Motionnet Starter Kit

G9001A-EV, G9002A_G9103C-EV

User's Manual

AXIS Sample Program

Impress, not just satisfy
NPM Nippon Pulse Motor Co., Ltd.

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1. Introduction

This manual describes the specifications, functions, connections, and usages of our Motionnet Starter Kit AXIS sample software (MNET-STK_AXIS_Sample.exe).

Be sure to read this manual thoroughly and keep it handy in order to use the product appropriately.

1.1 How to use this manual

1. Reproduction of this manual in whole or in part without permission is prohibited by the Copyright Act.
2. The contents of this manual are subject to change without the prior notice along with the improvement of performance and quality.
3. Although this manual is produced with the utmost care, if there are any questions, errors or omissions, please contact our sales representative.

1.2 Notice

This document aims to describe the details of functions of the product. It does not warrant fitness for a particular purpose of the customer. The examples of applications and circuit diagrams in this manual are included only for your reference. Please confirm the features and the safeties of devices or equipment before use.

1.3 Confirmation

Please do not use this product in the following conditions. If you need to use in the following conditions, please contact our sales representatives:

1. Any equipment that may require a high reliability or a safety, such as nuclear facilities, electricity or gas supply systems, transportation facilities, vehicles, various safety systems, medical equipment, etc.
2. Any equipment that may directly affect human survivals or properties.
3. Usages under conditions or circumstances that are not specified in the catalog, manual, etc.

For applications that may cause serious damages to a human life or property due to failure of this product, ensure high reliability and safety by redundant design.

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2. Information

This manual is the operation manual of AXIS sample software (MNET-STK_AXIS_Sample.exe) that operates a control board.

By using this software and Motionnet Starter Kit (G9001A-EV, G9002A_G9103C-EV), you can learn the Motionnet communication specifications as well as the motor control functions using the center device, G9001A and the local device, G9103C.

Please refer to the following manuals along with this manual.

(x: revision)

	Manual name [Outline]	Document file name	Software file name	Document No.
Hardware Manual	Motionnet Starter Kit User's Manual (Hardware)	MotionnetStarterKit _HardwareManual_VerxE.pdf	—	TA600036-ENx/x
	Motionnet Starter Kit User's Manual (Simple Manual)	MotionnetStarterKit _SimpleManual_VerxJE.pdf		TA600035-ENx/x
Application Software Manual	Motionnet Starter Kit User's Manual (Application Software) [Display of all registers]	MotionnetStarterKit _ApplicationManual_VerxE.pdf	MotionnetStartKit_Application_ VxxxJE.zip	TA600037-ENx/x
I/O Sample Software Manual	Motionnet Starter Kit I/O Sample User's Manual	Motionnet Starter Kit_IO_ SampleManual_VerxE.pdf	MotionnetStarteKit_IO_ Sample_Vxxx.zip	TA600048-ENx/x
Axis Sample Software Manual	Motionnet Starter Kit AXIS Sample User's Manual	Motionnet Starter Kit_AXIS_ SampleManual_VerxE.pdf	MotionnetStarteKit_AXIS_ Sample_Vxxx.zip	TA600049-JPx/x (This document)
Reference	G9001A/G9002A User's Manual			DA70109-4/xE
	G9103C User's Manual			DA70143-1/xE

Please download application software and related materials from NPM website.

2.1 Operating environment

We have confirmed the operation of this software with Windows 7 and Windows10 (both 32 bit and 64 bit).

(not confirmed to operate with OS other than the above.)

Change the power saving setting in your PC so as not to move to "sleep mode" during operation.

2.2 Operation mode

This software controls G9001A in 8-bit parallel bus interface mode through USB.

The center device, G9001A and the local device, G9103C are connected by a Motionnet cable to control.

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2.3 Programming language

The following software from Microsoft is used.

Microsoft Visual Studio Express 2013 for Windows Desktop (Free version)

2.4 Notes

- We cannot answer the questions regarding "Microsoft Visual C#".

- We cannot answer the questions regarding FTDI products.

- We are not responsible even if any damage may occur as a result of operating the applications created based on this sample program.

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3. Structure of sample program

3.1 Folder structure

When you unzip the compressed file (MotionnetStarteKit_AXIS_Sample_V100.zip), the following folders are generated:

```
¥MotionnetStarteKit_AXIS_Sample_V100
        ├── ¥Driver ──── CDM21226_Setup.exe
        ├── ¥MNET-STK_AXIS_Sample
        │       ├── ¥bin
        │       │     └── ¥Debug
        │       │              └── Execution file etc.
        │       │                       ⋮
        │       │                       ⋮
        │       ├── ¥Properties      (Work folder)
        │       ├── Form1.cs    (Source code)
        │       ┊              ⋮
        │       ┊              ⋮
        └── MNET-STK_AXIS_Sample.sln
```

3.2 File structure

<¥MotionnetStarteKit_AXIS_Sample_V100> folder
　　　MNET-STK_AXIS_Sample.sln　　　・・・・・　　Solution file
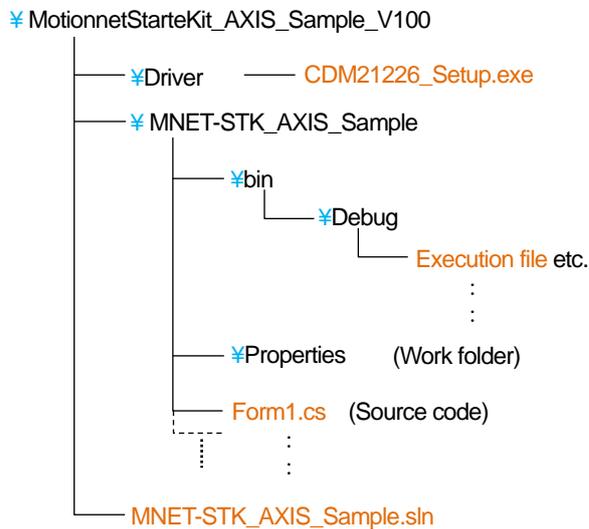
<¥MotionnetStarteKit_AXIS_Sample_V100¥Driver> folder
　　　CDM21226_Setup.exe　　　・・・・・　　Device driver installer (FTDI)

<¥MotionnetStarteKit_AXIS_Sample_V100¥MNET-STK_AXIS_Sample> folder
　　　Form1.cs　　　　　　　・・・・・　　Source code
　　　clsFTDI.cs　　　　　　・・・・・　　FTDI access function
　　　accessMNET_Axis.cs　　・・・・・　　G9001A, G9103C access function
　　　FTD2XX_NET.dll　　　　・・・・・　　FTDI library
　　　FTD2XX_NET.xml　　　　・・・・・　　FTDI XML document
　　　＊.bmp　　　　　　　　・・・・・　　Image data
　　　Others

<¥MNET-STK_AXIS_Sample¥MNET-STK_AXIS_Sample¥bin¥Debug> folder
　　　MNET-STK_AXIS_Sample.exe　　　・・・・・　　Execution file
　　　FTD2XX_NET.dll　　　　・・・・・　　FTDI library (Required at execution)
　　　FTD2XX_NET.xml　　　　・・・・・　　FTDI　XML document (No need for execution)
　　　Others　　　　　　　　・・・・・　　Work file etc. (No need for execution)

Even if "Microsoft Visual C #" is not installed, the AXIS sample program starts by executing MNET-STK_AXIS_Sample.exe (executable file).

3.3 Install the device driver

Double-click "CDM21226_Setup.exe" to launch the installer and follow the instructions on the screen to complete the installation.

If you have already installed it, you do not need to install it again.
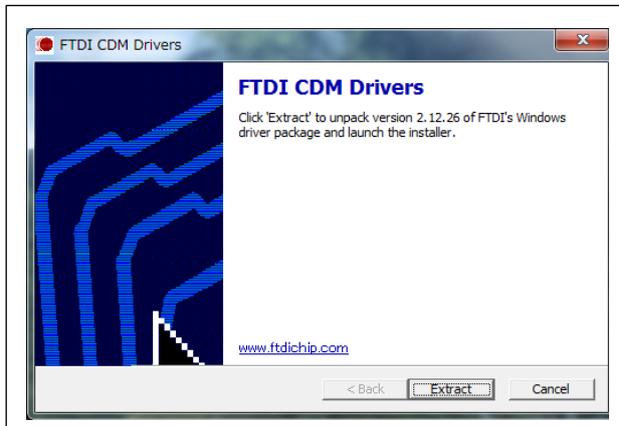
Note: Please download the latest version of the device driver on FTDI's website
(http://www.ftdichip.com/Drivers/D2XX.htm).

4. Start-up project in C#

Make sure that Motionnet Starter Kit (G9001A-EV, G9002A_G9103C-EV) is properly connected to your PC.

Confirm that "Microsoft Visual C#" has been installed and double-click MNET-STK_AXIS_Sample.sln "Solution file".
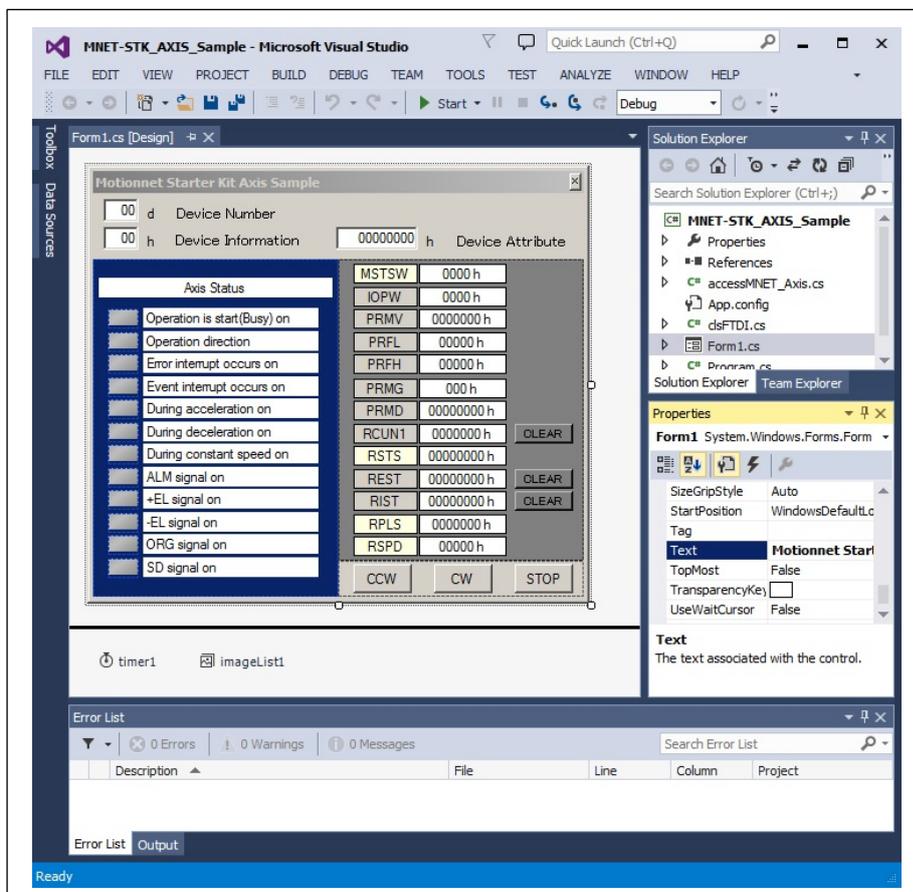
For installation of Microsoft products, please refer to Microsoft's website.

For details on how to build and debug projects, please also refer to Microsoft's website.

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5. Operation explanations

5.1 Start-up program

When you start debugging, the software on the following screen will start up.
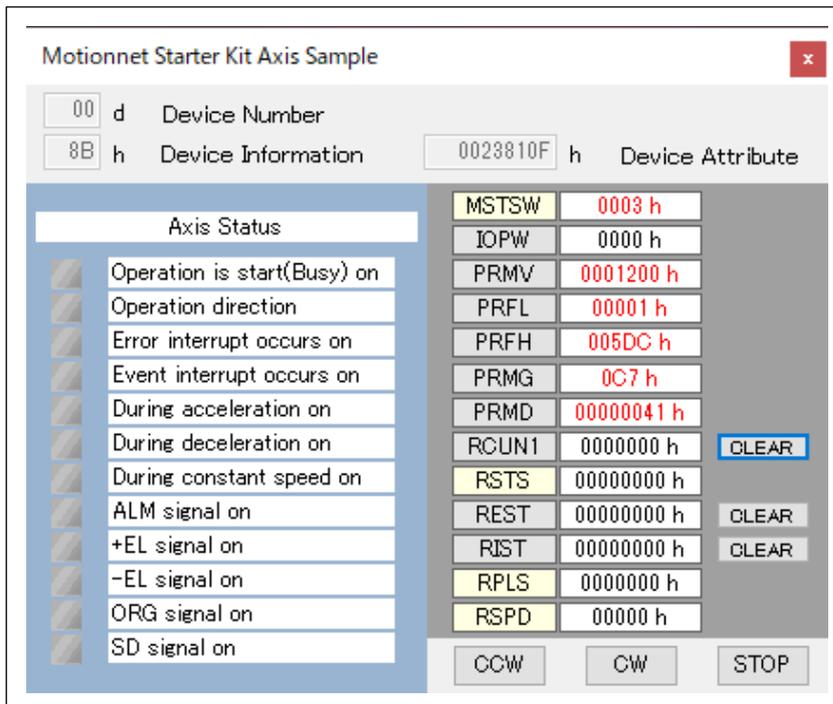
If the Motionnet Starter Kit (G9001A-EV, G9002A_G9103C-EV) is not connected to your PC, the following error screens will be displayed.

G9001A-EV is not connected.
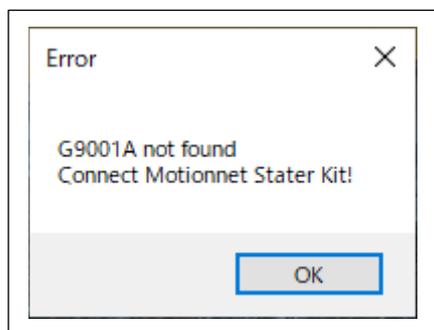
G9001A-EV is connected; G9002A_G9103C-EV is not connected
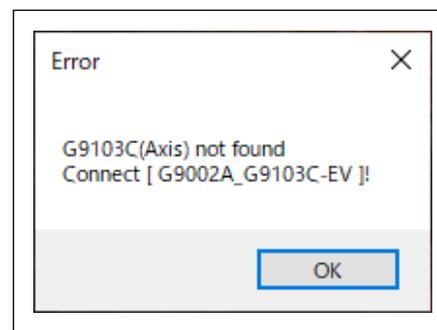
Click the [OK] button to exit the software.

5.2 Device information

The device number, device information, and device attribute data of "G9103C" mounted on the connected G9002A_G9103C-EV board are displayed as follows:

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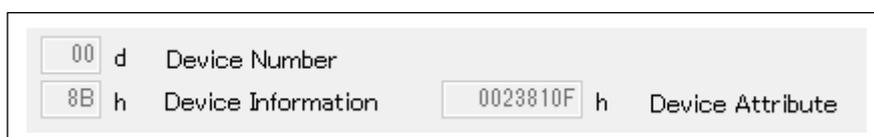
5.3 Status information

You can check some statuses of G9103C in "Axis Status" on the following screen:
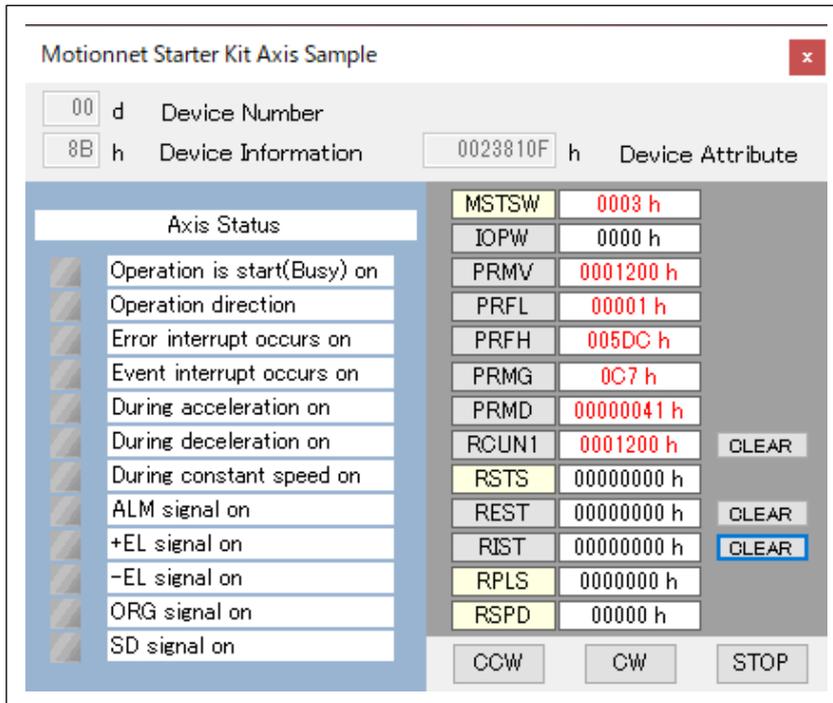
Details are as follows:

Displays	Descriptions	
Operation is start(Busy) on	Becomes "1" during operation (MSTSW.SSCM)	[Blue]
Operation direction	CW operation: "0", CCW operation: "1" (RSTS.SDIR)	[Blue]
Error interrupt occurs on	Becomes "1" when an error interrupt occurs (MSTSW.SERR)	[Red]
Event interrupt occurs on	Becomes "1" when an event interrupt occurs (MSTSW.SEVT)	[Blue]
During acceleration on	Becomes "1" while accelerating (SSTSW.CND = 0x08)	[Blue]
During deceleration on	Becomes "1" while decelerating (SSTSW. CND = 0x0A)	[Blue]
During constant speed on	Becomes "1" while operating at constant speed (SSTSW. CND = 0x06,0x07,0x09)	[Blue]
ALM signal on	Becomes "1" when ALM input is ON (SSTSW.SALM)	[Red]
+EL signal on	Becomes "1" when +EL input is ON (SSTSW.SPEL)	[Red]
-EL signal on	Becomes "1" when -EL input is ON (SSTSW.SMEL)	[Red]
ORG signal on	Becomes "1" when ORG input is ON (SSTSW.SORG)	[Blue]
SD signal on	Becomes "1" when SD input is ON (SSTSW.SSD)	[Blue]

When the status becomes "1", the display color next to each item changes as follows:

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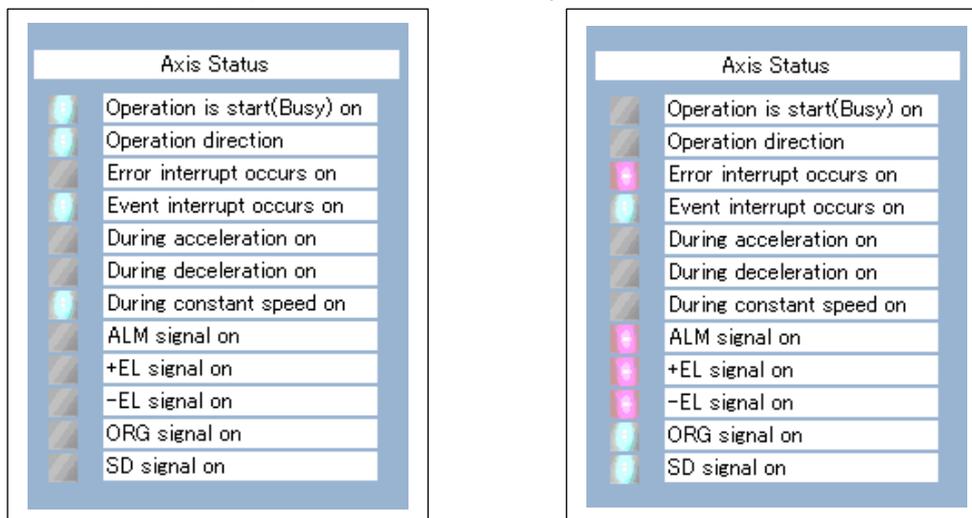
5.4 Resister information

For G9103C, the status, the general-purpose I/O output data and the contents of several registers are displayed as follows:

Displays	Descriptions
MSTSW	Main status
IOPW	General-purpose I/O data
PRMV	Feeding amount
PRFL	FL speed
PRFH	FH speed
PRMG	Speed magnification
RCUN1	COUNTER 1
RSTS	Extension status
REST	Error interrupt factor register
RIST	Event interrupt factor register
RPLS	Positioning counter
RSPD	Current speed monitor

All are displayed in hexadecimal notation. "0" is displayed in black and "other than 0" are displayed in red.

MSTSW	0000 h		MSTSW	0000 h
IOPW	0000 h		IOPW	0000 h
PRMV	0000000 h		PRMV	0
PRFL	00001 h		PRFL	1
PRFH	005DC h		PRFH	1500
PRMG	0C7 h		PRMG	199
PRMD	00000041 h		PRMD	00000041 h
RCUN1	0000000 h	CLEAR	RCUN1	0	CLEAR
RSTS	00000000 h		RSTS	00000000 h
REST	00000000 h	CLEAR	REST	00000000 h	CLEAR
RIST	00000000 h	CLEAR	RIST	00000000 h	CLEAR
RPLS	0000000 h		RPLS	0
RSPD	00000 h		RSPD	0

You can switch between decimal and hexadecimal by right clicking the register values.

However, registers that have meaning in bit units (such as RSTS) are fixed in hexadecimal and cannot be switched.

5.5 Operation buttons

5.5.1 CCW

By clicking, the operation in CCW starts. The operation stops when 4,608 pulses are output (2 rotations of a motor shaft).

After the operation starts, the motor accelerates from 1 pps to 1500 pps in about 1 second and runs at 1500 pps for a while. Then, it decelerates and stops in about 1 second.

5.5.2 CW

By clicking, the operation in CW starts.

The operation is the same as CCW except the direction.

5.5.3 STOP

Click during operation to decelerate and stop.

5.5.4 CLEAR

The status of RCUN1 (COUNTER 1), REST (error interrupt factor register), and RIST (event interrupt factor register) can be cleared.

Click the button next to each register to clear the value of corresponding register to zero.

5.6 Error occurrence display

The following error screens will be displayed, if

    G9001A-EV USB cable is disconnected

    Power of G9002A_G9103C-EV turns off, or

    Motionnet cable is disconnected

while the software is running.

G9001A-EV USB cable is disconnected
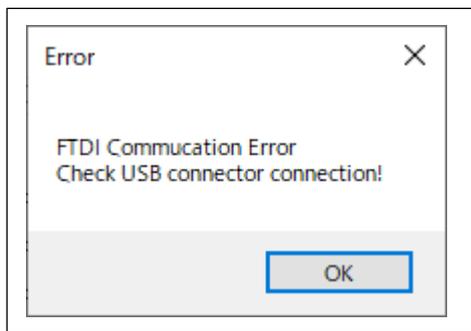
Power of G9002A_G9103C-EV turns off or
Motionnet cable is disconnected

Error   ✕
FTDI Commucation Error Check USB connector connection! OK

Error   ✕
G9103C(Axis) not found Connect [G9002A_G9103C-EV]! OK

Click the [OK] button to exit the software.

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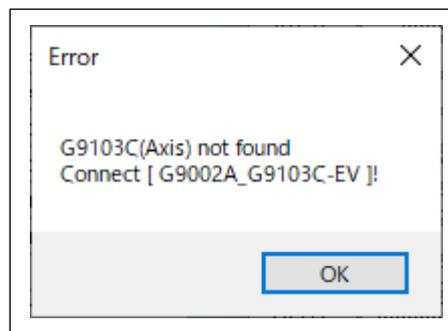
6. Source code

The source file is "Form1.cs" in the "MotionnetStarteKit_AXIS_Sample_V100¥MNET-STK_AXIS_Sample" folder.

Enter values that you want to try and check the procedures of the operation.

6.1 Access function to FTDI

Opening the access to FTDI is described in the "Form1_Load" function.

Function to confirm that the connected board is G9001A-EV

LSI_Open (string description)	
description	If the product description data of G9001A-EV is correct, start to access.

Closing the access to FTDI is described in the "Form1_FormClosed" function.

Function to cancel the access to G9001A-EV

LSI_Close()	
	G9001A-EV access canceled.

6.2 Access function to the center device, G9001A

Access to the center device is described in the "Form1_Load" function.

Function to reset the contents in the center device G9001A

MNETCenterComWriteSoftwareReset ()	
	Reset G9001A(command = 0x0100)

Function to start the system communication from the center device, G9001A, to the all devices

MNETCenterComdWriteSystemComm()	
	System communication to the all devices (command = 0x1000)

Function to start the cyclic communication from the center device, G9001A, to the all devices

MNETCenterComdWriteCyclicComm()	
	Cyclic communication to the all devices (command = 0x3000)

Function to acquire the status information of the center device, G9001A

MNETCenterReadSts(ref Status, ref IntStatus)	
Status	Acquire the status information in G9001A
IntStatus	Acquire the interrupt status information in G9001A

Local device search access is described in the "Device_Search" function.

Function to access to the address map to acquire the device information

MNETCenterReadInf(dno, ref Devinf_D)	
dno	Device number
Devinf_D	A buffer to acquire and store the specified device information data

Function to read the device attribute information by command access

MNETCenterComdReadDevAttribute(dno)	
dno	Device number (command = 0x1300 + dno)

Function to acquire the device attribute information by command access

MNETCenterComdGetDevAttribute(dno, ref Attr_D)	
dno	Device number (command = 0x1300 + dno)
Attr_D	Buffer to acquire and stores the specified device attribute information data (Read the data from the data reception FIFO)

Access to read the local device status is described in "Axis_StatusRead" function.

Function to read and acquire the port data by command access

MNETCenterComdReadPortD(dno, 0/1, ref portrd[x], ref portrd[y]);	
dno	Device number (command = 0x6400 + dno × 2)
0/1	0: Port 1,0 specified 1: Port 3,2 specified
portrd[]	Buffer to acquire and stores the port data for the specified device (Read the data through I/O buffer)

Function to write port data by command access

MNETCenterComd WritePortD(dno, 0/1, portx, porty);	
dno	Device number (command = 0x5400 + dno × 2)
0/1	0: Port 1,0 specified 1: Port 3,2 specified
port	Port data to be written to the specified device (Writes data to I/O buffer)

6.3 Default setting for local device G9103C

The default settings are described in the "Axis_InitSet" function and are called when the software starts.

The following default settings are operated.

Function to write wrcom and data to the data transmission FIFO and write the device specified by command access

MNETLocalRegisterWrite (dno, wrcom, data);	
dno	Device number (command = 0x4000 + dno)
wrcom	Register write command
data	Register write data

Operation	Descriptions
wrcom = 0x9C(RENV1) data = 0x00000002	Set environment setting 1 as follows. Set the output pulse specification (PMD = "010"). Negative logic pulses are output from the OUT terminal. Low is output from DIR terminal in positive direction.
wrcom = 0x9D(RENV2) data = 0x000000FF	Set the environment setting 2 as follows. Set the general-purpose ports 0 to 7 (P0M-PM7 = "FF") as output ports.
wrcom = 0x9F(RENV4) data = 0x81000000	Set the environment setting 4 as follows. Set the latch timing (LTM = "01") of COUNTER1 to COUNTER3 to ORG signal ON. Cancel the reading automatic reset (ISMR = "1") function of REST and RIST registers This software reads and displays the all registers regularly including REST and RIST registers. If the reading automatic reset function performs, the error occurrence flag may be cleared by the function so that it cannot be visually confirmed. To prevent it, set RENV2.MRST = 1.
wrcom = 0x AC(RIRQ) data = 0x00000C01	Set the evet interrupt factors as follows: When normal stop; (IREN = "1") When ORG signal is ON; (IROL = "1") When SD signal is ON; (IRSD = "1")
wrcom = 0x B1(PRFL) data = 0x00000001	Set the FL speed as follows: Pre-register (PRFL) to "0x01". [1 pps]
wrcom = 0x B2(PRFH) data = 0x000005DC	Set the FH speed as follows. Pre-register (PRFH) to "0x5DC". [1500 pps]
wrcom = 0x B3(PRUR) data = 0x00000D07	Set the acceleration rate as follows. Pre-register (PRUR) to "0xD07". [1 s]
wrcom = 0x B5(PRMG) data = 0x000000C7	Set the magnification as follows. Magnification (PRMG = "0xC7") to 1 ×. [199]
wrcom = 0x B7(PRMD) data = 0x00000041	Set the operation mode as follows. Positioning mode (MOD = "41"). Linear acceleration / deceleration (MSMD = "0"). Automatic slow-down point setting (MSDP = "0").

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6.4 Reading register contents from local device, G9103C

Process to read the register contents is described in the "Axis_RegisterRead" function.

Function to write rrcom to data transmission FIFO and write the device specified by a command access

MNETLocalAllRegisterRead (dno, ref rrcom, ref readflag, min, max, allflag);	
dno	Device number (command = 0x4000 + dno)
rrcom	Register read command group
readflag	Flags that require register reading ("1") / not require ("0")
min	Set the minimum value of register read command group
Max	Set the maximum value of the register read command group
allflag	Read all registers ("1")

Function to read register data from data reception FIFO

MNETLocalAllRegisterGet (ref rrcom, ref readflag, min, max, allflag, ref rbuffer);	
rrcom	Register read command group
readflag	Flags that require register reading ("1") / not require ("0")
min	Set the minimum value of register read command group
Max	Set the maximum value of the register read command group
allflag	Read all registers ("1")
rbuffer	Buffer to store register read data

The display of the read register contents is described in the "AllDataDisp", "DispReg", "DispLed", "SetLed", "reg_MouseClick" functions.

6.5 CCW operation

The "btn_ccw_Click" function in the source file performs CCW operation.
The following operations are performed in the function.

Function to write wrcom and data to the data transmission FIFO and write the device specified by command access

MNETLocalRegisterWrite (dno, wrcom, data);	
dno	Device number (command = 0x4000 + dno)
wrcom	Register write command
data	Register write data

Function to write RCom to the data transmission FIFO and write the device specified by command access

MNETLocalWrite_COM (dno, RCom)	
dno	Device number (command = 0x4000 + dno)
RCom	Operation command

Operation	Descriptions
wrcom = 0x B0(PRMV) data = 0xFFFFEE00	Set the feeding amount as follows. Set "FFFFEE00h" (-4608) as the feeding amount.
Rcom = 0x53(STAUD)	Execute high-speed start 2.

When you execute the start command, the motor accelerates from 1 pps to 1500 pps in about 1 second. It operates at 1500 pps for a while, then decelerates and stops in about 1 second.

4,608 pulses are output in negative direction during operation.

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6.6 CW operation

The "btn_cw_Click" function in the source file performs CW operation.

The following operations are performed in the function.

Function to write wrcom and data to the data transmission FIFO and write the device specified by command access

MNETLocalRegisterWrite (dno, wrcom, data);	
dno	Device number (command = 0x4000 + dno)
wrcom	Register write command
data	Register write data

Function to write RCom to the data transmission FIFO and write the device specified by command access

MNETLocalWrite_COM (dno, RCom)	
dno	Device number (command = 0x4000 + dno)
RCom	Operation command

Operation	Descriptions
wrcom = 0x B0(PRMV) data = 0x00001200	Set the feeding amount as follows. Set "00001200h" (4608) as the feeding amount.
Rcom = 0x53(STAUD)	Execute high-speed start 2.

When you execute the start command, the motor accelerates from 1pps to 1500 pps in about 1 second. It operates at 1500 pps for a while, then decelerates and stops in about 1 second.

4,608 pulses are output in the positive direction during operation.

6.7 STOP operation

The "btn_stop_Click" function in the source file performs STOP operation.

The following operations are performed in the function.

Function to write RCom to the data transmission FIFO and write the device specified by command access

MNETLocalWrite_COM (dno, RCom)	
dno	Device number (command = 0x4000 + dno)
RCom	Operation command

Operation	Descriptions
Rcom = 0x4A(SDSTP)	Execute deceleration stop.

6.8 CLEAR operation

The "btn_rcun1_clr_Click" function in the source file performs COUNTER1 clear operation.

The following operations are performed in the function.

Function to write RCom to the data transmission FIFO and write the device specified by command access

MNETLocalWrite_COM(dno, RCom)	
dno	Device number (command = 0x4000 + dno)
RCom	Operation command

Operation	Descriptions
Rcom = 0x20(SDSTP)	Execute to clear COUNTER 1.

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The "btn_rest_clr_Click" function in the source file performs REST clear.

The following operations are performed in the function.

Function to write RCom and WriteD to the data transmission FIFO and write the device specified by command access

MNETLocalRegisterWrite (dno, Rcom, WriteD)	
dno	Device number (command = 0x4000 + dno)
RCom	Operation command
WriteD	Register write data

Operation	Descriptions
Rcom = 0xAD(WREST)	Write command for error interrupt status data.
WriteD = (Read data)	Reset by writing any data with setting the bit to be reset to "1".

The "btn_rist_clr_Click" function in the source file performs RIST clear.

The following operations are performed in the function.

Function to write RCom and WriteD to the data transmission FIFO and write the device specified by command access

MNETLocalRegisterWrite(dno, Rcom, WriteD)	
dno	Device number (command = 0x4000 + dno)
RCom	Operation command
WriteD	Register write data

Operation	Descriptions
Rcom = 0xAE(WRIST)	Write command for event interrupt status data.
WriteD = (Read data)	Reset by writing any data with setting the bit to be reset to "1".

In this software, bit 31 (ISMR) of the RENV4 register is set to "1". In this case, REST or RIST is cleared by writing "1" to the bit to be cleared.

If you write the value read from REST or RIST as it is, all will be cleared.

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Revision

Revision	Date	Contents
1st	March 11 2020	Initial Release

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