

MELSEC-F FX3 Series MODBUS Communication Sample Ladder Reference Manual

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Reference Manual Revision History

Reference Manual No.	Date of Revision	Details of Revision
JY997D72001A	November, 2016	Newly Prepared

Registration

MODBUS® is a registered trademark of Schneider Electric SA.

1. Outline

Outline of sample ladder

This program is sample ladder for a system that controls FX3 Series and FREQROL-800 Series by MODBUS communication instruction.

Applicable devices

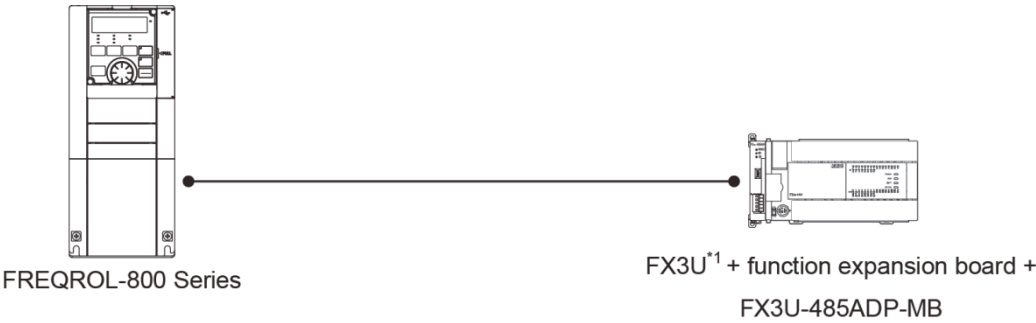
The applicable devices for this sample ladder are indicated below.

Model	Description		
Main unit			
	Series	Model	
	MELSEC-F Series	FX3S: Ver. 1.00 and later FX3G: Ver. 1.30 and later FX3GC: Ver. 1.40 and later FX3U: Ver. 2.40 and later FX3UC: Ver. 2.40 and later	
Inverter			
	Series	Model	
	FREQROL-800 Series	FREQROL-A800 FREQROL-F800	
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)



- FX3UC



*1 : Including FX3UC-32MT-LT(-2)
*2 : Excluding FX3UC-32MT-LT(-2)

- FX3G



- FX3GC



- FX3S



Description of sample ladder function

The following functions are realized with this program.

No.	Project name	Description	Version
1	01_LD-FX3U_Modbus_V100A_E	The operation status of the inverter is read out to the PLC. Action equivalent to IVCK instruction	Ver.1.00A
2	02_LD-FX3U_Modbus_V100A_E	The control value necessary for operating the inverter is written into the inverter from the PLC. Action equivalent to IVDR instruction	Ver.1.00A
3	03_LD-FX3U_Modbus_V100A_E	The inverter parameters are read out to the PLC. Equivalent to IVRD instruction	Ver.1.00A
4	04_LD-FX3U_Modbus_V100A_E	The inverter parameter values are written from the PLC. Equivalent to IVWR instruction	Ver.1.00A

Prerequisites for using sample ladder

■ Wiring and communication setting

For the wiring methods for FX3 Series and FREQROL-800 Series, see “FX3S/FX3G/FX3GC/FX3U/FX3UC Series User’s Manual - MODBUS Serial Communication Edition” and “FR-A800 INSTRUCTION MANUAL (DETAILED)” *1.


*1 In addition, see the manual for the inverter used.

■ Changing the PLC type

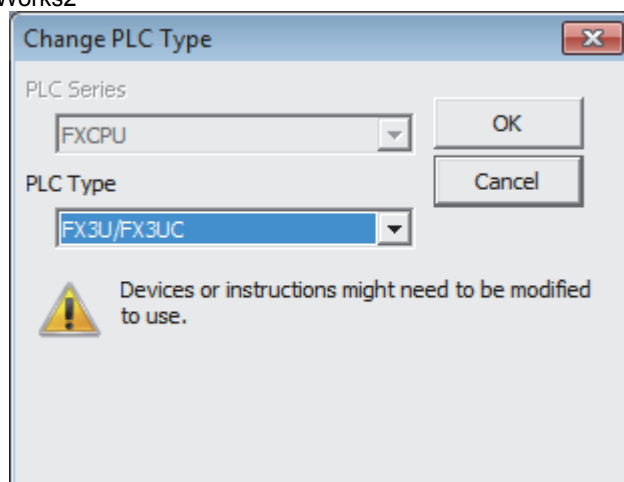
The sample ladder is provided with the model listed in the project name as shown below. When using with a model other than the provided project, change the PLC type using the engineering tool.

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

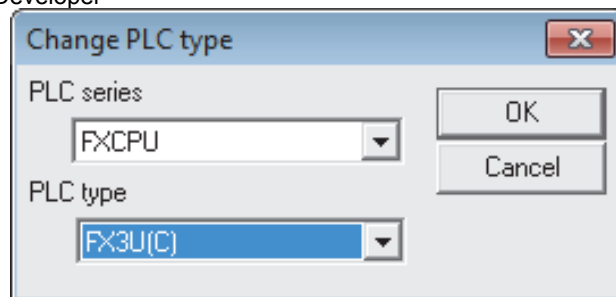
01_LD-FX3U_□□□_□□□_V100A_E

 [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

FR-A800 INSTRUCTION MANUAL (STARTUP)

FR-A800 INSTRUCTION MANUAL (DETAILED)

FR-F800 INSTRUCTION MANUAL (STARTUP)

FR-F800 INSTRUCTION MANUAL (DETAILED)

FX Series User's Manual - Data Communication Edition

FX3S/FX3G/FX3GC/FX3U/FX3UC Series User's Manual - MODBUS Serial Communication Edition

Notice

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

2. Sample Ladder

2. 1. Inverter operation monitoring function (01_LD-FX3U_Modbus_V100A_E)

Outline of System

The operation status of the inverter is read out to the PLC. (Action equivalent to IVCK instruction)

■ Description of functions

- (1) When Execution Command (M0) is turned on, the operation status of the inverter will be read out to the PLC in accordance with the set inverter station number and inverter instruction code.
- (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 (D100) in the devices used.

* Supplement: Refer to the related manuals for details on the communication errors and setting parameter errors.

In this sample ladder, the index register is backed up and recovered. However, this processing is not required if it is unnecessary to retain the index register values for any processing other than this sample processing.

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_Modbus_V100A_E	Inverter operation monitoring function	This project 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: Operation is monitored. OFF: Operation monitoring is stopped.
2	D0	Word	Input	Inverter station number	The inverter station number is set. [Effective range (decimal)] 1 to 32
3	D1	Word	Input	Inverter instruction code	The inverter instruction code is set. [Effective range (hexadecimal)] H7B: Operation mode H6F: Output frequency [speed] H70: Output current H71: Output voltage H72: Special monitor H73: Special monitor selection No. H74: Alarm definition H75: Alarm definition H76: Alarm definition H77: Alarm definition H79: Inverter status monitor (expansion) H7A: Inverter status monitor H6E: Set frequency (EEPROM) H6D: Set frequency (RAM)

Output device

No.	Device name	Data type	Kind	Device comment	Remark
1	Y000	Bit	Output	Abnormal end	When this device is ON, it indicates that an error has occurred in the program.
2	M100	Bit	Output	Execution status	ON: Execution command ON OFF: Execution command OFF
3	M101	Bit	Output	Normal end	When this device is ON, it indicates that processing has finished.
4	D100	Word	Output	Error code	The error codes caused in the program are stored. [Error code (DEC)] 10: Inverter station number out of range 11: Inverter instruction code out of range
5	D101	Word	Output	Read value	Read value is stored.

Internal device

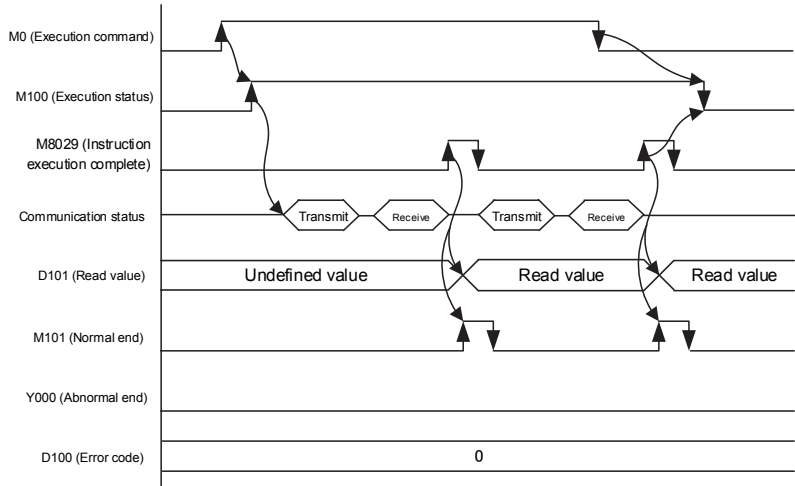
No.	Device name	Data type	Kind	Device comment	Remark
1	M205	Bit	Internal	Program error	The program error flag is retained.
2	M210 to M223	Bit	Internal	For setting instruction code	The inverter instruction code is set. M210: Operation mode M211: Output frequency M212: Output current M213: Output voltage M214: Special monitor M215: Special monitor selection No. M216: Alarm definition 1,2 M217: Alarm definition 3,4 M218: Alarm definition 5,6 M219: Alarm definition 7,8 M220: Expansion status monitor M221: Status monitor M222: Set frequency EEPROM M223: Set frequency RAM
3	M300 to M303	Bit	Internal	For setting execution process	The processing to be executed by this program is set. M300: Execute MODBUS communication M301: MODBUS communication post process M302: MODBUS communication not executed M303: MODBUS communication complete
4	M8000	Bit	Internal	RUN monitor NO contact	Used for index register backup and recovery commands
5	M8029	Bit	Internal	Instruction execution complete	Used to end MODBUS communication
6	M8168	Bit	Internal	SMOV data mode	SMOV instruction is set to hexadecimal.
7	D70	Word	Internal	For setting read address	Used to set the read address
8	D71	Word	Internal	For setting read quantity	Used to set the read quantity
9	D80, D81	Word	Internal	For storing read value 1,2	Used to store the read value
10	D99	Word	Internal	Index register backup and recovery	Used to back up and recover the index register (Z7) to be used
11	D200 to D232	Word	Inside	For setting special monitor selection No., special monitor selection No. 1 to 32	Used to set the special monitor number selected from inverter station numbers 1 to 32

No.	Device name	Data type	Kind	Device comment	Remark
12	Z7	Word	Inside	Inverter station number to be used	The inverter station number to be used is stored.

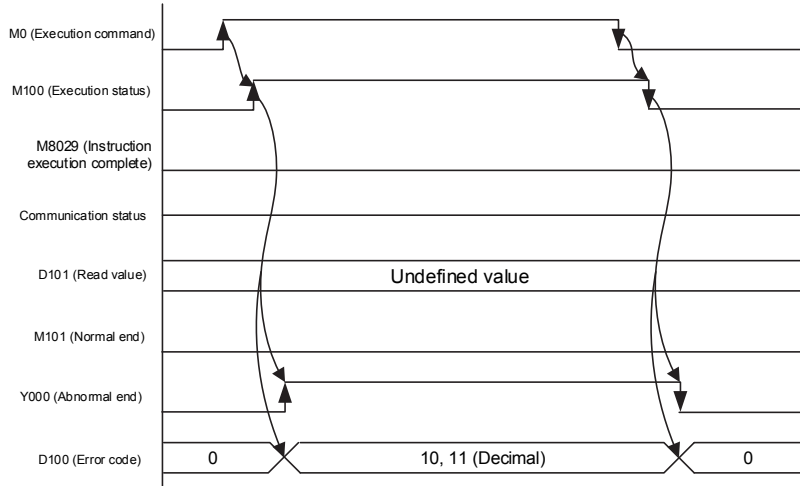
Operation of I/O signals

■ The timing chart for this program is shown below.

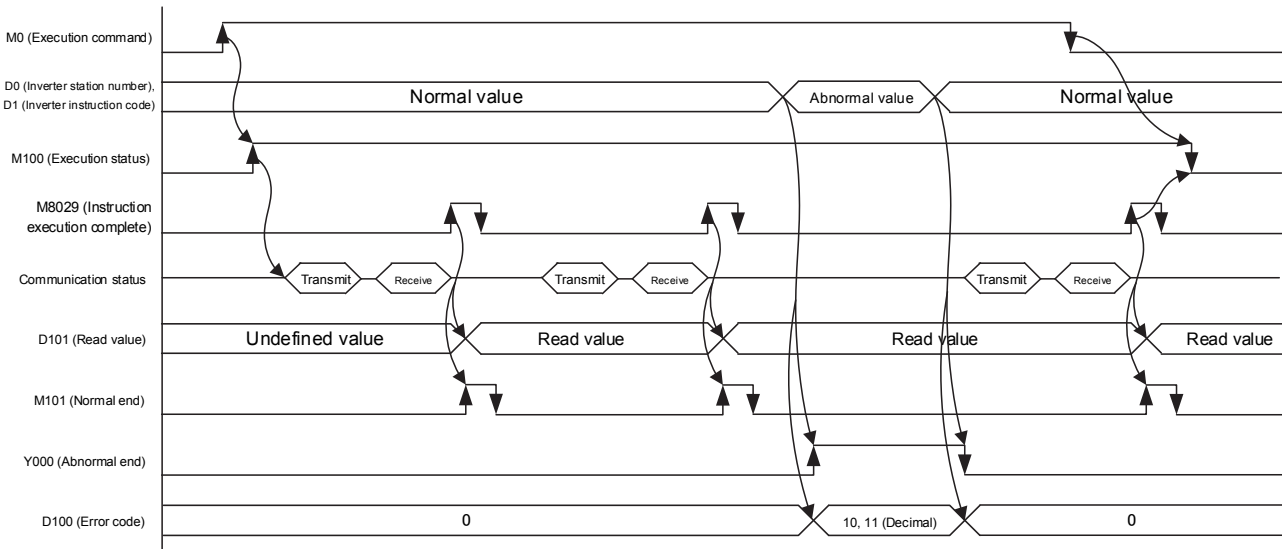
[In case of normal end]



[In case of abnormal end]



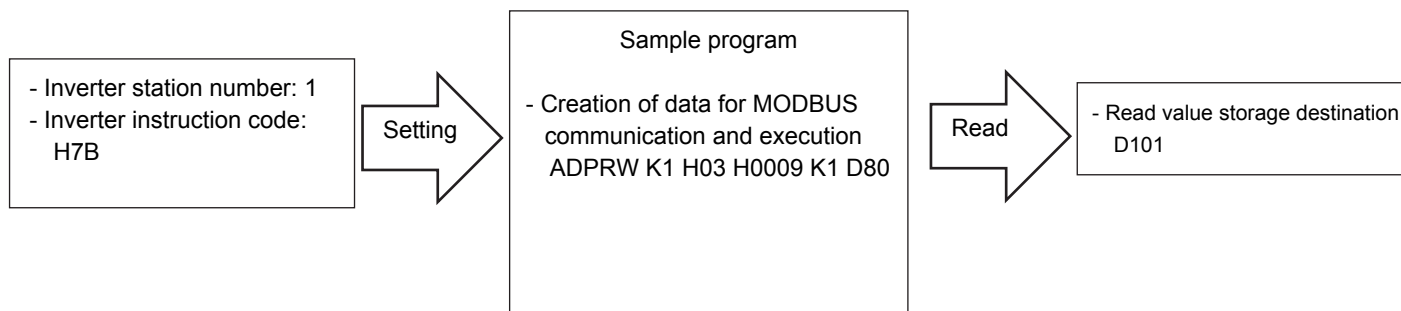
[In case of change of input value: Normal input ->Abnormal input ->Normal input]



■ The processes of this program are given below.

- (1) The input data (inverter station number and inverter instruction code) is checked to confirm that the values are within the effective ranges, and if there is an error, the results are output to the Error code (D100).
- (2) MODBUS communication data is created from the input inverter station number and inverter instruction code.
- (3) MODBUS communication is executed.
- (4) The data read out from the inverter is stored in For storing read value 1,2 (D80, D81) of the Internal devices.
- (5) The data of the internal devices read out from the inverter is stored in Read value (D101). At this time, some of the data that is read out is converted to match the structure and value as that given by the IVCK instruction.
- (6) Monitoring is continued until the Execution command (M0) is turned off.

An example of monitoring of operation mode by this program is given below.



Data for MODBUS communication

Setting data	Description
ADPRW	MODBUS read/write instruction
K1	Station No.
H03	Command code (H03: Read Holding Register)
H0009	Read address (Read address = MODBUS register - 40001)
K1	Read quantity
D80	Destination device

D101: Operation mode read value

Operation mode	Read value
Network operation	H0000
External operation, External JOG operation	H0001
PU operation, PU/external combined operation, PU JOG operation	H0002

The correspondence between inverter instruction codes and MODBUS registers is shown below.

Monitoring item	Inverter instruction code	MODBUS register	Remarks
Operation mode	H7B	40010	The value is output after conversion because the value read out by MODBUS communication is different from that of IVCK instruction.*1
Output frequency [speed]	H6F	40201	–
Output current	H70	40202	–
Output voltage	H71	40203	–
Special monitor	H72	*2	The value is read out from the register corresponding to the number stored in the special monitor selection number setting device (D201 to D232).
Special monitor selection No.	H73	*3	The value is read out from the special monitor selection number setting device (D201 to D232).
Alarm definition	H74	40502/40501	MODBUS stores one item of data in the low 8 bits of 16 bits, and therefore two items of data are output in combination. (Example): When 40501 is H00A0 and 40502 is H0030, H30A0 is output.
Alarm definition	H75	40504/40503	
Alarm definition	H76	40506/40505	
Alarm definition	H77	40508/40507	
Inverter status monitor (expansion)	H79	40009	–
Inverter status monitor	H7A	40009	–

Monitoring item	Inverter instruction code	MODBUS register	Remarks
Set frequency (EEPROM)	H6E	40014	The value is read out from the set frequency (RAM) register because it cannot be read out from the set frequency (EEPROM) register.
Set frequency (RAM)	H6D	40014	

*1 In the case of operation mode (instruction code: H7B), the value read out by MODBUS communication is converted to that of IVCK instruction and output.

Operation mode	MODBUS communication (Read value)	Inverter communication (output value)
External operation	H0000	H0001
PU operation	H0001	H0002
External JOG operation	H0002	H0001
PU JOG operation	H0003	H0002
Network operation	H0004	H0000
PU/external combined operation	H0005	H0002

*2 In the case of special monitor (instruction code: H72), the following processing is executed.

- (1) The value stored in the special monitor selection number setting device (D201 to D232) is read.
The device to be used is switched according to the inverter station number.
(Example) When the inverter station number is 1, D201 is used. When the number is 32, D232 is used.
- (2) The MODBUS register is determined based on the read value.
- (3) The value of the MODBUS register is read and stored in Read value (D101).

*3. The special monitor selection number is read out from the internal devices (D201 to D232) and stored in Read value (D101).
MODBUS communication is not executed.

The device to be used is switched according to the inverter station number.

(Example) When the inverter station number is 1, D201 is used. When the number is 32, D232 is used.

Version upgrade history

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

* Sample Ladder Name: 01_LD-FX3U_Modbus_V100A_E
* Function: Inverter Operation Monitoring Function
* Version: Ver.1.00A

* Backup Process of Index Register

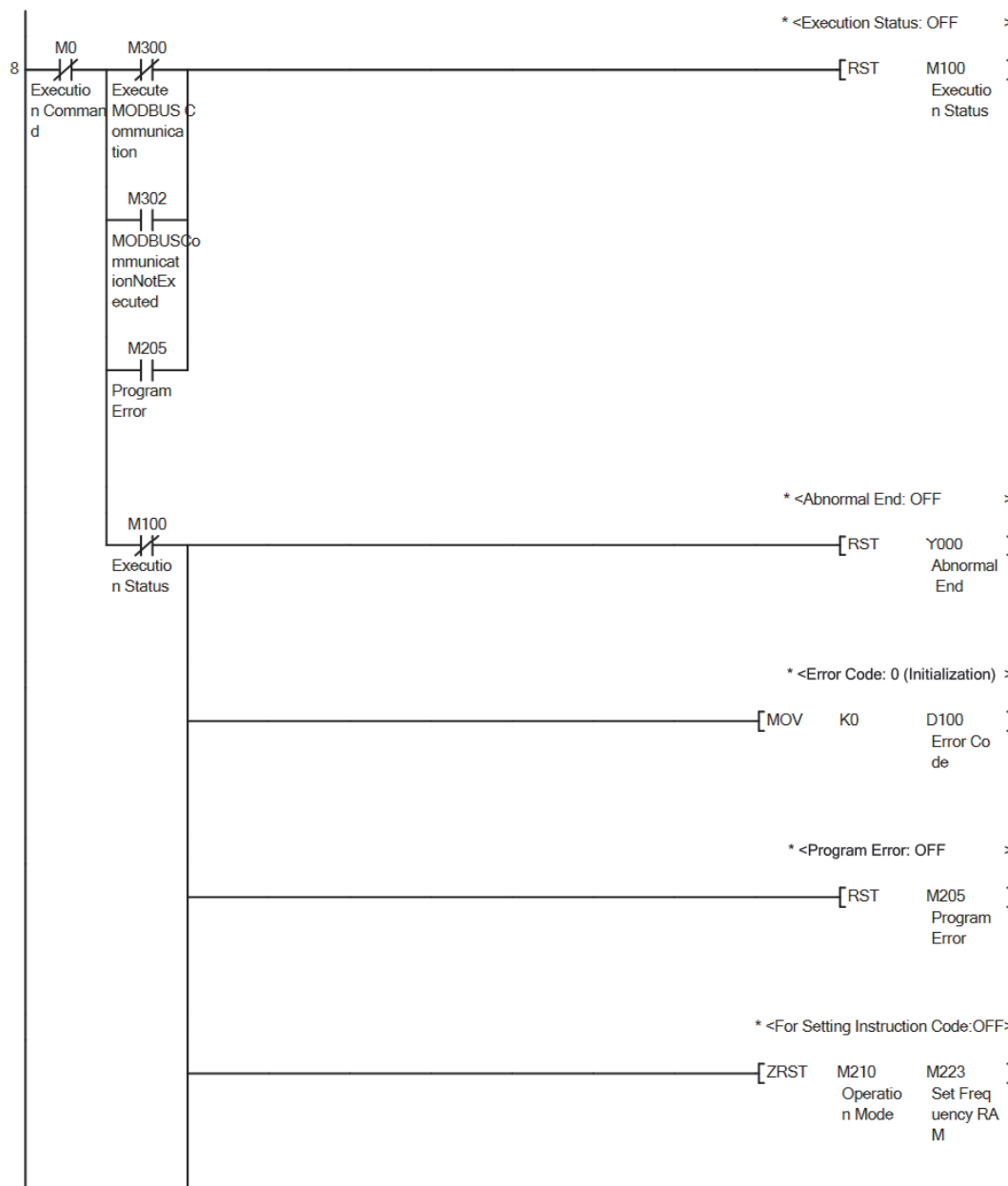


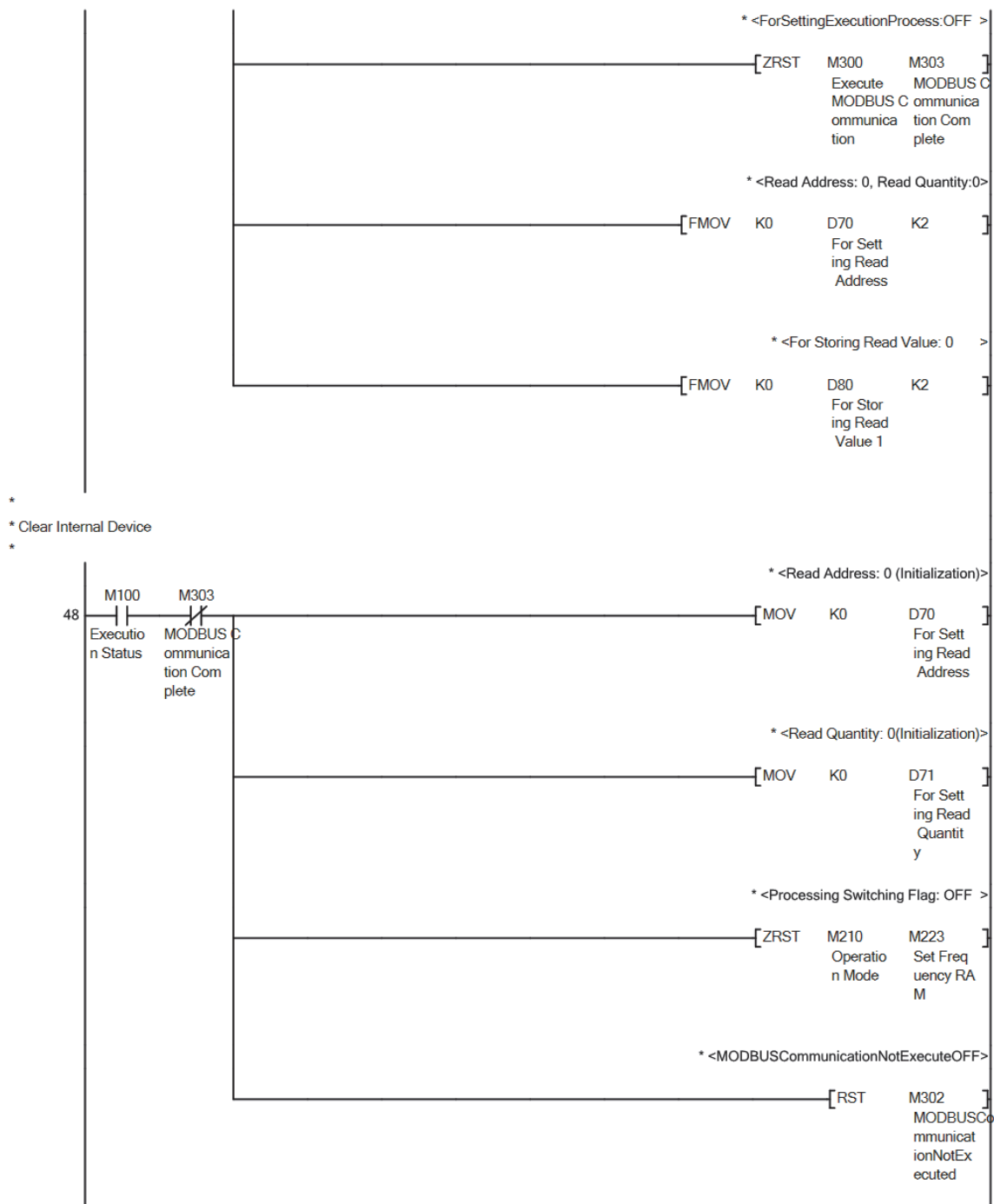
* Process of Executing Program

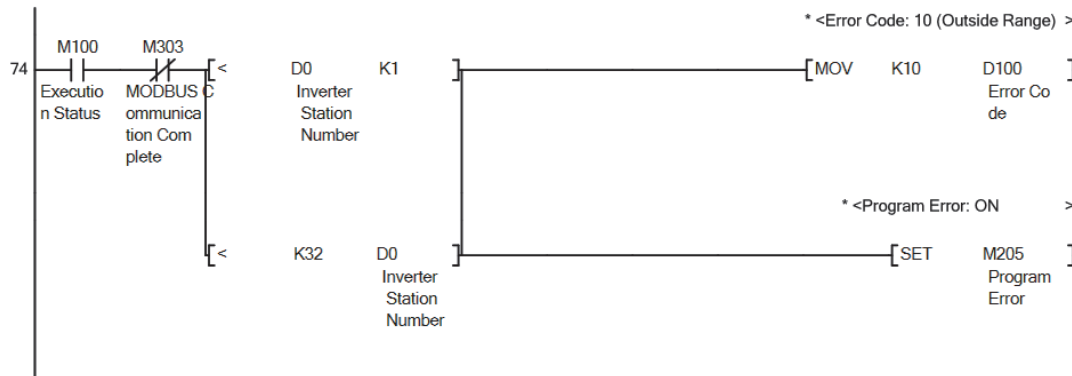
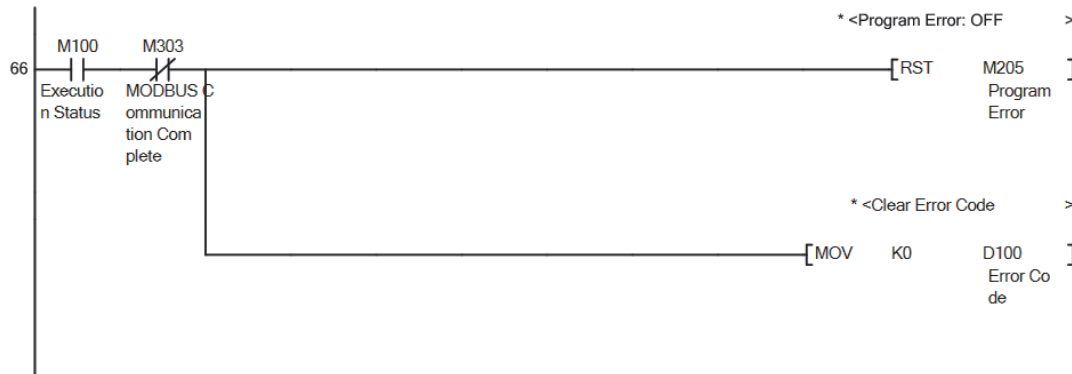


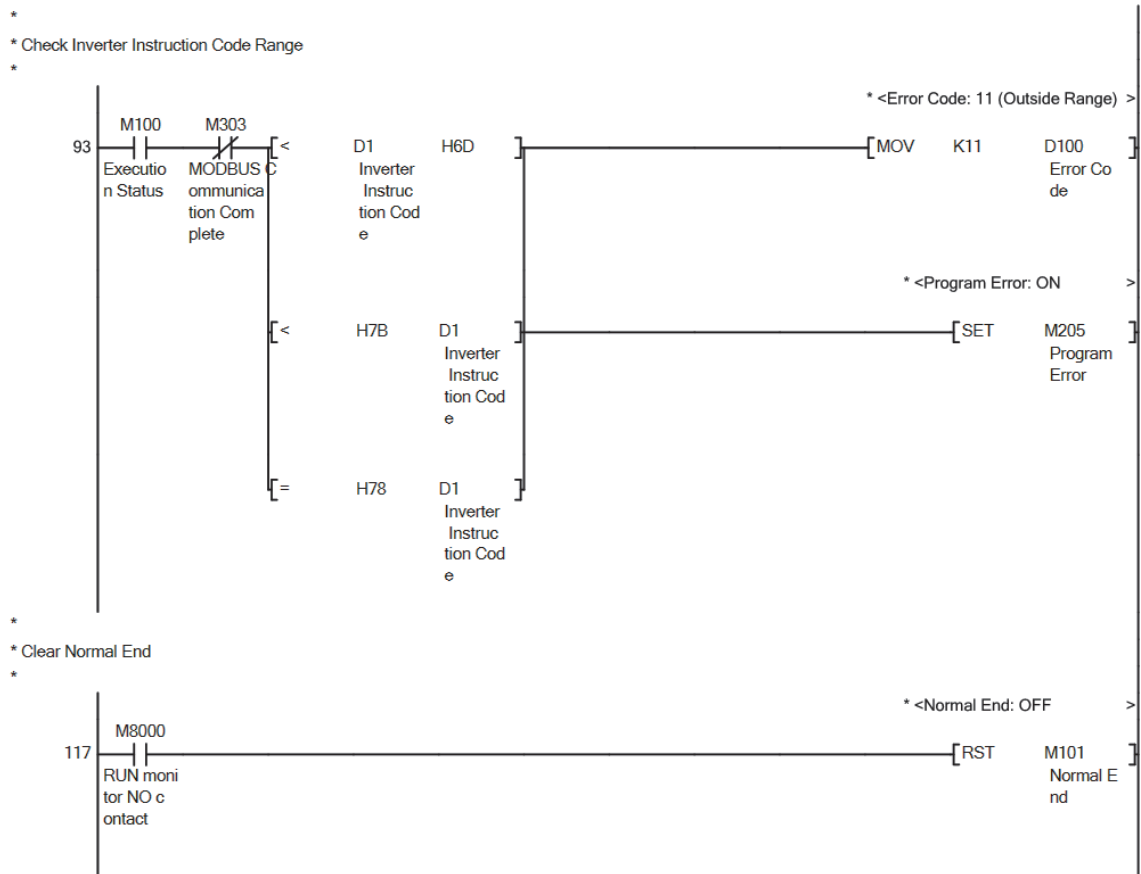
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* Process of Program Completion

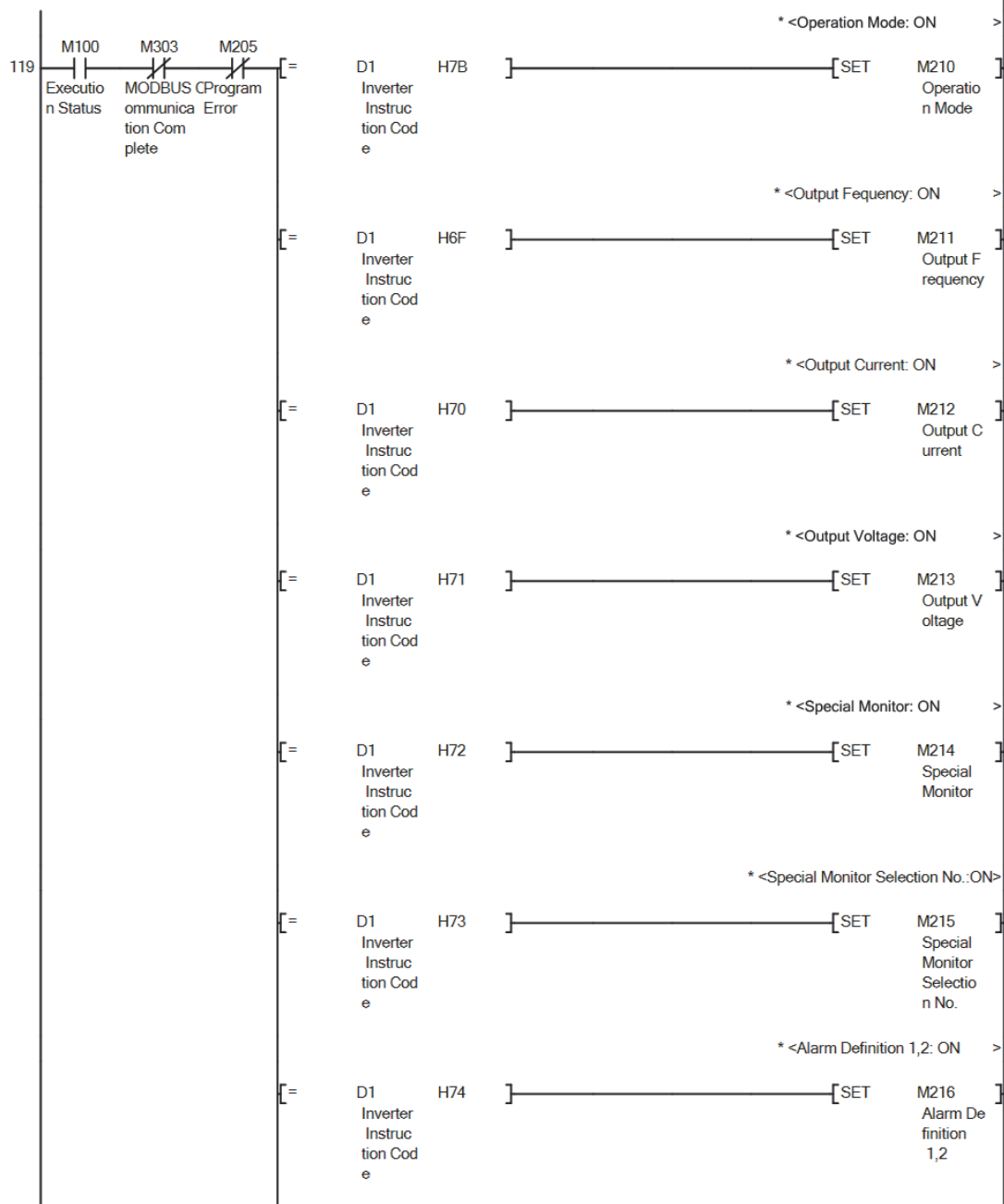


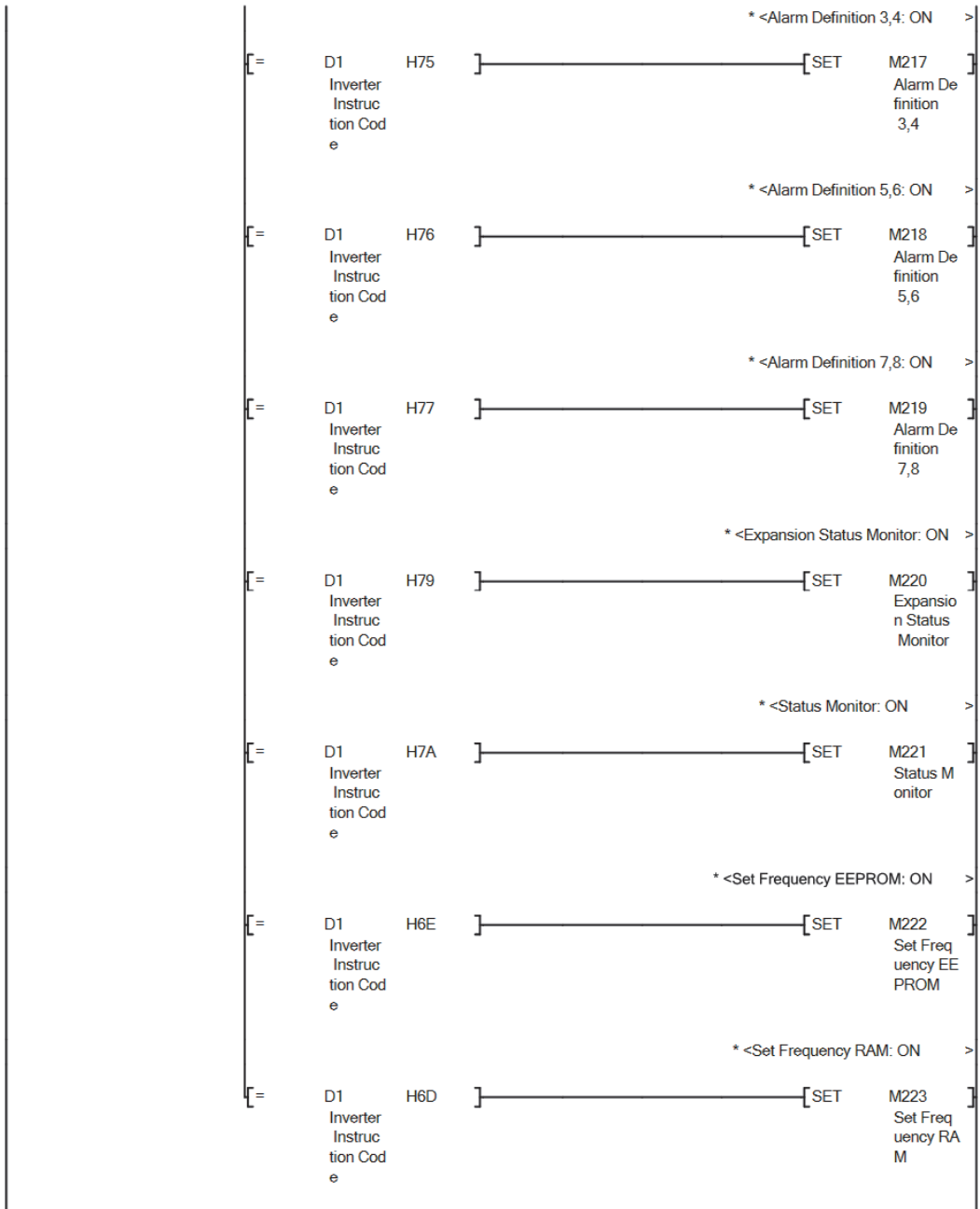


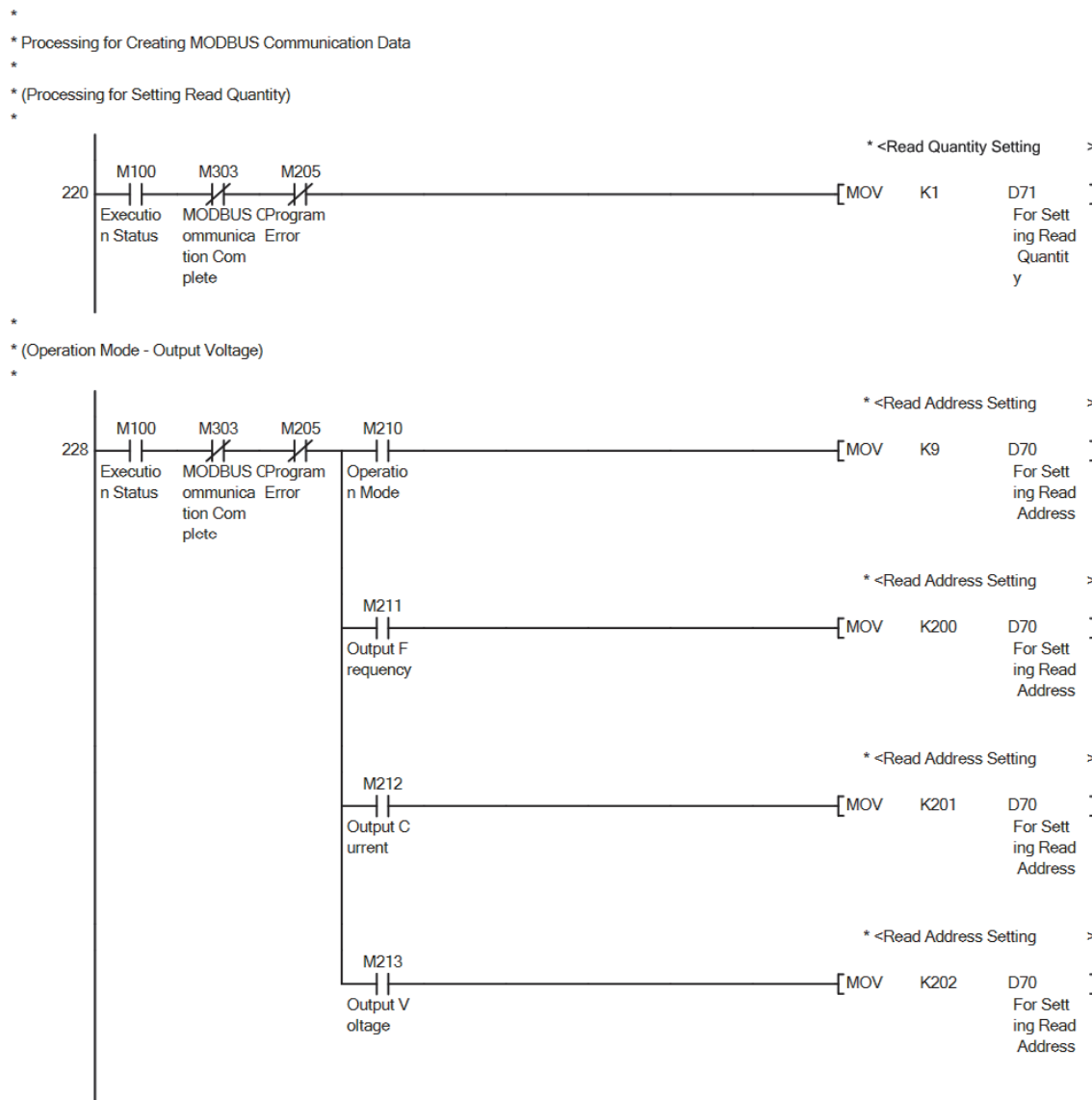




*
 * Processing for Setting Processing Switching
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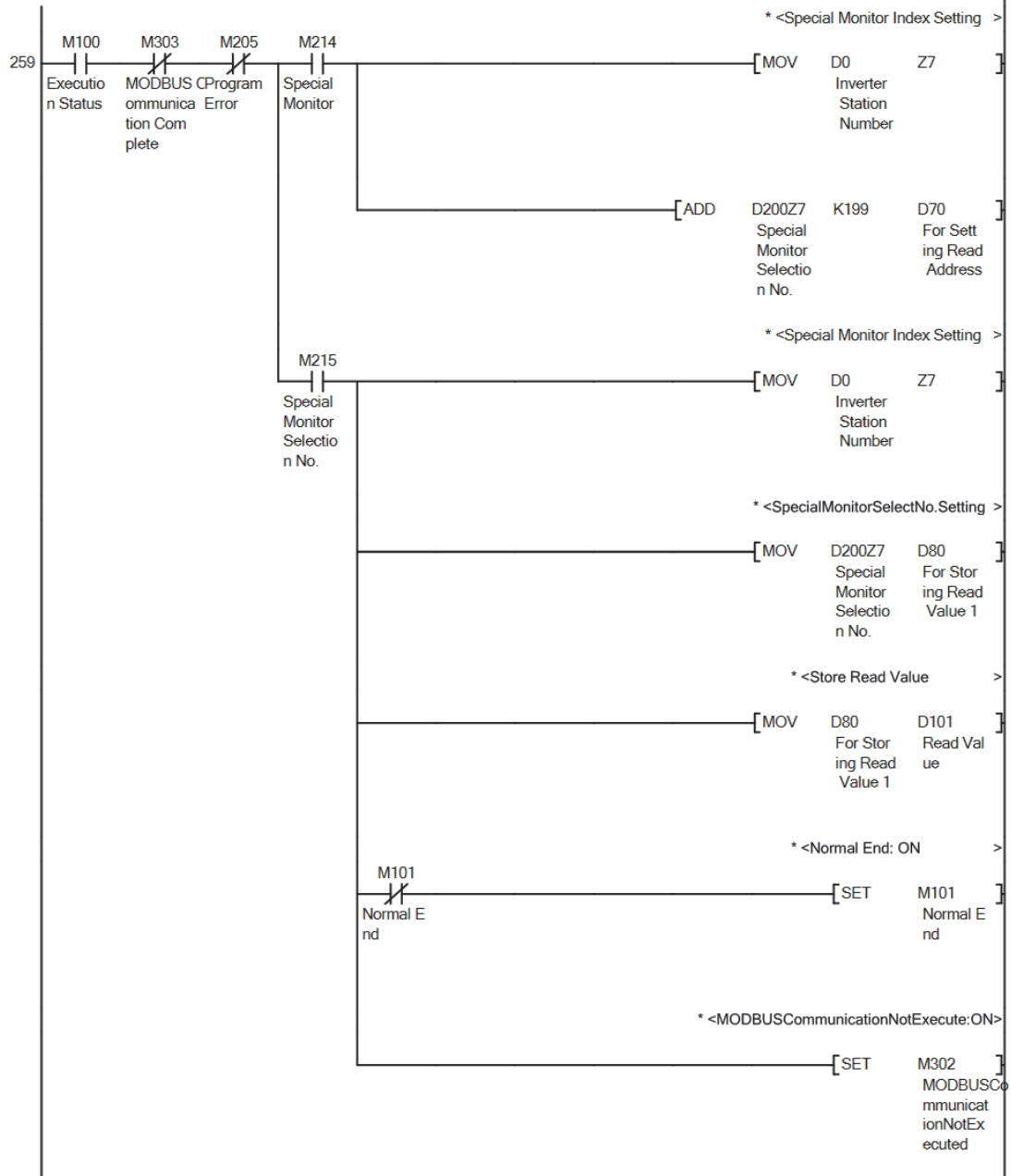




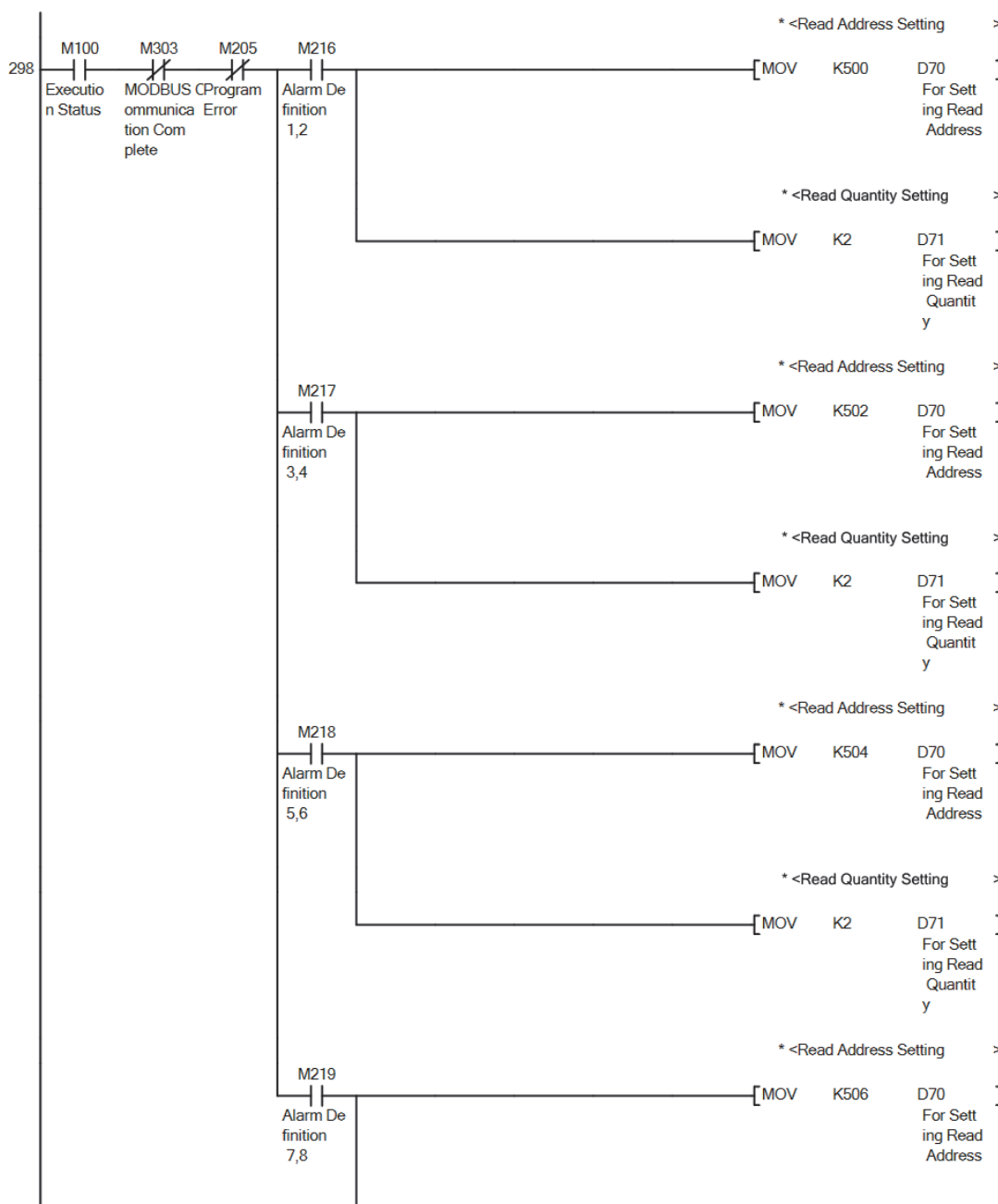


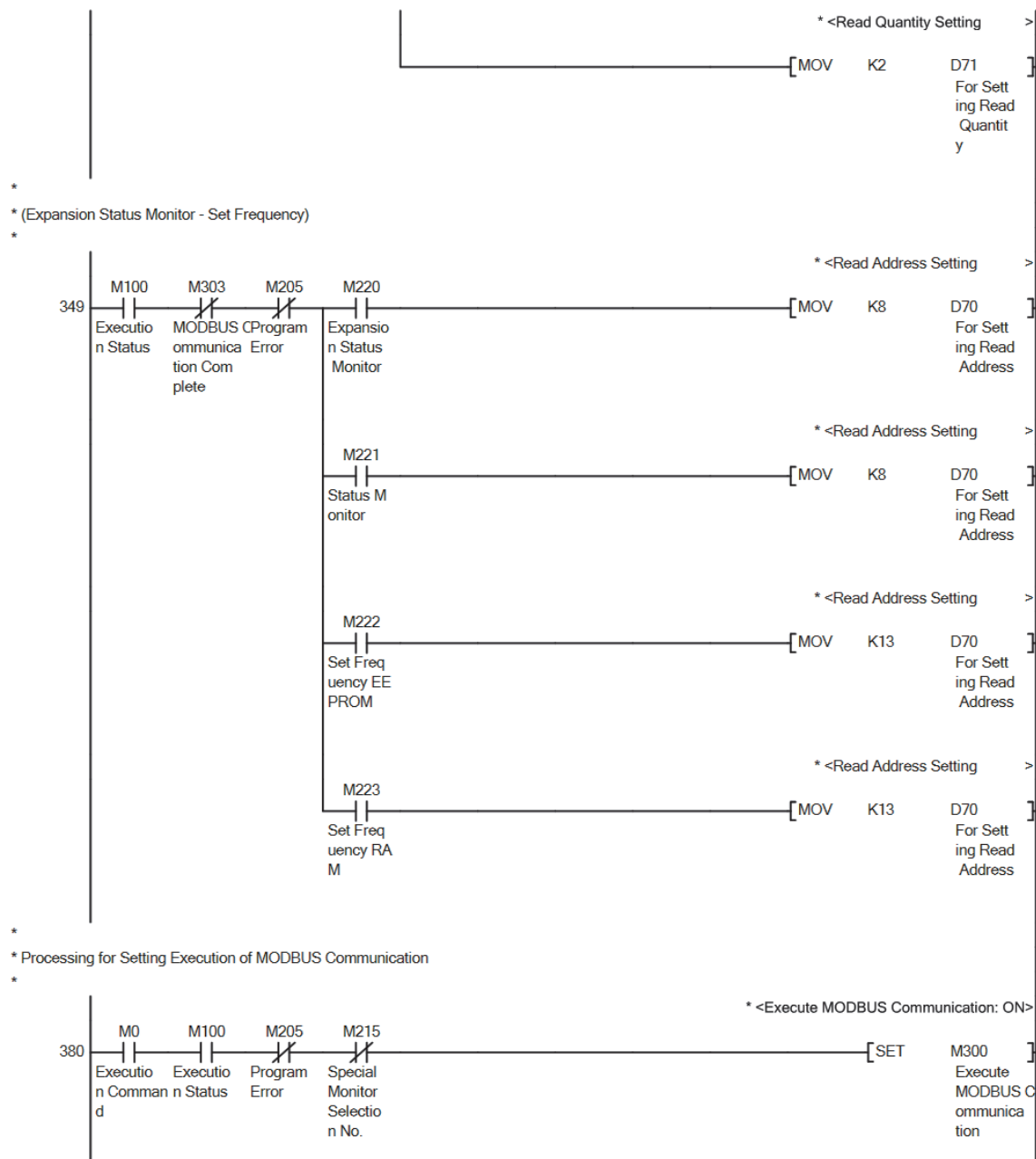
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*(Special Monitor - Special Monitor Selection No.)



- * (Alarm Definition)

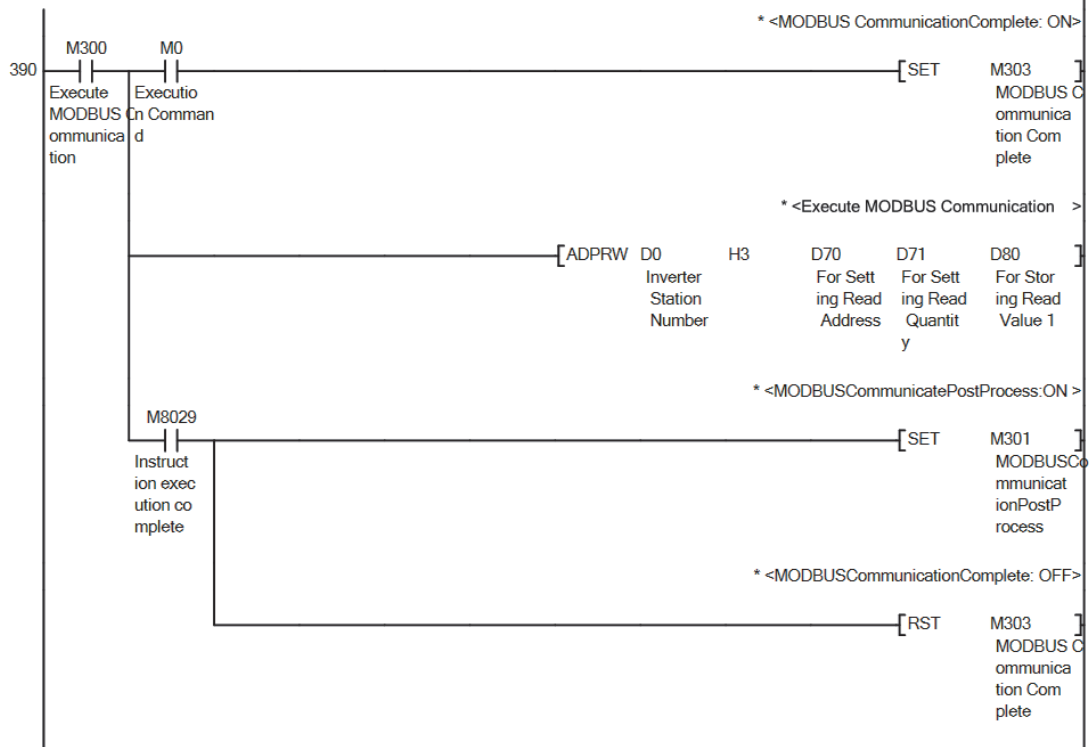


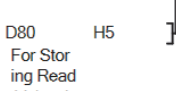


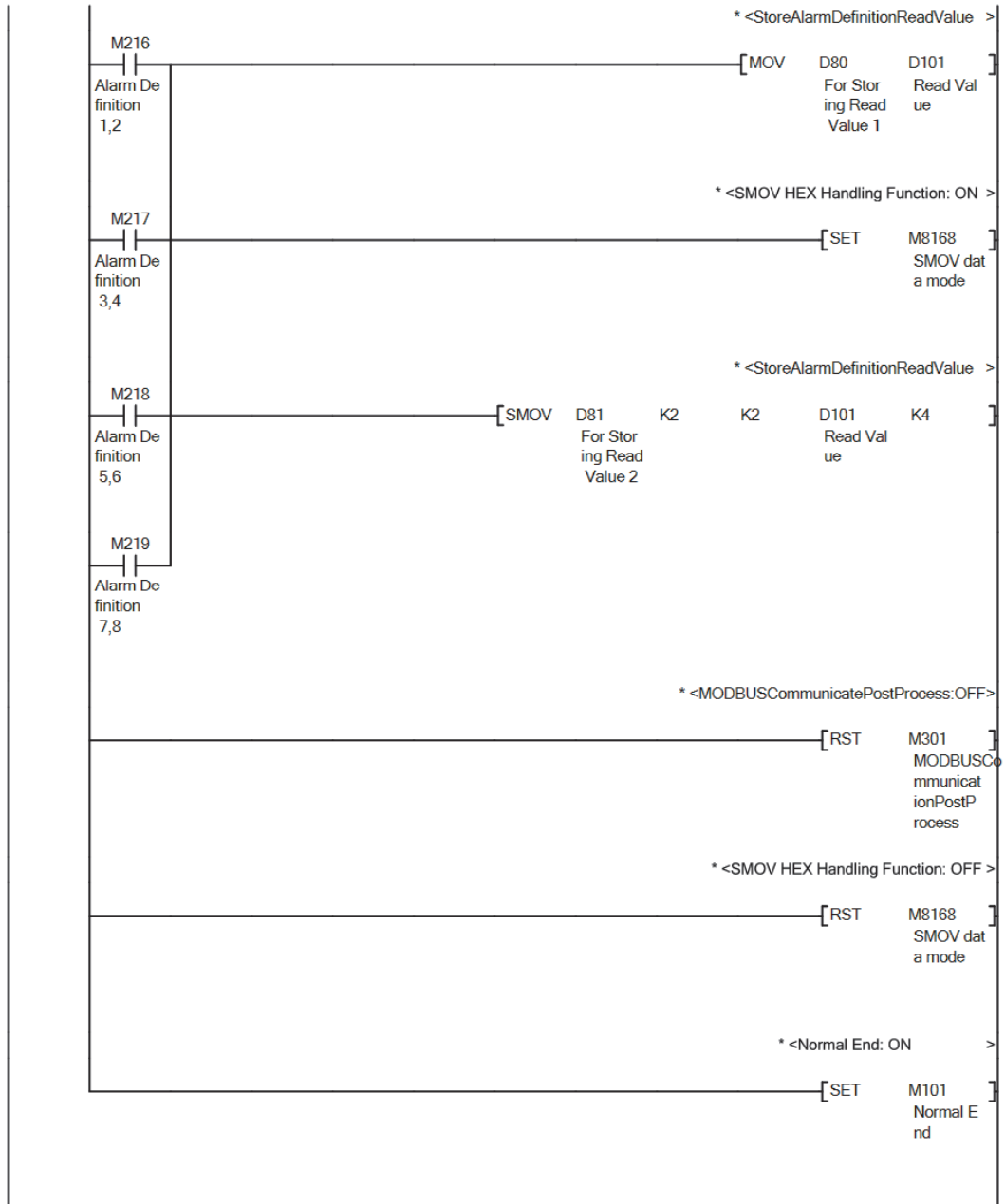
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*
 * MODBUS Communication Execution Processing
 *







* Abnormal End Setting Processing

496

M100
Execution Status

M205
Program Error

* <Abnormal End: ON>

[SET Y000
Abnormal End]

M205
Program Error

* <Abnormal End: OFF>

[RST Y000
Abnormal End]

* Recovery Process of Index Register

503 M8000
RUN monitor NO contact

509

* <Recovery of Index Register

[MOV D99 IndexRegisterBackup and Recovery Z7]

[END]

2. 2. Inverter operation control function (02_LD-FX3U_Modbus_V100A_E)

Outline of System

The control value necessary for operating the inverter is written into the inverter from the PLC. (Action equivalent to IVDR instruction)

■ Description of functions

- (1) When Execution command (M0) is turned on, in accordance with the set inverter station number and the inverter instruction code, the control value is written into the inverter.
- (2) When the input value is incorrect, Abnormal end (Y000) will be turned on, and the processing will be suspended. The error code will be stored in Error code (D100). For the error code, see Error code (D100) of the device used.

* Supplement: Refer to the related manuals for details on the communication errors and setting parameter errors.

In this sample ladder, the index register is backed up and recovered. However, this processing is not required if it is unnecessary to retain the index register values for any processing other than this sample processing.

Applicable program

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

The projects used in this program are indicated below.

No.	Project name	Function name	Remark
1	02_LD-FX3U_Modbus_V100A_E	Inverter operation control function	This project 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: Operation is controlled. OFF: Operation control is stopped.
2	D0	Word	Input	Inverter station number	The inverter station number is set. [Effective range (decimal)] 1 to 32
3	D1	Word	Input	Inverter instruction code	The inverter instruction code is set. [Effective range (hexadecimal)] H7B: Operation mode HF3: Special monitor selection No. HF9: Operation command (expansion) HFA: Operation command HEE: Set frequency (EEPROM) HED: Set frequency (RAM) HFD: Inverter reset HF4: Alarm definition batch clear HFC: Parameter all clear HFF: Link parameter expansion setting
4	D2	Word	Input	Control value	The control value is set. [Effective range (hexadecimal)] H0000 to HFFFF * The effective range varies depending on the instruction code.

Output device

No.	Device name	Data type	Kind	Device comment	Remark
1	Y000	Bit	Output	Abnormal end	When this device is ON, it indicates that an error has occurred in the program.
2	M100	Bit	Output	Execution status	ON: Execution command ON OFF: Execution command OFF
3	M101	Bit	Output	Normal end	When this device is ON, it indicates that processing has finished.
4	D100	Word	Output	Error code	The error codes caused in the program are stored. [Error code (DEC)] 10: Inverter station number out of range 11: Inverter instruction code out of range

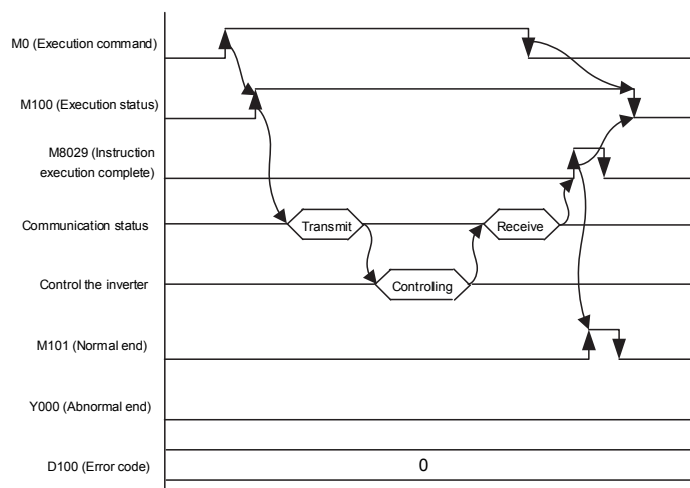
Internal device

No.	Device name	Data type	Kind	Device comment	Remark
1	M205	Bit	Internal	Program error	The program error flag is retained.
2	M210	Bit	Internal	For checking instruction code	Used to check the instruction code
3	M220 to M231	Bit	Internal	For setting the operation command	Used to set the operation command. M220: AU (Terminal 4 input selection) M221: Forward rotation command M222: Reverse rotation command M223: RL (Low-speed command) M224: RM (Middle-speed command) M225: RH (High-speed command) M226: RT (Second function selection) M227: MRS (Output stop) M228: JOG (JOG operation selection) M229: CS (Moment power fail restart select) M230: STP (Restart & self-holding select) M231: RES (Inverter reset)
4	M300 to M303	Bit	Internal	For setting the processing to be executed	The processing to be executed by this program is set. M300: Execute MODBUS communication M301: (Unused) M302: MODBUS communication not executed M303: MODBUS communication complete
5	M8000	Bit	Internal	RUN monitor NO contact	Used for index register backup and recovery commands
6	M8029	Bit	Internal	Instruction execution complete	Used to end MODBUS communication
7	D60	Word	Internal	For setting write address	Used to set the write address
8	D82	Word	Internal	For storing control value	Used to store the control value
9	D99	Word	Internal	Index register backup and recovery	Used to back up and recover the index register (Z7) to be used
10	D200 to D232	Word	Internal	For setting special monitor selection No., special monitor selection No. 1 to 32	Used to set the special monitor number selected from inverter station numbers 1 to 32
11	Z7	Word	Internal	Inverter station number to be used	The inverter station number to be used is stored.

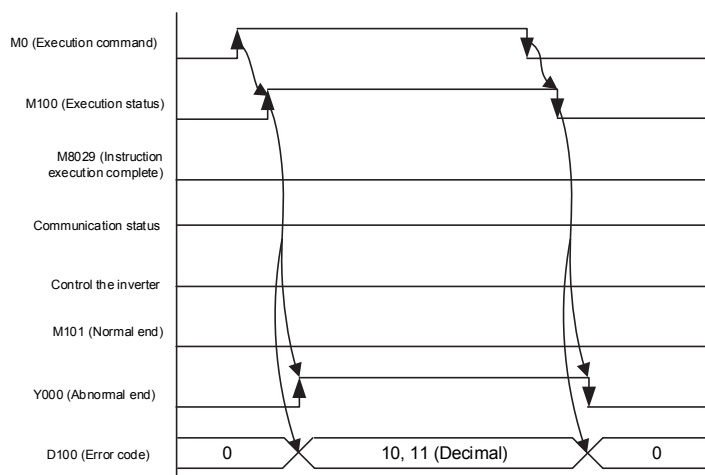
Operation of I/O signals

■ The timing chart for this program is shown below.

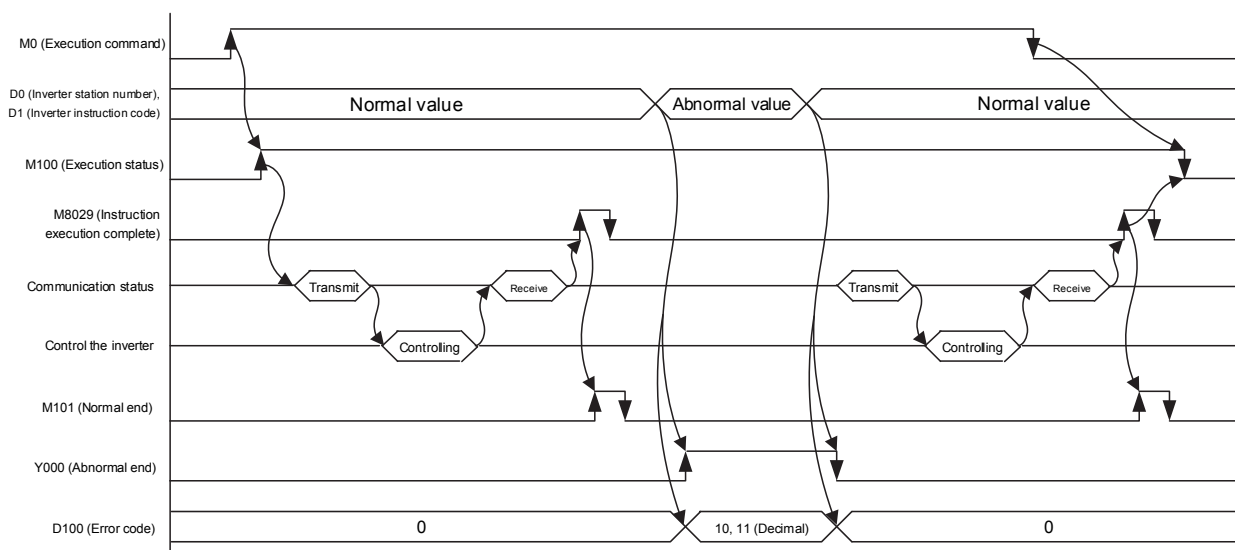
[In case of normal end]



[In the case of abnormal end]



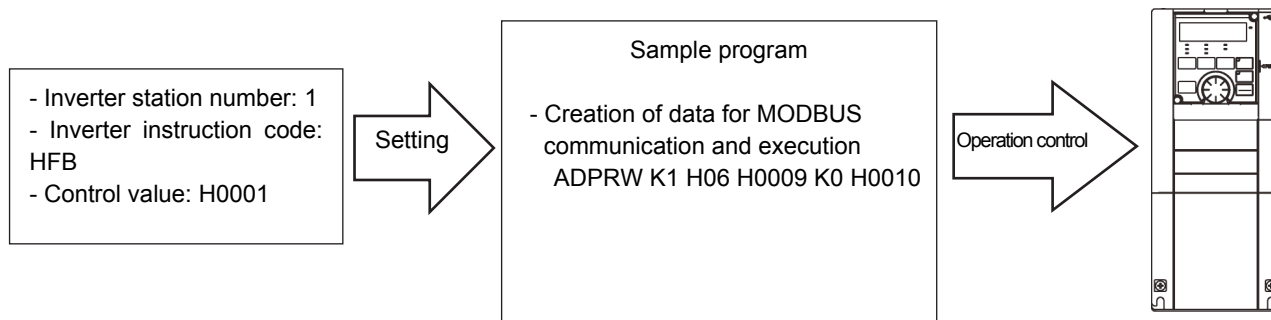
[In case of change of input value: Normal input ->Abnormal input ->Normal input]



■ The processes of this program are given below.

- (1) The input data (inverter station number and inverter instruction code) is checked to confirm that the values are within the effective ranges, and if there is an error, the results are output to the Error code (D100).
The effective range of the control value varies depending on the inverter instruction code and can be checked during communication error detection. Therefore, this program does not check for the effective range.
- (2) MODBUS communication data is created from the input inverter station number, inverter instruction code and control value.
- (3) MODBUS communication is executed and the control value is written into the inverter.
- (4) Controlling is continued until the Execution command (M0) is turned off.

An example of operation control in the operation mode (when the operation mode is set to the external operation mode) by this program is given below.



Data for MODBUS communication

Setting data	Description
ADPRW	MODBUS read/write instruction
K1	Station No.
H06	Function code (H06: Write single register)
H0009	Write address (Write address = MODBUS register - 40001)
K0	(Fixed)
H0010	MODBUS written value

The correspondence between the input inverter instruction codes and control values and the MODBUS communication data created by this program is shown below.

Operation control item	Inverter instruction Code	Control value	Data for MODBUS communication		Remarks
			MODBUS register	Control value	
Operation mode	HFB	H0000: Network operation	40010	H0014	—
		H0001: External operation	40010	H0010	—
		H0002: PU operation	40010	H0011	—
Special monitor selection No.	HF3	H01 to H62 *1	*2	H01 to H62	—
Operation command (expansion)	HF9	*3	40009	*3	—
Operation command	HFA	*3			—
Set frequency (EEPROM)	HEE	H0000 to HE678 (0 to 590.00 Hz, unit: 0.01 Hz)	40015	H0000 to HE678 (0 to 590.00 Hz, unit: 0.01 Hz)	—
Set frequency (RAM)	HED		40014		—
Inverter reset	HFD	H9696: Reset without return H9966: Reset after returning ACK	40002	(Any value)	When the inverter is reset, a time-out error will occur.
Alarm definition batch clear	HF4	H9696	40501	(Any value)	—

Operation control item	Inverter instruction Code	Control value	Data for MODBUS communication		Remarks
			MODBUS register	Control value	
Parameter all clear	HFC	H9966: Parameter all clear The communication parameters are cleared.	40004	H99AA	–
		H55AA: Parameter all clear The communication parameters are not cleared.	40007	HAA99	–
		H9696: Parameter clear The communication parameters are cleared.	40003	H965A	–
		H5A5A: Parameter clear The communication parameters are not cleared.	40006	H5A96	–
Link parameter expansion setting	HFF	H00 to H0D	–	–	The processing is not performed by the MODBUS communication.

*1 See the manual of each inverter for the special monitor selection number which is possible to be set.

*2 The special monitor selection number is written into the internal device (D201 to D232).

MODBUS communication is not executed.

Therefore, communication error does not occur if the control value is set outside of the ranges.

The device to be used is switched according to the inverter station number.

(Example) When the inverter station number is 1, D201 is used. When the number is 32, D232 is used.

*3 The correspondence between the control values of operation commands (expansion) "HF9," operation commands "HFA" and the data for MODBUS communication is shown below.

Operation control item		Control value	Data for MODBUS communication
Operation command (expansion) "HF9" *1	Operation command "HFA" *1		Control value
AU (terminal 4 input selection)	AU (Terminal 4 input selection)	H0001	H0100
Forward rotation command	Forward rotation command	H0002	H0002
Reverse rotation command	Reverse rotation command	H0004	H0004
RL (Low-speed command)	RL (Low-speed command)	H0008	H0020
RM (Middle-speed command)	RM (Middle-speed command)	H0010	H0010
RH (High-speed command)	RH (High-speed command)	H0020	H0008
RT (Second function selection)	RT (Second function selection)	H0040	H0080
MRS (Output stop)	MRS (Output stop)	H0080	H0400
JOG (JOG operation selection)		H0100	H0040
CS (Selection of restart after momentary power failure, flying start)		H0200	H0200
STP (Selection of start and self-holding)		H0400	H0800
RES (Inverter reset)		H0800	H1000
Stop command	Stop command	H0000	H0001

*1 The content of each operation command: operation command (expansion) "HF9" and operation command "HFA" refers to the content of FREQROL-A800.

Version upgrade history

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

Program

* Sample Ladder Name: 02_LD-FX3U_Modbus_V100A_E

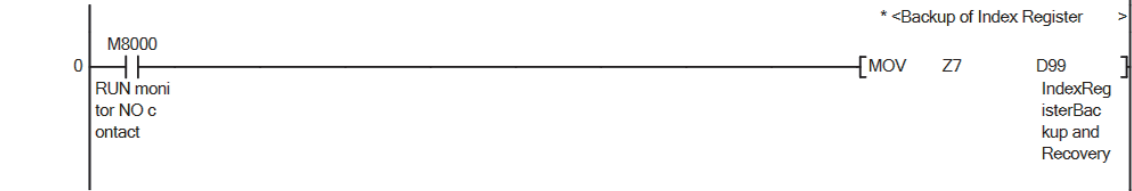
* Function: Inverter Operation Control Function

* Version: Ver.1.00A

*

* Backup Process of Index Register

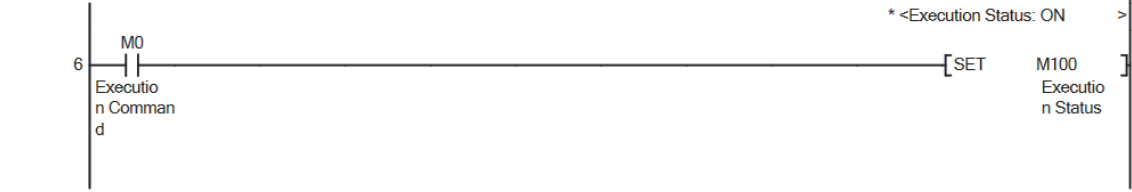
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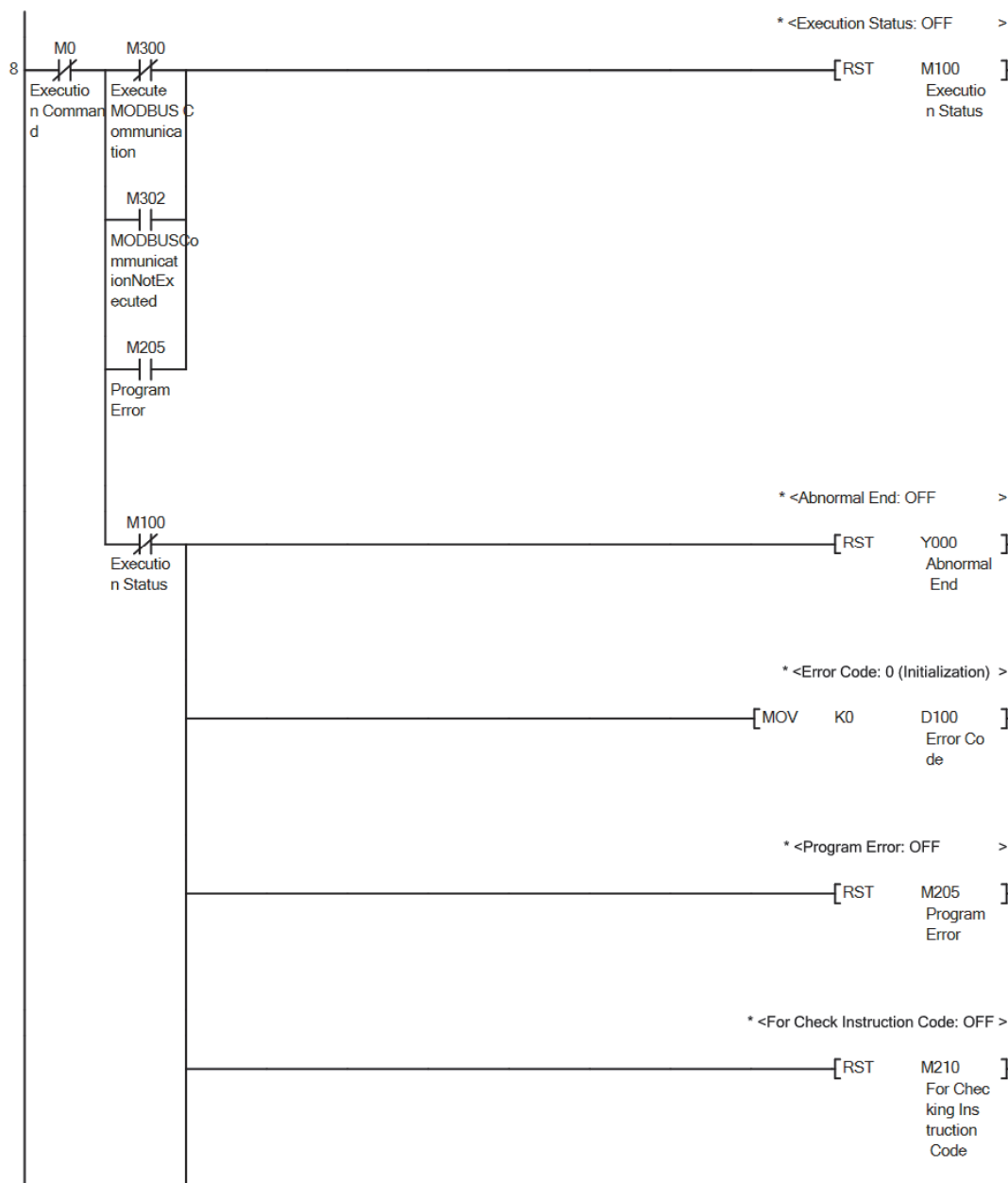
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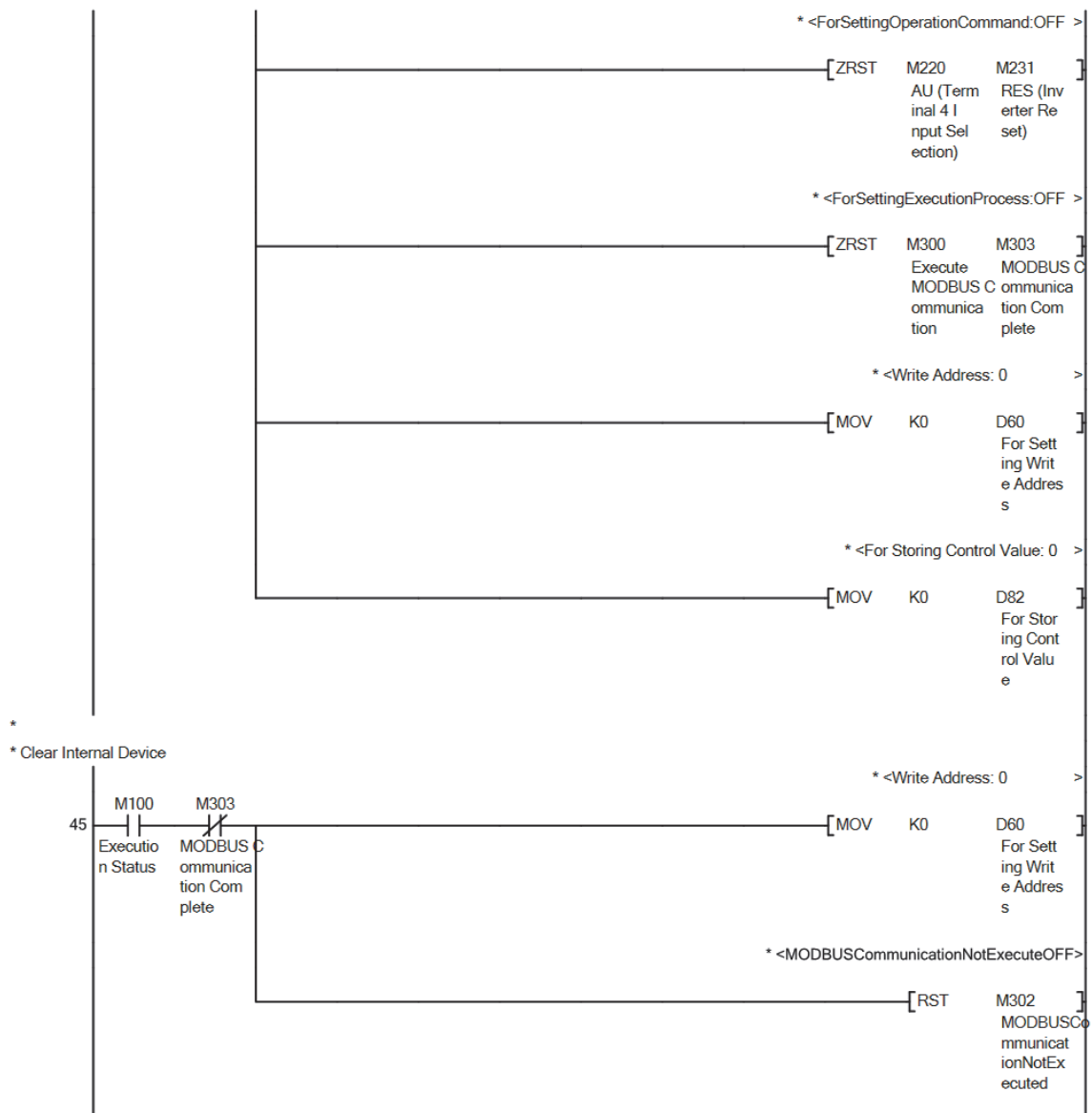
* Process of Executing Program

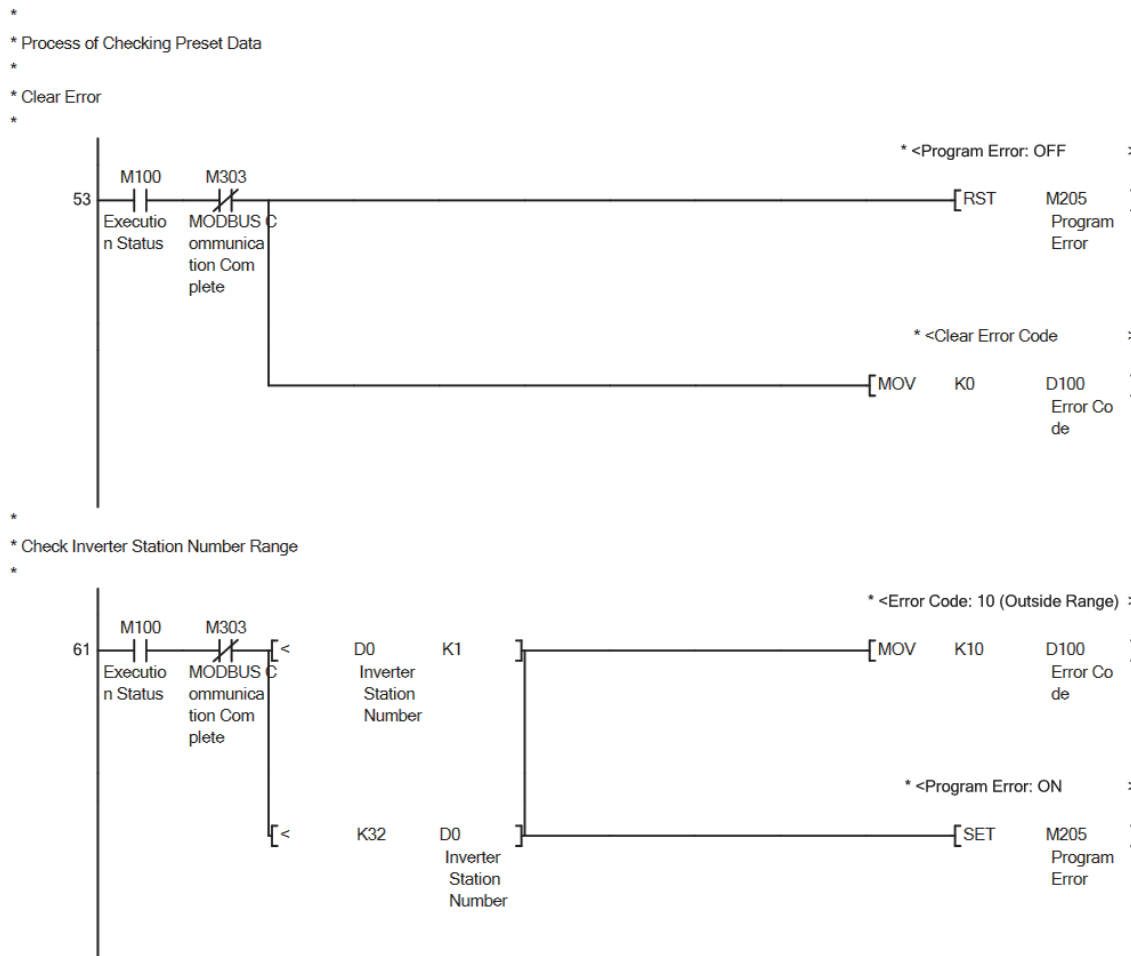
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*
 * Process of Program Completion
 *

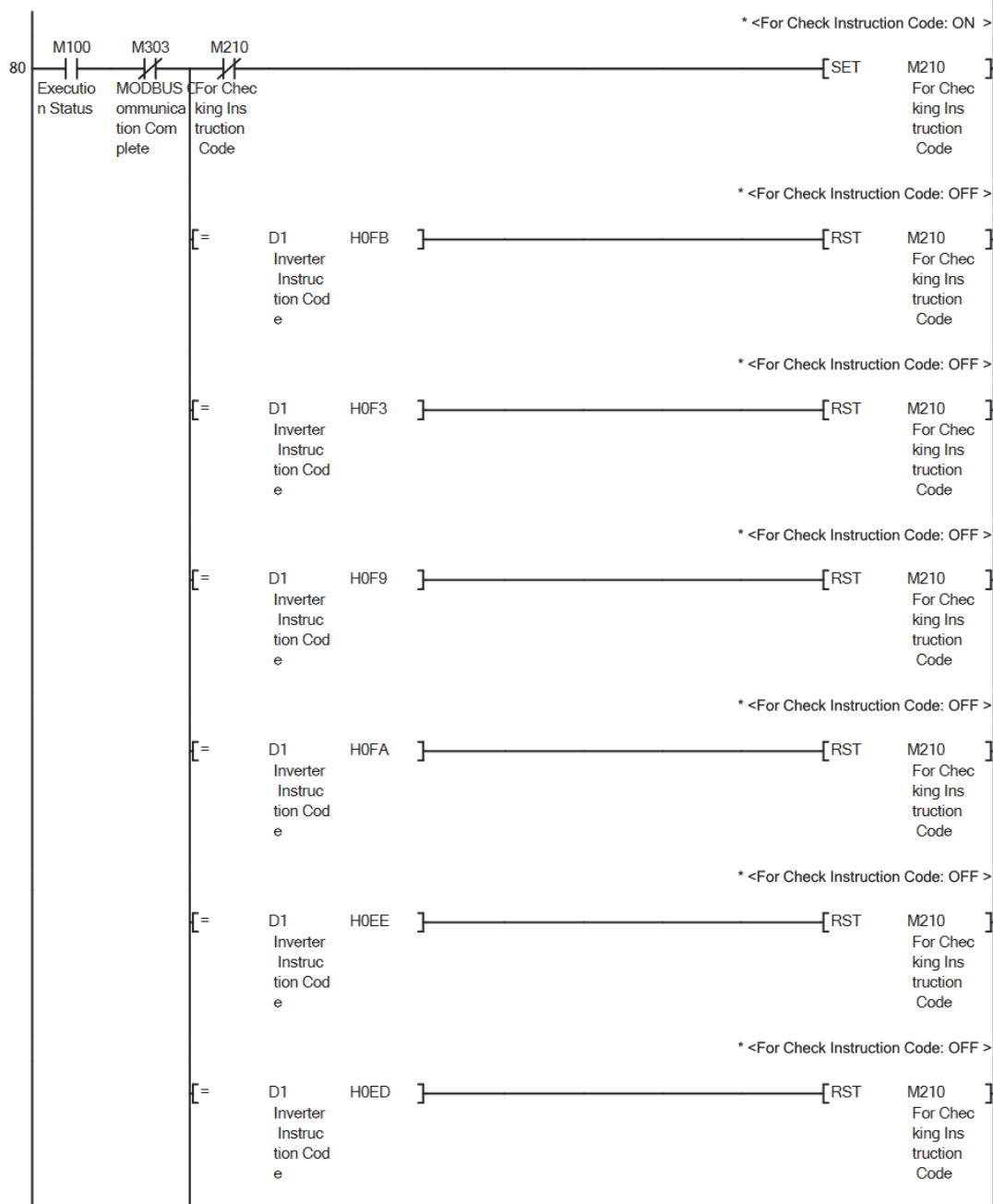


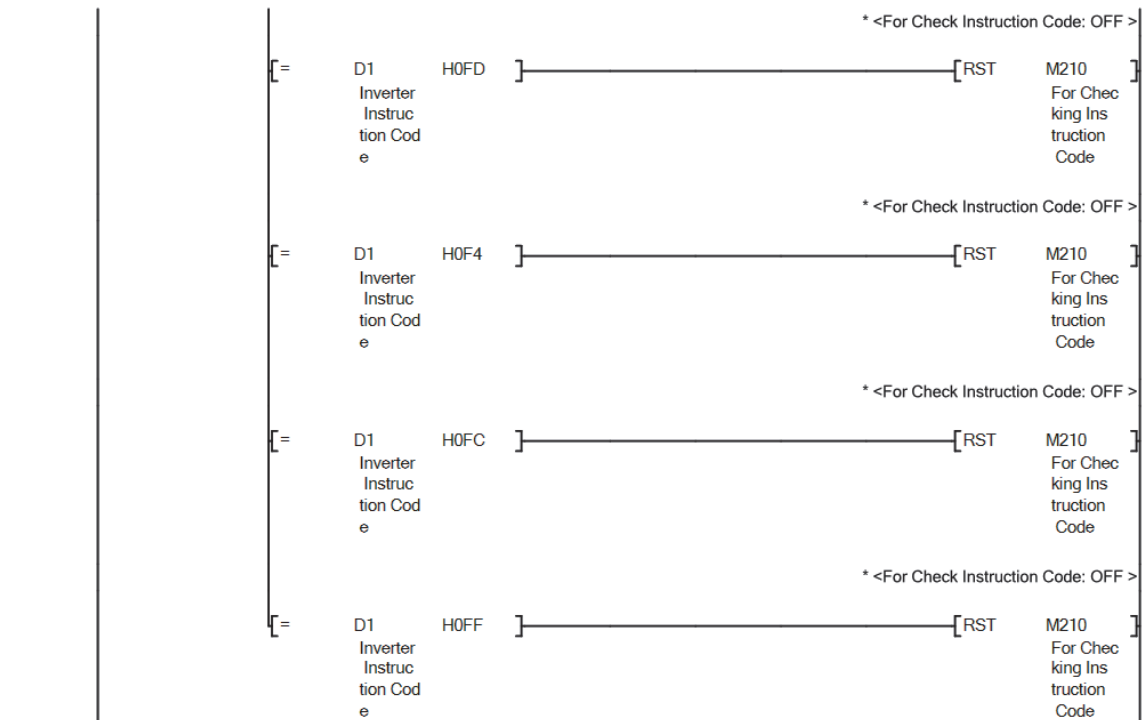




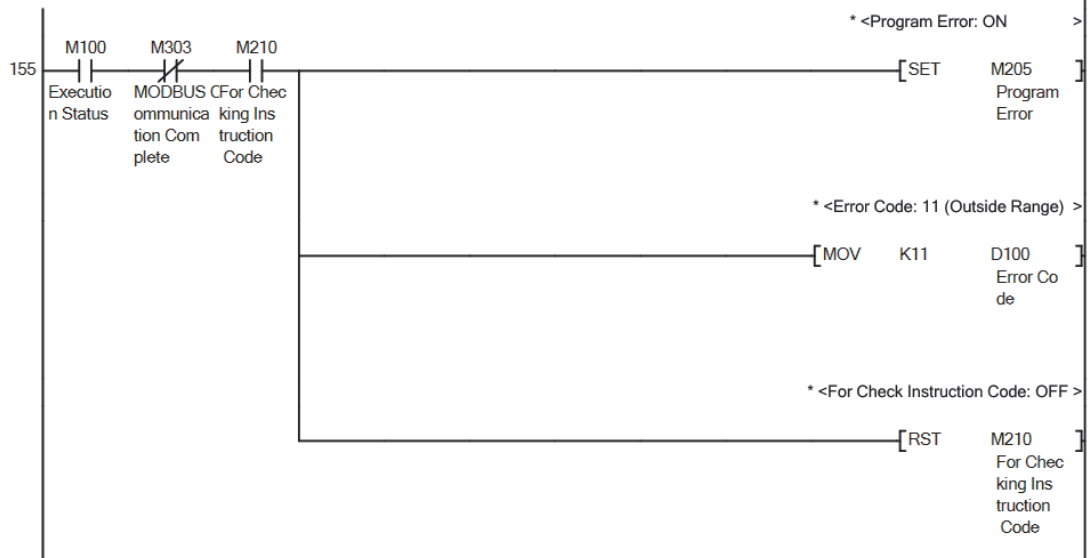
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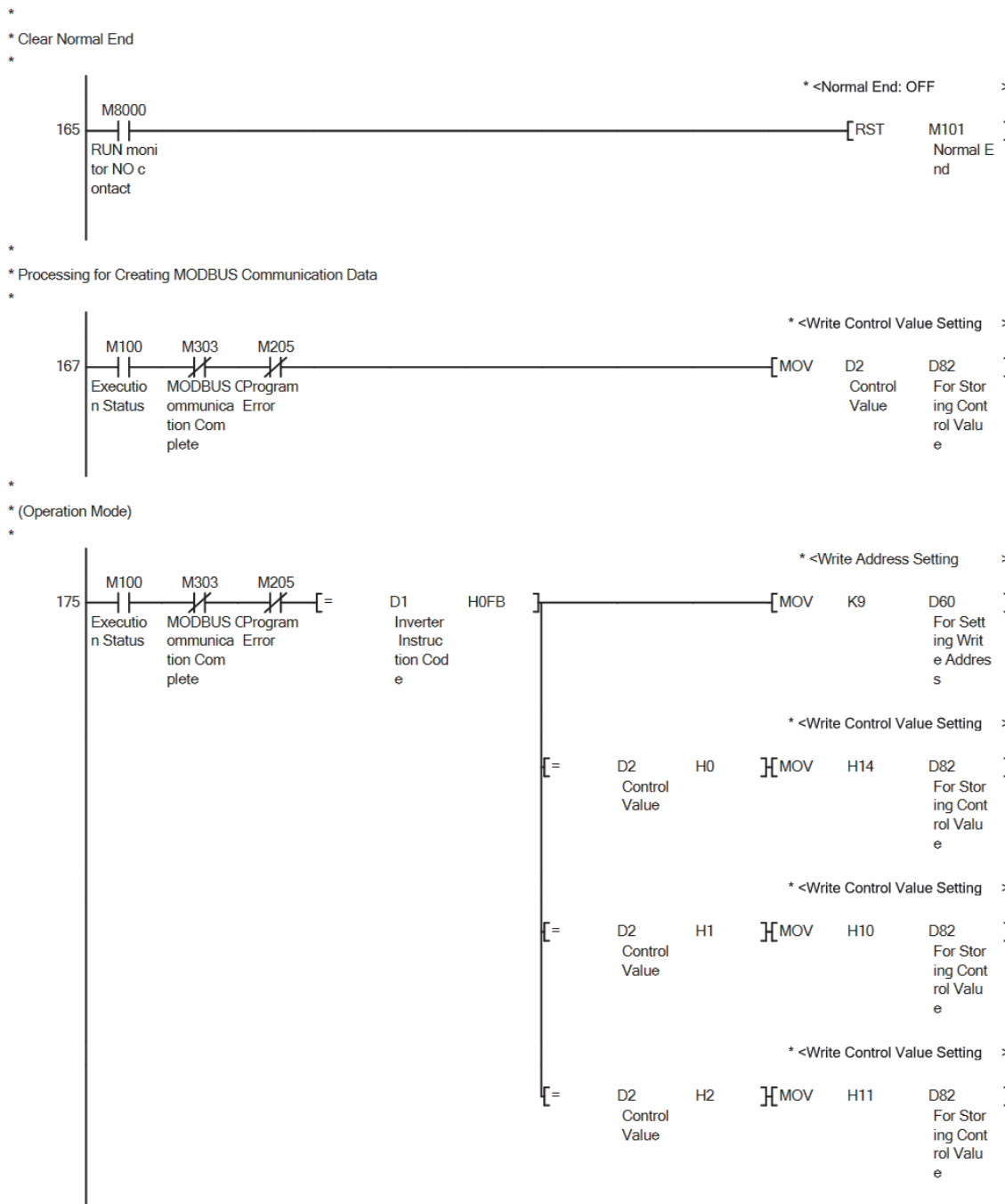
* Check Inverter Instruction Code Range





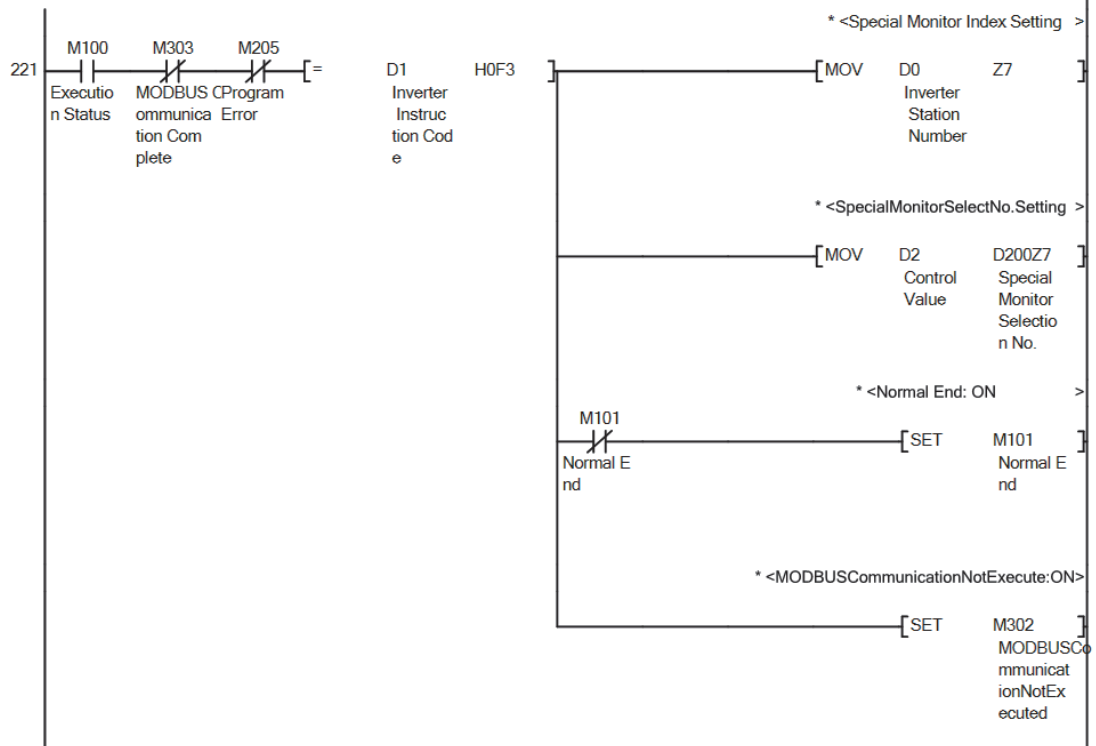
*
 * Error Processing for Inverter Instruction Code
 *



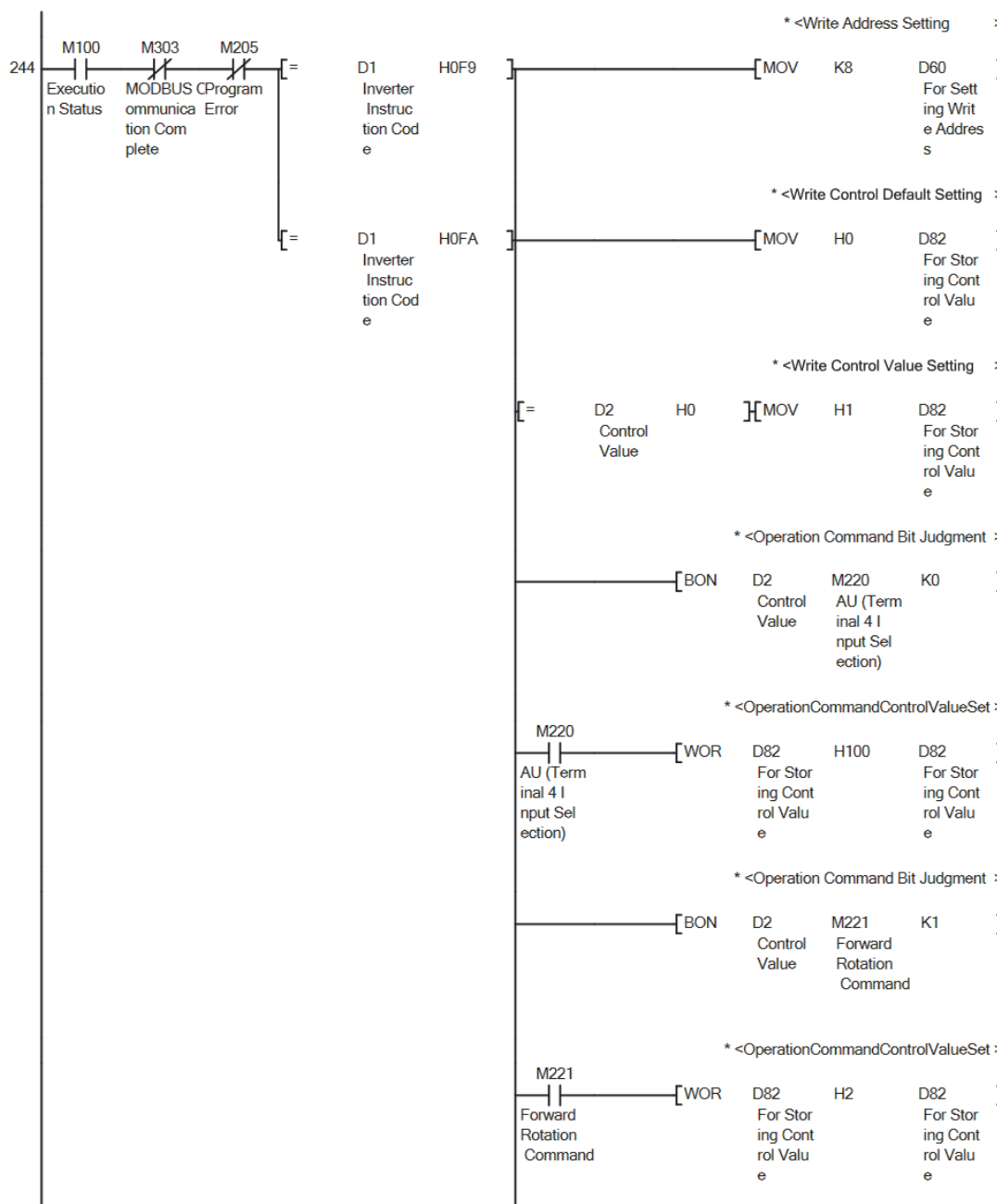


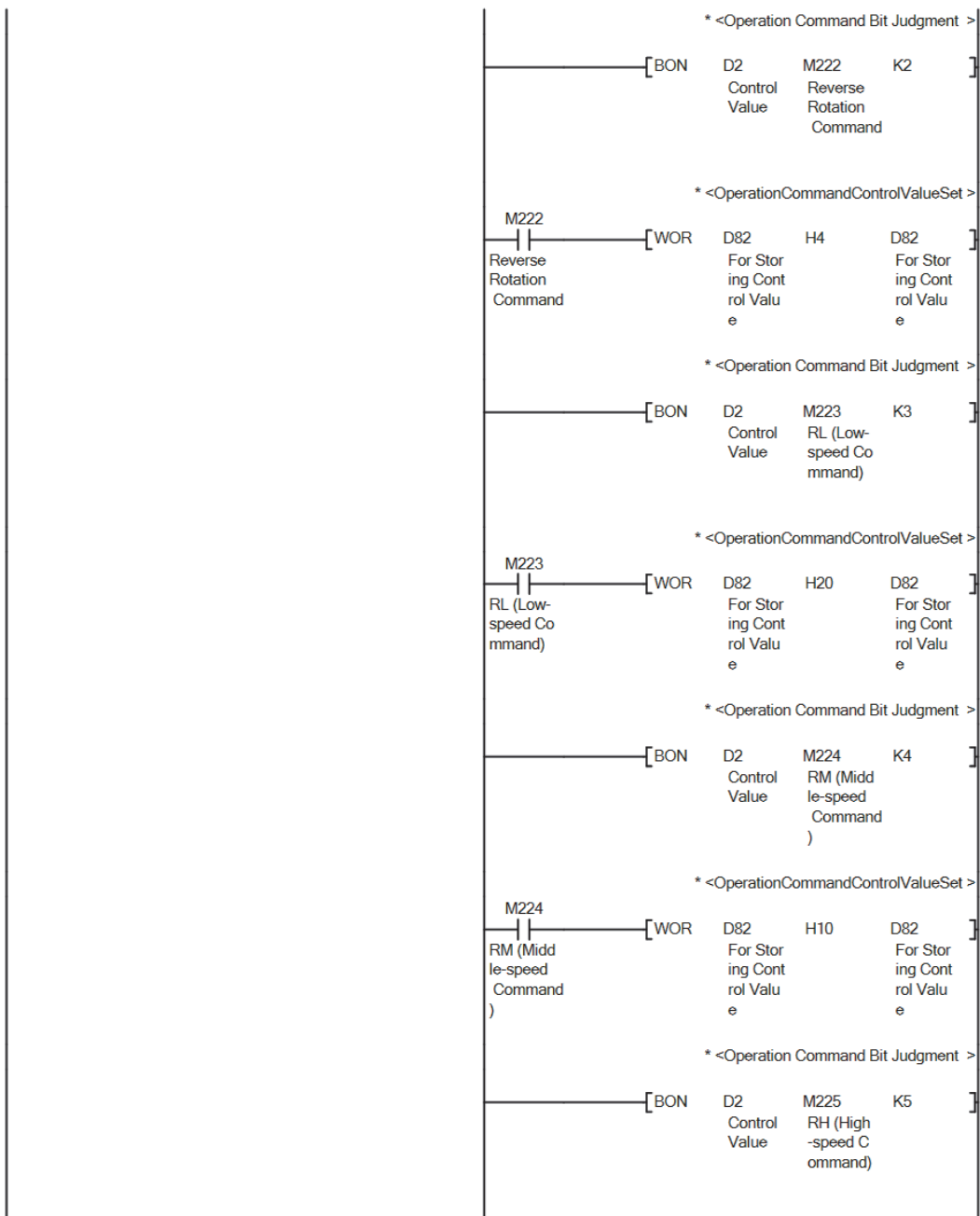
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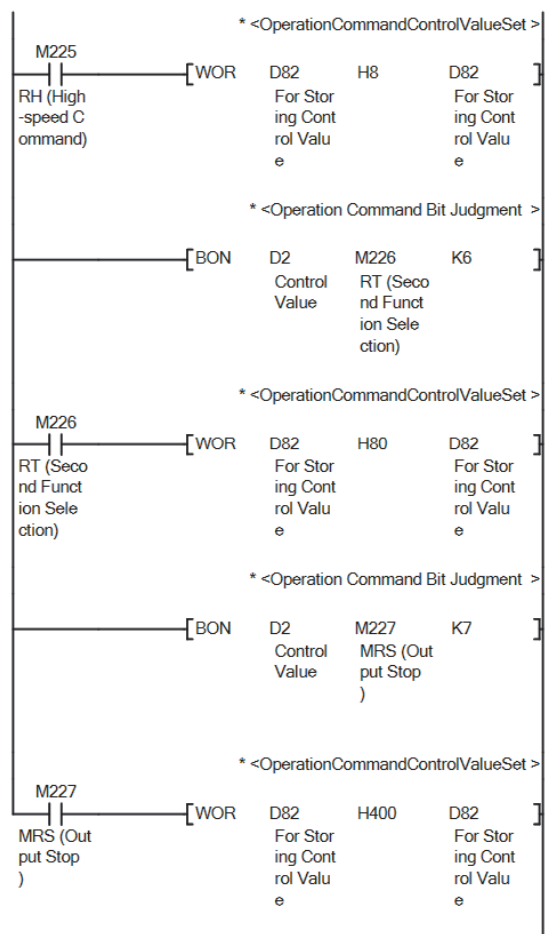
*(Special Monitor Selection No.)



*
 * (Operation Command bits 0 to 7)
 *

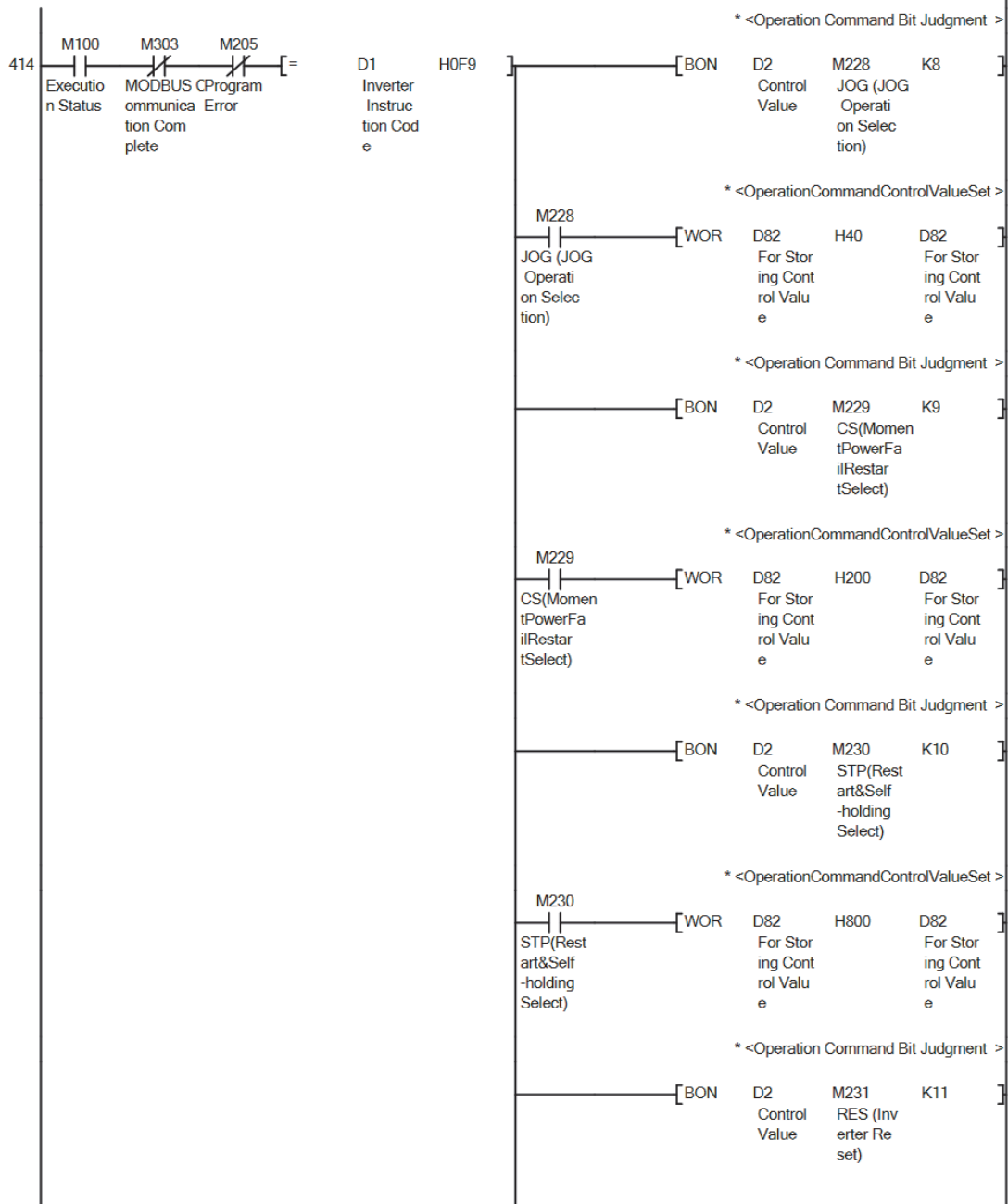




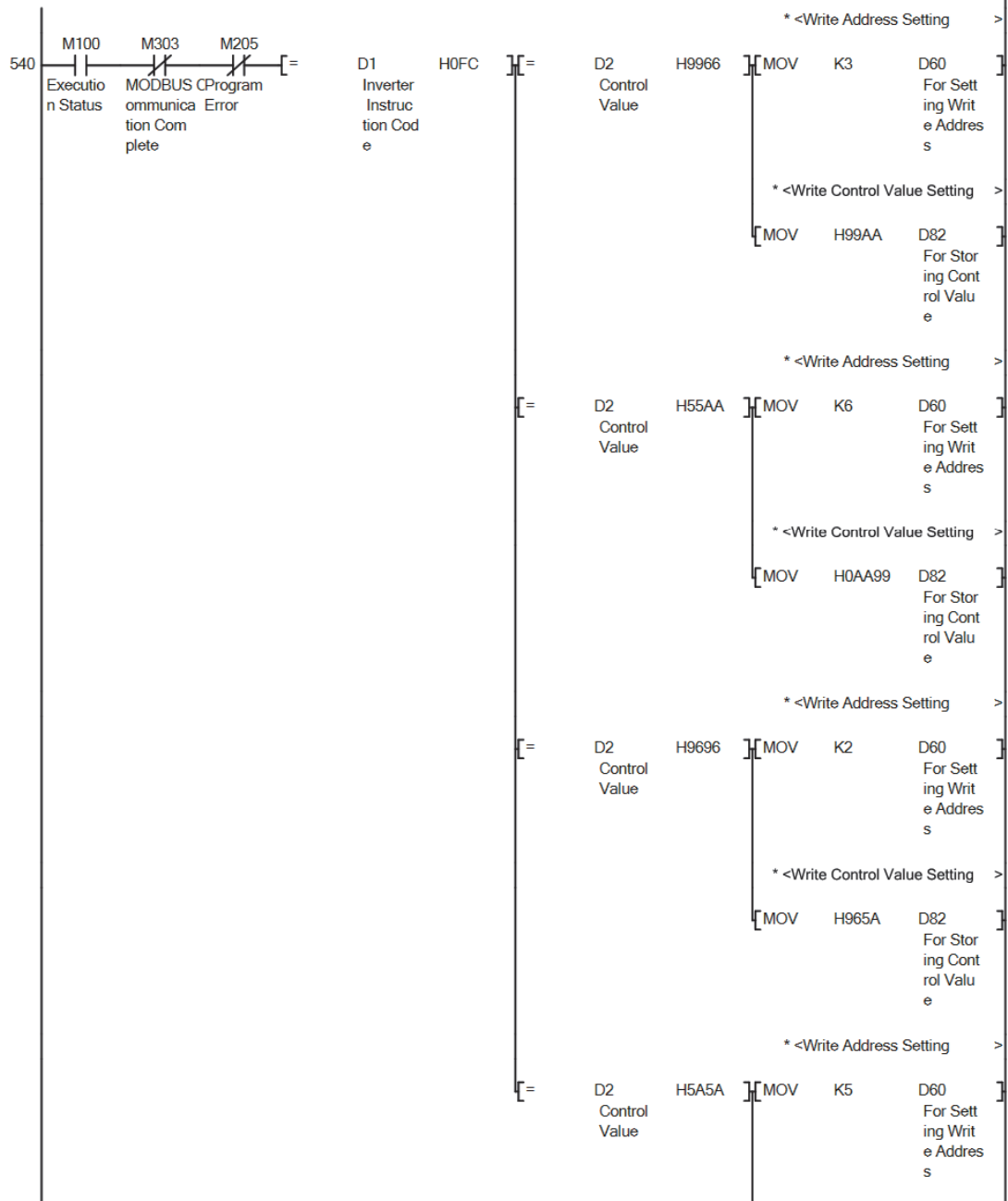


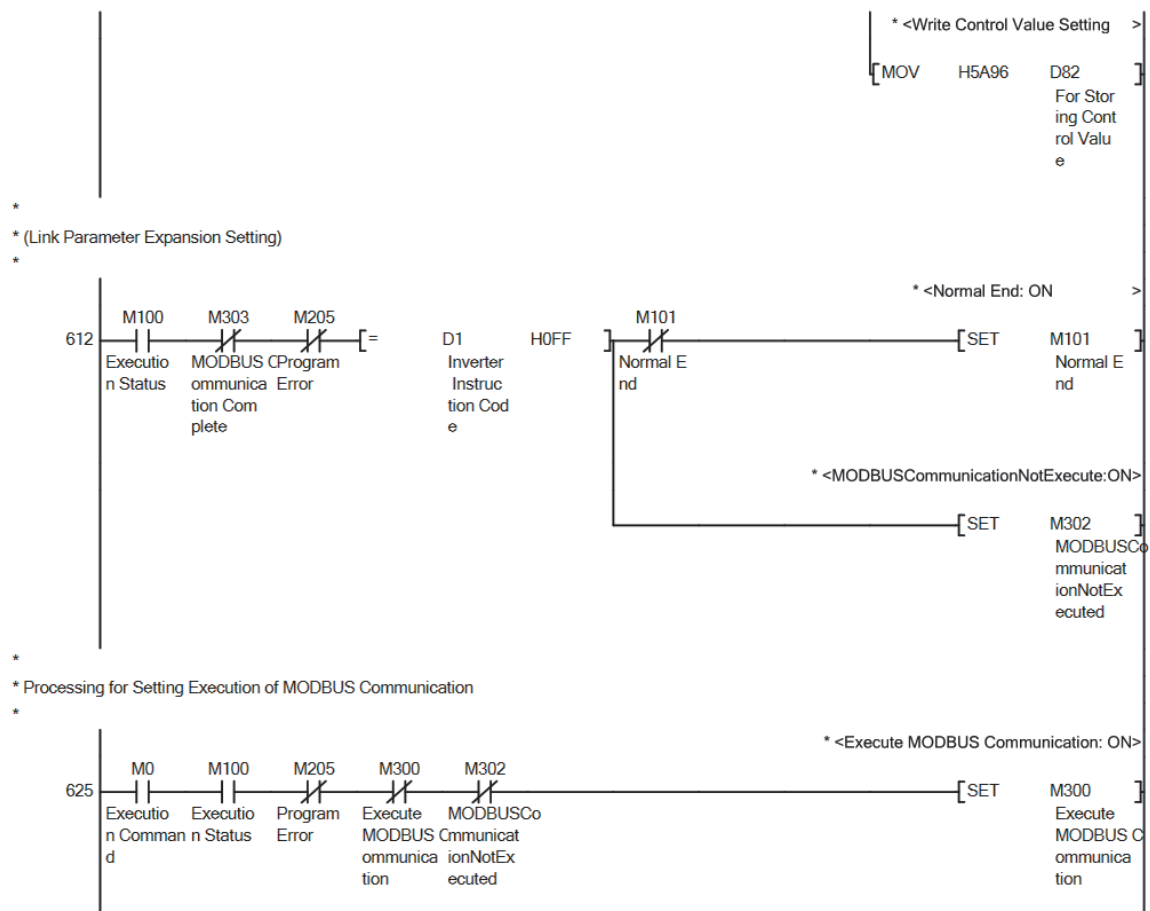
*
*
*

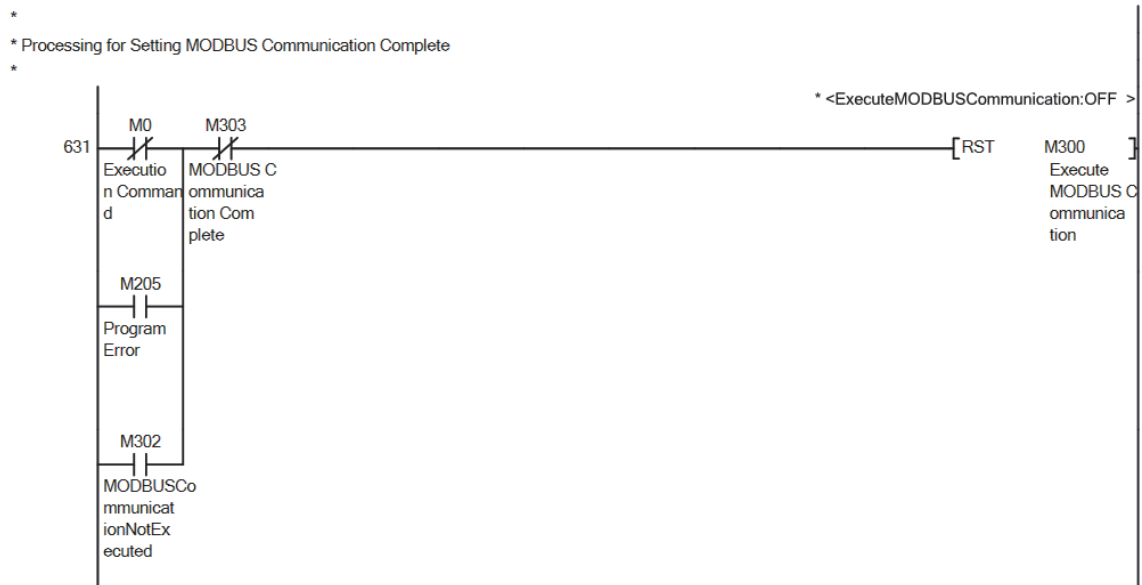
*(Operation Command Expansion bits 8 to 11)



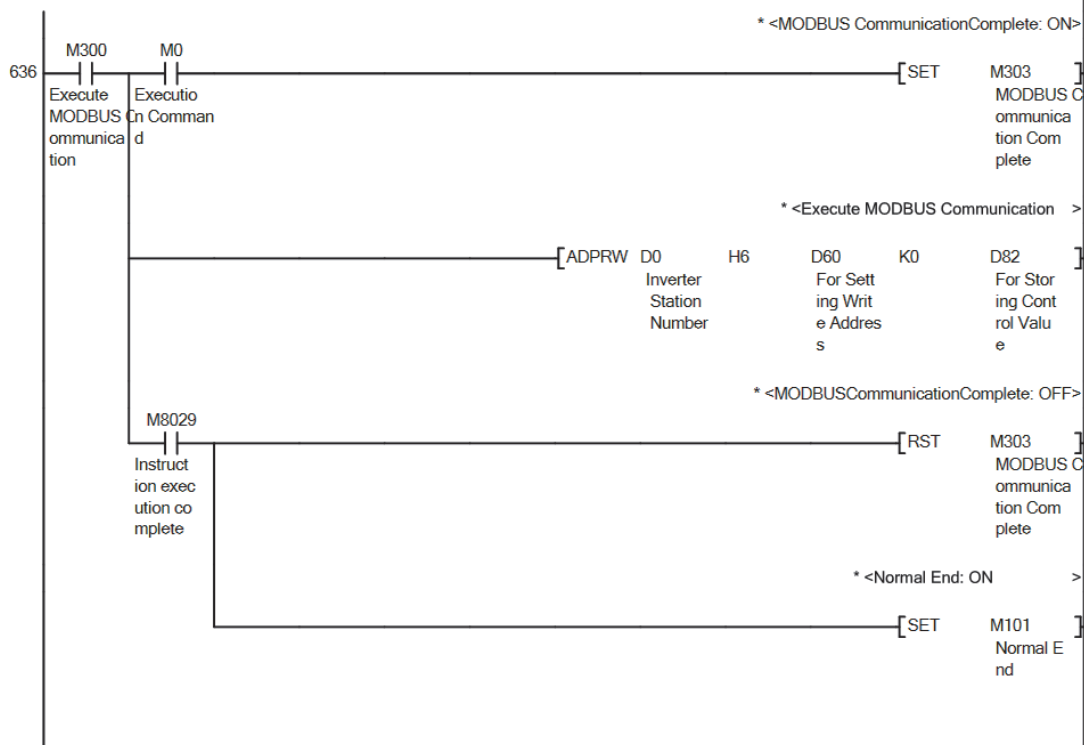
*
 * (Parameter All Clear)
 *



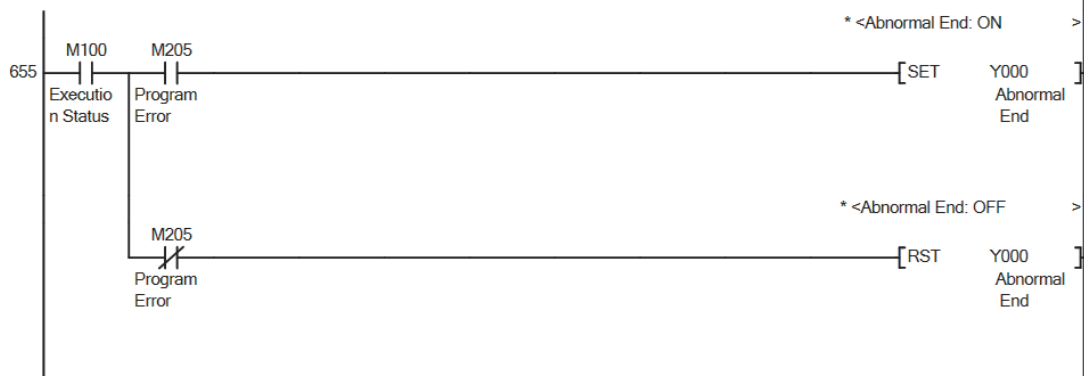


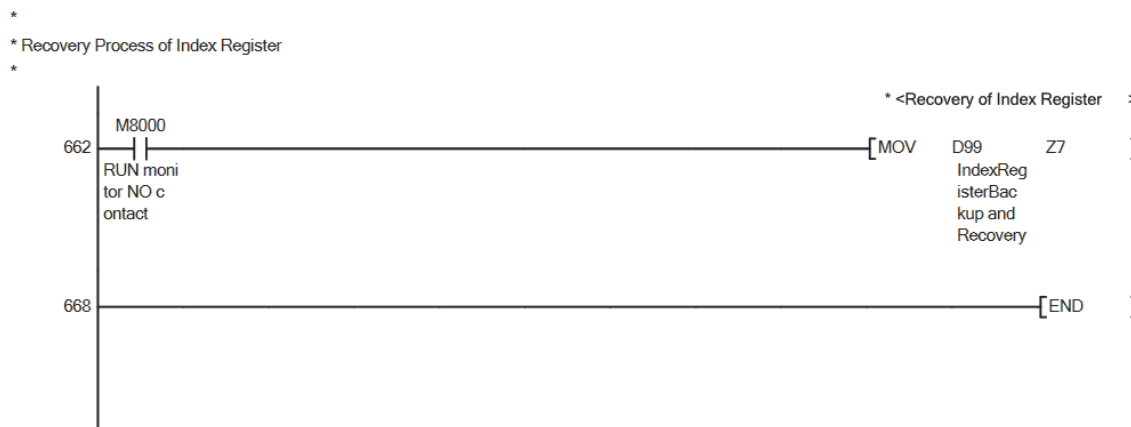


*
 * MODBUS Communication Execution Processing
 *



*
 * Abnormal End Setting Processing
 *





2. 3. Inverter parameter readout function (03_LD-FX3U_Modbus_V100A_E)

Outline of System

The inverter parameters are read out to the PLC. (Action equivalent to IVRD instruction)

■ Description of functions

- (1) When Execution command (M0) is turned on, the inverter parameters are read out to the PLC.
- (2) When the input value is incorrect, Abnormal end (Y000) will be turned on, and the processing will be suspended. The error code will be stored in Error code (D100). For the error code, see Error code (D100) of the device used.

* Supplement: Refer to the related manuals for details on the communication errors and setting parameter errors.

Programs Used

This program is intended 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_Modbus_V100A_E	Inverter parameter readout function	This project 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 inverter parameters are read out. OFF: Readout of inverter parameters is stopped.
2	D0	Word	Input	Inverter station number	The inverter station number is set. [Effective range (decimal)] 1 to 32
3	D1	Word	Input	Parameter No.	The inverter parameter number or 2nd parameter specification code is set. [Effective range (decimal)] 0 to 1999, 2902 to 2935 * For the parameters which are possible to be read out, see the manual of each inverter.

Output device

No.	Device name	Data type	Kind	Device comment	Remark
1	Y000	Bit	Output	Abnormal end	When this device is ON, it indicates that an error has occurred in the program.
2	M100	Bit	Output	Execution status	ON: Execution command ON OFF: Execution command OFF
3	M101	Bit	Output	Normal end	When this device is ON, it indicates that processing has finished.
4	D100	Word	Output	Error code	The error codes caused in the program are stored. [Error code (DEC)] 10: Inverter station number out of range 11: Parameter No. out of range
5	D101	Word	Output	Read value	Read value is stored.

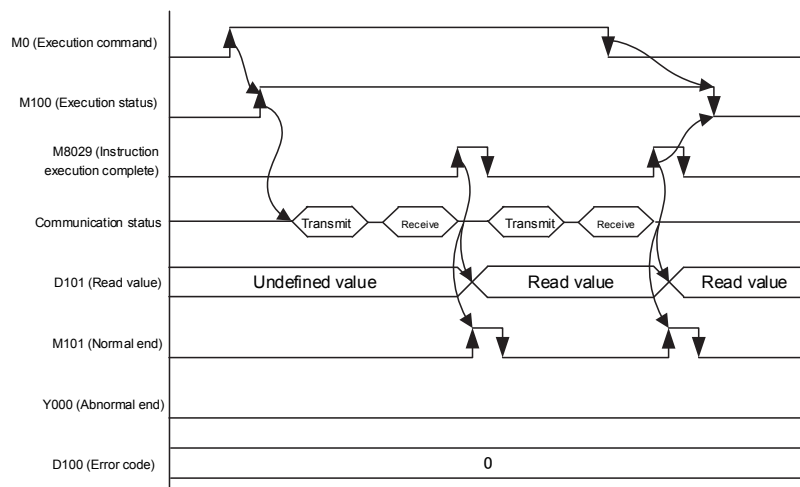
Internal device

No.	Device name	Data type	Kind	Device comment	Remark
1	M205	Bit	Internal	Program error	The program error flag is retained.
2	M300	Bit	Internal	Execute MODBUS communication	Used for processing to execute MODBUS communication
3	M303	Bit	Internal	MODBUS communication complete	Used for processing to end MODBUS communication
4	M8000	Bit	Internal	RUN monitor NO contact	Used for command to turn off Normal end
5	M8029	Bit	Internal	Instruction execution complete	Used for processing to end MODBUS communication
6	D70	Word	Internal	For setting read address	Used to set the read address

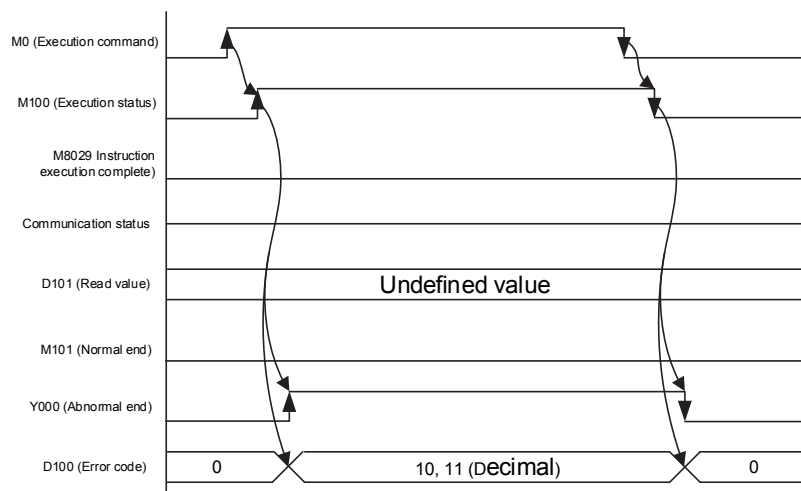
Operation of I/O signals

■ The timing chart for this program is shown below.

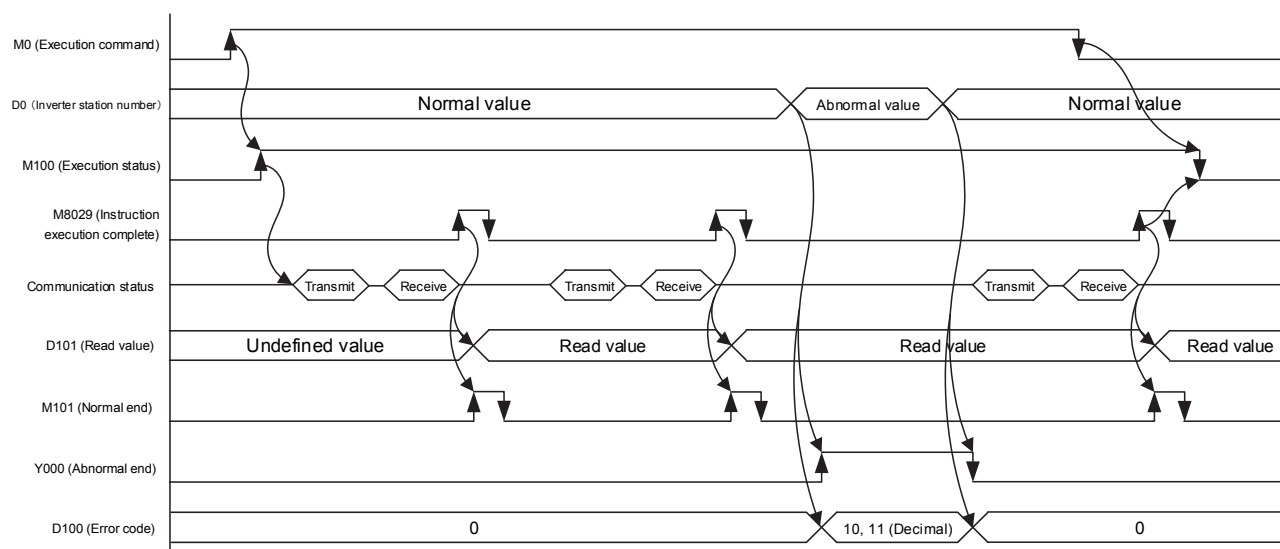
[In case of normal end]



[In case of abnormal end]



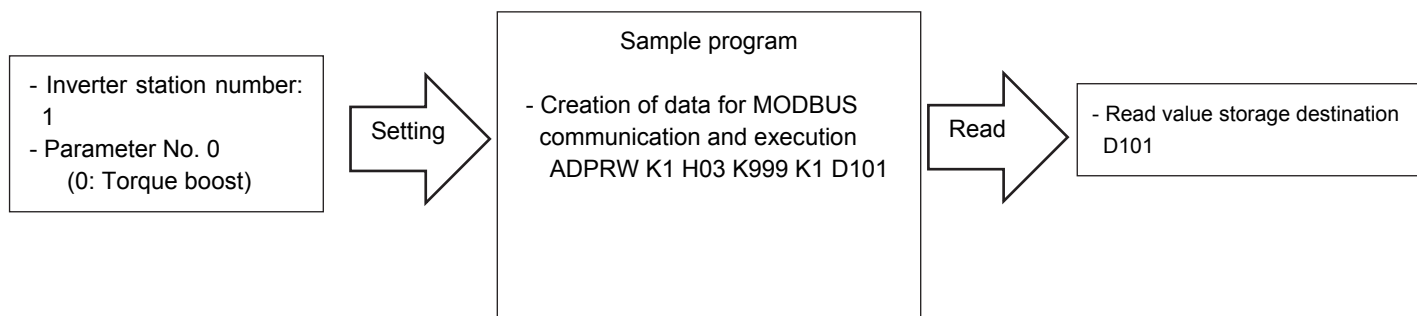
[In case of change of input value: Normal input ->Abnormal input ->Normal input]



■ The processes of this program are given below.

- (1) The input data (inverter station number and parameter number) is checked to confirm that the values are within the effective ranges, and if there is an error, the results are output to the Error code (D100).
- (2) MODBUS communication data is created from the input parameters.
- (3) MODBUS communication is executed.
- (4) The data read out from the inverter is stored in Read value (D101).
- (5) Readout is continued until the Execution command (M0) is turned off.

An example of readout of inverter parameters by this program is given below.



Data for MODBUS communication

Setting data	Description
ADPRW	MODBUS read/write instruction
K1	Station No.
H03	Function code (H03: Read holding register)
K999	Read address The address is set as stated below. - Parameter No.: 0 to 999 (except parameter Nos. 902 to 935) Read address = parameter No. + 999 - Parameter No.: 902 to 935 (the second parameter specification code) Read address = parameter No. + 999 - Parameter No.: 1000 to 1999 (except parameter Nos. 1902 to 1935) Read address = parameter No. + 3999 - Parameter No.: 1902 to 1935 (the second parameter specification code) Read address = parameter No. + 189 - Parameter No.: 2902 to 2935 (the second parameter specification code) Read address = parameter No. + 999
K1	Read quantity
D101	Destination device

■ The second parameter specification codes

When readout is executed from the parameters in a diagram below, input the second parameter specification code on Parameter Number.

Parameter Number	Parameter name	Second parameter specification code	MODBUS register	Read address	Remarks
902	Terminal 2 frequency setting bias (Frequency)	902	41902	1901	–
	Terminal 2 frequency setting bias (Analog value)	1902	42092	2091	–
	Terminal 2 frequency setting bias (Terminal analog value)	2902	43902	3901	–

Parameter Number	Parameter name	Second parameter specification code	MODBUS register	Read address	Remarks
903	Terminal 2 frequency setting gain (Frequency)	903	41903	1902	—
	Terminal 2 frequency setting gain (Analog value)	1903	42093	2092	—
	Terminal 2 frequency setting gain (Terminal analog value)	2903	43903	3902	—
904	Terminal 4 frequency setting bias (Frequency)	904	41904	1903	—
	Terminal 4 frequency setting bias (Analog value)	1904	42094	2093	—
	Terminal 4 frequency setting bias (Terminal analog value)	2904	43904	3903	—
905	Terminal 4 frequency setting gain (Frequency)	905	41905	1904	—
	Terminal 4 frequency setting gain (Analog value)	1905	42095	2094	—
	Terminal 4 frequency setting gain (Terminal analog value)	2905	43905	3904	—
917	Bias frequency (speed) for terminal No. 1	917	41917	1916	—
	Bias (speed) for terminal No. 1	1917	42107	2106	—
	Bias (speed) for terminal No. 1 (Terminal analog value)	2917	43917	3916	—
918	Gain frequency (speed) for terminal No. 1	918	41918	1917	—
	Gain (speed) for terminal No. 1	1918	42108	2107	—
	Gain (speed) for terminal No. 1 (Terminal analog value)	2918	43918	3917	—
919	Bias command (torque/magnetic flux) for terminal No. 1	919	41919	1918	—
	Bias (torque/magnetic flux) for terminal No. 1	1919	42109	2108	—
	Bias (torque/magnetic flux) for terminal No. 1 (Terminal analog value)	2919	43919	3918	—
920	Gain command (torque/magnetic flux) for terminal No. 1	920	41920	1919	—
	Gain (torque/magnetic flux) for terminal No. 1	1920	42110	2109	—
	Gain (torque/magnetic flux) for terminal No. 1 (Terminal analog value)	2920	43920	3919	—
925	Motor temperature detection calibration (Analog input)	1925	42115	2114	—
	Motor temperature detection calibration (Analog input) (Terminal analog value)	2925	43925	3924	—
926	Bias frequency (speed) for terminal No. 6	926	41926	1925	—
	Bias (speed) for terminal No. 6	1926	42116	2115	—
	Bias (speed) for terminal No. 6 (Terminal analog value)	2926	43926	3925	—
927	Gain frequency (speed) for terminal No. 6	927	41927	1926	—
	Gain (speed) for terminal No. 6	1927	42117	2116	—
	Gain (speed) for terminal No. 6 (Terminal analog value)	2927	43927	3926	—

Parameter Number	Parameter name	Second parameter specification code	MODBUS register	Read address	Remarks
928	Bias command (torque/magnetic flux) for terminal No. 6	928	41928	1927	–
	Bias (torque/magnetic flux) for terminal No. 6	1928	42118	2117	–
	Bias (torque/magnetic flux) for terminal No. 6 (Terminal analog value)	2928	43928	3927	–
929	Gain command (torque/magnetic flux) for terminal No. 6	929	41929	1928	–
	Gain (torque/magnetic flux) for terminal No. 6	1929	42119	2118	–
	Gain (torque/magnetic flux) for terminal No. 6 (Terminal analog value)	2929	43929	3928	–
930	Current output bias signal	930	41930	1929	Parameter Nos. 930 and 931 are not usable for FM type. (They are usable only for CA type.)
	Current output bias current	1930	42120	2119	
931	Current output gain signal	931	41931	1930	
	Current output gain current	1931	42121	2120	
932	Bias command (torque/magnetic flux) for terminal No. 4	932	41932	1931	–
	Bias (torque/magnetic flux) for terminal No. 4	1932	42122	2121	–
	Bias (torque/magnetic flux) for terminal No. 4 (Terminal analog value)	2932	43932	3931	–
933	Gain command (torque/magnetic flux) for terminal No. 4	933	41933	1932	–
	Gain (torque/magnetic flux) for terminal No. 4	1933	42123	2122	–
	Gain (torque/magnetic flux) for terminal No. 4 (Terminal analog value)	2933	43933	3932	–
934	PID display bias coefficient	934	41934	1933	–
	PID display bias analog value	1934	42124	2123	–
	PID display bias analog value (Terminal analog value)	2934	43934	3933	–
935	PID display gain coefficient	935	41935	1934	–
	PID display gain analog value	1935	42125	2124	–
	PID display gain analog value (Terminal analog value)	2935	43935	3934	–

Version upgrade history

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

Program

* Sample Ladder Name: 03_LD-FX3U_Modbus_V100A_E

* Function: Inverter Parameter Read Function

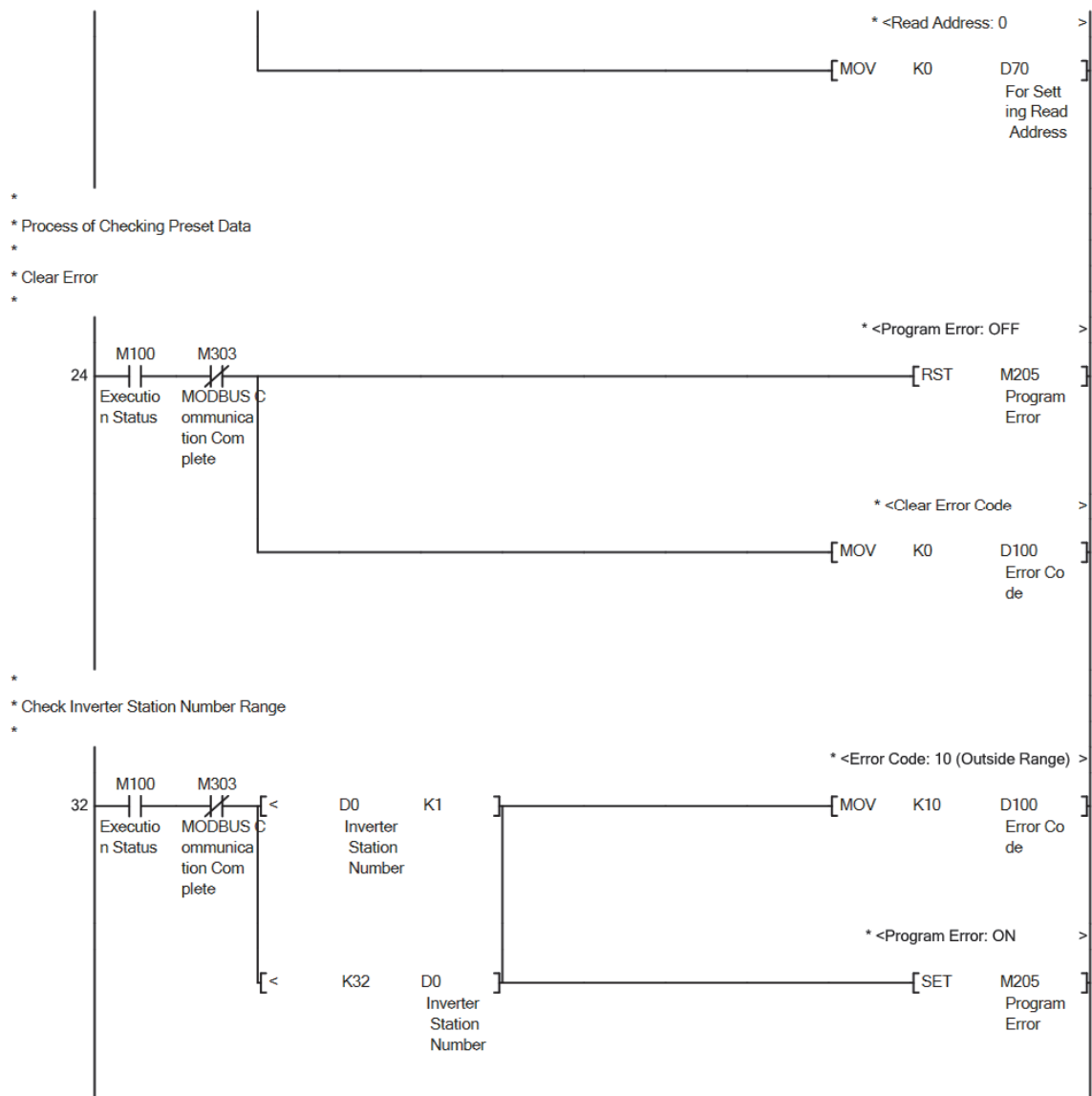
* Version: Ver.1.00A

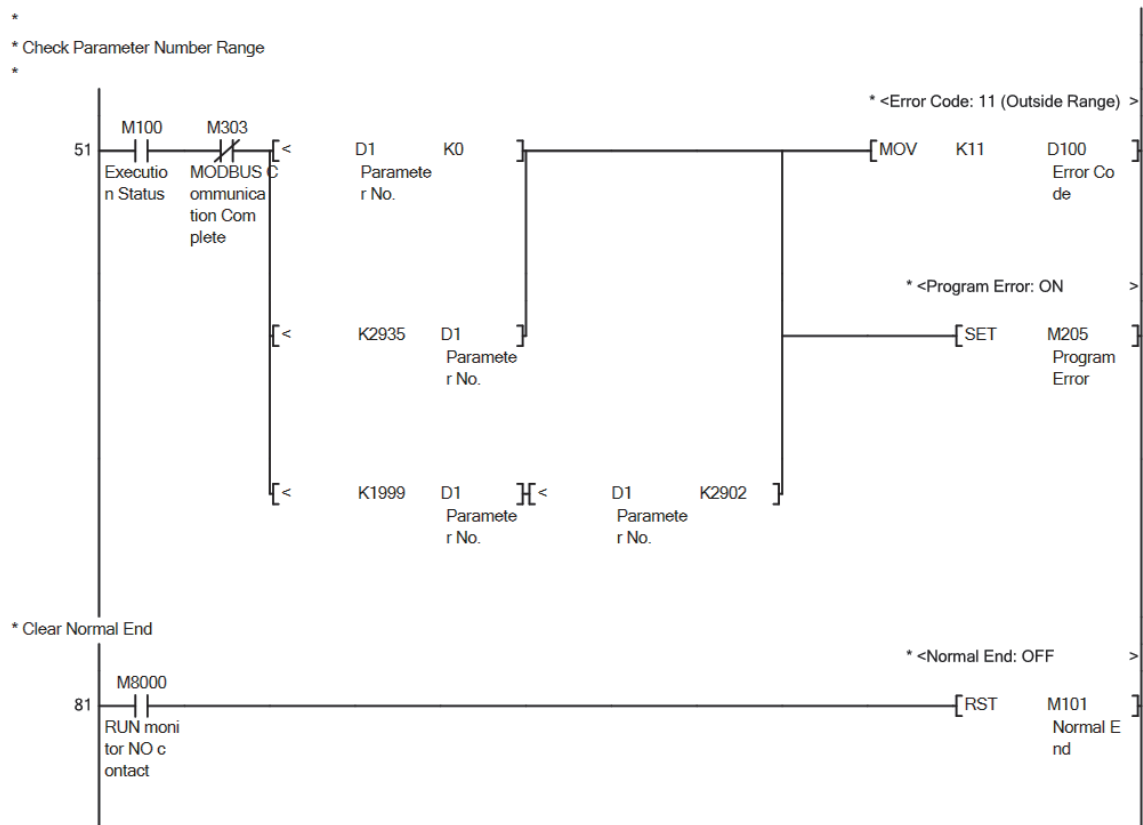
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* Process of Executing Program

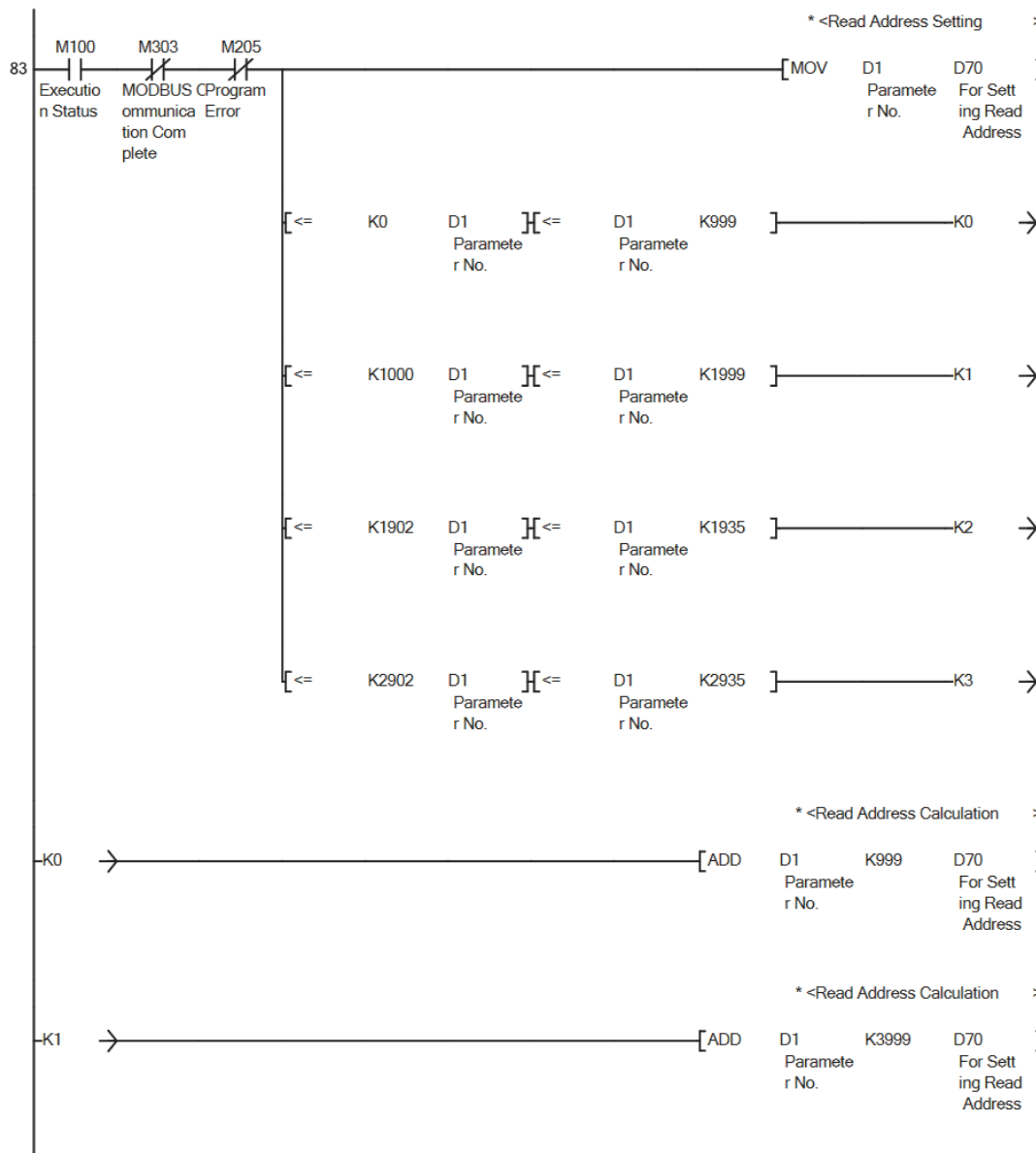
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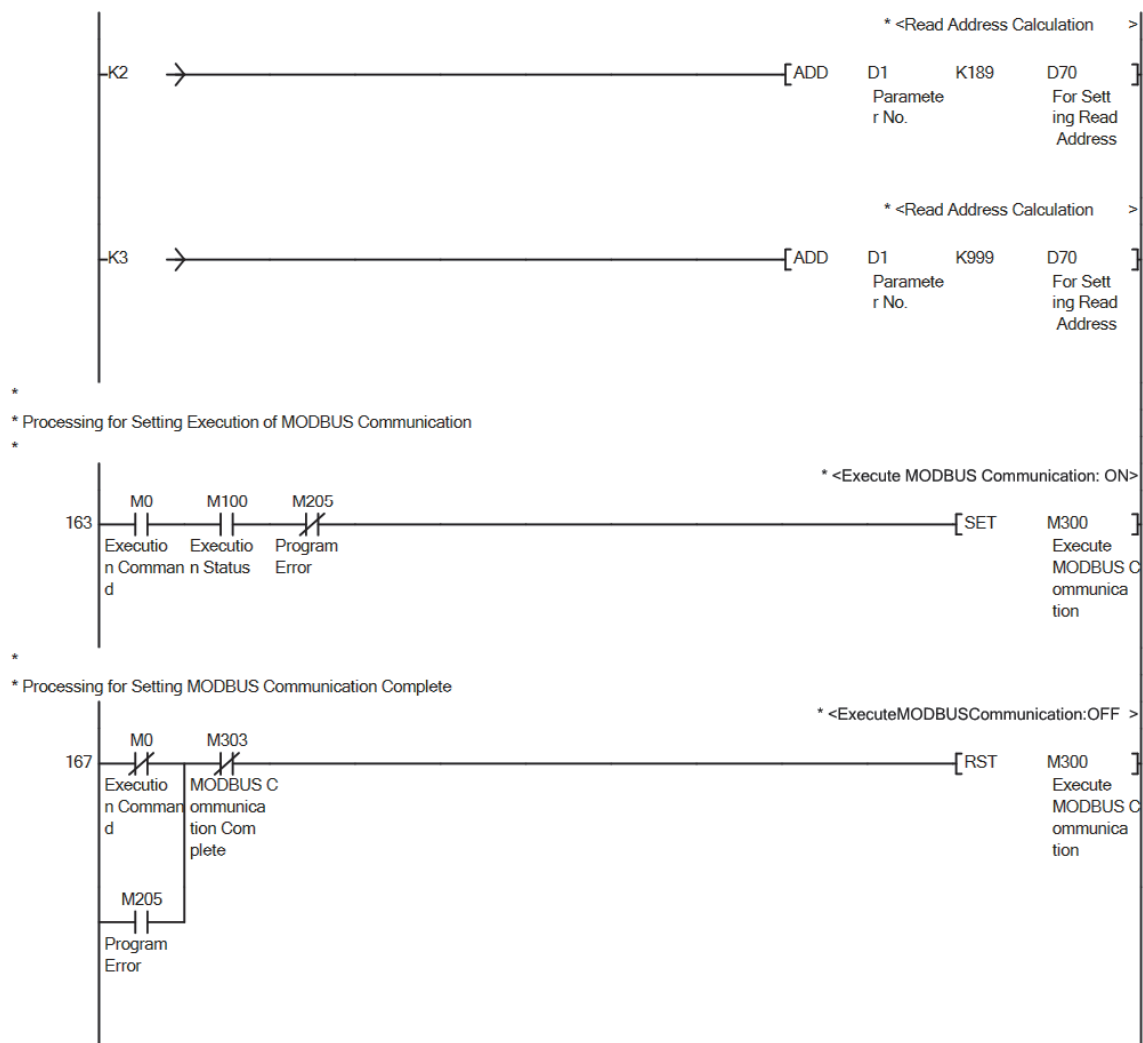


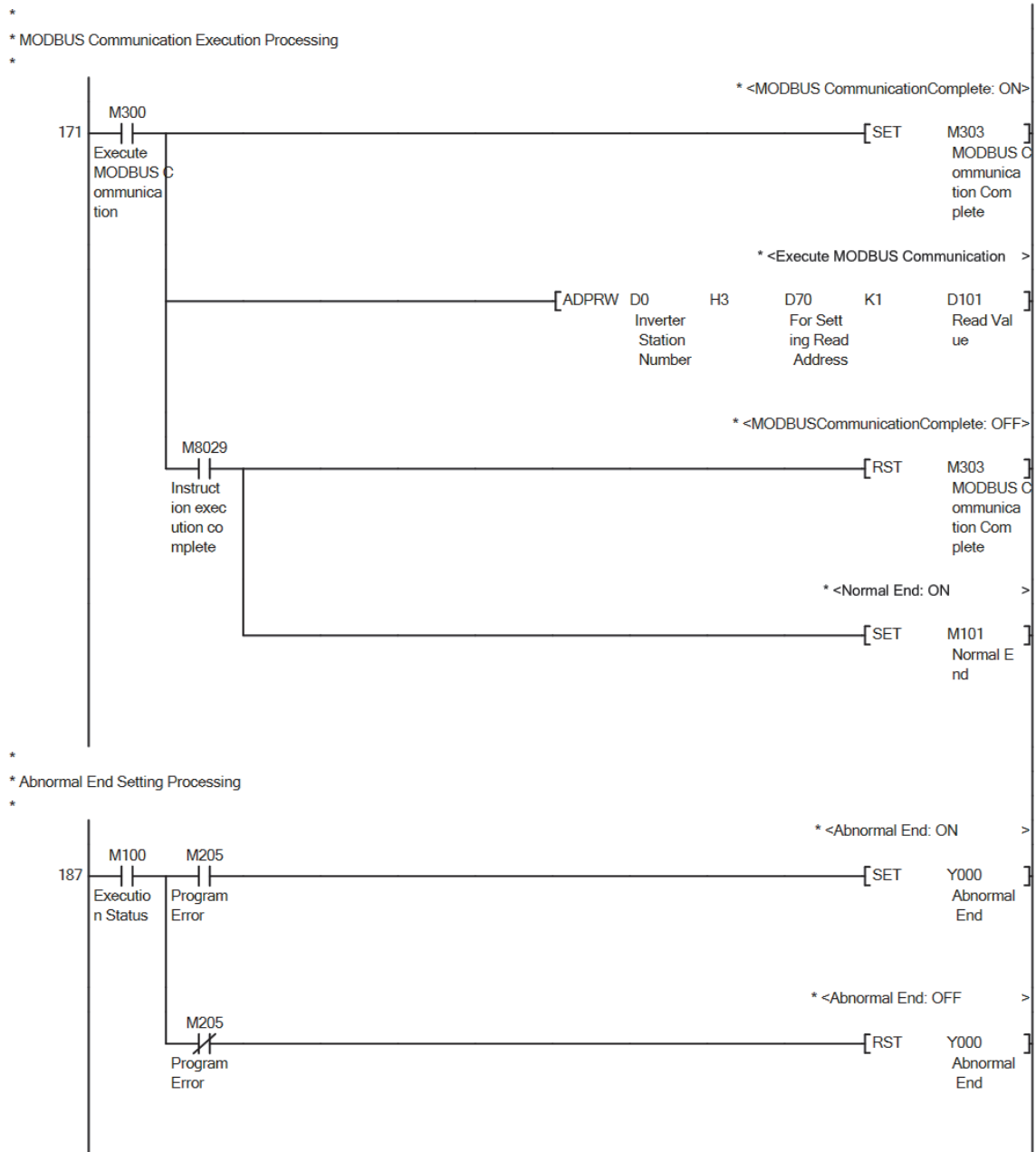




*
 * Processing for Creating MODBUS Communication Data
 *









2. 4. Inverter parameter write function (04_LD-FX3U_Modbus_V100A_E)

Outline of System

The inverter parameter values are written from the PLC. (Action equivalent to IVWR instruction)

■ Description of functions

- (1) When the execution command (M0) is turned on, the inverter parameter values are written.
- (2) When the input value is incorrect, Abnormal end (Y000) will be turned on, and the processing will be suspended. The error code will be stored in Error code (D100). For the error code, see Error code (D100) of the device used.

* Supplement: Refer to the related manuals for details on the communication errors and setting parameter errors.

Programs Used

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

The projects used in this program are indicated below.

No.	Project name	Function name	Remark
1	04_LD-FX3U_Modbus_V100A_E	Inverter parameter write function	This project is created with FX3U/FX3UC. When using with a model other than the provided project, change the PLC type using the engineering tool.

Applicable devices

The devices to be used in this program are shown below.

Input device

No.	Device name	Data type	Kind	Device comment	Remark
1	M0	Bit	Input	Execution command	ON: The inverter parameters are written. OFF: Writing of the inverter parameters is stopped.
2	D0	Word	Input	Inverter station number	The inverter station number is set. [Effective range (decimal)] 1 to 32
3	D1	Word	Input	Parameter No.	The inverter parameter number or 2nd parameter specification code is set. [Effective range (decimal)] 0 to 1999 * For the parameters which are possible to be written, see the manual of each inverter.
4	D2	Word	Input	Written value	The written value is set. * The effective range varies depending on the parameter.

Output device

No.	Device name	Data type	Kind	Device comment	Remark
1	Y000	Bit	Output	Abnormal end	When this device is ON, it indicates that an error has occurred in the program.
2	M100	Bit	Output	Execution status	ON: Execution command ON OFF: Execution command OFF
3	M101	Bit	Output	Normal end	When this device is ON, it indicates that processing has finished.
4	D100	Word	Output	Error code	The error codes caused in the program are stored. [Error code (DEC)] 10: Inverter station number out of range 11: Parameter No. out of range

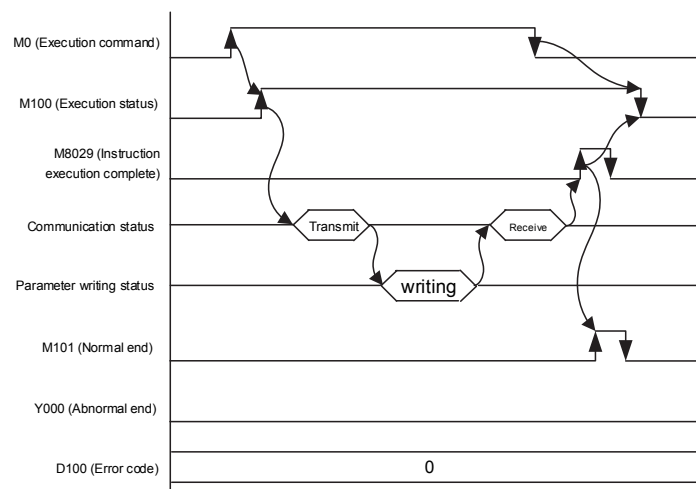
Internal device

No.	Device name	Data type	Kind	Device comment	Remark
1	M205	Bit	Internal	Program error	The program error flag is retained.
2	M300	Bit	Internal	Execute MODBUS communication	Used for processing to execute MODBUS communication
3	M303	Bit	Internal	MODBUS communication complete	Used for processing to end MODBUS communication
4	M8000	Bit	Internal	RUN monitor NO contact	Used for command to turn off Normal end
5	M8029	Bit	Internal	Instruction execution complete	Used for processing to end MODBUS communication
6	D60	Word	Internal	For setting write address	Used to set the write address

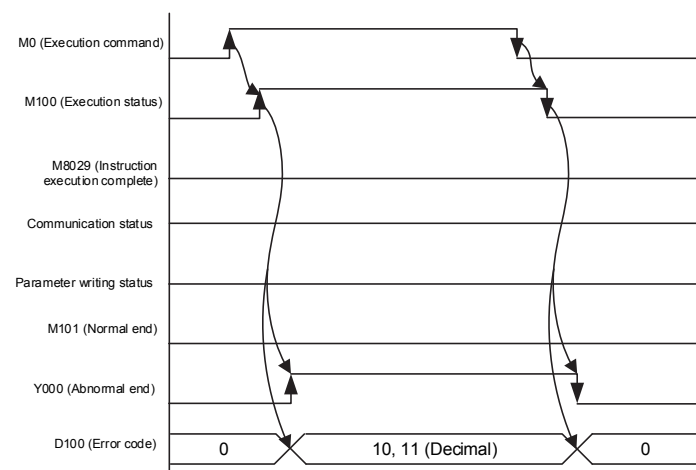
Operation of I/O signals

■ The timing chart for this program is shown below.

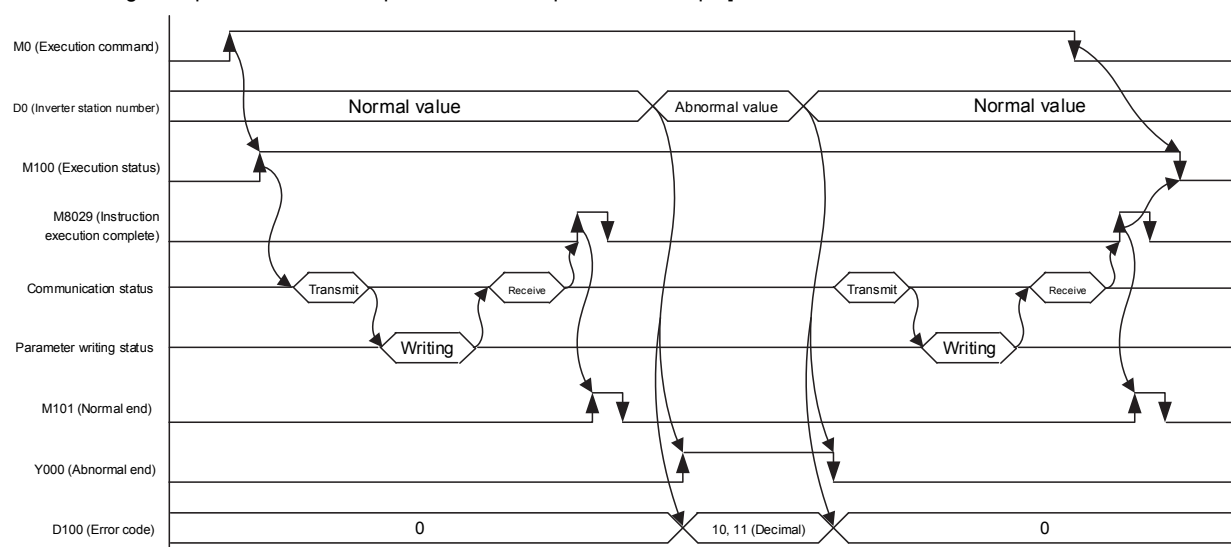
[In case of normal end]



[In case of abnormal end]



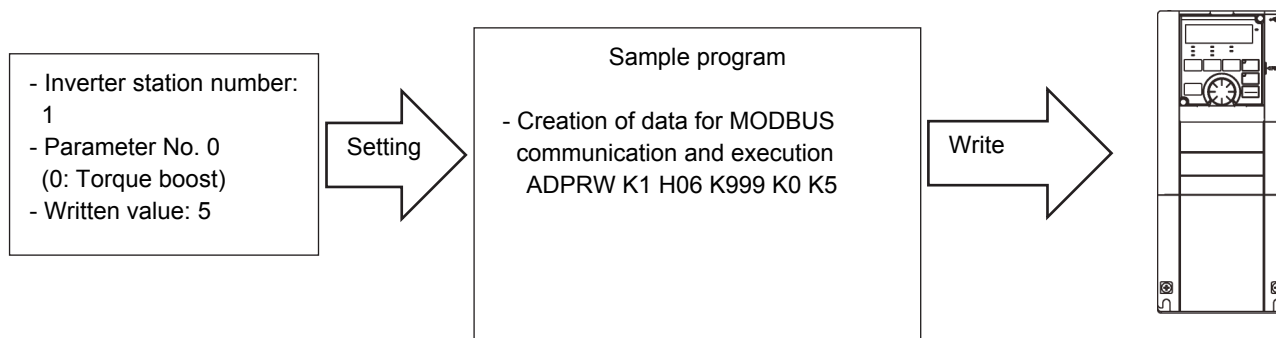
[In case of change of input value: Normal input ->Abnormal input ->Normal input]



■ The processes of this program are given below.

- (1) The input data (inverter station number and parameter number) is checked to confirm that the values are within the effective ranges, and if there is an error, the results are output to the Error code (D100). The effective range of the written value can be checked during communication error detection. Therefore, this program does not check for the effective range.
- (2) MODBUS communication data is created from the input parameter number.
- (3) MODBUS communication is executed and the written value is written to the inverter.
- (4) Writing is continued until the Execution command (M0) is turned off.

An example of writing of inverter parameters by this program is given below.



Data for MODBUS communication

Setting data	Description
ADPRW	MODBUS read/write instruction
K1	Station No.
H06	Function code (H06: Write single register)
K999	Write address The address is set as stated below. - Parameter No.: 0 to 999 (except parameter Nos. 902 to 935) Write address = parameter No. + 999 - Parameter No.: 902 to 935 (the second parameter specification code) Write address = parameter No. + 999 - Parameter No.: 1000 to 1999 (except parameter Nos. 1902 to 1935) Write address = parameter No. + 3999 - Parameter No.: 1902 to 1935 (the second parameter specification code) Write address = parameter No. + 189
K0	(Fixed)
K5	MODBUS written value

■ The second parameter specification codes

When writing to the parameters in a diagram below, input the second parameter specification code on Parameter Number.

Parameter Number	Parameter name	Second parameter specification code	MODBUS register	Write address	Remarks
902	Terminal 2 frequency setting bias (Frequency)	902	41902	1901	—
	Terminal 2 frequency setting bias (Analog value)	1902	42092	2091	—
903	Terminal 2 frequency setting gain (Frequency)	903	41903	1902	—
	Terminal 2 frequency setting gain (Analog value)	1903	42093	2092	—

Parameter Number	Parameter name	Second parameter specification code	MODBUS register	Write address	Remarks
904	Terminal 4 frequency setting bias (Frequency)	904	41904	1903	–
	Terminal 4 frequency setting bias (Analog value)	1904	42094	2093	–
905	Terminal 4 frequency setting gain (Frequency)	905	41905	1904	–
	Terminal 4 frequency setting gain (Analog value)	1905	42095	2094	–
917	Bias frequency (speed) for terminal No. 1	917	41917	1916	–
	Bias (speed) for terminal No. 1	1917	42107	2106	–
918	Gain frequency (speed) for terminal No. 1	918	41918	1917	–
	Gain (speed) for terminal No. 1	1918	42108	2107	–
919	Bias command (torque/magnetic flux) for terminal No. 1	919	41919	1918	–
	Bias (torque/magnetic flux) for terminal No. 1	1919	42109	2108	–
920	Gain command (torque/magnetic flux) for terminal No. 1	920	41920	1919	–
	Gain (torque/magnetic flux) for terminal No. 1	1920	42110	2109	–
925	Motor temperature detection calibration (Analog input)	1925	42115	2114	–
926	Bias frequency (speed) for terminal No. 6	926	41926	1925	–
	Bias (speed) for terminal No. 6	1926	42116	2115	–
927	Gain frequency (speed) for terminal No. 6	927	41927	1926	–
	Gain (speed) for terminal No. 6	1927	42117	2116	–
928	Bias command (torque/magnetic flux) for terminal No. 6	928	41928	1927	–
	Bias (torque/magnetic flux) for terminal No. 6	1928	42118	2117	–
929	Gain command (torque/magnetic flux) for terminal No. 6	929	41929	1928	–
	Gain (torque/magnetic flux) for terminal No. 6	1929	42119	2118	–
930	Current output bias signal	930	41930	1929	Parameter Nos. 930 and 931 are not usable for FM type. (They are usable only for CA type.)
	Current output bias current	1930	42120	2119	
931	Current output gain signal	931	41931	1930	
	Current output gain current	1931	42121	2120	
932	Bias command (torque/magnetic flux) for terminal No. 4	932	41932	1931	–
	Bias (torque/magnetic flux) for terminal No. 4	1932	42122	2121	–
933	Gain command (torque/magnetic flux) for terminal No. 4	933	41933	1932	–
	Gain (torque/magnetic flux) for terminal No. 4	1933	42123	2122	–
934	PID display bias coefficient	934	41934	1933	–
	PID display bias analog value	1934	42124	2123	–
935	PID display gain coefficient	935	41935	1934	–
	PID display gain analog value	1935	42125	2124	–

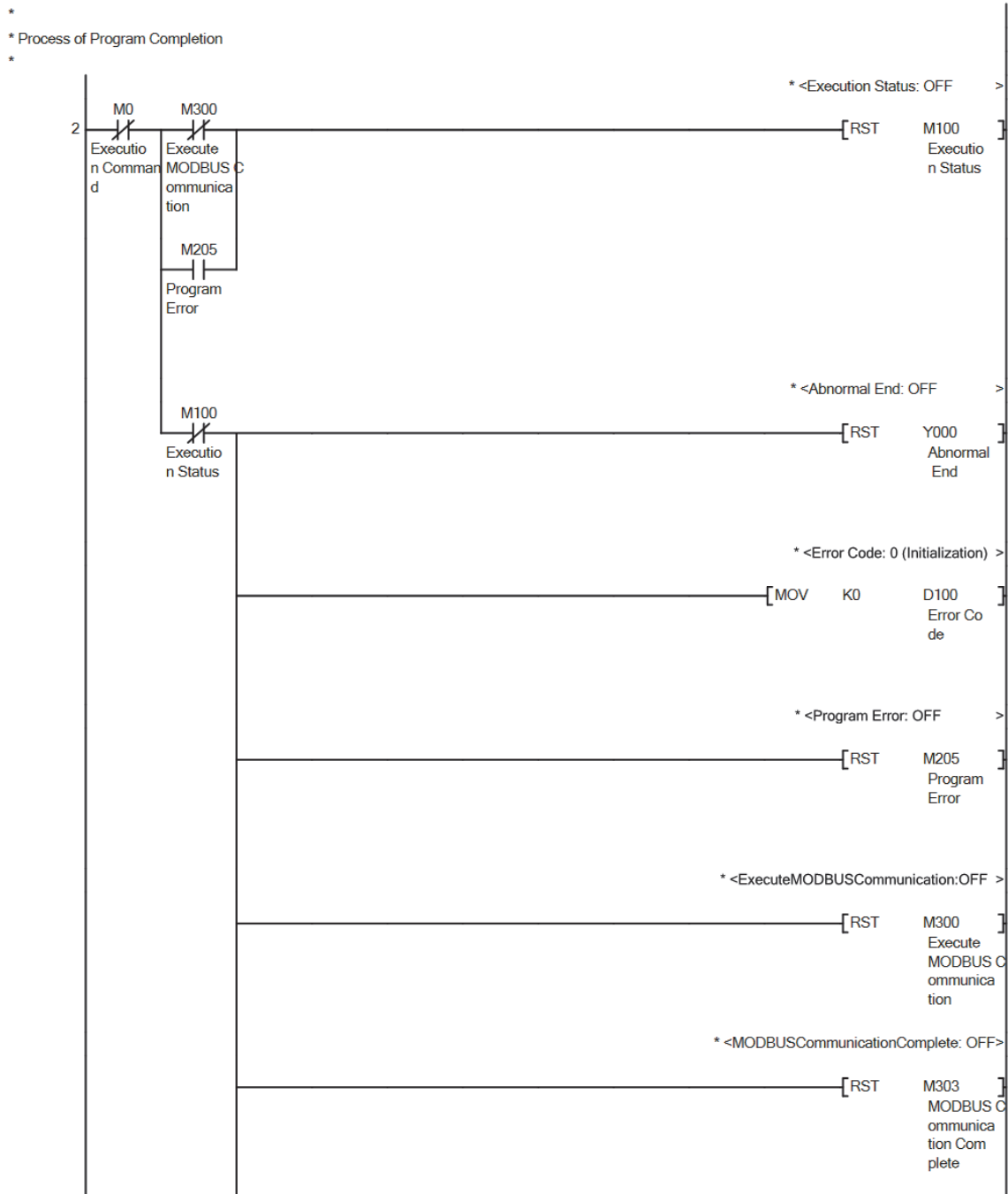
Version upgrade history

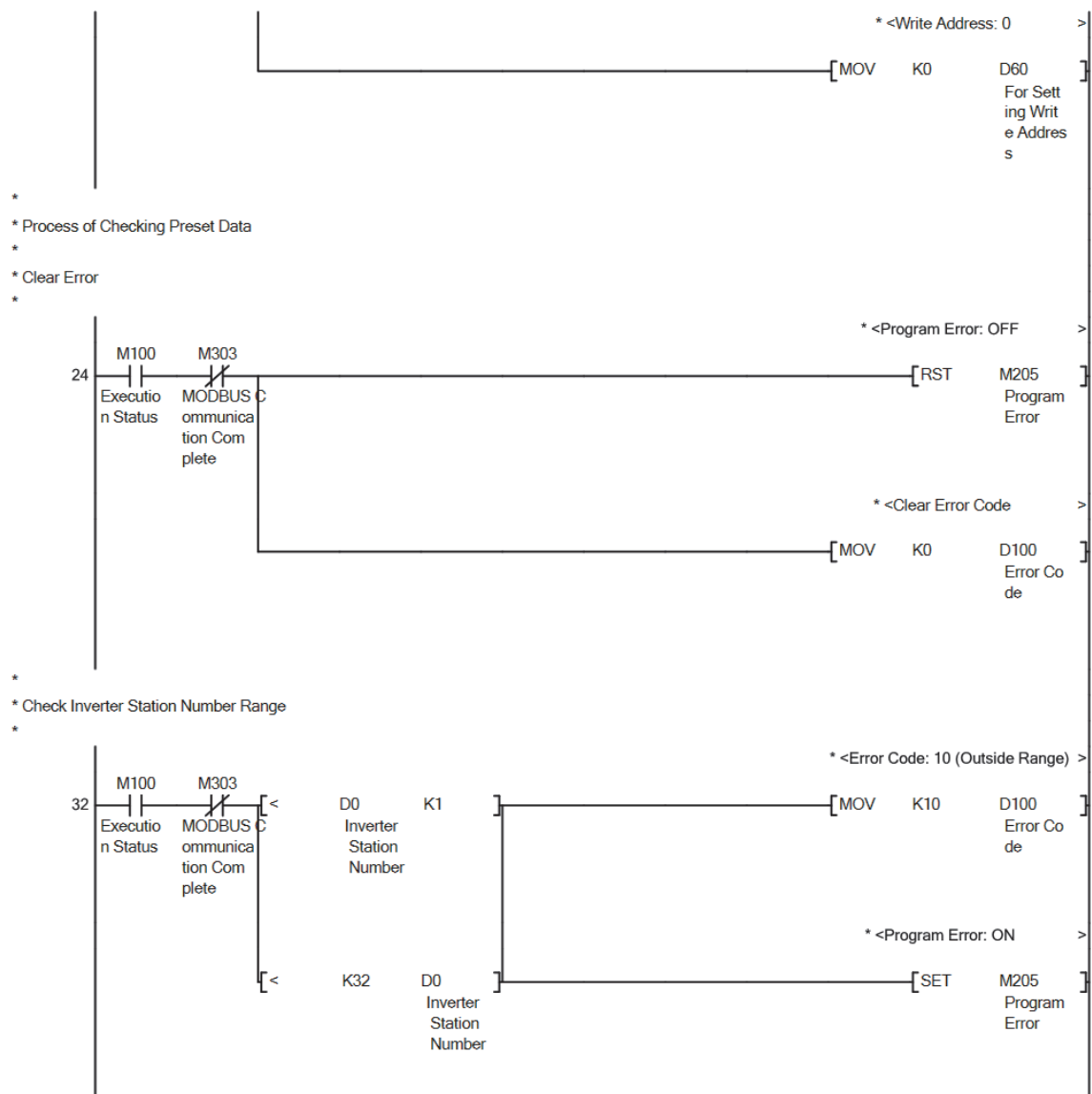
Version	Date	Description
Ver. 1.00A	November, 2016	First Edition

Program

* Sample Ladder Name: 04_LD-FX3U_Modbus_V100A_E
* Function: Inverter Parameter Write Function
* Version: Ver.1.00A
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* Process of Executing Program
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 * Processing for Creating MODBUS Communication Data
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