



三英精控

IMC-01 Controller

User Reference Manual

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Sanying MotionControl Instruments Ltd.

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The Chapter One Device Instruction

1.1 product description

The IMC-01 is a high modular integrated piezoelectric motor controller and driver, It can be used as a standalone single axis, or stacked as a compact multi-axis control system. It can drive a piezoelectric motor with a resolution as fine as 1 nm in open loop (motor dependent). The closed loop resolution is dependent on the resolution of the encoder.

The panel front and panel back are shown in Fig 1.1 and Fig 1.2:

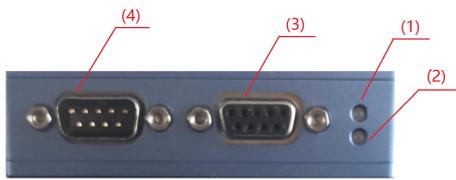


Fig 1.1 panel front

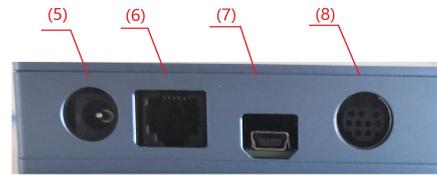


Fig 1.2 panel back

1. LED Error Indicator
 - Red – An error has occurred
2. LED Addressing Indicator
 - a. Red – Stage is Unaddressed
 - b. Green – Stage has an address
3. Motor/Axis Output, male D-SUB 9Pin Connector
4. Encoder Input, Female D-SUB 9 Pin Connector
5. Power Supply, +5VDC, Regulated
6. RS485 Intermodular Connector
7. USB Connector
8. I/O Connector

Encoder Input Pin-Out

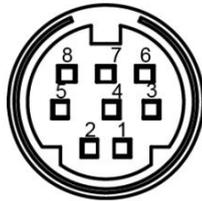
Pin	Color	Description
1	Brown	A+/Cos+
2	Red	B+/Sin+
3	Orange	Index +
4	Yellow	Ground
5	Green	+5V
6	Blue	A-/Cos-
7	Purple	B-/Sin-
8	Grey	Index -
9	Black	Not In Use

Motor Input Pin-Out

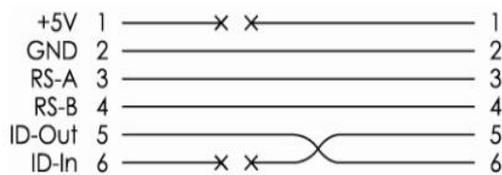
Pin	Description
1	Phase 1
2	Phase 2
3	N/C
4	Not In Use
5	Ground
6	Limit -
7	Limit +
8	+5V
9	Ground

8 Pin IO Connector

Pin8 - +5V
 Pin7 - IO1 (output only)
 Pin6 - IO2
 Pin5 - IO3
 Pin3 - IO4
 Pin4 - GND



RS-485 Intermodular Connector Cable Pin-out



The RS-485 intermodular connector cable is used to daisy chain two modules together. The cable is directional and its orientation should be noted when configuring axis numbers, for the direction of the cable will determine axis order. This connector can also be used to communicate with the controller in place of the USB connection by connecting your RS-485 Bus to pins 2, 3 and 4 as they appear below.

1.2 Features

- Integrated controller and driver
- Can be used as a single axis or stackable up to 99 axes
- Open loop or closed loop operation
- Open loop resolution of 1 nm
- Closed loop resolution dependent on the encoder
- A quad B encoder feedback
- USB2.0 interface (one interface for up to 99 axes)

- Dimension: 145 x 85 x 25(mm)

1.3 RS485 Bus

The RJ11 connector of RS485 intermodular connects directly to the same RS485 bus. The RS485 line needs a terminating resistor of 22k Ω or higher. This connector can be used to communicate with the Controller in the place of the USB connection.

1.4 Open loop/closed loop

The Controller has three different movement modes of operation. When executing a movement, the controller will drive a stage differently when set to different modes.

The first mode(Legacy Open Loop) is a traditional Open Loop. It follows a standard trapezoidal velocity characteristic. It bases the transition between acceleration, constant velocity and deceleration. This is entirely theoretical and does not guarantee a set trajectory or end point.

The second mode(Special Open Loop) is also open loop, however this one does not follow the standard trapezoidal velocity set by the user. Instead, it rounds off the velocity to an even number of servo clocks per transition. This causes the motor to sound much cleaner than the previous mode. However it does sacrifice accuracy.

The third mode (Closed Loop) is a traditional closed loop. The controller will constantly try to achieve an ideal trapezoidal velocity characteristic. Like the previous mode it can guarantee position final within the specified deadband.

1.5 Package Contents

The Piezo motor system includes the following components:

- IMC-01 Controller
- Power Supply
- USB Cable
- One User Manual
- One U Disk For storing Software

Carefully remove the items from the package. Report any damage or missing items immediately by phone (+86 022-22977677) or e-mail (info@symc-tec.com).

1.6 Controller Installation

1.6.1、 Place the controller on a hard flat surface

1.6.2、 Connect the male D-SUB(9-pin)piezo motor cable to the Motor Input

1.6.3、 Connect the female D-SUB(9-pin) encoder adapter cable to the Encoder Input if this controller provide encoder,the other side of that cable to encoder head

1.6.4、 Connect USB cable to USB Connector ,the other side of that cable to PC

1.6.5、 Connect the controller to a 5V, regulated power supply included in your order.Each Controller requires 1A. If powering a stack; add up the amperage requirements of the

individual controllers to determine the necessary power supply for the stack

1.6.6、 See the COM Port assigned to the Controller int the device manager after powering up

1.7 Software Installation

There are two procedures for Software Installation:

- 1、 Install USB driver. The installation file can be found in U-disk/driver. Please refer to appendix B for details.
- 2、 Install control software. Installation file can be found in U-disk/bin/Setup.exe. Double click Setup.exe, follow instructions to complete the installation.

The controller software requires pre-installation of Microsoft .NET Framework 4.0. If that component hasn't been installed in your PC yet, please find the installation file in U-disk/bin/Microsoft.NET Framework 4.exe. Double click and install it.

The Chapter Two Software Operation Instruction

2.1 Software start-up interface

This section will describe the capabilities of the controller program and give you a brief understanding of how to use it, the star-up interface of controller is shown in Fig 2.1. The bottom area of interface is used to connect controller. The center of interface is used for status displaying. The top of interface is used for parameters setting and moving curve.

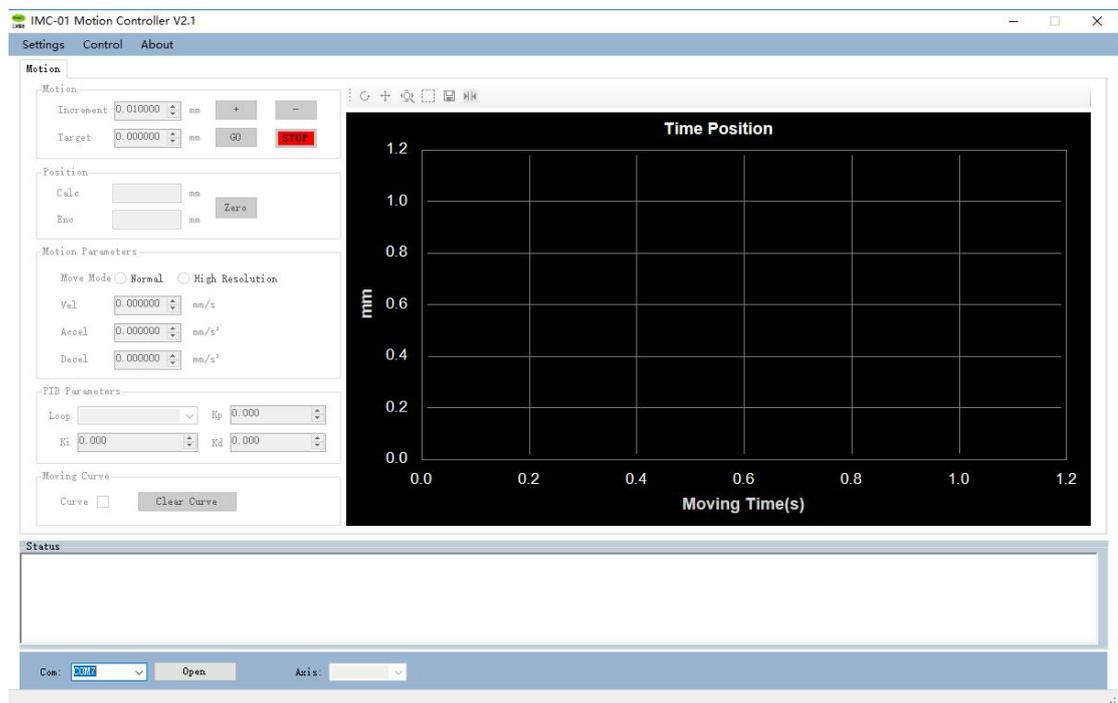


Fig 2. 1 Software start-up interface

2.2 Connect Controller

You need to connect the controller through a serial port before doing anything. The device manager detects the new hardware but cannot assign the serial number to the controller if the driver is not installed, so you need install the USB driver firstly and set the serial port parameters as follows:

Serial Port Parameter	Setting
Baud rate	38400
Data Bits	8
Stop Bits	1
Parity	No
Handshake	No

Please select the serial port number assigned by the system to the controller, then click "Open" button in Fig2.2 to connect controller and enumerate all axes attached to this controller at the same time; The button name will change from "Open" to "Close" and the status area will display: "COM7:Open Success", Axis field will list all axes enumerated if connection is successful; otherwise status area will display "COM7:Open Fail".

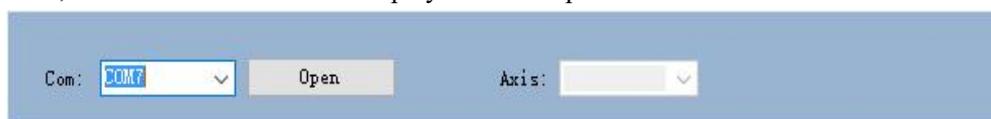


Fig 2. 2 connect



Fig 2. 3 connect success

2.3 Status

"Connection phase" Display the connection status such as: Begin to Scan Axis, and the number of axes enumerated, etc.



"Motion phase" Display whether reach the position of positive or negative soft limit or not.

2.4 Motion Parameters

- "Move Mode" This field indicates the moving mode. Normal set low resolution, high resolution can move in nanometer scale
- "Vel" This field indicates the controllers current set value for velocity
- "Accel" This field indicates the controllers current set value for acceleration
- "Decel" This field indicates the controllers current set value for acceleration

2.5 Open Or Closed Loop

- "Loop" This field allows you to choose 3 different modes of motion

- “Kp”- Proportional Gain for closed loop
- “Ki”- Integral Gain for closed loop
- “Kd”- Differential Gain for closed loop

2.6 Motion And Moving Curve

This section allows you to control movement of a stage attached to your controller:

- “Target” - This field shows the target for an absolute move that will be executed upon pressing the adjacent ‘GO’ button
- “STOP” - This button will execute an Emergency Stop
- “Increment” This field indicates the amount of displacement a relative move will travel upon pressing one of the adjacent ‘-’, ‘+’ buttons
- “Curve” This button will control to display curve.
- “Clear Curve” - This button will clear curve data.

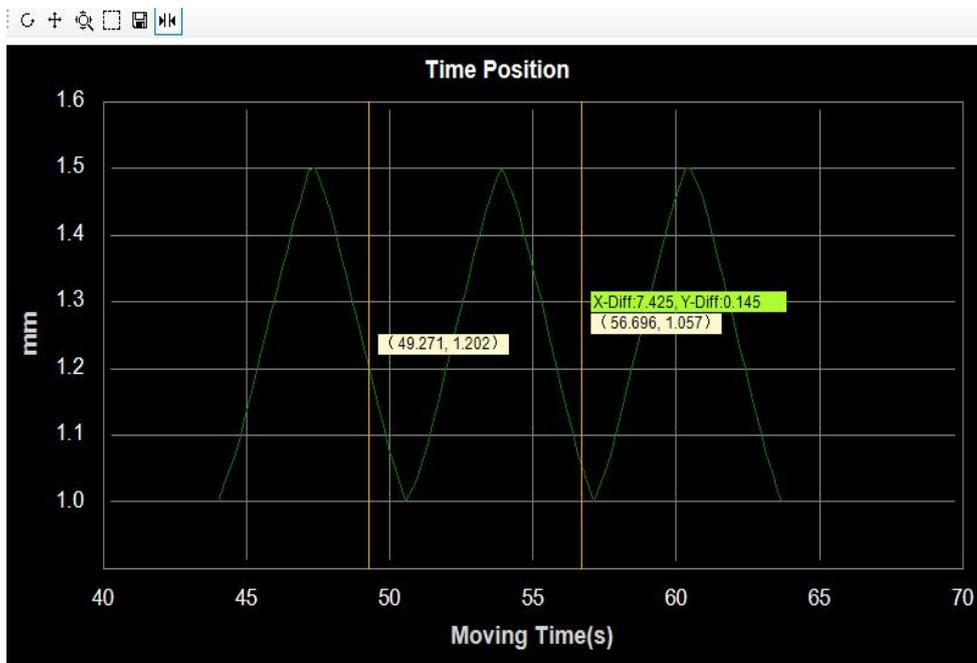


图 2.4 Moving Curve

Table 3.1 Function description of toolbar buttons

	Change curve display to default status
	Select the curve in the window, hold left button of the mouse and move it, the position of the curve will be changed
	Allows the users to zoom in the X-axis and Y-axis by placing and dragging the mouse over the axis of interest.
	To zoom the selected part of the curve
	Display or hide the cursor. Cursor can be dragged and moved.
	Save the curve data

2.7 Position

- “Calc” This is the calculated position based on the number of steps
- “Enc” This is the feedback position of encoder assuming one is attached
- “Zero” This button sets the current position to zero for both the calculated and encoder reading

2.8 System Interface

This section allows you to set motion parameters, encoder polarity, motor polarity and loop motion between two positions etc.

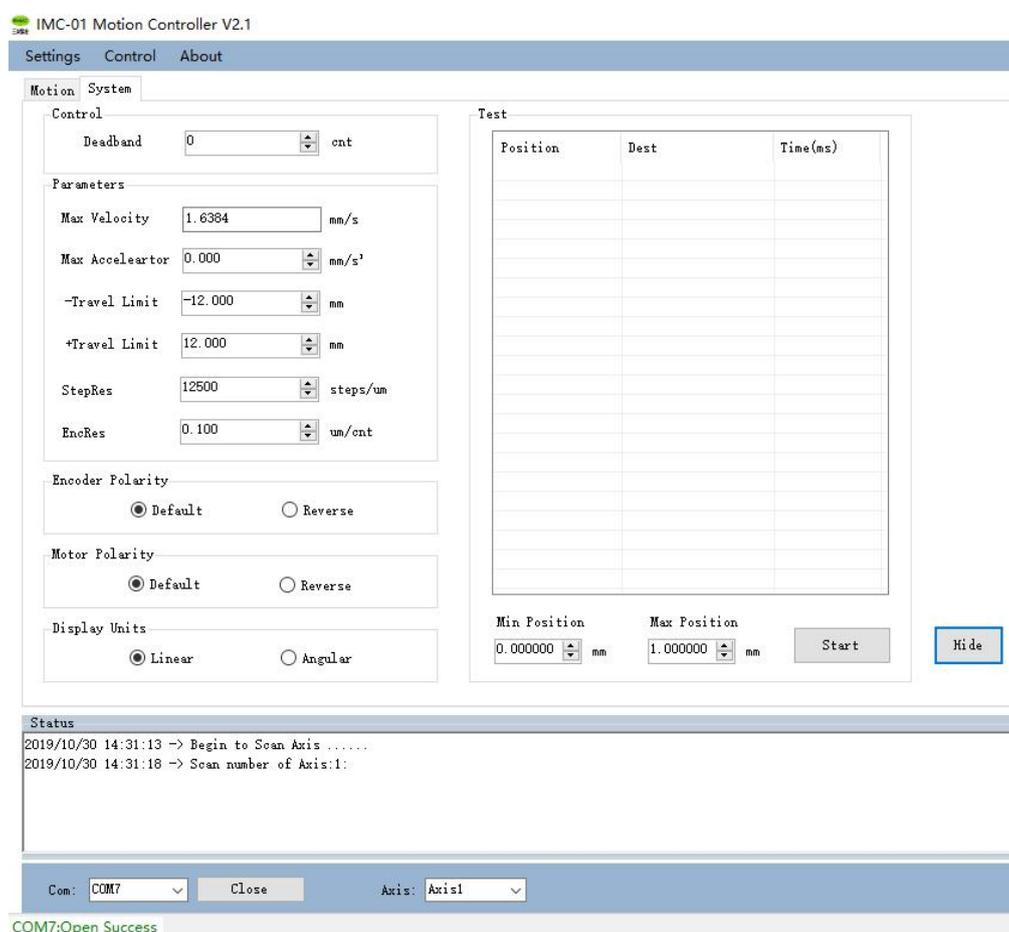


Fig 2.5 “System” interface

- “Deadband” This setting changes the amount of error the closed loop control mode will allow before trying to reposition
- “Max Velocity”- Maximum allowed Velocity
- “Max Accelerator” - Maximum Allowed Acceleration
- “-Travel Limit” - The soft travel limit in the negative direction

- “+Travel Limit” - The soft travel limit in the positive direction
- “StepRes” - Steps per micron resolution
- “EncRes” - Microns per encoder count

2.9 Polarity Settings

“Encoder Polarity” field allows you to flip positive and negative directions of the Encoder:

- “Default” This is the default encoder polarity
- “Reverse” This selection reverse encoder polarity,select this option

only if the direction of motion contrary to the direction of feedback

“Motor Polarity” field allows you to flip positive and negative directions of the Motor:

- “Default” This is the default motor polarity,the positive direction is away from motor;
- “Reverse” This selection will reverse motor polarity,the positive direction is toward

motor;

2.10 Test

“Max Position” – Set this value to the desired upper limit of travel

“Min Position” - Set this value to the desired lower limit of travel

“Start” This will execute the movements between limits

“Position” This column is position number of motion

“Dest” This column is the destination position for the move that is currently occurring.

“Time” This column indicates the time at which each move arrived.

2.11 Menu

“Settings” item allows you to handle current axis settings:

- “Save Current Axis Parameters to Flash” This sub-item can save current axis settings to FLASH;

- “Save Current Axis Parameters to File” This sub-item can save current axis settings to File;

- “Read Current Axis Parameters from File” This sub-item can load current axis settings from File ;

- “Axis Address Setting” This sub-item can set axis address、 change current axis address and set auto configured axis address;

- “System Other Parameters Setting” This sub-item can open “System” setting view.

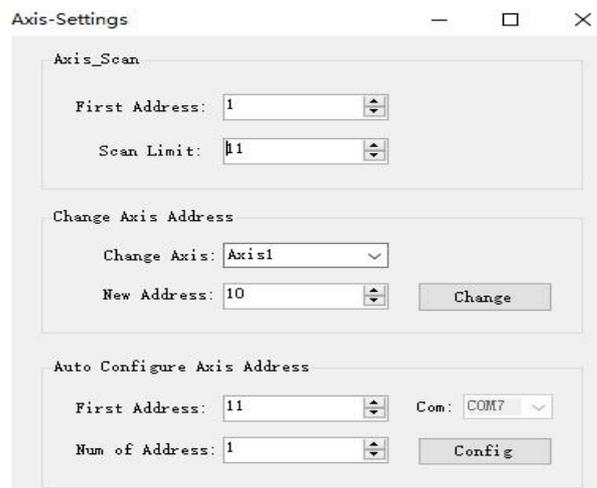


Fig 2. 6 axis address setting

“Axis_Scan” Group:

- “First Address” The first address to be scanned
- “Scan Limit” The number of addresses to be scanned

“Change Axis Address” Group:

- “Change Axis” The axis whose address will be changed
- “New Address” New axis address

“Auto Configure Axis Address” Group:

- “First Address” The first address to be configured
- “Num of Address” The number of addresses to be configured
- “Com” The serial number of controller
- “Config” Begin to configure addresses

“Control” item can set sync move an home:

- “Sync” This sub-item can set synchronized move;
- “Home+” This sub-item can set home in positive direction;
- “Home-” This sub-item can set home in negative direction;

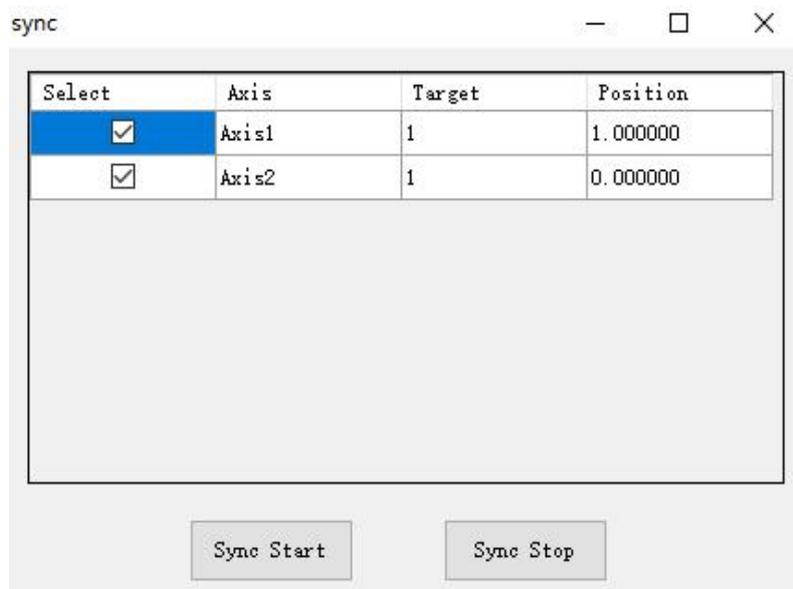


Fig 2.7 “Sync Motion”

“Select” column can select axis of motion synchronous ;”Target” column can set target position;”Position” can display current position.”Sync Start” begin to move synchronously;”Sync Stop” stop motion synchronous.

“About” item allows you to view software version and Company’s website

Appendix A: Controller Specifications

Number of axis:	1-99 axes
Processor frequency	168MHz
Servo Cycle:	10 kHz
Communication interface:	USB 2.0
Software:	Sanying control software
	User SDK
Software Platform:	Window XP/7/8/10
Dimension:	L:145mm W:84mm H:25 mm
Supply:	DC +5V

Appendix B: Install USB driver

You can run the CDM v2.08.30 WHQL Certified.exe program to install the USB driver automatically. You can also follow these steps to install the driver manually if the installation fails.

1. Open "Device Manager", right click "USB Serial Port", click " Update Driver Software..."



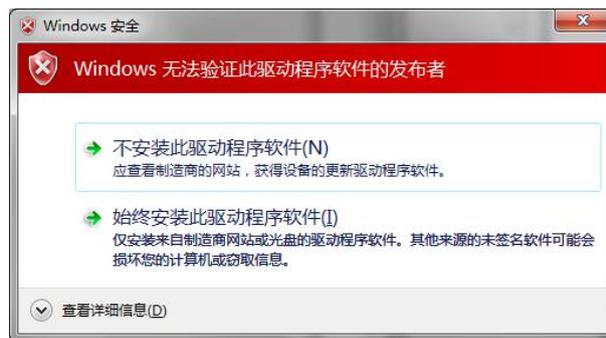
2. Click "Browse my computer for driver software"



3. Click "Browse", select the USB driver, click "OK", then click "Next"



4. If “Windows Security” appear, click “Install this driver software anyway”



5. Wait a moment, then the driver will be installed successfully.



Appendix C: Troubleshooting

Communication with controller does not work

※Check cable

The USB cable must be securely connected in the process of communication

※Check USB Driver

Please check if the USB driver has been installed properly. A new COM name will be shown in "Device Manager" if the installation is successful

※COM Be Used

Please check if other software is using the same COM,close that software using this COM.

Stage does not move.

※Cable not be connected properly

Please check if the motor cable or encoder cable is connected to the controller

Stage moves toward one direction in closed loop

※Cable Encoder Polarity

Please check if the feedback direction of the encoder is opposite to that of movement



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