Make Life Easy :

Quick Manual

Closed-Loop Stepper System

AiCA-D Series

MMD-AiCAO1-V1.1-2008US

Thank you for purchasing an Autonics product.

This quick manual contains information about the product and its proper use,
And should be kept in a place where it will be easy to access.

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Preface

Thank you for purchasing Autonics product.

Please familiarize yourself with the information contained in the Safety Considerations section before using this product.

This manual contains information about the product and its proper use, and should be kept in a place where it will be easy to access.

Quick Manual Guide

Please familiarize yourself with the information in this manual before using the product.

- This manual provides detailed information on the product's features
  It does not offer any guarantee concerning matters beyond the scope of this manual.
- This manual may not be edited or reproduced in either part or whole without permission.
- This manual is not provided as part of the product package.
  Visit our website (www.autonics.com) to download a copy.
- The manual's content may vary depending on changes to the product's software and other unforeseen developments within Autonics, and is subject to change without prior notice. Upgrade notice is provided through out website.
- We contrived to describe this manual more easily and correctly. However, if there are any corrections or questions, please notify us these on our website.

Quick Manual Symbols

Symbol	Description
 **Note**	Supplementary information for a particular feature.
 **Warning**	Failure to follow instructions can result in serious injury or death.
 **Caution**	Failure to follow instructions can lead to a minor injury or product damage.
 **Ex.**	An example of the concerned feature's use.
※1	Annotation mark.

Safety Considerations

- Following these safety considerations will ensure the safe and proper use of the product and help prevent accidents, as well as minimizing possible hazards.
- Safety considerations are categorized as Warnings and Cautions, as defined below:

Warning	**Warning**	Failure to follow these instructions may result in serious injury or death.
Caution	**Caution**	Failure to follow these instructions may result in personal injury or product damage.

Warning

- Fail-safe device must be installed when using the unit with machinery that may cause serious injury or substantial economic loss. (e.g. nuclear power control, medical equipment, ships, vehicles, railways, aircraft, combustion apparatus, safety equipment, crime/disaster prevention devices, etc.)
  Failure to follow this instruction may result in personal injury, economic loss or fire.
- Do not use the unit in the place where flammable/explosive/corrosive gas, high humidity, direct sunlight, radiant heat, vibration, impact, or salinity may be present.
  Failure to follow this instruction may result in explosion or fire.
- Do not connect, repair or inspect the unit while connected to a power source.
  Failure to follow this instruction may result in fire.
- Install the unit after considering counter plan against power failure.
  Failure to follow this instruction may result in personal injury, or economic loss or fire.
- Re-supply power after min. 20 sec from disconnected power.
  Failure to follow this instruction may result in product damage or malfunction.
- Check 'Connections' before wiring.
  Failure to follow this instruction may result in fire.
- For installing the unit, ground it exclusively and use over AWG 18 (0.75 mm^2) ground cable.
  Failure to follow this instruction may result in electric shock.
- Do not disassemble or modify the unit.
  Failure to follow this instruction may result in fire or electric shock.
- Insulate the connector not to be exposed.
  Failure to follow this instruction may result in electric shock.
- Install the motor and driver in the housing or ground it.
  Failure to follow this instruction may result in personal injury, fire or electronic shock.

- Do not touch the unit during or after operation for a while.
  Failure to follow this instruction may result in burn or electric shock due to high temperature of the surface.
- Do not remove the conne4ctor during or after operation for a while.
  Failure to follow this instruction may result in electronic shock or product damage.
- Emergency stop directly when error occurs.
  Failure to follow this instruction may result in fire, or personal injury.

Caution

- When connecting the power input, use AWG 18(0.75mm^2) cable or over.
- Brake is non-polar. When connecting the brake, use AWG 24 (0.3mm^2) cable or over.
  Failure to follow this instruction may result in fire or malfunction due to contact failure.
- Install overcurrent prevention device (e.g. the current breaker, etc) to connect the driver with power.
  Failure to follow this instruction may result in fire.
- Check the control input signal before supplying power to the driver.
  Failure to follow this instruction may result in personal injury or product damage by unexpected driver movement.
- Install a safety device to maintain the vertical position after turn off the power of this driver.
  Failure to follow this instruction may result in personal injury or product damage by releasing holding torque of the motor.
- Use the unit within the rated specifications.
  Failure to follow this instruction may result in fire or product damage.
- Use dry cloth to clean the unit, and do not use water or organic solvent.
  Failure to follow this instruction may result in fire.
- The driver may overheat depending on the environment.
  Install the unit in the well ventilated place and forced cooling with a cooling fan.
  Failure to follow this instruction may result in product damage and degradation by heat.
- Keep metal chip, dust, and wire residue from flowing into the unit.
  Failure to follow this instruction may result in fire or product damage.
- Use the designated motor only.
  Failure to follow this instruction may result in fire or product damage.

The above specifications are subject to change and some models may be discontinued without notice.

The specifications of this manual are subject to change and some models may be discontinued without notice.

Cautions during Use [Motor]

- Follow instructions in 'Cautions during Use'.
  Otherwise, it may cause unexpected accidents.
- Using motors at low temperature may cause reducing ball bearing's grease consistency and friction torque is increased.
  Start the motor in a steady manner since motor's torque is not to be influenced.
- If wiring encoder cable, separate it from high voltage line or power cable for preventing surge and inductive noise. The cable length should be as short as possible.
  Failure to follow this instruction may result in raised cable resistance, residual voltage, and output waveform noise
- Must connect the encoder shield cable to the F.G. terminal.
- For using motor, it is recommended to maintenance and inspection regularly.
  ① Unwinding bolts and connection parts for the unit installation and load connection
  ② Strange sound from ball bearing of the unit
  ③ Damage and stress of lead cable of the unit
  ④ Connection error with driver
  ⑤ Inconsistency between the axis of motor output and the center, concentric (eccentric, declination) of the load, etc.
- This unit may be used in the following environments.
  ① Indoors (in the environment condition rated in 'Specifications')
  ② Altitude max. 2,000m
  ③ Pollution degree 2
  ④ Installation category II

Cautions during Use [Driver]

- Follow instructions in 'Cautions during Use'.
  Otherwise, it may cause unexpected accidents.
- It is recommended to use 485 converter with the separate power.
  (Autonics product, SCM-38I, recommended)
- Use designated cable to extend motor+encoder wire.
- Install vertically so that the Alarm/Status display part located on top.
- Keep the distance between power cable and signal cable more than 10cm.
- Motor vibration and noise can occur in specific frequency period
  ① Change motor installation method or attach the damper.
  ② Use the unit out of the dedicated frequency range when vibration and noise occurs due to changing motor RUN speed.
- For using motor, it is recommended to maintenance and inspection regularly.
  ① Unwinding bolts and connection parts for the unit installation and load connection
  ② Strange sound from ball bearing of the unit
  ③ Damage and stress of lead cable of the unit
  ④ Connection error with motor
  ⑤ Inconsistency between the axis of motor output and the center, concentric (eccentric, declination) of the load, etc.
- This product does not prepare protection function for a motor.
- This unit may be used in the following environments.
  ① Indoors (in the environment condition rated in 'Specifications')
  ② Altitude max. 2,000m
  ③ Pollution degree 2
  ④ Installation category II

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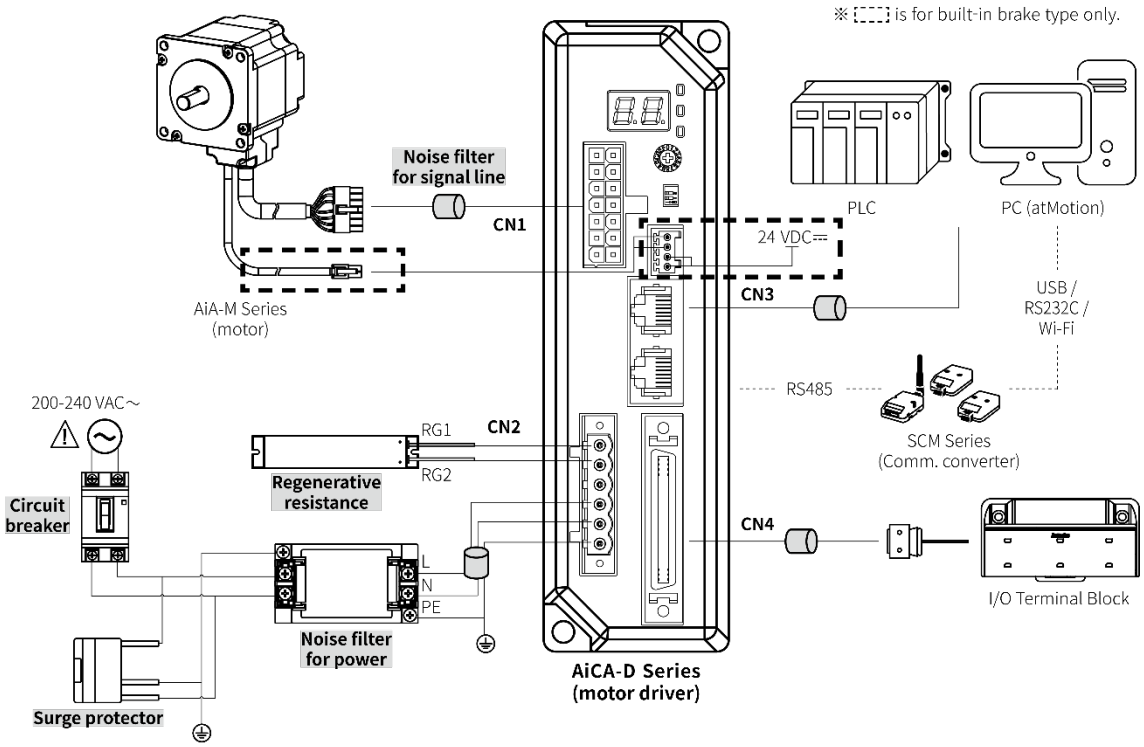
1 AiCA-D Overview

1.1 Features

AiCASeries is a closed- loop stepper motor driver with integrated stepping motor driver and motion controller, which is able to control up to 31-axis simultaneously or independently through network communication.
In addition, as AC power system, the SMPS is not required for power connection and motor system can maintain higher torque during high speed drive compared to DC type motor.

- Brake operation for safe control of vertical load at power OFF and alarm occur. (Built-in brake type)
- Real-time position controllable with closed-loop system
- Motor driver and controller integral type
- Torque control mode surpported
- As AC power type, possible to omit SMPS and perform higher torque than DC power type
- Able to check alarm and status with Alarm/Warning display (7 segment)
- Controllable maximum 31 axis with RS485 communication
- Auto Current Down Mode available
- C language library provided (32-bit, 64-bit)
- Dedicated Windows program (atMotion) provided
- Easy to set various Gain with program (GUI)
- Applicable to the precision equipment such as optical inspection equipment with the features of maintaining torque in stop and having no micro vibration (hunting)
- 10-levels of resolution setting
- Frame size 60mm, 86mm (Applied motor: AiA-M Series)

1.2 Configuration Diagram



1.3 Comparison of Driving Method

Driving method / Driving mode	by atMotion	by Visual Studio	by I/O control
Jog mode	●	×	●
Continuous mode	●	●	●
Position mode	●	●	×
Torque mode	●	●	×
Program mode	●	●	●
Index mode	●	●	●
Home search	●	●	●

2 Driving by atMotion

Please refer to the user manual of atMotion or AiCA for more details.

2.1 System Requirements

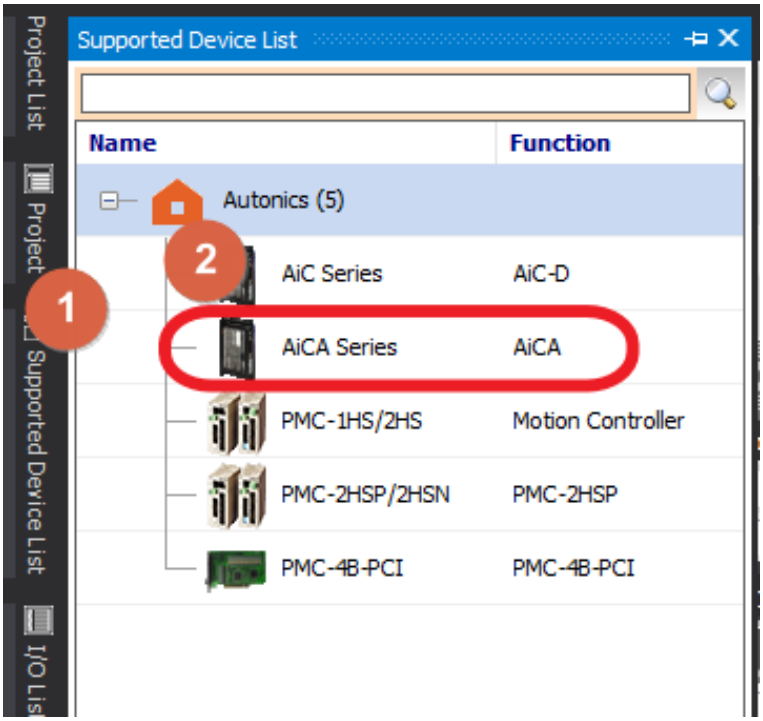
Item	Minimum specifications
System	IBM PC compatible computer with Intel Pentium III or above
Operations	Windows 98/NT/XP/Vista/7/8/10
Memory	256 MB+
Hard disk	1GB+ of available hard disk space
VGA	Resolution: 1024×768 or higher
Others	RS232C serial port (9-pin), USB port

2.2 Connection of atMotion and AiCA

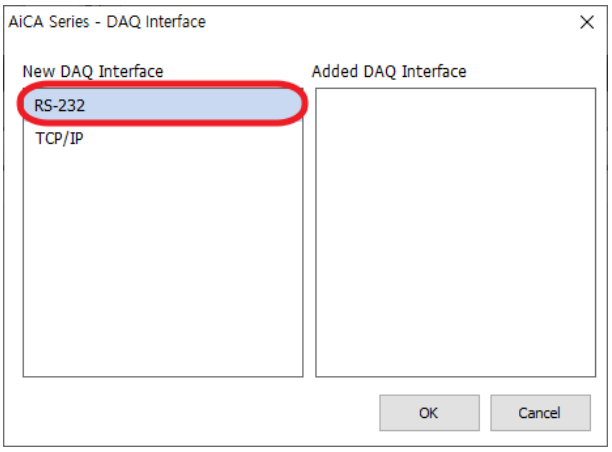
1st Visit our website (www.autonics.com) to download and install newest version of 'atMotion'.

2nd Run 'atMotion' which is installed on PC.

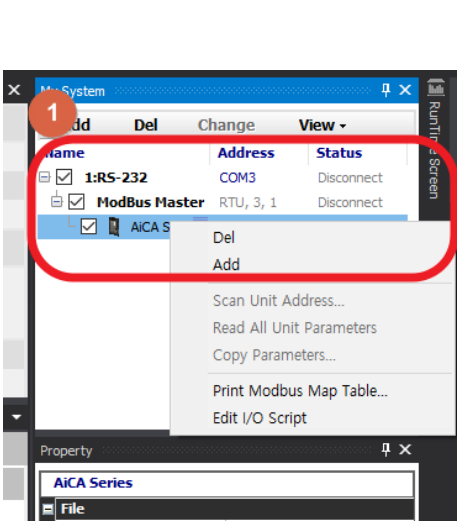
3rd On the left side, select ① 'Supported Device List' - ② 'AiCA Series'.

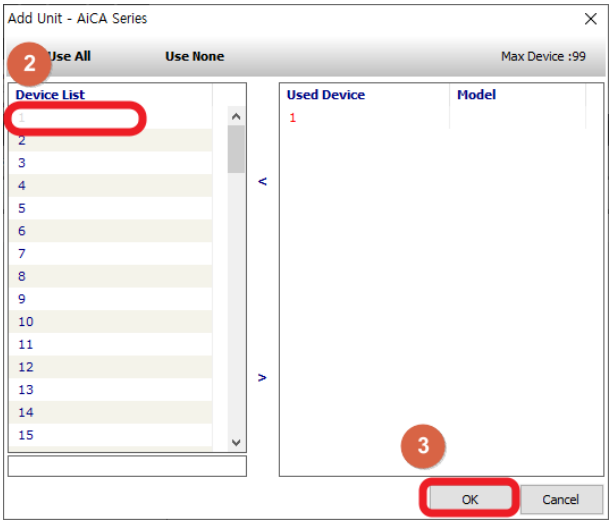


4th Set communication method as ‘RS-232’ at New DAQ interface

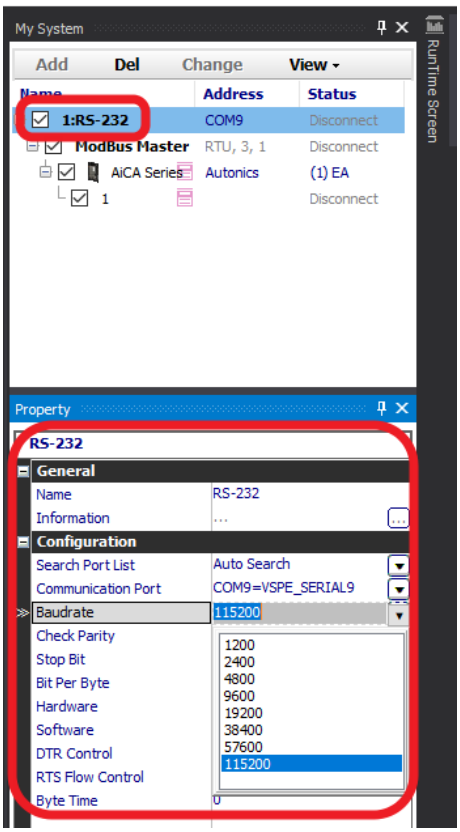


5th Right click the newly added device on ‘My System’ then click ① ‘Add’.
When ② ‘Add Unit’ window displays, double click the device list or click the arrow, placed in the middle of the widnow, to create node number then select ③ ‘OK’.

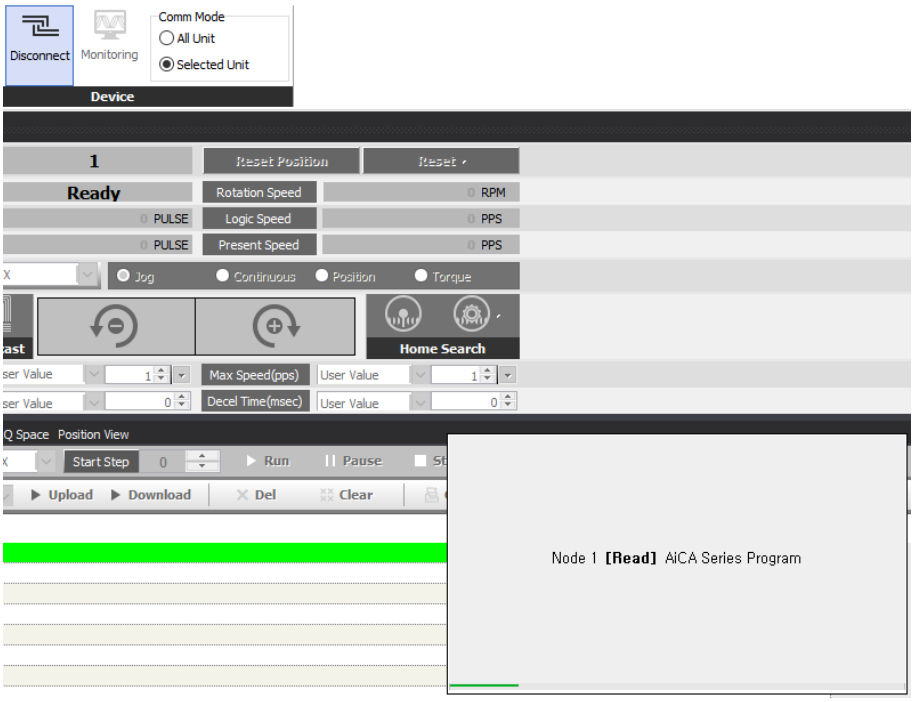




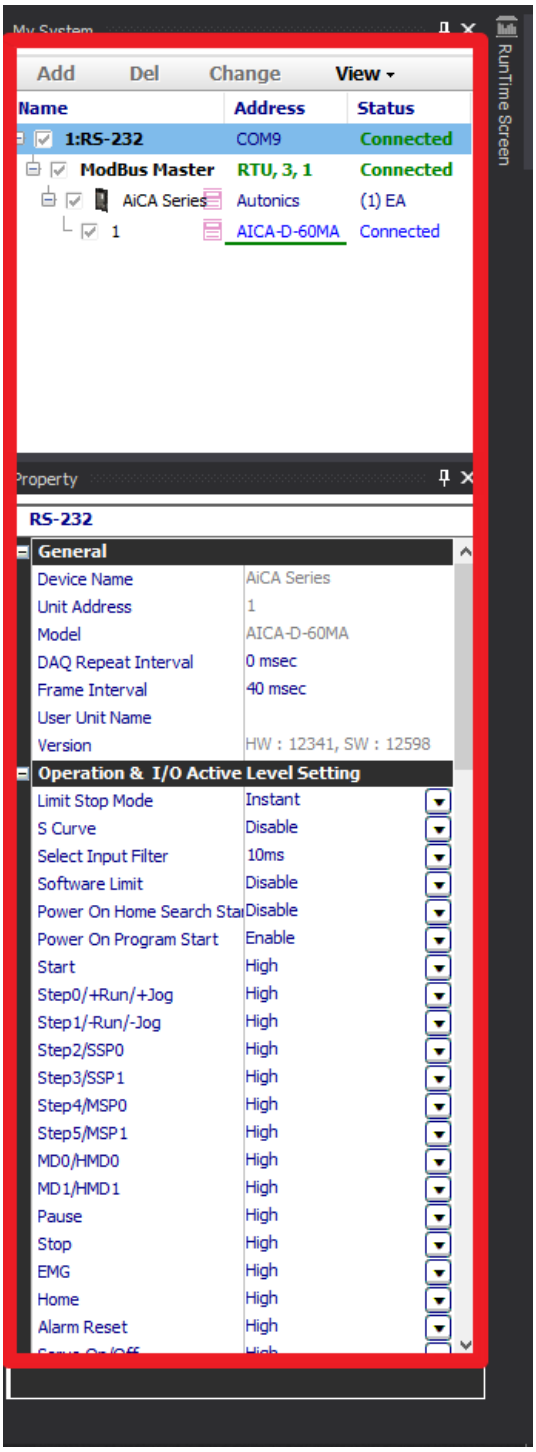
6th Select ‘RS-232’ on the right side of the window, set the communication port, and baud rate for the connected device.



7th Click ‘Connect’ on the upper side of the window to connect the communication.

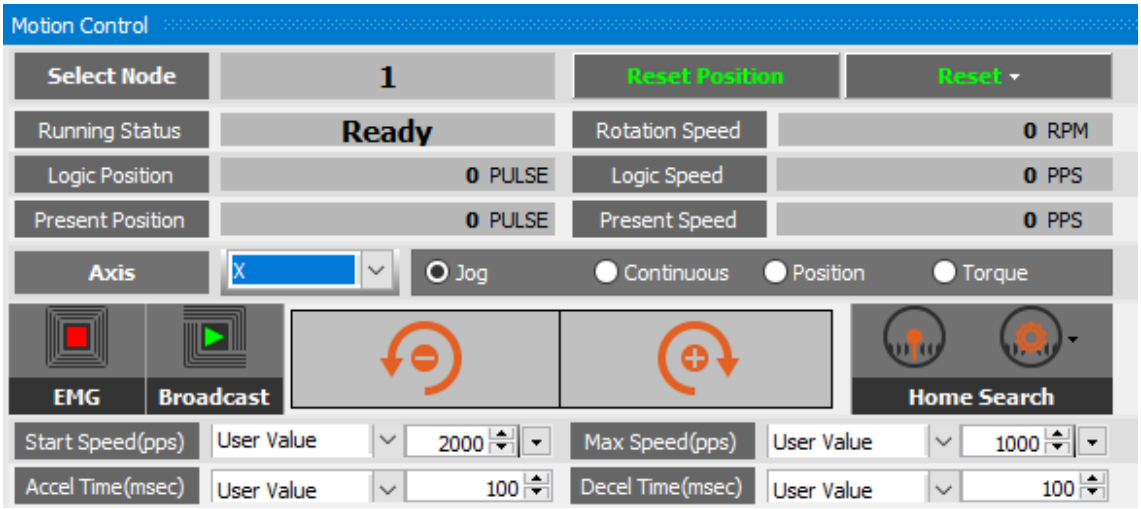


8th To make sure the communication is connected properly, check the 'My System' items on the right side of the window to figure out the device node setting.



2.3 Jog Mode

Jog mode operates the motor in CW or CCW direction by clicking or button.



1st Select 'Jog' on Motion Control – mode selection box.

2nd Set the 'Start Speed', 'Max Speed', 'Accel Rate', 'Decel Rate' value for jog mode.

3rd Motor begins to operate to designated directon by clicking or button.

4th Operation stops by releasing the button.

Note

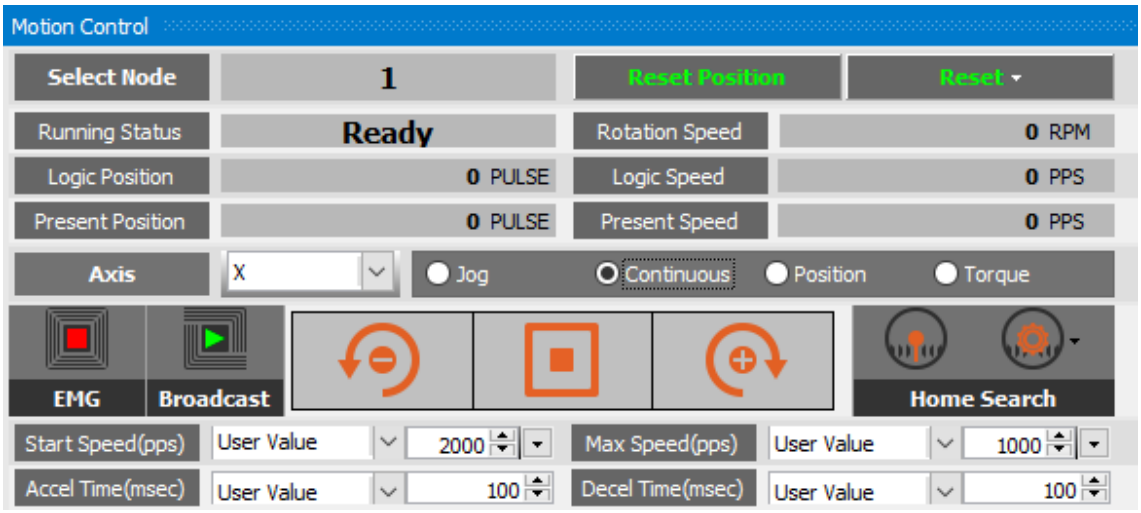
- Start Speed, Max Speed, Accel Rate and Decel Rate can be loaded from the saved value without entering these values.

2.4 Continuous Mode

Continuouse mode outputs pulse continuously in the designated direction until stop command from upper level or stop signal from outside. Continuous mode and home search mode is applicable for this funciton.

Stop commands include deceleration stop and immidiate stop. Deceleration stop is operated when final operation spped is lower than the initial operation speed or in all cases except for reset or emergency stop.

Continuous mode operates the motor continuously in CW or CCW direction by clicking  or  button.



1st Select 'Continuous' on Motion Control – mode selection box.

2nd Set the 'Start Speed', 'Max Speed' value for continuous mode.

3rd Motor begins to operate to designated directon by clicking  or  button.

4th Operation stops by clicking  button or when the designated direction limit signal is applied.

Note

- Start Speed, Max Speed, Accel Rate and Decel Rate can be loaded from the saved value without entering these values.

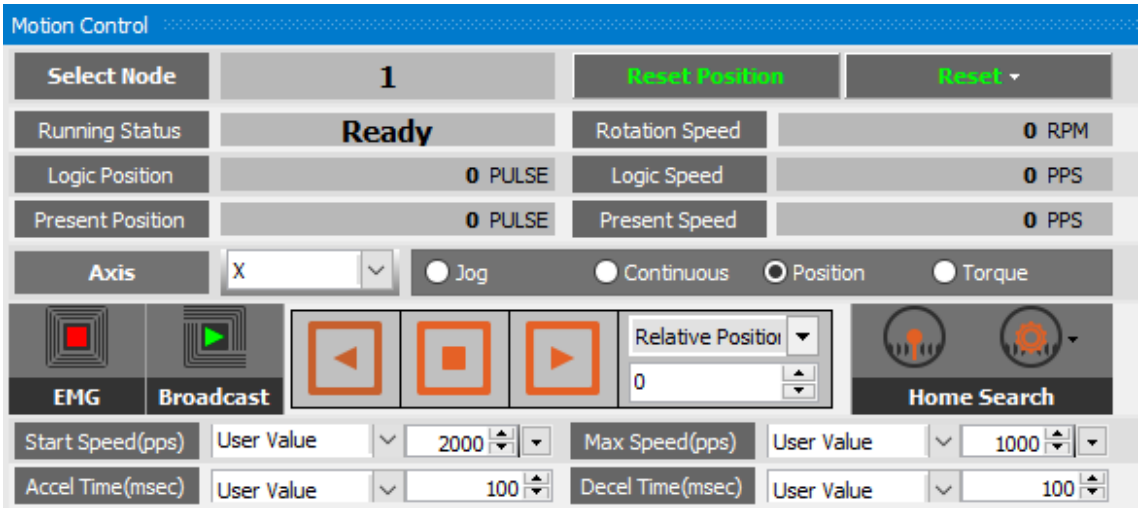
2.5 Position Mode

atMotion provides 'relative position' and 'absolute position' control.

Relative position control moves by the input pulse based on current position.
Absolute position control moves by the input pulse based as the origin.

The position value may change depending on the parameter 'Resolution' setting.

Check the actual position displayed on the program screen to move the position.



1st Select 'Position' on Motion Control – mode selection box.
2nd Set the 'Start Speed', 'Max Speed', 'Accel Rate', 'Decel Rate' value for position mode.
3rd Select the position control method between 'Relative Position' and 'Absolute Position'.
4th After entering designated position value, select  and  to input pulse value in the desired direction to move the position.
5th If the middle button is clicked during the position moving, it does not reach the entered position and stops immediately by decelerating operation.

Note

- Start Speed, Max Speed, Accel Rate and Decel Rate can be loaded from the saved value without entering these values.
- Recognize the position when the initial power is entered as the origin. To change the origin, run home search mode.
- To specify the current position as the origin, click the 'Reset Position' button to set as the origin.

2.5.1 Position Override

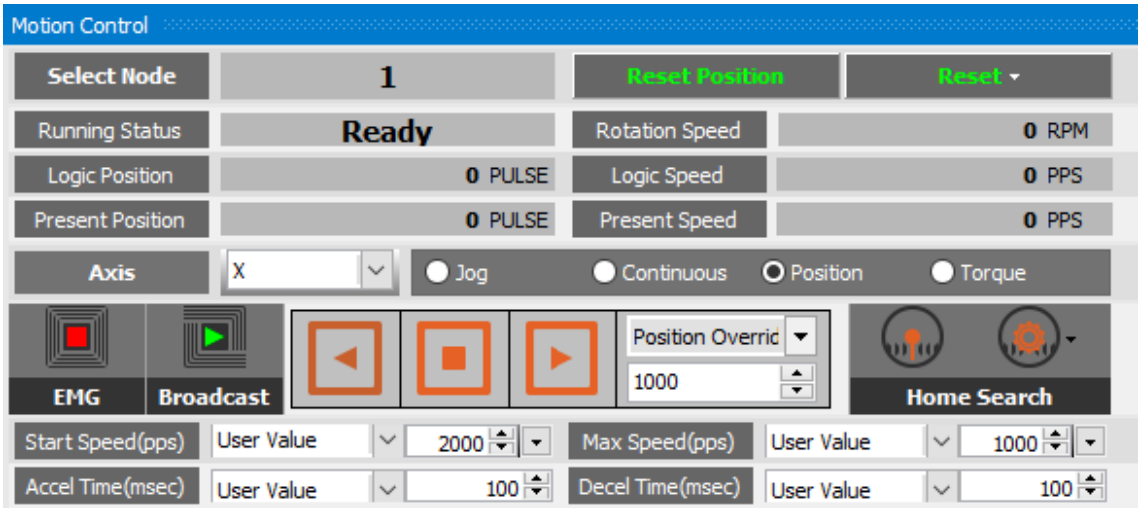
atMotion provides 'Position Override' control.

Position override control moves by changing the target position without stopping operation during position mode.

The command must be executed before reaching the initial target position. When the initial target is reached, subsequent position override commands are not executed.

The position value may change depending on the parameter 'Resolution' setting.

Check the actual position displayed on the program screen to move the position.



- Position Override operation

  1st Select 'Position' on Motion Control – mode selection box.

  2nd Set the 'Start Speed', 'Max Speed', 'Accel Rate', 'Decel Rate' value for position mode.

  3rd Select the position control method between 'Relative Position' and 'Absolute Position'.

  4th After entering designated position value, select ▶ and ◀ to input pulse value in the desired direction to move the position.

  5th Before reacing the target position, switch control mode as position override and enter the desired position value, select ▶ and ◀ to assign new target position.

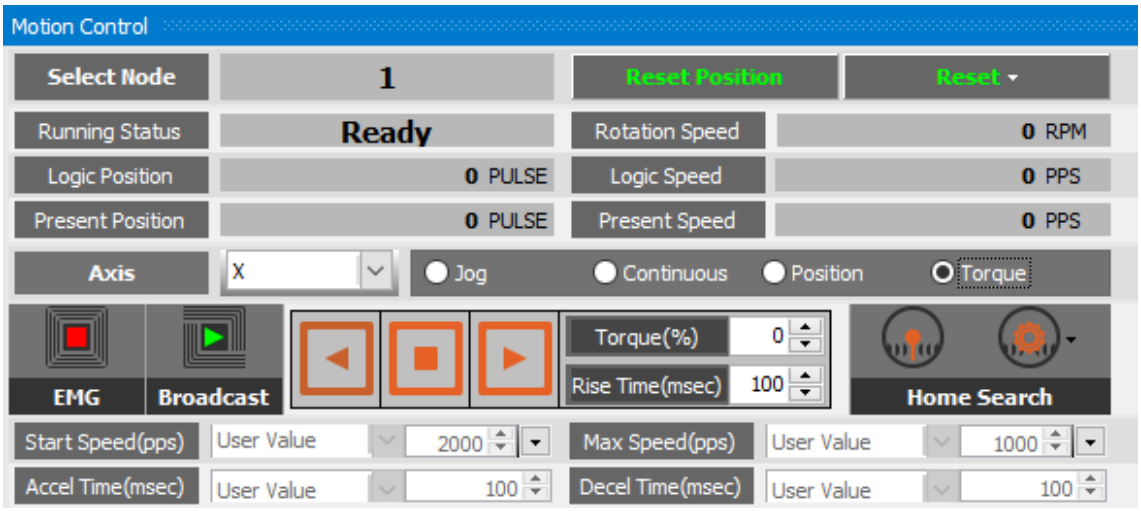
  6th If the middle ■ button is clicked during the position moving, it does not reach the entered position and stops immediately by decelerating operation.

Note

- If the position override operation is not available properly, the position override warning occurs and the final target position is reached at the specified starting speed.

2.6 Torque Mode

Control the motoer by setting the torque that the motor can operate at the specified speed.



1st Select 'Torque' on Motion Control – mode selection box.

2nd Limit the max speed by setting the parameter 'T_Mode Limit Speed'.

3rd Set the desired torque in percentage, and assign the 'Rise Time' to reach the output torque.

4th Control the motor torque by clicking the  and  to designated direction.

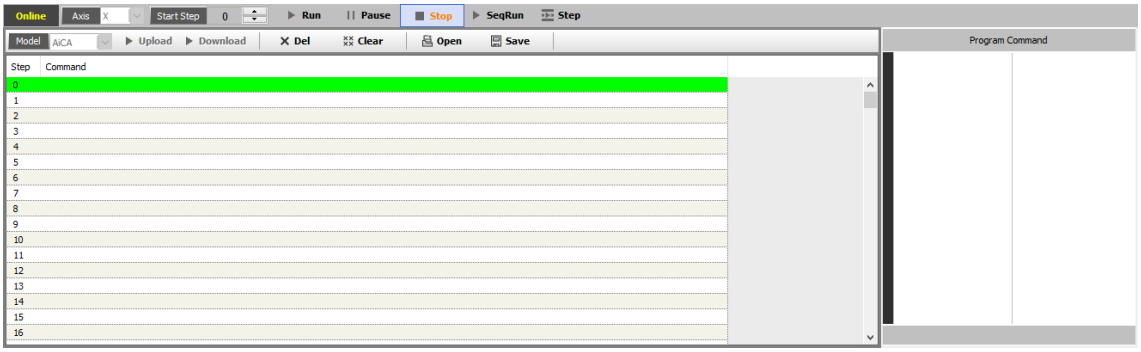
5th By clicking  button to stop the motor.

2.7 Program Mode

To end the program operation, 'END' command must be entered at the end of the step. The alarm no. 15 will occur when the 'END' command is not entered.

There are 256 steps in range of 0 to 255.

If the parameter 'Power On Program Start' is set to 'Enable', it automatically executes the saved program operation sequentially at initial power on.



1st Enter the command at the desired step.

2nd When step input is completed, click ▶ SeqRun button to execute program operation sequentially.

3rd To start from a step other than step 0, select the step number from Start Step 0 and click the ▶ Run button.

4th Click the ❙❙ Pause button to finish the active step and pause the motor. Click ▶ Run button to start the next step.

5th Click the ■ Stop button to finailze and stop the active step. Click ▶ Run button to restart at the designated step.

6th When the program command 'END' reaches the entered step during program operation, the program operation is terminated.

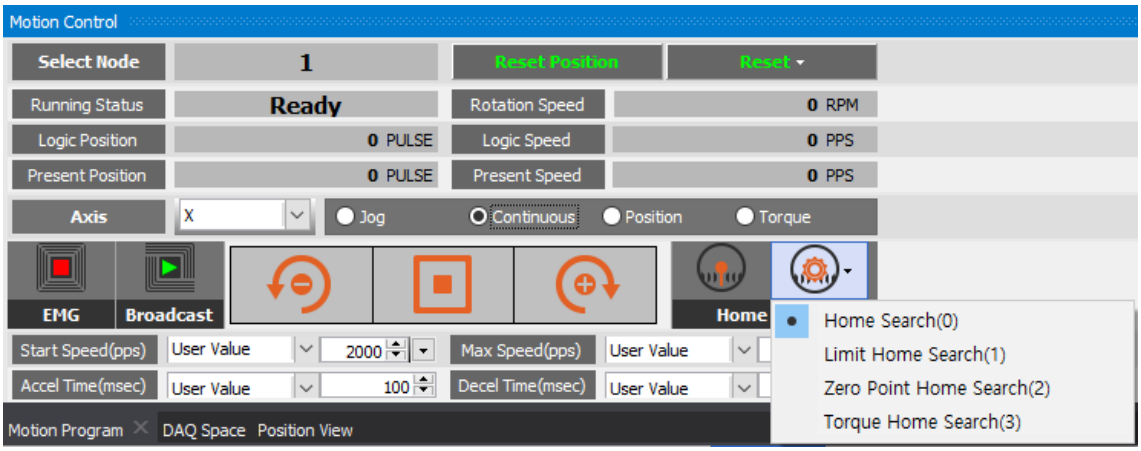
Note

- For more information, refer to User Manual.
- To execute only one step, select the desired step and click the Step button. However, executing a step with a command other than 'ABS' or 'INC', or clicking 'Stop' button during the step operation, the alarm no. 16 will occur.

2.8 Home Search Mode

There are 4 types of home search mode can be executed; 'Nomal', 'Limit', 'Position' and 'Torque'.

If the parameter 'Power On Home Search' is set to 'Enable', it automatically executes the home search mode from the time when the power is applied and motor alignment is completed. (However, alarm no. 17 occurs when it is executed by zero point home search mode operation.)



1st Click  button to select the home search operation mode.

2nd Set the value of Start Speed, Max Speed, Accel Rate and Decel Rate for Home search mode.

3rd Click  button to execute the home search operation.

4th When the home is found, the home search operation is completed.

2.8.1 Normal Home Search

Connect the external origin sensor to 'ORG' and receive the signal output from the sensor to designate as home.

1st Click  button and select 'Nomal'.

2nd Click  button to execute the home search operation.

3rd When the operation is executed, the motor operates in the direction set in the parameter 'Home Search Direction'.

4th Operation starts according to the start speed set in the parameter 'Home Search Start Speed', and acceleration starts according to the acceleration time set in the parameter 'Home Search Acceleration Time'.

5th The constant speed operation is performed until a signal is input to the origin sensor 'ORG', when the maximum speed set in the parameter 'Home Search Max Speed' is reached.

6th If a signal is input to the limit sensor (±Limit) before the signal is input to the origin sensor 'ORG', after the deceleration stop, it operates in the opposite direction to find the origin.

7th When a signal is input to the origin sensor 'ORG', the motor decelerates and stops according to the deceleration time set in the parameter 'Home Search Deceleration Time'.

8th After stop, it moves to the opposite diretion as far as the distance past the origin sensor at the start speed set in the parameter 'Home Search Start Speed'to find the origin sensor and stops.

9th When the origin found, the operation completion signal (In-Position) is output and the In-Position indicator lights to indicate the status.

Note

- If a value other than 0 is set in the parameter 'Home Search Offset', it moves to the set position value after finding the home and outputs the operation completion signal (In-Position) and lights up in the In-Position indicator to display the status.
- If a value other than 0 is set in the parameter 'Home Search Position Set', the position specified after finding the home is set to the set value other than 0.
- In normal home search mode, alarm no. 17 occurs if the ORG signal does not input until it reaches the opposite limit sensor past the limit sensor (±Limit).

2.8.2 Limit Home Search

Connect the external limit sensor to '±Limit' and receive the signal output from the sensor to designate as home.

If the parameter 'Software Limit' is set to 'Enable', the home search mode is available with Software ±Limit.

1st Click  button and select 'Limit'.

2nd Click  button to execute the home search operation.

3rd When the operation is executed, the motor operates in the direction set in the parameter 'Home Search Direction'.

4th Operation starts according to the start speed set in the parameter 'Home Search Start Speed', and acceleration starts according to the acceleration time set in the parameter 'Home Search Acceleration Time'.

5th The constant speed operation is performed until a signal is input to the limit sensor '±Limit' when the maximum speed set in the parameter 'Home Search Max Speed' is reached.

6th If a signal is input to the limit sensor (±Limit) or reaches to Software ±Limit, the motor decelerates and stops according to the deceleration time set in the parameter 'Home Search Deceleration Time'.

7th After stop, it moves to the opposite direction as far as the distance past the limit sensor at the sart speed set in the parameter 'Home Search Start Speed' to find the limit sensor and stops.

8th When the home found, the operation completion signal (In-Position) is output and the In-Position indicator lights to indicate the status.

Note

- If a value other than 0 is set in the parameter 'Home Search Offset', it moves to the set position value after finding the home and outputs the operation completion signal (In-Position) and lights up in the In-Position indicator to display the status.
- If a value other than 0 is set in the parameter 'Home Search Position Set', the position specified after finding the origin is set to the set value other than 0.
- If the deceleration time is set long during deceleration and stop, it may collide with the structure, so the deceleration time should be set short or the limit sensor should be installed from the structure with sufficient margin.

2.8.3 Zero Point Home Search

Zero point home search operation can be performed by specifying zero point (absolute coordinate '0') as home.

To change the home position, use 'Reset Position'.

The zero point should be re-assigned since the zero point is also reset when reset or resupplying the power.

The alarm no. 17 occurs since the zero point is not assigned when use automatically execution by setting parameter 'Power On Home Search' is set to 'Enable'.

1st Click  button and select 'Position'.
2nd Click  button to execute the home search operation.
3rd When the operation is executed, the motor operates in the direction set in the parameter 'Home Search Direction'.
4th Operation starts according to the start speed set in the parameter 'Home Search Start Speed', and acceleration starts according to the acceleration time set in the parameter 'Home Search Acceleration Time'.
5th The constant speed operation is performed when the maximum speed set in the parameter 'Home Search Max Speed' is reached.
6th As closer to home (zero point), the motoer decelerates and stops according to the deceleration time set in the parameter 'Home Search Deceleration Time'.
7th When the home found, the operation completion signal (In-Position) is output and the In-Position indicator lights to indicate the status.

Note

- If a value other than 0 is set in the parameter 'Home Search Offset', it moves to the set position value after fining the home and outputs the operation completion signal (In-Position) and lights up in the In-Position indicator to display the status.
- If a value other than 0 is set in the parameter 'Home Search Position Set', the position specified after finding the origin is set to the set value other than 0.

2.8.4 Torque Home Search

If there is no home sensor and limit sensor, home search mode can be executed by contact with a specific instrument.

If the torque value is output as much as the value set in the parameter 'Home Search Torque' after contacting a specific device, the position that has moved in the opposite direction by the position valu set in the parmeter 'Home Search Offset' is designated as the origin.

1st Click  button and select 'Position'.
2nd Click  button to execute the home search operation.
3rd When the operation is executed, the motor operates in the direction set in the parameter 'Home Search Direction'.
4th Operation starts according to the start speed set in the parameter 'Home Search Start Speed', and acceleration starts according to the acceleration time set in the parameter 'Home Search Acceleration Time'.
5th The constant speed operation is performed until contact is made with a specific instrument.
6th Stops when the load is applied as the torque value set in the parameter 'Home Search Torque' by contacting a specific instrument.
7th After stop, it moves to the opposite direction as far as the distance past the limit sensor at the start speed set in the parameter 'Home Search Start Speed' and stops.
8th The operation completion signal (In-Position) is output and the In-Position indicator lights to indicate the status.

Note

- If a value other than 0 is set in the parameter 'Home Search Position Set', the position specified after finding the origin is set to the set value other than 0.

3 Driving by Visual Studio

Please refer to the library manual AiCA-D for more details.

3.1 Environment for Example of Using C Language Library

Item	Specifications
Operations	Windows7 (64bit)
Development environment	Visual Studio 2013
Language	C/C++

Note

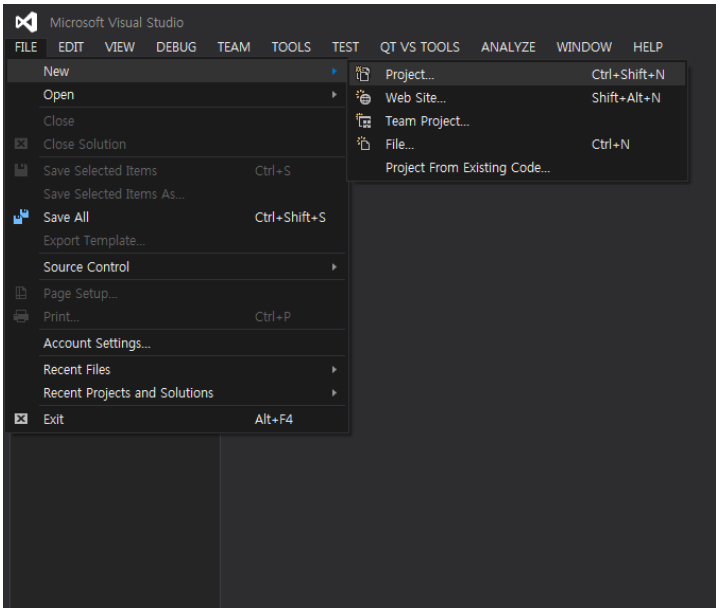
Please refer to the library manual for more details about error code or function.

3.2 Connection of Visual Studio and AiCA

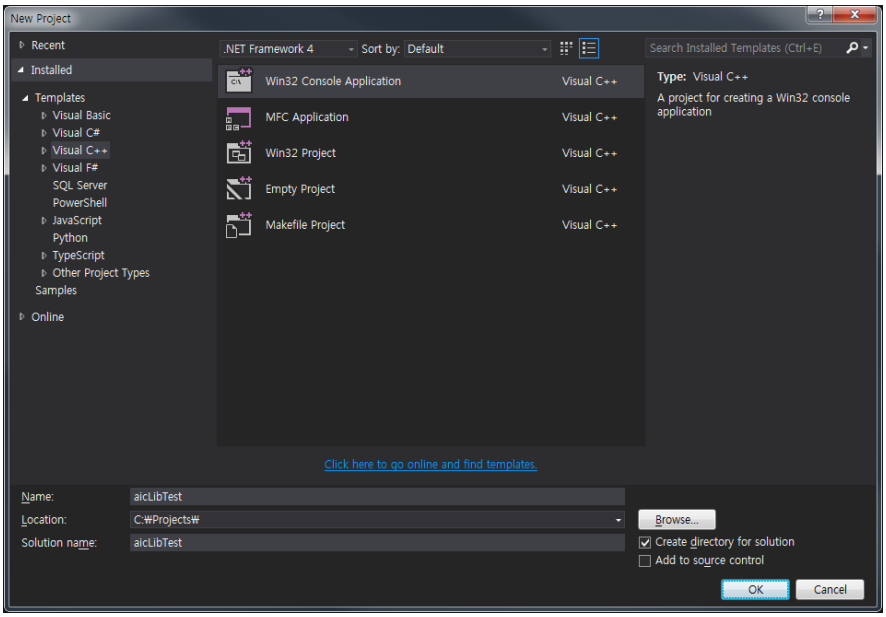
3.2.1 Creating a project

1st Create a project which utilizes the DLL file.

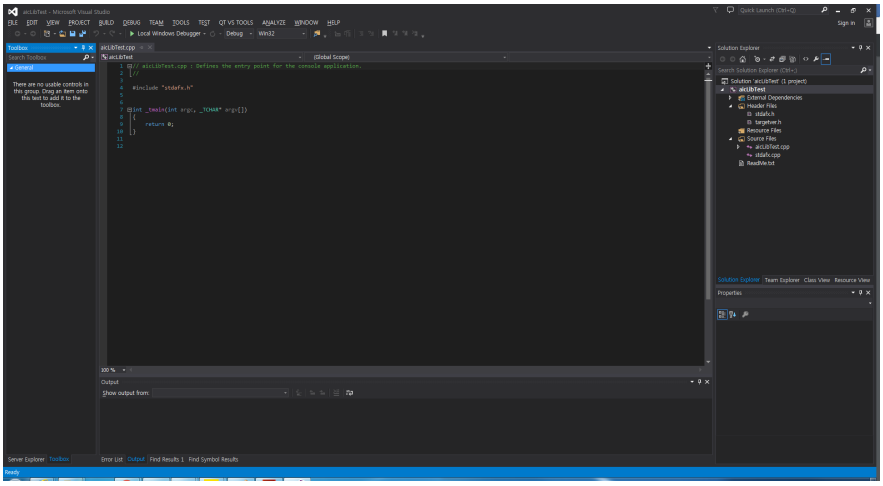
2nd Click ‘File(F)’ > ‘New(N)’ > ‘Project(P)’ > in Visual Studio 2013



3rd Select ‘Win32 Console Application’ in the popped up dialogue, and click [OK] button after entering project name(N).



Following image is the initial screen of the created project.

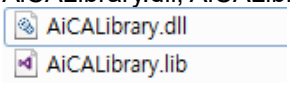


3.2.2 Copying library files

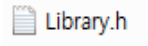
1st Released library files includes three files.
: AiCALibrary.dll, AiCALibrary.lib, Library.h

2nd Path

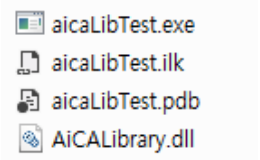
① AiCALibrary.dll, AiCALibrary.lib: …\AiCA Library\lib\x64, …\AiCA Library\lib\x86



② Library.h: …\AiCA Library\include



3rd Copy 'AiCALibrary.dll' file in the directory (Debug folder) where the executable of the program is located.



4th Copy 'Library.h' and 'AiCALibrary.lib' files in the desired path and use as followings.
#include "Path\Library.h"
#pragmacomment (lib, "Path \\AiCALibrary.lib")

5th Add codes of 4th as following.

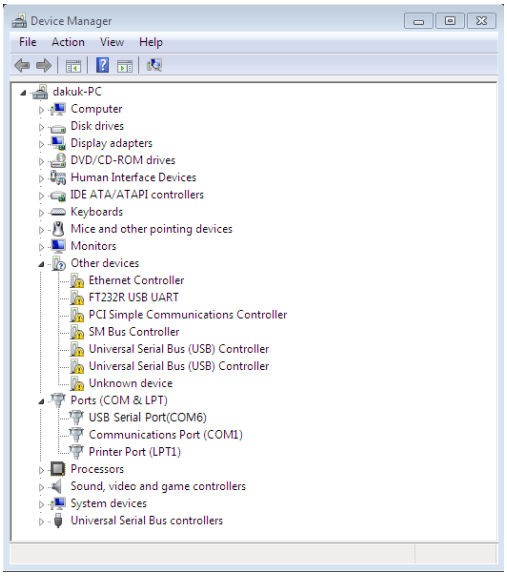
```
#include <Windows.h>
#include <stdio.h>
#include "lib₩include₩Library.h"
#pragma comment(lib,"lib₩₩x64₩₩AiCALibrary.lib")

#define PORTNO 31

int main()
{
    return 0;
}
```


3.2.3 Opening COM Port

1st Check the COM Port number connected to PC in Device Manager.



2nd Function of opening COM Port

: int autaica_Open (int PortNum,int BaudRate,int Parity,int Stopbit);

3rd Set to checked COM Port number, baudrate, parity bit, stop bit

: autaic_Open (PORTNO,AIC_BAUD_115200,NOPARITY,ONESTOPBIT)

Note

When COM Port is opened successfully, function returns 'AICA_OK'.

Please refer to the library manual for more details about error code or function.

4th Function of closing COM Port

: int autaica_Close (int PortNum);

Ex.

```
#include <₩indows.h>
#include <stdio.h>
#include "lib₩include₩Library.h"
#pragma comment(lib,"lib₩₩x64₩₩AiCALibrary.lib")

#define PORTNO 31

int main()
{
    int ret = 0;

    if (autaica_Open(PORTNO, AICA_BAUD_115200, NOPARITY, ONESTOPBIT) != AICA_OK)
    {
        printf("연결실패₩n");
        return -1;
    }
    printf("연결완료₩n");

    autaica_Close(PORTNO);

    return 0;
}
```

3.3 Continuous Mode

1st Operation parameter setting

: start drive speed, maximum drive speed, acceleration time, deceleration time

int autaica_SetInitDrvSet (int PortNum, char nNodeId, long lStartSpd, long lMaxSpd, int iAccTime, int iDecTime);

2nd CW continuous operation instruction

: int autaica_ContPulseCW (int PortNum, char nNodeId);

CCW continuous operation instruction

: int autaica_ ContPulseCCW (int PortNum, char nNodeId);

Ex.

Settings

: start drive speed = 100, maximum drive speed = 25000, acceleration time = 100, deceleration time = 100

```
#include <Windows.h>
#include <stdio.h>
#include "libWincludeWLibrary.h"
#pragma comment(lib,"libWWx64WWAiCALibrary.lib")

#define PORTNO 31

int main()
{
    int ret = 0;

    if (autaica_Open(PORTNO, AICA_BAUD_115200, NOPARITY, ONESTOPBIT) != AICA_OK)
    {
        printf("Open FailWn");
        return -1;
    }
    printf("Open SuccessWn");

    long iStartSpeed = 100; //시작속도
    long iMaxSpeed = 25000; //최고속도
    int iAcctime = 100;     //가속시간(msec)
    int iDectime = 100;     //감속시간(msec)

    //시작속도, 최고속도, 가속시간, 감속시간 등록
    autaica_SetInitDrvSet(PORTNO, Node01, iStartSpeed, iMaxSpeed, iAcctime, iDectime);

    autaica_ContPulseCW(PORTNO, Node01);

    autaica_Close(PORTNO);

    return 0;
}
```

3.4 Program Mode

3.4.1 Program Control

- Program operation
  int autaica_PgmModeRun (int PortNum, char nNodeId);
- Pause
  int autaica_PgmPause (int PortNum, char nNodeId);
- Stop
  int autaica_PgmStop (int PortNum, char nNodeId);
- Delete program data
  int autaica_ DelPgmDelAll (int PortNum, char nNodeId);
- Delete program step data
  int autaica_PgmDelStep (int PortNum, char nNodeId, int nStepNo);

3.4.2 Program Operation

- ABS (absolute position move)
  int autaica_PgmABS (int PortNum, char nNodeId, int nStepNo, int ParaStartSpd, long StartSpd, int ParaMaxSpd, long MaxSpd, int ParaAccel, int Accel, int ParaDecel, int Decel, long lPos, BOOL SCurveEnable, int iSCurvTime, BOOL ContinueEnable);
- INC (Relative position move)
  int autaica_PgmINC (int PortNum, char nNodeId, int nStepNo, int ParaStartSpd, long StartSpd, int ParaMaxSpd, long MaxSpd, int ParaAccel, int Accel, int ParaDecel, int Decel, long lPos, BOOL SCurveEnable, int iSCurvTime, BOOL ContinueEnable);
- HOM (Home search)
  int autaica_ PgmHOM (int PortNum, char nNodeId, int nStepNo, int iHomeMode);
- ICJ (Input condition jump)
  int autaica_ PgmICJ (int PortNum, char nNodeId, int nStepNo, int nJumpStep, int nInputPtNo);
- IRD (Input wait)
  int autaica_ PgmIRD (int PortNum, char nNodeId, int nStepNo,int nInputPtNo);
- OPC (Output port ON/OFF)
  int autaica_ PgmOPC (int PortNum, char nNodeId, int nStepNo, int nOutPtNo, BOOL bOn);
- OPT (Output port ON pulse)
  int autaica_ PgmOPT (int PortNum, char nNodeId, int nStepNo, int nOutPtNo, int ParaOnTim, int iOnTim, BOOL bOn);
- JMP (Jump)
  int autaica_ PgmJMP (int PortNum, char nNodeId, int nStepNo, int nJumpStep);
- REP (Repeat start)
  int autaica_ PgmREP (int PortNum, char nNodeId, int nStepNo, int nRepCnt);
- RPE (Repeat end)
  int autaica_ PgmRPE (int PortNum, char nNodeId, int nStepNo);
- END (Program end)
  int autaica_ PgmEND (int PortNum, char nNodeId, int nStepNo);
- POS (Position set)
  int autaica_PgmPOS (int PortNum, char nNodeId, int nStepNo, long lPos);
- TIM (Ready)
  int autaica_PgmTIM (int PortNum, char nNodeId, int nStepNo, int ParaDelayTim, int DelayTim);

- CMP (Compare output)
  int autaica_ PgmCMP (int PortNum, char nNodeId, int nStepNo, int iCompareNo, int iCompMode, int iPulseWidth, long lPulsePeriod, long lPos);
- TOQ (Torque mode drive)
  int autaica_ PgmTOQ (int PortNum, char nNodeId, int nStepNo, int iTorque, int iTAccTime);

Ex.

Settings
: step number = 1, start drive speed = 1000, maximum drive speed = 5000, acceleration time = 100, deceleration time = 100, location to move = 50000, not use S type accel/deceleration, not use Continuation

```
#include <Windows.h>
#include <stdio.h>
#include "lib₩include₩Library.h"
#pragma comment(lib,"lib₩₩x64₩₩AiCALibrary.lib")

#define PORTNO 31

int main()
{
    int ret = 0;

    if (autaica_Open(PORTNO, AICA_BAUD_115200, NOPARITY, ONESTOPBIT) != AICA_OK)
    {
        printf("Open Fail₩n");
        return -1;
    }
    printf("Open Success₩n");

    int iStepNo = 1;
    int ParaStartSpd = 6;
    long StartSpd = 1000;   //시작속도
    int ParaMaxSpd = 6;
    long MaxSpd = 25000;    //최고속도
    int ParaAccel = 6;
    int Accel = 100;        //가속시간(msec)
    int ParaDecel = 6;
    int Decel = 100;        //감속시간(msec)
    long lPos = 50000;
    BOOL SCurveEnable = 0;
    int iSCurvTime = 0;
    BOOL ContinueEnable = false;

    autaica_PgmINC(PORTNO, NodeO1, iStepNo, ParaStartSpd, StartSpd, ParaMaxSpd, MaxSpd, ParaAccel, Accel,
        ParaDecel, Decel, lPos, SCurveEnable, iSCurvTime, ContinueEnable);
    iStepNo++;
    autaica_PgmEND(PORTNO, NodeO1, iStepNo);
    autaica_PgmModeRun(PORTNO, NodeO1);

    autaica_Close(PORTNO);

    return 0;
}
```

3.5 Position Mode

3.5.1 Absolute Position Move

1st Operation parameter setting
: start drive speed, maximum drive speed, acceleration time, deceleration time
int autaica_SetInitDrvSet (int PortNum, char nNodeId, long lStartSpd, long lMaxSpd, int iAccTime, int iDecTime);

2nd Location to move setting
autaica_SetInitPosition (PORTNO, Node01, lLocate);

3rd Absolute position move
int autaica_ABSMove (int PortNum, char nNodeId);

3.5.2 Relative Position Move

1st Operation parameter setting
: start drive speed, maximum drive speed, acceleration time, deceleration time
int autaica_SetInitDrvSet (int PortNum, char nNodeId, long lStartSpd, long lMaxSpd, int iAccTime, int iDecTime);

2nd Location to move setting
autaica_SetInitPosition (PORTNO, Node01, lLocate);

3rd Absolute position move
int autaica_INCMove (int PortNum, char nNodeId);

3.5.3 Position Override

1st Operation parameter setting
: start drive speed, maximum drive speed, acceleration time, deceleration time
int autaica_SetInitDrvSet (int PortNum, char nNodeId, long lStartSpd, long lMaxSpd, int iAccTime, int iDecTime);

2nd Location to move setting
autaica_SetInitPosition (PORTNO, Node01, lLocate);

3rd Position OVerride move
int autaica_OverrideMove (int PortNum, char nNodeId);

3.6 Torque Mode

1st Operation parameter setting

: start drive speed, maximum drive speed, acceleration time, deceleration time

int autaica_SetInitDrvSet (int PortNum, char nNodeId, long lStartSpd, long lMaxSpd, int iAccTime, int iDecTime);

2nd CW continuous operation instruction

: int autaica_TorqueCW (int PortNum, char nNodeId,int iRaiseTime,int iTorque);

CCW continuous operation instruction

: int autaica_TorqueCCW (int PortNum, char nNodeId,int iRaiseTime,int iTorque);

3.7 Home Search Mode

1st Set needed parameters for home search.

- Home search mode
  int autaica_SetInitHomeRunMode (int PortNum, char nNodeId, int iMode);
- Maximum drive speed
  int autaica_SetHomeMaxSpd (int PortNum, char nNodeId, long lHomeMaxSpd);
- Start speed
  int autaica_SetHomeStartSpd (int PortNum, char nNodeId, long lHomeStartSpd);
- Acceleration time
  int autaica_SetHomeAccTime (int PortNum, char nNodeId, int iAccTime);
- Deceleration time
  int autaica_SetHomeDecTime (int PortNum, char nNodeId, int iDecTime);
- Home search direction
  int autaica_SetHomeDir (int PortNum, char nNodeId, bool bDir);
- Home search offset
  int autaica_SetHomeOffset (int PortNum, char nNodeId, long lOffset);
- Home search position setting
  int autaica_SetHomePos (int PortNum, char nNodeId, long lPos);
- Torque setting
  int autaica_SetHomeTorque (int PortNum, char nNodeId, int iTorque);

2nd Input home search instruction

int autaica_HomeModeRun (int PortNum, char nNodeId);

Ex.

Settings

: home search mode = 3, maximum drive speed = 3000, acceleration time = 10, deceleration time = 10, torque = 50

```
#include <Windows.h>
#include <stdio.h>
#include "lib₩include₩Library.h"
#pragma comment(lib,"lib₩₩x64₩₩AiCALibrary.lib")

#define PORTNO 31

int main()
{
    int ret = 0;

    if (autaica_Open(PORTNO, AICA_BAUD_115200, NOPARITY, ONESTOPBIT) != AICA_OK)
    {
        printf("Open Fail₩n");
        return -1;
    }
    printf("Open Success₩n");

    int iMode = 3;
    long iHomeMaxSpeed = 3000;
    int iAccTime = 10;
    int iDecTime = 10;
    int iTorque = 50;

    autaica_SetInitHomeRunMode(PORTNO, Node01, iMode);
    autaica_SetHomeMaxSpd(PORTNO, Node01, iHomeMaxSpeed);
    autaica_SetHomeAccTime(PORTNO, Node01, iAccTime);
    autaica_SetHomeDecTime(PORTNO, Node01, iDecTime);
    autaica_SetHomeTorque(PORTNO, Node01, iTorque);

    autaica_HomeModeRun(PORTNO, Node01);

    autaica_Close(PORTNO);

    return 0;
}
```

4 Driving by I/O Control

Please refer to the user manual of AiCA.

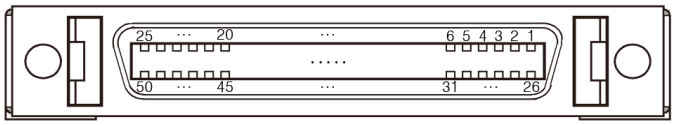
AiCA series has 4 types of driving mode and home search as following.

There are two ways to execute each driving mode that are using atMotion, PC program, and using input of input/output connector (CN4).

Drive mode name	Descriptions	MD0/HMD0 (13)	MD1/HMD1 (14)
Jog mode	Outputs drive while instruction input signal is ON to ±direction	ON	OFF
Continuous mode	Starts drive output when instruction input signal to ±direction turns on once, and stops it when the signal turns off.	OFF	ON
Program mode	Operates by the designated program.	ON	ON
Index mode	Designates and operates the one step among the saved instructions in the program	OFF	OFF
Home search	Operates home search	-	-

Note

I/O Connector (CN4)



Pin No.	I/O	Function	Pin No.	I/O	Function
1	-	N.C	26	Input	IN0
2	-	N.C	27	Input	IN1
3	Input	Reset	28	Input	IN2
4	Input	Start	29	-	N.C
5	Input	Stop	30	Input	IN3
6	Input	EMG	31	Input	IN4
7	Input	Step0/+Run/+Jog	32	Input	IN5
8	Input	Step1/-Run/-Jog	33	Input	IN6
9	Input	Step2/SSP0	34	Input	IN7
10	Input	Step3/SSP1	35	Input	IN8 / Brake ON/OFF※1
11	Input	Step4/MSP0	36	Input	VEX
12	Input	Step5/MSP1	37	Input	GEX
13	Input	MD0/HMD0	38	Output	Alarm
14	Input	MD1/HMD1	39	Output	Compare1
15	Input	Pause	40	Output	Compare2
16	Input	Servo On/Off	41	Output	OUT0
17	Input	Home	42	Output	OUT1
18	Input	Alarm Reset	43	Output	OUT2
19	Input	+Limit	44	Output	OUT3
20	Input	-Limit	45	Output	OUT4
21	Input	ORG	46	Output	OUT5
22	Input	SD	47	Output	OUT6
23	Output	In-Position	48	Output	OUT7
24	Input	VEX	49	Output	OUT8
25	Input	GEX	50	Output	OUT9

※1. Brake ON/OFF function is added for built-in brake type.

4.1 Jog Mode

When operating in jog mode, it is available to set start drive speed using pin-9, 10(SSP0, SSP1) and maximum drive speed using pin-11, 12 (MSP0, MSP1)

After finishing settings, it is available to rotate to CW direction and CCW direction using pin-7 (+Jog) and pin-8 (-Jog).

During operating in jog mode, turning on pin-5 (Stop) cannot stop the motor, but turning on pin-6 (EMG) can stop the motor as emergency stop.

4.2 Continuous Mode

When operating in continuous mode, it is available to set start drive speed using pin-9, 10(SSP0, SSP1) and maximum drive speed using pin-11, 12 (MSP0, MSP1)

After finishing settings, it is available to rotate to CW direction and CCW direction using pin-7 (+Run) and pin-8 (-Run).

During operating in continuous mode, turning on pin-5 (stop) can stop the motor, and turning on pin-6 (EMG) also can stop the motor as emergency stop.

4.3 Program Mode

Since program mode operates saved instructions with pin-4 (Start) on, there must be designated instructions in each step.

During operating in program mode, turning on pin-5 (Stop) stops the motor after finising operating step and turning on pin-4 (Start) operates the motor from the first step (0 step).

Turning on pin-15 (Pause) stops the motor after finising operating step and turning on pin-4 (Start) operates the motor from the next step continuously.

Tuning on pin-6 (EMG) can stop the motor as emergency stop.

4.4 Index Mode

During I/O control, turning off pin-13 (MD0/HMD0) and pin-14(MD1/HMD1) can operates the motor in index mode.

In this case, there must be designated instructions in each step, and it is available to select up to 64 steps (from 0 to 63 step) using pin-7 to 12 (step 0 to 5)

After all of this, turning on pin-4 (Strat) operates the motor in index mode.

4.5 Home Search Mode

During I/O control, pin-17 (Home) operates the motor in home search mode.

In this case, it is available to set to Home Mode 0 to 3 using pin-13 (MD0/HMD0) and pin-14 (MD1/HMD1).

Home search direction, accel/deceleration time, and maximum/start drive speed follow settings of “Home Serch Mode” parameter.

Make Life Easy : Autonics

* Dimensions or specifications on this manual are subject to change and some models may be discontinued without notice.