

MELSEC-F FX3 Series Data Operation Sample Ladder Reference Manual

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Reference Manual Revision History

Reference Manual No.	Date of Revision	Details of Revision
JY997D70301A	October, 2016	Newly Prepared

1. Outline

Outline of sample ladder

This program is sample ladder for a system that uses the FX3 Series main unit's data operation function.

Applicable devices

The applicable devices for this sample ladder are indicated below.

Model	Description		
Main unit			
	Series	Model	
	MELSEC-F Series	FX3S, FX3G, FX3GC, FX3U, FX3UC	
Engineering tool	GX Works2		
	Series	Language	Supported software version
	MELSEC-F Series	English	Version 1.545T and later
	GX Developer		
	Series	Language	Supported software version
	MELSEC-F Series	English	Version 8.119Z and later

System configuration

The configuration of a system using this sample ladder is shown below.

- FX3U(C)

Main unit FX3U(C)

- FX3G(C)

Main unit FX3G(C)

- FX3S

Main unit FX3S

Description of sample ladder function

The following functions are realized with this program.

No.	Project name	Description	Version
1	01_LD-FX3U_CPU_Data_V100A_E	An 8-digit value is generated by merging two 4-digit values.	Ver. 1.00A
2	02_LD-FX3G_CPU_Data_V100A_E	An operation equivalent to the SCL instruction is realized with ladder.	Ver. 1.00A
3	03_LD-FX3U_CPU_Data_V100A_E	The quantity that can be produced per hour is calculated from the production plans of a maximum of 5 models.	Ver. 1.00A


Prerequisites for using sample ladder

■ Changing the PLC type

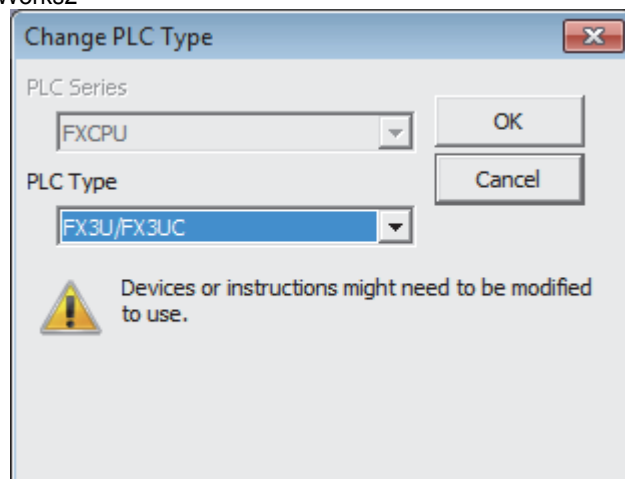
The sample ladder is provided with the model listed in the project name as shown below. When using with a model other than the provided project, change the PLC type using the engineering tool.

Example: With the following project name, the model is FX3U/FX3UC.

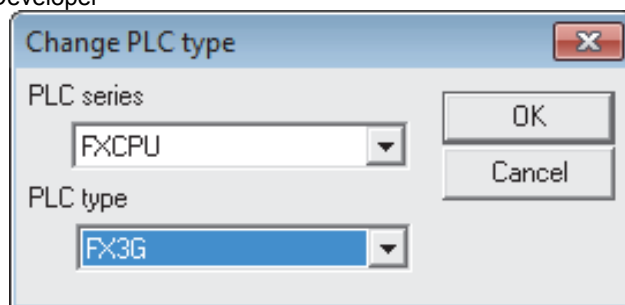
01_LD-FX3U_□□□_□□□_V100A_E

 [Project] ⇒ [Change PLC Type]

- For GX Works2



- For GX Developer



When using a GX Developer project with FX3S, refer to the TECHNICAL BULLETIN "HIME-T-P-0118 Limitations and precautions when using FX3S Series with GX Developer".

The provided project is not guaranteed to run with the user's system. Check the device assignments and parameters, etc., and adjust them to the user's system specifications before starting use.

Related manuals

FX3S/FX3G/FX3GC/FX3U/FX3UC Series Programming Manual - Basic & Applied Instruction Edition

Notice

This manual explains the functions of the sample ladder. The restrictions for using and the restrictions for combining the programmable controller, various function expansion boards, special adapters, and extension devices are not covered. Always read the User's Manual for the target product before starting use.

2. Sample ladder

2. 1. Combining numeric values (01_LD-FX3U_CPU_Data_V100A_E)

Outline of System

An 8-digit value is generated by merging two 4-digit values.

■ Description of functions

(1) When the execution command (M0) is ON, an 8-digit value is generated by merging two 4-digit values.

(2) If the input value is incorrect, abnormal end (Y000) turns ON, and the process is halted. The error code is stored in error code (D100). For the error codes, refer to error code in devices used (D100).

Programs Used

This program is targeted for FX3S, FX3G, FX3GC, FX3U and FX3UC.

The projects used in this program are indicated below.

No.	Project name	Function name	Remark
1	01_LD-FX3U_CPU_Data_V100A_E	Combining numeric values	This product is created with FX3U/FX3UC. When using with a model other than the provided project, change the PLC type using the engineering tool.

Devices used

The devices used in this program are indicated below.

Input device

No.	Device name	Data type	Kind	Device comment	Remark
1	M0	Bit	Input	Execution command	ON: The program starts. OFF: The program does not start.
2	D0	Word	Input	Target data to combine (high-order)	Sets the target data for the high-order four digits to be merged. [Valid range (decimal)] 0 --- 9999
3	D1	Word	Input	Target data to combine (low-order)	Sets the target data for the low-order four digits to be merged. [Valid range (decimal)] 0 --- 9999

Output device

No.	Device name	Data type	Kind	Device comment	Remark
1	Y000	Bit	Output	Abnormal end	When ON, it means an error has occurred in the program.
2	M100	Bit	Output	Execution status	ON: The execution command is ON. OFF: The execution command is OFF.
3	M101	Bit	Output	Normal end	When ON, it means that the process has ended.
4	D100	Word	Output	Error code	Stores the error code that occurred in the program. [Error code (decimal)] 10: Target data to combine (high-order) is out-of-range. 11: Target data to combine (low-order) is out-of-range.
5	D102 --- D103	Double Word	Output	Resulting data of combination	Stores the merged 8-digit data.

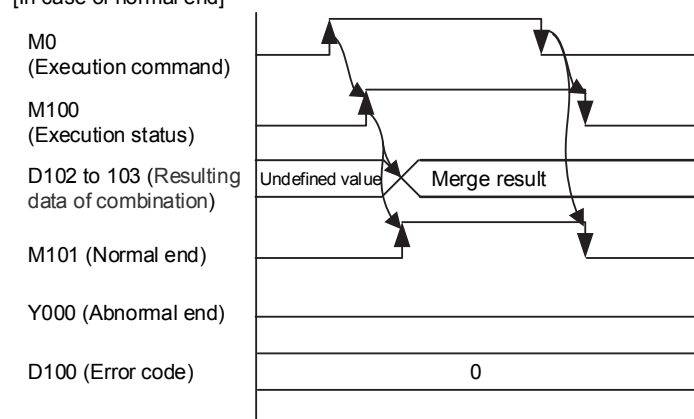
Internal device

No.	Device name	Data type	Kind	Device comment	Remark
1	M200	Bit	Internal	Setting data check command	Holds the check command flag for the set data.
2	M201	Bit	Internal	Main process execution command	Holds the execution command flag for the main process.
3	M203	Bit	Internal	Program completed	Holds the program completed flag.
4	M204	Bit	Internal	Main process execution completed	Holds the execution completed flag for the main process.
5	M205	Bit	Internal	Program error	Holds the program error flag.
6	M206	Bit	Internal	Pulsed execution command	Holds the pulsed flag for the execution command.
7	D50 --- D51	Word	Internal	Combined data (high 4 digits)	Stores the data (high-order 4-digits) that is being merged.
8	D52 --- D53	Word	Internal	Combined data (low 4 digits)	Stores the data (low-order 4-digits) that is being merged.

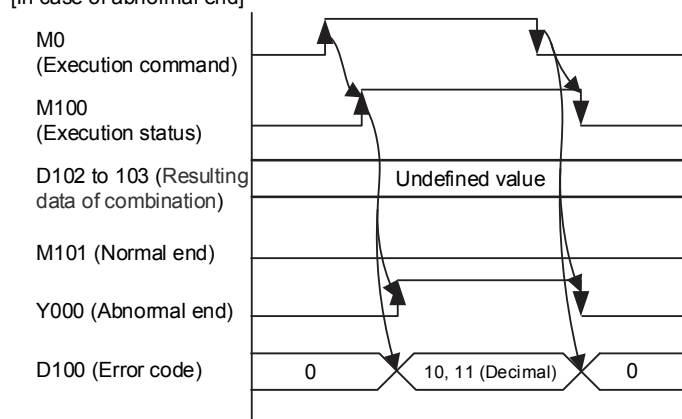
Operation of I/O signals

- The timing chart for this program is shown below.

[In case of normal end]



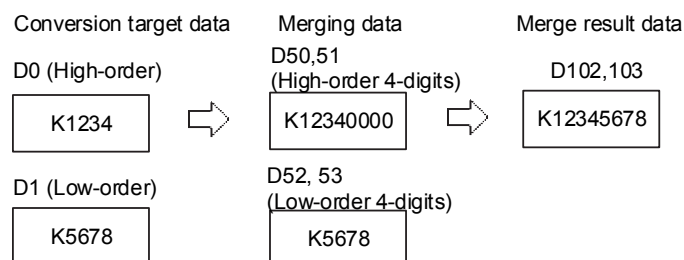
[In case of abnormal end]



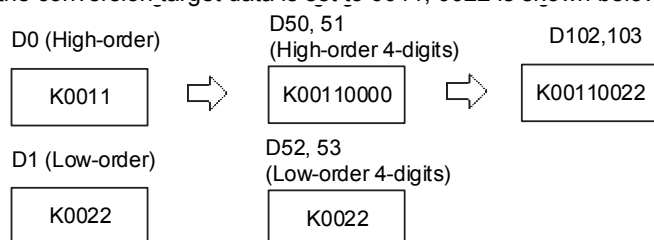
- The processes of this program are given below.

- The input target data to combine (high-order) and target data to combine (low-order) is checked.
- The merge data (low-order 4-digits) is added to the merge data (high-order 4-digits) that has been multiplied by 10000, to generate an 8-digit value.
- The data from step (2) is stored as the resulting data of combination.

The operation when the conversion target data is set to 1234, 5678 is shown below.



The operation when the conversion target data is set to 0011, 0022 is shown below.

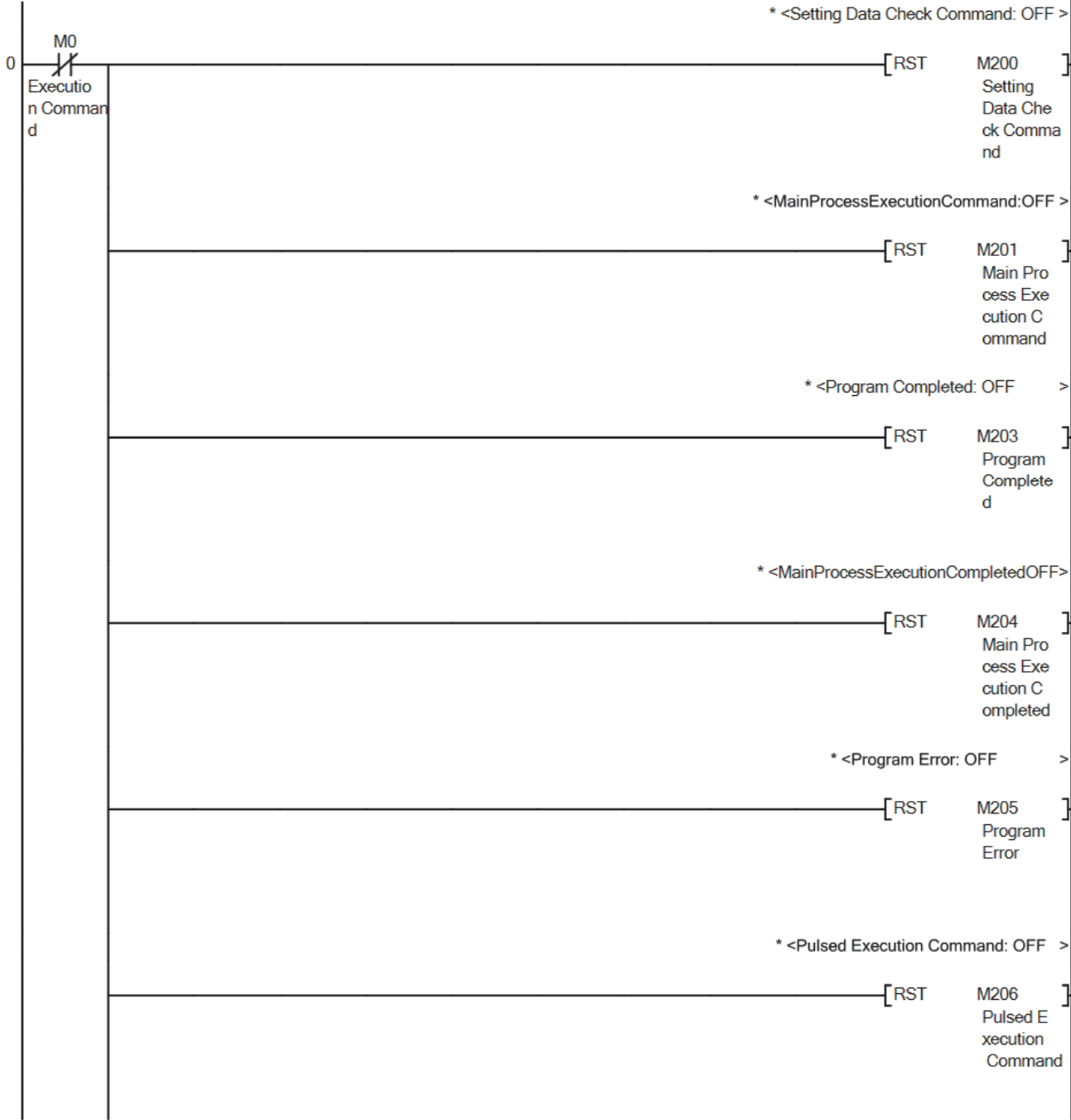


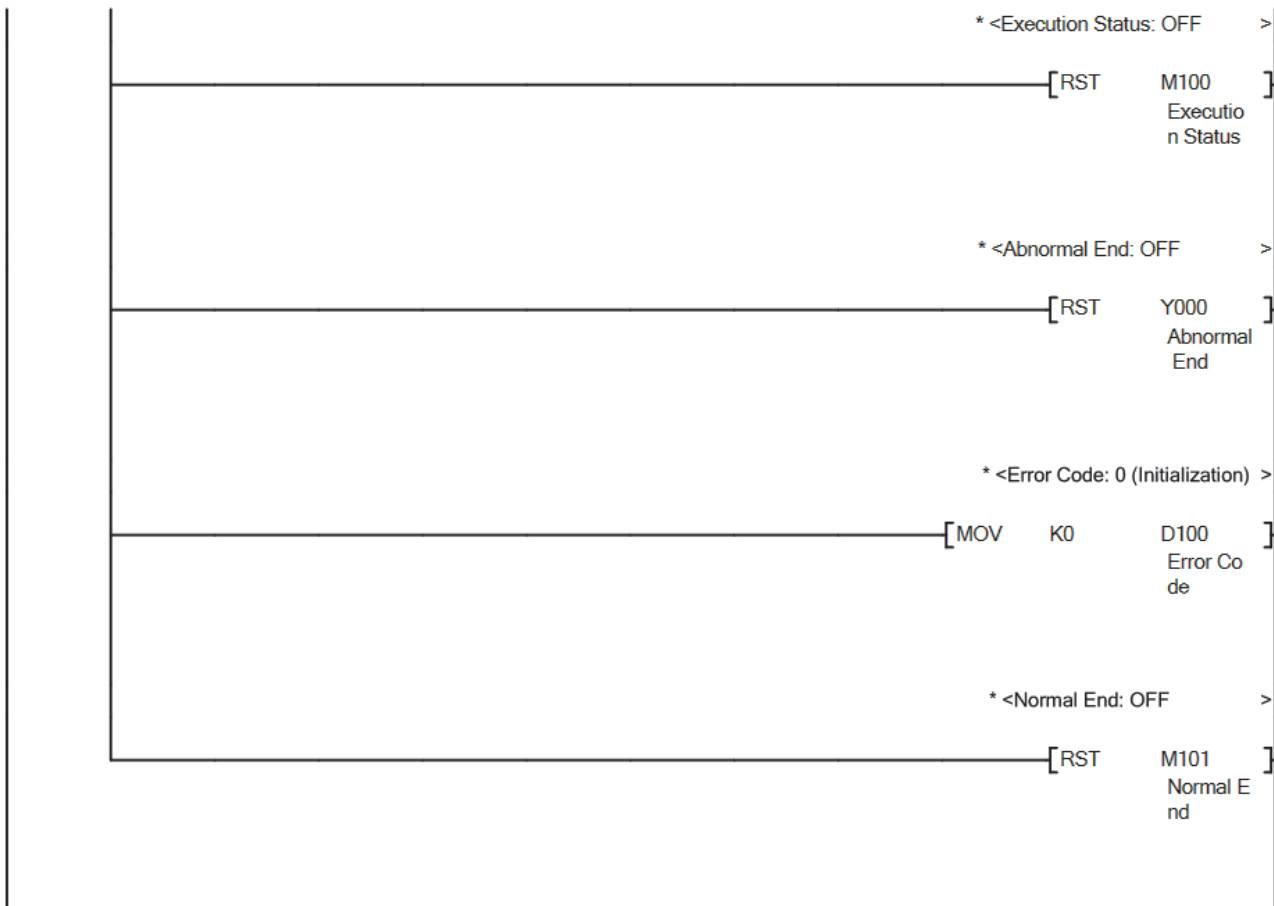
Version upgrade history

Version	Date	Description
Ver. 1.00A	October, 2016	First Edition

Program

* Sample Ladder Name: 01_LD-FX3U_CPU_Data_V100A_E
* Function: Combining Numeric Values
* Version: Ver.1.00A
*
* Process of Initializing Program
*





*
 * Process of Executing Program
 *



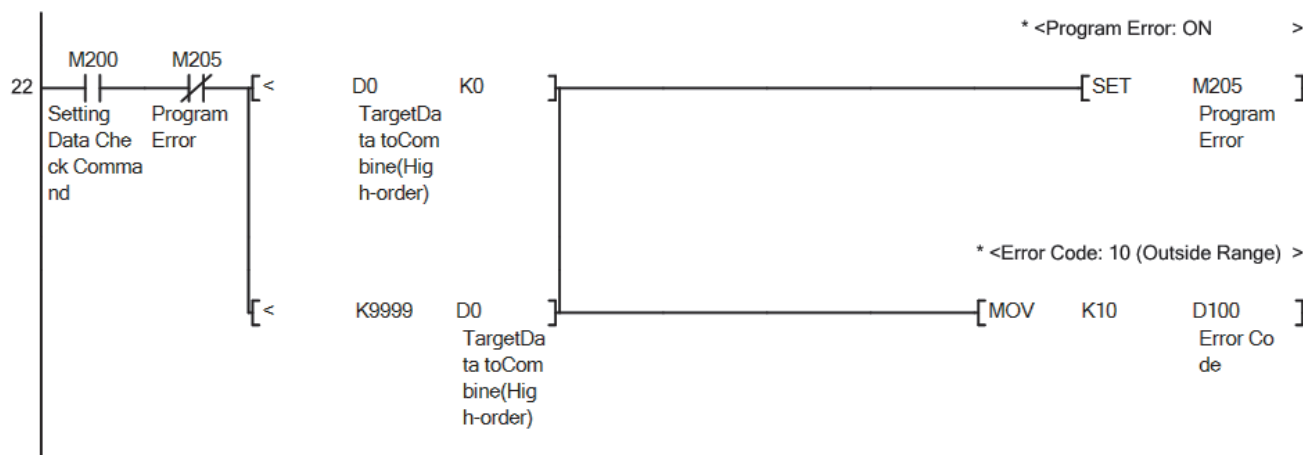
*

* Process of Checking Preset Data

*

* Confirm Range of Target Data to Combine (High-order)

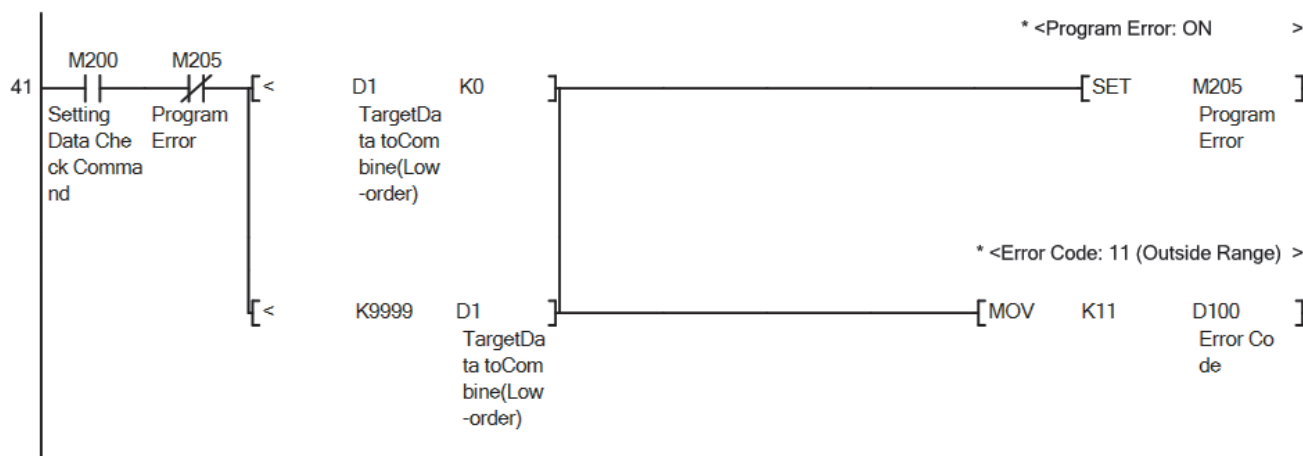
*



*

* Confirm Range of Target Data to Combine (Low-order)

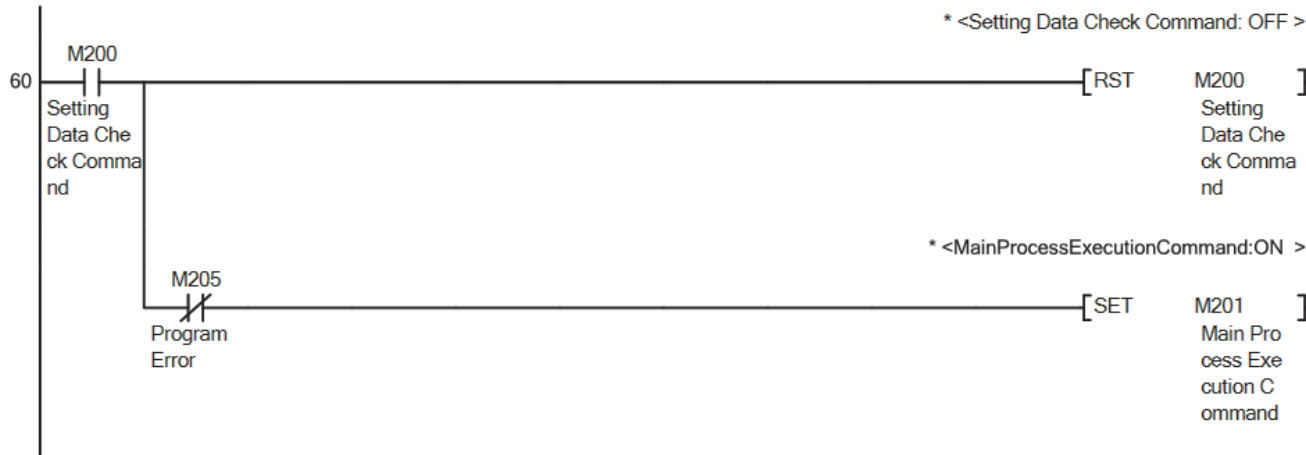
*



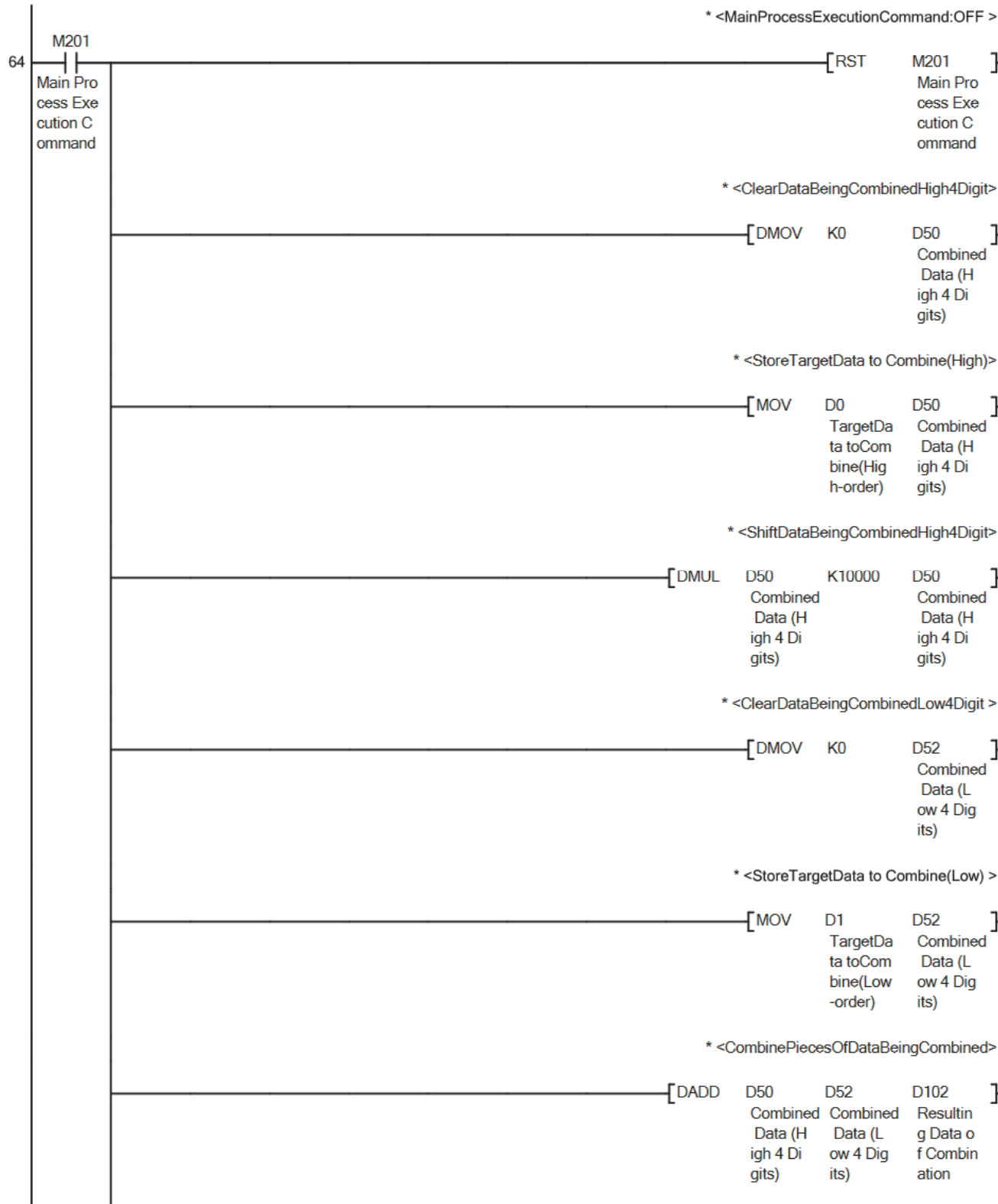
*

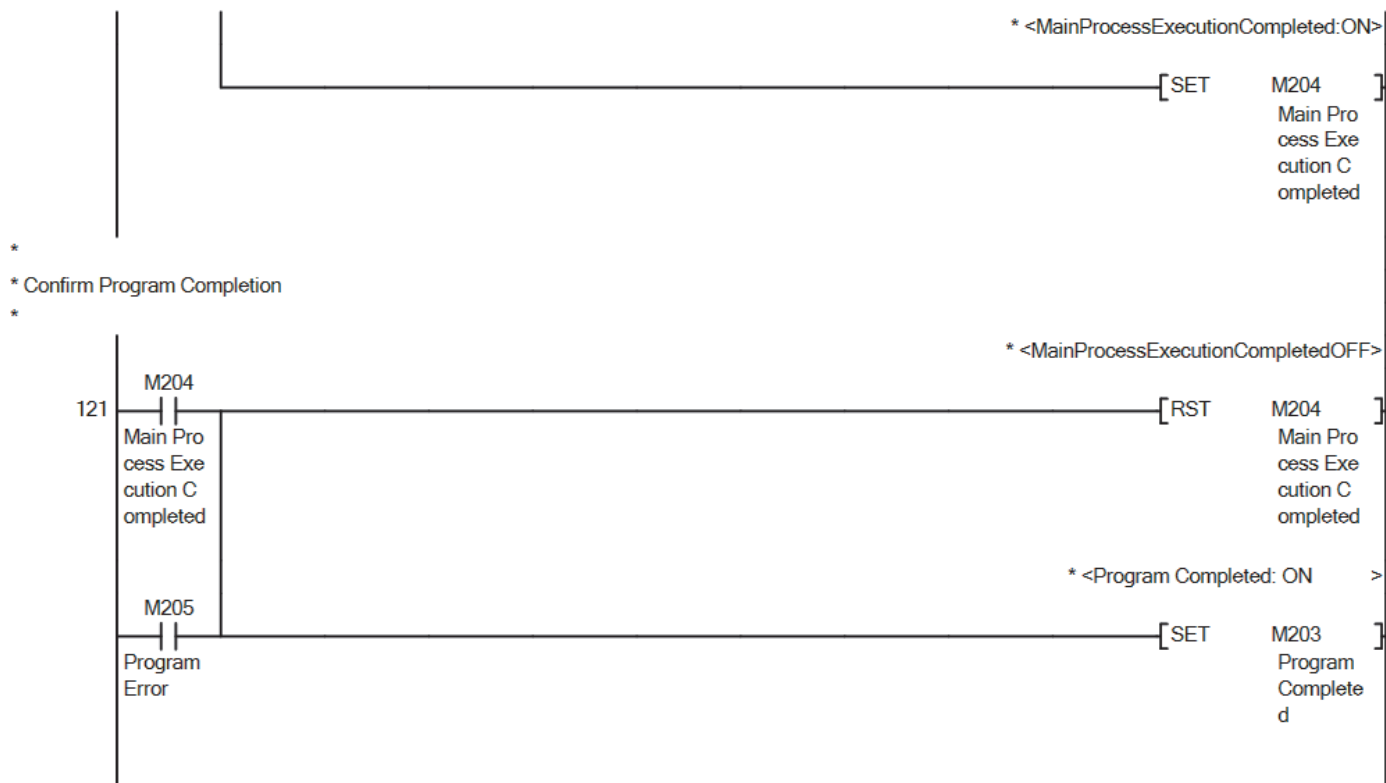
* Confirm Completion of Checking Preset Data

*

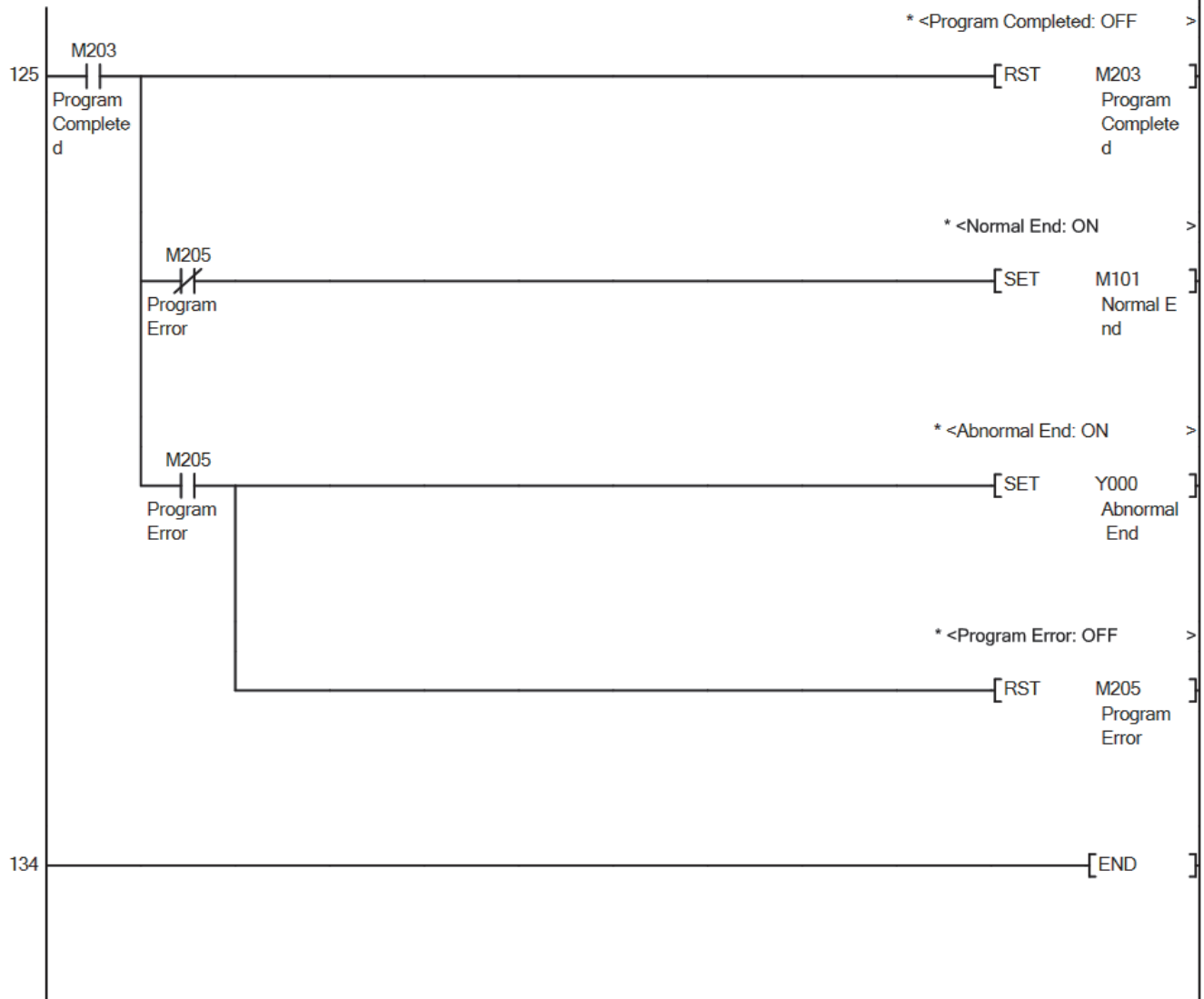


*
 * Execute Process of Combining Numeric Values
 *





*
 * Process of Program Completion
 *



2. 2. SCL instruction implementation (02_LD-FX3G_CPU_Data_V100A_E)

Outline of System

An operation equivalent to the SCL instruction is realized with ladder.

■ Description of functions

When the execution command (M0) turns ON, the following process is continually executed.

(1) When the execution command (M0) turns ON, scaling is executed using the data table with designated input values, and the same operation as SCL instruction takes place.

Note that only two points can be used with this independent sample ladder. *

(2) If the input value is incorrect, abnormal end (Y000) turns ON, and the process is halted. The error code is stored in error code (D100). For the error codes, refer to error code in devices used (D100).

* Supplement: When this sample ladder is used multiple times, scaling with three or more points can be executed in the same manner as SCL.

Programs Used

This program is targeted for FX3S, FX3G and FX3GC. Use the SCL instruction for FX3U and FX3UC.

The projects used in this program are indicated below.

No.	Project name	Function name	Remark
1	02_LD-FX3G_CPU_Data_V100A_E	SCL instruction implementation	This product is created with FX3G/FX3GC. When using with a model other than the provided project, change the PLC type using the engineering tool.

Devices used

The devices used in this program are indicated below.

Input device

No.	Device name	Data type	Kind	Device comment	Remark
1	M0	Bit	Input	Execution command	ON: The program starts. OFF: The program does not start.
2	D0	Word	Input	Input value	Sets the input value. [Valid range (decimal)] -32768 --- 32767
3	D1	Word	Input	Point 1 X coord	Sets the X coordinate for the first point. [Valid range (decimal)] -32768 --- 32767
4	D2	Word	Input	Point 1 Y coord	Sets the Y coordinate for the first point. [Valid range (decimal)] -32768 --- 32767
5	D3	Word	Input	Point 2 X coord	Sets the X coordinate for the 2nd point. [Valid range (decimal)] -32768 --- 32767
6	D4	Word	Input	Point 2 Y coord	Sets the Y coordinates for the 2nd point. [Valid range (decimal)] -32768 --- 32767

Output device

No.	Device name	Data type	Kind	Device comment	Remark
1	Y000	Bit	Output	Abnormal end	When ON, it means an error has occurred in the program.
2	M100	Bit	Output	Execution status	ON: The execution command is ON. OFF: The execution command is OFF.
3	M101	Bit	Output	Normal end	When ON, it means that the process has ended.

No.	Device name	Data type	Kind	Device comment	Remark
4	D100	Word	Output	Error code	Stores the error code that occurred in the program. [Error code (decimal)] 10: The point 1 X coordinate and point 2 X coordinate are reversed. 11: The input point is not between the point 1 X coordinate and point 2 X coordinate.
5	D101	Word	Output	Scaling conversion result	Stores the scaling conversion results.

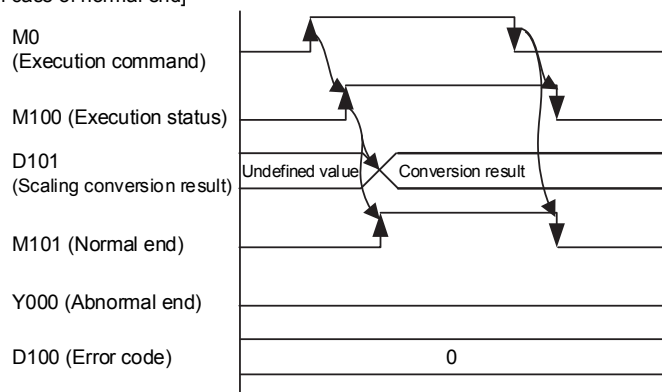
Internal device

No.	Device name	Data type	Kind	Device comment	Remark
1	M200	Bit	Internal	Setting data check command	Holds the check command flag for the set data.
2	M201	Bit	Internal	Main process execution command	Holds the execution command flag for the main process.
3	M203	Bit	Internal	Program completed	Holds the program completed flag.
4	M204	Bit	Internal	Main process execution completed	Holds the execution completed flag for the main process.
5	M205	Bit	Internal	Program error	Holds the program error flag.
6	M210	Bit	Internal	Y axis up flag	Turns ON when the point 1 Y coordinate is smaller than or equal to the point 2 Y coordinate.
7	M211	Bit	Internal	Y axis down flag	Turns ON when the point 1 Y coordinate is greater than the point 2 Y coordinate.
8	D50 --- D51	Double Word	Internal	Resolution	Stores the Y coordinate change amount per X coordinate 1.
9	D52 --- D53	Double Word	Internal	X axis differential	Stores the difference of the point 1 X coordinate and point 2 X coordinate.
10	D54 --- D55	Double Word	Internal	Y axis differential	Stores the difference of the point 1 Y coordinate and point 2 Y coordinate.
11	D56 --- D57	Double Word	Internal	Increase/decrease on X axis	Stores the difference of the input value and point 1 X coordinate.
12	D58 --- D59	Double Word	Internal	Increase/decrease on Y axis	Stores the difference of the point 1 Y coordinate and scaling conversion results Y coordinates.
13	D60 --- D61	Double Word	Internal	Point 1 for Y coord calculation	Stores the point 1 Y coordinate as double word for calculating with double word.
14	D62 --- D63	Double Word	Internal	For calculate scaling convert result	Stores the scaling conversion results as double word.
15	D64 --- D65	Double Word	Internal	For input value calculation	Stores the input value as double word for calculating with double word.
16	D66 --- D67	Double Word	Internal	Point 1 for X coord calculation	Stores the point 1 X coordinate as double word for calculating with double word.
17	D68 --- D69	Double Word	Internal	Point 2 for X coord calculation	Stores the point 2 X coordinate as double word for calculating with double word.
18	D70 --- D71	Double Word	Internal	Point 2 for Y coord calculation	Stores the point 2 Y coordinate as double word for calculating with double word.

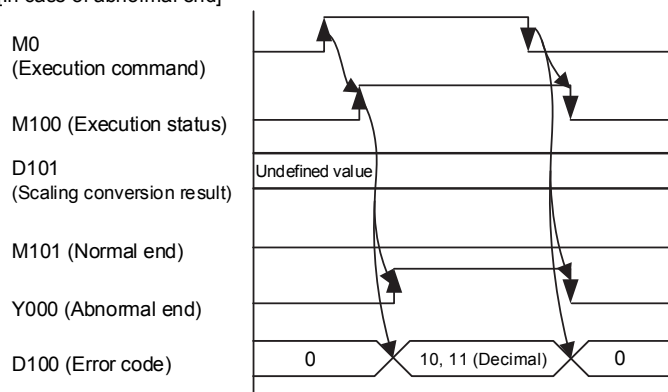
Operation of I/O signals

■ The timing chart for this program is shown below.

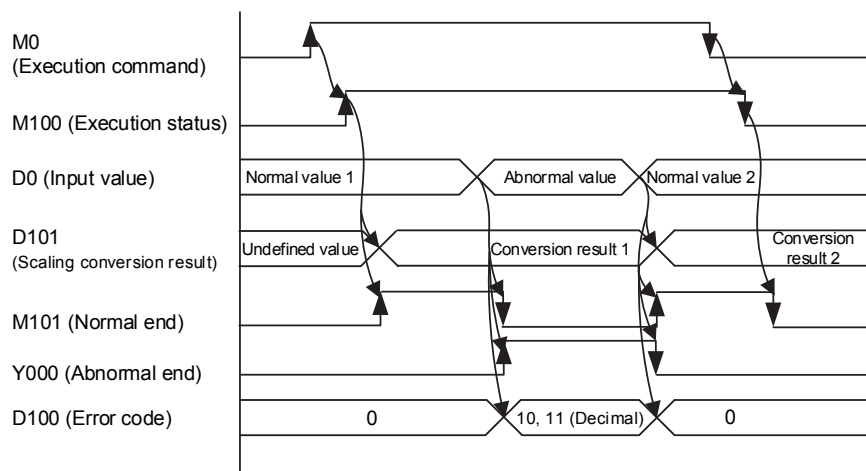
[In case of normal end]



[In case of abnormal end]



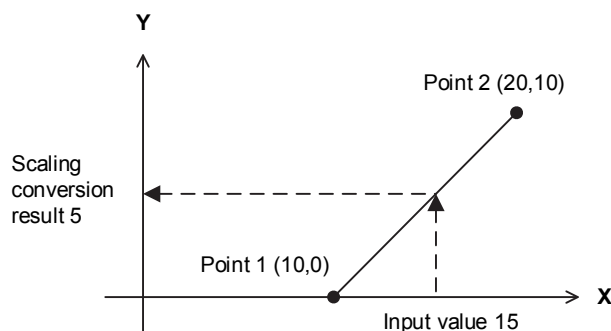
[In case of change of input value: Normal input → Abnormal input → Normal input during execution command ON]



■ The processes of this program are given below.

- (1) When execution command (M0) is ON, the point 1 X coordinate, point 2 X coordinate, and input value are checked.
- (2) If the point 1 X coordinate and point 2 X coordinate are equal, the point 2 Y coordinate are stored in the scaling conversion results.
- (3) If the point 1 X coordinate and point 2 X coordinate are different, the following process is executed.
 1. The X axis difference, Y axis difference, Y axis up flag, and Y axis down flag, are calculated from the point 1 X coordinate/Y coordinates and point 2 X coordinate/Y coordinates.
 2. The resolution is calculated with the X axis difference and Y axis difference calculated in step 1.
 3. The X axis increment/decrement value is calculated from the input value and point 1 X coordinate.
 4. The Y axis increment/decrement value is calculated from the resolution calculated in step 2, and the X axis increment/decrement value calculated in step 3.
 5. The scaling conversion results are calculated from the Y axis up flag and Y axis down flag calculated in step 1, and the Y axis increment/decrement value calculated in step 4.
 - When Y axis up flag is ON: Scaling conversion results = point 1 Y coordinate + Y axis increment/decrement value
 - When Y axis down flag is ON: Scaling conversion results = point 1 Y coordinate - Y axis increment/decrement value.

The operation when (10,0) is set in the point 1 coordinates, (20,10) is set in the point 2 coordinates, and 15 is set for the input value is shown below.



[Method for using this sample ladder when scaling with three or more points]

Scaling with multiple points can be realized by using this sample ladder multiple times.

A setting example when scaling with three points by using two of these sample ladders is shown below. Copy the sample ladders and for the 2nd sample ladder, change each device and set value as follows.

(Continuous paste can be used with GX Works2. For the number of increments when continuously pasting, see “Number of increments” in the table below.)

The first sample ladder (the 1st point, the 2nd point)	The second sample ladder (the 2nd point, the 3rd point)	Number of increments
M0	M0	0
M200	M220	20
M201	M221	20
M203	M223	20
M204	M224	20
M205	M225	20
M100	M120	20
Y000	Y001	1
K0	K0	0
D100	D120	20
M101	M121	20
D3	D5	2
D1	D3	2
K10	K10	0
D0	D0	0
K11	K11	0
D4	D6	2
D101	D121	20
D64	D84	20
D65	D85	20
H0FFFF	H0FFFF	0
D66	D86	20
D67	D87	20
D2	D4	2
D60	D80	20
D61	D81	20
D68	D88	20
D69	D89	20
D70	D90	20
D71	D91	20
D54	D74	20
M210	M230	20
M211	M231	20
D52	D72	20
D50	D70	20
D56	D76	20
D58	D78	20
D62	D82	20

The method of using a program created by continuously pasting this sample ladder with the above setting is shown below.

- (1) Sets the coordinates for the 1st point to the first sample ladder point 1 X, Y coordinates (D1, D2).
- (2) Sets the coordinates for the 2nd point to the first sample ladder point 2 and second sample ladder point 1 X, Y coordinates (D3, D4).
- (3) Sets the coordinates for the 3rd point to the second ladder point 2 X, Y coordinates (D5, D6).
- (4) Turns execution command (M0) ON.

When the scaling target value is set for the input value (D0) after the above settings are completed, if the input range is within the range, the sample ladder turns normal end (M101 or M121) ON, and turns abnormal end (Y000 or Y001) OFF. If the input value is not within the range, the sample ladder turns normal end OFF, and turns abnormal end ON.

Use the scaling conversion results (D101 or D121) of the sample ladder for which normal end has turned ON as the scaling conversion results for multiple points.

* Precautions

If the input value is equal to the designated point's X coordinate, the normal end may turn ON for multiple sample ladders. In this case, of the sample ladders for which normal end has turned ON, use the scaling conversion results for the sample ladder with the sequentially earliest points designated for points 1 and 2.

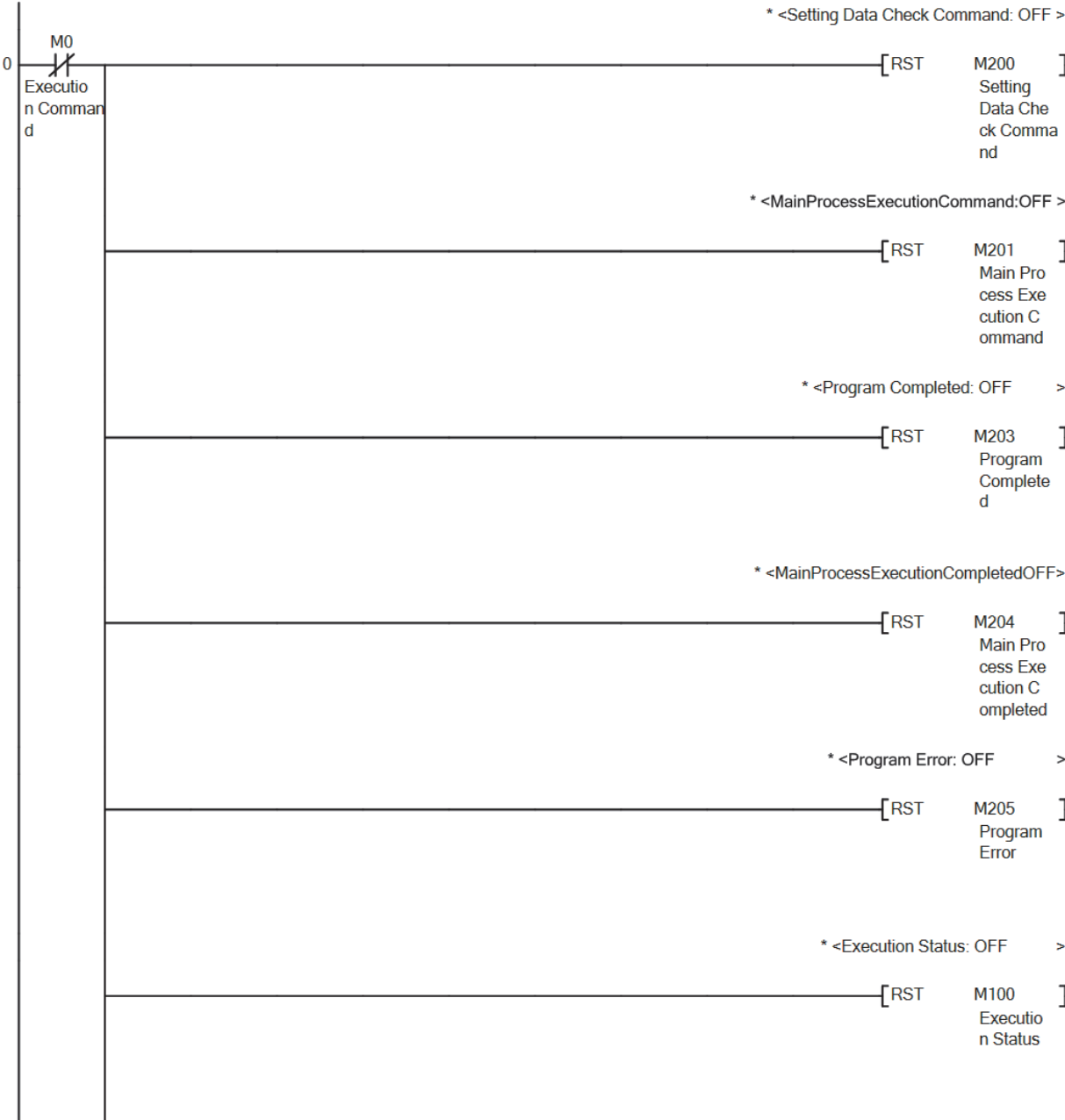
Example: When (1) to (3) is set as shown above, if the input value is the same as the 2nd point's X coordinate, the 1st sample ladder and 2nd sample ladder normal end will turn ON. The 1st point and 2nd points are set in the 1st sample ladder, and the 2nd point and 3rd point are set in the 2nd sample ladder, so use the scaling conversion results of the 1st sample ladder with the sequentially earliest points (1st point and 2nd point).

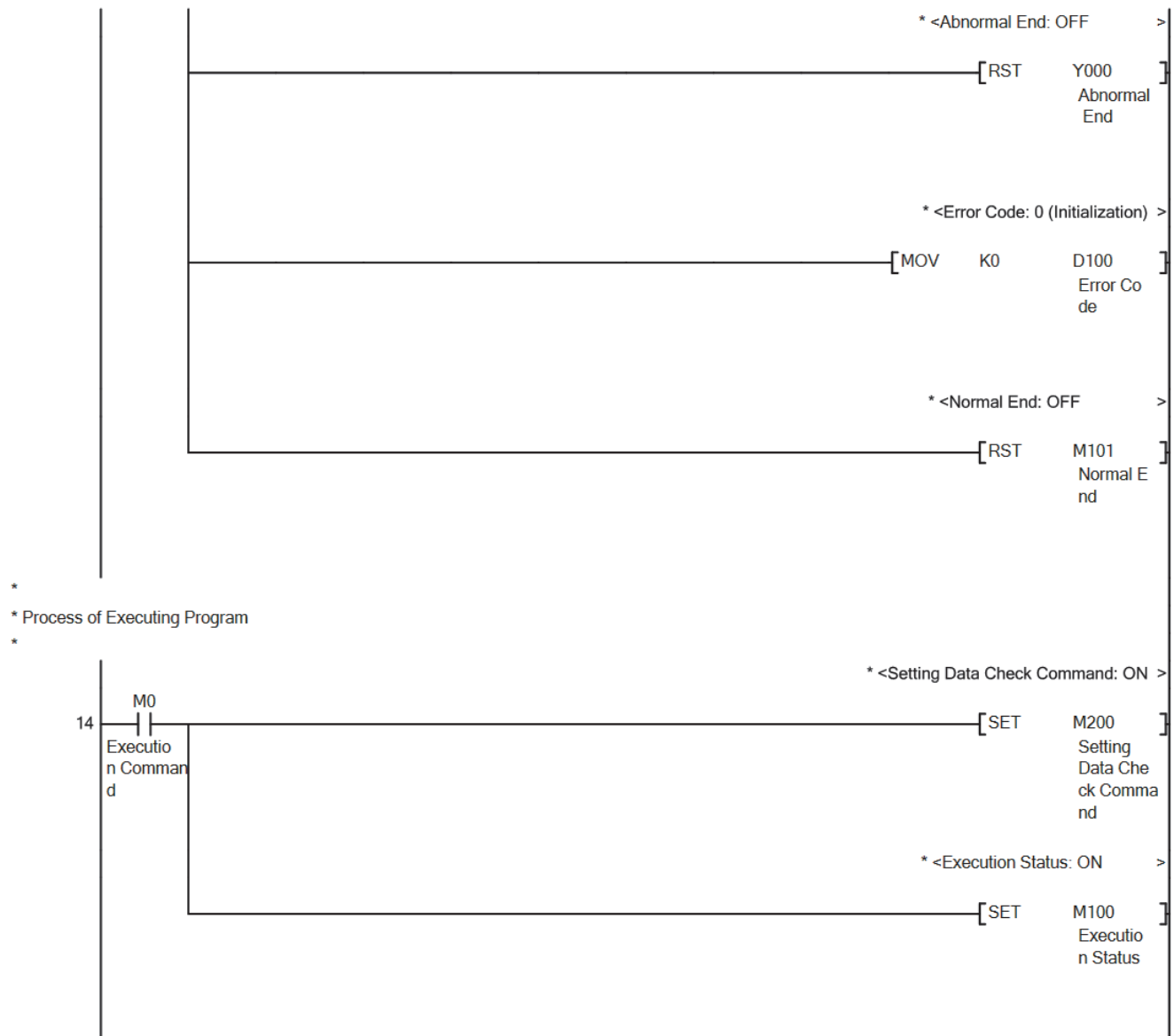
Version upgrade history

Version	Date	Description
Ver. 1.00A	October, 2016	First Edition

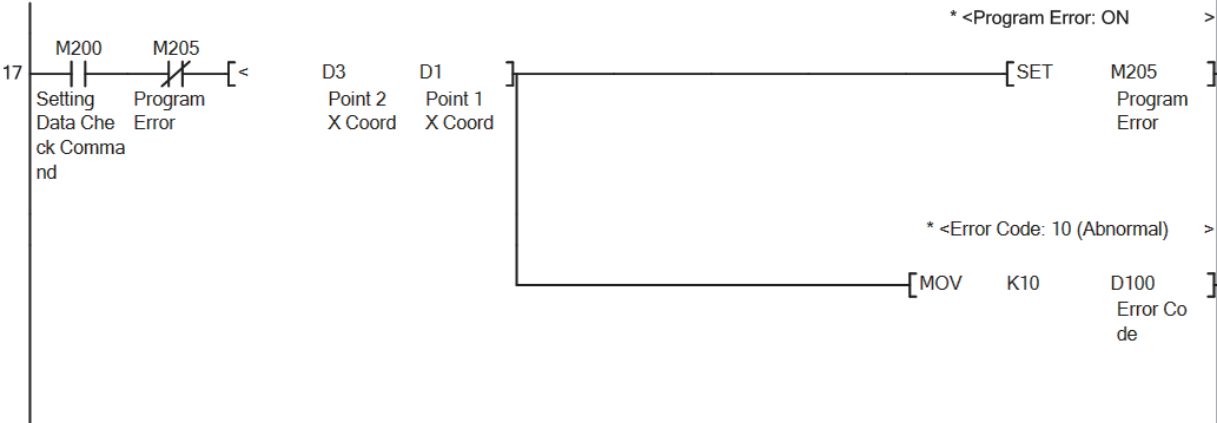
Program

* Sample Ladder Name: 02_LD-FX3G_CPU_Data_V100A_E
* Function: SCL Instruction Implementation
* Version: Ver.1.00A
*
* Process of Initializing Program
*

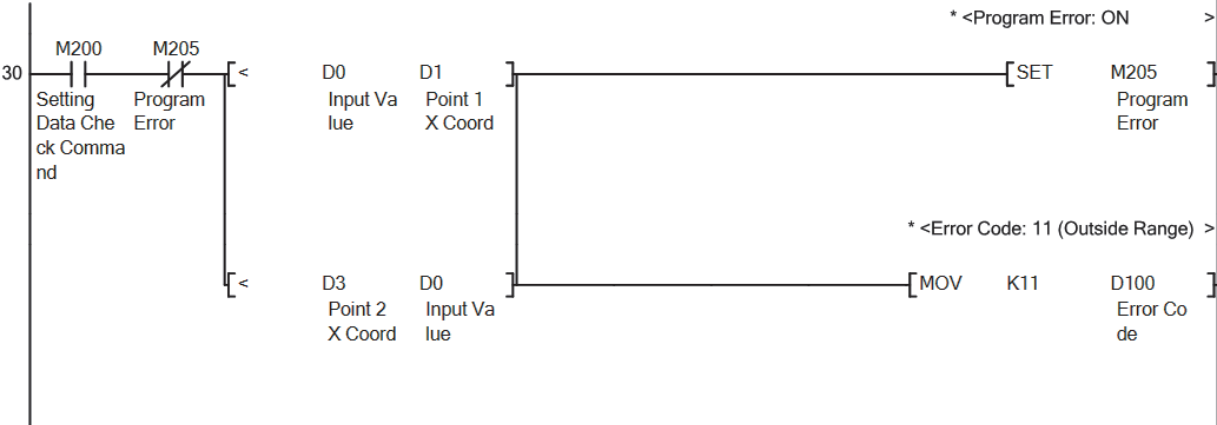




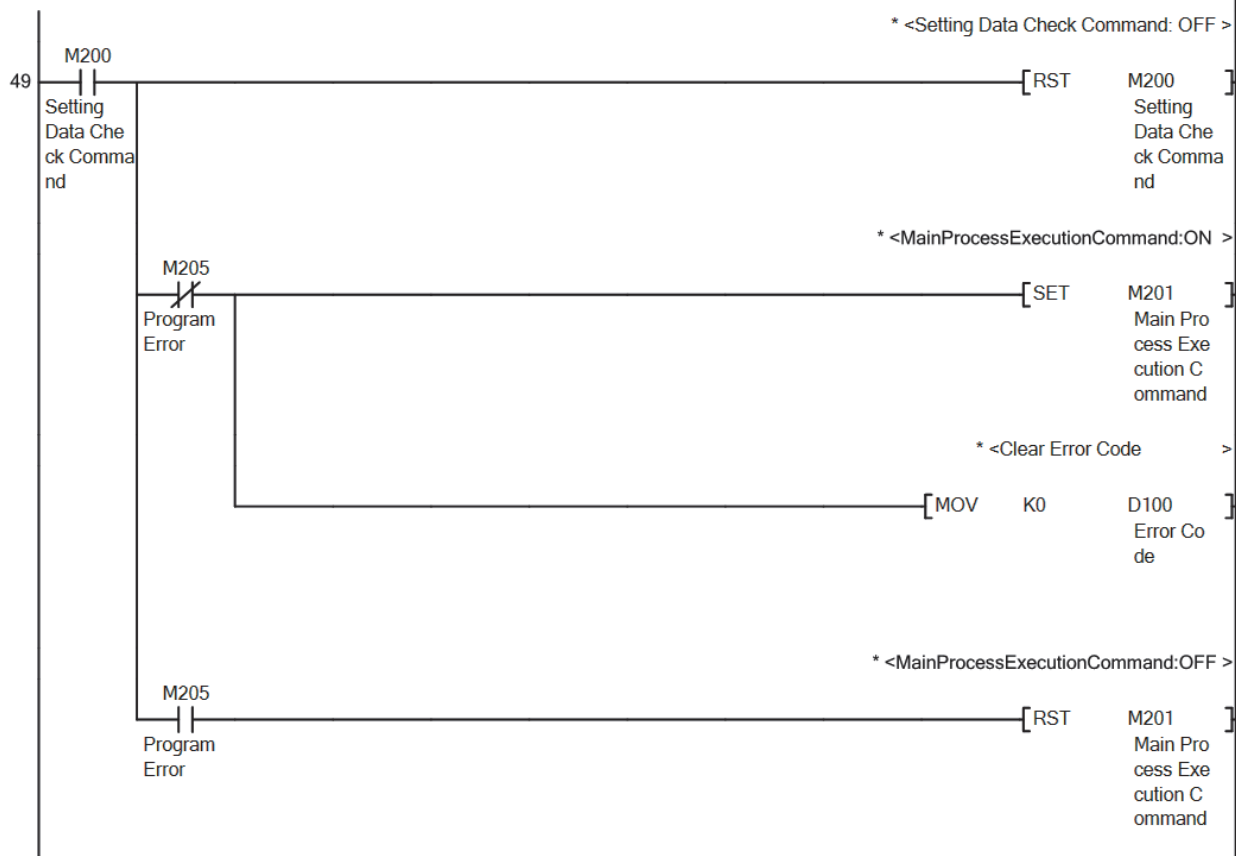
*
 * Process of Checking Preset Data
 *
 * Confirm Reversal of Point 1/2 X Coord
 *



*
 * Confirm Input Value Range
 *



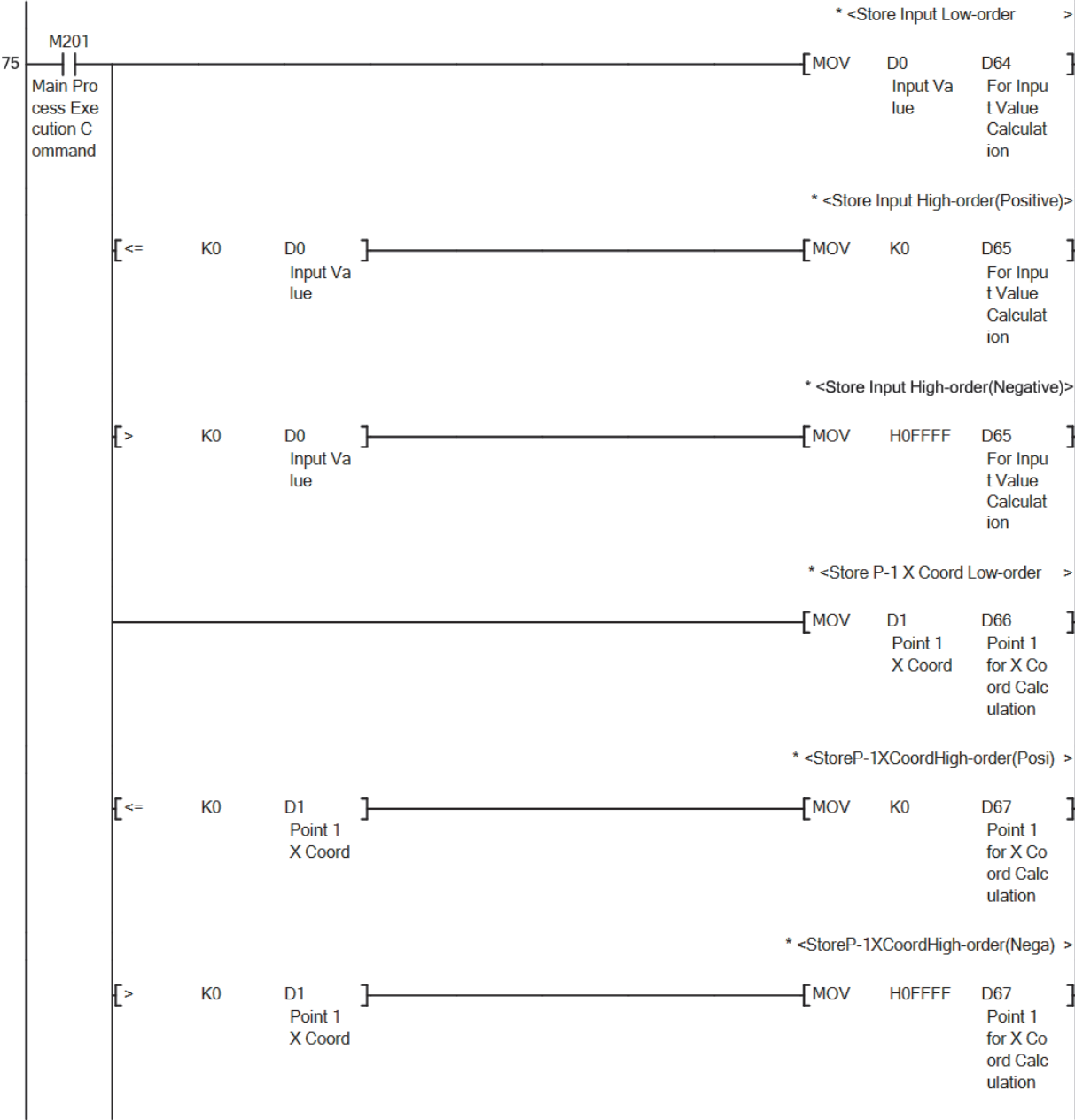
*
 * Confirm Completion of Checking Preset Data
 *

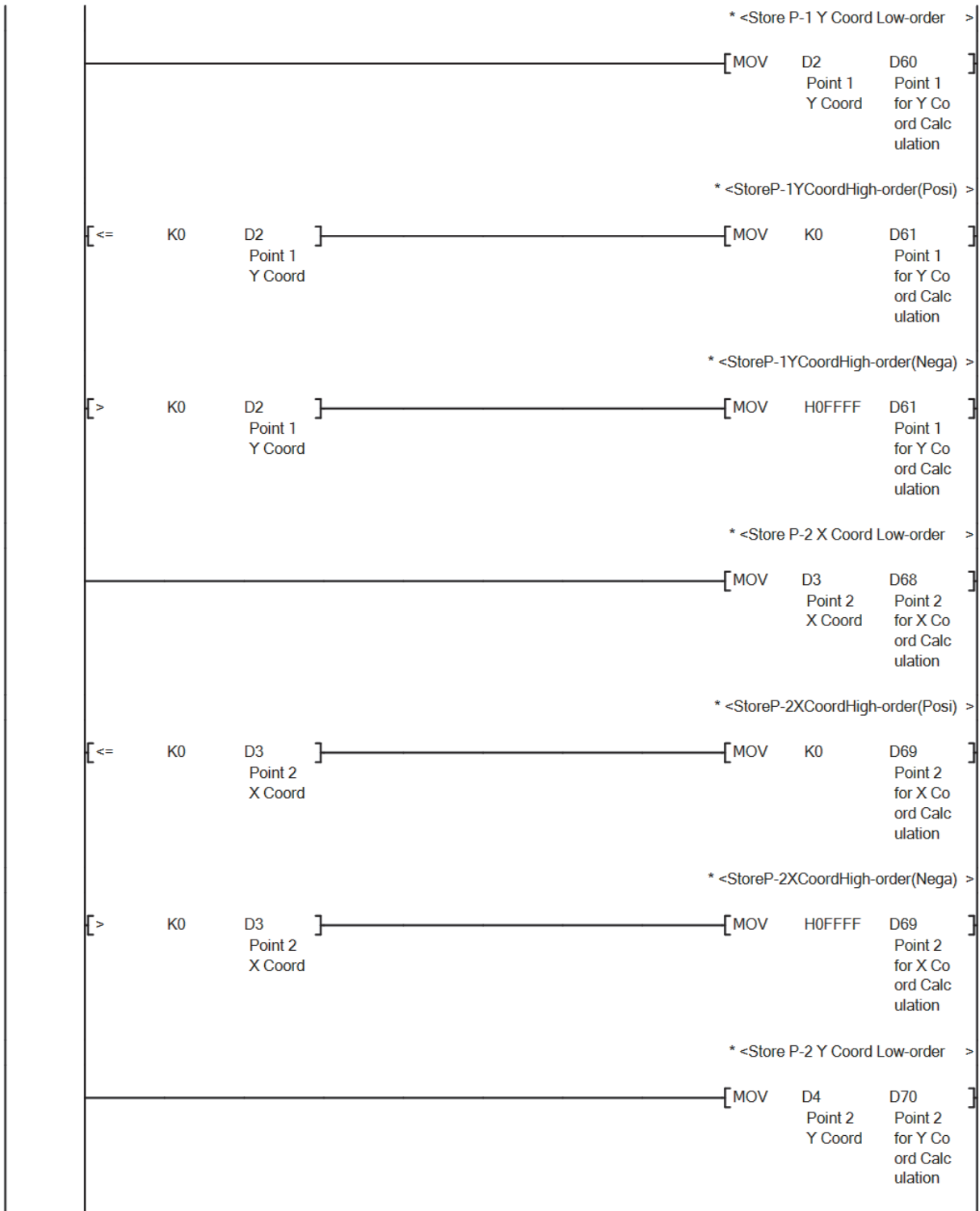


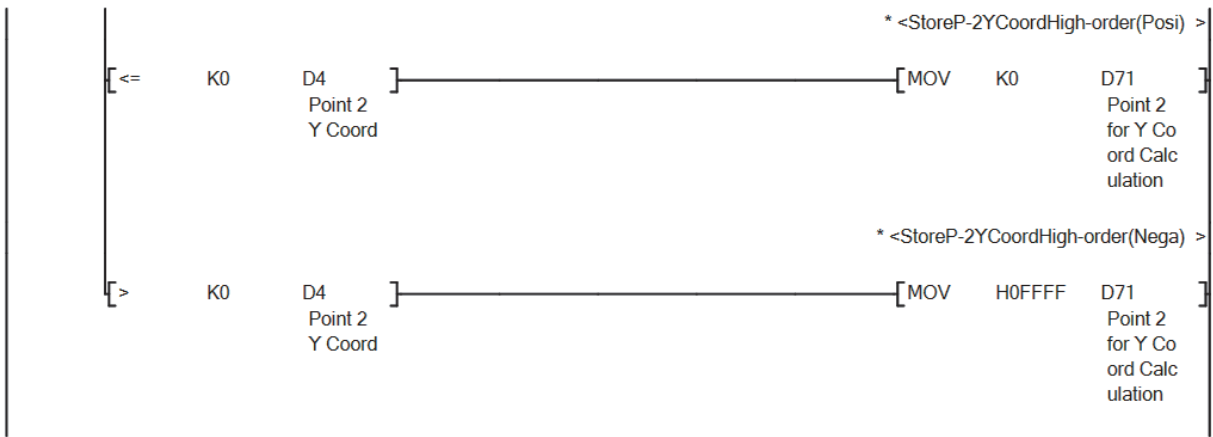

```

graph LR
    M201[M201 Main Process Execution Command] -- "=" --> J1(( ))
    J1 --> RST[RST M201 Main Process Execution Command]
    J1 --> MOV[MOV D4 Point 2 Y Coord to D101 Scaling Conversion Result]
    J1 --> SET[SET M204 Main Process Execution Completed]
    D1[D1 Point 1 X Coord] --> J1
    D3[D3 Point 2 X Coord] --> J1
    RST --- C1["* <MainProcessExecutionCommand:OFF >"]
    MOV --- C2["* <Store Scaling Conversion Results>"]
    SET --- C3["* <MainProcessExecutionCompleted:ON>"]
  
```

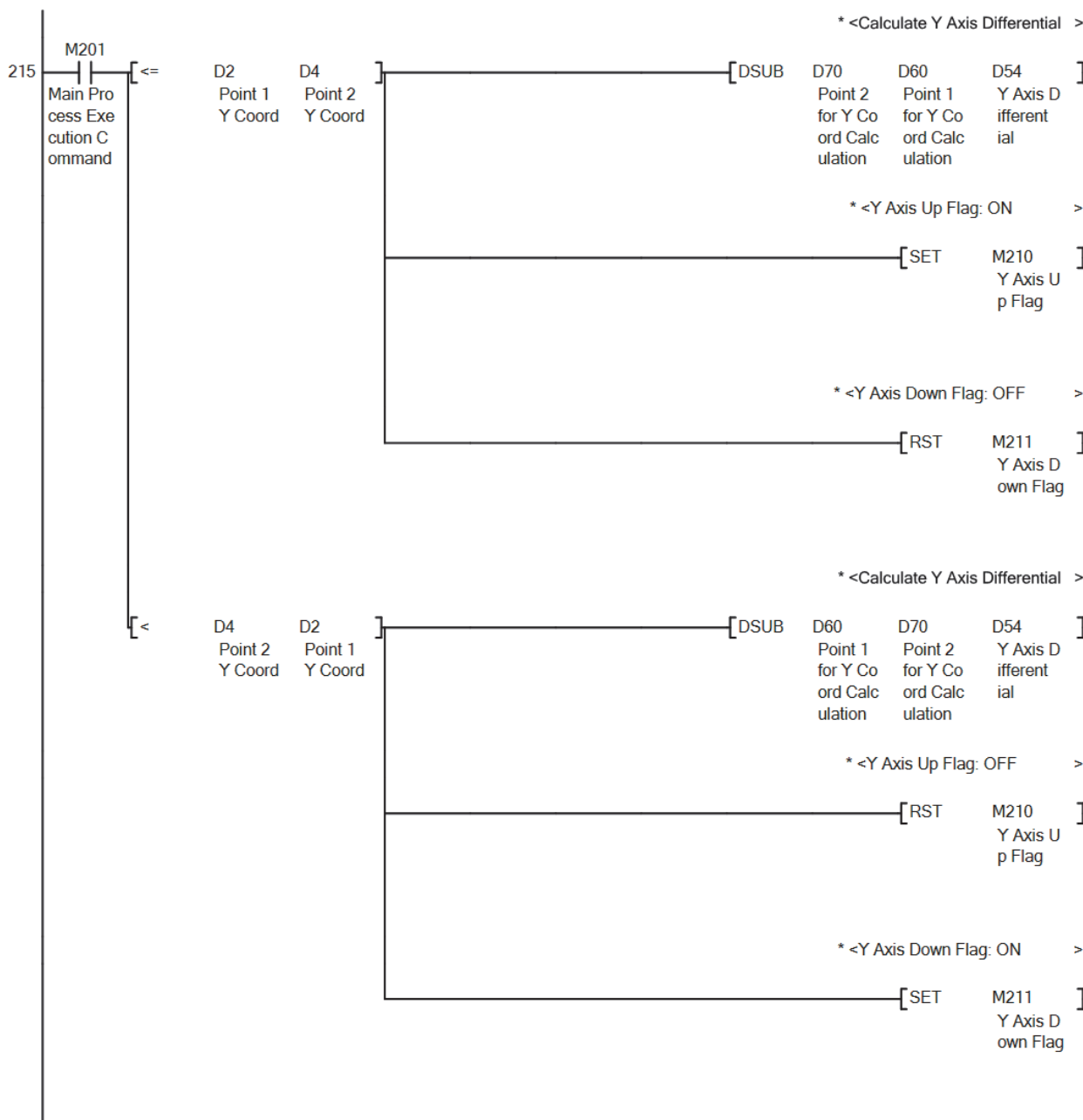
*
* In the Event X Coord of 2 Points are Different
*
* Converts the Input Device into the Double Word
*



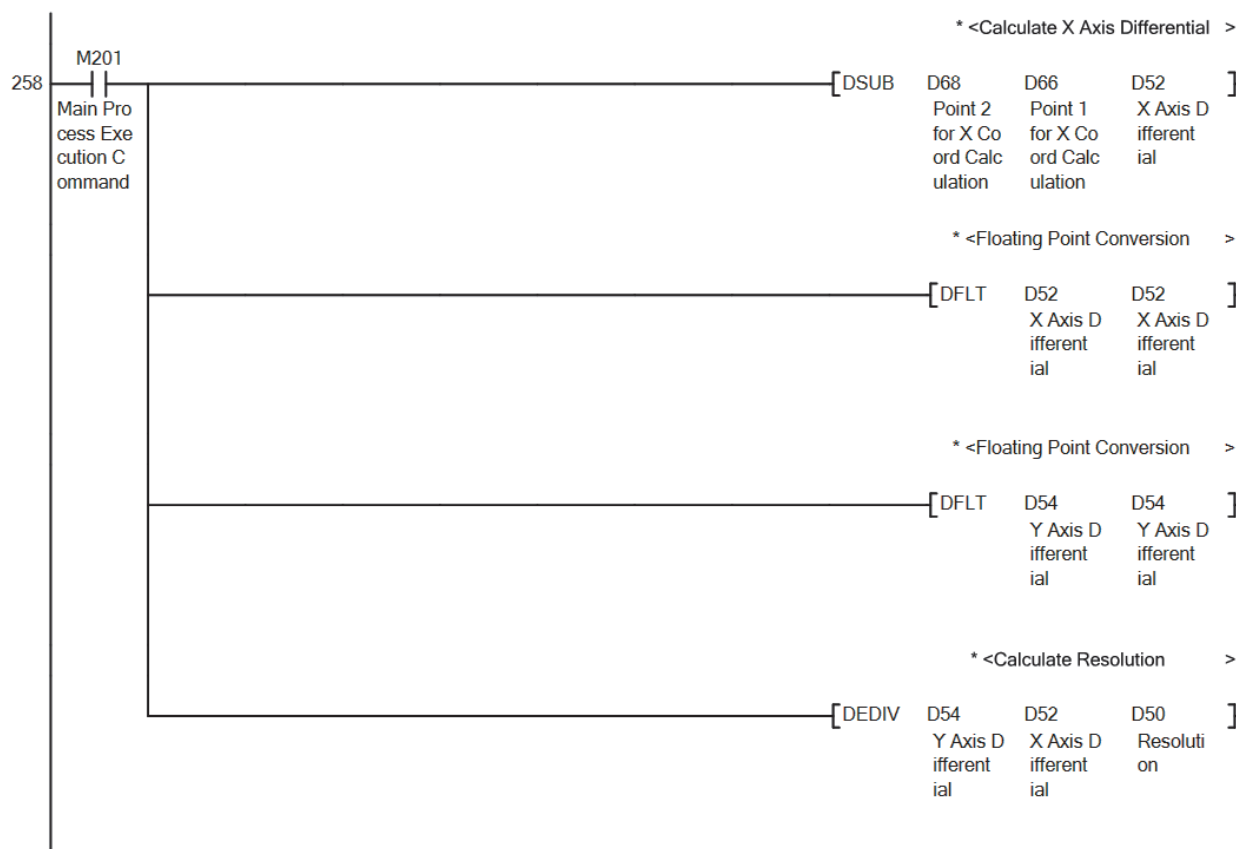




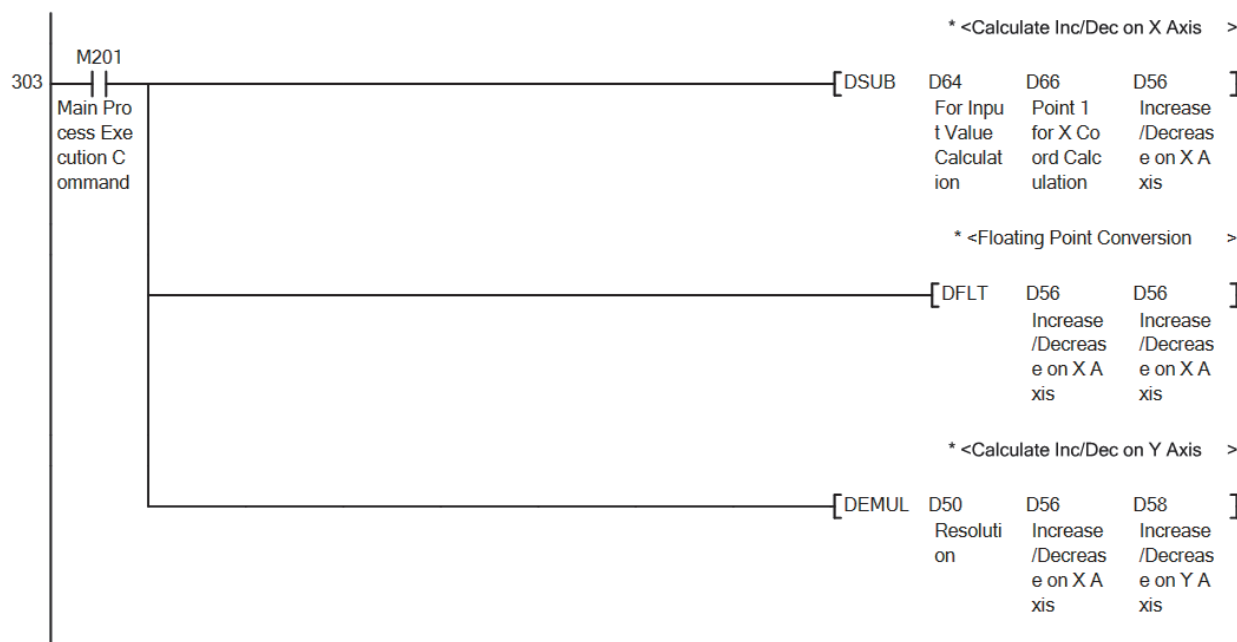
*
 * Y Axis Difference Calculation Processing
 *



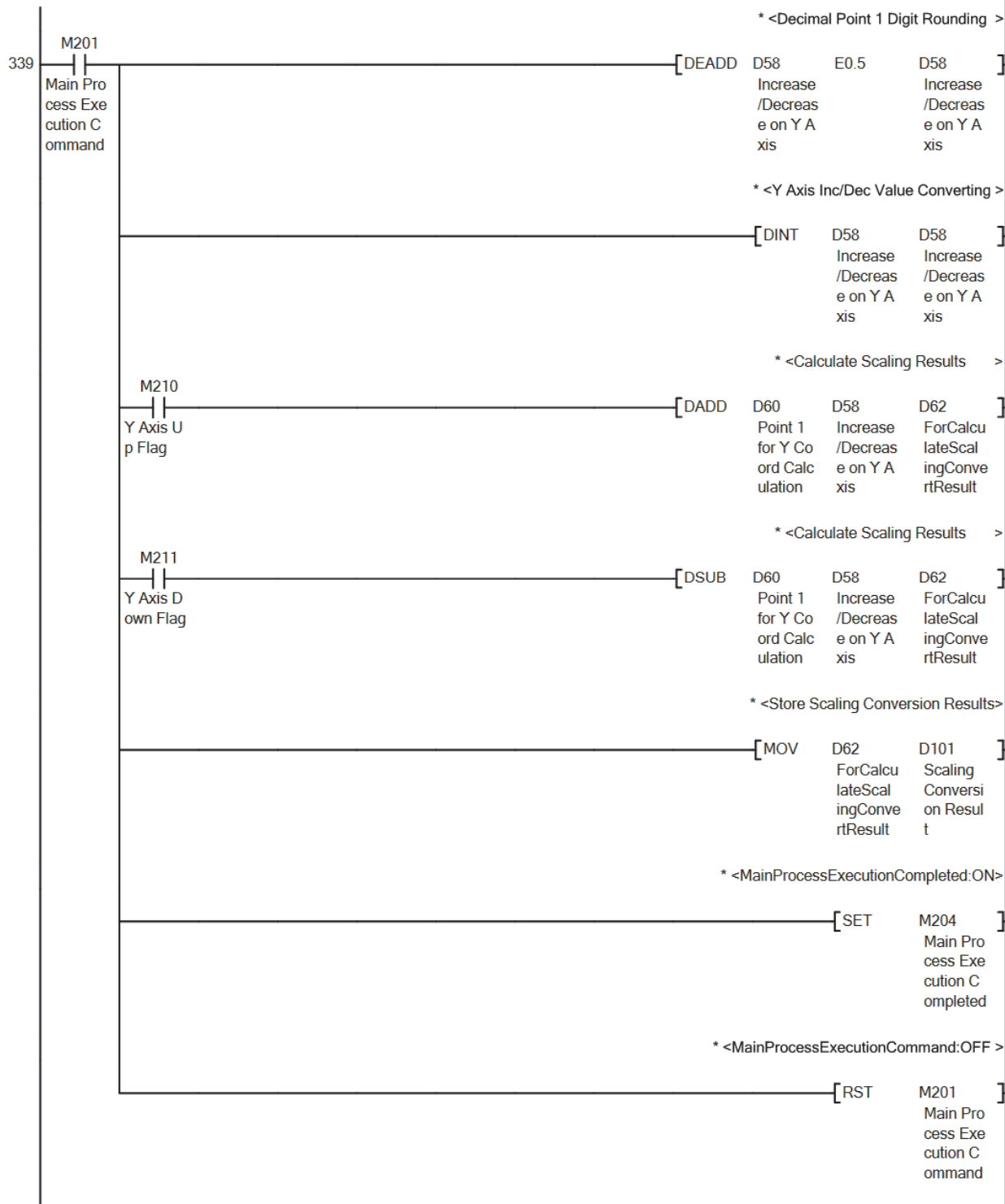
*
 * Resolution Calculation Processing
 *

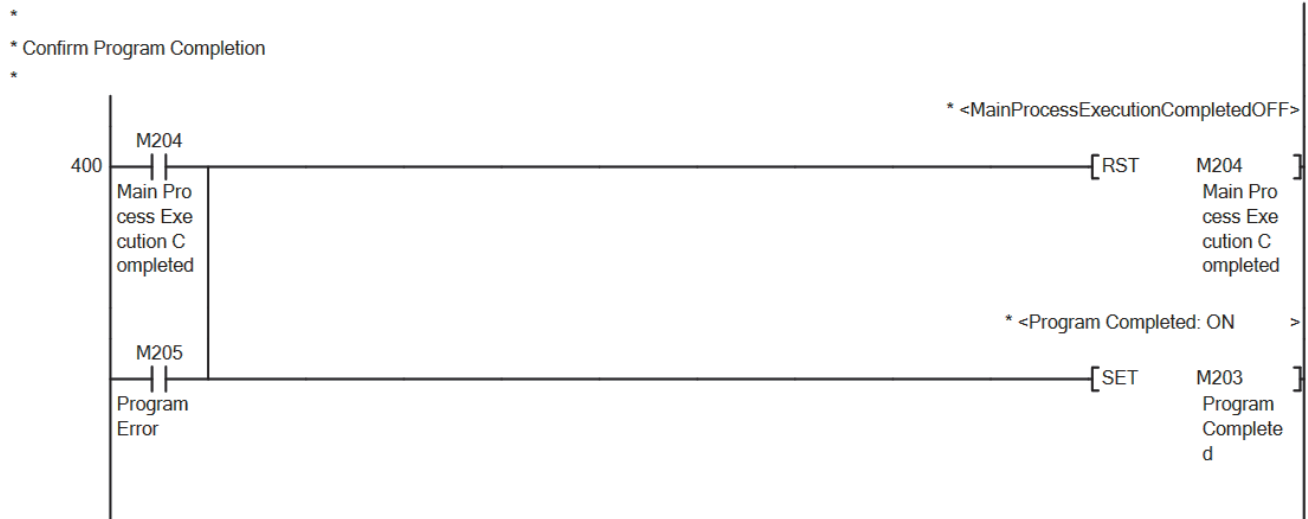


*
 * Increase/Decrease on X Axis Calculation Processing
 *

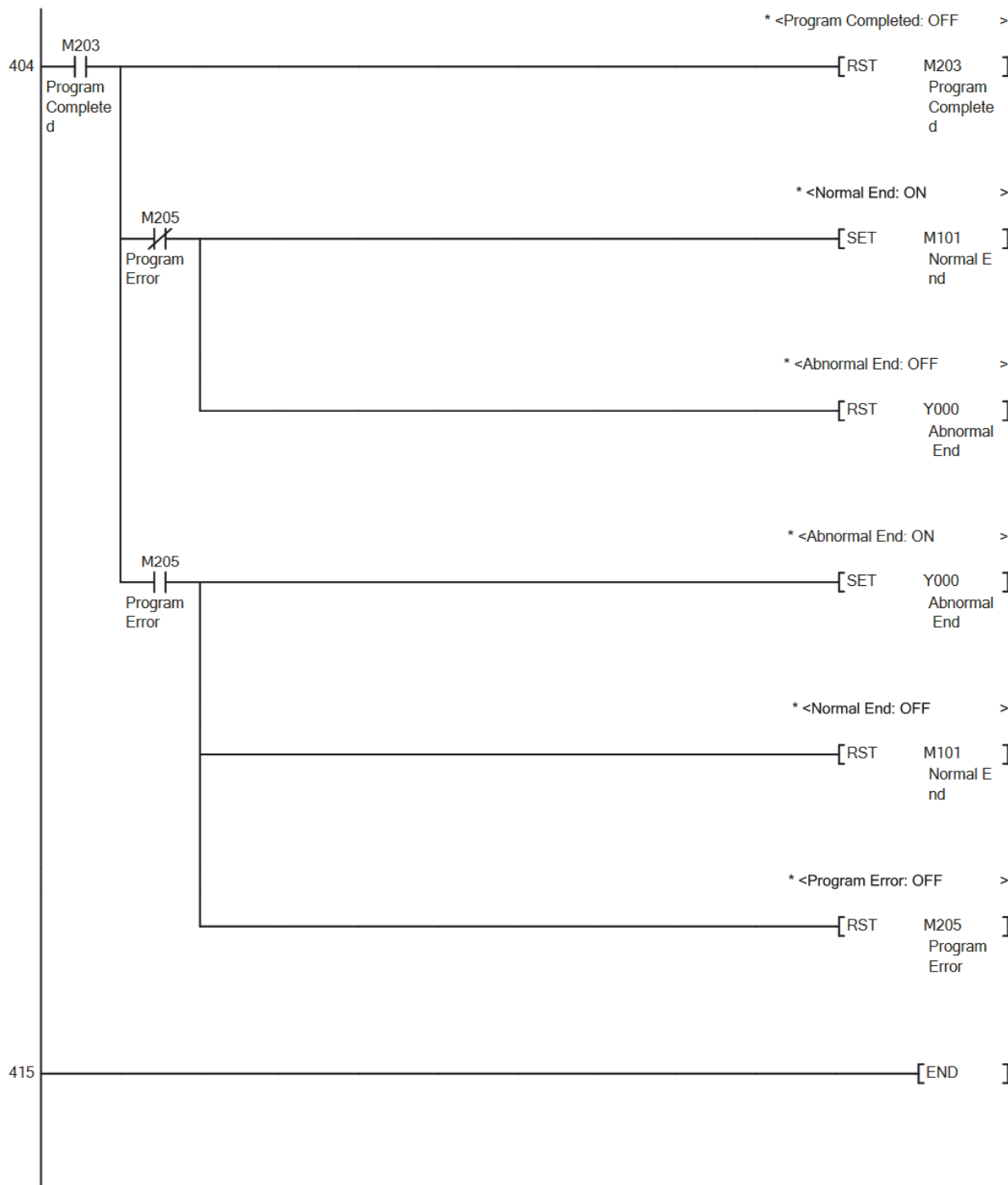


*
 * Scaling Results Calculation Processing
 *





*
 * Process of Program Completion
 *



2. 3. Calculating production quantity (03_LD-FX3U_CPU_Data_V100A_E)

Outline of System

The quantity that can be produced per hour is calculated from the production plans of a maximum of 5 models.

■ Description of functions

- (1) When the execution command (M0) turns ON, the quantity that can be produced per hour is calculated from the production plan (production quantity, cycle time, standard setup time).
- (2) If the input value is incorrect, abnormal end (Y000) turns ON, and the process is halted. The error code is stored in error code (D100). For the error codes, refer to error code in devices used (D100).

* Supplement: In this sample program, the index register backup and recovery process is executed, but this is not necessary if there is no need to hold the index register value other than in this sample process.

Programs Used

This program is targeted for FX3S, FX3G, FX3GC, FX3U and FX3UC.

The projects used in this program are indicated below.

No.	Project name	Function name	Remark
1	03_LD-FX3U_CPU_Data_V100A_E	Calculating production quantity	This product is created with FX3U/FX3UC. When using with a model other than the provided project, change the PLC type using the engineering tool.

Devices used

The devices used in this program are indicated below.

Input device

No.	Device name	Data type	Kind	Device comment	Remark
1	M0	Bit	Input	Execution command	ON: The program starts. OFF: The program does not start.
2	D0	Word	Input	No. of production plans	Sets the no. of production plans. [Valid range (decimal)] 1 --- 5
3	D1	Word	Input	Production quantity 1	Sets the production quantity 1. [Valid range (decimal)] 1 --- 32767
4	D2	Word	Input	Production quantity 2	Sets the production quantity 2. [Valid range (decimal)] 1 --- 32767
5	D3	Word	Input	Production quantity 3	Sets the production quantity 3. [Valid range (decimal)] 1 --- 32767
6	D4	Word	Input	Production quantity 4	Sets the production quantity 4. [Valid range (decimal)] 1 --- 32767
7	D5	Word	Input	Production quantity 5	Sets the production quantity 5. [Valid range (decimal)] 1 --- 32767
8	D6	Word	Input	Cycle time 1	Sets the cycle time 1 (seconds). [Valid range (decimal)] 1 --- 32767
9	D7	Word	Input	Cycle time 2	Sets the cycle time 2 (seconds). [Valid range (decimal)] 1 --- 32767
10	D8	Word	Input	Cycle time 3	Sets the cycle time 3 (seconds). [Valid range (decimal)] 1 --- 32767
11	D9	Word	Input	Cycle time 4	Sets the cycle time 4 (seconds). [Valid range (decimal)] 1 --- 32767

No.	Device name	Data type	Kind	Device comment	Remark
12	D10	Word	Input	Cycle time 5	Sets the cycle time 5 (seconds). [Valid range (decimal)] 1 --- 32767
13	D11	Word	Input	Standard setup time 1	Sets the standard setup time 1 (seconds). [Valid range (decimal)] 1 --- 32767
14	D12	Word	Input	Standard setup time 2	Sets the standard setup time 2 (seconds). [Valid range (decimal)] 1 --- 32767
15	D13	Word	Input	Standard setup time 3	Sets the standard setup time 3 (seconds). [Valid range (decimal)] 1 --- 32767
16	D14	Word	Input	Standard setup time 4	Sets the standard setup time 4 (seconds). [Valid range (decimal)] 1 --- 32767
17	D15	Word	Input	Standard setup time 5	Sets the standard setup time 5 (seconds). [Valid range (decimal)] 1 --- 32767

Output device

No.	Device name	Data type	Kind	Device comment	Remark
1	Y000	Bit	Output	Abnormal end	When ON, it means an error has occurred in the program.
2	M100	Bit	Output	Execution status	ON: The execution command is ON. OFF: The execution command is OFF.
3	M101	Bit	Output	Normal end	When ON, it means that the process has ended.
4	D100	Word	Output	Error code	Stores the error code that occurred in the program. [Error code (decimal)] 10: No. of production plans is out-of-range. 11: Production quantity 1 is out-of-range. 12: Production quantity 2 is out-of-range. 13: Production quantity 3 is out-of-range. 14: Production quantity 4 is out-of-range. 15: Production quantity 5 is out-of-range. 16: Cycle time 1 is out-of-range. 17: Cycle time 2 is out-of-range. 18: Cycle time 3 is out-of-range. 19: Cycle time 4 is out-of-range. 20: Cycle time 5 is out-of-range. 21: Standard setup time 1 is out-of-range. 22: Standard setup time 2 is out-of-range. 23: Standard setup time 3 is out-of-range. 24: Standard setup time 4 is out-of-range. 25: Standard setup time 5 is out-of-range.
5	D101	Word	Output	Number of producible units per hour	Stores the number of producible units per hour.

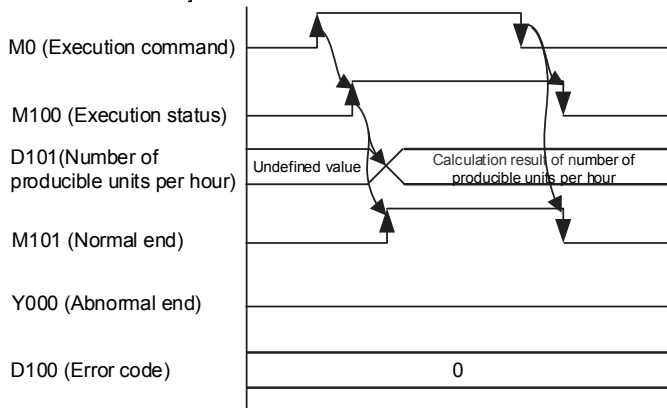
Internal device

No.	Device name	Data type	Kind	Device comment	Remark
1	M200	Bit	Internal	Setting data check command	Holds the check command flag for the set data.
2	M201	Bit	Internal	Main process execution command	Holds the execution command flag for the main process.
3	M202	Bit	Internal	Exe command before start main process	Holds the execution command flag for the main process start pre-process.
4	M203	Bit	Internal	Program completed	Holds the program completed flag.
5	M204	Bit	Internal	Main process execution completed	Holds the execution completed flag for the main process.
6	M205	Bit	Internal	Program error	Holds the program error flag.
7	M206	Bit	Internal	Pulsed execution command	Holds the pulsed flag for the execution command.
8	M8000	Bit	Internal	RUN monitor NO contact	Used for index register backup and recovery command.
9	M8002	Bit	Internal	Initial pulse NO contact	Used to retrieve the production time when startup.
10	D50 --- D51	Double Word	Internal	Remaining production time	Production time - Production time per model = Remaining production time
11	D52 --- D53	Double Word	Internal	Production time per model	Production quantity x Cycle time = Production time per model
12	D54	Word	Internal	Production time	Holds the value 3600 used to convert the production time one hour into seconds.
13	D55	Word	Internal	Production quantity in process	If the production time has elapsed during production, the production quantity in process is stored.
14	D56	Word	Internal	For calculate product qty in process	Used to calculate the production quantity in process.
15	D57	Word	Internal	Production quantity completed	Stores the quantity of completed production.
16	D58	Word	Internal	For memorize no. of production plans	Holds the no. of production plans.
17	D59	Word	Internal	For memorize production quantity 1	Holds the production quantity 1.
18	D60	Word	Internal	For memorize production quantity 2	Holds the production quantity 2.
19	D61	Word	Internal	For memorize production quantity 3	Holds the production quantity 3.
20	D62	Word	Internal	For memorize production quantity 4	Holds the production quantity 4.
21	D63	Word	Internal	For memorize production quantity 5	Holds the production quantity 5.
22	D64	Word	Internal	For memorize cycle time 1	Holds the cycle time 1 (second).
23	D65	Word	Internal	For memorize cycle time 2	Holds the cycle time 2 (second).
24	D66	Word	Internal	For memorize cycle time 3	Holds the cycle time 3 (second).
25	D67	Word	Internal	For memorize cycle time 4	Holds the cycle time 4 (second).
26	D68	Word	Internal	For memorize cycle time 5	Holds the cycle time 5 (second).
27	D69	Word	Internal	For memorize standard setup time 1	Holds the standard setup time 1 (second).
28	D70	Word	Internal	For memorize standard setup time 2	Holds the standard setup time 2 (second).
29	D71	Word	Internal	For memorize standard setup time 3	Holds the standard setup time 3 (second).
30	D72	Word	Internal	For memorize standard setup time 4	Holds the standard setup time 4 (second).
31	D73	Word	Internal	For memorize standard setup time 5	Holds the standard setup time 5 (second).
32	D74	Word	Internal	Production plan data to be used	Holds which data of production plans 1 to 5 to use.
33	D99	Word	Internal	Index register backup and recovery	Used to backup and recover production plan data (Z7) being used.
34	Z7	Word	Internal	Production plan data to be used	Stores which data of production plans 1 to 5 to use.

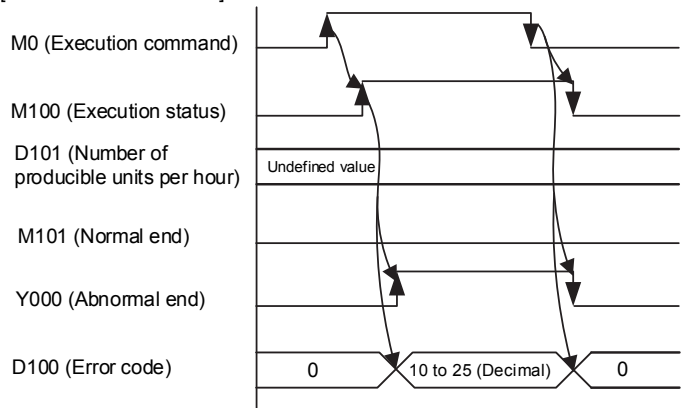
Operation of I/O signals

■ The timing chart for this program is shown below.

[In case of normal end]



[In case of abnormal end]



■ The processes of this program are given below.

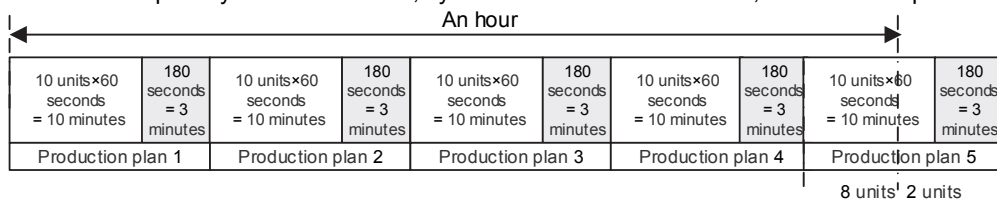
- (1) When the execution command (M0) changes from OFF -> ON, the no. of production plans, production quantity, cycle time, and standard setup time are checked. If there is an error, the results are output to error code (D100). When the data is normal, the input data is retrieved into the internal device.
- (2) The remaining production time is initialized to 3600, the value obtained by calculating the production time one hour into seconds.
- (3) The production plan data to be used is initialized to 0.
- (4) The production plan data value to use is set in the index register.
- (5) The production quantity and cycle time in the production plan data to use is multiplied to calculate the production time per model.
- (6) If the remaining production time is shorter than the production time per model, the following process is executed.
 1. The remaining production time is divided by the cycle time in the production plan data being used to calculate the production quantity in process.
 2. The production quantity in process is added to the quantity of completed production.
 3. The quantity of completed production at this point is set as the number of producible units per hour, and the process ends.
- (7) If the remaining production time is longer than the production time per model, the following process is executed.
 1. The production time per model is subtracted from the remaining production time.
 2. The production quantity is added to the quantity of completed production.
 3. The standard setup time in the production plan data being used is subtracted from the remaining production time.
 4. If the remaining production time is 0 or less, the quantity of completed production at this point is set as the number of producible units per hour, and the process ends.
 5. The production plan data being used is incremented.
 6. If the production plan data being used is larger than the no. of production plans, the quantity of completed production at this point is set as the number of producible units per hour, and the process ends.
 7. If the production plan data being used is smaller than the no. of production plans, the process returns to step (4).

Example of operation:

In the following case, the number of producible units is 48 units.

No. of production plans: 5

Production quantity 1 to 5: 10 units, cycle time 1 to 5: 60 seconds, standard setup time 1 to 5: 180 seconds



In the following case, the number of producible units is 94 units.

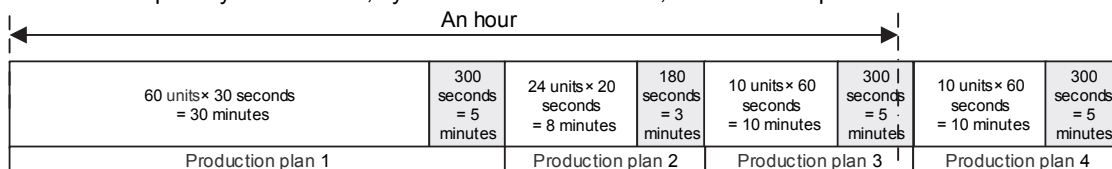
No. of production plans: 4

Production quantity 1: 60 units, cycle time 1: 30 seconds, standard setup time 1: 300 seconds

Production quantity 2: 24 units, cycle time 2: 20 seconds, standard setup time 2: 180 seconds

Production quantity 3: 10 units, cycle time 3: 60 seconds, standard setup time 3: 300 seconds

Production quantity 4: 10 units, cycle time 4: 60 seconds, standard setup time 4: 300 seconds

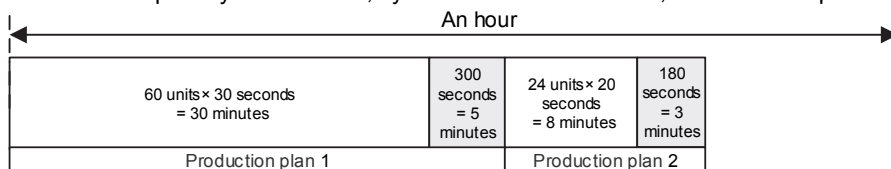


In the following case, the number of producible units is 84 units.

No. of production plans: 2

Production quantity 1: 60 units, cycle time 1: 30 seconds, standard setup time 1: 300 seconds

Production quantity 2: 24 units, cycle time 2: 20 seconds, standard setup time 2: 180 seconds



Version upgrade history

Version	Date	Description
Ver. 1.00A	October, 2016	First Edition

Program

* Sample Ladder Name: 03_LD-FX3U_CPU_Data_V100A_E
* Function: Calculating Production Quantity
* Version: Ver.1.00A

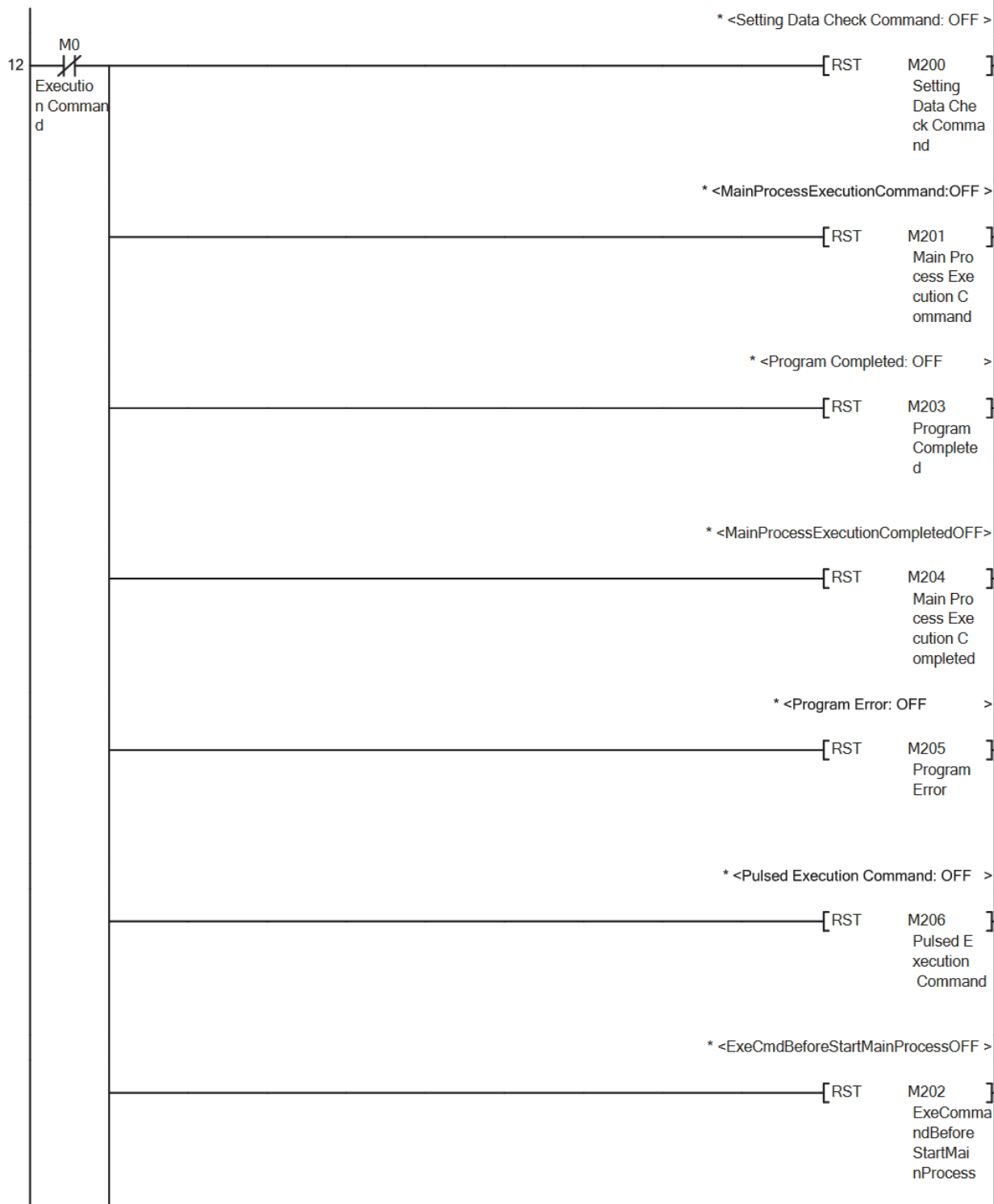
* Read Out Preset Values at the Time of Startup

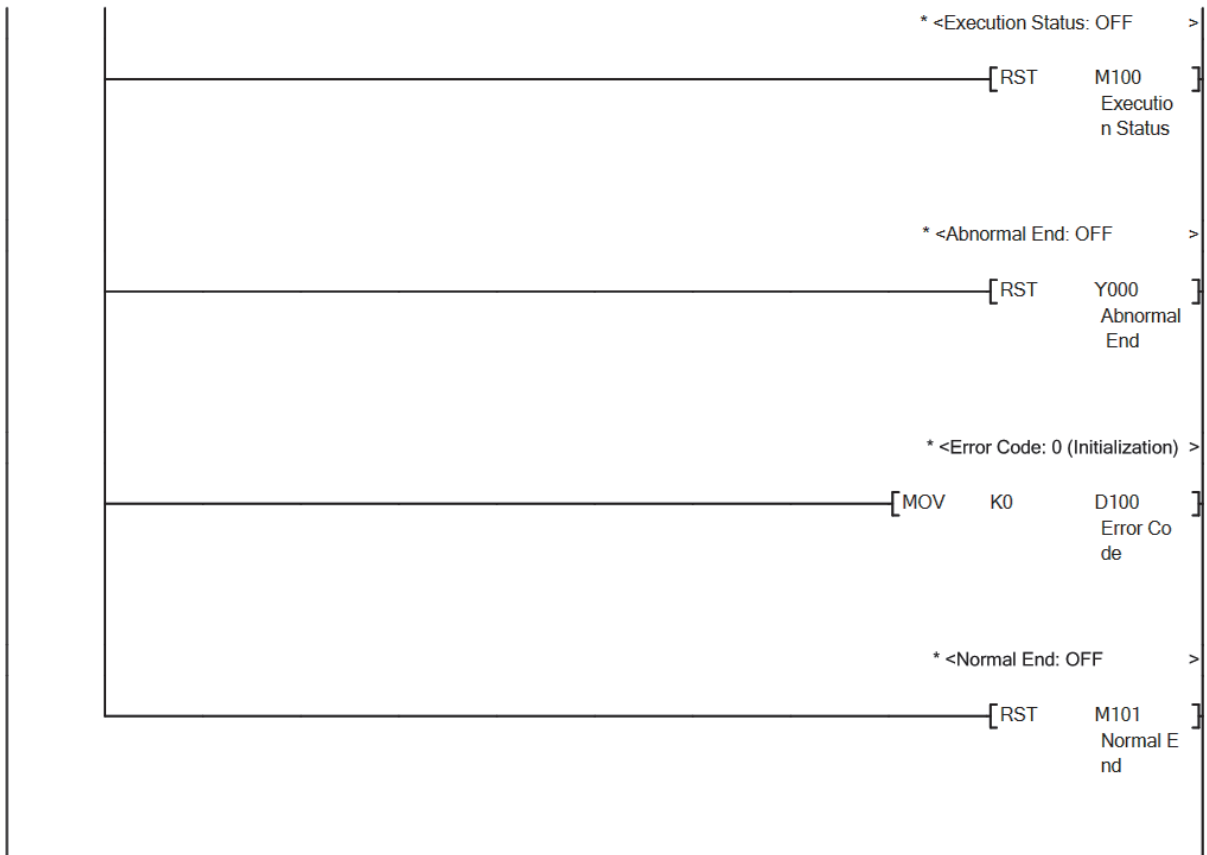


* Backup Process of Index Register



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 * Process of Initializing Program
 *





*
 * Process of Executing Program
 *

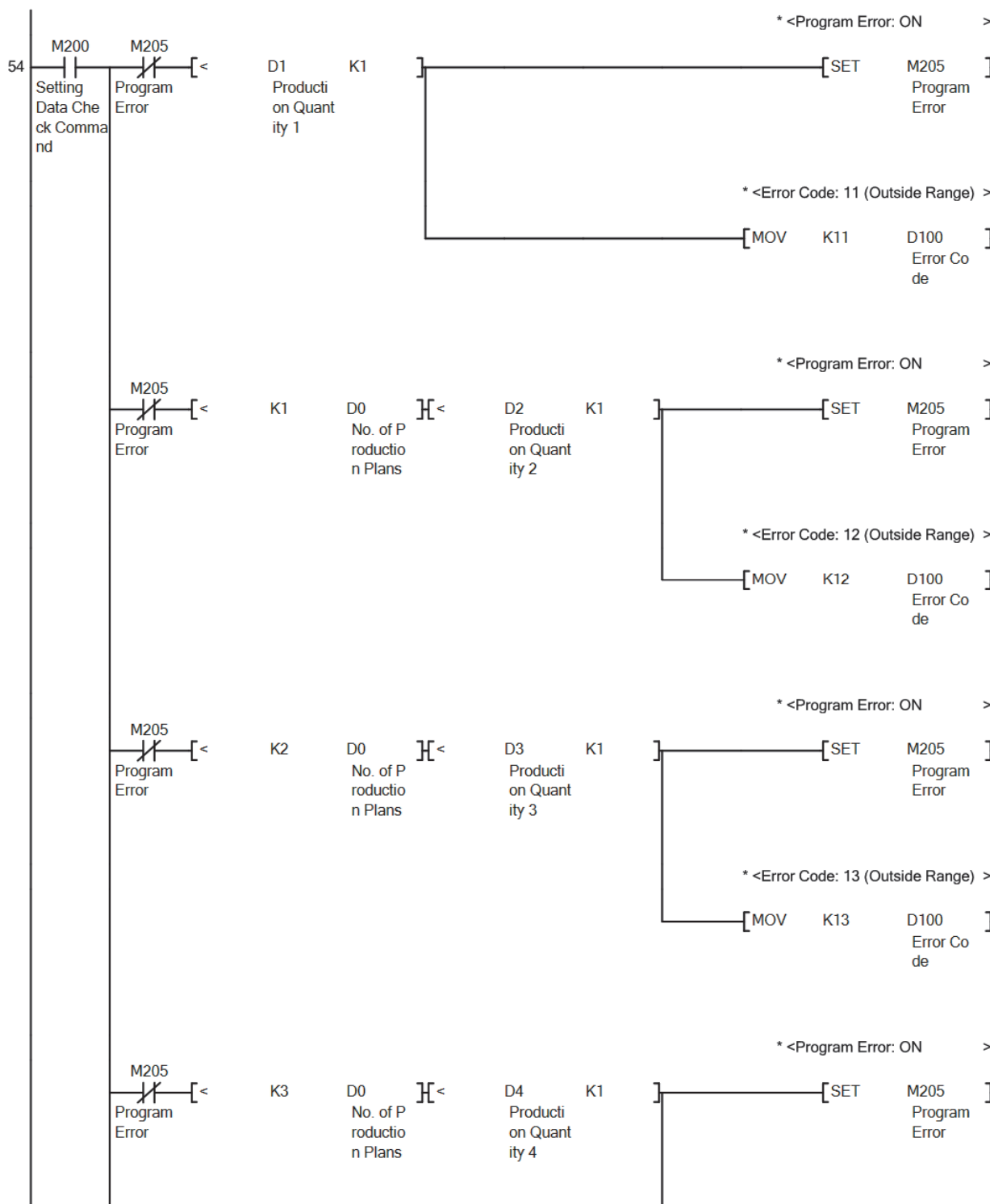


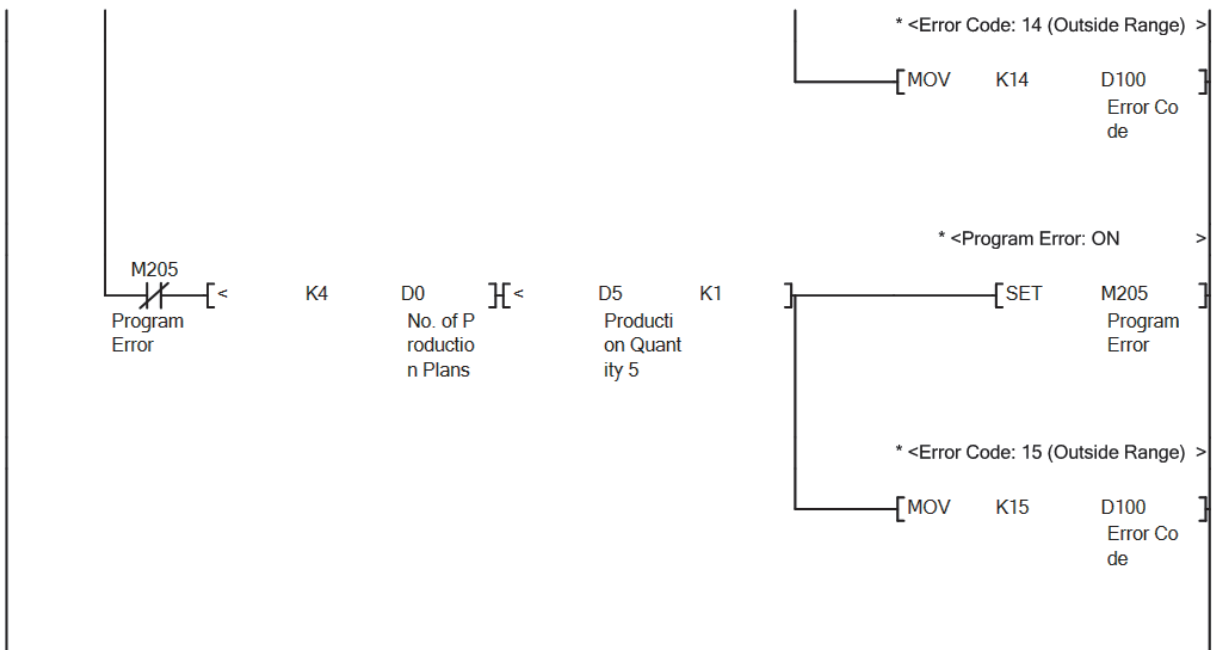
* Process of Checking Preset Data

* Confirm Range of No. of Production Plans

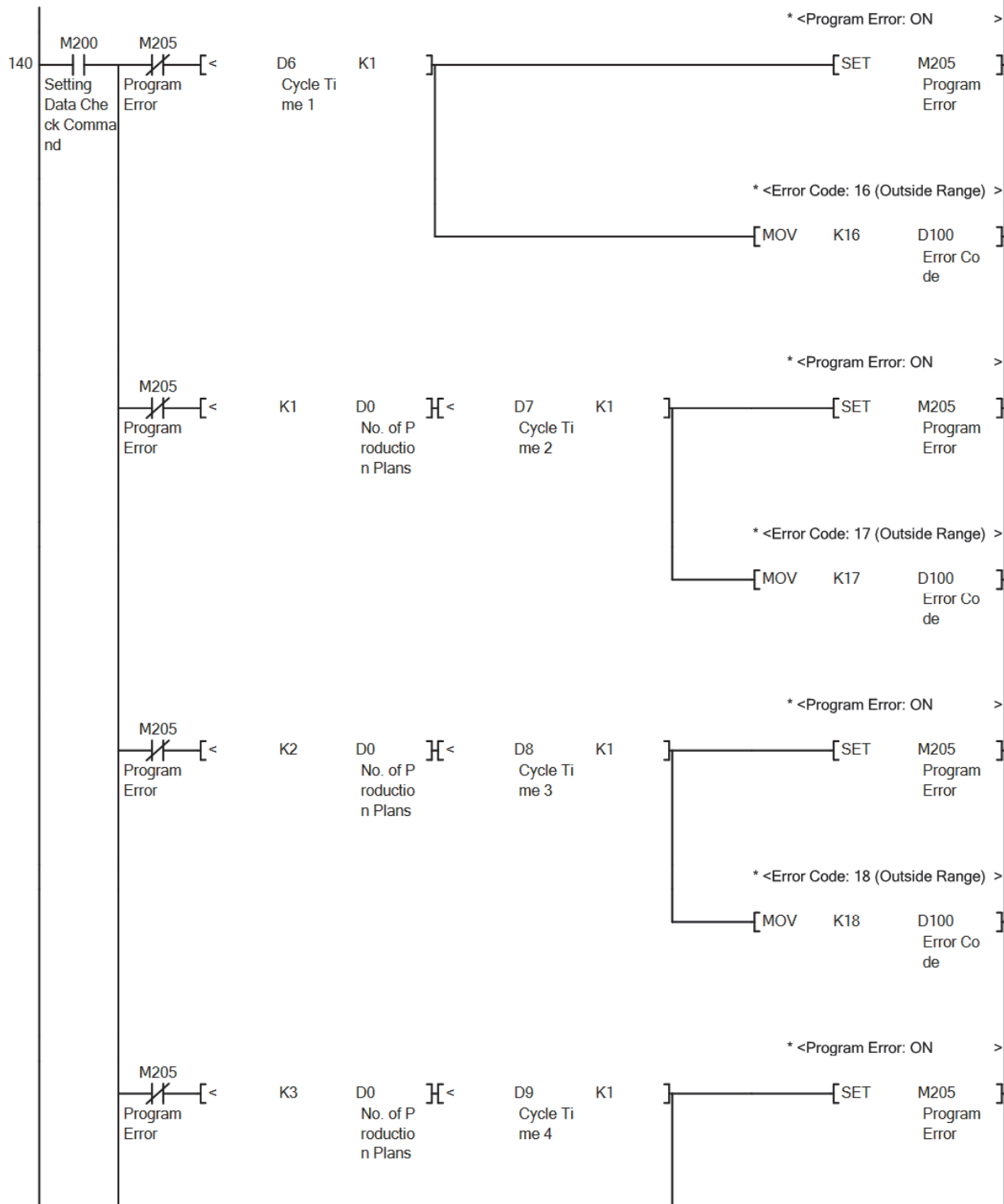


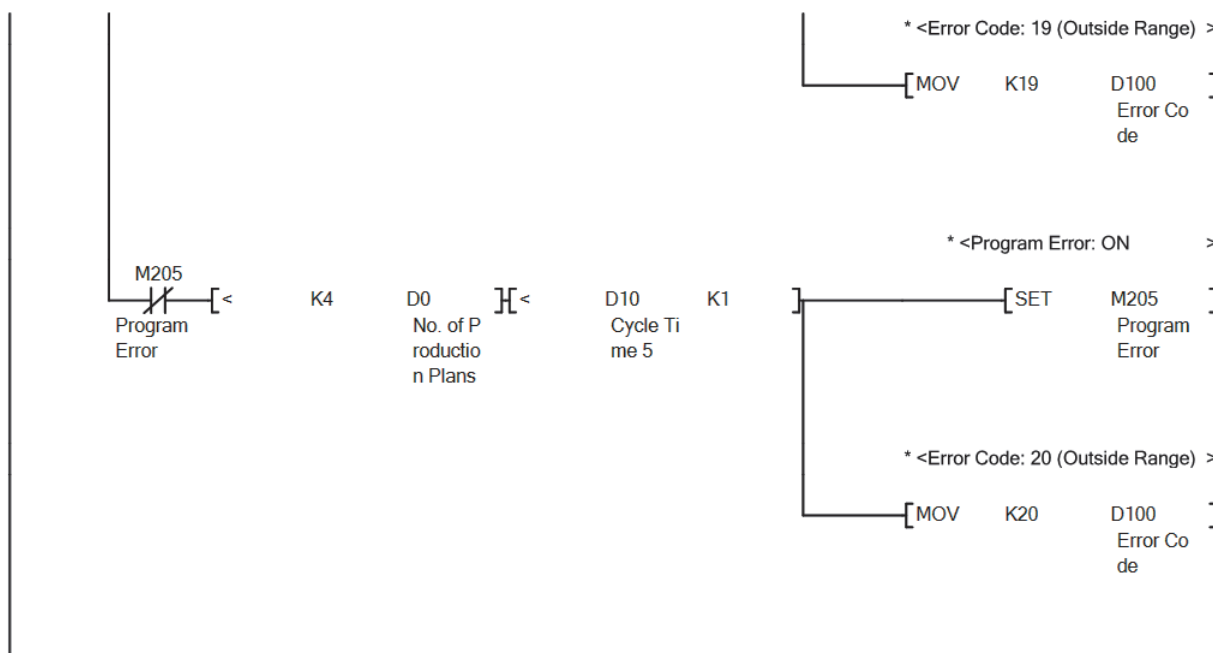
*
 * Confirm Range of Production Quantity
 *



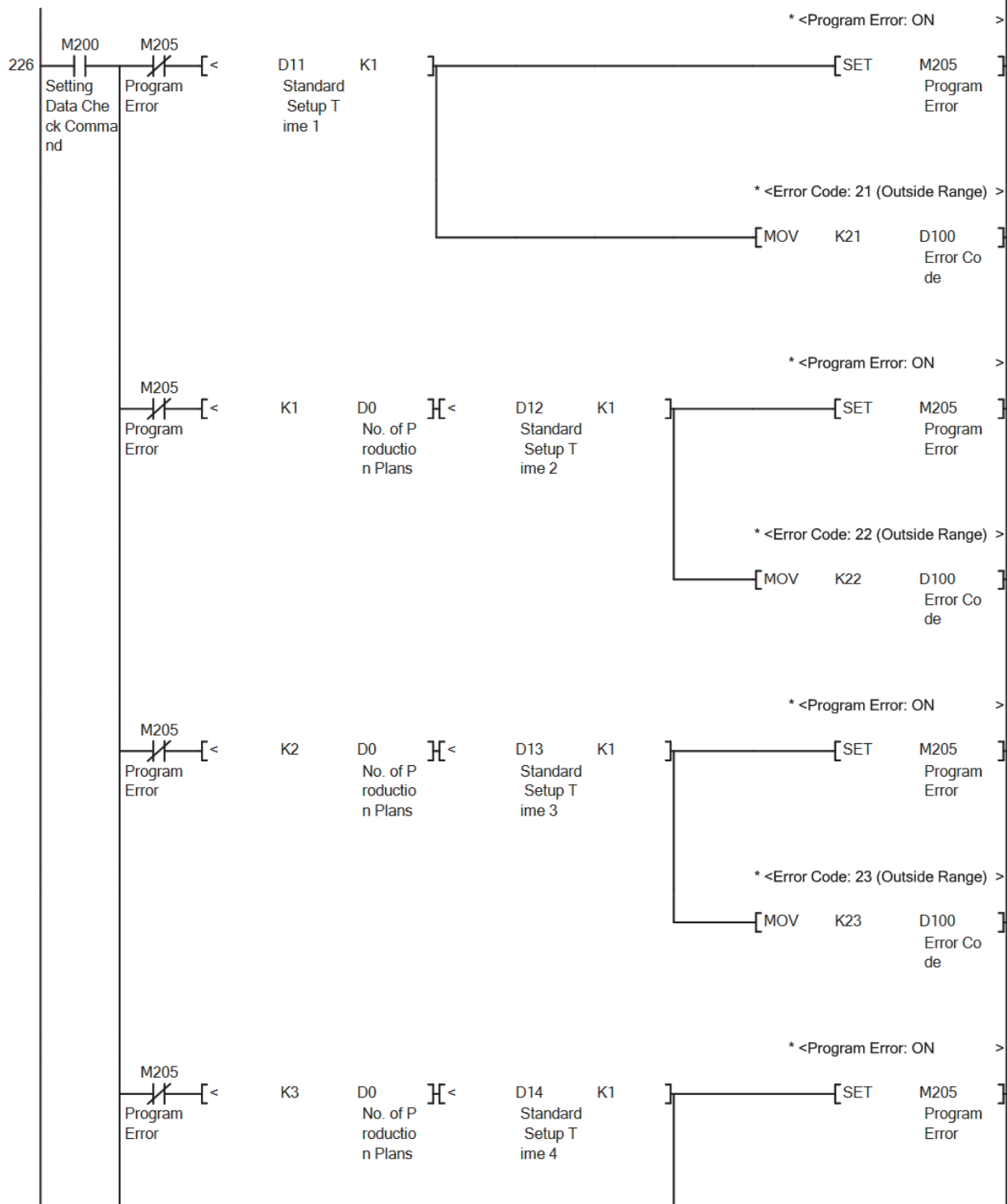


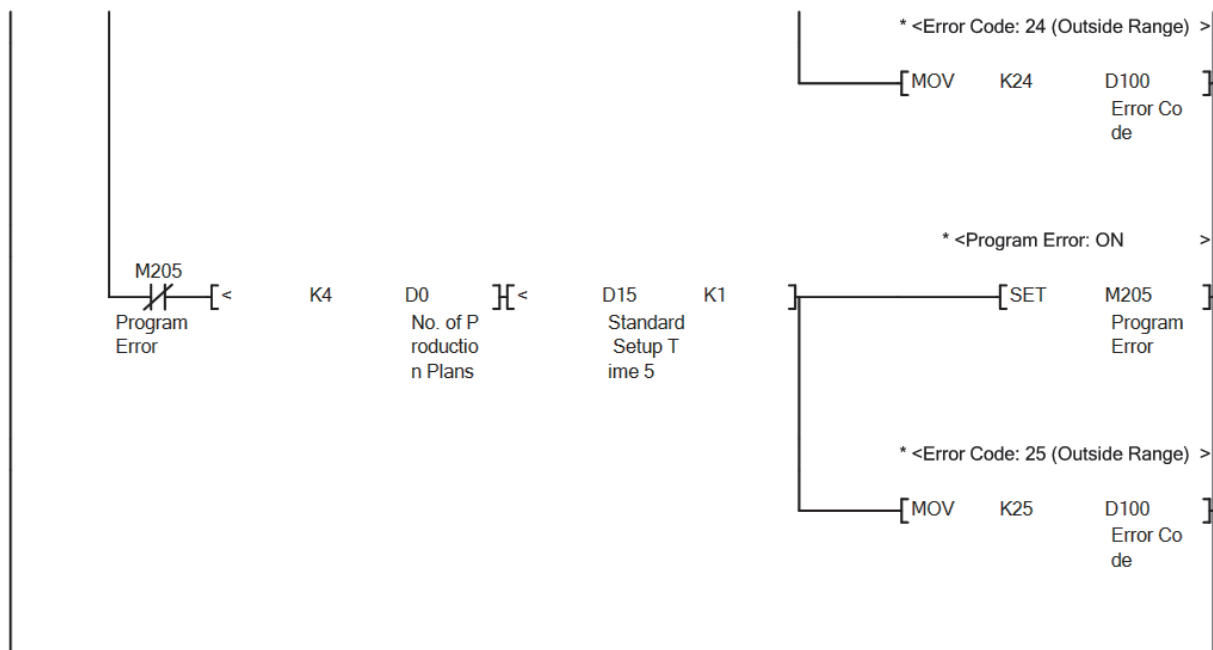
- * Confirm Range of Cycle Time



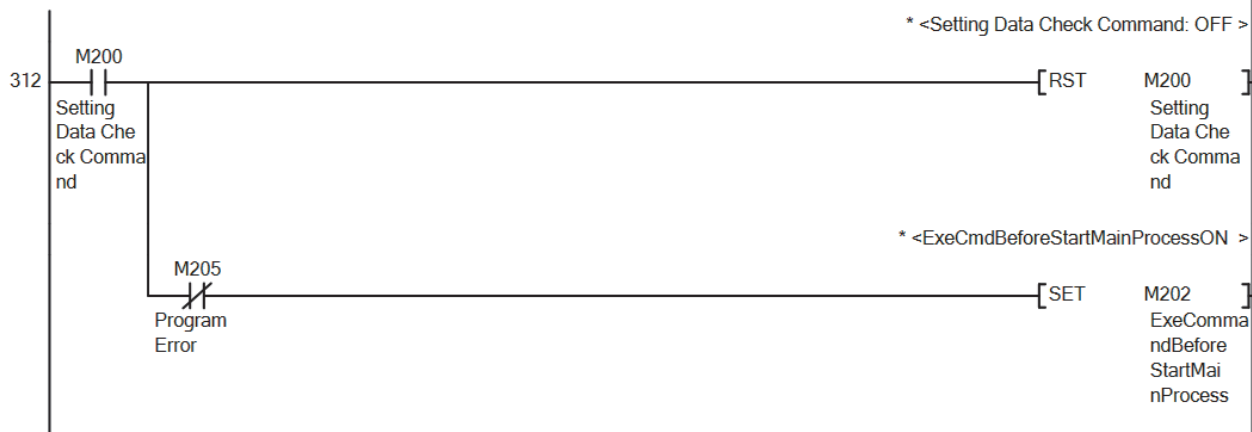


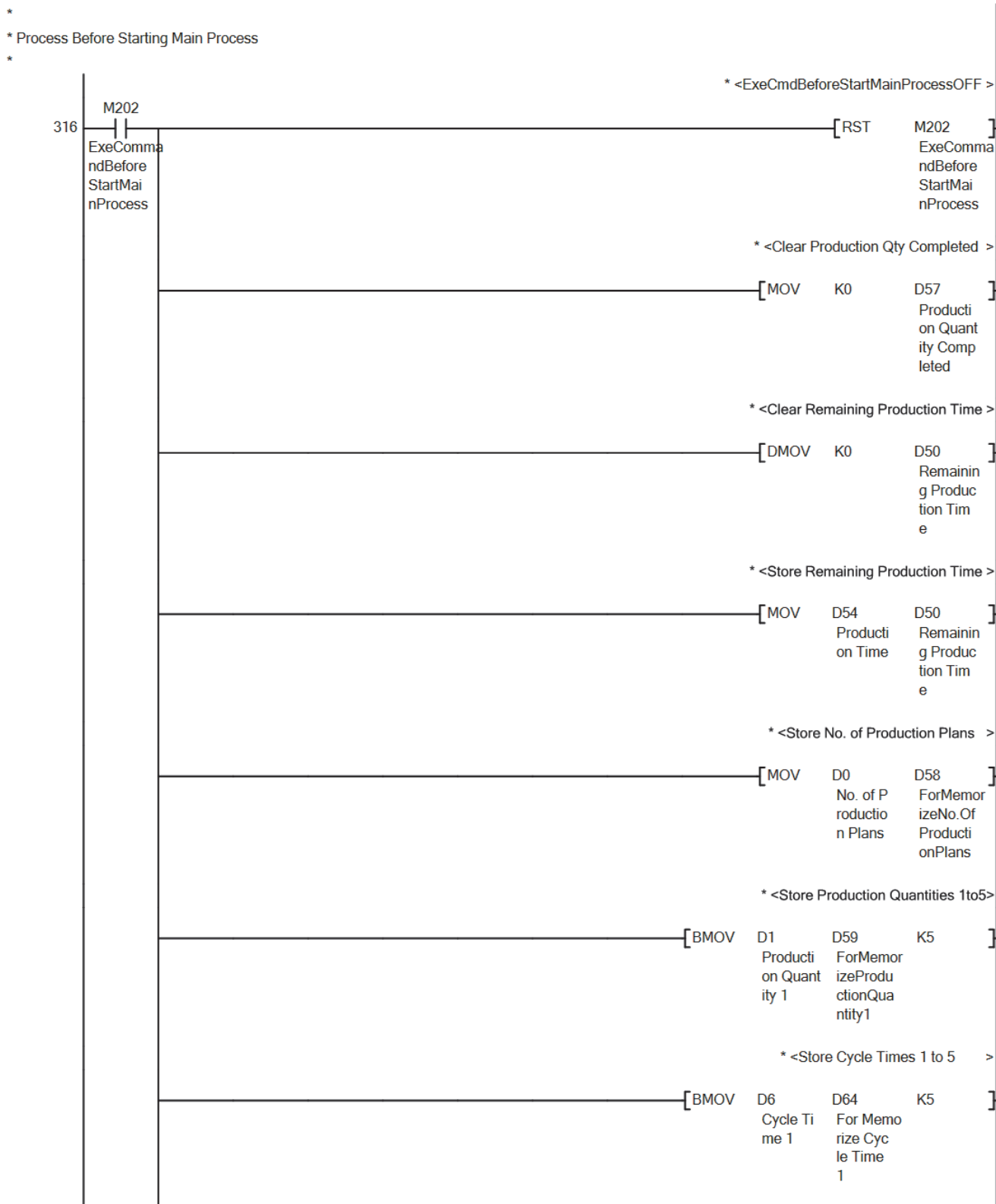
*
 * Confirm Range of Standard Setup Time
 *

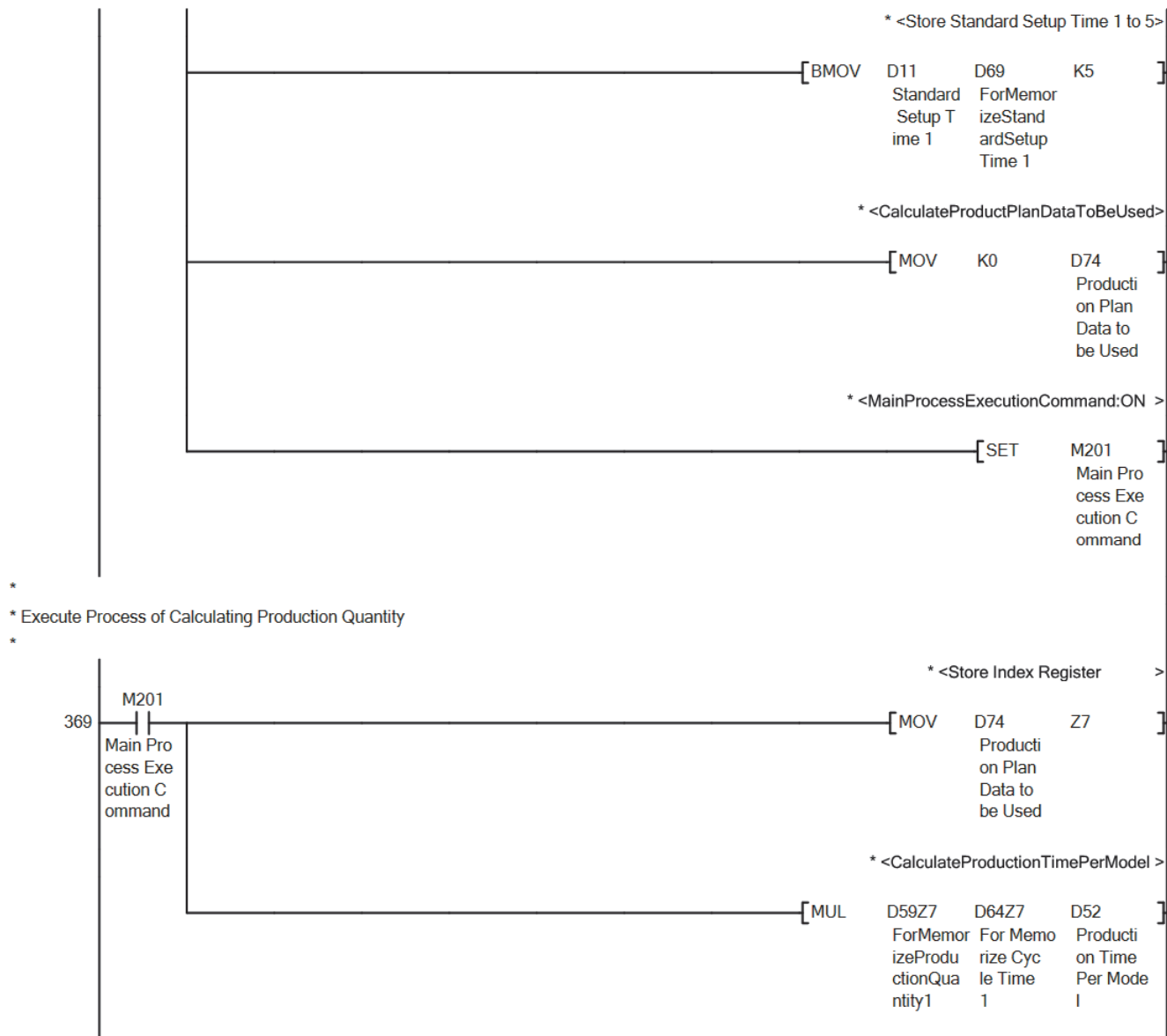




*
 * Confirm Completion of Checking Preset Data
 *







*
 * Execute Process for Calculating No. of Producible Units Per Hour
 *

