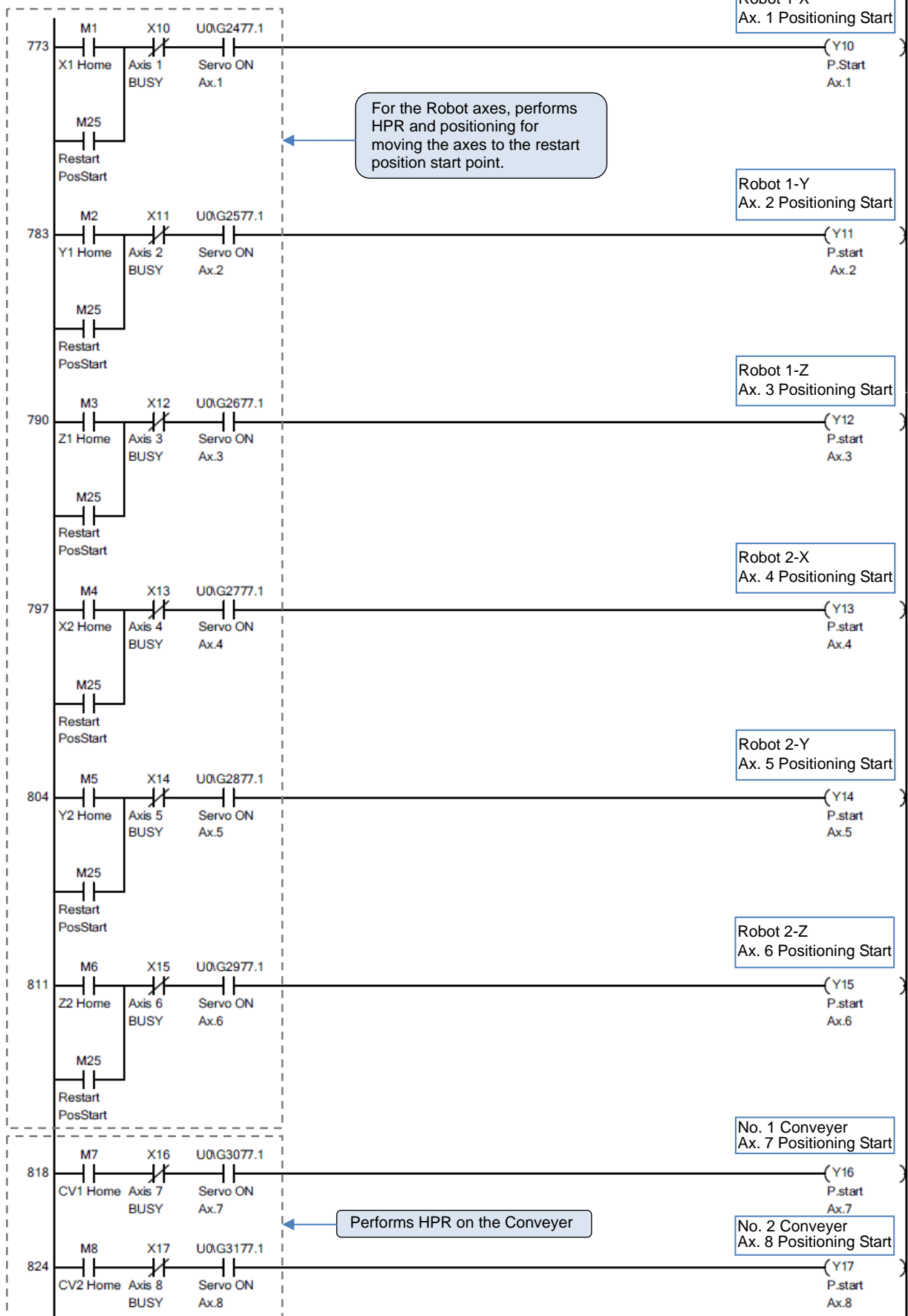
Synchronous control start processing

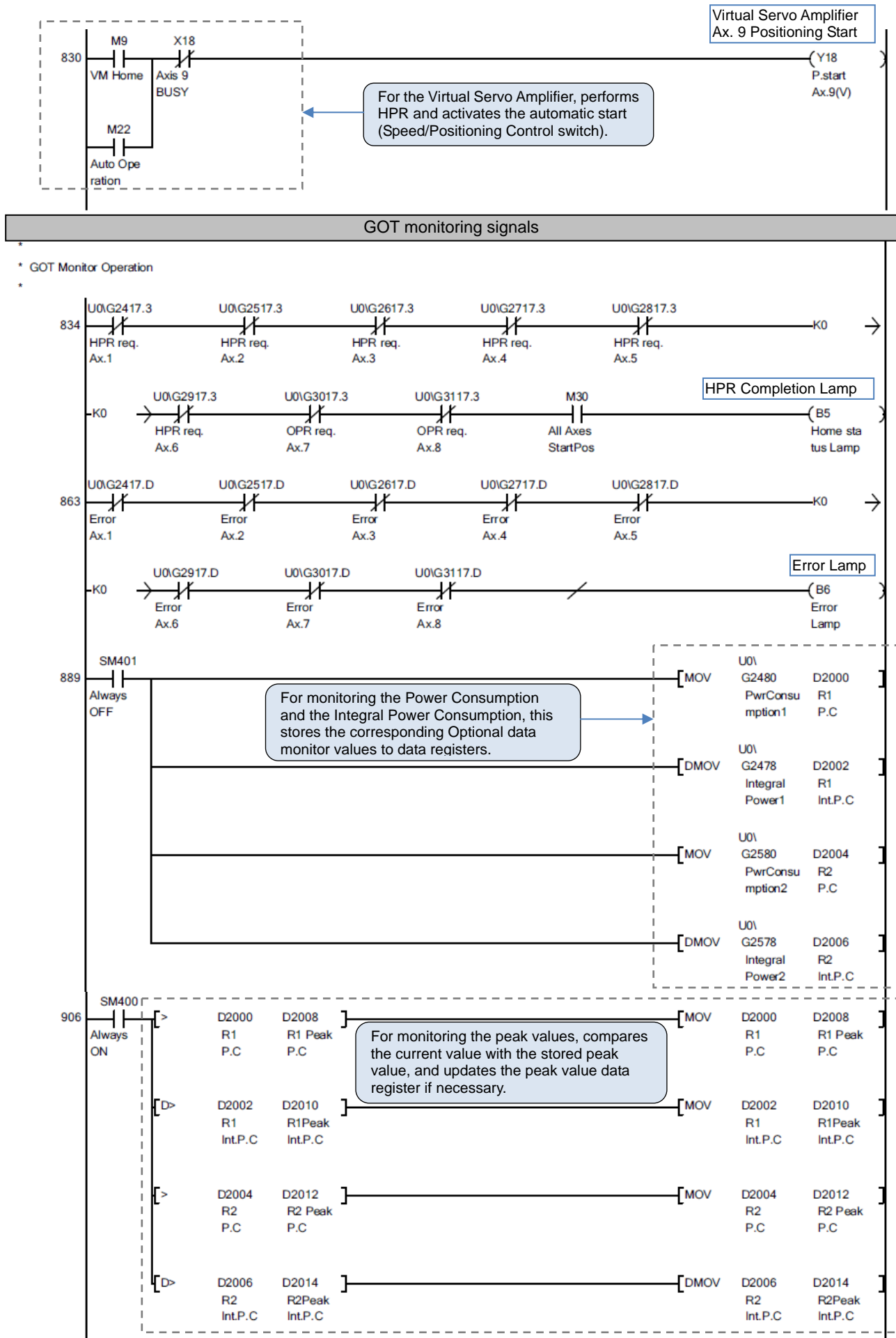




Positioning start signal processing

* Positioning start





Error reset

*
* Error Reset
*

