

# MELSEC-F FX3 Series Inverter Control Sample Ladder Reference Manual

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## Reference Manual Revision History

Reference No.	Manual	Date of Revision	Details of Revision
JY997D71201A		October, 2016	Newly Prepared

1. Outline

Outline of sample ladder

This program is sample ladder for a system that controls FX3 Series and FREQROL-700 Series by inverter communication instruction.

Applicable devices

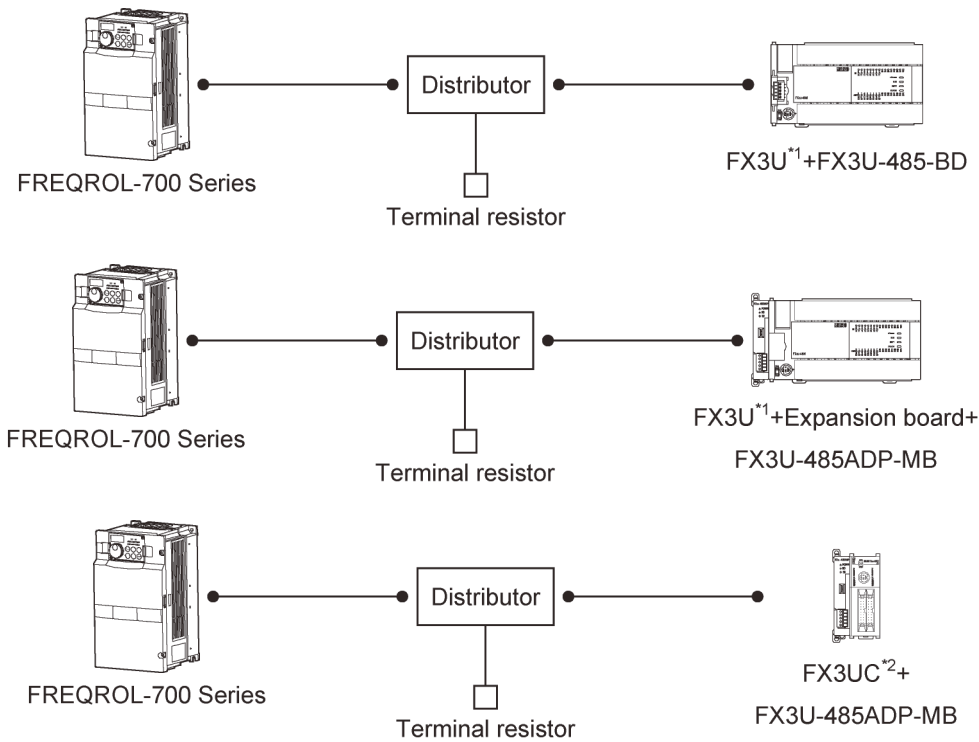
The applicable devices for this sample ladder are indicated below.

Model	Description		
Main unit			
	Series	Model	
	MELSEC-F Series	FX3S, FX3G, FX3GC, FX3U and 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

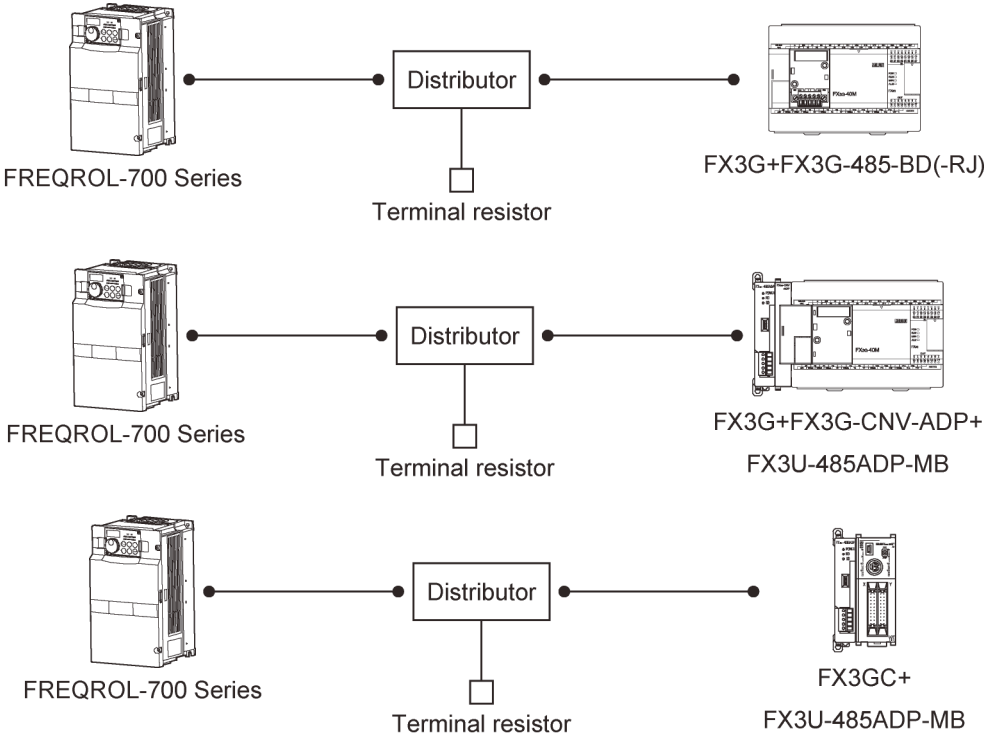
The configuration of a system using this sample ladder is shown below.

- FX3U(C)

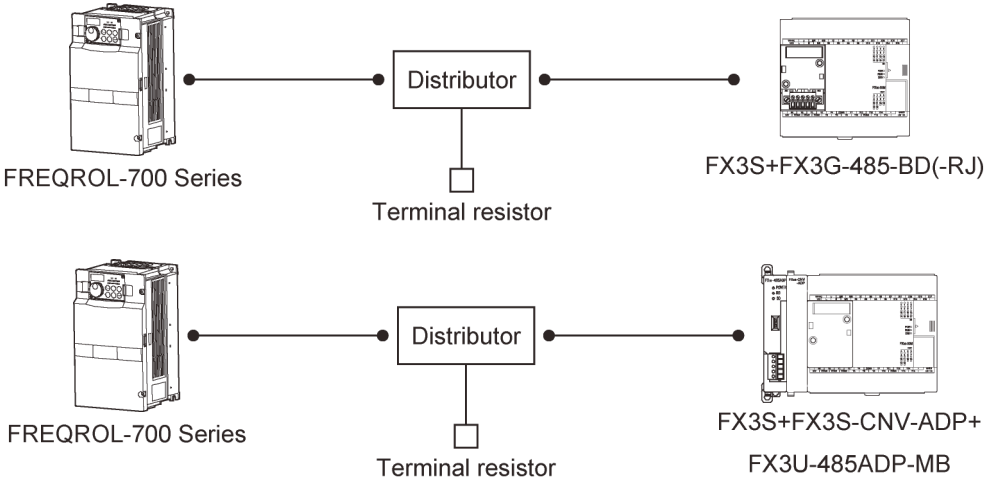


\*1: Including FX3UC-32MT-LT(-2)  
\*2: Excluding FX3UC-32MT-LT(-2)

• FX3G(C)



• FX3S



Description of sample ladder function

The following functions are realized with this program.

No.	Project name	Description	Version
1	01_LD-FX3U_InvCom_V100A_E	Controls the devices with inverter communication.	Ver. 1.00A

## Prerequisites for using sample ladder

### ■ Serial communication setting

To communicate with the inverter, open the Serial Communication Setting screen and complete the settings with the following method.

#### ● For GX Works2

- (1) Double-click [Parameter] -> [PLC Parameter] on the Navigation window Project View.
- (2) Click <<PLC System(2)>> on the dialog box.

FX Parameter

Memory Capacity | Device | PLC Name | PLC System(1) | **PLC System(2)** | Special Function Block | Positioning | Ethernet Port

CH1

The setting contents are cleared when unchecked.  
(When communicate with GX Works2, GOT, etc. by PLC using optional board for FX etc., the D8120 special register of PLC must be 0 cleared, and must be unchecked.)

☒ Operate Communication Setting

Protocol: Non-Procedural

Data Length: 7Bit

Parity: Even

Stop Bit: 1Bit

Transmission Speed: 19200 (bps)

H/W Type: RS-485

Control Mode: Invalid

☐ Sum Check

Transmission Control Procedure: Form1(Without CR,LF)

Station Number Setting: 00 H (00H-0FH)

Time Out Judge Time: 1 X 10ms (1-255)

☐ Header

☐ Terminator

Print Window... | Print Window Preview | Default | Check | End | Cancel

#### ● For GX Developer

- (1) Double-click [Parameter] -> [PLC Parameter] on the Project Data List window.
- (2) Click <<PLC System (2)>> on the dialog box.

FX parameter

Memory capacity | Device | PLC name | I/O assignment | **PLC system(1)** | **PLC system(2)** | Positioning

CH1

If the box is not checked, the parameters will be cleared.  
(When the program is transferred to the communication board, parameters and D8120 values in the PLC must be cleared upon program transfer.)

☒ Operate communication setting

Protocol: Non-procedural

Data length: 7bit

Parity: Odd

Stop bit: 1bit

Transmission speed: 9600 (bps)

H/W type: RS-485

Control mode: Invalid

☐ Sum check

Transmission control procedure: Form1(without CR,LF)

Station number setting: 00 H (00H-0FH)

Time out judge time: 1 X10ms (1-255)

☐ Header

☐ Terminator

Default | Check | End | Cancel

The parameters to be set are explained below.

Set item	Setting Content	Remarks
Communication channel	CH1	—
Protocol	Non-protocol communication	—
Data length	Set according to inverter	Refer to the Inverter side communication settings (mandatory items) for details.
Parity	Set according to inverter	Refer to the Inverter side communication settings (mandatory items) for details.
Stop bit	Set according to inverter	Refer to the Inverter side communication settings (mandatory items) for details.
Transmission Speed	Set according to inverter	Refer to the Inverter side communication settings (mandatory items) for details.
Hardware type	RS-485	—
Transmission control procedures	Do not set	—
Station No. setting	Do not set	—
Timeout judgment time	Do not set	—

#### ■ Inverter side communication settings (mandatory items)

The parameters that must be set in the inverter (D700) are explained in this section.

When using the inverters other than D700, refer to the "FX Series User's Manual - Data Communication Edition".

Parameter number	Parameter item	Inverter Set value	Setting Content
Pr117	PU communication station number	00 to 31	Up to eight inverters can be connected.
Pr118	PU communication speed (baud rate)	48	4800 bps
		96	9600 bps
		192	19200 bps (standard)
		384	38400 bps
Pr119	PU communication stop bit length	10	Data length: 7 bits / Stop bit: 1 bit
Pr120	PU communication parity check	2	2: Even parity
Pr123	PU communication waiting time setting	9999	Set in communication data
Pr124	PU communication CR, LF selection	1	CR: Provided, LF: Not provided
Pr79	Operation mode selection	0	External operation mode is selected when power is turned ON.
Pr549	Protocol selection	0	Mitsubishi inverter (computer link) protocol
Pr340	Communication startup mode selection	1 or 10	1: Network operation mode 10: Network operation mode Operation mode can be changed between the PU operation mode and network operation mode from the operation panel.

#### ■ Wiring the inverter


Refer to the "FX Series User's Manual - Data Communication Edition" for details on wiring to D700.

## ■ Changing the PLC type

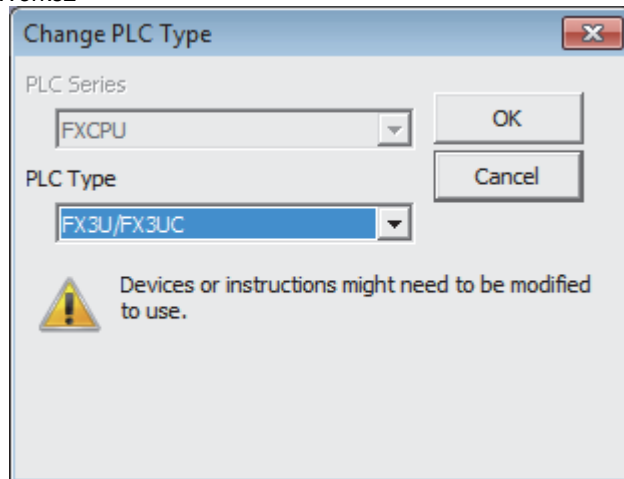
The sample ladder is provided with the model listed in the project name as shown below. When using with a model other than the provided project, change the PLC type using the engineering tool.

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

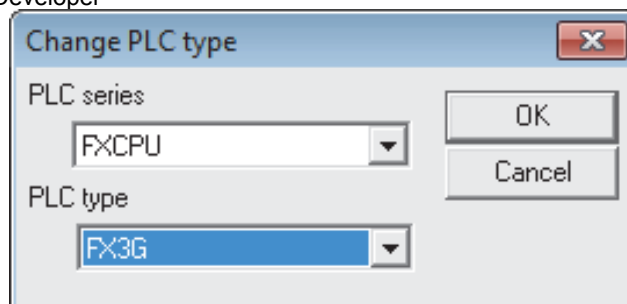
01\_LD-FX3U\_□□□\_□□□\_V100A\_E

 [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  
FREQROL-D700 Instruction Manual (Basic)  
FREQROL-D700 Instruction Manual (Applied)  
FREQROL-E700 Instruction Manual (Basic)  
FREQROL-E700 Instruction Manual (Applied)  
FREQROL-F700 Instruction Manual (Basic)  
FREQROL-F700 Instruction Manual (Applied)  
FREQROL-A700 Instruction Manual (Basic)  
FREQROL-A700 Instruction Manual (Applied)  
FX Series User's Manual - Data 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 extension devices are not covered. Always read the User's Manual for the target product before starting use.

## 2. Sample ladder

### 2. 1. Inverter Communication Function (01\_LD-FX3U\_InvCom\_V100A\_E)

#### Outline of System

Controls the devices with inverter communication.

##### ■ Description of functions

- (1) When the execution command (M0) turns ON, forward run operation starts at the set frequency.
- (2) After workpiece detection (X000) turns ON during forward run operation and movement equal to the set distance has completed, movement completed (M110) turns ON.
- (3) 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: Refer to the related manuals for details on the communication errors and setting parameter errors.

#### 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_InvCom_V100A_E	Inverter Communication Function	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	X000	Bit	Input	Workpiece detection	ON: Work detected OFF: Work not detected
2	M0	Bit	Input	Execution command	ON: Starts forward rotation. OFF: Stops forward rotation.
3	D0 --- D1	Double Word	Input	Set frequency	Sets the frequency in 0.01 Hz units. [Valid range (decimal)] 1 --- 40000
4	D2 --- D3	Double Word	Input	Movement distance	Sets the movement distance. The movement time (100 ms unit) is calculated with "movement distance"/"set frequency". The movement distance differs according to the system, and must be set according to the user's system. [Valid range (decimal)] 1 --- 2147483647

##### 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	M101	Bit	Output	Normal end	When ON, it means that the process has ended.
3	M110	Bit	Output	Movement completed	When ON, it means that movement for the set distance has completed.
4	D100	Word	Output	Error code	Stores the error code that occurred in the program. [Error code (decimal)] 10: Set frequency is out-of-range. 11: Movement distance is out-of-range. 12: The calculated movement time is not within the timer setting value range.



No.	Device name	Data type	Kind	Device comment	Remark
5	D102 --- D103	Double Word	Output	Output frequency	Stores the output frequency.

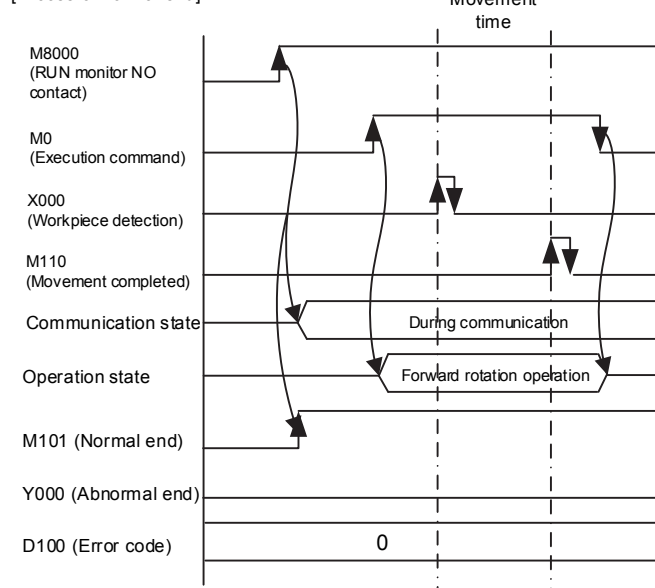
#### Internal device

No.	Device name	Data type	Kind	Device comment	Remark
1	M210 --- M217	Bit	Internal	Operation method	Sets the operation method. M210: AU (terminal 4 input selection) M211: Forward rotation command M212: Reverse rotation command M213: RL (low-speed command) M214: RM (middle-speed command) M215: RH (high-speed command) M216: RT (second function selection) M217: MRS (output stop)
2	M218	Bit	Internal	For measuring time of movement	This is used to measure the movement time.
3	M8000	Bit	Internal	RUN monitor NO contact	This is used as the control contact for executing this program.
4	D50 --- D53	Double Word	Internal	For calculating time of movement	This is used to calculate the movement time.
5	D54	Word	Internal	Time of movement	Holds the movement time.
6	T0	Timer	Internal	For measuring time of movement	This is used as the timer for measuring the movement time.

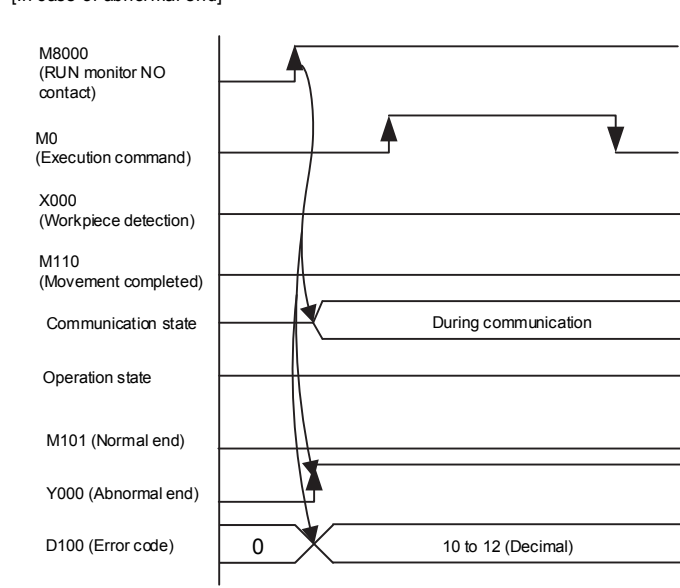
### Operation of I/O signals

- The timing chart for this program is shown below.

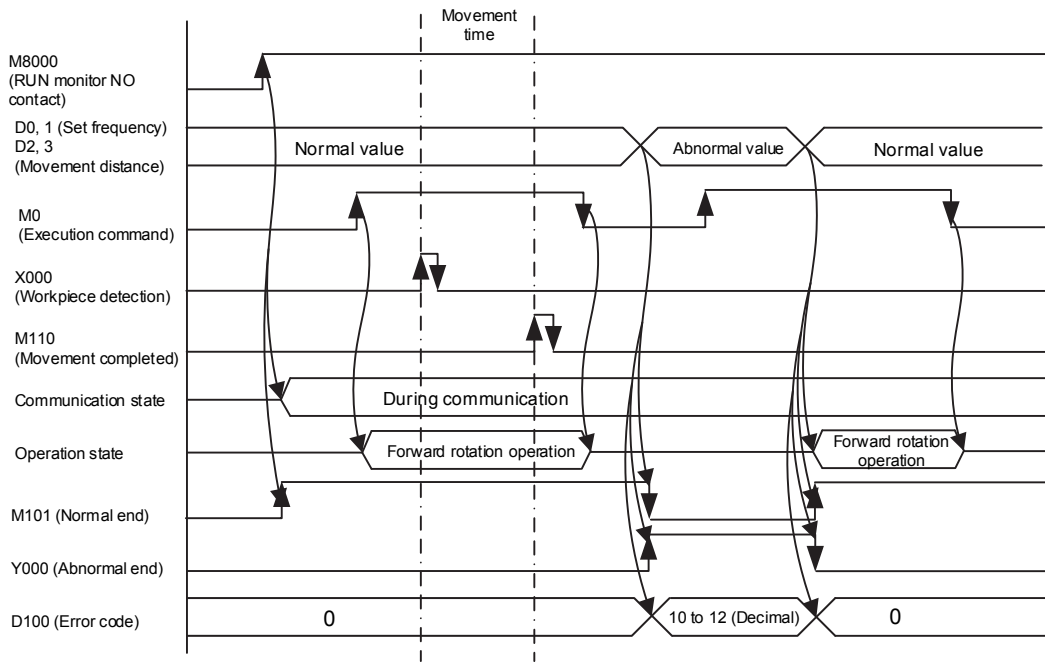
[In case of normal end]



[In case of abnormal end]



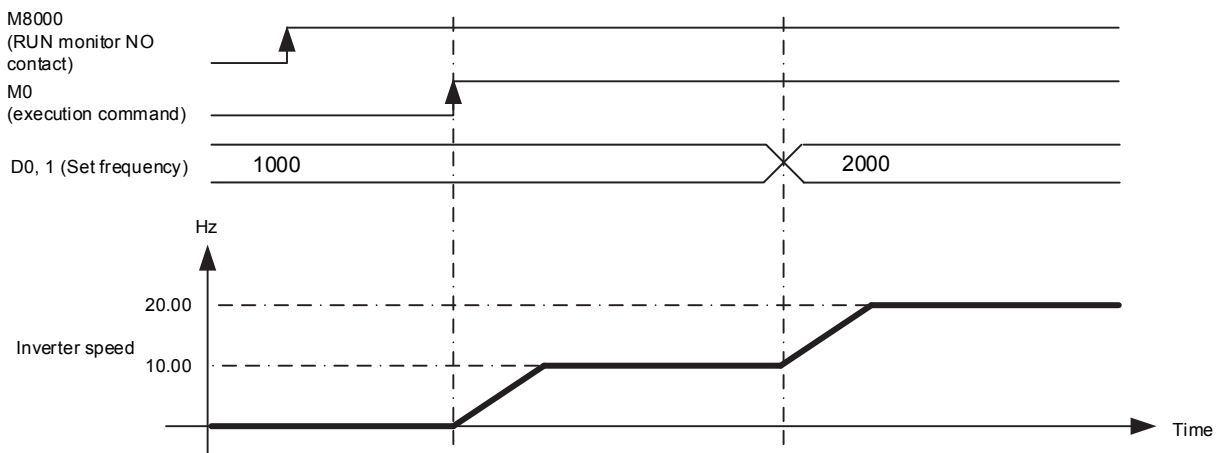
[In case of change of input value: Normal input → Abnormal input → Normal input]



■ The processes of this program are given below.

- (1) When the RUN monitor NO contact (M8000) turns ON, the input data is checked, the movement time is calculated with the set frequency and movement distance, and then checked. If there is an error, the results are output to the Error Code (D100).
- (2) The following process is executed when RUN monitor NO contact (M8000) turns ON.
  1. The output frequency is read out with inverter communication
  2. The operation instruction is set with inverter communication
    - If the input data is normal, the operation instruction corresponding to the execution command (M0) ON/OFF state is set
    - If the input data is abnormal, the stop instruction is set, and operation is stopped.
  3. When the input data is normal, the frequency is set with inverter communication
- (3) If the execution command (M0) is ON, the forward rotation instruction at the operation method turns ON, and the run execution is set. If the execution command (M0) is OFF, the forward rotation instruction at operation method turns OFF, and operation stop is set.
- (4) After workpiece detection (X000) turns On during forward run operation and movement corresponding to the set distance is completed, movement completed (M110) turns ON for only one scan.

An example of operation using inverter control executed by this program is given below.



#### \* Precautions

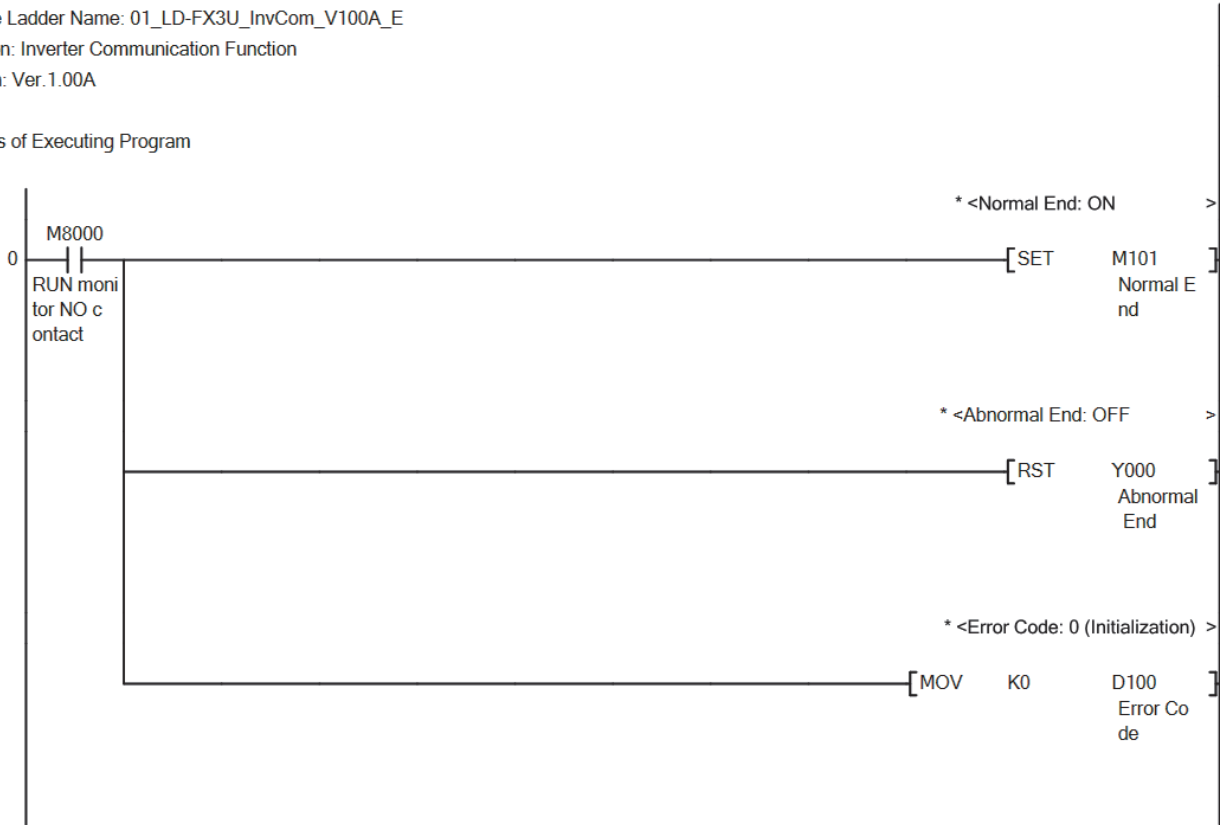
Do not change the setting value for the movement distance after workpiece detection or the inverter output frequency. Normal operation will not take place if these values are changed.

## Version upgrade history

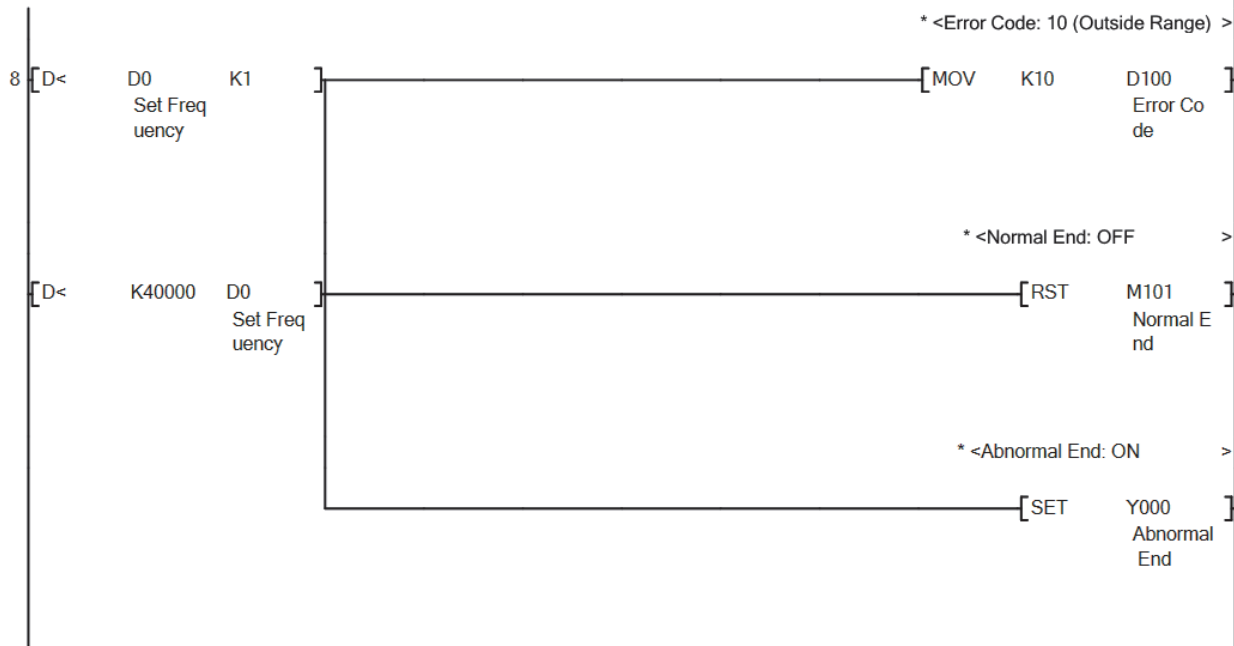
Version	Date	Description
Ver. 1.00A	October, 2016	First Edition

Program

\* Sample Ladder Name: 01\_LD-FX3U\_InvCom\_V100A\_E  
\* Function: Inverter Communication Function  
\* Version: Ver.1.00A  
\*  
\* Process of Executing Program  
\*



\*  
 \* Process of Checking Preset Data  
 \*  
 \* Confirm Frequency Range  
 \*



\*  
 \* Confirm Range of Movement Distance  
 \*

