NcEditor V12 Laser Cutting CNC System Manufacturer Manual

Version: 2023.07.10 2nd version
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Contents

1 CNC System Installation

This section introduces how to install **NcEditor V12 Laser Cutting CNC System**, including the following:

- Install Hardware
- Install Software
- Install Driver
- Optional: Install a Camera

1.1 Install Hardware

This section introduces how to install hardware of **NcEditor V12 Laser Cutting CNC System**.

Before installing hardware, do the following:

- Check Configuration
- Mounting Dimension

To install hardware, do the following:

- Connect Hardware
- Install Motion Control Card

To get details of wiring inside hardware, see Wiring Diagram of Terminal Board, Wiring Diagram of the Drive and Wiring Diagram of Laser Device.

1.1.1 Check Configuration

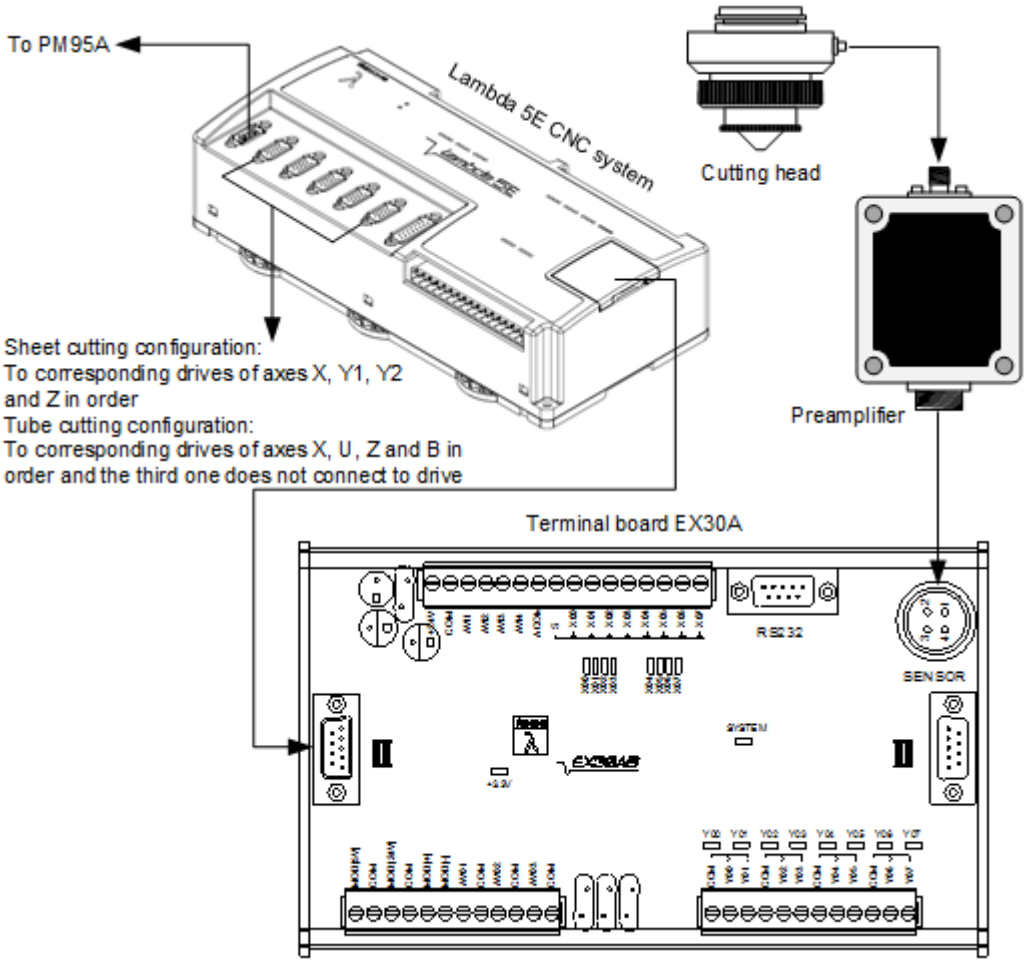
To check whether the hardware that you have received is complete and correct, see the following list:

- PM95A motion control card
- Lambda 5E terminal board
- EX30A terminal board (in position loop control mode) / EX33A terminal board (in velocity loop control mode)
- EX31A terminal board (optional when exchanging workbench)
- SE001 follow-up amplifier
- Two DB9M/F communication cables
- One radio frequency cable
- One M16 tow cable with 4-core air plug
- WHB05S wireless handwheel / WHB05L wireless handwheel

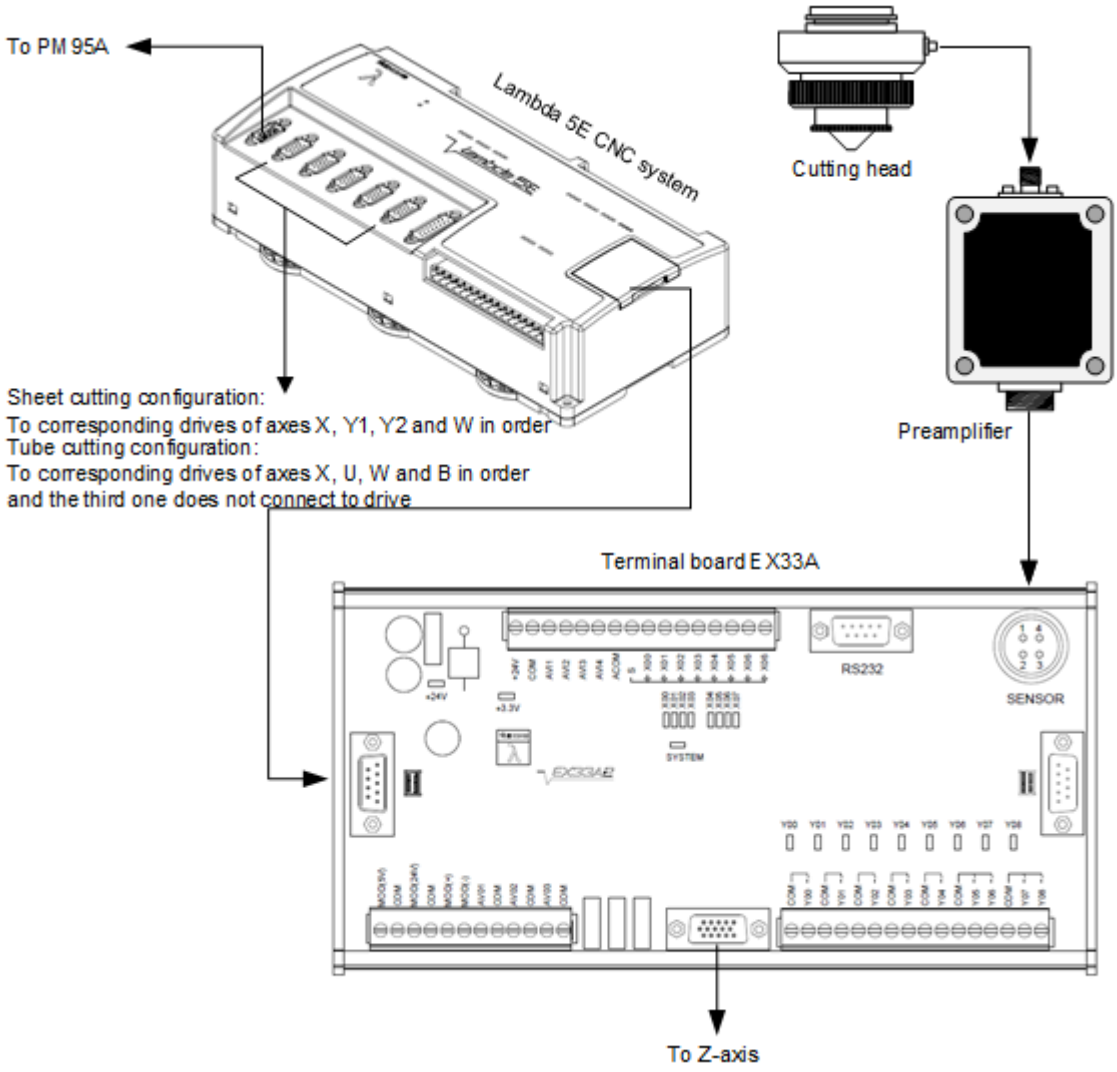
1.1.2 Connect Hardware

To connect hardware, see the following wiring diagrams:

- In position loop control mode

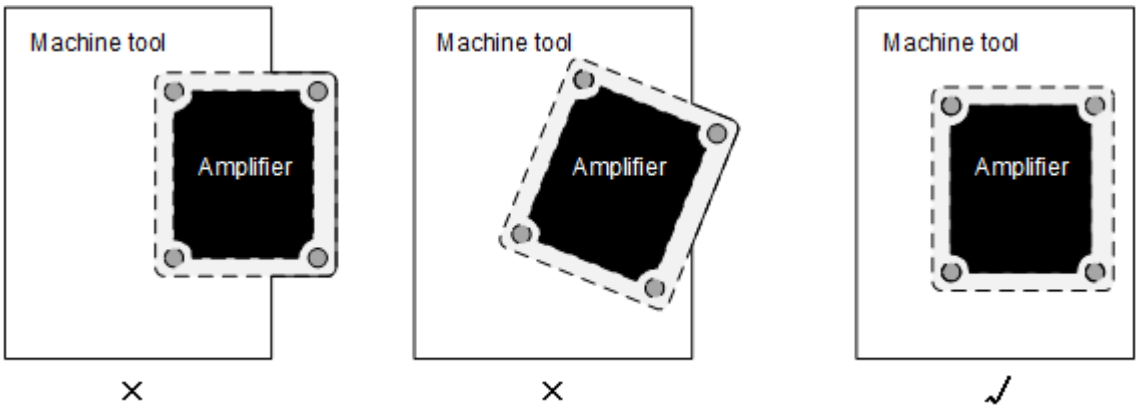


- In velocity loop control mode



W-axis refers to the focus axis and B-axis refers to the rotation axis. To avoid being confused with Y-axis in plane cutting configuration, Y-axis in tube cutting configuration is U-axis.

When installing the follow-up amplifier, you need to ensure the outer metal part of the amplifier surface is well installed on the machine tool because its coat is used to shield all signals that interfere internal circuit. Mounting diagram is as follows:



1.1.3 Install Motion Control Card

NcEditor V12 Laser Cutting CNC System uses PM95A motion control card to mate with NcEditor software, so as to control laser cutting rapidly and accurately.

Before installing motion control card, check whether the computer meets the requirement according to the following list:

- CPU: basic frequency 1G or above
- Memory: above 1G
- Hard disk: above 20G
- Display adapter: 1024*864 at least (longitudinal resolution ≥ 864)
- Display: above VGA 14"
- CD-ROM: 4X or higher (optional)
- Main board extension slot: 1 or more PCI/PCIE slot

To install motion control card, do the following:

1. Power off the host computer and open the computer case.
2. Insert the motion control card into the PCI/PCIE slot.
3. Tighten the mounting screw and lid the computer case.
4. Restart the computer.

If NcEditor software cannot be run normally after the motion control card and Driver are installed, turn off the computer and check the connecting finger:

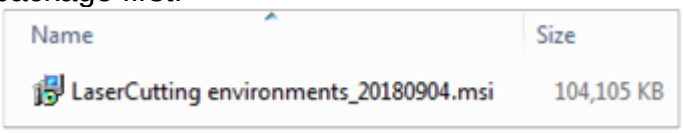
- If it is not clean, clear it with an eraser.
- If it is clean, change the motion control card.

1.2 Install Software

This section introduces how to install software of **NcEditor V12 Laser Cutting CNC System**, hereinafter referred to as NcEditor software.

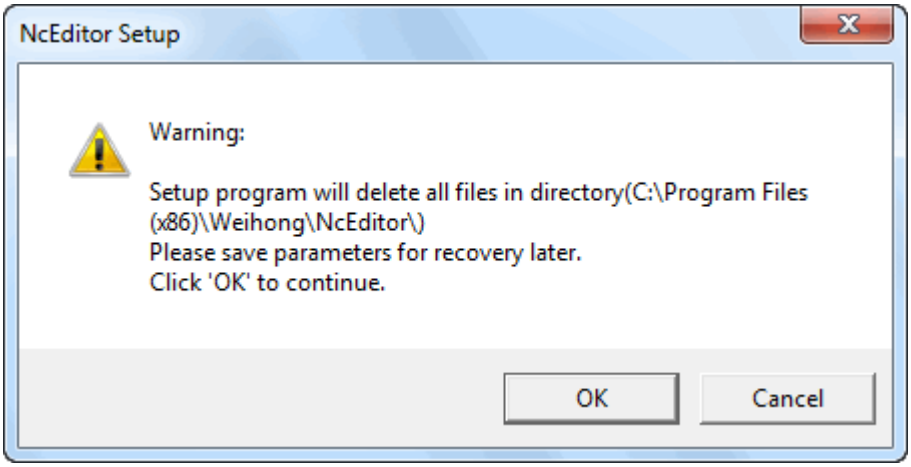
Before installing the software, note the following:

- There must be a D disk in your computer, otherwise the installation will fail.
- NcEditor software is installed under directory *C:\Program Files\Weihong\NcEditor* by default.
- If it is your first time to install the software, you need to install the basic environment package first:

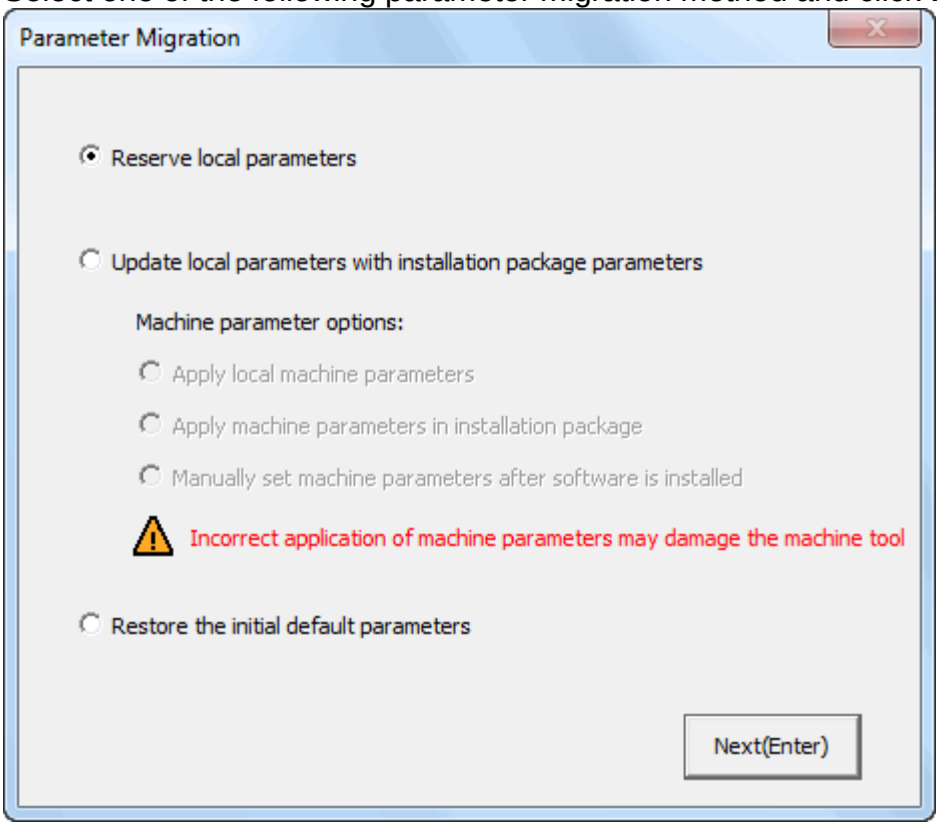


To install the software, do the following (If it is your first time to install the software, skip steps 6 and 7):

1. Copy the installation package to your computer.
2. Unzip the installation package and double click  . **NcEditor Setup** dialog box pops up.
3. According to the prompt, select the display language between Chinese and English.
4. According to the prompt, click **Yes** to start to update the system.
5. **Optional:** Close the running NcEditor software when a prompt **Waiting for closing NcEditor** pops up.
6. According to the prompt, click **OK** to delete files of the old version software and avoid interfering the installation of the new version software.



7. Select one of the following parameter migration method and click **Next**:



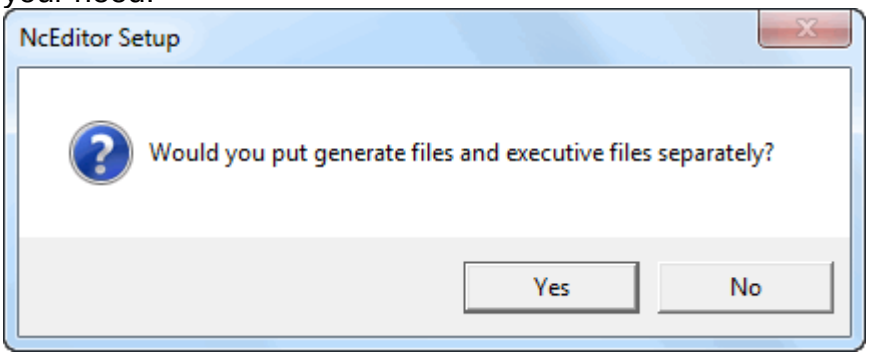
- **Reserve local parameters：** use all parameters at the local.
- **Restore the initial default parameters**: use initial parameters in the software.
- **Update local parameters with installation package parameters：** use application parameters in the installation package:
  - **Apply local machine parameters**: use machine tool parameters at the local.
  - **Apply machine parameters in installation package**: use machine tool parameters in the installation package.
  - **Manually set machine parameters after software is installed**: use initialized machine tool parameters.

  Machine parameters include the following:

- Double Y Origin Error (also called Double Y Gantry Initialization), Detect Double Y Origin
- Origin Capacitance of Z-axis
- Parameters related to calibration
- Screw Error Compensation, Backlash Compensation
- Absolute Encoder Datum Value

The system starts to install driver automatically. See Automatically Install Driver for details.

8. Select whether to put generated files and executive files separately according to your need.



9. According to the prompt, click **Yes** to reboot the computer at once.

If you need to uninstall the software, do the following:

1. Delete *NcEditor* folder under directory *C:\Program Files\Weihong*.
2. Delete *NcEditor* shortcut on the desktop.

1.3 Install Driver

This section introduces how to install driver to match the software with the hardware.

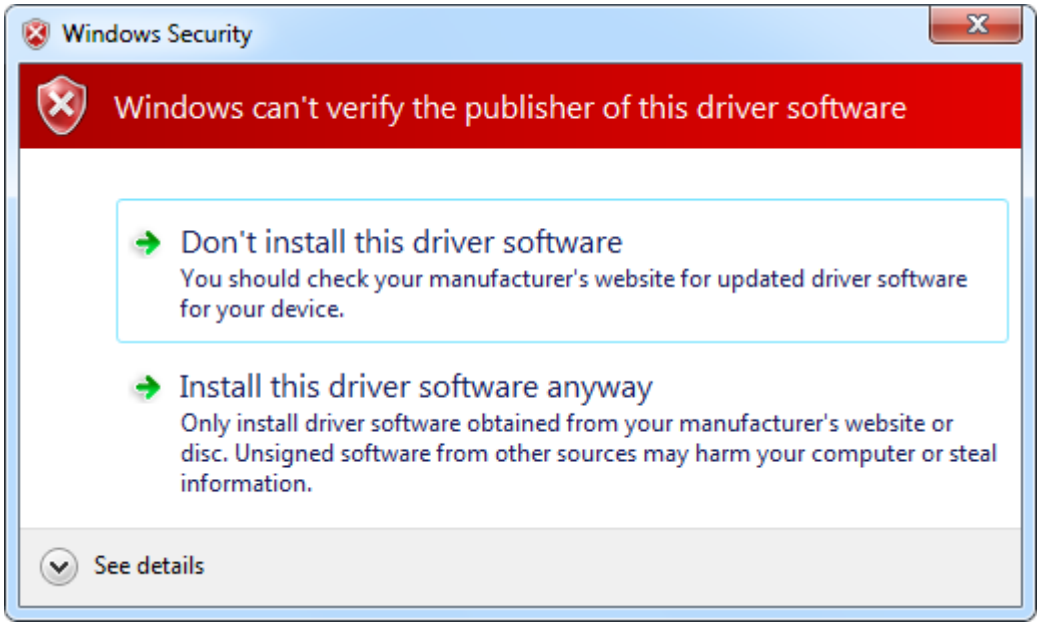
To install driver, do the following:

- Automatically Install Driver
- Manually Install Driver

During installing NcEditor software, the system automatically installs driver. If the system failed to automatically install driver, you can manually install it.

1.3.1 Automatically Install Driver

Taking Windows 7 as an example, during installing NcEditor software, **Windows Security** dialog box pops up:

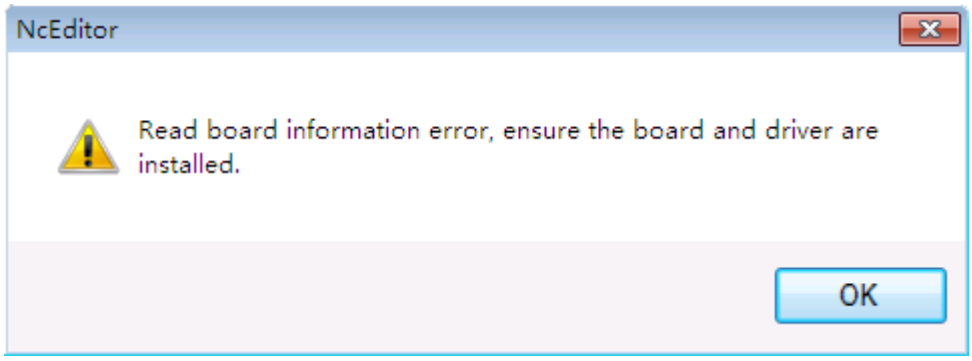


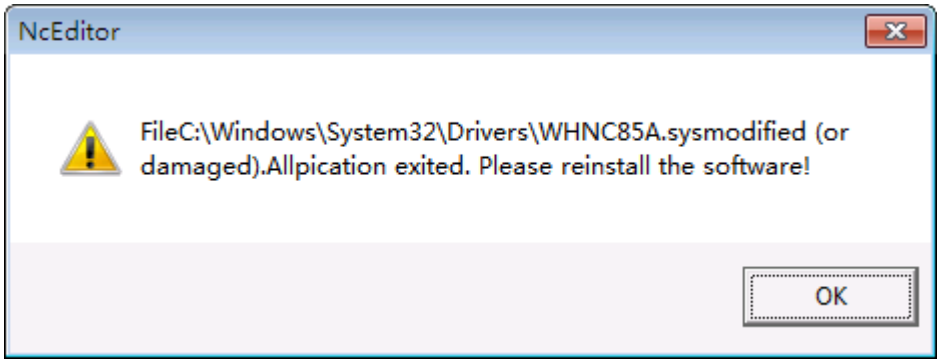
Click **Install this driver software anyway**.

After finishing installing NcEditor software, restart the software.

1.3.2 Manually Install Driver

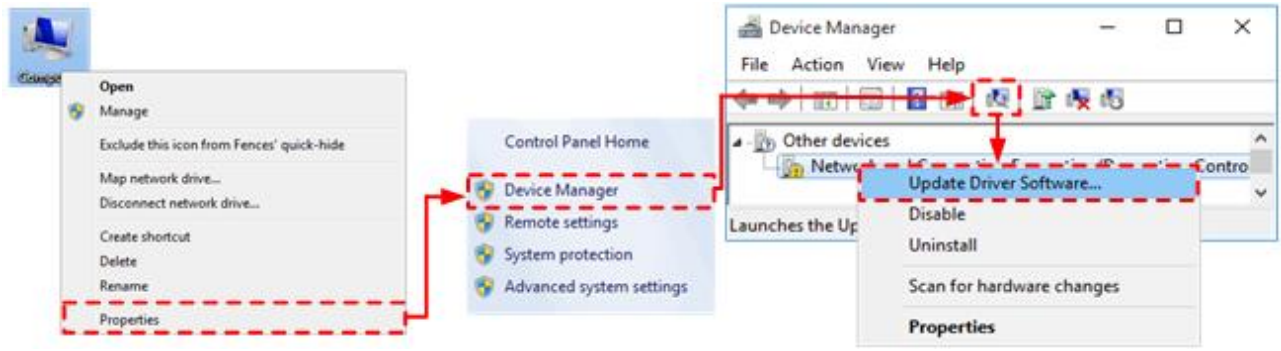
After installing NcEditor software and motion control card, if the software cannot be opened and one of the following dialog boxes pops up, it indicates that the system may fail to automatically install driver. After eliminating problems such as the motion control card loosens, you can manually install driver to solve the problem.



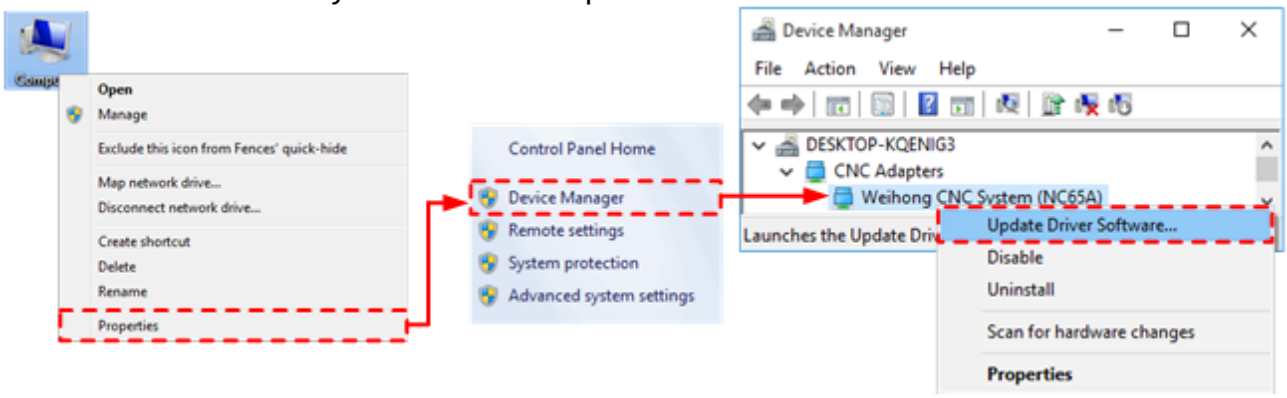


Taking Windows 7 as an example, to manually install driver, do the following:

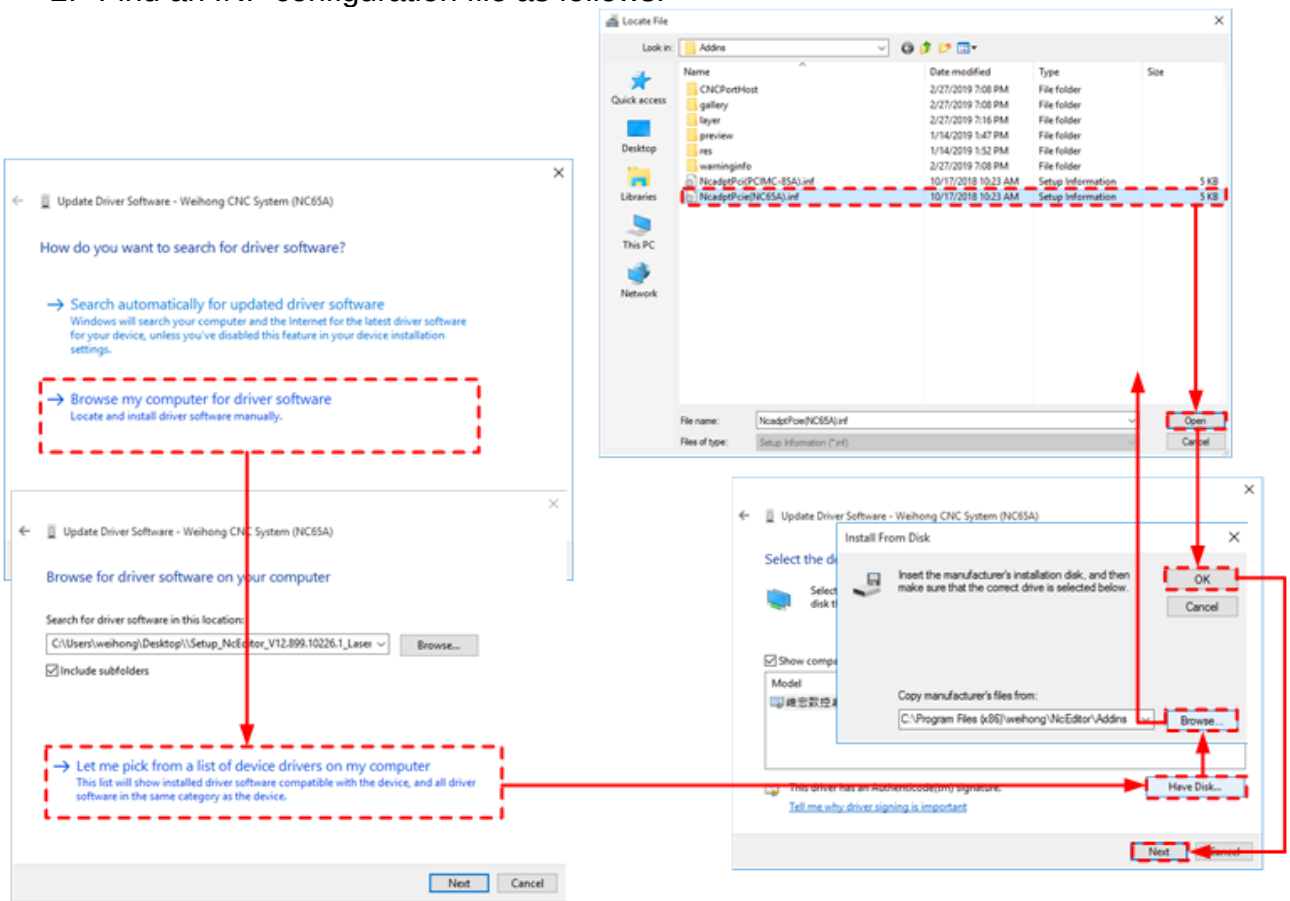
1. Open *Device Manager* and do one of the following:
    - If it is your first time to update the driver:



- If it is not your first time to update the driver:

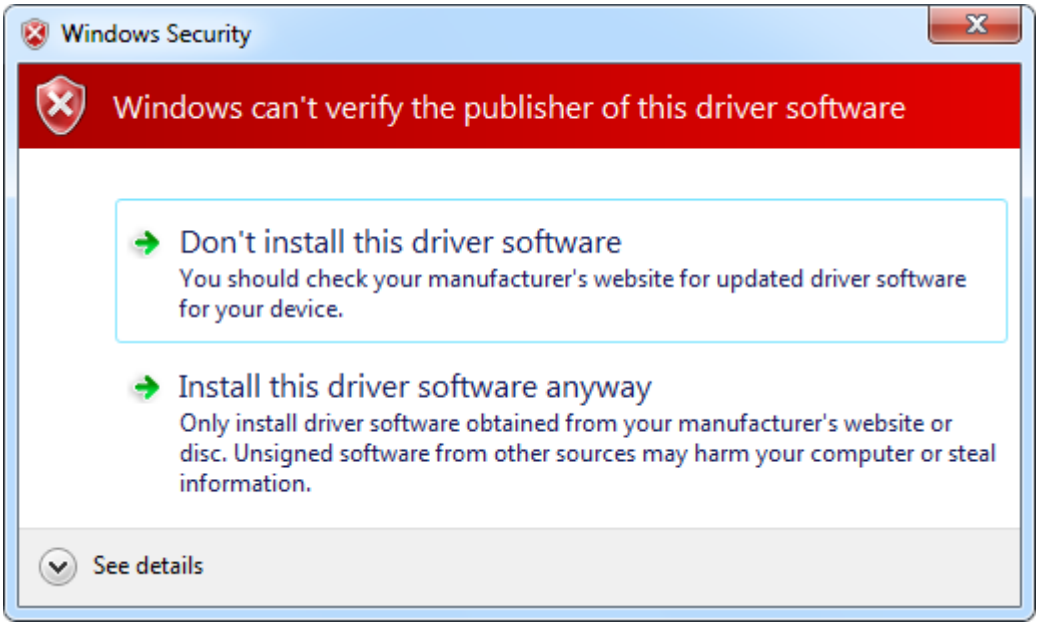


2. Find an INF configuration file as follows:



The folder is under directory *C:\ProgramFiles\Weihong\NcEditor\Addins*.

3. Click **Install this driver software anyway** in **Windows Security** dialog box:

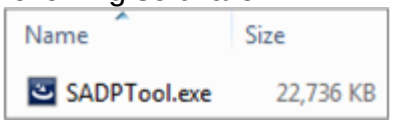


1.4 Install a Camera

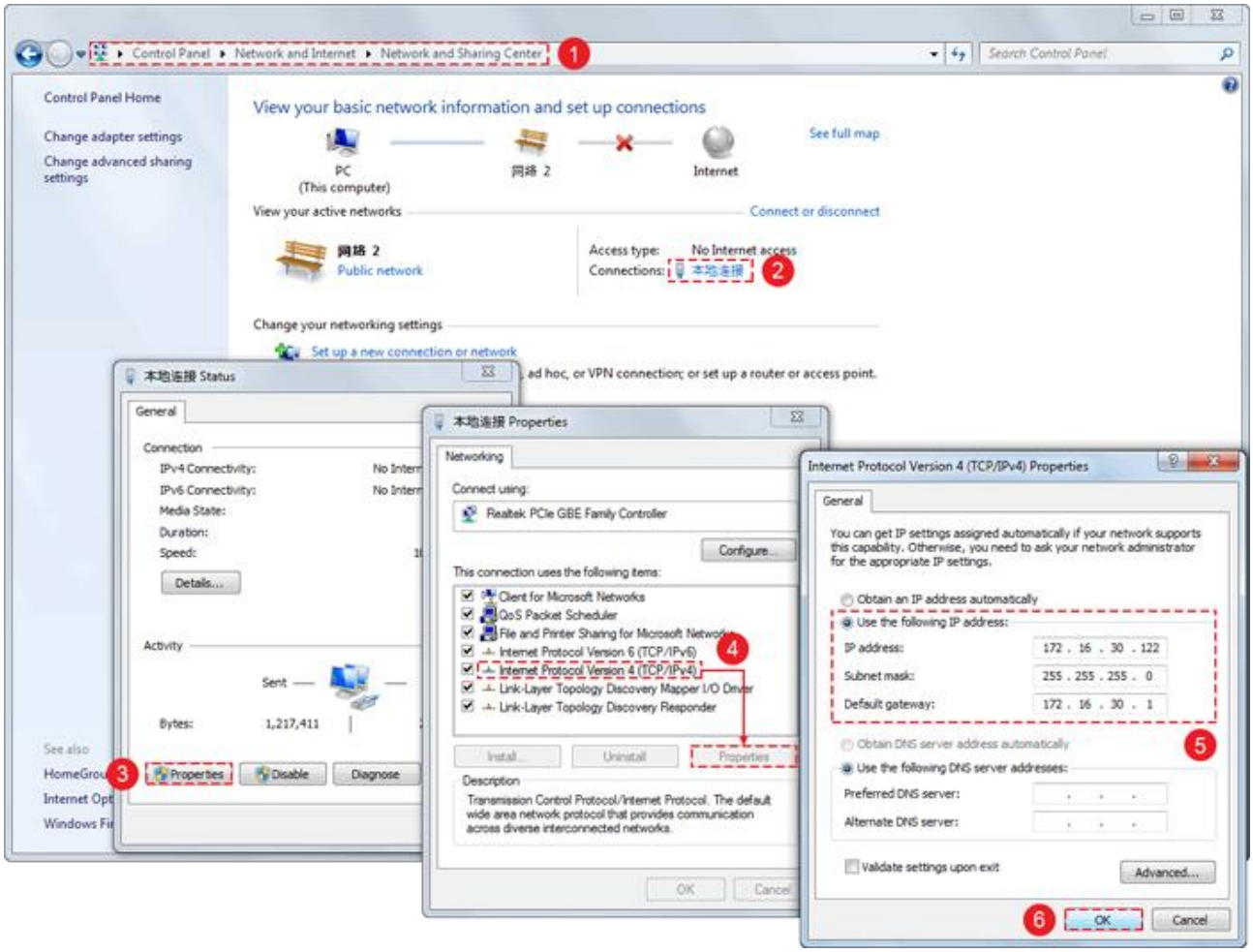
This section introduces how to install a camera and enable camera function, so as to monitor the machining condition and control machining.

To install a camera, do the following:

1. Link at most two cameras to the computer.
2. To get IP address, port, subnet mask and default gateway of the camera, install the following software:



3. To link the camera and the computer, set the computer address according to the information of the camera:



The first three parts of IP address, subnet mask and default gateway should be the same with those of the camera, and the last part of IP address should be different from that of the camera.

After installing a camera, you need to enable camera function by modifying the value of parameter **Enable Camera** to **Yes**.

2 Interface Overview

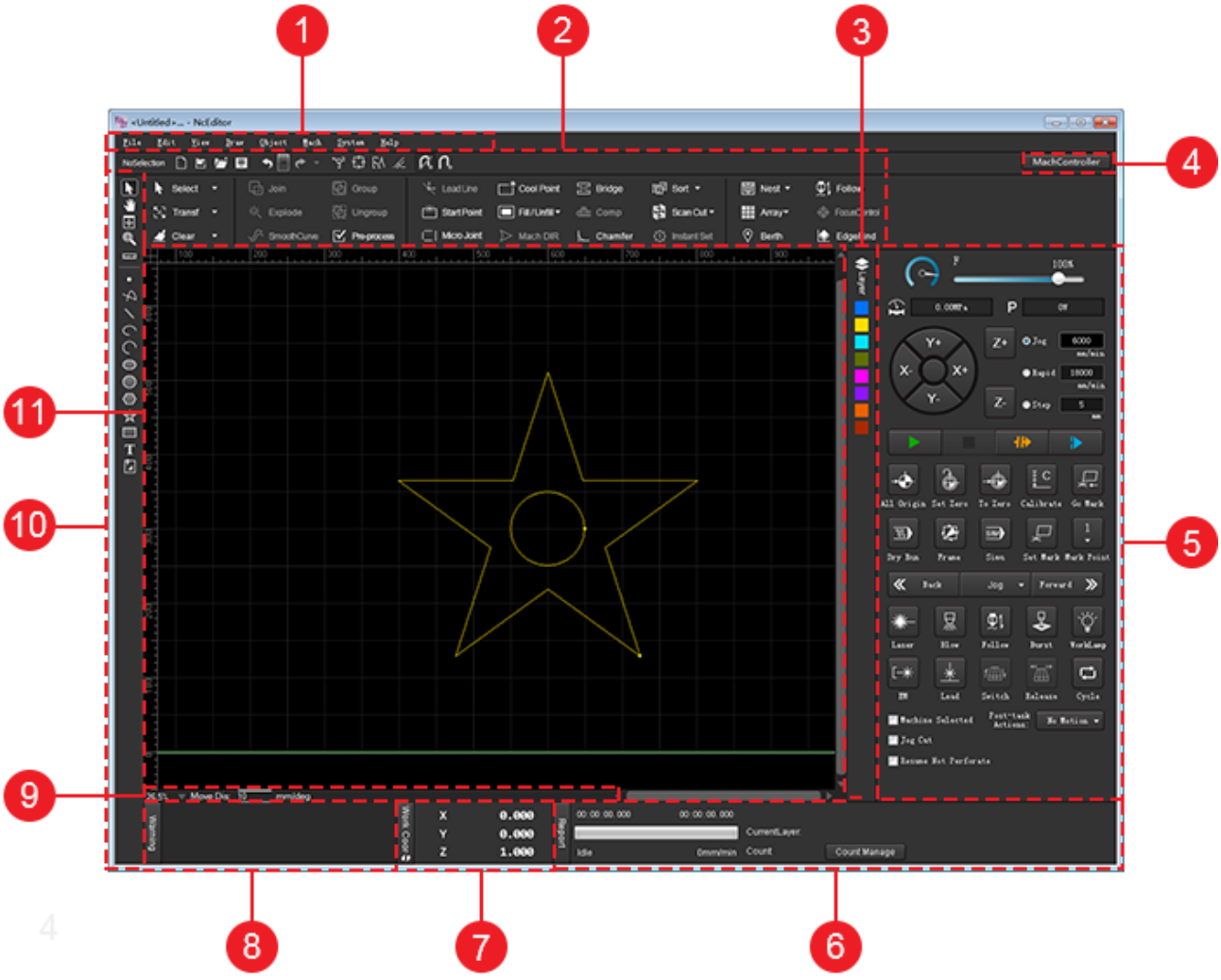
NcEditor V12 Laser Cutting CNC System includes the following interfaces:

- Interface of Sheet Cutting Configuration
- Interface of Tube Cutting Configuration

2.1 Interface of Sheet Cutting Configuration

Used to cut sheets.

It is shown as follows:



1. Menu bar
2. Common Tool Bar
3. Layer Tool Bar
4. Window Display Button
5. Machine Control Area
6. Running Report Bar
7. Axis Coordinate Display Area
8. Alarm Bar
9. Status Bar

10. Drawing Tool Bar
11. Drawing Window

2.1.1 Common Tool Bar

It is used to show frequently used instructions.

-  : New
  Used to create a new file.
-  : Import
  Used to import a/an G/NC/DXF/DWG/PLT/ENG file.
-  : Open
  Used to open a NCE file.
-  : Save
  Used to save a toolpath file.
  A new file is saved as a NCE file.
-  : Undo
  Used to go back a previous state.
-  : Redo
  Used to recover canceled operations.
-  : Show order
  Used to show the machining order and hide it by clicking the button again.
-  : Show direction
  Used to show the machining direction and hide it by clicking the button again.
-  : Highlight unclosed objects
  Used to mark all unclosed objects with special color or symbols.
-  : Clear trace
  Used to clear the machining trace.
-  : Catch
  Used to enable/disable catching function.
-  : Catch option

Used to catch option.

-  : Select objects
Used to select unclosed objects, tiny objects, all objects of the same layer, inner objects, outer objects, similar objects.
-  : Transform objects
Used to translate objects, rotate objects, mirror objects vertically or horizontally.
-  : Do clearing
Used to clear some set technics.
-  : Combine objects
Used to open **Combine** dialog box and combine objects.
-  : Explode objects
Used to trim the toolpath.
-  : Smooth polylines
Used to make polylines flat and even.
-  : Group objects
Used to bind several objects.
-  : Ungroup objects
Used to separate the grouped objects.
-  : Preprocess
Used to open **Instant Pre-process** dialog box when several target objects are selected and preprocess with one click.
-  : Set a lead line
Used to open **Set** dialog box and set a lead line.
-  : Set start point
Used to set the start point of the lead line. If there is no lead line, the system starts machining from the start point by default.
-  : Execute micro joint
Used to open **Micro Joint** dialog box and set related parameters.

-  : Add cooling points
Used to open **Cooling Point** dialog box and add cooling point.
-  : Set fill or unfill
Used to set fill or unfill.
-  : Change machining direction
Used to open **Set Machining Direction** dialog box and set it.
-  : Bridge objects
Used to open **Bridge** dialog box and bridge objects.
-  : Compensate kerf
Used to open **Kerf Compensation** dialog box and compensate the kerf.
-  : Add chamfer
Used to open **Chamfer** dialog box and compensate the kerf and add chamfers.
-  : Sort machining order
Used to set the machining order.
-  : Set scan cutting
Used to replan the toolpath to find the most efficient path for machining by turning laser on/off, so as to avoid unnecessary tool lifting and feeding and improve machining efficiency.
-  : Execute instant setting
Used to set fill/unfill, lead line, machining direction, machining order and kerf compensation with one click.
-  : Nest objects
Use to select a nesting method.
-  : Execute array
Use to select rectangular array, circle array and circle fill.
-  : Set berth point
Use to set the berth point as the workpiece origin.

-  : Set follow-up
  Used to open **Follow-up Control** dialog box. See

Follow-up for details.

-  : Control focus
  Used to open **Focus Control** dialog box.
-  : Find edges
  Used to open **Edge Finding** dialog box.

2.1.2 Layer Tool Bar

It is used to specify a layer and open **Layer Setting** dialog box so as to set general parameters and technics for the layer.

2.1.3 Window Display Button

It is used to show/hide the machine control area.

See Machine Control Area for details.

It is shown as follows:

2.1.4 Machine Control Area

It includes the following:

- Feed Override Control Bar
- Pressure and Power Check Bar
- Manual Control Area
- Common Operation Buttons
- Machining Control Area
- Machining Selection Area

2.1.4.1 Feed Override Control Bar

It is used to control current feed speed by adjusting current feed override.

It is shown as follows:

The relationship among current feed speed, current feed override and set feed speed is as follows:

Current feed speed = Current feed override * Set feed speed

To adjust feed override, do one of the following:

- Drag the slider.
- Repeatedly click on the target position on the slider.
- Click the slider and press ↑/↓ or **PgUp**/**PgDown** on the keyboard.

2.1.4.2 Pressure and Power Check Bar

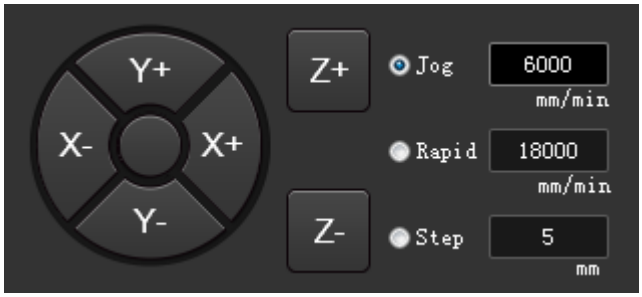
It is used to check the cutting pressure and power of the laser.

It is shown as follows:

2.1.4.3 Manual Control Area

It is used to manually move the machine tool.

It is shown as follows:



- Axis direction buttons
  Used to move each axis towards positive or negative direction.
  Note: Please do not click an axis direction button too frequently because the system needs a certain time to execute the command.

- Feed mode button
  Used to select among the following feed modes:
  - To switch to low-speed jog mode, click **Jog**. The machine tool moves at the jog speed when you click an axis direction button or several axis direction buttons and stops when you release it or them.
    You can change the jog speed in the input box. The default jog speed is 6000mm/min.
  - To switch to rapid-speed jog mode, click **Rapid**. The machine tool moves at the jog speed when you click an axis direction button or several axis direction buttons and stops when you release it or them.
    You can change the jog speed in the input box. The default jog speed is 18000mm/min.
  - To switch to step mode, click **Step**. The machine tool moves the step size when you click an axis direction button.
    You can change the step size in the input box. The default customized step size is 5mm.
    Note: The step size should not be too large to avoid damage due to misoperation.

2.1.4.4 Common Operation Buttons

It is used to execute the following common operations:

-  : All to origin
  Used to return all axes to the machine origin.
-  : Set workpiece origin
  Used to set the workpiece origin.
-  : Workpiece origin
  Used to control the cutting head to return to the workpiece origin.

-  : Calibrate
  Used to set a follow-up height.
-  : Return mark
  Used to return the position of the selected mark point. You should select the target mark point by clicking the button **Mark Point** in the machine control area.

2.1.4.5 Machining Control Area

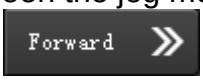
It includes the following:

-  : Start
  Used to start machining from the beginning.
-  : Stop
  Used to stop machining.
-  : Breakpoint position
  Used to locate the exact interrupted position when the power interruption or e-stop occurs and the workpiece origin is secured.
  When you need resume machining from the exact interrupted position but cannot determine the security, you should click the button. And before clicking the button **Breakpoint resume**, ensure the cutting head is on the right position.
-  : Breakpoint resume
  Used to resume machining from the exact interrupted position when the power interruption or e-stop occurs and the workpiece origin is secured.
  Related parameter: **Retract for Breakpoint Resume**.
-  : Dry run
  Used to run the machine tool without turning on related ports about laser and machining. There is no actual machining.
-  : Cut frame
  Used to confirm the machining range by running the system along the frame of the toolpath.
- 

: Simulation
  Used to execute simulation to check the toolpath in real-time.
-  : Mark coor
  Used to mark the coordinate of the current point.
- 

: Mark point
  Used to set the current points as the mark point 1 ~ mark point8.

- 

: Jog
Used to switch between the jog mode and step mode by clicking ▼.
In **Jog** mode, press 

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and the machine tool does not stop moving until you release it.
In **Step** mode, press 

/ 

and the machine tool only moves according to the set step size.
- 

: Go forward
Used to control the machine tool to move forward along the toolpath.
- 

: Go backward
Used to control the machine tool to move backward along the toolpath.
- 
: Laser
Used to turn on/off the laser valve by pressing/releasing the button.
It is turned on automatically when machining starts.
- 
: Blow
Used to turn on the blow valve by clicking the button and turn it off by clicking the button again.
It is turned on automatically when machining starts and is turned off after the set time.
- 
: Follow-up
Used to turn on follow-up valve by clicking the button to keep the distance between the nozzle and the workpiece surface and turn it off by clicking the button again.
It is turned on automatically when machining starts.
- 
: Burst
Used to turn on the laser valve for a certain time.
It keeps on for the set burst time until it is turned off automatically.
- 
: Shutter
Used to manually turn on the laser shutter.
To eject laser light, first, turn on the laser shutter; then, open the laser valve.
- 
: Work light
Used to turn on the work light by clicking the button and turn it off by clicking the button again.
- 
: Lead light
Used to manually turn on the red light, which is a kind of guide light.
It is used to point out the position of laser on the sheet.

-  : Exchange workbenches
  Used to exchange workbenches, so as to improve the machining efficiency.
-  : Release
  Used to manually control the machine tool to release workbenches during exchanging workbenches.
-  : Cycle machining
  Used to open **Cyclical Machining** dialog box and set cycle machining.

2.1.4.6 Machining Selection Area

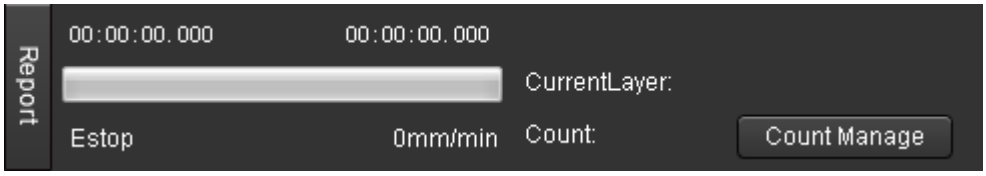
It includes the following:

- Machine Selected
  Used to execute machining, including machining, dry run, simulation, cutting frame, machining from the near point and breakpoint resume for the selected objects.
- Jog Cut
  Used to manually control the machine tool with laser on. Check it and then manually move the axis for a certain distance.
  When jog cutting ends, it is unchecked by default. The laser will not be automatically turned on during the next machining.
- Resume Not Pierce
  Used to execute breakpoint resume without piercing during cutting a thick sheet, so as to avoid damage to the sheet and effect on machining.
- Actions after Machining
  Used to select the actions after the machining ends including no motion, returning to the fixed point, returning to the workpiece origin and returning to the mark point.

2.1.5 Running Report Bar

It is used to show running status of the machine tool.

It is shown as follows:



You can do the following:

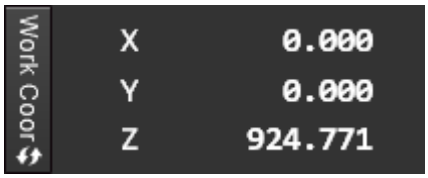
- Check the following:
  - Current machining time
  - Remaining machining time
  - Current system status
  - Current machining speed
  - Current machining layer
- Click **Count Manage** and enable counting machining function.
- Clicking **Report** and check the statistics.

2.1.6 Axis Coordinate Display Area

It is used to show the following:

- Workpiece coordinates

- Machine coordinates

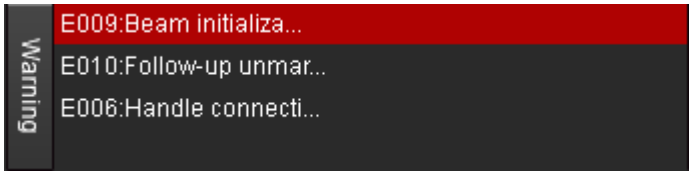


To switch between workpiece coordinates and machine coordinates, click **WorkCoor/MachCoor**.

After returning to the machine origin, sign appears before each axis.

2.1.7 Alarm Bar

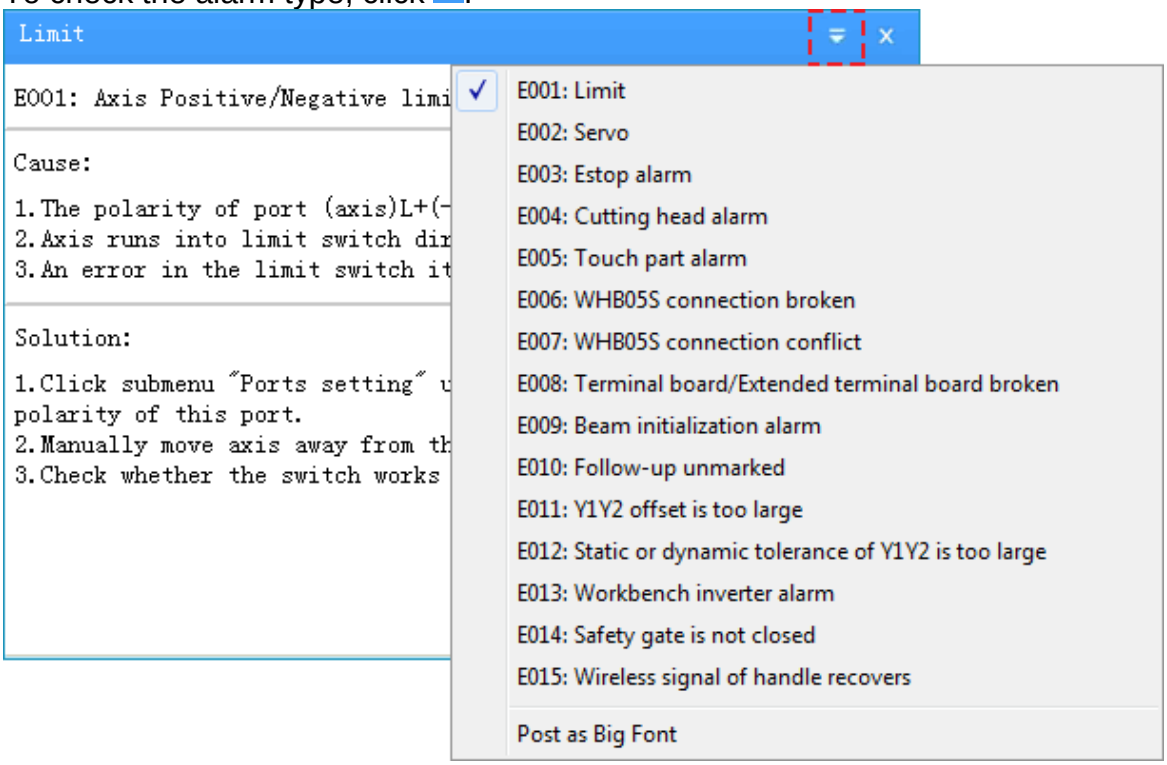
It is shown as follows:



It is used to check alarm information.

You can do the following:

- To check causes and solutions of alarms, click **Warning**.
- To check the alarm type, click .



2.1.8 Status Bar

It is used to show the following:

- Related information of current drawing objects: drawing steps and meaning, step result, tuning distance, etc.
- Tips during machining.

2.1.9 Drawing Tool Bar

It is used to draw all kinds of objects with drawing tools.

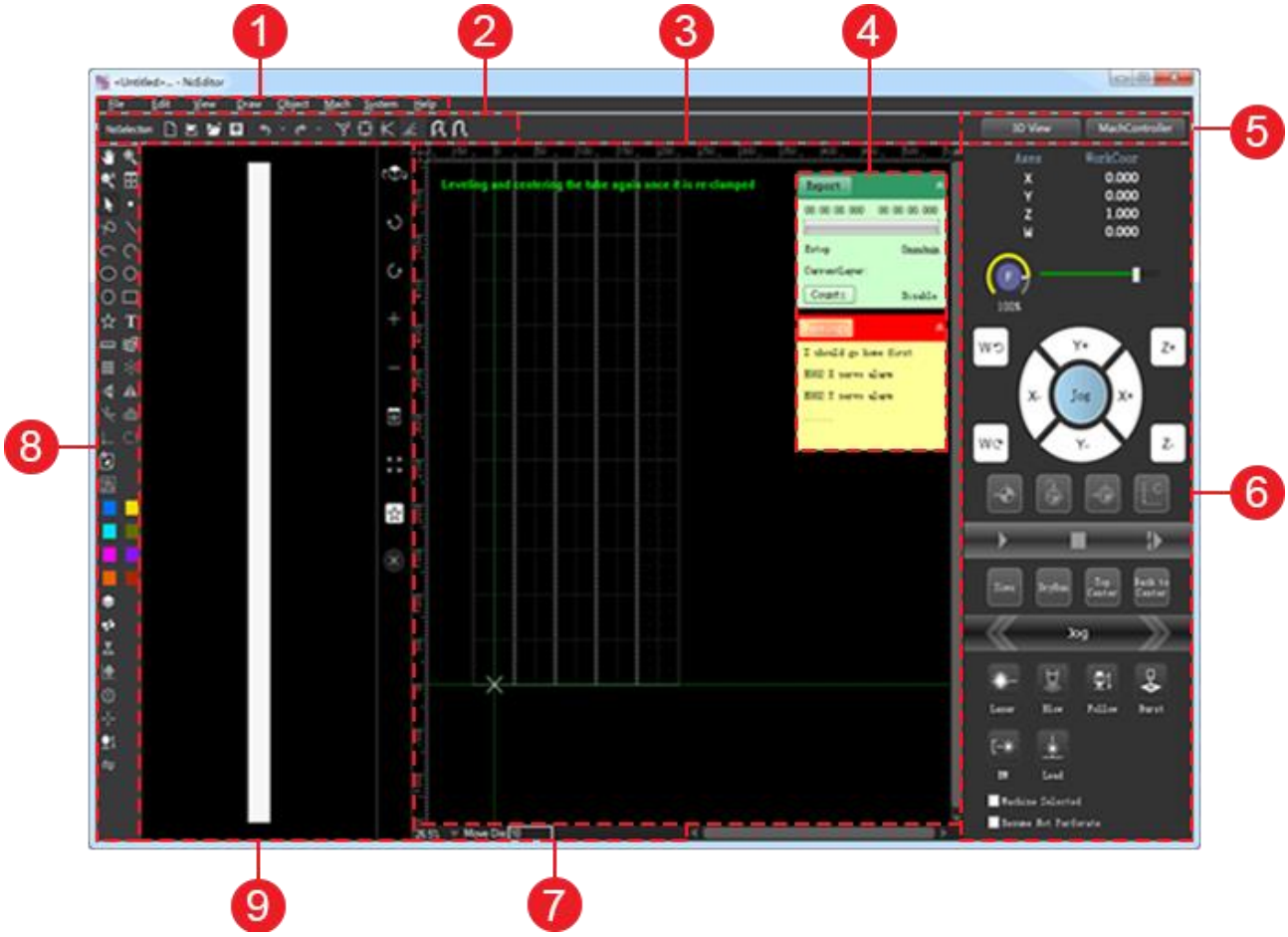
2.1.10 Drawing Window

It is used to draw and preview objects.

2.2 Interface of Tube Cutting Configuration

Used to cut tubes.

It is shown as follows:



1. Menu bar
2. Common Tool Bar
3. Drawing Window
4. Running Information Bar
5. Window Display Buttons
6. Machine Control Area
7. Status Bar
8. Drawing Tool bar
9. 3D View Area

2.2.1 Common Tool Bar

It is used to show frequently used instructions.

It differs in the number of selected objects:

- If no object is selected, it shows the following:
  -  : New
    Used to create a new file.

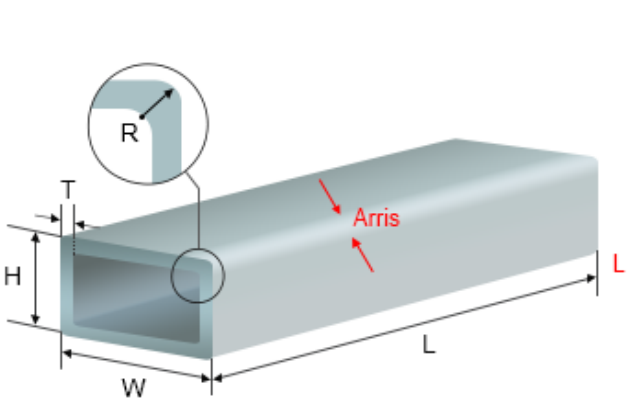
-  : Import
  Used to import a/an G/NC/DXF/DWG/PLT/ENG file.
-  : Open
  Used to open a NCE file.
-  : Save
  Used to save a toolpath file.
  A new file is saved as a NCE file.
-  : Undo
  Used to go back a previous state.
-  : Redo
  Used to recover canceled operations.
-  : Show order
  Used to show the machining order and hide it by clicking the button again.
-  : Show direction
  Used to show the machining direction and hide it by clicking the button again.
-  : Highlight unclosed objects
  Used to mark all unclosed objects with special color or symbols.
-  : Clear trace
  Used to clear the machining trace.
-  : Catch
  Used to enable/disable catching function.
-  : Catch option
  Used to open **Catch Option** dialog box and select feature points.

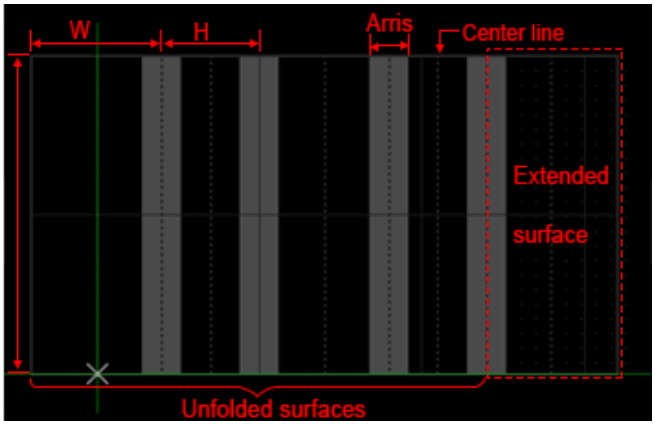
- If one or more objects are selected, it shows related information of the objects and the following buttons:
  -  : Preprocess
  -  : Group
  -  : Ungroup

2.2.2 Drawing Window

It is used to draw and preview objects.

In tube cutting configuration, the development effect of a rectangular tube shows in drawing window for ease of drawing:





- Length of an arris: depending on the corner radius and thickness of the rectangular tube.
- Extended face: corresponding to the first face of the actual tube.
- Center line: including face center line and arris center line. It exists on each face. When you drag the object, the center of the object automatically gets close to the center line.

2.2.3 Running Information Bar

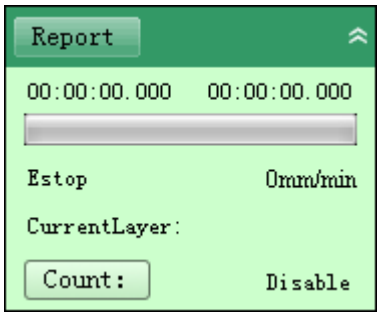
It is used to show running status and alarms of the machine tool.

It includes the following:

- Report Bar
- Alarm Bar

2.2.3.1 Report Bar

It is shown as follows:



You can do the following:

- Check the following:
  - Current machining time
  - Remaining machining time
  - Current system status
  - Current machining speed
  - Current machining layer
- Click **Count Manage** and enable counting machining function.
- Clicking **Report** and check the statistics.

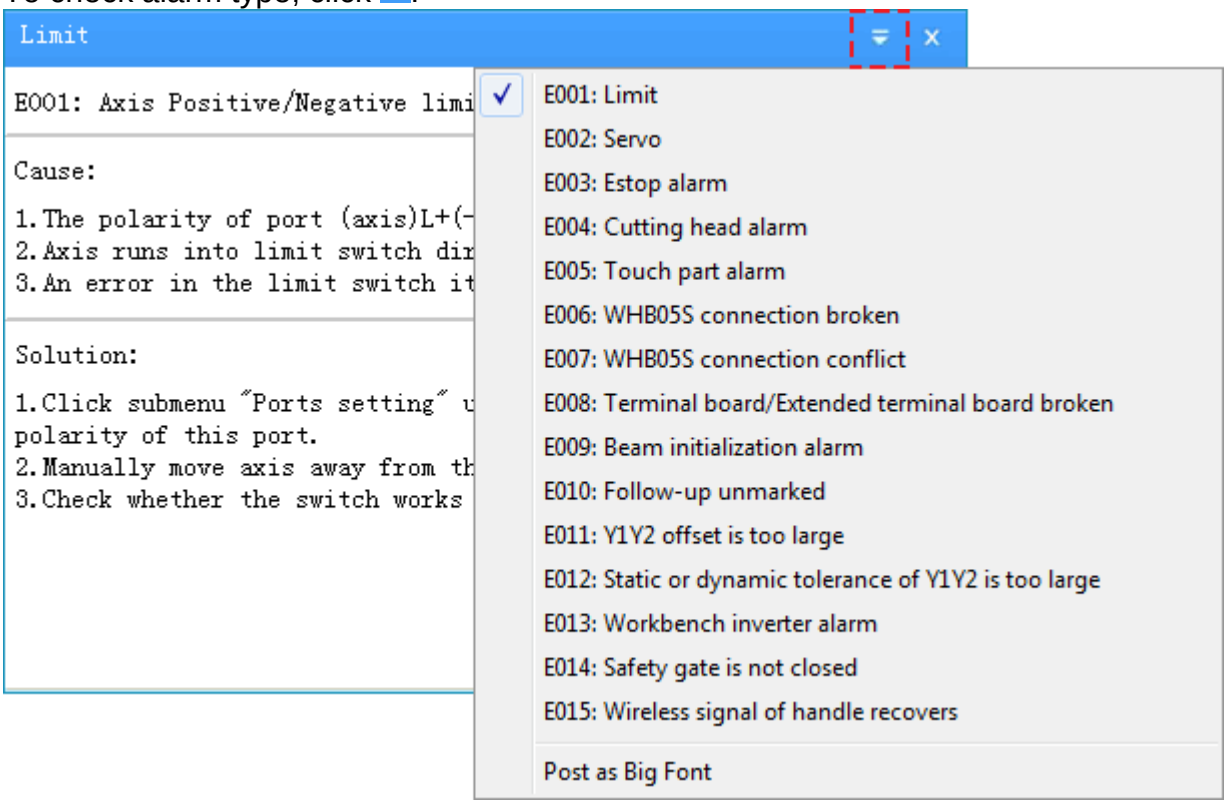
2.2.3.2 Alarm Bar

It is shown as follows:

It is used to check alarm information.

You can do the following:

- To check causes and solutions of alarms, click **Warning**.
- To check alarm type, click .



2.2.4 Window Display Buttons

MachController: show/hide machine control area

See Machine Control Area for details.

2.2.5 Machine Control Area

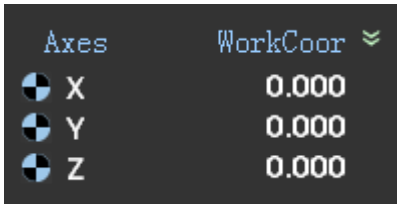
It includes the following:

- Axis Coordinate Display Area
- Feed Override Control Bar
- Manual Control Area
- Common Operation Buttons
- Machining Control Area
- Machining Selection Area

2.2.5.1 Axis Coordinate Display Area

It includes the following:

- Workpiece coordinates
- Machine coordinates



To switch between workpiece coordinates and machine coordinates, do one of the following:

- Click .
- Double click **WorkCoor/MachCoor**.

After returning to the machine origin, sign appears before each axis.

2.2.5.2 Feed Override Control Bar

It is used to control current feed speed by adjusting current feed override.

It is shown as follows:

The relationship among current feed speed, current feed override and set feed speed is as follows:

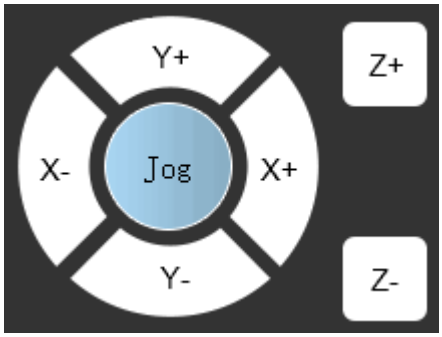
Current feed speed = Current feed override * Set feed speed

To adjust feed override, do one of the following:

- Drag the slider.
- Click on the target position on the slider repeatedly.
- Click the slider and press ↑/↓ or **PgUp/PgDown** on the keyboard.

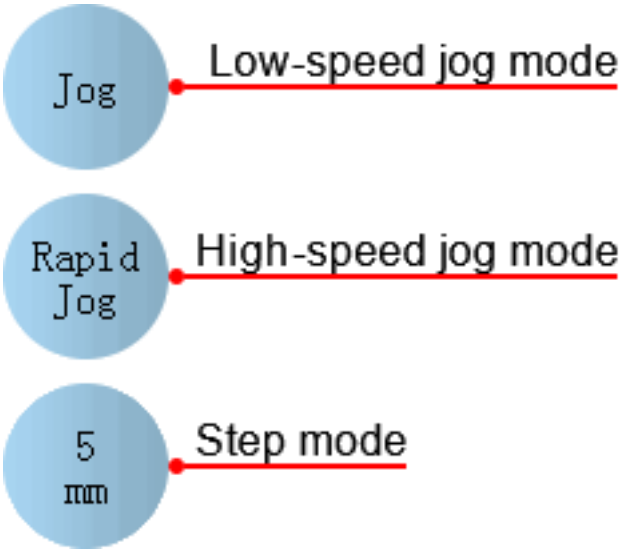
2.2.5.3 Manual Control Area

It is used to move the machine tool manually.



It includes the following:

- Axis direction buttons
  Used to move each axis towards positive or negative direction.
- Feed mode button
  Used to switch among the following feed modes by clicking the circular button in the middle:



- Jog mode
  Including low-speed jog mode and high-speed jog mode.
  Click an axis direction button. The machine tool moves at jog/rapid jog speed until you release the button.
  Click several axis direction buttons at the same time. The clicked axes move at the same time at jog/rapid jog speed.
- Step mode
  Click an axis direction button. The machine tool moves the customized step size.
  The default customized step size is 5mm. To customize the step size, double click the feed mode button. The value should not be too large to avoid damage due to misoperation.

Note: Please do not click an axis direction button too frequently because the system needs a certain time to execute the command.

2.2.5.4 Common Operation Buttons

It is used to execute the following common operations:

-  : All to origin
  Used to return all axes to the machine origin.
-  : Set workpiece origin
  Used to set the workpiece origin.
-  : Workpiece origin
  Used to control the cutting head to return to the workpiece origin.
- 

: Calibrate
  Used to set a follow-up height.

2.2.5.5 Machining Control Area

It includes the following:

-  : Start

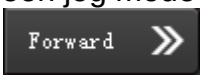
Used to start machining from the beginning.

-  : Stop
Used to stop machining.
-  : Breakpoint resume
Used to resume machining from the exact interrupted position when the power interruption or e-stop occurs and the workpiece origin is secured.
- 

: Simulation
Used to execute simulation to check the toolpath in real-time.
-  : Dry run
Used to run the machine tool without turning on related ports of laser and machining. There is no actual machining.
-  : Cut frame
Used to confirm the machining range by running the system along the frame of the toolpath file.
- 

: Leveling and centering
Used to adjust a tube to horizontal status and find the center line of certain face of the tube.
- 

: Return to center
Used to move each axis to return to the center position of the tube. W-axis turns to horizontal status and X-axis returns to the center line of the tube.
- 

: Jog
Used to switch between jog mode and step mode by clicking .
In **Jog** mode, press 

/ 

and the machine tool does not stop moving until you release it.
In **Step** mode, press 

/ 

and the machine tool only moves according to the set step size.
-  : Go forward
Used to control the machine tool to move forward along the toolpath.
-  : Go backward
Used to control the machine tool to move backward along the toolpath.
-  : Laser
Used to turn on/off the laser valve by pressing/releasing the button.
It is automatically turned on when machining starts.

-  : Blow
  Used to turn on the blow valve by clicking the button and turn it off by clicking the button again.
  It is turned on automatically when machining starts and is turned off after the set time.
-  : Follow-up
  Used to turn on follow-up valve by clicking the button to keep the distance between the nozzle and the workpiece surface and turn it off by clicking the button again.
  It is turned on automatically when machining starts.
-  : Burst
  Used to turn on the laser valve for a certain time.
  It keeps on for the set burst time until it is turned off automatically.
-  : Shutter
  Used to turn on laser shutter manually.
  To eject laser light, first, turn on the laser shutter; then, open the laser valve.
-  : Lead light
  Used to manually turn on the red light , which is a kind of guide light.
  It is used to point out the position of laser on the sheet.

2.2.5.6 Machining Selection Area

It includes the following:

- Machine Selected

Used to machine the selected objects, including machining, dry run, simulation, cutting frame, machining from the near point and breakpoint resume.

- Resume without Piercing
  Used to execute breakpoint resume without piercing during cutting a thick sheet, so as to avoid damage to the sheet and effect on machining.

2.2.6 Status Bar

It is used to show the following:

- Related information of current drawing objects: drawing steps and meaning, step result, tuning distance, etc.
- Tips during machining.

2.2.7 Drawing Tool bar

It is used to do the following:

- Draw objects
- Execute auxiliary editing operations
- Execute basic editing operations
- Set technics
- Set layers

2.2.8 3D View Area

It includes the following:

2.2.8.1 View Area

It is used to check the tube from different perspectives and preview cutting effect.

In this area, you can do the following:

- Press the left button:
  - To rotate the tube, drag the mouse left and right.
  - To move the tube, drag the mouse up and down.
- To zoom in/out the tube, scroll the mouse wheel.

2.2.8.2 View Toolbar

It includes the following:

-  : Switch view
  Used to observe a tube from different perspectives.
-  : Rotate CW
  Used to rotate the view in a clockwise direction.
-  : Rotate CCW
  Used to rotate the tube view in a counterclockwise direction.
-  : Zoom in
  Used to make the view appear larger.
-  : Zoom out
  Used to make the view appear smaller.
-  : Best view
  Used to adjust 3D view area to the best size, so as to check the toolpath effect.
-  : Maximize
  Used to maximize 3D view area and hide drawing window.
-  : Restore view
  Used to restore the maximized view to its previous size.
-  : Hollow out
  Used to show hollow-out-effect of objects, so as to check the cutting effect.
-  : Solid
  Opposite to  instruction.
-  : Instant Hollowing
  Used to show hollow-out-effect of objects which have been executed machining or dry run, while executing  instruction for other objects.
-  : Close
  Used to close 3D view area.

3 Machine Tool Commissioning

This section mainly introduces how to do commissioning for the machine tool.

Before commissioning, click **System** → **Configs** and select the proper configuration.

The machine tool commissioning includes the following:

- Modify Port Polarity
- Set Drive Parameters
- Adjust Pulse Equivalent and Electronic Gear Ratio
- Set Speed Parameters
- Adjust the Axis Direction
- Set the Workbench Stroke
- Compensate Lead Screw Errors
- Set Parameters of Air Pressure and Laser Device

After commissioning, you need to Check Machine Tool Setting.

3.1 Modify Port Polarity

This operation is used to modify the polarity of a port, so as to make the port effective.

Relationship between the status of the machine tool and IO ports is as follows:

- Input port: ● means no signal; while ● means having a signal.
- Output port: ◎ means no signal; while ◎ means having a signal.

To modify port polarity, do the following:

1. Click **System** → **Ports Setting**. **IO Ports** dialog box pops up.
2. Click **Convert Pol**.

You can conduct or close a simulation test by clicking **Test On** or **Test Off**. The sign **T** next to a port means the port is under testing.

3.2 Set Drive Parameters

Basic drive parameters need to be set before the drive can start driving machining movement.

Different control systems require different settings.

- Set Drive Parameters in Non-bus Control Systems
- Set Drive Parameters in Bus Control Systems

3.2.1 Set Drive Parameters in Non-bus Control Systems

Different servo drive parameters need to be set in different follow control modes:

- Set Drive Parameters in Position Loop Control Mode
- Set Drive Parameters in Velocity Loop Control Mode

If you are using a non-WEIHONG drive (WISE):

- Ensure that the servo drive SON signal is active low (ON when connected to GND of a 24V power supply).
- If the servo drive is active low when it works normally, set the polarity of the drive alarm input port to **NC**. If the servo drive is active low when it reports an alarm, set the polarity of the drive alarm input port to **NO**.
- Set the drive **pulse signal type** parameter to **pulse + direction**.

- Ensure that the servo drive does not have an external emergency stop signal input port. If it does, check the signal logic.
- Ensure that the terminal board is connected to a 24V power supply before drive trial run.

3.2.1.1 Set Drive Parameters in Position Loop Control Mode

Test parameter settings in position loop control mode as shown below:

- WISE
- Yaskawa Σ- II
- Yaskawa Σ- V /Σ-7
- Panasonic MINAS A4
- Panasonic MINAS A5
- Fuji FALDIC-β
- Fuji ALPHA 5
- Delta ASDA-A
- Delta ASDA-A2
- Delta ASDA-B
- Delta ASDA-B2

3.2.1.1.1 WISE

The parameters and descriptions are shown below:

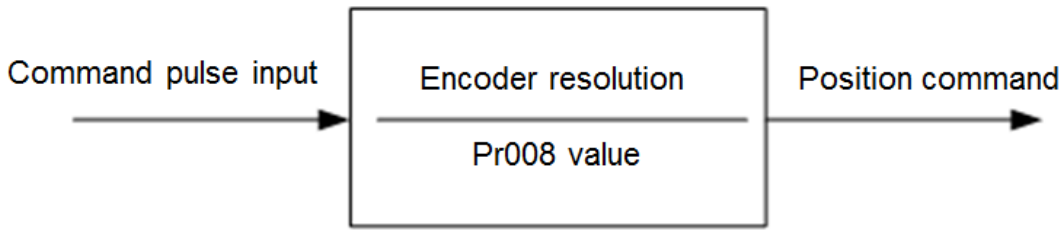
- **Pr001 Control mode selection**
  - Description: Control mode setting
  - Unit: -
  - Range
    - 1: Position control mode
    - 2: Velocity control mode
  - Value: 1
- **Pr528 LED initial state**
  - Description: Pulse detection is used in WEIHONG control systems to check to see if correct pulses are sent and determine if there is electric interference.
  - Unit: -
  - Range: -
  - Value: 6 Command pulse sum
- **Pr008 Number of command pulses per motor turn**
  - Description: The number of command pulses for the motor to rotate by one turn
  - Unit: -
  - Range
    - 0: **Pr009** and **Pr010** are effective
    - Not 0: **Pr008 = Screw pitch/(pulse equivalent * mechanical reduction ratio)**
  - Value: 0
- **Pr009 1st command division and multiplication (numerator), Pr010 Command division and multiplication (denominator)**
  - Description: Pay attention to the ratio between Pr009 and Pr010.
  - Unit: -
  - Range: 0–2^{30}

  - Value: If screw pitch = 5 mm, encoder resolution = 10000, directly connected to the coupler, pulse equivalent = 0.001 mm: Pr009 = 10000, Pr010＝screw pitch / pulse equivalent＝5000, which means Pr009/Pr010 = 10000/5000=2/1.

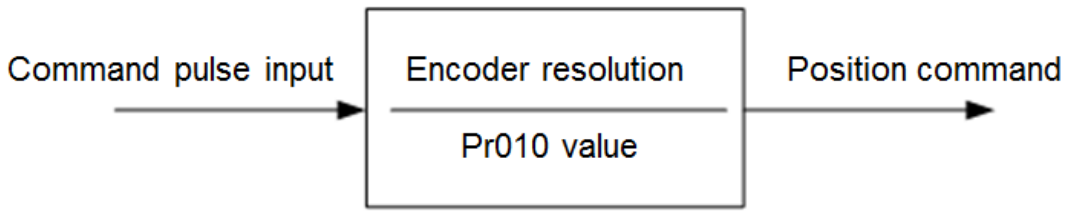
- **Pr011 Number of pulses output by one motor turn**
  - Description: Number of pulses output by one motor turn
  - Unit: -
  - Range: -
  - value: If pulse equivalent = 0.001, there is no speed reducer, screw pitch = 10 mm: Pr011=2500; if screw pitch = 5 mm: Pr011 = 1250
- **Pr100 1st position loop gain**
  - Description: 1st position loop gain
  - Unit: 0.1/s
  - Range: -
  - Value: 480 (default) or subject to actual situation.
- **Pr101 1st velocity loop gain**
  - Description: 1st velocity loop gain
  - Unit: 0.1 Hz
  - Range: -
  - Value: 270 (default) or subject to actual situation.
- **Pr102 1st velocity loop integral time constant**
  - Description:1st velocity loop integral time constant
  - Unit: 0.1 ms
  - Range: -
  - Value: 210 (default) or subject to actual situation.

Relationship between Pr008, Pr009, and Pr010

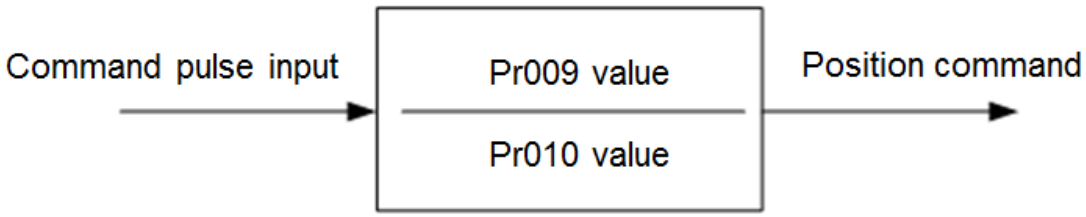
- Pr009 and Pr010 values are not valid. System processing is based on the Pr008 value.



- If Pr008 and Pr009 are 0, system processing is based on the Pr010 value.



- If Pr008 is 0, and Pr009 and Pr010 values are not valid:



3.2.1.1.2 Yaskawa Σ-Ⅱ

The parameters and descriptions are shown below:

- **Fn010 Password setting (preventing random parameter modification)**
  - Description: Password setting (preventing random parameter modification)
  - Unit: -
  - Range
    - If Fn010 is set to 0000, modification of user parameters (PnXXX) and some auxiliary function parameters (FnXXX) is allowed.
    - If Fn010 is set to 0001, modification of user parameters (PnXXX) and some auxiliary function parameters (FnXXX) is not allowed.
  - Value: 0000
- **Un00C Input command pulse counter**
  - Description: Pulse detection is used in WEIHONG control systems to check to see if correct pulses are sent and determine if there is electric interference.
  - Unit: -
  - Range: -
  - Value: In hexadecimal, low-order (L) 4 digits
- **Pn000 Rotation direction and control mode selection**
  - Direction: Rotation direction and control mode selection
  - Unit: -
  - Range
    - 0: The motor rotates CW (anti-clockwise when observing from the load/lead screw side).
    - 1: The motor rotates CCW. The control mode is position control. Always calculates pulse commands.
  - Value: 0010
- **Pn200 Pulse command format selection**
  - Description: Pulse command format selection
  - Unit: -
  - Range
    - Digit 0: If digit 0 is set to 5, the command is pulse + direction, negative logic.
    - Digit 3: If digit 3 is set to 0, the differential signal goes into the filter.
  - Value: 0005
- **Pn50A Function selection**
  - Description: Function selection
  - Unit: -
  - Range
    - Digit 1: If digit 1 is set to 0, the /S-ON signal is enabled and its input pin is No.40. If digit 1 is set to 7, the /S-ON signal is always ON.
    - Digit 3: If digit 3 is set to 8, the CW input inhibition signal P-OT will not be used.

  - Value: 8100
- **Pn50B Function selection**
  - Description: Function selection
  - Unit: -
  - Range: Digit 0: If digit 0 is set to 8, the CCW input inhibition signal N-OT will not be used.
  - Value: 6548
- **Pn50F Function selection**
  - Description: Applicable when the servo motor has a brake.
  - Unit: -
  - Range: Digit 2: If digit 2 is set to 3, CN1-29 and 30 output brake interlocking signal/BK to control the 24V relay for brake.
  - Value: 0300
- **Pn50E Function selection**
  - Description: Applicable when the servo motor has a brake.
  - Unit: -
  - Range: None of the four digits can be set to 3 in case that CN1-29 and CN1-30 are used for other functions, causing braking failure.
  - Value: 0211
- **Pn506 Brake delay when servo motor is off**
  - Description: Applicable when the servo motor has a brake.
  - Unit: 10 ms
  - Range: -
  - Value: Subject to actual situation.
- **Pn202 Electronic gear ratio numerator, Pn203 Electronic gear ratio denominator**
  - Description: Relation between Pn202 and Pn203
  - Unit: 10 ms
  - Equation:
    - **Pn202 = Pulse number per encoder turn × 4 × Mechanical deceleration rate**
    - **Pn203 = Screw pitch/ Pulse equivalent**
  - Range: -
  - Value
    - When screw pitch = 5 mm, the encoder is 17 digits, axis coupling joint is used, pulse equivalent = 0.001 mm: Pn202＝16384 and Pn203＝625
    - When screw pitch = 5 mm, the encoder is 17 digits, axis coupling joint is used, pulse equivalent = 0.0005 mm: Pn202＝8192 and Pn203＝625

3.2.1.1.3 Yaskawa Σ-Ⅴ/Σ-7

The parameters and descriptions are shown below:

- **Fn010 Parameter input inhibition setting**
  - Description: Parameter input inhibition setting
  - Unit: -
  - Range

        - If Fn010 is set to 0000, modification of user parameters (PnXXX) and some auxiliary function parameters (FnXXX) is allowed.
        - If Fn010 is set to 0001, modification of user parameters (PnXXX) and some auxiliary function parameters (FnXXX) is not allowed.
    - Value: 0000
- **Pn000 Function selection basic switch 0**
    - Description: Function selection basic switch 0
    - Unit: -
    - Range
        - Digit 0: If digit 0 is set to 0, the motor rotates CW after receiving CW commands.
        - Digit 1: If digit 1 is set to 1, the control mode is position control (pulse sequence commands).
    - Value: 0010
- **Pn200 Position control command format selection switch**
    - Description: Position control command format selection switch
    - Unit: -
    - Range: If digit 0 is set to 5, the command format is pulse + direction, negative logic.
    - Value: 0005
- **Pn50A Input signal selection 1**
    - Description: Input signal selection 1
    - Unit: -
    - Range
        - Digit 1: If digit 1 is set to 0, /S-ON signal is enabled and its input pin is No.40. If digit 1 is set to 7, the servo drive is always ON.
        - Digit 3: If digit 3 is set to 8, the CW input inhibition signal P-OT will not be used.
    - Value: 8100
- **Pn50B Input signal selection 2**
    - Description: Input signal selection 2
    - Unit: -
    - Range: If digit 0 is set to 8, the CCW input inhibition signal N-OT will not be used.
    - Value: 6548
- **Pn50F Output signal selection 2**
    - Description: Applicable when the servo motor has a brake.
    - Unit: -
    - Range: If digit 2 is set to 3, CN1-29 and 30 output brake interlocking signal/BK to control the 24V relay for brake.
    - Value: 0300
- **Pn50E Output signal selection 1**
    - Description: Applicable when the servo motor has a brake.
    - Unit: -
    - Range: None of the four digits can be set to 3 in case that CN1-29 and CN1-30 are used for other functions, causing braking failure.
    - Value: 0211
- **Pn506 Brake command: Servo OFF delay**
    - Description: Applicable when the servo motor has a brake.
    - Unit: ms

  - Range: -
  - Value: Subject to actual situation.
- **Pn20E Electronic gear ratio numerator, Pn210 Electronic gear ratio denominator**
  - Description: Relation between Pn20E and Pn210
  - Unit: -
  - Equation: **Pn20E/Pn210 = (Encoder resolution × pulse equivalent × mechanical reduction ratio)/screw pitch**
  - Range: -
  - Value: Manual calculation
- **Pn212 Encoder allocated pulse number**
  - Description: Encoder allocated pulse number
  - Unit: -
  - Range:2^4–2^{30}
  - Value: When pulse equivalent = 0.001, there is no reducer, and screw pitch = 10 mm, Pn212 = 2500; when screw pitch = 5 mm, Pn212 = 1250

3.2.1.1.4 Panasonic MINAS A4

The parameters and descriptions are shown below:

- **Pr01 LED initial state**
  - Description: Pulse detection is used in WEIHONG control systems to check to see if correct pulses are sent and determine if there is electric interference.
  - Unit: -
  - Range: -
  - Value: 15
- **Pr02 Control mode selection**
  - Description: Control mode selection
  - Unit: -
  - Range
    - 0: Position control
    - 1: Velocity control
    - 2: Torque control
  - Value: 0
- **Pr40 Command pulse input selection**
  - Description: Command pulse input selection
  - Unit: -
  - Range: 1: input via dedicated differential circuit.
  - Value: 1
- **Pr42 Command pulse input format selection**
  - Description: Command pulse input format selection
  - Unit: -
  - Range: 3: The command pulse input format is pulse + direction, negative logic
  - Value: 3
- **Pr44 Feedback pulse division and multiplication numerator**
  - Description: Feedback pulse division and multiplication numerator
  - Unit: -
  - Range: 1–32767
  - Typical value: When pulse equivalent = 0.001, there is no reducer, and screw pitch = 10 mm, Pr44 = 2500; when screw pitch = 5 mm, Pr44 = 1250

- **Pr48 Command pulse division and multiplication 1st numerator, Pr4B Command pulse division and multiplication denominator**
  - Description: Relation between Pr48 and Pr4B
  - Unit: -
  - Range: 1–10000
  - Value: When screw pitch = 5 mm, the encoder resolution is 10000, axis coupling joint is used, and pulse equivalent = 0.001 mm: Pr48= 10000, Pr4B ＝ screw pitch/pulse equivalent = 5/0.001=5000. Pr48/Pr4B=10000/5000=2/1.

3.2.1.1.5 Panasonic MINAS A5

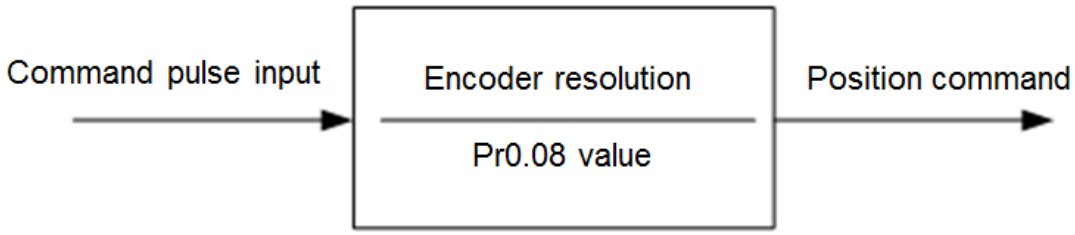
The parameters and descriptions are shown below:

- **Pr5.28 LED initial state**
  - Description: Pulse detection is used in WEIHONG control systems to check to see if correct pulses are sent and determine if there is electric interference.
  - Unit: -
  - Range: -
  - Value: 6
- **Pr0.01 Control mode setting**
  - Description: Control mode setting
  - Unit: -
  - Range
    - 0: Position control.
    - 1: Velocity control.
    - 2: Torque control.
  - Value: 0
- **Pr0.05 Command pulse input selection**
  - Description: Command pulse input selection
  - Unit: -
  - Range
    - 0: Opto-electronic coupler input (PULS1, PULS2, SIGN1, SIGN2)
    - 1: Dedicated line drive input (PULSH1, PULSH2, SIGNH1, SIGNH2)
  - Value: 1 (in common cases)
- **Pr0.07 Command pulse input format selection**
  - Description: Command pulse input format selection
  - Unit: -
  - Range: 3: the command pulse input format is pulse + direction, negative logic
  - Value: 3
- **Pr0.08 Number of command pulses per turn**
  - Description: Number of command pulses per turn
  - Unit: -
  - Range
    - If Pr0.08 is set to 0, Pr0.09 and Pr0.10 are valid.
    - If Pr0.08 is not 0, **Pr0.08 = screw pitch/(pulse equivalent × mechanical reduction ratio)**
  - Value: 0
- **Pr0.09 1st command division and multiplication numerator, Pr0.10 Command pulse division and multiplication denominator**
  - Description: Relation between Pr0.09 and Pr0.10
  - Unit: -

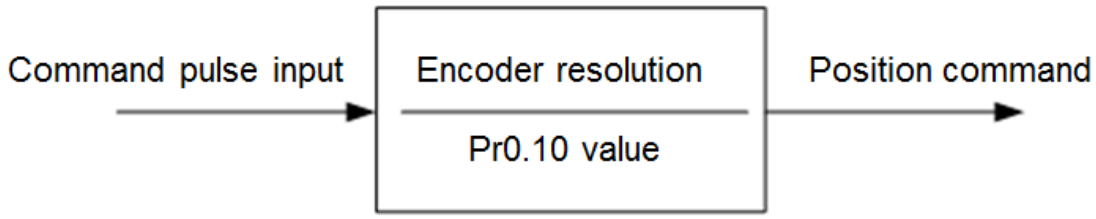
  - Range: 0–2^{30}
  - Value: When screw pitch = 5 mm, the encoder resolution is 10000, axis coupling joint is used, and pulse equivalent = 0.001 mm: Pr0.09＝10000 and Pr0.10＝screw pitch/pulse equivalent=5/0.001＝5000. Pr0.09/Pr0.10=10000/5000=2/1.
- **Pr0.11 Number of pulse output by one motor turn**
  - Description: Number of pulse output by one motor turn
  - Unit: -
  - Range: 1–262144
  - Value: When pulse equivalent = 0.001, there is no reducer, and screw pitch = 10 mm, Pr0.11 = 2500; when screw pitch = 5 mm, Pr0.11 = 1250

Relation between Pr0.08, Pr0.09, and Pr0.10 values

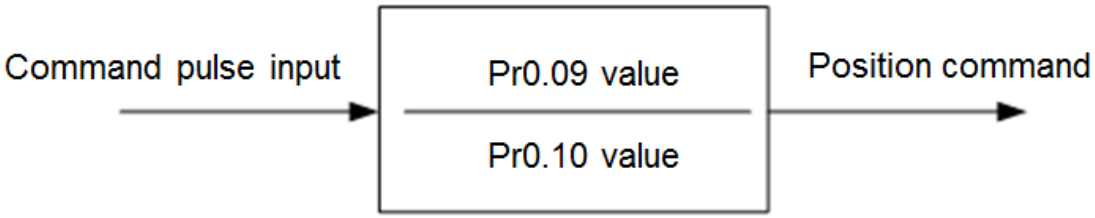
- Pr0.09 and Pr0.10 values are not valid. System processing is based on the Pr0.08 value.



- If Pr0.08 and Pr0.09 are 0, system processing is based on the Pr0.10 value.



- If Pr0.08 is 0 but Pr0.09 is not 0, system processing is based on the Pr0.09 and Pr0.10 values.



3.2.1.1.6 Fuji FALDIC-β

The parameters and descriptions are shown below:

- **Command pulse numerator α, 02 Command pulse denominator β**
  - Description: Stand for electronic gear ratio numerator and denominator.
  - Unit: -
  - Range: 1–32767
  - Equation: **α/β = (encoder resolution × pulse equivalent × mechanical reduction ratio)/screw pitch**

  - Value: When encoder resolution = 65536, pulse equivalent = 0.001, screw pitch = 5 mm, and mechanical reduction ratio = 1: α/β=65536×0.001/5=8192/625, which means α=8192 and β=625.
- **Pulse train input format**
  - Description: Pulse train input format
  - Unit: -
  - Range: 0: The pulse train input format is pulse + direction (symbol), negative logic
  - Value: 0
- **Rotation direction**
  - Description: Rotation direction
  - Unit: -
  - Range
    - 0: Rotates CW (anti-clockwise when observing from the load side)
    - 1: Rotates CCW (clockwise when observing from the load side)
  - Value: 0 or 1
- **CONT1 signal distribution**
  - Description: CONT1 signal distribution
  - Unit: -
  - Range: 1: CONT1 is distributed to RUN (SON). If CONT1 is not distributed, it becomes ON if there is no alarm after power-on.
  - Value: 1
- **CONT2 signal distribution**
  - Description: CONT2 signal distribution
  - Unit: -
  - Range: 2: CONT2 is distributed to RST (CLR: servo alarm clearing). Parameter 12, 13, and 14 are 0, which means that CONT3, CONT4, and CONT5 cannot be distributed to OT (overtravel) or EMG (external emergency stop).
  - Value: 2
- **OUT1 signal distribution**
  - Description: OUT1 signal distribution
  - Unit: -
  - Range
    - 1: OUT1 is distributed to alarm output contact a, which is normally open.
    - 2: OUT1 is distributed to alarm output contact b, which is normally closed.
  - Value: 1
- **Parameter modification inhibition**
  - Description: Parameter modification inhibition
  - Unit: -
  - Range
    - 0: Drive parameter values can be modified.
    - 1: Drive parameter values cannot be modified.
  - Value: 0 or 1
- **CONT 1 constant validity 1**
  - Description: CONT 1 constant validity 1
  - Unit: -
  - Range: 1: valid upon servo motor start (RUN).

- Value: 1

3.2.1.1.7 Fuji ALPHA 5

The parameters and descriptions are shown below:

- **PA1_01 Control mode selection**
  - Description: PA1_01 control mode selection
  - Unit: -
  - Range
    - 0: Position control.
    - 1: Velocity control.
  - Value: 0
- **PA1_06 Electronic gear ratio numerator 0, PA1_07 Electronic gear ratio denominator**
  - Description: Relation between PA1_06 and PA1_07
  - Unit: -
  - Range: 1–32767
  - Equation: **PA1_06/PA1_07 =(Encoder resolution × pulse equivalent × mechanical reduction ratio)/screw pitch**
  - Value: When encoder resolution = 65536, pulse equivalent = 0.001, screw pitch = 5 mm, and mechanical reduction ratio = 1: PA1_06/PA1_07 =65536×0.001/5=8192/625. Therefore, PA1_06 = 8192 and PA1_07 = 625.
- **PA1_03 Command pulse format**
  - Description: PA1_03 command pulse format
  - Unit: -
  - Range: 0: The pulse train input format is pulse + direction (symbol), negative logic.
  - Value: 0
- **PA1_04 Rotation direction**
  - Description: Rotation direction
  - Unit: -
  - Range
    - 0: Rotates CW (anti-clockwise when observing from the load side)
    - 1: Rotates CCW (clockwise when observing from the load side)
  - Value: 0 or 1
- **PA3_01 CONT1 signal distribution**
  - Description:CONT1 signal distribution
  - Unit: -
  - Range: 1: CONT1 is distributed to RUN (SON). If CONT1 is not distributed, it becomes ON if there is no alarm after power-on.
  - Value: 1
- **PA3_02 CONT2 signal distribution**
  - Description: CONT2 signal distribution
  - Unit: -
  - Range 2: CONT2 is distributed to RST (CLR: servo alarm clearing). Parameter 12, 13, and 14 are 0, which means that CONT3, CONT4, and CONT5 cannot be distributed to OT (overtravel) or EMG (external emergency stop).
  - Value: 2
- **PA3_51 OUT1 signal distribution**
  - Description: OUT1 signal distribution

  - Unit: -
  - Range
    - 16: OUT1 is distributed to alarm output contact a, which is normally open.
    - 76: OUT1 is distributed to alarm output contact b, which is normally closed.
  - Value: 16
- **PA3_26 CONT 1 constant validity 1**
  - Description: CONT 1 constant validity 1
  - Unit: -
  - Range: 1: valid upon servo motor start (RUN).
  - Value: 2
- **PA1_08 Number of pulse output by one motor turn**
  - Description: Number of pulse output by one motor turn
  - Unit: -
  - Range: 16–214
  - Typical value: When pulse equivalent = 0.001, there is no reducer, and screw pitch = 10 mm, PA1_08 = 2500; when screw pitch = 5 mm, PA1_08 = 1250

3.2.1.1.8 Delta ASDA-A

The parameters and descriptions are shown below:

- **P0-02 Drive status display**
  - Description: Pulse detection is used in WEIHONG control systems to check to see if correct pulses are sent and determine if there is electric interference.
  - Unit: -
  - Format: -
  - Range: -
  - Value: 02
- **P1-00 External pulse input format**
  - Description: External pulse input format
  - Unit: -
  - Format: ZYX
    - X=2: The external pulse input format is pulse + direction, negative logic
    - Z=1: negative logic
  - Range: -
  - Value: 102
- **P1-01 Control mode setting**
  - Description: Control mode setting
  - Unit: -
  - Format: ZYX1X0
    - Z=0: DIO value does not change when the control mode is switched. Control mode was not switched; therefore, Z=0.
    - Y=0: Rotates CW (anti-clockwise when observing from the load side). Y=1: Rotates CCW.
    - X1X0=00: The control mode is position control.
  - Range: -
  - Value: 0000
- **P1-32 Motor stopping mode**

  - Description: Motor stopping mode
  - Unit: -
  - Format: YX
    - Y=0: When the servo motor is disabled, dynamic braking is used. Y=1: When the servo motor is disabled, the motor moves freely.
    - X=0: The motor is stopped instantly. X=1: The motor decelerates before stops completely.
  - Range: -
  - Value: 00
- **P1-44 Electronic gear ratio numerator N1, P1-45 Electronic gear ratio denominator M**
  - Description: Relation between P1-44 and P1-45.
  - Unit: -
  - Format: -
  - Range: 1–32767
  - Equation: **N1/M =(Encoder pulse number × 4 × pulse equivalent × mechanical reduction ratio)/screw pitch.**
  - Value: When the encoder pulse number = 2500, pulse equivalent = 0.001, screw pitch = 5 mm, and mechanical reduction ratio = 1, N1/M=2500×4×0.001/5=2/1. Therefore, N1=2 and M=1.
- **P2-10 Digital input pin DI1 function setting**
  - Description: Digital input pin DI1 function setting
  - Unit: -
  - Format: X2X1X0
    - X1X0=01: Set digital input DI1 to SON, matching pin No.9 of CN1.
    - X2=1: Set input DI1 to the normally open contact a.
  - Range: -
  - Value: 101
- **P2-15 Digital input pin DI6 function setting and P2-16 Digital input pin DI7 function setting**
  - Description: DI6 are DI7 are NC position limit signal input by default. The drive cannot work before the CN1 pin No.32 and pin No.31 are connected.
  - Unit: -
  - Format: P2-15=P2-16=X2X1X0
    - X2=1: Set DI6 and DI7 input to the NO contact a.
    - X1X0=00: Drive position limit input was not used.
  - Range: -
  - Value: P2-15=P2-16=100
- **P2-17 Digital input pin DI8 function setting**
  - Description: Digital input pin DI8 function setting
  - Unit: -
  - Format: X2X1X0. X2X1X0=100: External EMG (emergency stop input) was not used.
  - Range: -
  - Value: 100
- **P2-21 Digital output pin DO4 function setting**
  - Description: DO4 pins are pin No.1 and No.26, which are used for Z-axis clamping position braking signals.
  - Unit: -
  - Format: X2X1X0

        - X2=1: Set DO4 output to the NO contact a. X2=1: Set DO4 output to the NC contact b.
        - X1X0=08: Set pin No.1 and No.26 to BK+ and BK- respectively.
    - Range: -
    - Value: 108
- **P2-22 Digital output pin DO5 function setting**
    - Description: DO5 pins are pin No.28 and No.27, which are used for servo alarm signals.
    - Unit: -
    - Format: X2X1X0
        - X2=0: Set DO5 output to the NC contact b.
        - X1X0=07: Set pin No.28 and No.27 to ALRM+ and ALRM- respectively.
    - Range: -
    - Value: 007
- **P2-51 Servo enablement SON setting**
    - Description: Servo enablement SON setting
    - Unit: -
    - Format: -
    - Range
        - 0: Servo motor enablement must be triggered by digital signals.
        - 1: Servo motor is automatically enabled after powered on if there is no alarm.
    - Value: 0 (1 when SON signal cables are unavailable)

3.2.1.1.9 Delta ASDA-A2

The parameters and descriptions are shown below:

- **P0-02 Drive status display**
    - Description: Pulse detection is used in WEIHONG control systems to check to see if correct pulses are sent and determine if there is electric interference.
    - Unit: -
    - Format: -
    - Range: -
    - Value: 02
- **P1-00 External pulse input format**
    - Description: External pulse input format
    - Unit: -
    - Format: ZYX
        - X=2: The external pulse input format is pulse + direction, negative logic
        - Z=1: negative logic
    - Range: -
    - Value: 102
- **P1-01 Control mode setting**
    - Description: Control mode setting
    - Unit: -
    - Format: ZYX1X0
        - Z=0: DIO value does not change when the control mode is switched. Control mode was not switched; therefore, Z=0.

        - Y=0: Rotates CW (anti-clockwise when observing from the load side). Y=1: Rotates CCW.
        - X1X0= 00: The control mode is position control.
    - Range: -
    - Value: 0000
- **P1-44 Electronic gear ratio numerator N1 and P1-45 Electronic gear ratio denominator M**
    - Description: Relation between P1-44 and P1-45
    - Unit: -
    - Format: -
    - Range: 1–32767
    - Equation: **P1-44/P1-45 = (Encoder resolution × pulse equivalent × mechanical reduction ratio)/screw pitch.**
    - Value: When the encoder pulse number = 2500, pulse equivalent = 0.001, screw pitch = 5 mm, and mechanical reduction ratio = 1, N1/M=2500×4×0.001/5=2/1. Therefore, N1=2 and M=1.
- **P1-46 Detector pulse output number setting**
    - Description: Setting of the revolving single-direction pulse number.
    - Unit: -
    - Format: -
    - Range: 20–320000
    - Value: When pulse equivalent = 0.001, there is no reducer, and screw pitch = 10 mm, P1-46 = 10000; when screw pitch = 5 mm, P1-46 = 5000
- **P2-10 Digital input pin DI1 function setting**
    - Description: Setting of the revolving single-direction pulse number.
    - Unit: -
    - Format: X2X1X0
        - X1X0=01: Set digital input DI1 to SON, matching pin No.9 of CN1.
        - X2=1: Set input DI1 to the normally open contact a.
    - Range: -
    - Value: 101
- **P2-15 Digital input pin DI6 function setting**
    - Description: DI6 are DI7 are NC position limit signal input by default. The drive cannot work before the CN1 pin No.32 and pin No.31 are connected.
    - Unit: -
    - Format: X2X1X0
        - X2=1: Set DI6 and DI7 input to the NO contact a.
        - X1X0=00: Drive position limit input was not used.
    - Range: -
    - Value: 100
- **P2-16 Digital input pin DI7 function setting**
    - Description: Digital input pin DI7 function setting
    - Unit: -
    - Format: X2X1X0
    - Range: -
    - Value: 100
- **P2-17 Digital input pin DI8 function setting**
    - Description: Digital input pin DI8 function setting
    - Unit: -

  - Format: X2X1X0. X2X1X0=100: External EMG (emergency stop input) was not used.
  - Range: -
  - Value: 100
- **P2-21 Digital output pin DO4 function setting**
  - Description: DO4 pins are pin No.1 and No.26, which are used for Z-axis clamping position braking signals.
  - Unit: -
  - Format: X2X1X0
    - X2=1: Set DO4 output to the NO contact a. X2=1: Set DO4 output to the NC contact b.
    - X1X0=08: Set pin No.1 and No.26 to BK+ and BK- respectively.
  - Range: -
  - Value: 108
- **P2-22 Digital output pin DO5 function setting**
  - Description: DO5 pins are pin No.28 and No.27, which are used for servo alarm signals.
  - Unit: -
  - Format: X2X1X0
    - X2=0: Set DO5 output to the NC contact b.
    - X1X0=07: Set pin No.28 and No.27 to ALRM+ and ALRM- respectively.
  - Range: -
  - Value: 007

3.2.1.1.10 Delta ASDA-B

The parameters and descriptions are shown below:

- **P0-02 Drive status display**
  - Description: Pulse detection is used in WEIHONG control systems to check to see if correct pulses are sent and determine if there is electric interference.
  - Unit: -
  - Format: -
  - Range: -
  - Value: 02
- **P1-00 External pulse train input format**
  - Description: Setting of external pulse train input format
  - Unit: -
  - Format: ZYX
    - X=2: The external pulse input format is pulse + direction, negative logic
    - Z=1: negative logic1
  - Range: -
  - Value: 102
- **P1-01 Control mode setting**
  - Description: Control mode setting
  - Unit: -
  - Format: YX1X0
    - Y=0: Rotates CW (anti-clockwise when observing from the load side). Y=1: Rotates CCW.
    - X1X0=00: The control mode is position control.

  - Range: -
  - Value: 000
- **P1-32 Motor stopping mode**
  - Description: Motor stopping mode
  - Unit: -
  - Format: YX
    - Y=0: When the servo motor is disabled, dynamic braking is used. Y=1: When the servo motor is disabled, the motor moves freely.
    - X=0: The motor is stopped instantly. X=1: The motor decelerates before stops completely.
  - Range: -
  - Value: 00
- **P1-44 Electronic gear ratio numerator N1 and P1-45 Electronic gear ratio denominator M**
  - Description: Relation between P1-44 and P1-45
  - Unit: -
  - Format: -
  - Range: 1–32767
  - Equation: **P1-44/P1-45 = (Encoder resolution × pulse equivalent × mechanical reduction ratio)/screw pitch**.
  - Value: When the encoder pulse number = 2500, pulse equivalent = 0.001, screw pitch = 5 mm, and mechanical reduction ratio = 1, N1/M=2500×4×0.001/5=2/1. Therefore, N1=2 and M=1.
- **P2-10 Digital input pin DI1 function setting**
  - Description: Digital input pin DI1 function setting
  - Unit: -
  - Format: X2X1X0
    - X1X0=01: Set digital input DI1 to SON, matching pin No.17 of CN1.
    - X2=1: Set input DI1 to the normally open contact a.
  - Range: -
  - Value: 101
- **P2-15 Digital input pin DI6 function setting**
  - Description: DI6 is NC position limit signal input by default. The drive cannot work before the CN1 pin No.32 and pin No.31 are connected.
  - Unit: -
  - Format: X2X1X0
    - X2=1: Set input DI6 to the normally open contact a.
    - X1X0=00: Drive position limit input was not used.
  - Range: -
  - Value: 100
- **P2-18 Digital output pin DO1 function setting**
  - Description: DO1 pin is pin No.16, which is used for Z-axis clamping position braking signals.
  - Unit: -
  - Format: X2X1X0
    - X2=1: Set DO1 output to the NO contact a. X2=0: Set DO4 output to the NC contact b.
    - X1X0=08: Set pin No.16 to BK+.
  - Range: -
  - Value: 108

- **P2-20 Digital output pin DO3 function setting**
  - Description: DO3 pin is pin No.1, which is used for servo alarm signals.
  - Unit: -
  - Format: 2X1X0
    - X2=0: Set DO3 output to the NC contact b.
    - X1X0=07: Set pin No.1 to ALRM+.
  - Range: -
  - Value: 007

3.2.1.1.11 Delta ASDA-B2

The parameters and descriptions are shown below:

- **P0-02 Drive status display**
  - Description: Pulse detection is used in WEIHONG control systems to check to see if correct pulses are sent and determine if there is electric interference.
  - Unit: -
  - Format: -
  - Range: -
  - Value: 02
- **P1-00 External pulse train input format**
  - Description: Setting of external pulse train input format
  - Unit: -
  - Format: ZYX
    - X=2: The external pulse input format is pulse + direction, negative logic
    - Z=1: negative logic
  - Range: -
  - Value: 102
- **P1-01 Control mode setting**
  - Description: Control mode setting
  - Unit: -
  - Format: ZYX1X0
    - Z=0: DIO value does not change when the control mode is switched. Control mode was not switched; therefore, Z=0.
    - Y=0: Rotates CW (anti-clockwise when observing from the load side). Y=1: Rotates CCW.
    - X1X0=00: The control mode is position control.
  - Range: -
  - Value: 0000
- **P1-44 Electronic gear ratio numerator N1 and P1-45 Electronic gear ratio denominator M**
  - Description: Relation between P1-44 and P1-45
  - Unit: -
  - Format: ZYX1X0
    - Z=0: DIO value does not change when the control mode is switched. Control mode was not switched; therefore, Z=0.
    - Y=0: Rotates CW (anti-clockwise when observing from the load side). Y=1: Rotates CCW.
    - X1X0=00: The control mode is position control.
  - Range: 1–32767

  - Equation: **P1-44/P1-45 = (Encoder resolution × pulse equivalent × mechanical reduction ratio)/screw pitch**.
  - Value: When the encoder pulse number = 2500, pulse equivalent = 0.001, screw pitch = 5 mm, and mechanical reduction ratio = 1, N1/M=2500×4×0.001/5=2/1. Therefore, N1=2 and M=1.
- **P1-46 Detector pulse output number setting**
  - Description: Setting of the revolving single-direction pulse number.
  - Unit: -
  - Format: -
  - Range: 20–40000
  - Value: When pulse equivalent = 0.001, there is no reducer, and screw pitch = 10 mm, P1-46 = 10000; when screw pitch = 5 mm, P1-46 = 5000
- **P2-10 Digital input pin DI1 function setting**
  - Description: Digital input pin DI1 function setting
  - Unit: -
  - Format: X2X1X0
    - X1X0=01: Set digital input DI1 to SON, matching pin No.9 of CN1.
    - X2=1: Set input DI1 to the normally open contact a.
  - Range: -
  - Value: 101
- **P2-15 Digital input pin DI6 function setting**
  - Description: DI6 are DI7 are NC position limit signal input by default. The drive cannot work before the CN1 pin No.32 and pin No.31 are connected.
  - Unit: -
  - Format: X2X1X0
    - X2=0: Set DI6 and DI7 input to the NC contact b.
    - X1X0=00: Drive position limit input was not used.
  - Range: -
  - Value: 000
- **P2-16 Digital input pin DI7 function setting**
  - Description: Digital input pin DI7 function setting
  - Unit: -
  - Format: X2X1X0
  - Range: -
  - Value: 000
- **P2-17 Digital input pin DI8 function setting**
  - Description: Digital input pin DI8 function setting
  - Unit: -
  - Format: X2X1X0. When X2X1X0=000: External EMG (emergency stop input) was not used.
  - Range: -
  - Value: 000
- **P2-18 Digital output pin DO1 function setting**
  - Description: DO1 pins are pin No.6 and No.7, which are used for Z-axis clamping position braking signals.
  - Unit: -
  - Format: X2X1X0
    - X2=1: Set DO1 output to the NO contact a. X2=1: Set DO4 output to the NC contact b.
    - X1X0=08: Set pin No.6 and No.7 to BK- and BK+ respectively.

  - Range: -
  - Value: 108
- **P2-22 Digital output pin DO5 function setting**
  - Description: DO5 pins are pin No.28 and No.27, which are used for servo alarm signals.
  - Unit: -
  - Format: X2X1X0
    - X2=0: Set DO5 output to the NC contact b.
    - X1X0=07: Set pin No.28 and No.27 to ALRM+ and ALRM- respectively.
  - Range: -
  - Value: 007

3.2.1.2 Set Drive Parameters in Velocity Loop Control Mode

Test parameter settings in velocity loop control mode as shown below:

- WISE
- Yaskawa Σ- 7
- Panasonic MINAS A5
- Fuji ALPHA 5

To make the motor output rated rotational speed under 10V voltage in velocity loop control mode, parameters need to be set differently from that Set Drive Parameters in Position Loop Control Mode, as shown below (taking a screw pitch of 10 mm as an example):

Parameter	WISE	Yaskawa Σ- 7	Panasonic MINAS A5	Fuji ALPHA 5
Control mode selection	Pr001=2	Pn000=0	Pr0.01=1	PA1_01=1
Command pulse number	Pr011=2500	Pn212=2500	Pr011=2500	PA1_08=250
Motor rotational speed under 10V	Pr302=300	Pn300=1000	Pr3.02=300	PA3-31=10

The parameter **Motor rotational speed under 10V** is available only in velocity loop control mode.

3.2.2 Set Drive Parameters in Bus Control Systems

Parameter setting methods vary based on the servo drive brand. This section mainly introduces how to set basic parameters and station addresses of WISE drive and Yaskawa ∑5 / ∑7 drives.

1. Set Common Drive Parameters
2. Set Station Address

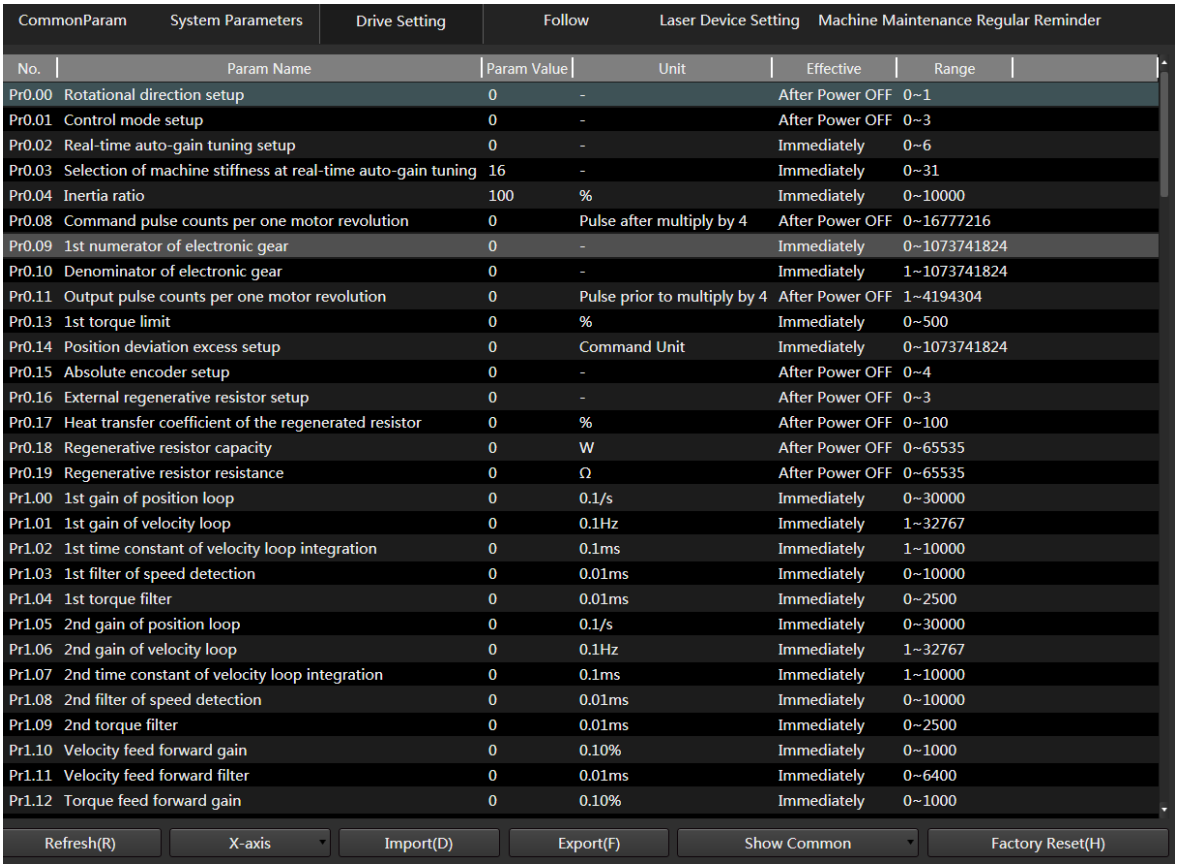
3.2.2.1 Set Common Drive Parameters

Two methods are available for you to set the drive parameters:

- Drive front panel. For details, see the drive user manual.
- **NcEditor** software.

Follow the steps below to set drive parameters in **NcEditor**:

1. In the menu, click **System** > **Drive Parameters** to open the **Driver Param** window:



No.	Param Name	Param Value	Unit	Effective	Range
Pr0.00	Rotational direction setup	0	-	After Power OFF	0~1
Pr0.01	Control mode setup	0	-	After Power OFF	0~3
Pr0.02	Real-time auto-gain tuning setup	0	-	Immediately	0~6
Pr0.03	Selection of machine stiffness at real-time auto-gain tuning	16	-	Immediately	0~31
Pr0.04	Inertia ratio	100	%	Immediately	0~10000
Pr0.08	Command pulse counts per one motor revolution	0	Pulse after multiply by 4	After Power OFF	0~16777216
Pr0.09	1st numerator of electronic gear	0	-	Immediately	0~1073741824
Pr0.10	Denominator of electronic gear	0	-	Immediately	1~1073741824
Pr0.11	Output pulse counts per one motor revolution	0	Pulse prior to multiply by 4	After Power OFF	1~4194304
Pr0.13	1st torque limit	0	%	Immediately	0~500
Pr0.14	Position deviation excess setup	0	Command Unit	Immediately	0~1073741824
Pr0.15	Absolute encoder setup	0	-	After Power OFF	0~4
Pr0.16	External regenerative resistor setup	0	-	After Power OFF	0~3
Pr0.17	Heat transfer coefficient of the regenerated resistor	0	%	After Power OFF	0~100
Pr0.18	Regenerative resistor capacity	0	W	After Power OFF	0~65535
Pr0.19	Regenerative resistor resistance	0	Ω	After Power OFF	0~65535
Pr1.00	1st gain of position loop	0	0.1/s	Immediately	0~30000
Pr1.01	1st gain of velocity loop	0	0.1Hz	Immediately	1~32767
Pr1.02	1st time constant of velocity loop integration	0	0.1ms	Immediately	1~10000
Pr1.03	1st filter of speed detection	0	0.01ms	Immediately	0~10000
Pr1.04	1st torque filter	0	0.01ms	Immediately	0~2500
Pr1.05	2nd gain of position loop	0	0.1/s	Immediately	0~30000
Pr1.06	2nd gain of velocity loop	0	0.1Hz	Immediately	1~32767
Pr1.07	2nd time constant of velocity loop integration	0	0.1ms	Immediately	1~10000
Pr1.08	2nd filter of speed detection	0	0.01ms	Immediately	0~10000
Pr1.09	2nd torque filter	0	0.01ms	Immediately	0~2500
Pr1.10	Velocity feed forward gain	0	0.10%	Immediately	0~1000
Pr1.11	Velocity feed forward filter	0	0.01ms	Immediately	0~6400
Pr1.12	Torque feed forward gain	0	0.10%	Immediately	0~1000

2. Click **Refresh** to update the drive parameters.
3. Double-click the target parameter to set it.

Basic parameters that need setting in **NcEditor** are shown below. Refer to the user manual of the drive brand to set other parameters.

Yaskawa drives:

- Pn00B function selection basic switch B: 0000 (three-phase)/0100 (single-phase)
- Pn50A input signal selection 1: 8881
- Pn50B input signal selection 2: 8888
- Pn50E output signal selection 1: 0000
- Pn50F output signal selection 2: 0100
- Pn510 output signal selection 3: 0000
- Pn514 output signal selection 4: 0000

WISE drives: Pr001 Control mode setting: 1 (position control)

3.2.2.2 Set Station Address

By setting the station address, information can be transferred between the software, Lambda controller, and drive.

Station address of each axis drive is unique and has to be consistent with the value of the corresponding station address parameter in NcEditor for V15. If its station address parameter is set to **0**, the communication function is disabled.

3.2.2.2.1 Set Station Address for Yaskawa Drives

Set the station addresses for Yaskawa drives by using two types of switches on the drive:

- Flip switches: Four small switches numbered 1–4 for setting of ON/OFF.
- Rotation switch: Rotate the switch to select from 0–9.

Follow the steps below to set station addresses for Yaskawa drives:

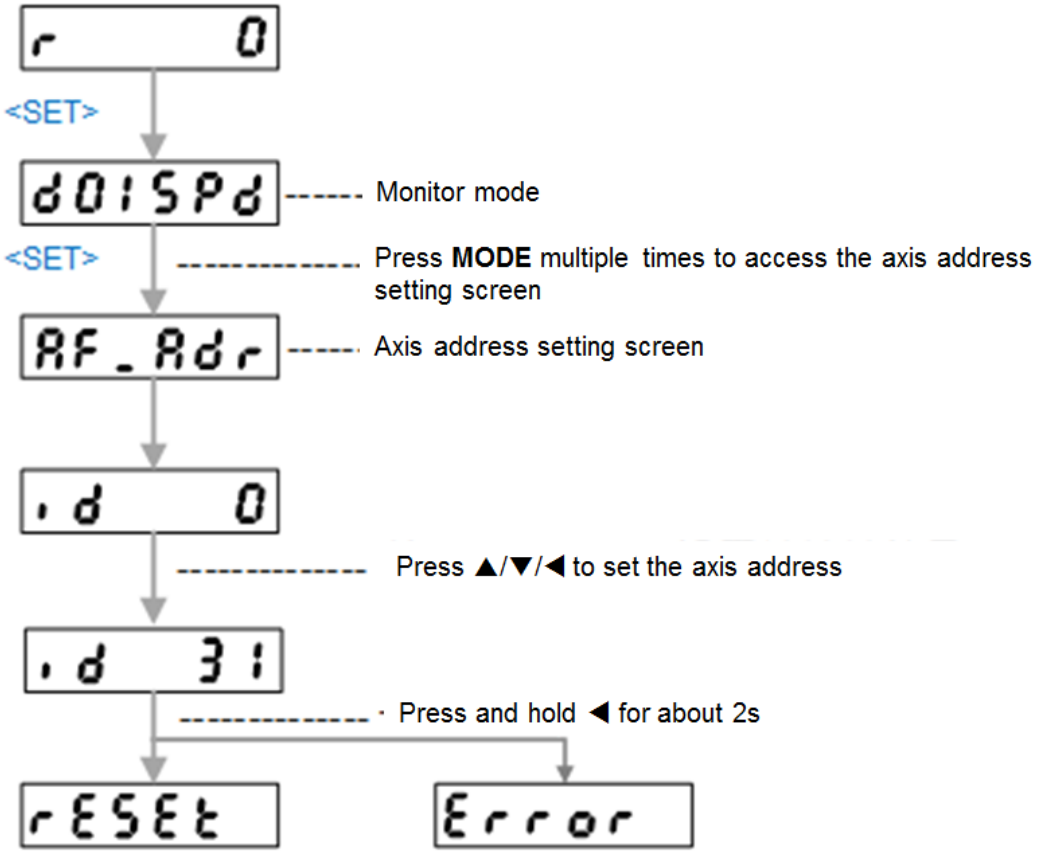
1. Set flip switch 1–4 to ON, ON, OF, and OFF respectively to enable bus functions.
2. Rotate the rotation switch to select a number as the station address.
   Note: Select station addresses for the axes in sequence (for example, 1 for X axis, 2 for Y axis, and 3 for Z axis, etc.).
3. Open **NcEditor**. Set the axis station address parameters to the values set by the drive rotation switch.

3.2.2.2.2 Set Station Address for WISE Drives

Set the station addresses for WISE drives by using the drive front panel.

Follow the steps below to set station addresses for WISE drives:

1. Set Pr001 **Control mode setting** to **1**.
2. Set the station addresses:



   - If **reset** is displayed, the station address is set successfully.
     Power off and restart the drive to make the setting take effect.
   - If **Error** is displayed, the station address setting has failed. Restart the drive and try again.
3. Open **NcEditor**. Set the axis station address parameters to the values set by the drive front panel.

3.3 Adjust Pulse Equivalent and Electronic Gear Ratio

This operation is used to adjust the control precision of the machine tool.

To adjust pulse equivalent and electronic gear ratio, do the following:

- To adjust pulse equivalent, set system parameter **Pulse Equivalent** in NcEditor software.

- To adjust electronic gear ratio, set drive parameter **Electronic Gear Ratio** on the drive.

For details of terms and calculation, see List of Terms and Calculation Formula.

3.3.1 List of Terms

This part introduces terms related to pulse equivalent and electronic gear ratio.

Pulse equivalent

- The moving distance of the lead screw or rotation degree of rotary axis corresponding to one pulse sent by CNC system, the minimum available distance controlled by CNC system as well.
- The smaller the pulse equivalent is, the higher the machining precision will be. The larger, the faster feedrate will be.

Electronic gear ratio

- The ratio represents servo scales up or down the pulse frequency sent by CNC system.
- If the value is greater than 1, it means scaling up and vice versa.

Pitch

- The moving distance per revolution of the motor.

Mechanical reducer ratio

- It is calculated by one of the following:
  Reducer input speed / Reducer output speed
  Teeth number of driven saw wheel / Teeth number of driving saw wheel
  Motor shaft speed / Screw speed

Encoder resolution

- Needed pulse number for one circle of servo motor.
- See the servo motor label plate and refer to the corresponding manual to confirm its encoder resolution.

Step angle

- The rotation degree of the motor corresponding to one pulse sent by CNC system.

Subdivision

- During running the motor, the actual step angle is a fraction of the natural step angle (full step).

3.3.2 Calculation Formula

This section introduces calculation formula related to pulse equivalent and electronic gear ratio. The formula differs in motor axis type:

- Linear axis
  - Stepper motor:
    Pulse equivalent = Pitch / (360/Step angle * Subdivision * Mechanical reducer ratio)
  - Servo motor:
    Electronic gear ratio = (Encoder resolution * Pulse equivalent) / Pitch * Mechanical reducer ratio
- Rotary axis
  - Stepper motor:
    Pulse equivalent = 360 / (360/Step angle * Subdivision * Mechanical reducer ratio)
  - Servo motor:
    Electronic gear ratio = (Encoder resolution * Pulse equivalent) / 360 * Mechanical reducer ratio

3.4 Set Speed Parameters

This operation is used to control the machining speed of the machine tool, so as to confirm the machining effect.

To set speed parameters, click **System** → **System Parameters** and set parameters under **Speed Accuracy** category.

For details of speed parameters, see Speed and Accuracy Parameters.

3.5 Adjust the Axis Direction

This operation is used to avoid that the axis direction is opposite to the direction judged by **Right Hand Rule**.

To adjust the axis direction, do the following (taking X-axis as an example):

1. Check current value of parameter **Axis Direction** under **1.0.0 X-axis** category.
2. Judge the positive direction of X-axis according to **Right Hand Rule**.
3. Click **X+** in machine control area to move X-axis and observe its moving direction.
4. **Optional:** If the actual moving direction is opposite to the judged direction, modify the set value to the opposite value.

Example

Current value of parameter **Axis Direction** is **1**. Manually move X-axis towards positive direction and find X-axis moves towards the negative direction.

Then, you need to change set value of the parameter to **-1**.

3.6 Set the Workbench Stroke

This operation is used to set the upper limit and lower limit of the workbench, so as to ensure the machine tool moves within a safe range.

If it is your first time to set the workbench stroke, confirm the actual size of the machine tool before setting.

To set the workbench stroke, do the following:

1. To enable soft limit protection function, modify value of parameter **Enable Soft Limit Protection** of each axis to **YES**.
2. According to the actual size of the machine tool, modify values of parameters **Soft Limit Lower Limit** and **Soft Limit Upper Limit** of each axis.

For details of these parameters, see Basic Parameters.

3.7 Compensate Lead Screw Errors

This operation is used to compensate the following errors when the expected precision is not reached due to errors in the machine tool itself, so as to improve machining precision:

- Screw pitch errors: caused by screw defect and long-term wear, etc.
- Backlash errors: caused by a sudden violent backward movement of the spindle.

Before compensating lead screw errors, modify the value of parameter **Lead Screw Compensation Mode** and **W-axis Lead Screw Compensation Mode** and select a lead screw compensation type:

- If high precision is required, modify it to **1**. The system only compensates backlash errors.
  See Compensate Backlash Errors for details.
- If higher precision is required, modify it to **2**. The system compensates both of these errors, namely comprehensive errors.
  See Compensate Comprehensive Errors for details.

3.7.1 Compensate Backlash Errors

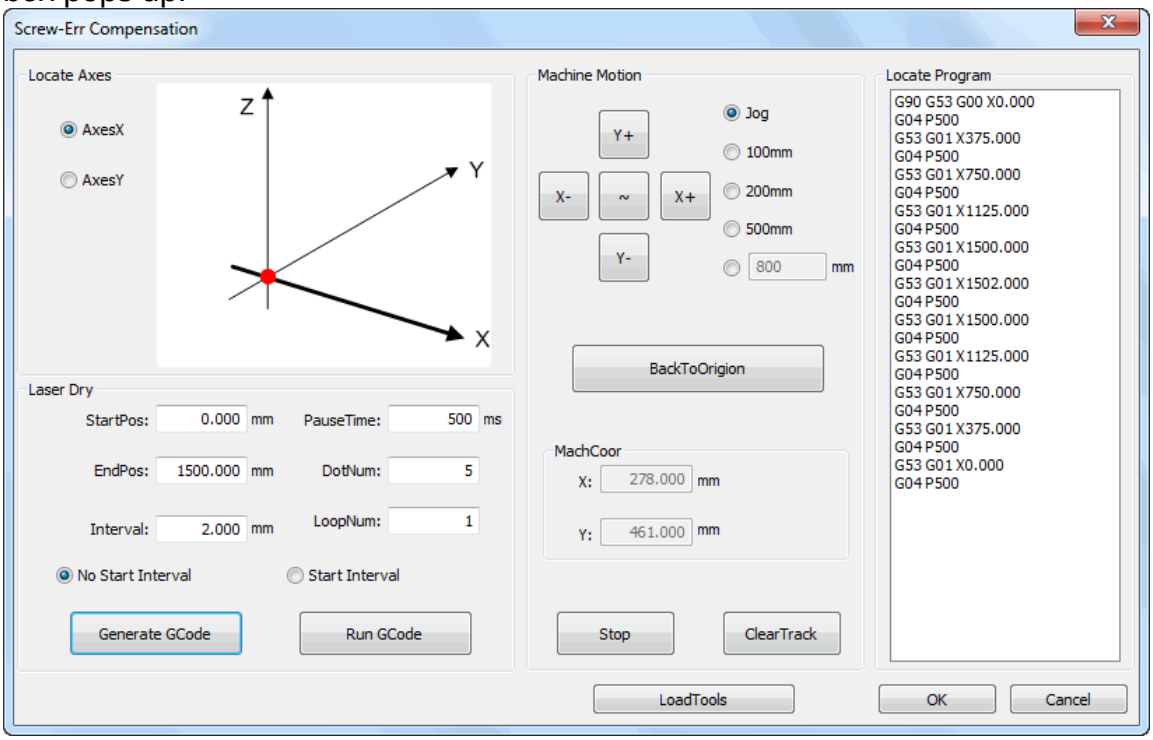
To compensate backlash errors, modify value of parameter **Backlash** of each axis according to the actual situation.

Restart the software to make the setting effective.

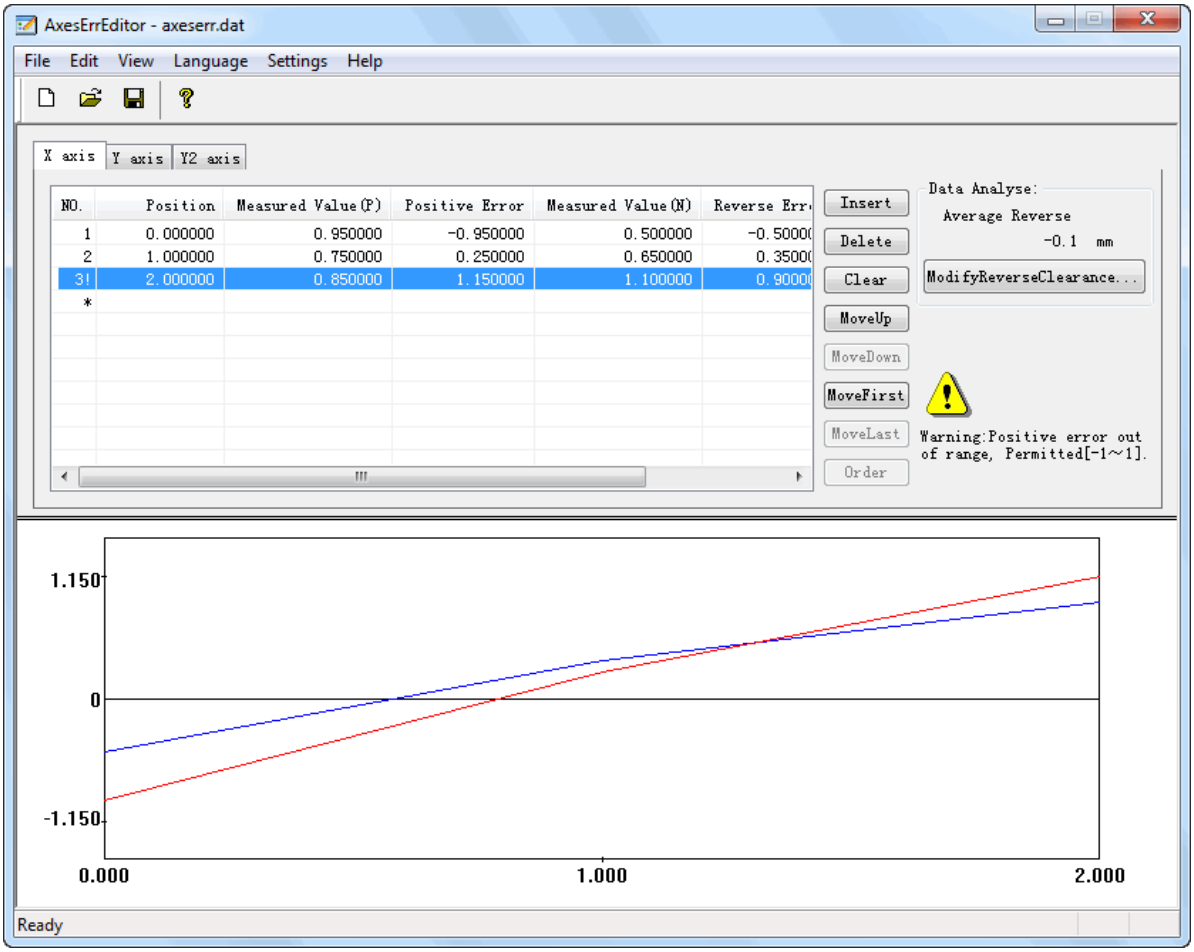
3.7.2 Compensate Comprehensive Errors

To compensate comprehensive errors, do the following:

1. Click **System** → **Screw Error Compensation**. **Screw Error Compensation** dialog box pops up:



2. To get the actual measurement data of the machine tool via laser interferometer, do the following:
   a. Select a positioning axis and set parameters in **Laser Interferometer** area.
   b. Click **Generate G Code**. The generated location program appears in **Location Program** area.
   c. Click **Run G Code**. The system starts to move the machine tool according to the generated location program and records location data at the measurement point.
   d. Save the data as a RTL or LIN file in the laser interferometer.
3. Click **Load Tools**. **AxesErrorEditor** dialog box pops up:



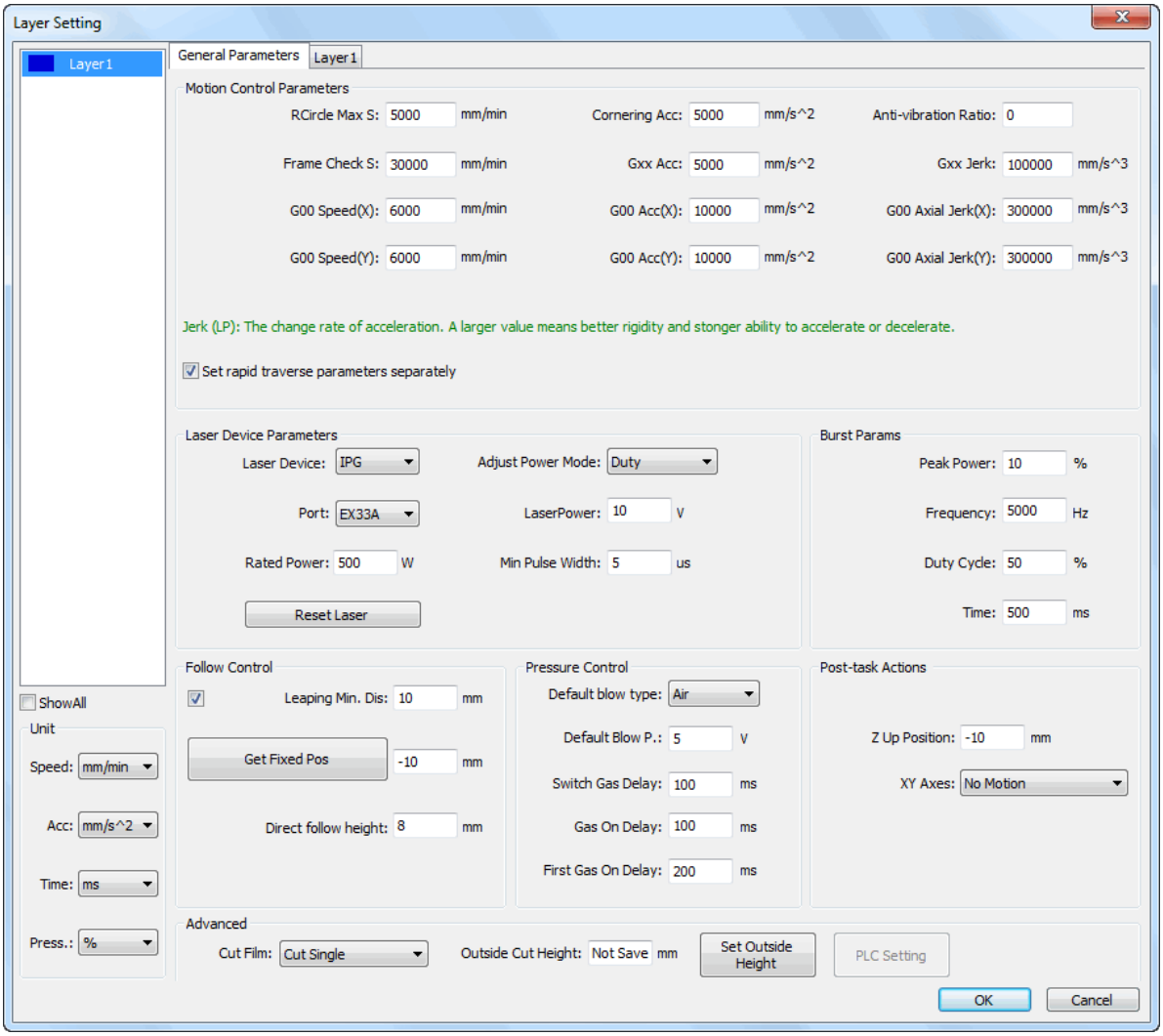
4. To import the RTL or LIN file, click **File** → **Import File**. The results include the following:
    - Values of parameters **Position**, **Measured Value(Positive)** and **Measured Value (Negative)** show in the dialog box.
    - Based on the above values, the system automatically calculates values of parameters **Positive Error**, **Negative Error**, **Backlash** and **Average Backlash** and fills into the dialog box.
    - A compensation line chart shows in the dialog box:
        - Red line represents errors in positive direction.
        - Blue line represents errors in the negative direction.
5. **Optional:** Modify values of parameters **Position**, **Measured Value(Positive)** and **Measured Value (Negative)**. The results are the same with those in step 4.
6. Click . The system automatically does the following:
    - Save the information into screw error compensation file as a DAT file with filename **axeserr** under directory *C:\Program Files\Weihong\NcEditor\config*.
    - Compensate comprehensive errors according to the data in the file.

Restart the software to make the compensation effective.

3.8 Set Parameters of Air Pressure and Laser Device

To set parameters of air pressure and laser device, do the following:

1. To enter into **General Parameters** page in **Layer Setting** dialog box, do one of the following:
    - In drawing tool bar, click → **General Parameters**.
    - In menu bar, click **Object** → **Layer Setting** → **General Parameters**.



2. Set parameters in **Pressure Control** area and **Laser Device Parameters** area. Parameters of air pressure and laser device are as follows:

Default Blow Type

- The default gas for blowing.
- If the selected gas is oxygen, port **Proportioning Valve Enabled** will be opened.

Default Blow P.

- The pressure when the machine tool is in idle status.

Switch Gas Delay

- Used for increment piercing and segment piercing.
- The delay time for switching gas after piercing if the cutting gas is different from that in piercing, with laser keeping on.

Gas on Delay

- The delay time when port **Blow** is switched from off status to on status.

First Gas on Delay

- Used to delay blowing for the start point.

Laser Device

- Types of laser device.

- If the selected laser device is **SPI** or **IPG**, the laser device will be turned on 5s before the laser gate is turned on.

Port

- The serial port for communication with the laser device.
- The option **None** means the laser device is connected to the machine tool directly.
- Modification of the parameter takes effect after the software is restarted.

Adjust Power Mode

- Including **Duty Ratio Adjust** and **Analog Adjust**.
- If **Duty Ratio Adjust** is selected, the speed power curve adjusts the duty ratio.
- If **Analog Adjust** is selected, the speed power curve adjusts the peak power.

Laser Power

- The power value when the laser power is 100%.

Min Pulse Width

- The minimum allowable pulse width when the laser power is controlled by duty ratio.
- When pulse width is less than this value, this value takes effect.
- When pulse width is greater than this value, pulse width in duty ratio takes effect.

Reset Laser

- Used to reset the laser device to normal status.
- It is required after alarms in laser device are removed.

3.9 Check Machine Tool Setting

After the machine tool commissioning, you need to check whether the machine tool is set correctly by checking the following:

- Check Pulse Equivalent and Electronic Gear Ratio
- Check Pulse
- Check Laser Technics

3.9.1 Check Pulse Equivalent and Electronic Gear Ratio

This operation is used to check whether the value of electronic gear ratio matches that of pulse equivalent.

To check pulse equivalent and electronic gear ratio, do the following:

1. Make a mark on any axis of the machine tool and set this marked point as the workpiece origin in the software. See Set the Workpiece Origin for details.
2. Move this marked axis for a fixed distance in **Jog** mode or **Handwheel** mode and so on.
3. Measure the actual moving distance with a vernier caliper and compare whether it is equal to the distance shown in the software.

3.9.2 Check Pulse

This operation is used to check whether the system loses any pulse.

To check pulse, select one of the following methods:

- Check Pulse through Two Points
  Check pulse by directly observing two points on a workpiece.
- Check Pulse through Servo Drive
  Check pulse by observing pulse count in a servo drive.

3.9.2.1 Check Pulse through Two Points

To check pulse through two points, do the following:

1. Make a dot on the surface of a workpiece with laser and set this dot as the workpiece origin.
2. Repeatedly move the machine tool without actual machining, and return to the workpiece origin.
3. Make a dot again with laser and check whether it completely coincides with the marked dot in step 1:
    - If it does, no pulse is lost and the system runs normally.
    - If it does not, pulse lost. You need to check the machine tool.

3.9.2.2 Check Pulse through Servo Drive

To check pulse through servo drive, do the following:

1. Set drive parameter **Surveillance Mode** to **Input Pulse Count Mode**.
   For a YASKAWA servo drive, the parameter is UN00C.
2. Regulate the servo drive to display lower 4 bits (with "L" before the count value) in count value (hexadecimal system), set the workpiece origin and record the current pulse count.
3. Repeatedly move the machine tool without actual machining, and return to the workpiece origin.
4. Check and compare the current pulse count with the original value:
    - For a YASKAWA servo drive, check whether the difference is greater than 4 (the frequency of pulse sent by servo drive is 1/4 times the frequency of main controller):
        - ≤4: the main controller sends pulses within the tolerance of one pulse and the system runs normally.
        - 4: check the pulse signal type of the servo drive, and make the pulse type received by servo drive the same with the pulse type sent by board card.
    - For other servo drives, check whether the current pulse count is the same with the original count:
        - Same: no pulse is lost and the control system runs normally.
        - Different: check the pulse signal type of the servo drive, and make the pulse type received by servo drive the same with the pulse type sent by board card.

3.9.3 Check Laser Technics

This operation is used to check whether the technic control of piercing is normal.

It includes the following:

- Whether the state of ports like laser, blow, follow-up and burst is the same with the actual situation.
- Whether parameters of time sequence is correct. See Layer Function for details.
- Whether parameters of laser technics in **Layer Setting** dialog box are appropriate, like time sequence and delay of follow-up, blow and laser. See Layer Function for details.
- Whether voltage change of the laser power control port **AVC** correlates with laser power change.

4 Follow-up

This section introduces follow-up in **NcEditor V12 Laser Cutting CNC System**, which is used to move Z-axis up and down in real time through the corresponding relationship between capacitance and distance and ensure the relative distance between the cutting head and the workpiece is unchanged.

It introduces follow-up from the following aspects:

4.1 Interface Overview

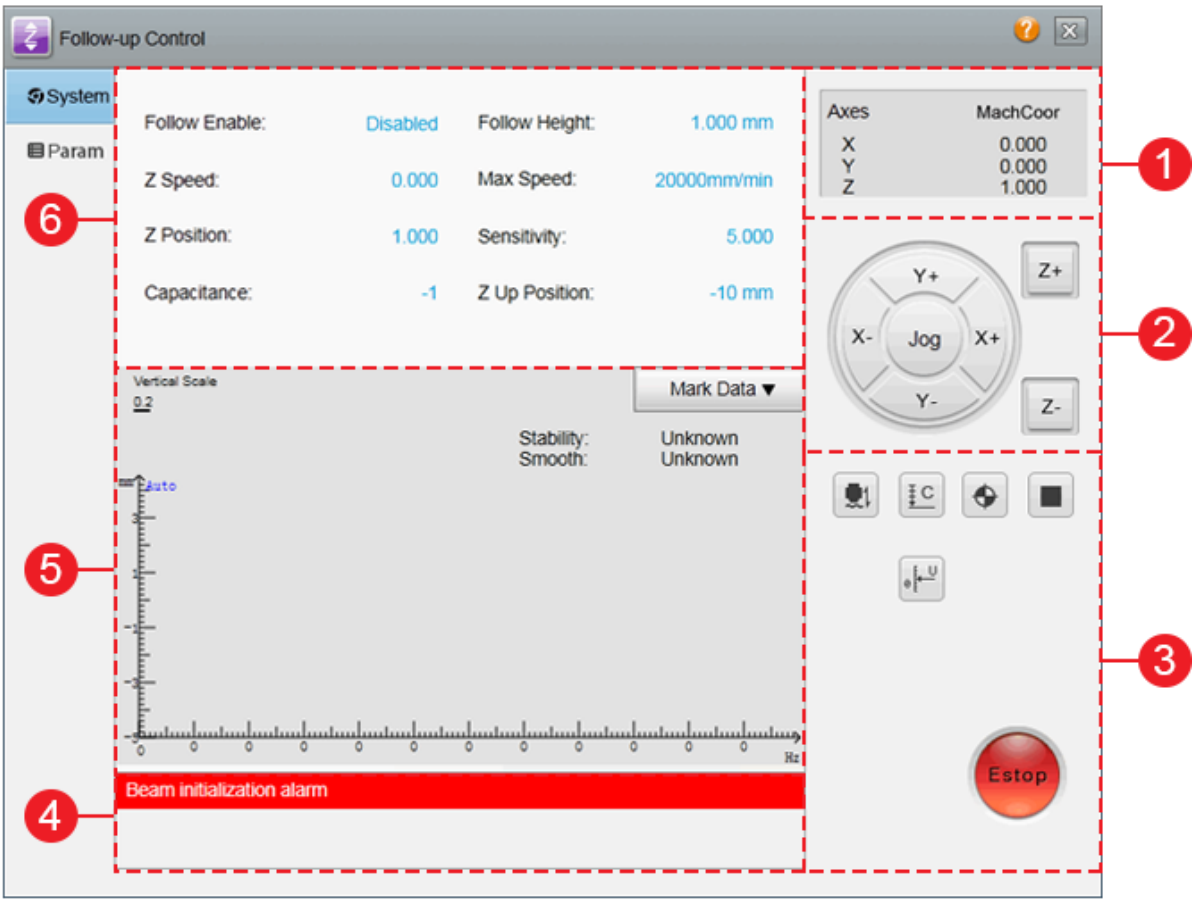
In this section, you can quickly get familiar with **Follow-up Control** dialog box and execute related operations.

To open **Follow-up Control** dialog box, do one of the following:

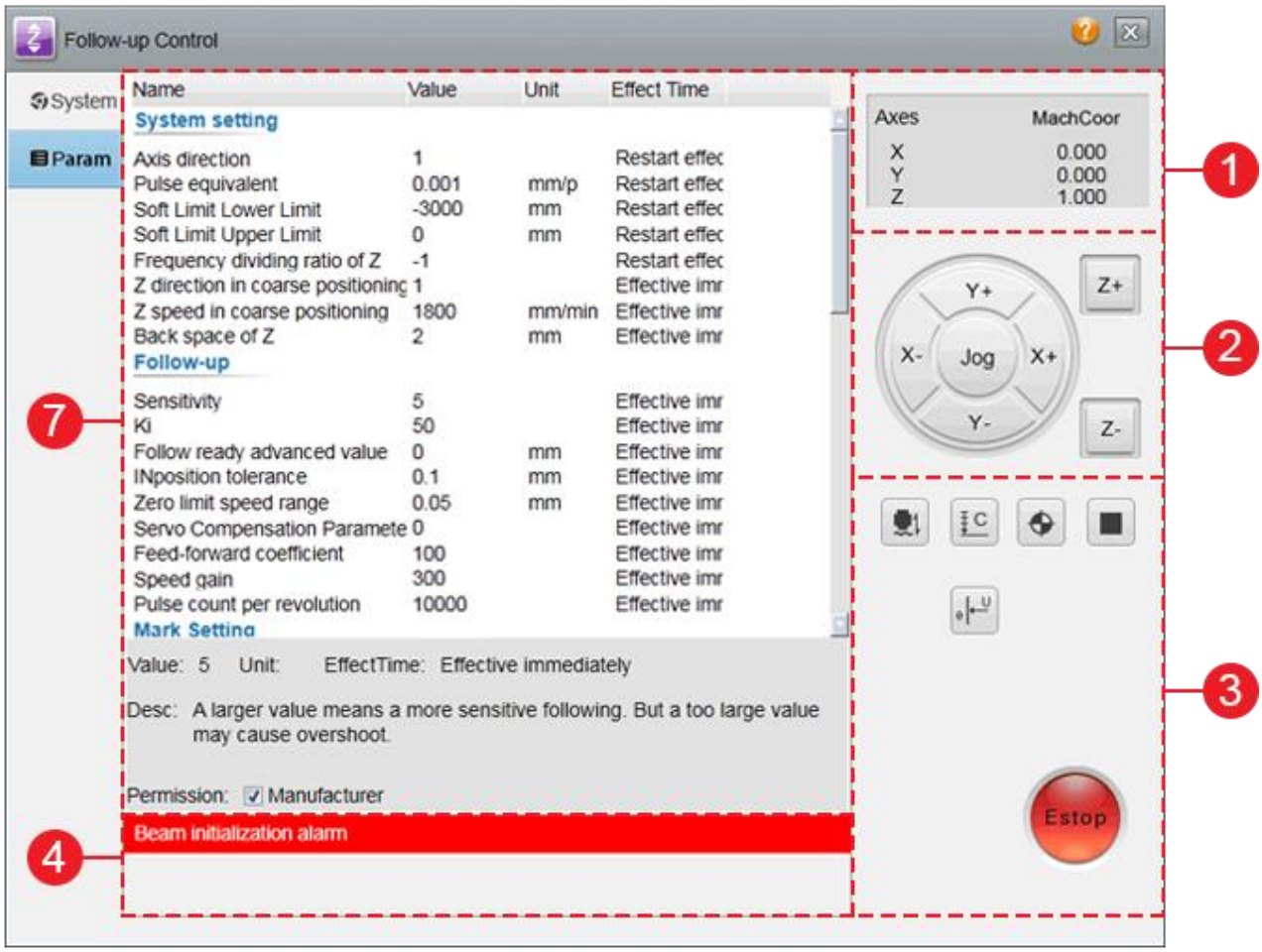
- In drawing tool bar, click  .
- In menu bar, click **System** → **Follow Control**.

You can switch between the following interfaces by clicking the buttons on the left:

- **System** interface



- **Param** interface



1. Axis Coordinate Display Area
2. Manual Control Area
3. Follow-up Control Buttons
4. Alarm display bar
5. Waveform Display Area
6. Main Parameters Area
7. Parameters Setting Area

4.1.1 Axis Coordinate Display Area

It is used to show the following:

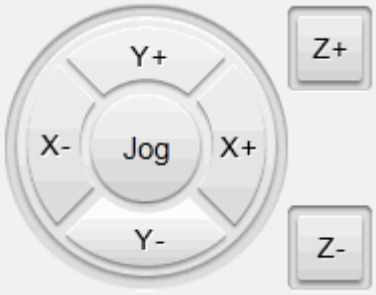
- Workpiece coordinates
- Machine coordinates

Axes	MachCoor
X	607.820
Y	461.000
Z	5.000

You can switch between workpiece coordinates and machine coordinates by clicking **WorkCoor**/**MachCoor**.

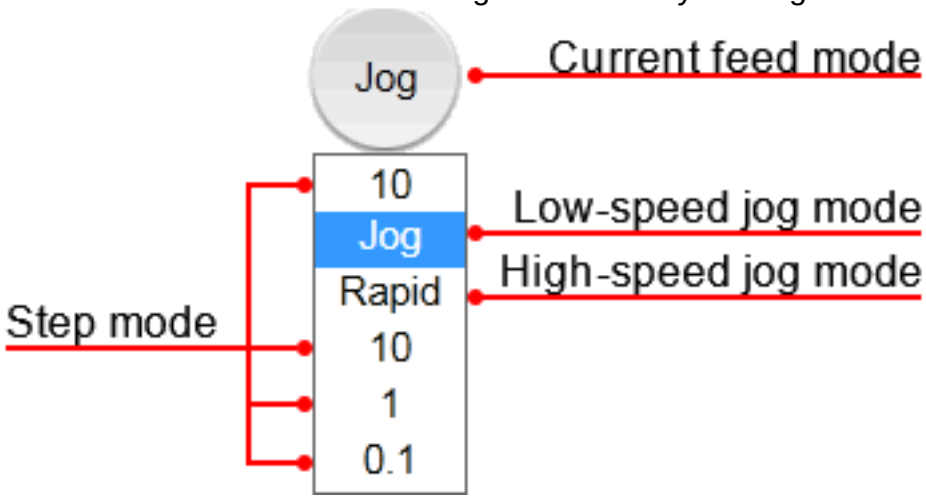
4.1.2 Manual Control Area

It is used to move the machine tool manually.

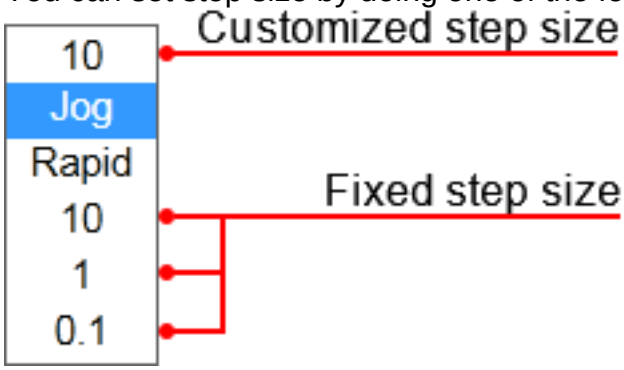


It includes the following:

- Axis direction buttons
  Used to move each axis towards positive or nagative direction.
- Feed mode button
  Used to select one of the following feed mode by clicking the circular button:



  - Jog mode
    Including low-speed jog mode and high-speed jog mode.
    If you click an axis direction button, the machine tool will move at jog/rapid jog speed until you release the button.
    If you click several axis direction buttons at the same time, the clicked axes will move at the same time at jog/rapid jog speed until you release the buttons.
  - Step mode
    If you click an axis direction button, the machine tool will move the customized step size.
    You can set step size by doing one of the following:



    - To customize step size, click the first button, and enter the value in **Customize Step Size** dialog box.
    - To set fixed step size, click one of the last three buttons.

4.1.3 Follow-up Control Buttons

It is used to control the machine tool to execute operations related to follow-up.

It includes the following:

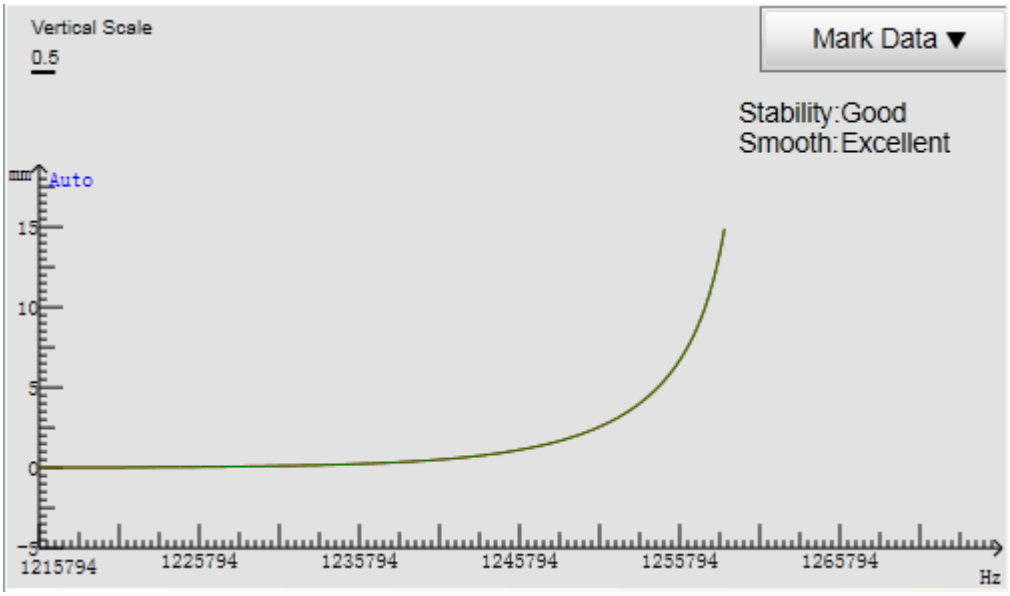
-  : Follow-up
  After the button is clicked, the system automatically starts to follow at the presence of calibration data.
  To stop following and move Z-axis to the berth point, click the button again.
  To end follow-up with Z-axis stopping at the current position, click  .
-  : Capacitance Calibration
  After the button is clicked, the system automatically calibrates capacitance.
  To stop automcatic calibration, click the button again.
-  : Z-axis Homing
  After the button is click, Z-axis returns to the machine origin.
  To stop returning to the machine origin, click the button again or click  .
  After returning to the machine origin, sign appears before Z-axis.
-  : Stop
  After the button is clicked, the system stops machining and enters idle status.
  It is used to normally stop machining task during follow-up control.
-  : Servo Calibration
  It is exclusive for velocity loop control mode.
  After the button is clicked, the system executes compensation and eliminate the zero drift of a servo motor.
- 

  : E-stop
  After the button is clicked, the system stops emergently.

4.1.4 Waveform Display Area

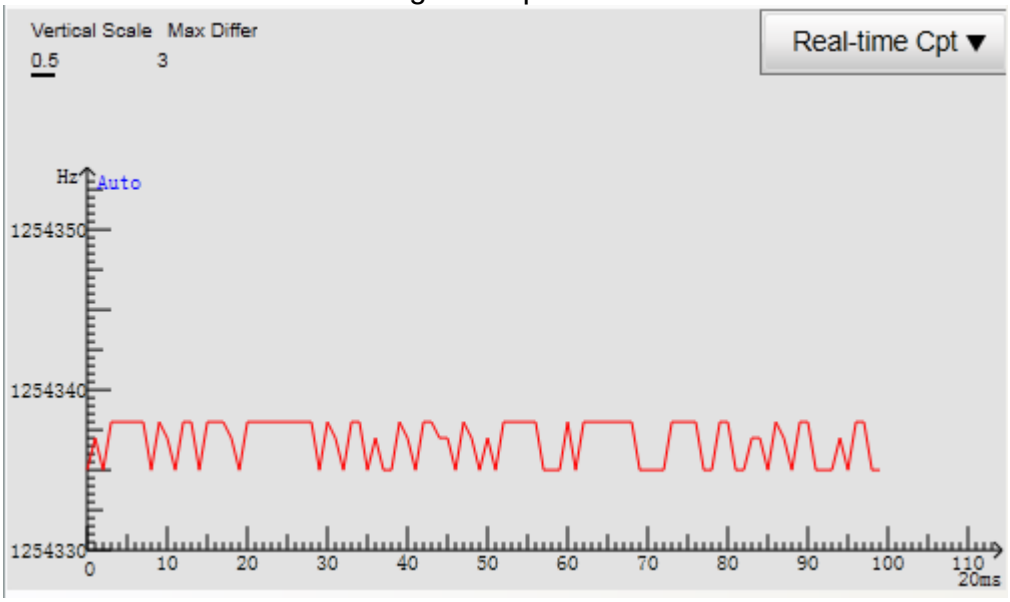
It is used to switch among the following waveform pages by clicking button ▼ on the upper right:

- **Mark Data** page
  Used to show the corresponding relationship between capacitance and position between the cutting head and the workpiece during calibrating capacitance.



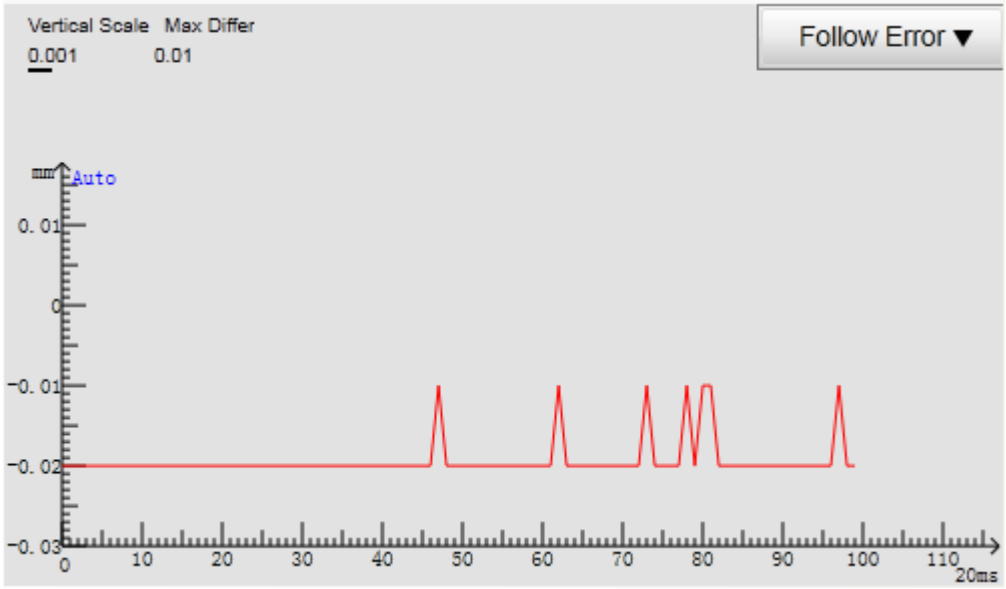
X-axis coordinate shows the capacitance while Y-axis coordinate shows the distance between the cutting head and the workpiece.

- **Real-time Capacitance** page
  Used to show real-time change of capacitance in certain time.



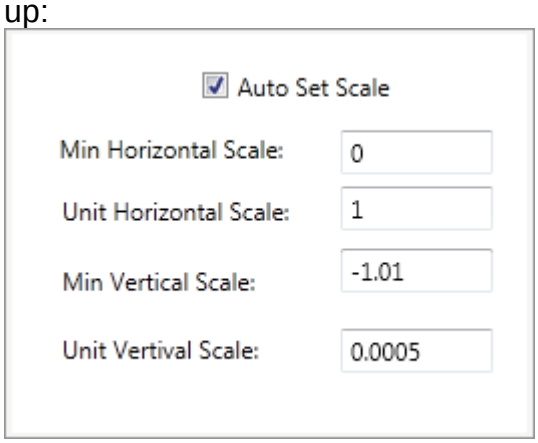
X-axis coordinate shows time while Y-axis coordinate shows the capacitance.
Max Differ on the upper left shows the difference between the maximum capacitance and the minimum one when the cutting head and the workpiece are still. The larger the value is, the stronger the interference is and the less stable the capacitance measurement is. Thus, the ideal value is no more than 30.

- **Follow Error** page
  Used to show the difference between current follow-up height and the set value of parameter **Follow Height**, so as to reflect the follow-up dynamic precision.



In this page, you can do the following:

- Pause the waveform change:
  If you double click within the coordinate, Auto at the top of Y-axis coordinate will turn into Auto.
- Set scale parameters:
  If you right click within the coordinate, a scale parameter dialog box will pop up:



  - If **Auto Set Scale** is checked, the system will automatically set scale parameters. At this time, you cannot manually modify the parameters.
  - If **Auto Set Scale** is unchecked, Auto at the top of Y-axis coordinate will disappear. At this time, you need to manually modify the parameters.
    To confirm the setting, click your mouse or press **Enter**.

4.1.5 Main Parameters Area

It is used to show parameters for monitoring, including:

- Real-time monitoring parameters (unchangeable):
  - Follow Enable
    Used to show the status of follow-up enabling.
    After  is clicked, follow-up enabling is opened and the value of this parameter turns into **Enabled**.
  - Z Speed
    Used to show current running speed of Z-axis.

  - Z Position
    Used to show current machine coordinate of Z-axis.
  - Capacitance
    Used to show current capacitance.
    The smaller the distance between the cutting head and the workpiece is, the smaller the value is.
    When the cutting head touches metal workpiece, the value turns into zero.
- Some common used parameters (changeable):
  - Follow Height
  - Max Speed
  - Sensitivity
  - Z Up Position

  See List of Parameters for details.
  You can modify parameters by doing one of the following:
  - Click the current value and enter a value in the dialog box.
  - Move the cursor to the right of the value and click the arrow 

to modify it.

4.1.6 Parameters Setting Area

It is used to show all parameters related to follow-up control. See List of Parameters for details.

According to different permissions and identities, follow-up parameters can be divided into operator parameters and manufacturer parameters. The system shows operator parameters by default.

If you need to check manufacturer parameters, check **Manufacturer** and enter the password.

If you need to modify a parameter, double click the value and enter a value.

4.2 Commissioning Steps

This section introduces the procedure of follow-up commissioning.

Before commissioning, do the following:

- To get familiar with layout and application of follow-up interface, see Interface Overview for details.
- See Get Preparation for what to prepare.

To do commissioning for follow-up, do the following:

1. To open **Follow-up Control** dialog box, do one of the following:
   - In drawing toolbar, click  .
   - In menu bar, click **System** → **Follow Control**.
2. Do the following:
   a. Detect Capacitance
   b. **Optional:** Calibrate ServoThis step is unnecessary if the system is in velocity loop control mode.
   c. Calibrate Capacitance

After commissioning, see Check Follow-up to check whether the operation is successful.

4.2.1 Get Preparation

To get preparation, do the following:

1. Check and confirm that the hardware has been well connected.
   See Install Hardware for details.
2. Check and confirm that parameters related to drive and follow-up have been set correctly.
   See Set Drive Parameters and List of Parameters for details.
3. To check **PG Frequency Dividing Ratio of Z**, do the following:
   a. Move Z-axis along positive or negative direction in jog mode.
   b. Observe the corresponding step length change of Z-axis coordinate and make a distinct between the increase and decrease of the changing value.
      - If Z-axis coordinate change is different from the specified step length, it indicates that the parameter is wrong and you should modify it. See PG Frequency Dividing Ratio is Set Incorrectly for details.
      - If Z-axis coordinate change is the same with the specified step length, it indicates that the parameter is correct.
4. Check and confirm that there is no alarm and **Current Capacitance** shows in the software.
5. Check and confirm that Z-axis direction is adjusted correctly.
   See Adjust the Axis Direction for details.
6. To ensure basic motion and coordinate display are correct, and Z-axis can return to the machine origin, check system parameters in the software.

4.2.2 Detect Capacitance

This operation is used to observe the capacitance and check its stability.

To detect capacitance, do the following:

1. Move the cutting head to the workpiece and check whether current capacitance changes in real time.
   When the cutting head touches the workpiece, the capacitance should be zero. If it is not zero, see The Capacitance is not 0 when the Cutting Head Touches the Workpiece/The Cutting Head Keeps Moving Downward during Calibration for details.
2. Set parameter **Z Up Position**. See Parameters Setting Area for details.
3. To check whether the current capacitance is stable, do the following:
   a. Move the cutting head to the position 30mm far from the workpiece surface and keep it still.
   b. Observe whether the change of the current capacitance is within 30Hz:
      - If it is, it indicates that the current capacitance is stable.
      - If it is not and the last three numbers of the current capacitance change obviously, it indicates that the electric interference is serious. See Electric Interference is Serious for details.

4.2.3 Calibrate Servo

This operation is used to eliminate the zero drift of servo motor caused by velocity loop control.

To judge zero drift, do the following:

1. Turn on the servo motor and enable servo in the software.
2. Observe the display interface of the servo drive. If the value changes greatly, it indicates large outside interference. Proceed to next step.
3. **Optional:** Observe the coupling at the joint of Z-axis motor and screw. You can find that the coupling rotates slightly.

To calibrate servo, do the following:

1. To move the cutting head to the middle of the stroke range and avoid the cutting head exceeding the stroke, click **X+/X-/Y+/Y-** in manual control area.
2. Click  . The system automatically generates the value of parameter **Servo Compensation Parameter**.

The cutting head slightly moves back and forth to compensate the error caused by zero drift.

4.2.4 Calibrate Capacitance

This operation is used to measure the corresponding distance between capacitance and position between the cutting head and the workpiece.

Before calibrating capacitance, do the following:

- To decide the workpiece type for calibration, set parameter **Nonmetal Mark**.
- Ensure the capacitance is stable.

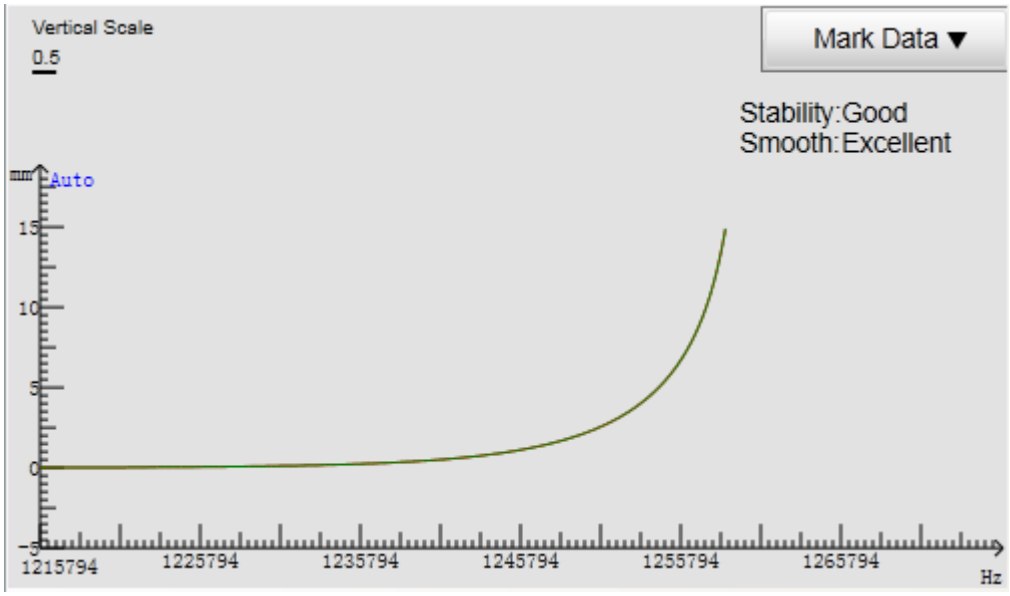
To calibrate capacitance, do the following:

1. Move the cutting head to the position about 5mm far from the workpiece surface, and keep the workpiece still all the time.
2. Click  . The system starts to calibrate capacitance for 20s.

During calibrating capacitance, the cutting head does the following:

1. Move downward slowly to detect and touch the workpiece.
2. Move upward 5mm after it touches the workpiece.
3. Move downward slowly to detect and touch the workpiece again.
4. Move upward the specified calibration distance after it touches the workpiece.

The system collects the calibration data and generates the calibration data:



- **Stability**
  The difference of the collected data between the segment of the cutting head down 5mm before touching the workpiece and that of the cutting head up 5mm after touching the workpiece.
  The larger the difference is, the smaller the stability is.
  If the stability is **Bad**, the fluctuation may be relatively more unstable or the external interference may be relatively more serious. You need to calibrate capacitance again.

- **Smooth**
  The smoothness of the curve.
  If the smoothness is **Bad**, the curve is not flat with ups and downs or burrs. You need to calibrate capacitance again.

Note: During calibrating capacitance, e-stop button is for use at any time in case of machine tool damage caused by cutting head continuous moving downward if the capacitance for touching the workpiece is incorrect.

4.2.5 Check Follow-up

This operation is used to check if follow-up commissioning succeeds.

Before checking follow-up, ensure the calibration is successful.

To check follow-up, do the following:

1. Turn on and off the follow-up and observe whether the cutting head shakes and whether the follow-up distance is correct.
   It is suggested to move a screw driver or a tiny metal plate back and forth under the cutting head and observe whether the cutting head moves up and down along the position of the screw driver or the metal plate and whether the cutting head shakes.
2. To improve security, set parameter **Out Margin Check** as **Yes**.
3. Draw a toolpath, cut it without turning on laser, and observe whether the cutting head shakes during following.

4.3 List of Parameters

This section introduces all parameters in **System** page in **Follow-up Control** dialog box, including:

- System setting parameters
  See 1.0.2 Z-axis, 1.1.3 Origin Setting (Z), 2.0.0 Jog Speed and 2.0.1 Manual Acceleration for details.
- Follow-up Parameters
- Calibration Setting Parameters
- Follow Setting Parameters
- Real-time State Check Parameters
- Speed Setting Parameters
- Manual speed (Z) parameters
  See 1.0.2 Z-axis, 1.1.3 Origin Setting (Z), 2.0.0 Jog Speed and 2.0.1 Manual Acceleration for details.
- Follow-up Outside Workpiece Parameters

4.3.1 Follow-up Parameters

Sensitivity

- A larger value means a more sensitive following.
- A too large value may cause overshoot.
- Range: [0, 20]
- Default value: 10

Ki

- Used as down Kp and to control down speed of following.
- Range: [0, 65535]
- Default: 50

Prefilter Value

- Exclusive for position loop control mode.
- Used to control capacitance jumps.
- The larger the value is, the stronger the ability to control capacitance jumps is and the lower the capacitance sensitivity is.
- Default value: 0.1ms

Enable Dynamic Anti-shake

- Exclusive for position loop control mode.
- Used to control following shake caused by operations such as blowing.
- Yes: enable dynamic anti-shake
- No: disable dynamic anti-shake
- Default value: Yes

Follow Ready Advanced Value

- Exclusive for position loop control mode.
- Suggested range: [0, 1.5]mm
- Default value: 0

In Position Tolerance

- When the detected height is equal to "Follow height ± In position tolerance", follow-up is in position.
- If the follow-up in position signal is not detected in 3s, the values will be doubled and the signal needs to be detected again. At this time, if it is detected in 2s, the system will cut normally; otherwise, an alarm will occur.
- Range: [0, 655]mm
- Default value: 0.1

Zero Limit Speed Range

- Within this range, following motion will not be adjusted.
- Range: [0, 0.1]mm
- Default value: 0.05

Servo Compensation Parameter

- Exclusive for velocity loop control mode.
- Generated after servo calibration.
- Range: [-255, 255]
- Default value: 0

Feed-forward Coefficient

- Exclusive for velocity loop control mode.
- Used to check whether follow-up is adjusted in advance.
- Too large values may lead to follow-up shake, and too small may lead to insensitive response.
- Range: [50, 150]
- Default value: 100

Speed Gain

- Exclusive for velocity loop control mode.
- Calculated by "Motor Rated Power" / 10V.
- Matching speed command input gain in motor.
- Range: [10, 2000]
- Default value: 300

Pulse Count Per Revolution

- Exclusive for velocity loop control mode.
- Number of pulses for per revolution of motor.
- Pitch = Number of pulses per revolution * Pulse equivalent
- Range: [0, 0.1]
- Default value: 10000

4.3.2 Calibration Setting Parameters

Nonmetal Mark

- Used to decide the workpiece type for calibration.
- Yes: calibrate metal workpieces
- No: calibrate nonmetal workpieces
- Default value: No

Touch Part Capacitance

- Capacitance in MHz when the cutting head touches the workpiece.
- Default value: 0Hz

Mark Length

- Used to record capacitance data within this range during calibration.
- It is suggested to set the value relatively small when the stroke of Z-axis is short.
- Range: [0, 25]mm
- Default value: 15

Touch Part Speed

- Speed when the cutting head touches the workpiece during calibration.
- Range: [0, 10000000]mm/min
- Default value: 100

Mark Speed

- Speed of calibration.
- Range: [0, 10000000]mm/min
- Default value: 100

Calibrate Curve Smoothing Point No.

- Used to set the number of calibrated points for the calibration curve.
- Range: [0, 500]
- Default value: 0

4.3.3 Follow Setting Parameters

Z Up Position

- After returning to the machine origin, the machine coordinate of Z-axis up position after following is turned off or cutting finishes.
- Default value: -10

Safety Height

- Safety height to lift Z-aixs before returning to the machine origin.
- Range: [0, 100]mm
- Default value: 10

Follow Height

- The relative distance between the cutting head and the workpiece under follow-up control.

- Range: [0, 30]mm
- Default value: 1

4.3.4 Real-time State Check Parameters

Out Margin Check

- Whether to check the cutting head moving beyond the workpiece margin during following.
- If the cutting head moves beyond the workpiece margin, it will stop.
- Default value: Yes

Out Margin Tolerance

- Compared with the follow-up height position, if the current position is beyond tolerance range, the system will consider the cutting head is beyond the workpiece margin.
- Range: [0, 20]mm
- Default value: 2

Out Margin Sensitivity

- The larger the value is, the higher the tendency is to judge whether the cutting head is beyond the workpiece margin.
- The larger the value is, the higher the tendency for judging out margin is.
- Range: [1, 10]
- Default value: 5

4.3.5 Speed Setting Parameters

Z-axis G00 Speed

- Speed of the cutting head during moving up and down.
- A too large value needs calibration length added accordingly for the cutting head to slow down, so as to avoid colliding with the workpiece.
- Range: [0, maximum speed of Z-axis]mm/min
- Default value: 15000

Max Speed in Follow

- Maximum speed during following.
- Range: [0, maximum speed of Z-axis]mm/min
- Default value: 20000

Max Speed Supported by Z

- Maximum value of following speed and G00 speed.
- Range: [60, 3932100]mm/min
- Default value: 20000

Follow Acceleration

- Acceleration during following.
- Default value: 10000mm/s^2

4.3.6 Follow-up Outside Workpiece Parameters

Max Kp in Follow Outside Part

- Follow outside workpiece is used to avoid following too fast and plunging too deep.
- Used to limit Kp value.
- During outside workpiece following, Kp value is limited within this parameter range.
- Range: [0, 65535]
- Default value: 100

Max Plugging Depth

- Maximum allowable plugging depth of the cutting head relative to the workpiece surface.
- If the actual plugging depth exceeds the set value of the parameter, the cutting head will be outside the workpiece and it will be lifted.
- Range: [0, 5]mm
- Default value: 0

Reference Height in Margin

- If current capacitance stays smaller than the capacitance corresponding to the value of this parameter during sense delay, the system considers the cutting head within the workpiece margin and automatically opens follow-up.
- Range: [0, 5]mm
- Default value: 0

Sense Delay in Margin

- Needed delay time for detecting whether the cutting head is within the workpiece margin.
- A too large large value leads to lag during following and a too small value leads to too sensitive response.
- Range: [1, 500]ms
- Default value: 10

Reference Height Out Margin

- If current capacitance stays larger than the capacitance corresponding to the value of this parameter during sense delay, the system considers the cutting head beyond the workpiece margin and closes follow-up.
- Range: [Reference height in margin, 20]mm
- Default value: 5

Sense Delay Out Margin

- Needed delay time for detecting whether the cutting head is beyond the workpiece margin.
- A too large value will cause that the cutting head detects the margin intensitively and plugs too deep.
- Range: [1, 500]ms
- Default value: 50

4.4 FAQs

This section mainly answers the following common questions that you may encounter during follow-up commissioning:

4.4.1 PG Frequency Dividing Ratio is Set Incorrectly

Cause

Parameter **PG Frequency Dividing Ratio** is set incorrectly.

Solution

Modify its value by adjusting related drive parameters according to the following calculation formula:

Drive	Calculation formula
WISE servo drive	$\text{Dividing Frequency Ratio} = \frac{\text{Pr008}}{(\text{Pr011})*4 \div \text{Mechanical Reducer Ratio}}$
Panasonic MINAS A5 servo drive	$\text{Dividing Frequency Ratio} = \frac{\text{Pr0.08}}{(\text{Pr0.11})*4 \div \text{Mechanical Reducer Ratio}}$
YASKAWA Σ-V/Σ-7 servo drive	$\text{Dividing Frequency Ratio} = \frac{\text{Pitch/Pulse Equivalent}}{(\text{Pr212})*4 \div \text{Mechanical Reducer Ratio}}$
DELTA servo drive	$\text{Dividing Frequency Ratio} = \frac{\text{Pitch/Pulse Equivalent}}{(\text{Pr1-46})*4 \div \text{Mechanical Reducer Ratio}}$

4.4.2 Electric Interference is Serious

Cause

- Physical hardware
  a. The drive, Lambda 5E terminal board and EX33A terminal board are not well grounded.
  b. The cable shielding layer is not well treated, that is, the shielding layer is broken and the shielding nest is not wired to the outer metal frame.
  c. The No.4 pin of M16 tow cable with 4-core air plug and follow-up amplifier are not well connected.
  d. The follow-up amplifier and the machine tool are not connected tightly and completely.
  e. The cable does not work well.
  f. The machine tool is not well grounded.
- Software setting
  a. Value of parameter **Sensitivity** is too large.
  b. Value of parameters **In Position Tolerance** and **Zero Limit Speed Range** are too small.

Solution

- Physical hardware
  a. Reconnect the hardware.
  b. Fix the shielding layer and wire the shielding nest to the outer metal frame.
  c. Connect the No.4 pin of M16 tow cable with 4-core air plug and the follow-up amplifier.
  The resistance value between the two should be very small, and **0** is the best.
  d. Connect the follow-up amplifier and the machine tool tightly and completely.
  e. Change the cable.
  f. Find out the cause for being not well grounded, and solve it.
- Software setting

a. Slightly reduce the value of parameter **Sensitivity**.
b. Slightly increase the values of parameters **In Position Tolerance** and **Zero Limit Speed Range**.

Note: Please be careful. Because these operations may lead to lower precision of follow-up and cutting separately.

4.4.3 The Capacitance is not 0 when the Cutting Head Touches the Workpiece/The Cutting Head Keeps Moving Downward during Calibration

Cause

- The workpiece and the machine tool are not connected or not well connected.
- Insulator like rust and paint exists on the calibrating position of the workpiece.

Solution

1. Manually move the cutting head downward with small step size like 0.1 until it touches the workpiece, and check current capacitance.
2. Set the value of parameter **Touch Part Capacitance** greater than current capacitance.

4.4.4 The Actual Follow-up Height is Different from the Calibrated Follow-up Height

Cause

Enormous change of the environment temperature causes the deviation of the calibration curve.

Solution

Calibrate the distance again.

See Commissioning Steps for details.

4.4.5 The Cutting Head Frequently Stops Working while the Capacitance Feedback is Normal, the Calibration Result is Well and No Alarm Occurs

Cause

The external force caused by gas that flows through the cutting head leads to poor connection between the contact inside the ceramic ring and the cutting head signal port, and then an alarm of touching workpiece occurs. As a result, the cutting head stops working even though the nozzle does not touch the workpiece during cutting.

Solution

Change the ceramic ring.

4.4.6 The Cutting Head Shakes Substantially during Cutting a Thin Sheet

Cause

The air pressure is high.

Solution

Set parameter **Sensitivity** as **2** (default value: 5) and parameter **In Position Tolerance** as **0.2** (default value: 0.1).

4.4.7 An Alarm *Follow-up Process at Error Status* Occurs when Z-axis Moves in Jog Mode or the Follow-up is Turned on Manually

Cause

- The axis direction of the drive is incorrect and outside interference leads to zero drift.
- Outside interference leads to zero drift.

Solution

Do the following (taking a Panasonic A6 series servo drive as an example):

1. To judge whether the axis direction of the drive is correct and solve the problem, do the following:
    a. Click **Z+** / **Z-** in the software and see whether the cutting head moves:
        - If it does, it indicates the direction is correct.
        - If it does not, it indicates that the direction is incorrect. Proceed to next step.
    b. **Optional:** Modify the value of parameter **Axis Direction** and restart the drive.
2. To adjust zero drift, do the following:
    a. Ensure the value of parameter **Pr3.15** is the default value **0**.
    b. Turn on the drive, and automatically adjust zero drift **AF_oF1**, **AF_oF2** and **AF_oF3**.
    Turning on the software is not required in this step.

5 List of System Parameters

This section introduces all parameters under **System → System Parameters** menu in **NcEditor V12 Laser Cutting CNC System**, including:

5.1 Basic Parameters

This section introduces basic parameters of the machine tool under **Basic Param** category, including the following:

1.0.0 X-axis

Moving Distance Per Revolution of Motor

- Moving diatance per revolution of motor on load axis.
- Range: (0, 200]mm
- Default value: 100

Pulse Equivalent

- Displacement or angle caused by per pulse in X-axis.
- Range: [1E-08, 1000]mm/p
- Default value: 0.002

Axis Direction

- Moving direction of X-axis.
- If the moving direction of X-axis is opposite to the direction judged by **Right Hand Rule** when the machine tool is moved manually, modify the value of the this parameter.
- 1: Positive
- -1: Negative
- Default value: 1

PG Frequency Dividing Ratio of X

- Ratio of sending pulse to feedback pulse in X-axis.
- Positive value: positive direction of axis encoder
- Negative value: negative direction of axis encoder
- 0: not enable encoder feedback

- Range: [-10000, 10000]
- Default value: -1

Max. Speed

- Maximum allowable speed of X-axis.
- Range: (0, maximum speed supported by hardware]mm/min
- Default value: 60000

Enable Soft Limit Protection

- Used to prevent the machine tool from colliding with hard limit switch.
- Yes: enable
- No: not enable
- Default value: Yes

Soft Limit Lower Limit

- Lower limit of soft limit.
- Range: [-999999, soft limit upper limit)mm
- Default value: 0

Soft Limit Upper Limit

- Upper limit of soft limit.
- Range: (soft limit lower limit, 999999]mm
- Default value: 1500

1.0.1 Y-axis

Enable Single Y Configuration

- Whether to enable single Y configuration.
- Yes: single Y configuration
- No: double Y configuration
- Default value: No

Moving Distance Per Revolution of Motor

- Moving diatance per revolution of motor on load axis.
- Range: (0, 200]mm
- Default value: 100

Pulse Equivalent

- Displacement or angle caused by per pulse in Y-axis.
- Range: [1E-08, 1000]mm/p
- Default value: 0.002

Axis Direction

- Moving direction of Y-axis.
- If the moving direction of Y-axis is opposite to the direction judged by **Right Hand Rule** when the machine tool is moved manually, modify the value of the this parameter.
- 1: Positive
- -1: Negative
- Default value: -1

PG Frequency Dividing Ratio of Y

- Ratio of sending pulse to feedback pulse in Y-axis.
- Positive value: positive direction of axis encoder

- Negative value: negative direction of axis encoder
- 0: not enable encoder feedback
- Range: [-10000, 10000]
- Default value: -1

Max. Speed

- Maximum allowable speed of Y-axis.
- Range: (0, maximum speed supported by hardware]mm/min
- Default value: 60000

Enable Soft Limit Protection

- Used to prevent the machine tool from colliding with hard limit switch.
- Yes: enable
- No: not enable
- Default value: Yes

Enable Soft Limit Protection

- Used to prevent the machine tool from colliding with hard limit switch.
- Yes: enable
- No: not enable
- Default value: Yes

Soft Limit Lower Limit

- Lower limit of soft limit.
- Range: [-999999, soft limit upper limit)mm
- Default value: 0

Soft Limit Upper Limit

- Upper limit of soft limit.
- Range: (soft limit lower limit, 999999]mm
- Default value: 3000

1.0.2 Z-axis

Pulse Equivalent

- Displacement or angle caused by per pulse in Z-axis.
- Range: [1E-08, 1000]mm/p
- Default value: 0.001

Axis Direction

- Moving direction of Z-axis.
- If the moving direction of Z-axis is opposite to the direction judged by **Right Hand Rule** when the machine tool is moved manually, modify the value of the this parameter.
- 1: Positive
- -1: Negative
- Default value: 1

PG Frequency Dividing Ratio of Z

- Ratio of sending pulse to feedback pulse in Z-axis.
- Positive value: positive direction of axis encoder
- Negative value: negative direction of axis encoder
- 0: not enable encoder feedback
- Range: [-10000, 10000]

- Default value: -1

Encoder Feedback Tolerance

- Tolerance of encoder feedback position and current position.
- Range: [0, 10000]mm
- Default value: 0.001

Max. Speed

- Maximum allowable speed of Z-axis.
- Range: (0, maximum speed supported by hardware]mm/min
- Default value: 36000

Enable Soft Limit Protection

- Used to prevent the machine tool from colliding with hard limit switch.
- Yes: enable
- No: not enable
- Default value: Yes

Soft Limit Lower Limit

- Lower limit of soft limit.
- Range: [-999999, soft limit upper limit)mm
- Default value: -3000

Soft Limit Upper Limit

- Upper limit of soft limit.
- Range: (soft limit lower limit, 999999]mm
- Default value: 0

1.0.3 W-axis

Pulse Equivalent

- Displacement or angle caused by per pulse in W-axis.
- Range: [1E-08, 1000]mm/p
- Default value: 0.001

Axis Direction

- Moving direction of W-axis.
- If the moving direction of W-axis is opposite to the direction judged by **Right Hand Rule** when the machine tool is moved manually, modify the value of the this parameter.
- 1: Positive
- -1: Negative
- Default value: 1

Max. Speed

- Maximum allowable speed of W-axis.
- Range: (0, maximum speed supported by hardware]mm/min
- Default value: 36000

Enable Soft Limit Protection

- Used to prevent the machine tool from colliding with hard limit switch.
- Yes: enable
- No: not enable
- Default value: Yes

Soft Limit Lower Limit

- Lower limit of soft limit.
- Range: [-999999, soft limit upper limit)mm
- Default value: -3000

Soft Limit Upper Limit

- Upper limit of soft limit.
- Range: (soft limit lower limit, 999999]mm
- Default value: 0

1.1.0 General Parameters

Force Homing before Machining

- Whether returning to the machine origin is required before machining.
- Used to retrieve machine coordinate system, so as to solve the problem that in case of e-stop or power faiure during machining, deviation occurs after the incremental machine tool is restarted.
- Yes: force
- No: not force
- Default value: No

Limit Switch Used as Home Switch

- Whether limit saitch can be used as home switch as well. That is, exclusive home switch can be absent, and limit switch signal serves as home switch signal in homing.
- Yes: used
- No: not used

Coarse Fine Positioning Minimum Distance

- Minimum distance between coarse positioning and fine positioning signals.
- Range: (0, 10]mm Default value: 2

1.1.1 Origin Setting (X)

X Direction in Coarse Positioning

- Moving direction of X-axis in coarse positioning stage during returning to the machine origin.
- 1: Positive
- -1: Negative
- Default value: -1

X Speed in Coarse Positioning

- Feedrate of X-axis in coarse positioning stage during returning to the machine origin.
- Range: [0.06, 9000]mm/min
- Default value: 6000

X Speed in Precision Positioning

- Feedrate of X-axis in fine positioning stage during returning to the machine origin.
- Range: [0.06, 6000]mm/min
- Default value: 600

Back Distance of X

- X-axis additional displacement after fine positioning stage during returning to the machine origin.

- Positive value: X-axis moving direction in retract stage is opposed to that in coarse positioning stage.
- Negative value: X-axis moving direction in retract stage is the same with that in coarse positioning stage.
- Range: [-2000, 2000]mm
- Default value: 2

1.1.2 Origin Setting (Y)

Y2-axis Homing Mode

- Coarse positioning mode of Y2-axis returning to the machine origin.
- 0: use Y1-axis machine origin
- 1: use Y2-axis machine origin
- Default value: 0

Y Direction in Coarse Positioning

- Moving direction of Y-axis in coarse positioning stage during returning to the machine origin.
- 1: Positive
- -1: Negative
- Default value: -1

Y Speed in Coarse Positioning

- Feedrate of Y-axis in coarse positioning stage during returning to the machine origin.
- Range: [0.06, 9000]mm/min
- Default value: 6000

Y Speed in Precision Positioning

- Feedrate of Y-axis in fine positioning stage during returning to the machine origin.
- Range: [0.06, 6000]mm/min
- Default value: 600

Back Distance of Y

- Y-axis additional displacement after fine positioning stage during returning to the machine origin.
- Positive value: Y-axis moving direction in retract stage is opposed to that in coarse positioning stage.
- Negative value: Y-axis moving direction in retract stage is the same with that in coarse positioning stage.
- Range: [-100, 1000]mm
- Default value: 2

1.1.3 Origin Setting (Z)

Z Direction in Coarse Positioning

- Moving direction of Z-axis in coarse positioning stage during returning to the machine origin.
- 1: Positive
- -1: Negative
- Default value: 1

Z Speed in Coarse Positioning

- Feedrate of Z-axis in coarse positioning stage during returning to the machine origin.
- Range: [0.06, 9000]mm/min

- Default value: 1800

Z Speed in Precision Positioning

- Feedrate of Z-axis in fine positioning stage during returning to the machine origin.
- Range: [0.06, 6000]mm/min
- Default value: 60

Back Distance of Z

- Z-axis additional displacement after fine positioning stage during returning to the machine origin.
- Positive value: Z-axis moving direction in retract stage is opposed to that in coarse positioning stage.
- Negative value: Z-axis moving direction in retract stage is the same with that in coarse positioning stage.
- Range: [-100, 1000]mm
- Default value: 2

1.1.4 Origin Setting (W)

W Direction in Coarse Positioning

- Moving direction of W-axis in coarse positioning stage during returning to the machine origin.
- 1: Positive
- -1: Negative
- Default value: -1

W Speed in Coarse Positioning

- Feedrate of W-axis in coarse positioning stage during returning to the machine origin.
- Range: [0.06, 9000]mm/min
- Default value: 600

W Speed in Precision Positioning

- Feedrate of W-axis in fine positioning stage during returning to the machine origin.
- Range: [0.06, 6000]mm/min
- Default value: 60

Back Distance of W

- W-axis adjusting displacement after fine positioning stage during returning to the machine origin.
- Range: [-100, 1000]mm
- Default value: 2

1.2 Error Compensation Setting

Lead Screw Compensation Mode

- Mode used to compensate lead screw error.
- 0: no compensation
- 1: backlash compensation
- 2: screw error compensation

Backlash X

- Valid only when lead screw compensation mode is set as backlash compensation.
- Range: [0, 0.1]mm
- Default value: 0

Backlash Y

- Valid only when lead screw compensation mode is set as backlash compensation.
- Range: [0, 0.1]mm
- Default value: 0

Backlash W

- Valid only when lead screw compensation mode is set as backlash compensation.
- Range: [0, 0.1]mm
- Default value: 0

W-axis Lead Screw Compensation Mode

- Mode used to compensate lead screw error.
- 0: no compensation
- 1: backlash compensation
- 2: screw error compensation

Screw Error Compensation Positioning Speed

- Positioning speed of laser interferometer in screw error compensation wizard.
- Range: [0.06, maximum value in X-axis and Y-axis maximum speed values]mm/min
- Default value: 1800

1.3 Double Y Error Setting

Y1Y2 Feedback Pulse Same Direction

- Whether directions of feedback pulses in Y1-axis and Y2-axis are the same.
- Yes: same direction
- No: opposite direction
- Default value: No

Double Y Tolerance

- Range of double Y encoder origin error.
- Range: [0, 10000]mm
- Default value: 5

Enable Double Y Error Detect

- Whether to enable double Y error detection.
- Yes: enable
- No: disable
- Default value: Yes

Y1Y2 Static Tolerance

- When Y1-axis and Y2-axis are steady, if the difference between the feedback value and output value is greater than the value, alarm will occur.
- Range: (0,100)mm
- Default value: 3

Y1Y2 Dynamic Tolerance

- When Y1-axis and Y2-axis are moving, if the difference between the feedback value and output value is greater than the value, alarm will occur.
- Range: [10, 1000]ms
- Default value: 3

Double Y Error Detect Cycle

- Cycle for detecting double Y error.

- If the value is too large, alarm will not occur in time and the machine tool will be damaged.
- Range: [10, 1000]ms
- Default value: 100

5.2 Speed and Accuracy Parameters

This section introduces parameters of speed and accuracy under **Speed and Accuracy** category, including the following:

2.0.0 Jog Speed

XY-axis Rapid Jogging Speed

- Speed in rapid jog mode.
- Range: [Jogging speed, Maximum value of maximum speeds between XY-axes]mm/min
- Default value: 18000

XY-axis Jogging Speed

- Default speed in jog mode.
- Parameter **XY-axis Rapid Jogging Speed** takes its value before returning to the machine origin.
- Range: [0.06, Rapid jogging speed]mm/min
- Default value: 6000

XY-axis Stepping Speed

- Step speed in step mode.
- Range: [0.06, Maximum value of maximum speeds between XY-axes]mm/min
- Default value: 6000

Z-axis Rapid Jogging Speed

- Speed in rapid jog mode.
- Range:
- Default value: 1800

Z-axis Jogging Speed

- Default speed in jog mode.
- Range- [0.06, Rapid jogging speed]mm/min
- Default value: 1200

Z-axis Stepping Speed

- Step speed in step mode.
- Range: [0.06, Minimum value of maximum speeds among all axes]mm/min
- Default value: 1200

W-axis Jogging Speed

- Default speed in jog mode.
- Range: [0.06, Rapid jogging speed]mm/min
- Default value: 120

2.0.1 Manual Acceleration

X-axis Manual Feed Acceleration

- Acceleration in jog mode.
- Used to control the acceleration in jog mode.
- Range: [16, 100000]mm/s^2
- Default value: 2000

Y-axis Manual Feed Acceleration

- Acceleration in jog mode.
- Used to control the acceleration in jog mode.
- Range: [16, 100000]mm/s^2
- Default value: 2000

Z-axis Manual Feed Acceleration

- Acceleration in jog mode.
- Used to control the acceleration in jog mode.
- Range: [8, 100000]mm/s^2
- Default value: 2000

W-axis Manual Feed Acceleration

- Acceleration in jog mode.
- Used to control the acceleration in jog mode.
- Range: [0, 100000]mm/s^2
- Default value: 400

2.0.2 Manual Axial Jerk

X-axis Manual Feed Jerk

- Jerk in jog mode.
- Used to control the jerk in jog mode.
- Range: [16, 100000]mm/s^3
- Default value: 10000

Y-axis Manual Feed Jerk

- Jerk in jog mode.
- Used to control the jerk in jog mode.
- Range: [16, 100000]mm/s^3
- Default value: 10000

Z-axis Manual Feed Jerk

- Jerk in jog mode.
- Used to control the jerk in jog mode.
- Range: [16, 100000]mm/s^3
- Default value: 10000

W-axis Manual Feed Jerk

- Jerk in jog mode.
- Used to control the jerk in jog mode.
- Range: [16, 100000]mm/s^3
- Default value: 10000

2.1 Machining Speed

G00 Speed

- Default speed during positioning.
- Range: [0.06, Maximum value of maximum speeds between XY-axes]mm/min
- Default value: 30000

G00 Acc

- Maximum acceleration of each axis during machining.
- Range: [100, 100000]mm/s^2
- Default value: 10000

G00 Jerk

- Change rate of single axis acceleration during rapid traverse.
- Range: [0.001, 9999999]mm/s^3: Default value: 100000

Gxx Acc

- Single axis acceleration is used to describe the acceleration/deceleration capability of single feed axis.
- Decided by the physical feature of the machine tool, such as quality of motion part, torque and resistance of the feed motor.
- The larger the value is, the less time the machine tool spends in acceleration/deceleration during motion process, and the higher the efficiency is.
- Set a smaller value at first, and repeatedly execute typical motions for a period of time. If there is no abnormal situation, you can gradually increase the value. If abnormal condition occurs, you should reduce the value, with 50%~100% insurance allowance.
- Range: [100, 100000]mm/s$^{2</sup}$
- Default value: 5000

2.2 Machining Accuracy

Max. Look-ahead Paths

- Maximum number of path to calculate distance.
- Range: [1, 1000]
- Default value: 300

Enable B-spline Interpolation

- Used to enable B-spline interpolation to segment that matches B-spline curve characteristic, so as to improve machining efficiency.
- 1: Yes
- 0: No
- Default value: 1

Corner Error

- The greater the value is, the larger the corner error is.
- Range: [0, 0.3]mm
- Default value: 0.1

Anti-vibration Ratio

- The greater the value is, the lower the mechanical vibration is, and greater value can smooth the sharper corner.
- Range: [0, 10]
- Default value: 0

Acceleration Factor

- Used to adjust startup acceleration.

- The greater the value is, the faster the startup acceleration is.
- Range: [0, 0.5]
- Default value: 0.1

Max. Angle of High-speed Connection

- If the angle of two adjacent segments are larger than the value during machining, the speed of machining joint is startup speed.
- If smaller than the value, an appropriate connection speed will be calculated according to the connection angle.
- Range: [0, 180]deg
- Default value: 180

Circular Speed Limit

- When it is enabled, parameters **Max. Look-ahead Paths**, **Max Speed of Ref Circle** and **Min Speed of Ref Circle** work.
- Yes: enable
- No: disable
- Default value: Yes

Max Speed of Ref Circle

- When an arc is machined, the machine tool will vibrate due to centripetal force. To reduce this kind of vibration, the software limits machining speed during machining an arc in terms of centripetal acceleration.
- Take default setting as an example, the maximum line velocity of the reference circle (diameter: 10mm) is 1800mm/min. The formula to calculate centripetal acceleration is $\alpha=v^2/r$; among it, r=(10/2)mm, v=1800mm/min. Thus centripetal acceleration α can be calculated; when other arcs are processed, this centripetal acceleration is the maximum allowable centripetal acceleration. Arc apeed will be limited if it is too large causing centripetal acceleration larger than α calculated in this formula.
- Range: (1, Minimum value of maximum speeds between XY-axes]mm/min
- Default value: 5000

5.3 External Device Parameters

This section introduces parameters of external device under **External Device** category, including the following:

3.0 Monitoring

Enable Camera

- Whether to enable camera fuction.
- Default value: No

3.1 Lube

Enable Lubricate

- Used to select the mode of lubrication.
- 0: Not enable lubrication
- 1: Automatic lubrication
- 2: Manual lubrication
- Default value: 0

Lubricate Len

- Distance between lubrication happening
- Range: [1, 999999]m
- Default value: 100

Lubricate Time

- Duration of each lubrication
- Range: [1, 100]s
- Default value: 5

3.2 Gas Control

Default Blow Type

- Gas type when the button **Blow** is clicked.
- 0: Air
- 1: Nitrogen
- 2: Oxygen
- Default value: 0

Default Blow P.

- Default value of air pressure in idle status.
- Range: [0, 10]V
- Default value: 5

Max Pressure of Proportioning Valve

- Maximum air pressure of the proportioning valve, also the air pressure corresponding to 100% analog.
- Range: [0.1, 10]MPa
- Default value: 3

Oxygen Proportioning Valve Output

- 0: Not use analog control
- 1: Use AVO1
- 2: Use AVO2
- 3: Use AVO3
- Default value: 1

Nitrogen Proportioning Valve Output

- 0: Not use analog control
- 1: Use AVO1
- 2: Use AVO2
- 3: Use AVO3
- Default value: 1

Analog AVO1/2/3

- Voltage of analog AVO1/2/3 when the analog rate is 100%.
- Range: [Pressure in idle status, 10]V
- Default value: 10

3.3 Exhaust

Enable Auto Exhaust

- Whether to enable automatic exhaust.
- Default value: No

Disable Exhaust Delay

- Delay time before disabling exhaust port when leaving out of the area.
- Range: [1, 1000]ms
- Default value: 1

Start Position of Exhausting

- Starting position of exhausting area, in machine coordinate.
- Range: [Lower limit of Y-axis, Upper limit of Y-axis]mm
- Default value: 0

Exhausting Interval1

- Length of No.1 exhausting area.
- Range: [10, 10000]
- Default value: 1000

Exhausting Interval2

- Length of No.2 exhausting area.
- Range: [10, 10000]
- Default value: 1000

Exhausting Interval3

- Length of No.3 exhausting area.
- Range: [10, 10000]
- Default value: 1000

3.4 Exchange Workbench

Enable Exchange Workbench

- Whether to exchange workbench.
- Default value: No

3.5 Focus Control

Enable Focus Control

- Whether to enable focus control function.
- Default value: No

3.6 Follow-up

Empty Move Collide Sensitivity

- Used to control the sensitivity of touching workpiece signal during rapid traverse process.
- The greater the value is, the lower the sensitivity will be.
- Range: [1, 10000]ms
- Default value: 100

Cutting Collide Sensitivity

- Used to control the sensitivity of touching workpiece signal during cutting.
- The greater the value is, the lower the sensitivity will be.
- During cutting a metal workpiece, the metal slag on the nozzle leads to an alarm of touching workpiece. Set the value larger.

- Range: [1, 10000]ms
- Default value: 200

3.7 Laser Device

Laser Power

- Voltage that corresponds to 100% laser power.
- Range: [0, 10]V
- Default value: 10

Min Pulse Width

- Minimum allowable pulse width when laser power is controlled by duty ratio.
- When pulse width is smaller than this value, this value is used.
- When pulse width is larger than this value, pulse width in duty ratio is used.
- Range: [0, 1000000]μs
- Default value: 5

Adjust Power Mode

- During analog adjustment, AVC output = Laser power * Cutting power * Speed power curve, Duty ratio = PWM duty ratio
- During duty ratio adjustment, AVC output = Laser power * Cutting power, Duty ratio = PWM duty ratio * Speed power curve
- 0: Analog adjustment
- 1: Duty ratio adjustment
- Default value: 1

Power Increasing Speed

- Time for power to increase from 0% to 100%, which can be used to solve the problem of over burning at the start point.
- Range: [0, 1000]ms
- Default value: 0

5.4 Advanced Function Parameters

This section introduces parameters of advanced function under **Advanced Function** category, including the following:

4.0 Habitual Setting

Prompt Type When Tack End

- Red light is on after machining.
- 0: No prompt
- 1: Res light on for 3s
- 2: Red light always on until there is input from mouse or keyboard
- Default value: 0

Auto Clear Workcoor

- Whether to clear workpiece coordinate when machining, cutting frame or dry run starts.
- 0: No
- 1: Yes
- Default value: 0

Enable Breakpoint Check

- Check breakpoint when machining starts. If breakpoint exists, a prompt box will pop up.
- Default value: No

Enable Handle

- Whether to enable handle control.
- Default value: Yes

Screen Switch

- Used to switch between landscape mode and portait mode.
- 0: Landscape mode
- 1: Portrait mode
- Default value: 0

4.1 Simulation

Simulation Speed

- Speed during executing simulation.
- Range: [0, 100000]mm/min
- Default value: 1000

4.2 Fixed Point

X Machine Coordinate

- X-axis machine coordinate of the fixed point.
- Range: [-99999, 99999]mm
- Default value: 0

Y Machine Coordinate

- Y-axis machine coordinate of the fixed point.
- Range: [-99999, 99999]mm
- Default value: 0

4.3 Resume

Enable Breakpoint Resume Not Perforate

- Whether to enable resume without piercing during cutting.
- Default value: No

Back Distance at Breakpoint Resume

- Retract distance during executing breakpoint resume.
- Range: [0, 10000]mm
- Default value: 2

Positioning Breakpoint Speed

- Positioning speed during executing breakpoint resume.
- Range: [10, Maximum value of maximum speed between X-axis and Y-axis]mm/min
- Default value: 30000

Forward/Retract Speed

- Speed during moving forward/backward.
- Range: [10, Maximum value of maximum speed between X-axis and Y-axis]mm/min
- Default value: 3000

4.4 Leap Frog

Enable Frog Leaping

- Whether to enable leapfrog.
- It is modified synchronously with frogleap function in **Layer Setting** dialog box. See Layer Function for details.
- Default value: Yes

Leaping Min. Dis

- When the distance between the start point and the end point is smaller than this value, Z-axis jumps to the machining point instead of executing leapfrog.
- Range: [0.01, 100]mm
- Default value: 10

4.5 Scan Cutting

Scan Type

- Used to change the terminal board during scan cutting.
- 1: 1st generation-LD5S
- 2: 2nd generation-LD5E
- Default value: 1

Wiring of S Port of Terminal Board

- Used to select the wiring type of port S of the terminal board.
- 0: COM
- 1: 24V
- Default value: 1

Laser on Lead Time for Scan Cutting

- It can be set larger when some workpiece is left uncut at trace start.
- Range: [0, 10]
- Default value: 2

Laser off Lag Time for Scan Cutting

- It can be set larger when some workpiece is left uncut in trace end.
- Range: [0, 10]
- Default value: 1

The Buffer Count for Scan Cutting

- Modify this parameter when cutting trace is dislocated.
- Set it larger when laser is turned on early and set it smaller when laser is turned on late.
- Range: [40, 128]
- Default value: 95

4.7 Edge Finding

Auto Find Edge Before Machining

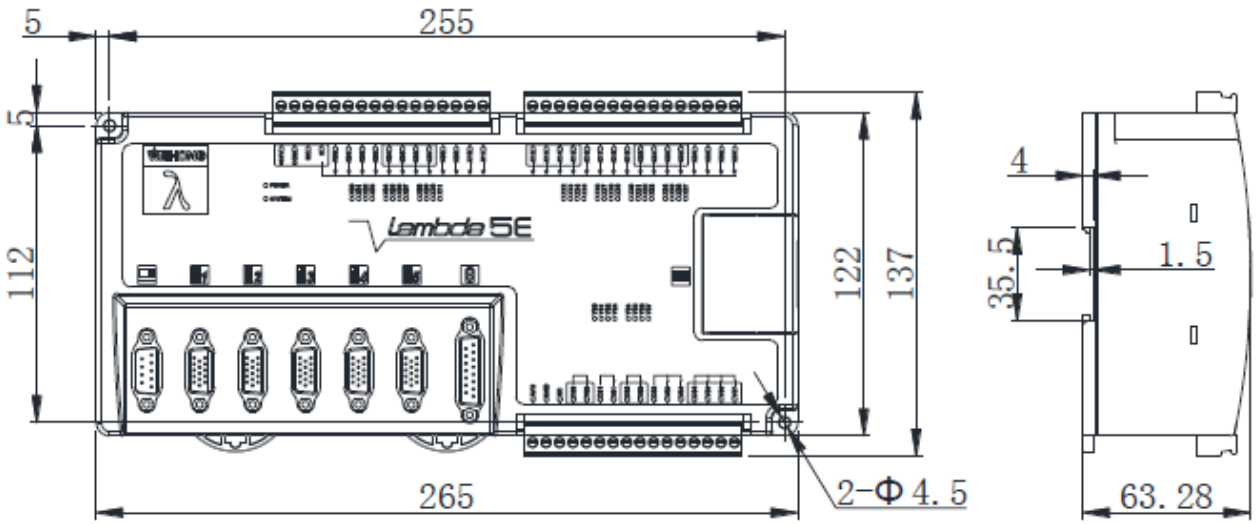
- Whether to automatically find edges before machining.
- Default value: No

6 Wiring Diagram of Drive

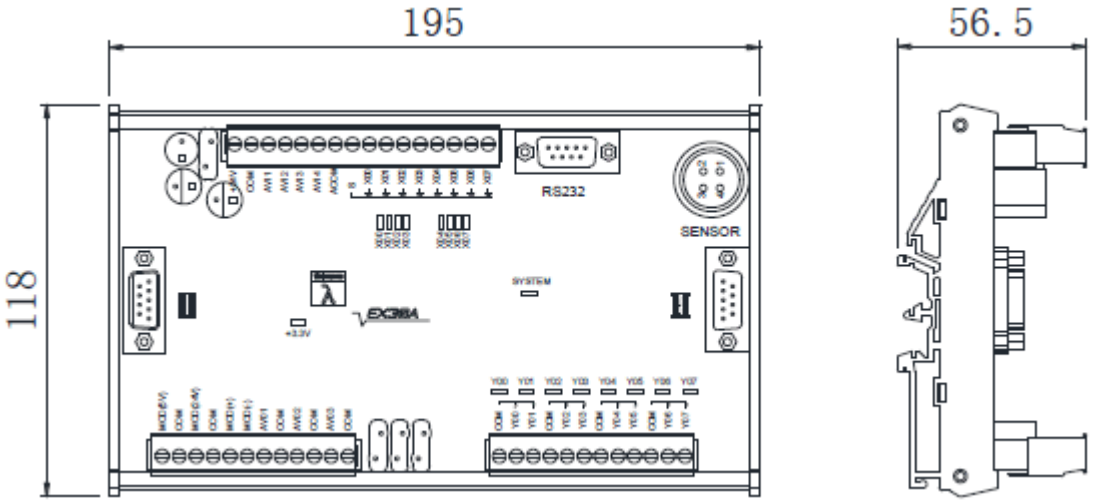
6.1 Mounting Dimension

In this section, you can quickly know about the dimension of hardware, so as to confirm the space is sufficient during installation.

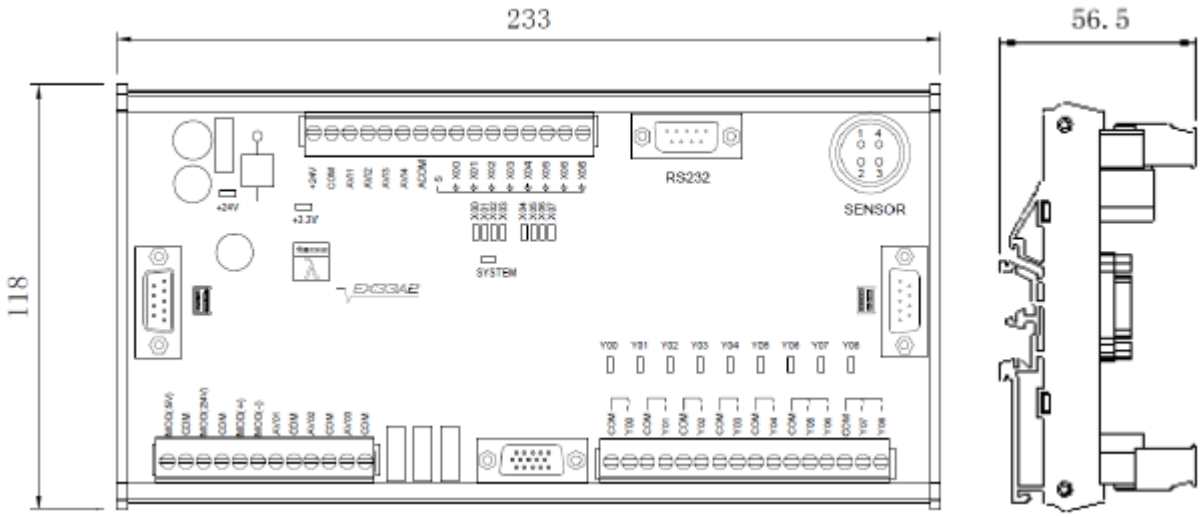
Mounting dimension of Lambda 5E terminal board is as follows:



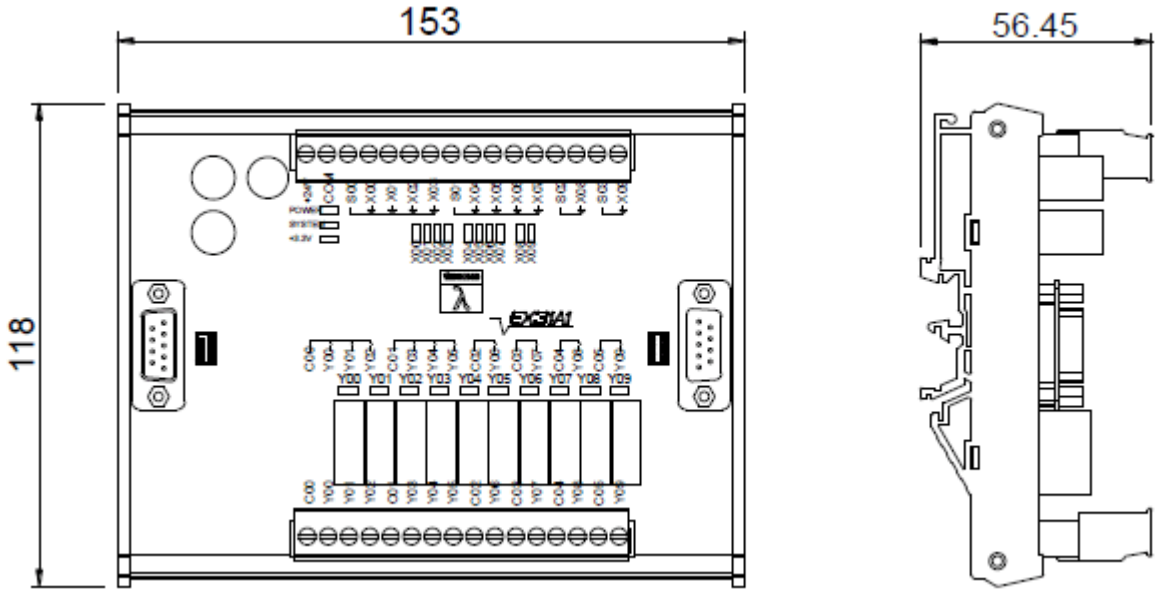
Mounting dimension of EX30A terminal board is as follows:



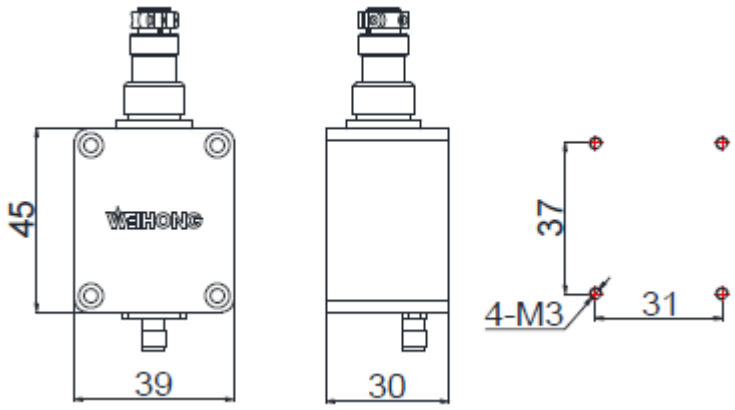
Mounting dimension of EX33A terminal board is as follows:



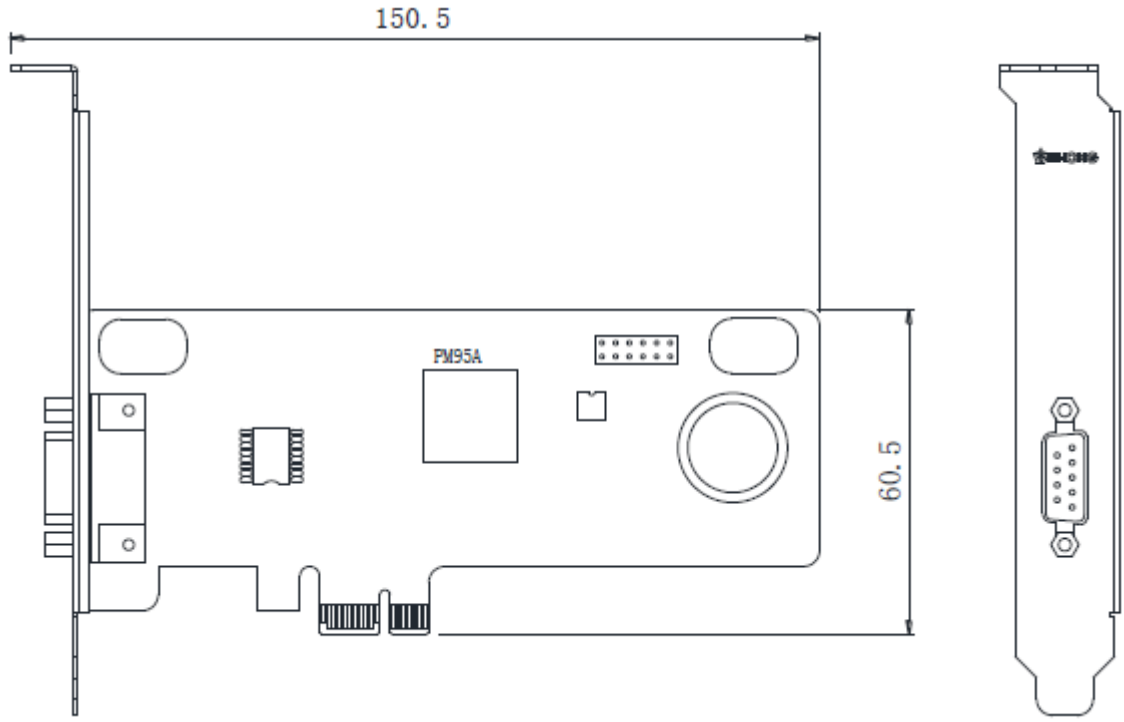
Mounting dimension of EX31A terminal board is as follows:



Mounting dimension of follow-up amplifier is as follows:



Mounting dimension of PM95A motion control card is as follows:



6.2 Wiring Diagram of Terminal Board

In this section, you can quickly know about how to connect I/O ports of each terminal board.

According to the configuration, wiring diagram of terminal board can be divided into the following:

- Wiring Diagram of Terminal Board (in Sheet Cutting Configuration)
- Wiring Diagram of Terminal Board (in Tube Cutting Configuration)

Terminal board differs in follow-up control mode:

- In position loop control mode, the terminal board is EX30A terminal board.
- In velocity loop control mode, the terminal board is EX33A terminal board.

To enable exchanging workbench function, EX31A terminal board must be added.

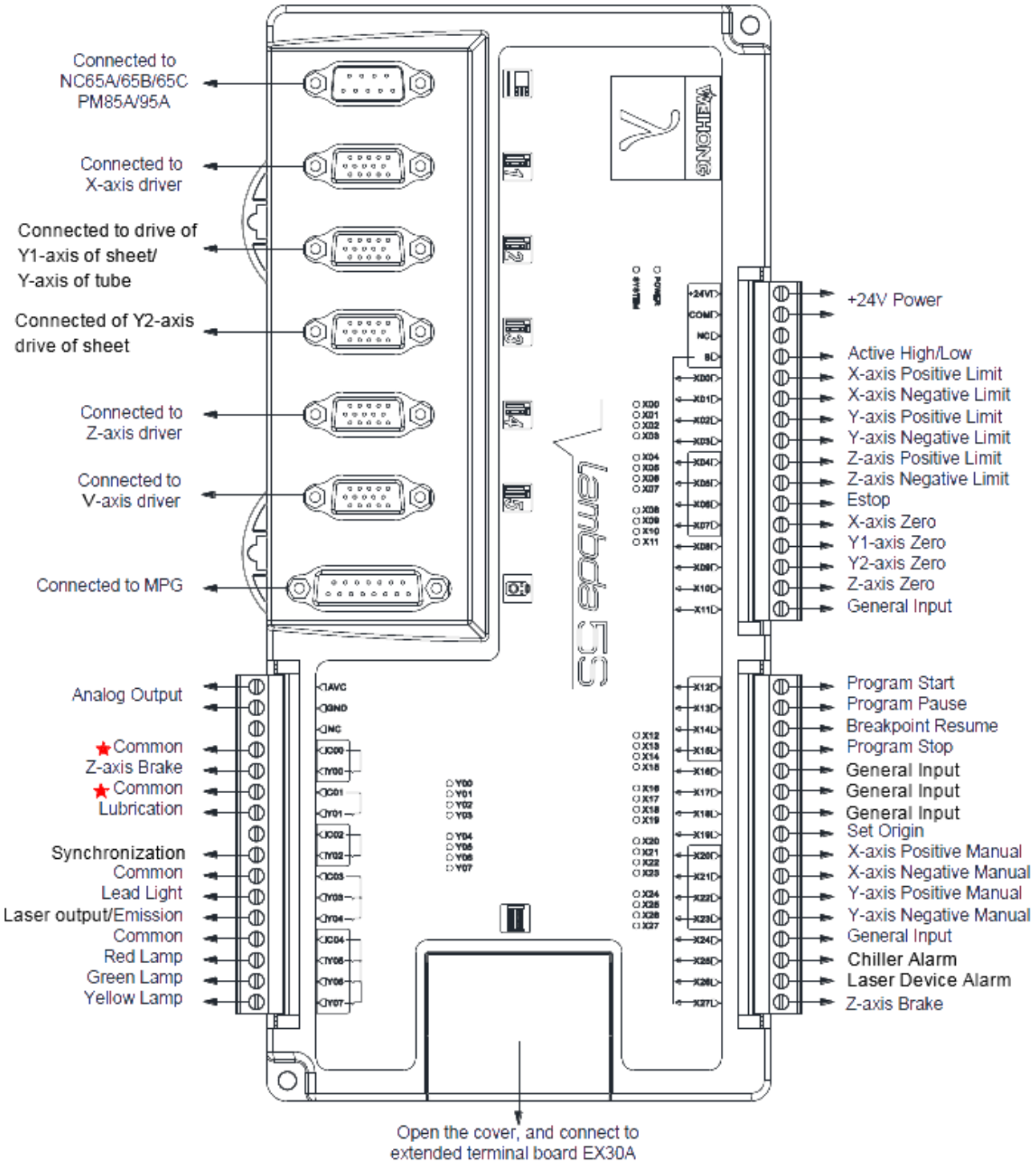
6.2.1 Wiring Diagram of Terminal Board (in Sheet Cutting Configuration)

In sheet cutting configuration, wiring diagram of terminal board includes the following:

- Wiring Diagram of Lambda 5E Terminal Board
- Wiring Diagram of EX30A Terminal Board
- Wiring Diagram of EX33A Terminal Board
- Wiring Diagram of EX31A Terminal Board

6.2.1.1 Wiring Diagram of Lambda 5E Terminal Board

In double Y configuration, wiring diagram of Lambda 5E terminal board in position loop control mode is as follows:



Wiring diagram in velocity loop control mode differs from that in position loop control mode in that:

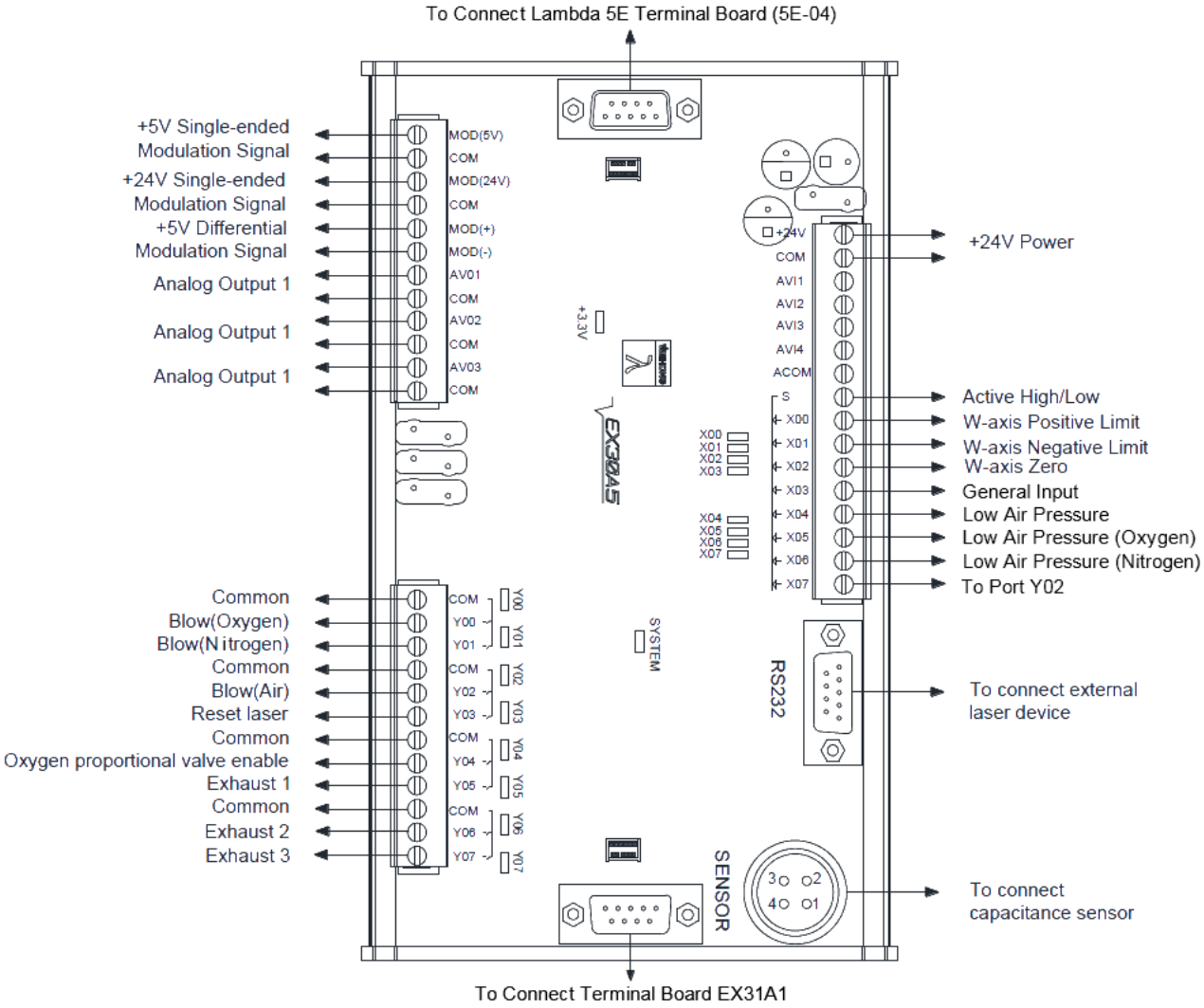
- Port **Connected to Z-axis driver** is not connected.
- The connected terminal board is EX33A.

Wiring diagram in single Y configuration differs from that in double Y configuration in that:

- X-axis, Y-axis and Z-axis servo interfaces should be connected to axis servo interfaces 1, 2 and 4.
- Port X08 is the origin of Y-axis and port X09 is general input port.

6.2.1.2 Wiring Diagram of EX30A Terminal Board

Wiring diagram of EX30A terminal board is as follows:

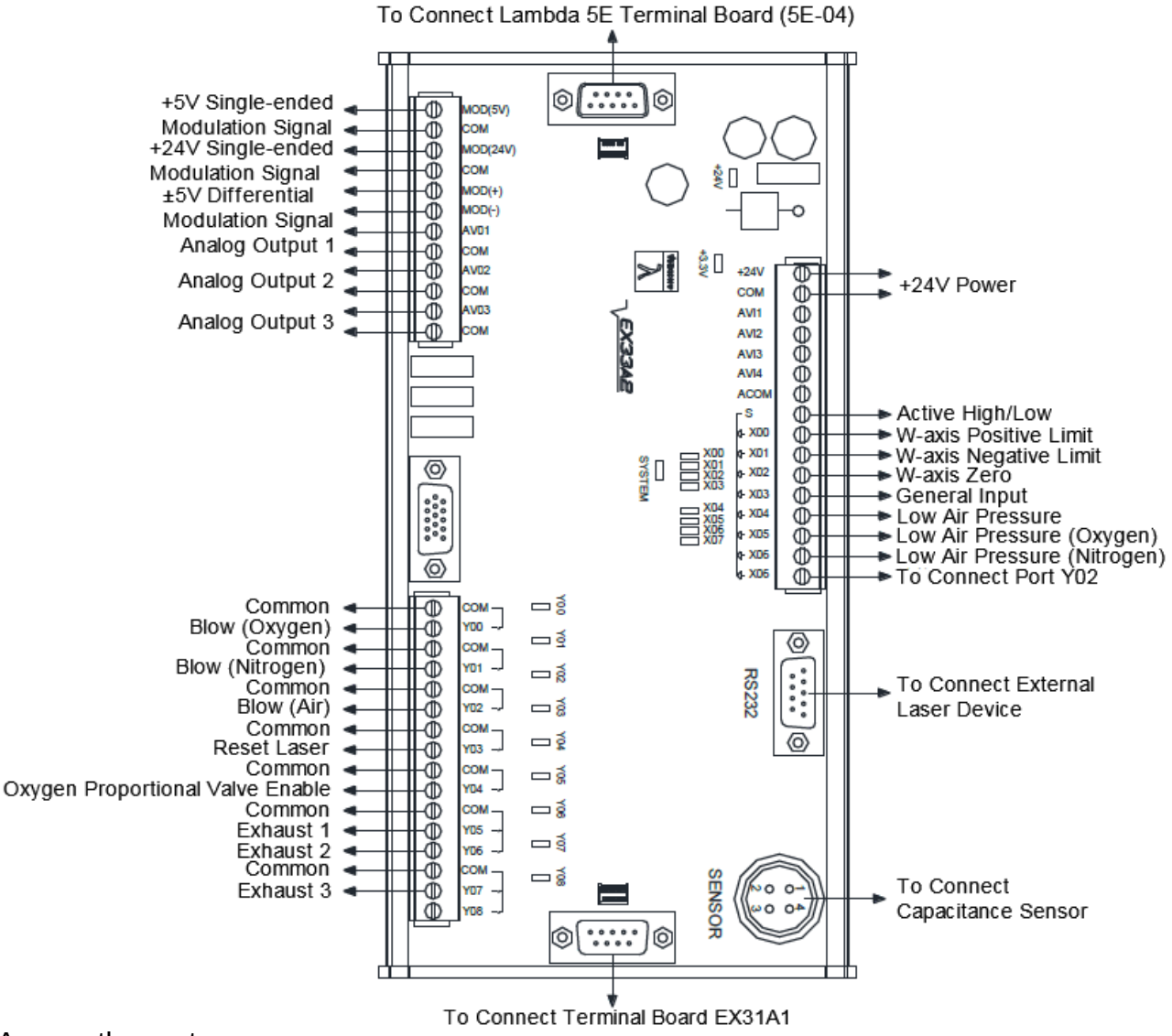


Among the ports:

- The outputs of EX30A terminal board are Darlington outputs and their load current cannot be more than 0.4A.
- Outputs Y00~Y05 should be conneted to relays.
- In configuration with follow-up, Y02 is set as **Blow (Air)**.
- In configuration without follow-up, Y02 is set as **Follow Control Switching**.

6.2.1.3 Wiring Diagram of EX33A Terminal Board

Wiring diagram of EX33A terminal board is as follows:

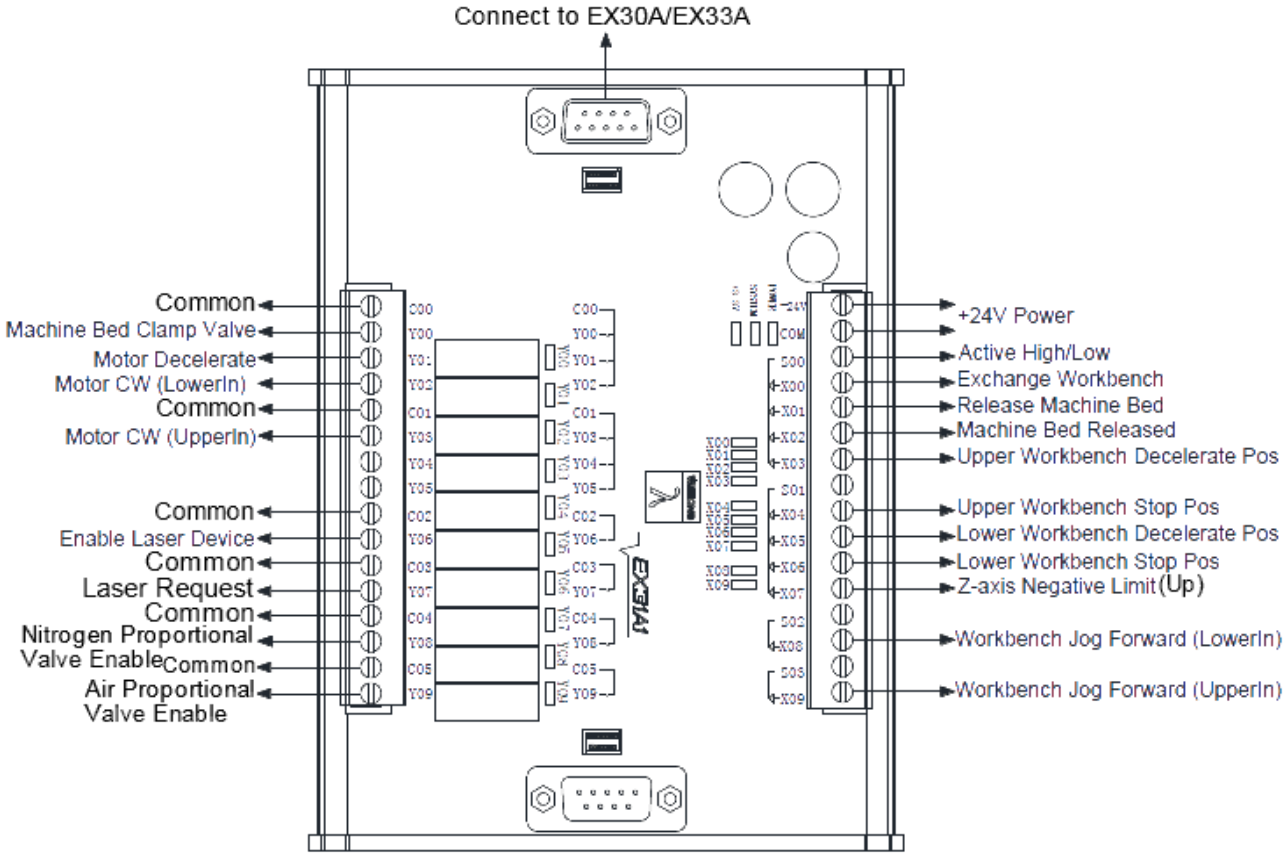


Among the ports:

- Outputs Y00~Y05 should be conneted to relays.
- In configuration with follow-up, Y02 is set as **Blow (Air)**.
- In configuration without follow-up, Y02 is set as **Follow Control Switching**.

6.2.1.4 Wiring Diagram of EX31ATerminal Board

Wiring diagram of EX31A terminal board is as follows:



Among the ports:

- C00~C05 are common ports.
- Y04~Y09 are reserved output ports.
- S00~S03 are active high/low ports.

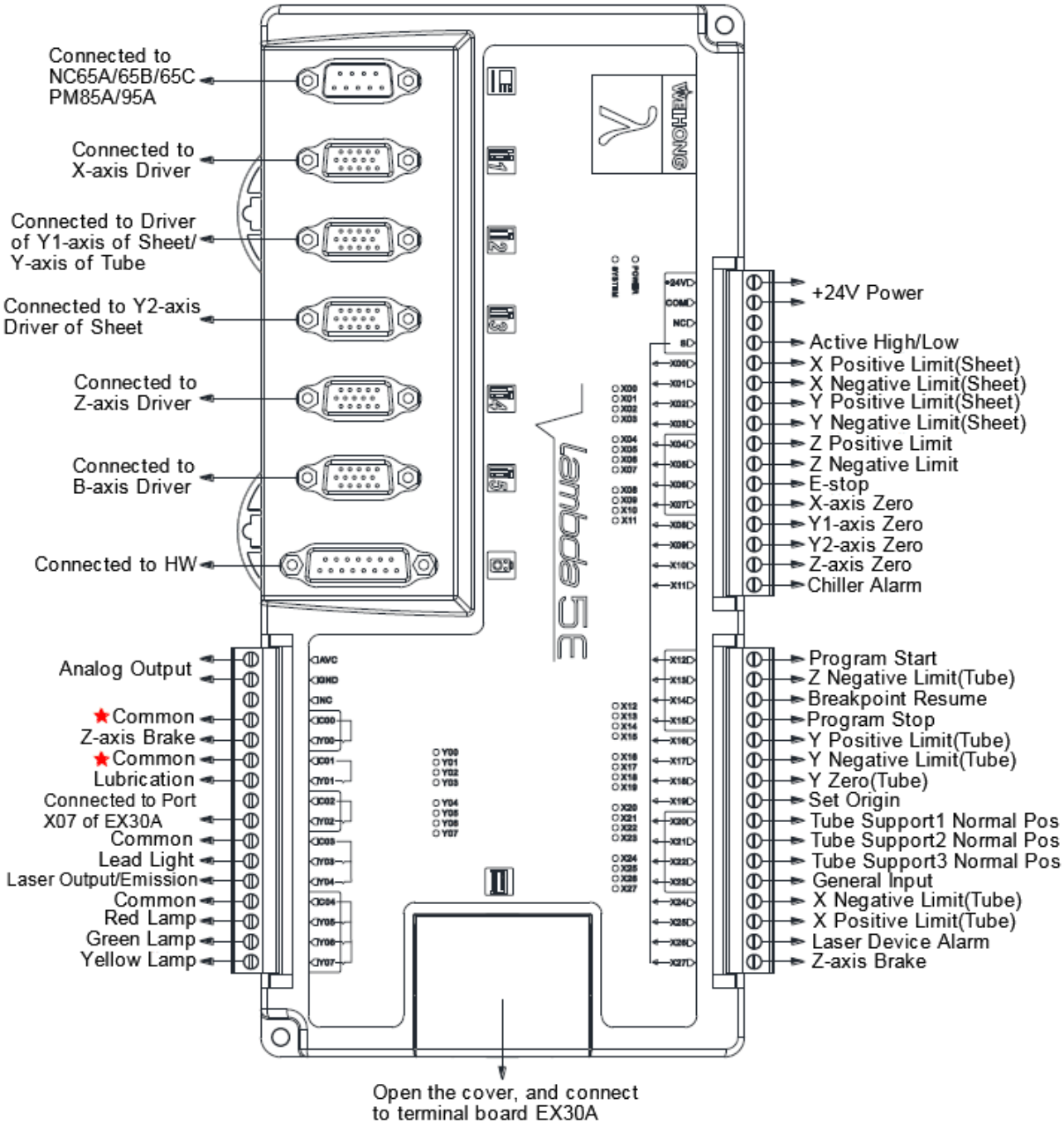
6.2.2 Wiring Diagram of Terminal Board (in Tube Cutting Configuration)

In tube cutting configuration, wiring diagram of terminal board includes the following:

- Wiring Diagram of Lambda 5E Terminal Board
- Wiring Diagram of EX30A Terminal Board
- Wiring Diagram of EX33A Terminal Board
- Wiring Diagram of EX31A Terminal Board

6.2.2.1 Wiring Diagram of Lambda 5E Terminal Board

Wiring diagram of Lambda 5E terminal board in position loop control mode is as follows:

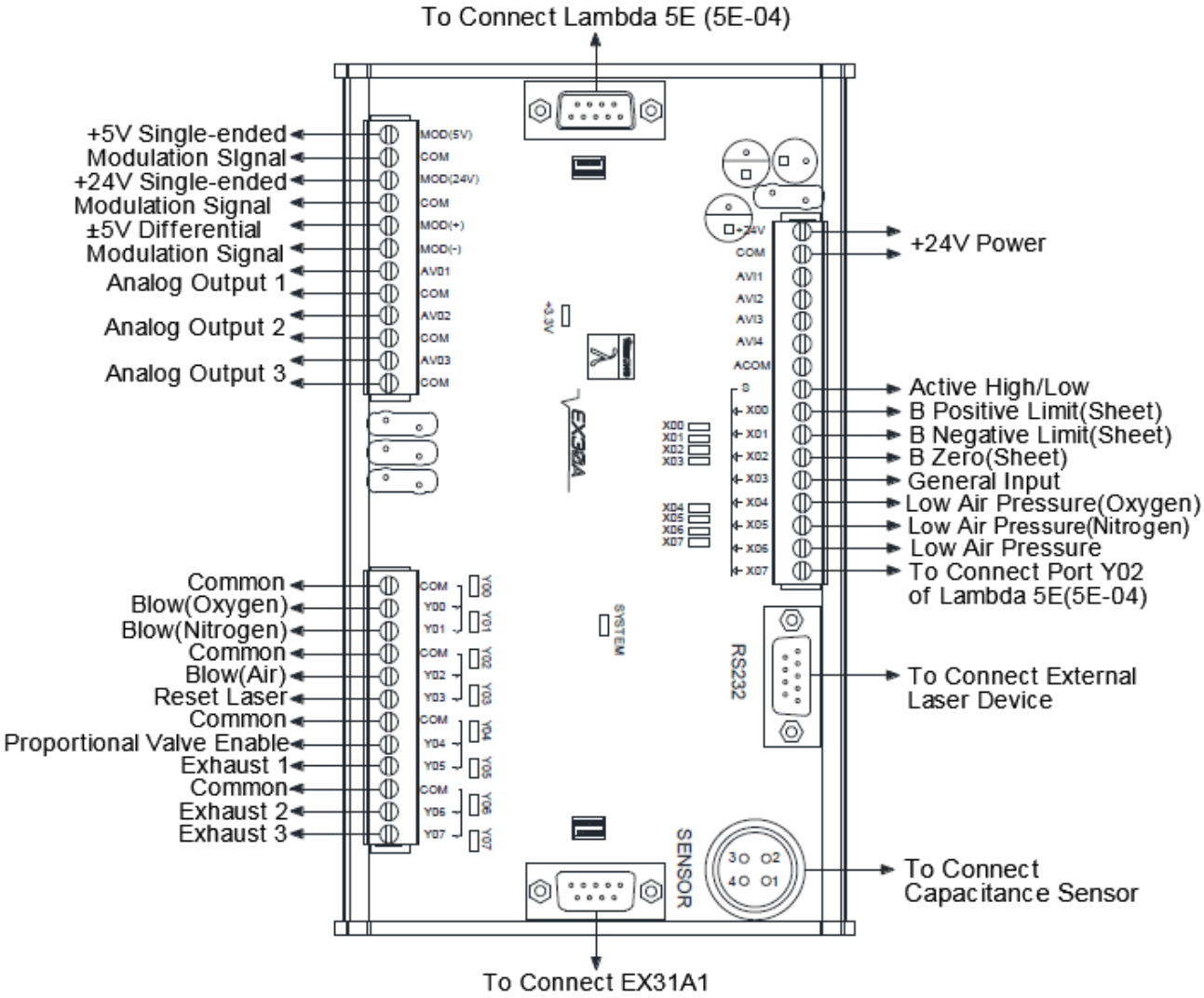


Wiring diagram in velocity loop control mode differs from that in position loop control mode in that:

- Port **Connected to Z-axis driver** is **Connected to W-axis driver**.
- The connected terminal board is EX33A.

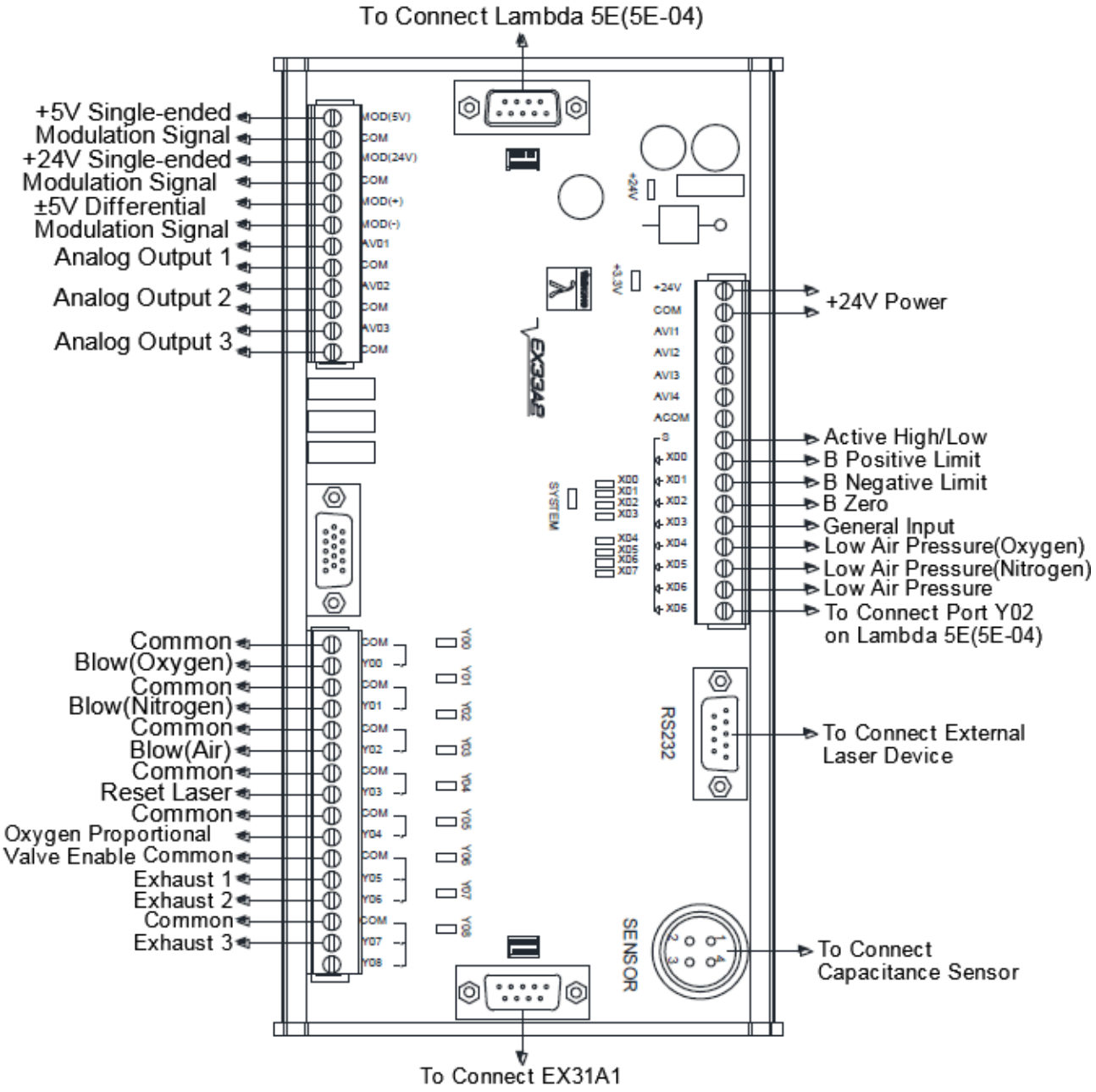
6.2.2.2 Wiring Diagram of EX30A Terminal Board

Wiring diagram of EX30A terminal board is as follows:



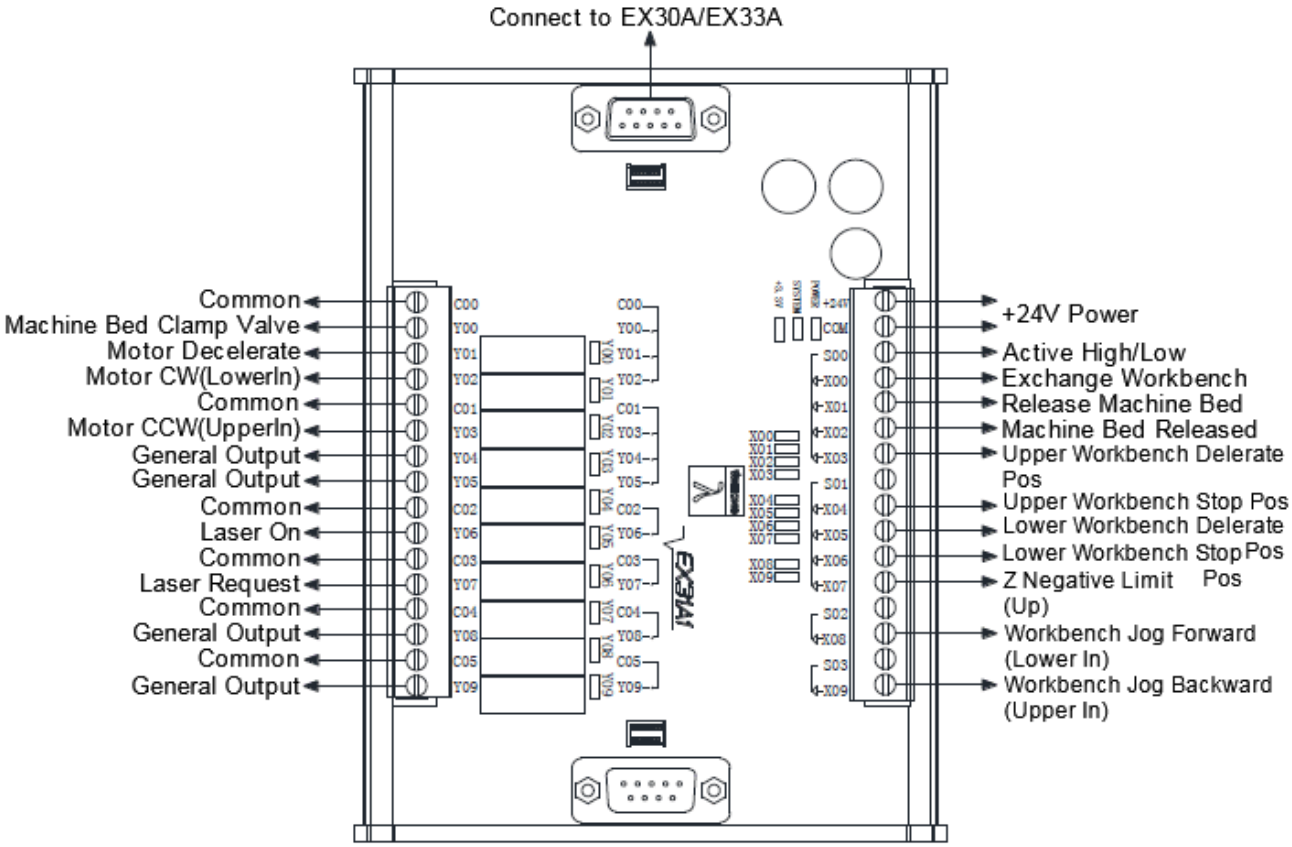
6.2.2.3 Wiring Diagram of EX33A Terminal Board

Wiring diagram of EX33A terminal board is as follows:



6.2.2.4 Wiring Diagram of EX31A Terminal Board

Wiring diagram of EX31A terminal board is as follows:



6.3 Wiring Diagram of Laser Device

In this section, you can quickly know about how to connect different laser devices.

Before connecting laser devices, do the following:

- Select and connect proper pulse modulation signals for different laser devices. The relationship between pulse modulation signals provided by **NcEditor V12 Laser Cutting CNC System** and corresponding interfaces on EX30A/EX33A termninal board is as follows:
  - +24V single-ended signal: MOD(24V) & COM
  - +5V single-ended signal: MOD(5V) & COM
  - ±5V differential signal: MOD(+) & MOD(-)
- If the laser device supports RS232 communication, connect RS232 interface on the laser device to RS232 on EX30A/EX33A terminal board via a DB9 cable, so as to realize communication between the laser device and the software.
  RS-232-C is the standard for serial communication, which is jointly made by EIA, AT&T (Bell System), modem manufacturers and computer terminal manufacturers. It is suitable for communication with transfer rate within the range of 0~20000 b/s and generally adopted by communication within 20m.

Wiring diagrams of the following laser devices are provided:

- IPG-YLR series laser device
- FEIBO MARS-500W laser device
- Raycus laser device
- JK/GSI-500W-FL laser device
- Maxphotonics laser device
- SPI-500W-R4 laser device
- HFB 1000-1500W laser device

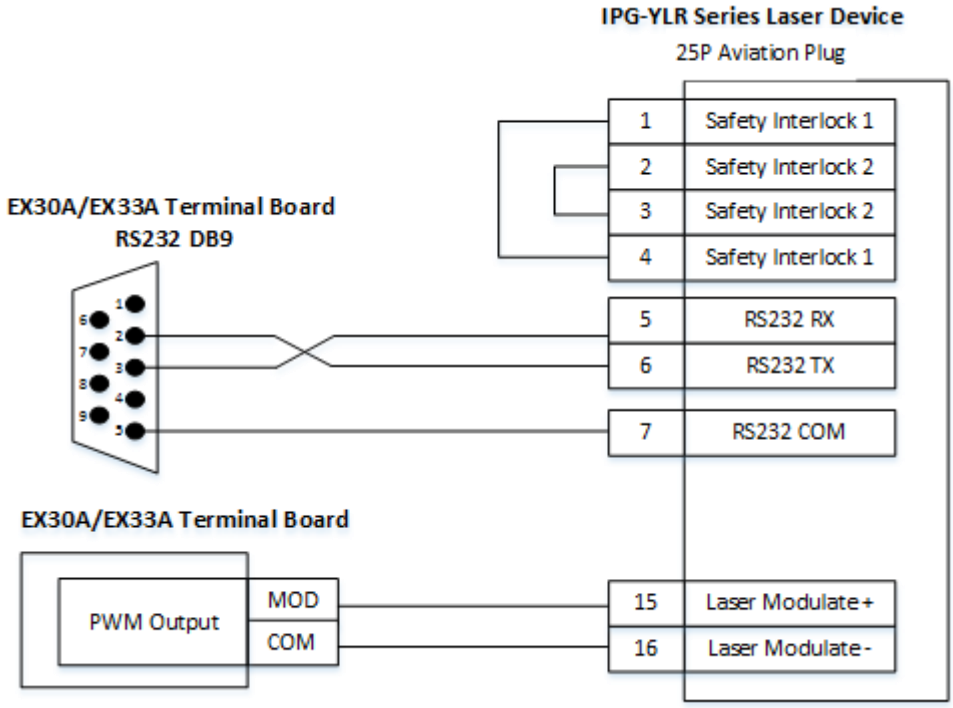
- GW SMATLas 3S laser device

During connecting laser devices, please note the following:

- Wiring of pin 2 and 3 of RS232 interface male head on terminal board of which the version is higher than EX30A4 need not to be overlapped. Thus, you need not need to make a special wire.
- Wiring of pin 2 and 3 of RS232 interface female head on EX30A4 terminal board need to be overlapped. Thus, you need to make a special wire.
- The MOD pin of EX30A/EX33A terminal board in wiring diagrams of this section is MOD (24V).

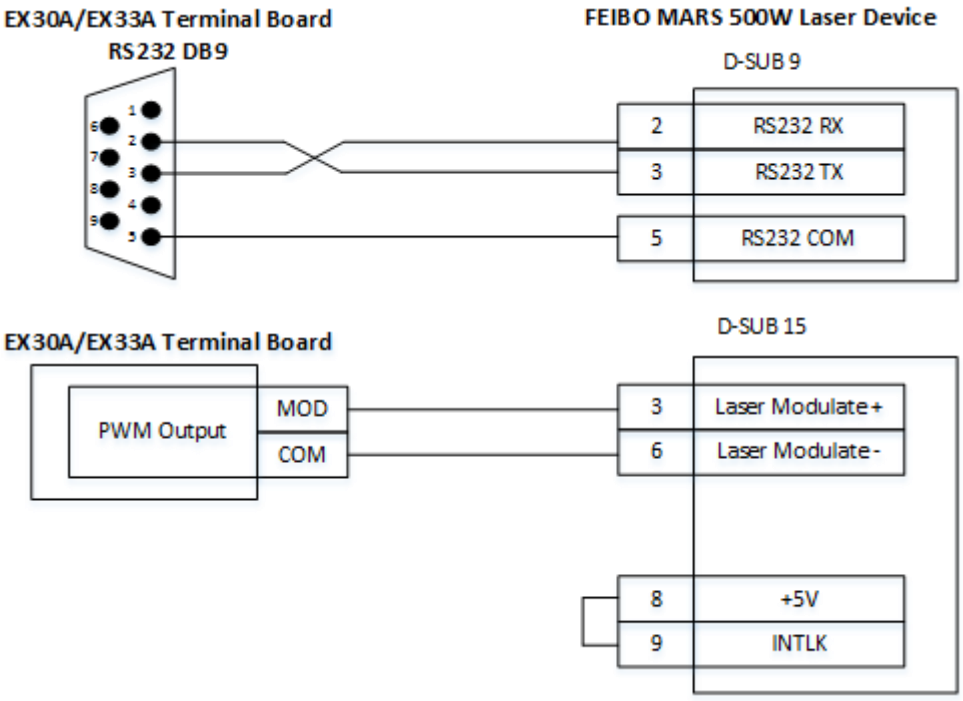
6.3.1 Wiring Diagram of IPG-YLR Series Laser Device

Wiring diagram is as follows:



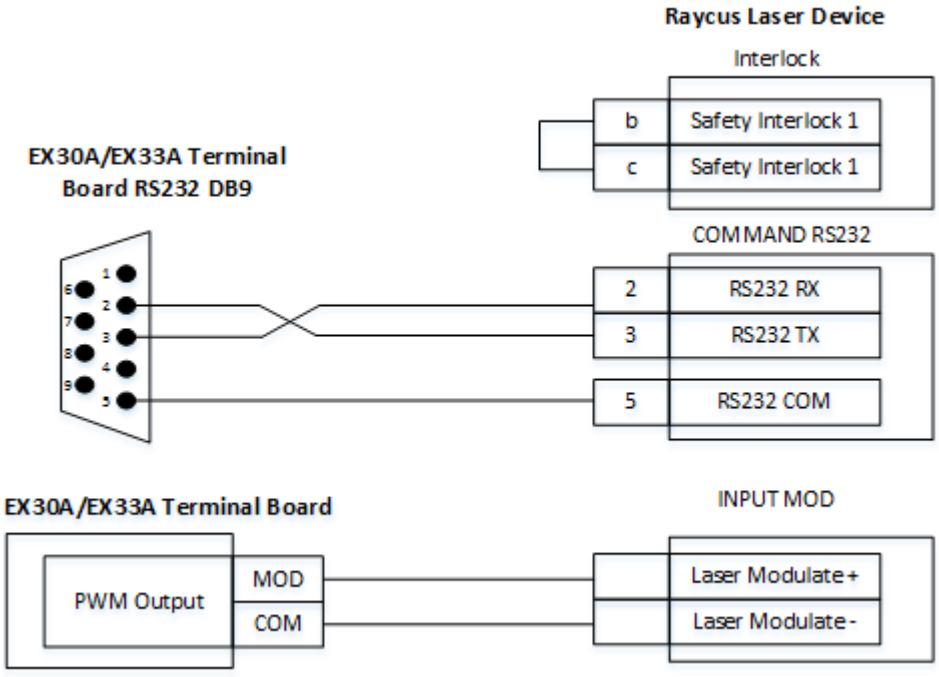
6.3.2 Wiring Diagram of FEIBO MARS-500W Laser Device

Wiring diagram is as follows:



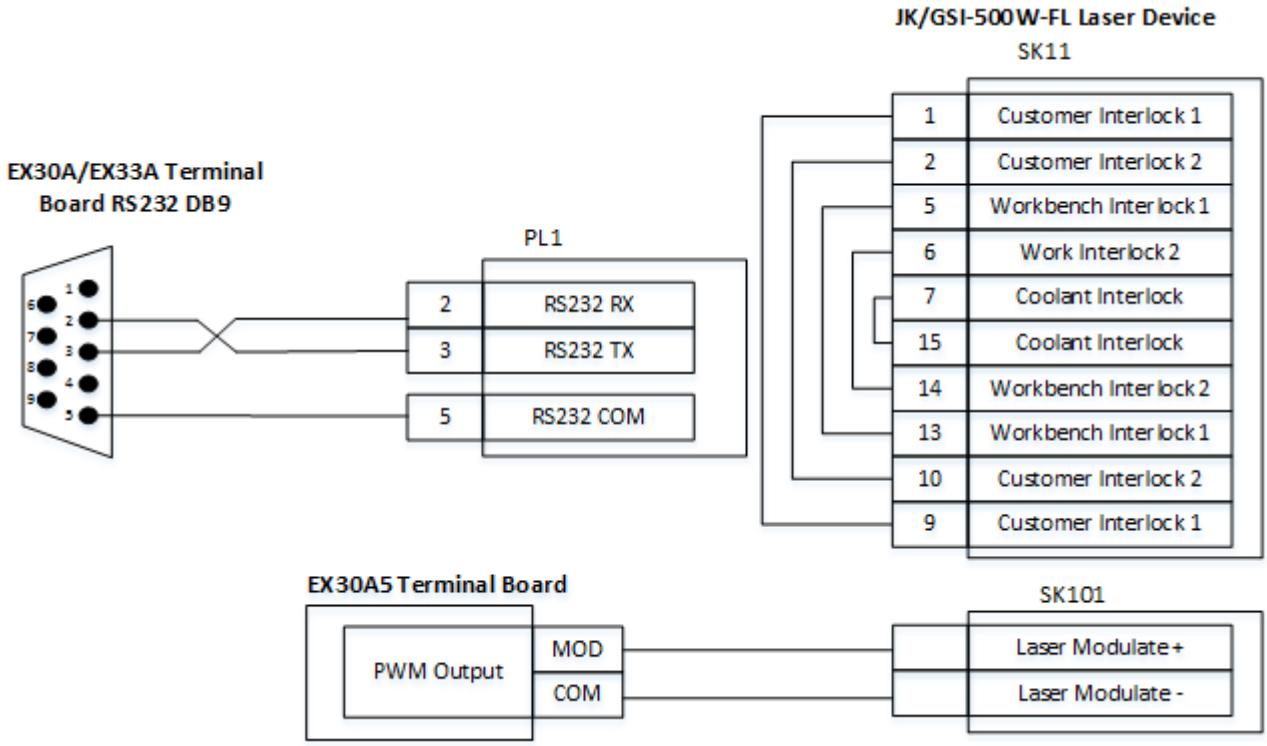
6.3.3 Wiring Diagram of Raycus Laser Device

Wiring diagram is as follows:



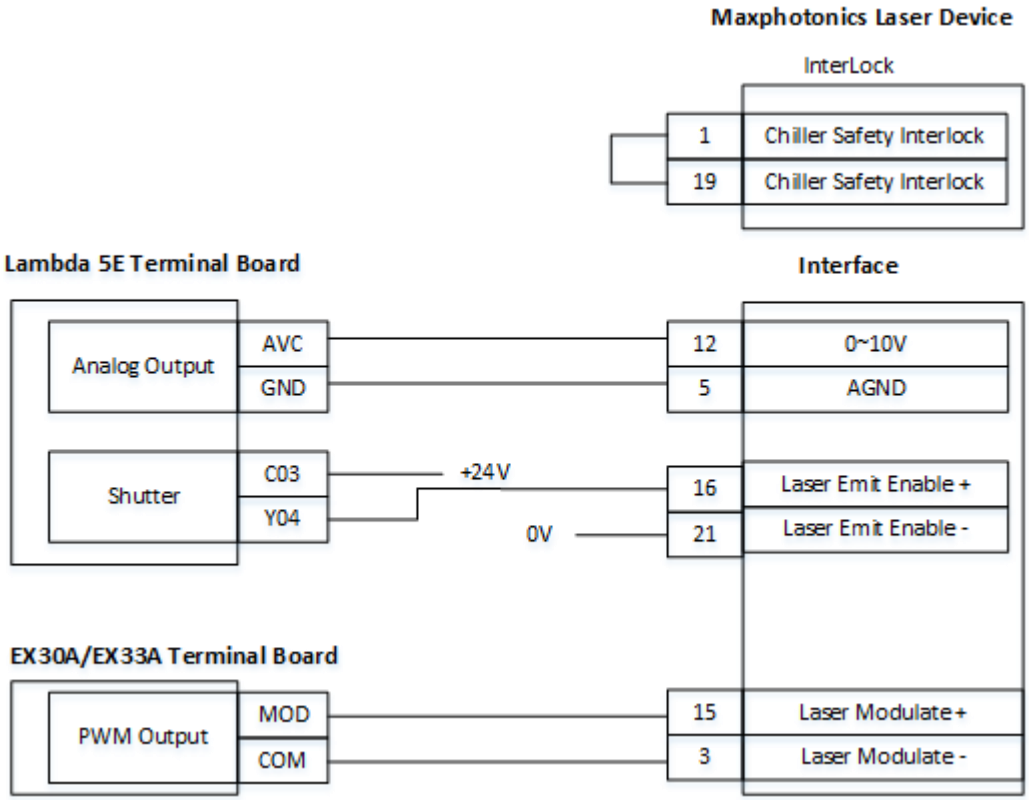
6.3.4 Wiring Diagram of JK/GSI-500W-FL Laser Device

Wiring diagram is as follows:



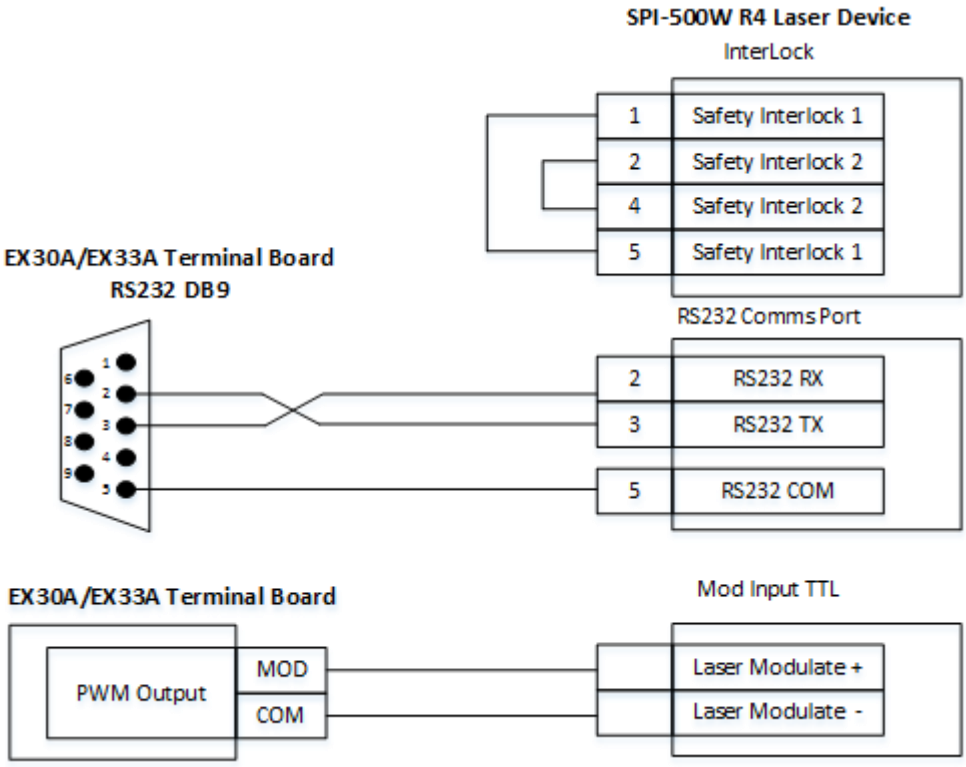
6.3.5 Wiring Diagram of Maxphotonics Laser Device

Wiring diagram is as follows:



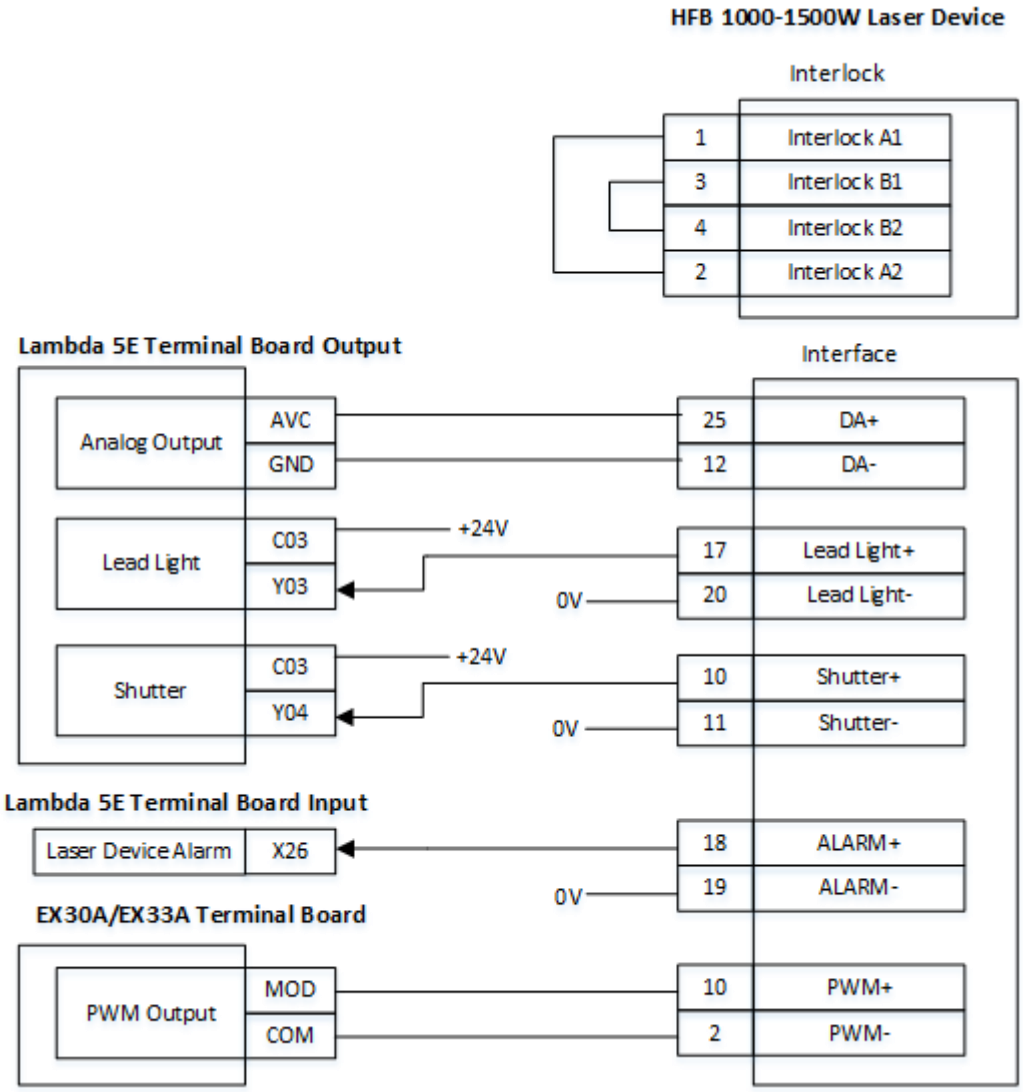
6.3.6 Wiring Diagram of SPI-500W-R4 Laser Device

Wiring diagram is as follows:



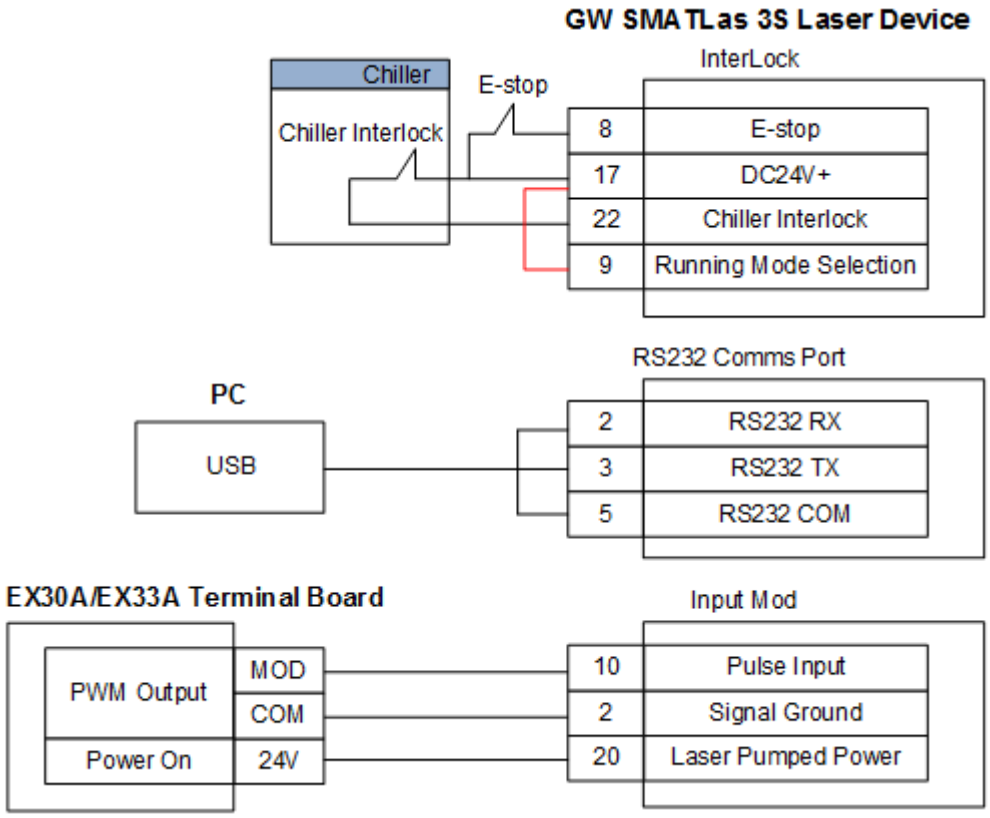
6.3.7 Wiring Diagram of HFB 1000-1500W Laser Device

Wiring diagram is as follows:



6.3.8 Wiring Diagram of GW SMATLas 3S Laser Device

Wiring diagram is as follows:



6.4 Wiring Diagram of the Drive

It is about how to connect WEIHONG DB15 drive interface to different servo motors.

Before connecting, you need to know the definition of each drive interface. See Definition of Each Drive Interface for details.

The wiring of a servo drive differs in the control mode. Thus, the wiring diagram of drive includes the following:

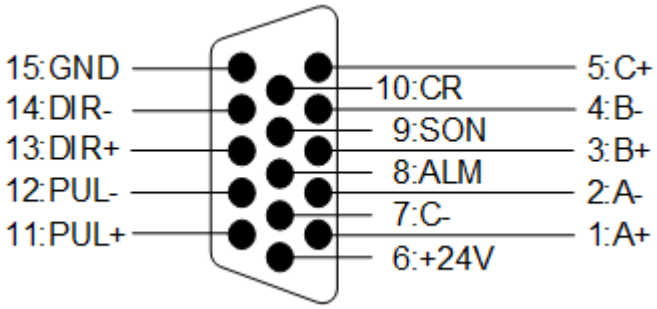
- Wiring Diagram of the Drive (in Position Control Mode)
- Wiring Diagram of the Drive (in Velocity Control Mode) (Exclusive for laser cutting industry)

6.4.1 Definition of Each Drive Interface

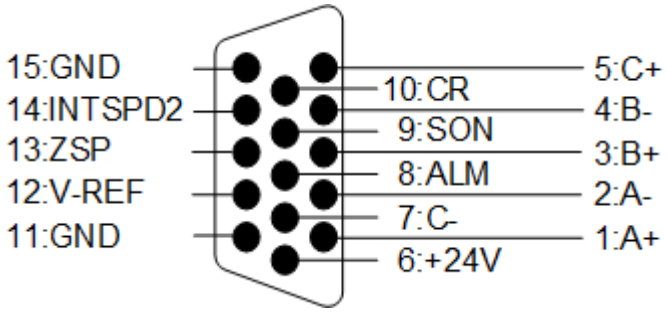
The socket of servo drive joint is three-row DB15 holes.

Its interface definition is shown as follows:

- Position control



- Velocity control



Remark of drive interface is as follows:

Signal	Definition	Input/Output	Remark
A+, A-	Feedback signal of encoder phase A	InputDifferential signal transmission mode	It is used to receive the differential output of encoder phase A signal from driver frequency divider (equal to RS422).
B+, B-	Feedback signal of encoder phase B	InputDifferential signal transmission mode	It is used to receive the differential output of encoder phase B signal from driver frequency divider (equal to RS422).
C+, C-	Feedback signal of encoder phase C	InputDifferential signal transmission mode	It is used to receive the differential output of encoder phase C signal from driver frequency divider (equal to RS422).
ALM	Drive alarm signal	Input	When the drive detects failure, this output (transistor) switch will be closed or disconnected.
SON	Servo ON signal	Output	It is used to turn on (power on) and turn off (power off) servo motor. When it is connected to COM, dynamic brake will be released and the drive is allowed to work (servo enabled).
CLR	Drive alarm clear signal	Output	It is used to remove alarms/warnings.
PUL+, PUL-	Pulse output	OutputDifferential signal transmission mode	-
DIR+, DIR-	Direction output	OutputDifferential signal transmission mode	-
INTSPD2	Internal command speed option 2	Output	-
ZSP	Speed zero clamp detection signal	Output	In speed zero clamp detection status, the output transistor is turned on.
V-REF	Analog speed command	Output	-
+24V, GND	DC 24V power	Output	It is connected to drive.

6.4.2 Wiring Diagram of the Drive (in Position Control Mode)

Please select the wiring diagram according to the brand of your servo drive:

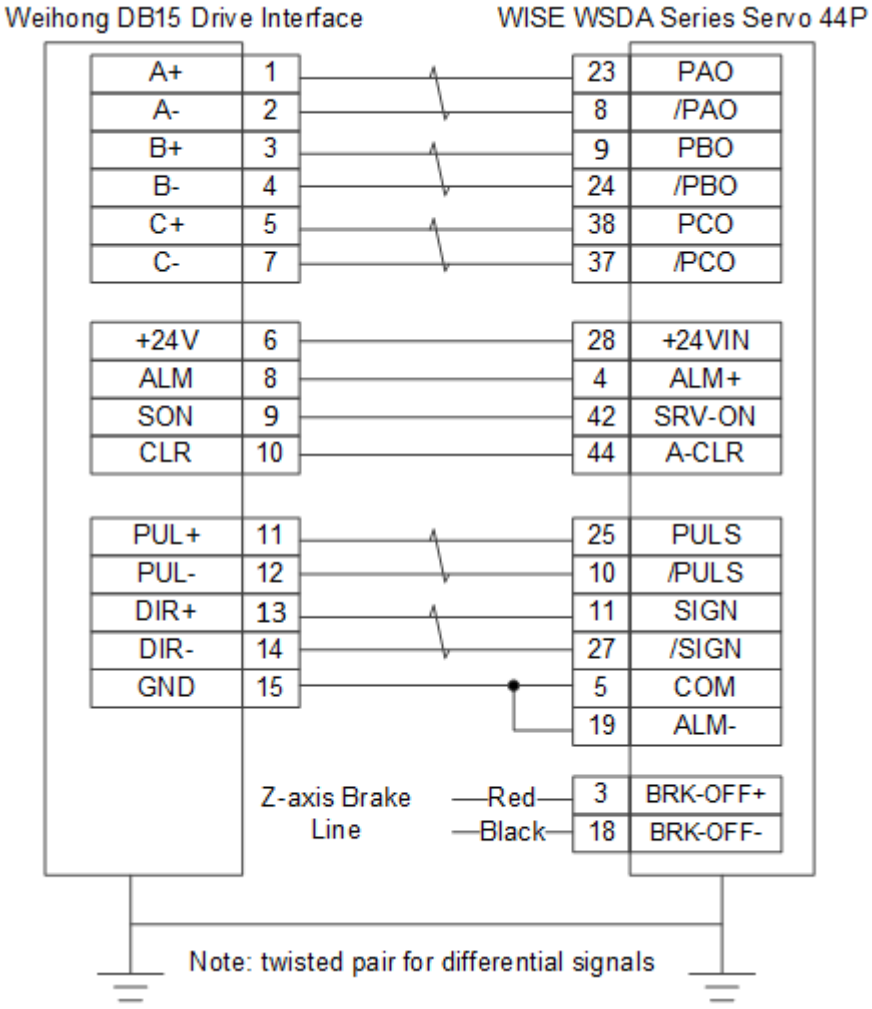
- WISE Servo Drive

- YASKAWA Σ- II /Σ- V /Σ-7 Servo Drive
- Panasonic AC Servo Drive
- Fuji Servo Drive
- DELTA Servo Drive
- MITSUBISHI Servo Drive
- STONE GS Servo Drive
- HITACHI Servo Drive
- TECO Servo Drive
- SANYO Servo Drive
- KT270 Servo Drive

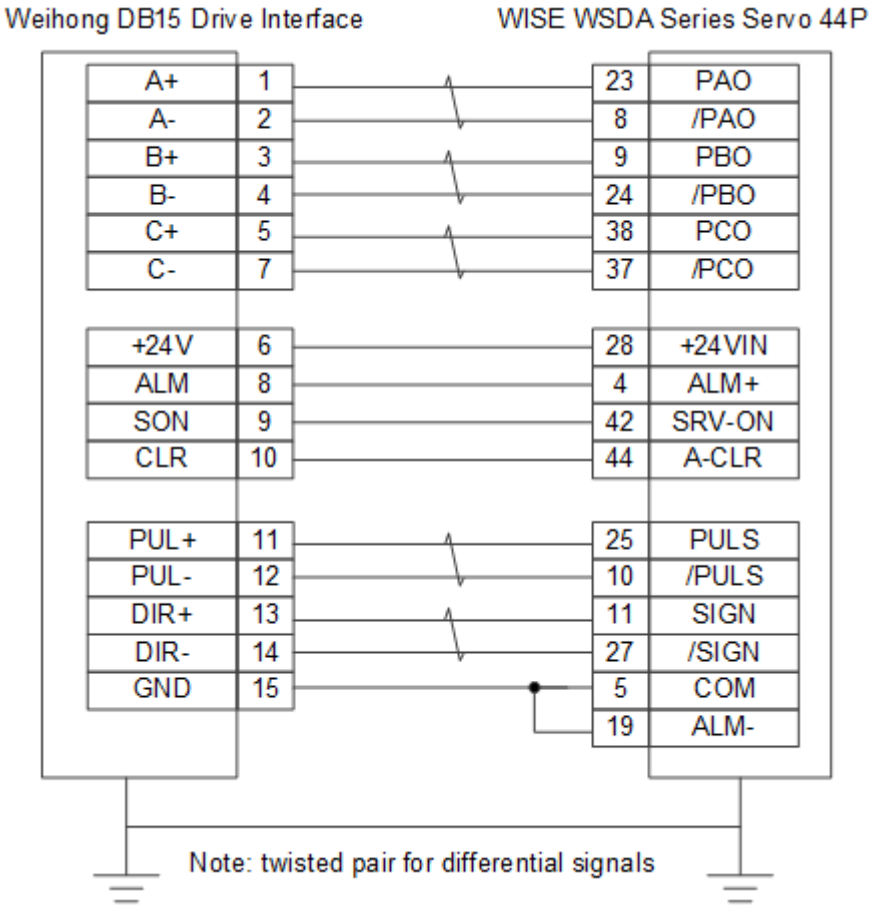
6.4.2.1 Wiring Diagram of WISE Servo Drive

The wiring diagram is as follows:

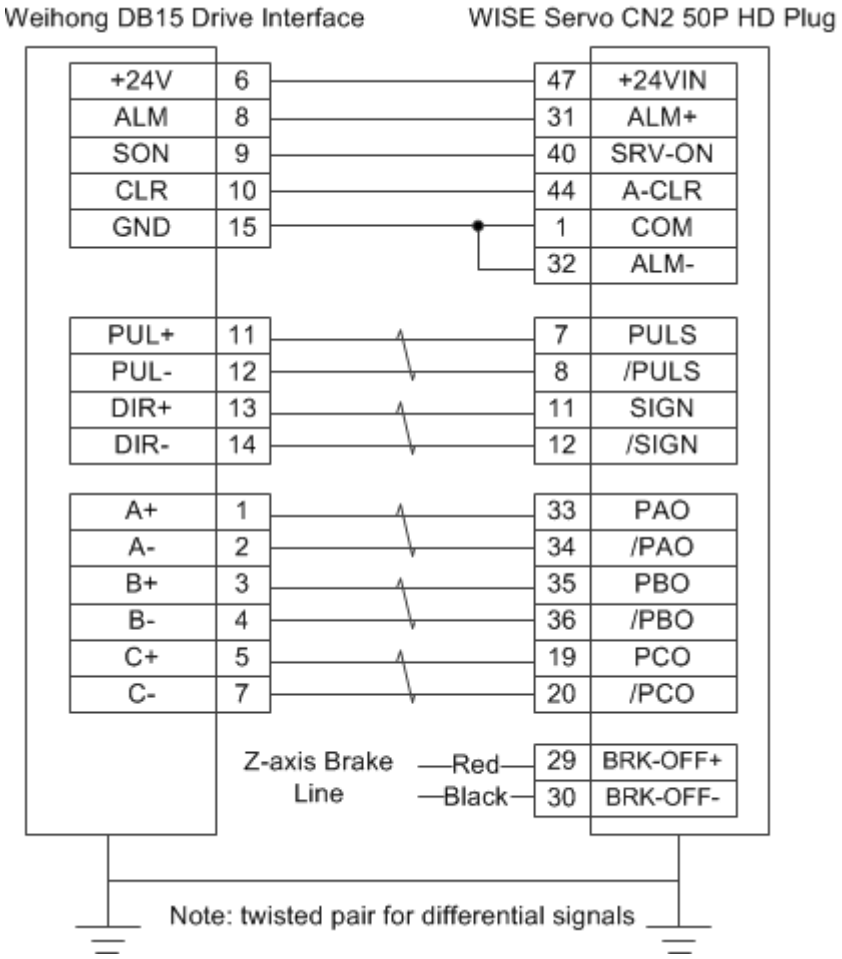
- With brake lines (44P interface)



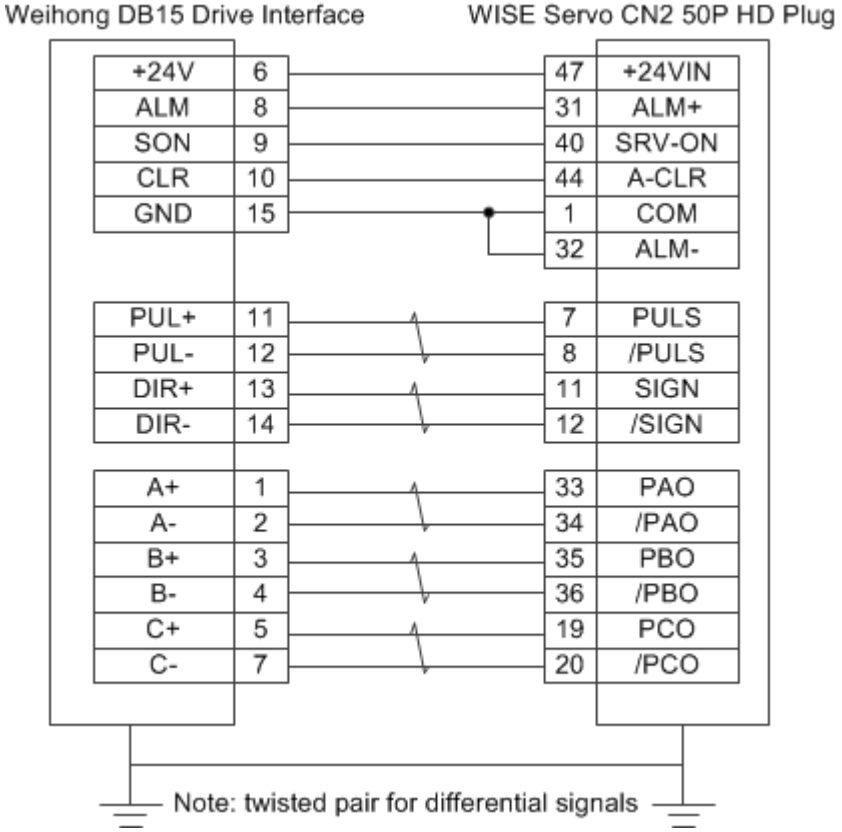
- Without brake lines (44P interface)



- With brake lines (50P HD plug)



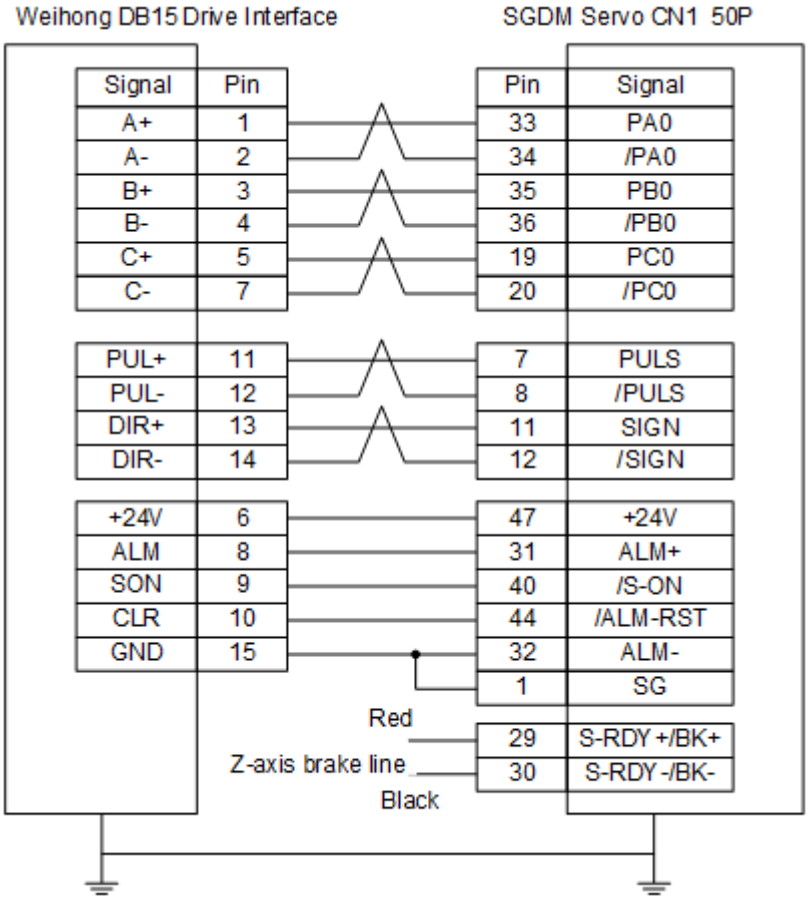
- Without brake lines (50P HD plug)



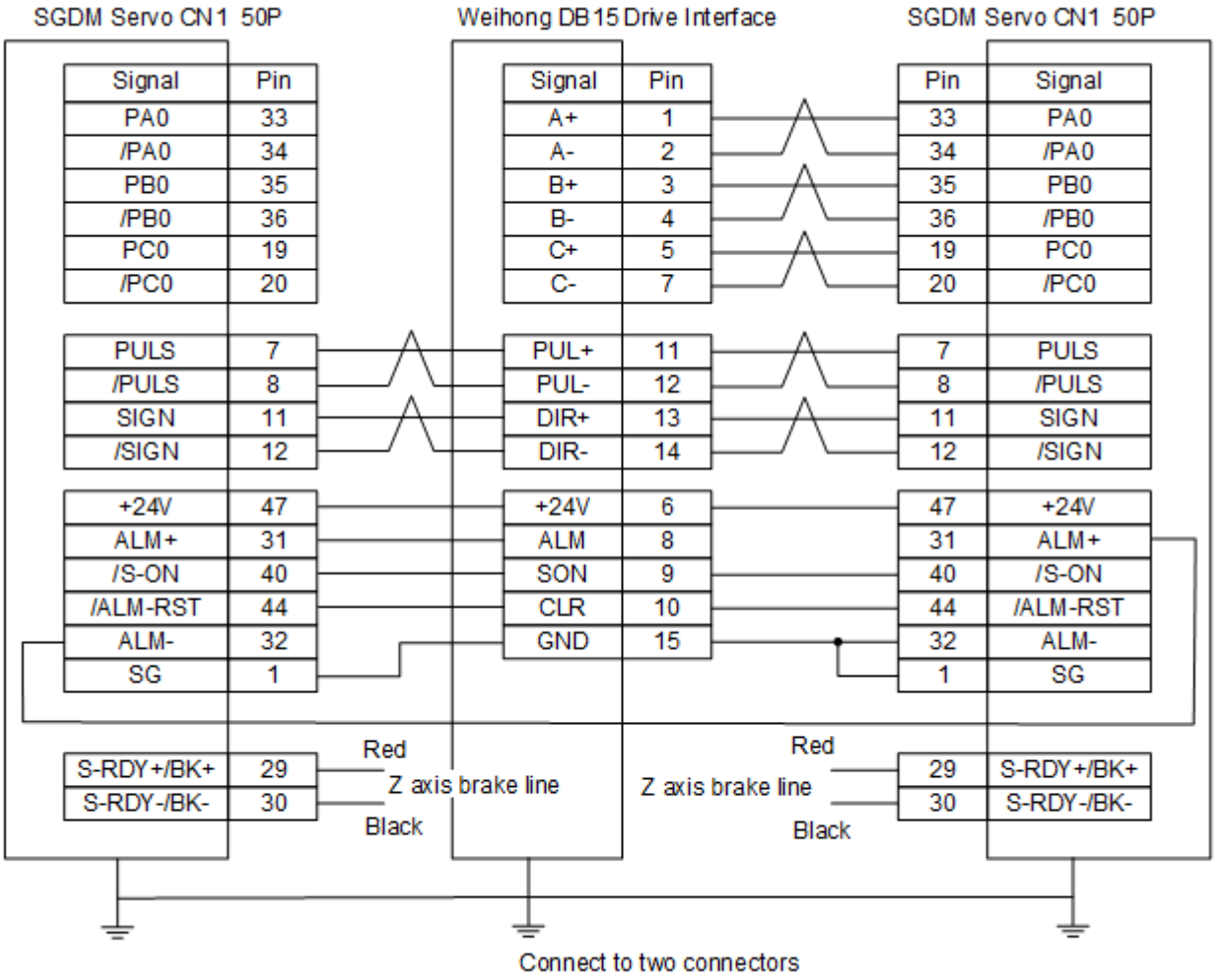
6.4.2.2 Wiring Diagram of YASKAWA Σ- ///Σ- V/Σ-7 Servo Drive

The wiring diagram is as follows:

- Connect to one connector

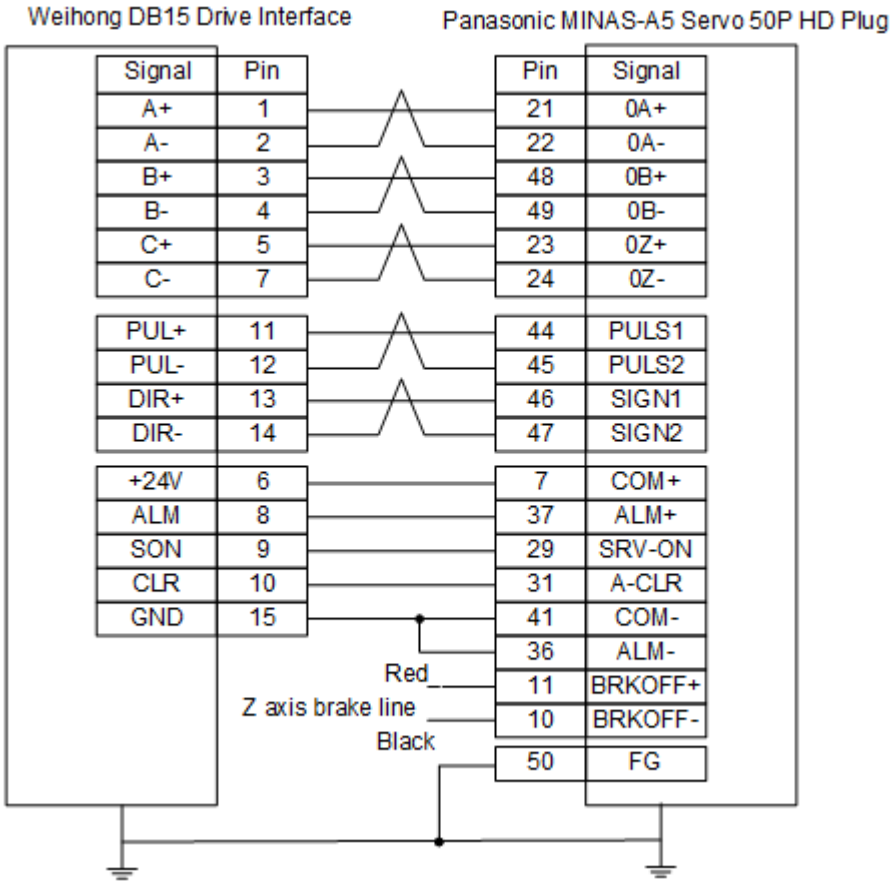


- Connect to two connectors



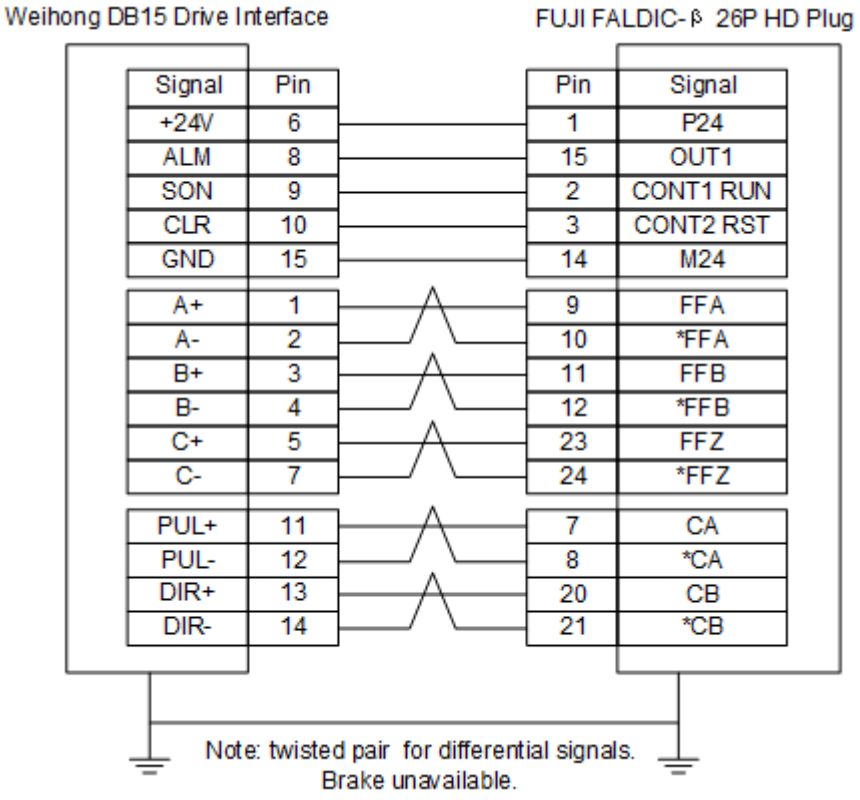
6.4.2.3 Wiring Diagram of Panasonic AC Servo Drive

The wiring diagram is as follows:



6.4.2.4 Wiring Diagram of Fuji Servo Drive

Wiring diagram is as follows:

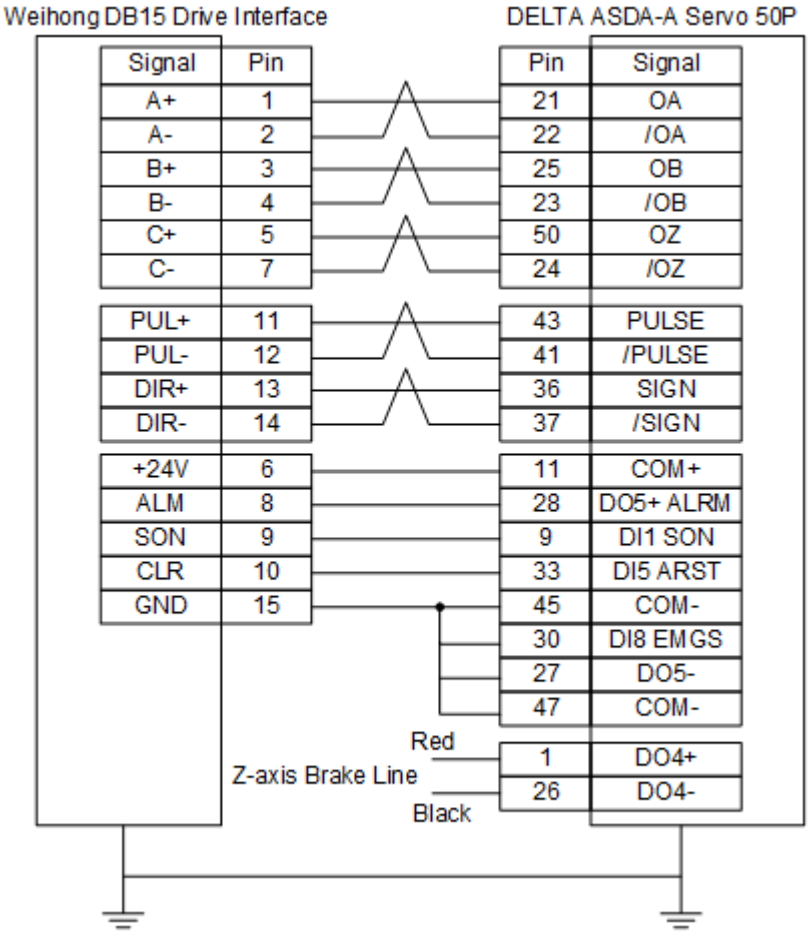


6.4.2.5 Wiring Diagram of DELTA Servo Drive

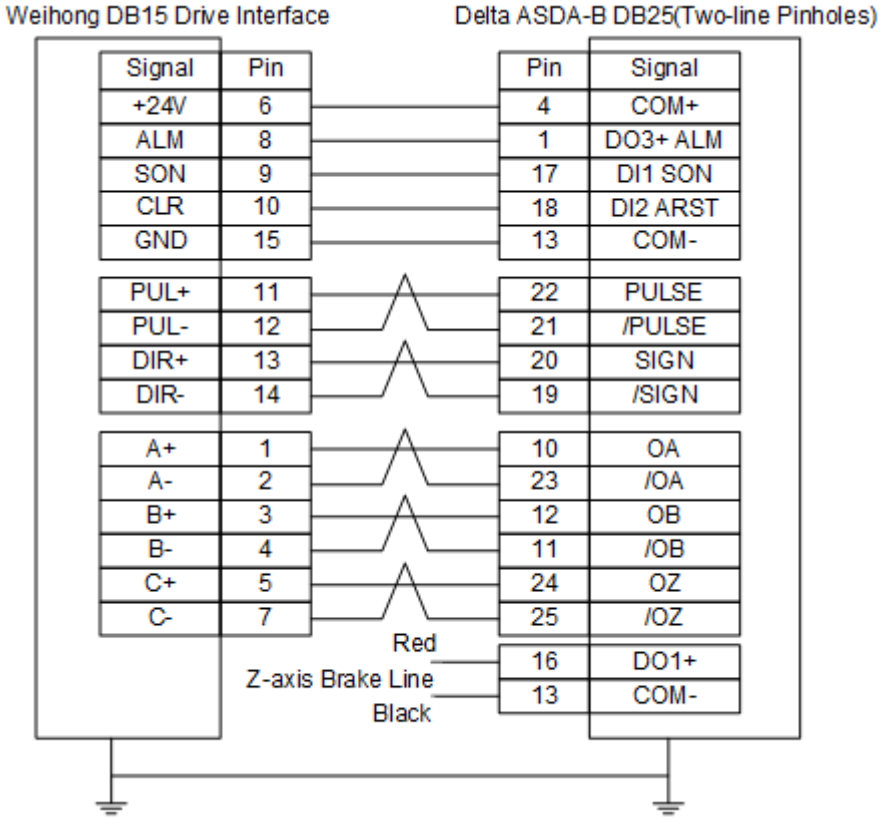
DELTA ASDA-A, ASDA-AB share the same wire. Among them, ASDA-A2 and ASDA-AB have the same wiring pin while ASDA-A has the contrary pulse pin, with PULSE 43, /PULSE 41.

The wiring diagram of DELTA ASDA-A servo drive is as follows:

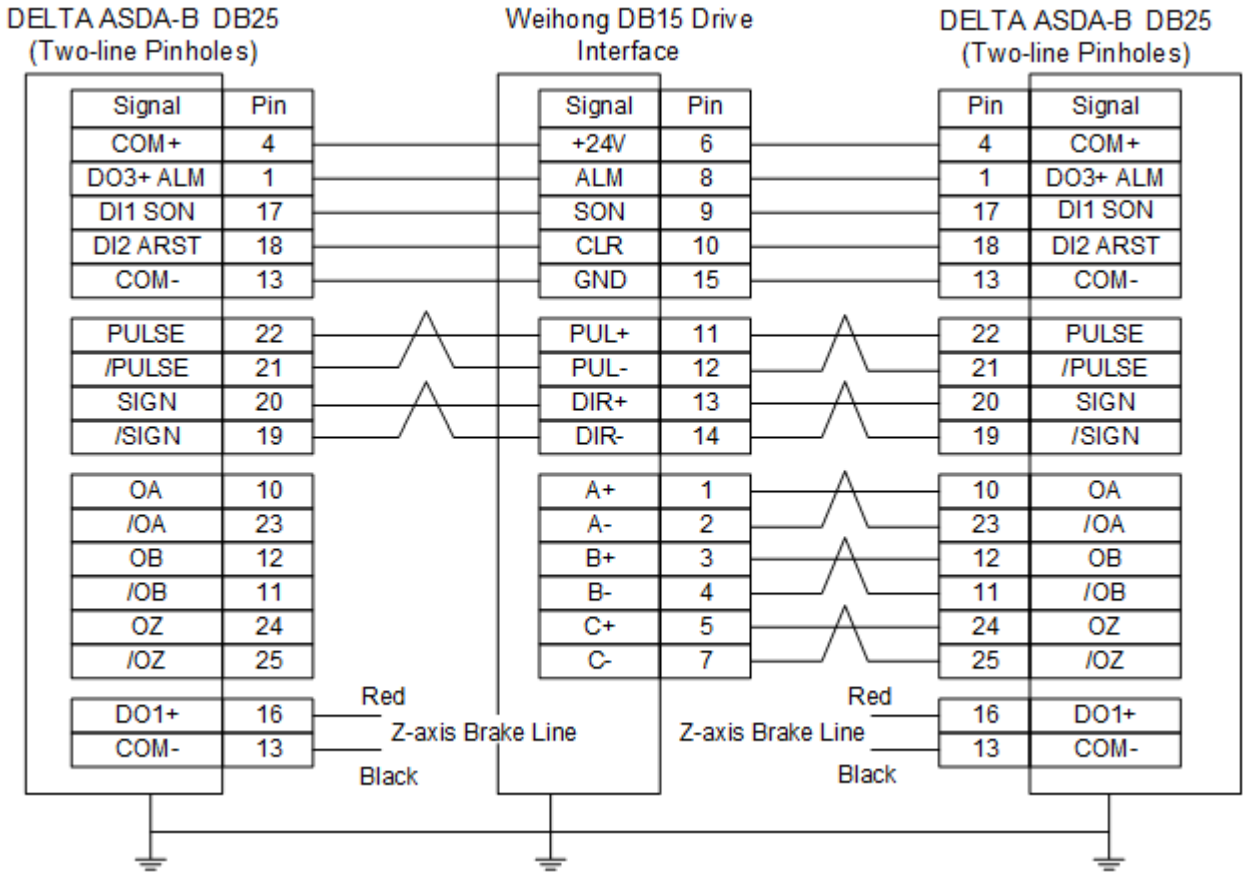
- DELTA ASDA-A



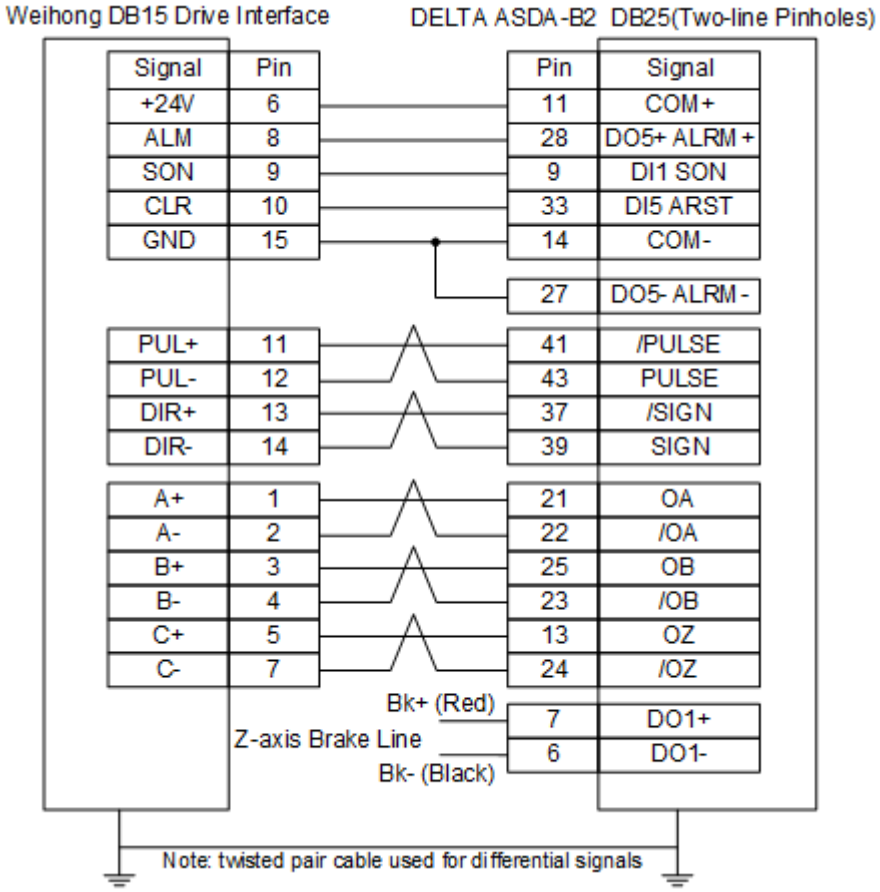
- DELTA ASDA-B (connect to one connector)



- DELTA ASDA-B (connect to two connectors)



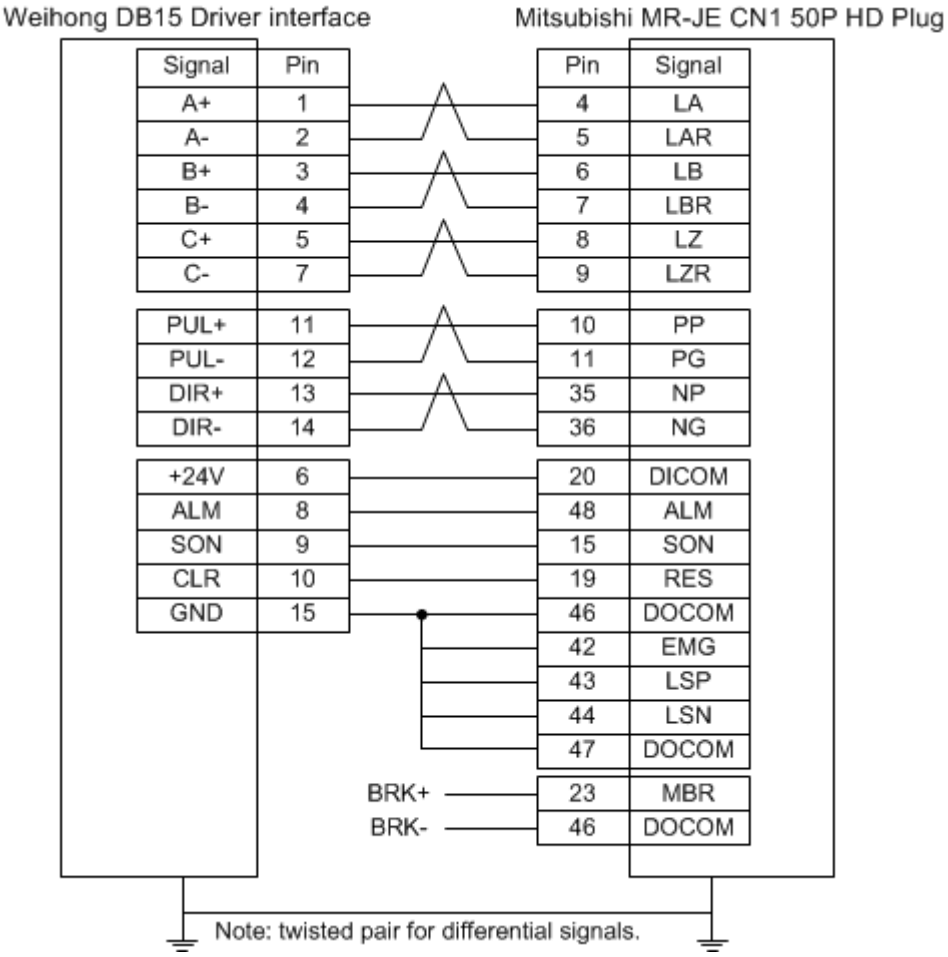
- DELTA ASDA-B2



6.4.2.6 Wiring Diagram of MITSUBISHI Servo Drive

The wiring diagram is as follows:

- MR-JE type (With brake lines)



- MR-JE type (Without brake lines)

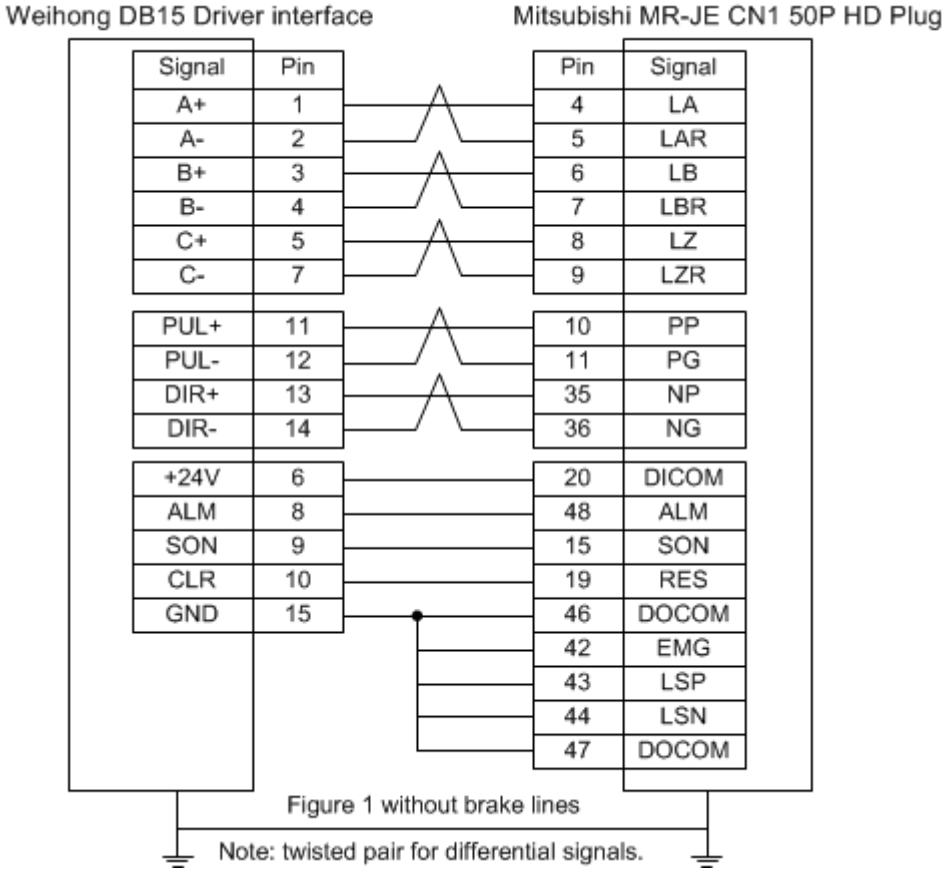
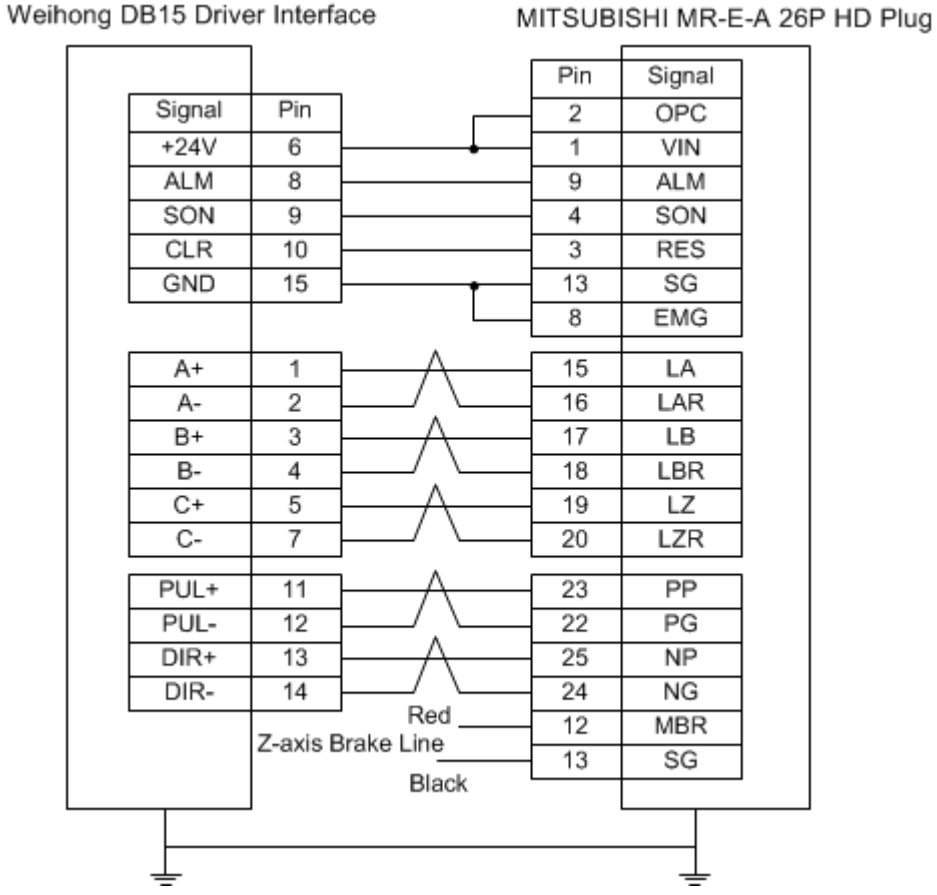


Figure 1 without brake lines

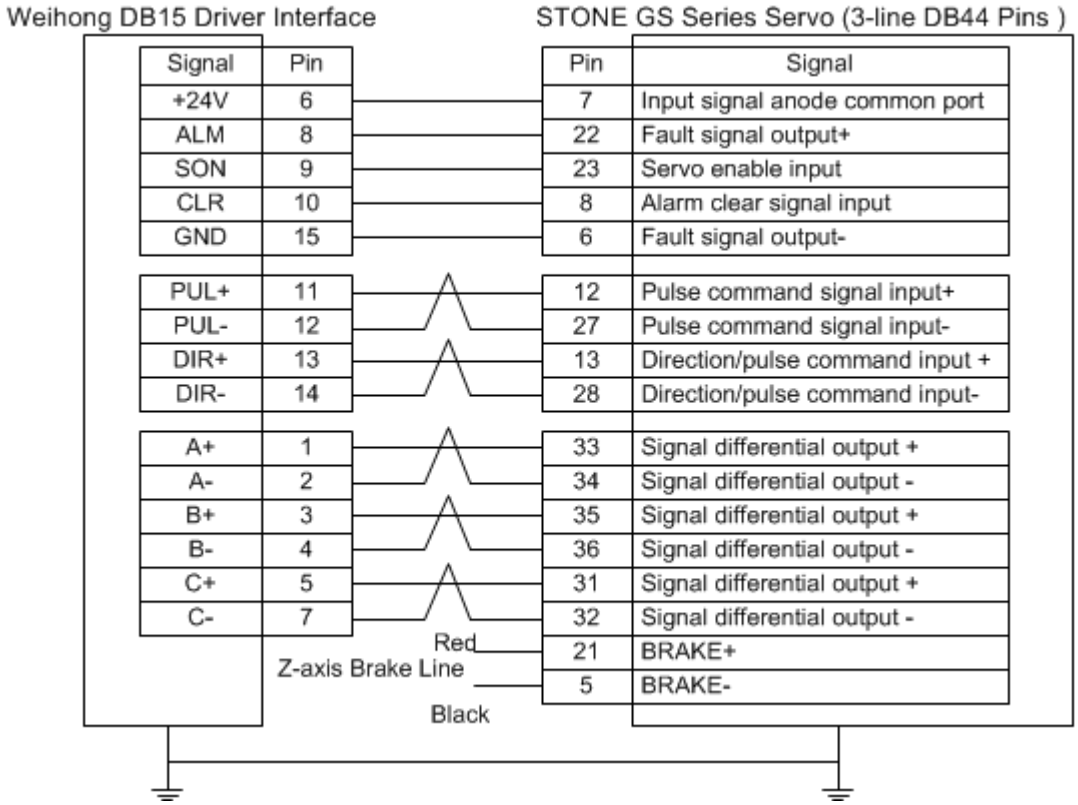
Note: twisted pair for differential signals.

- MR-E type



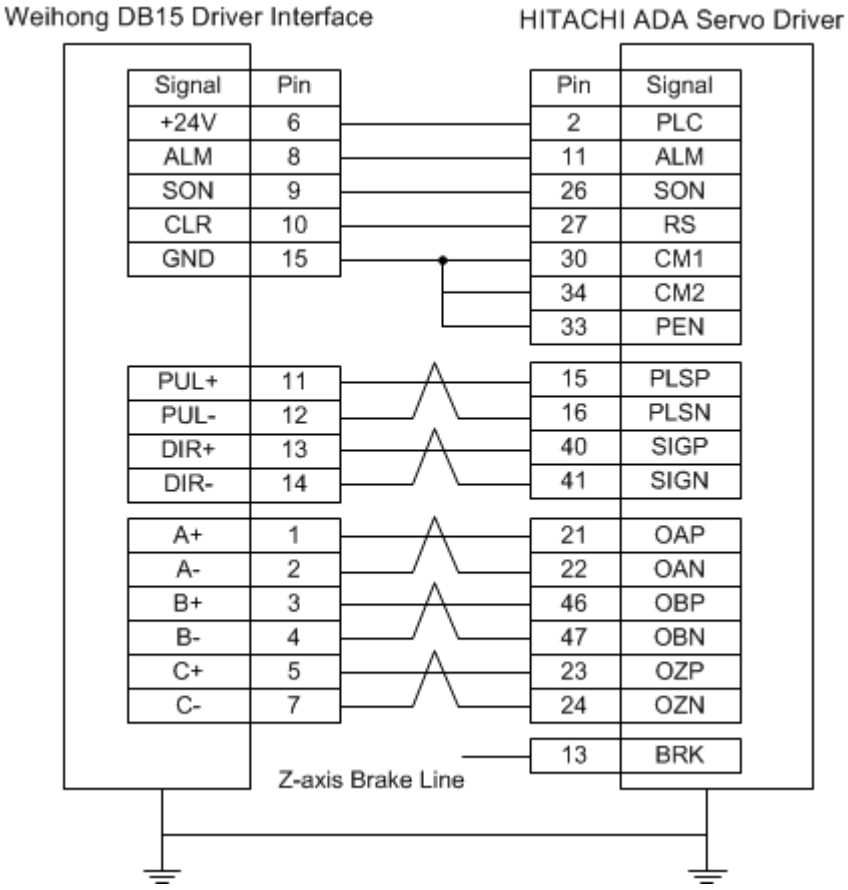
6.4.2.7 Wiring Diagram of STONE GS Servo Drive

The wiring diagram is as follows:



6.4.2.8 Wiring Diagram of HITACHI Servo Drive

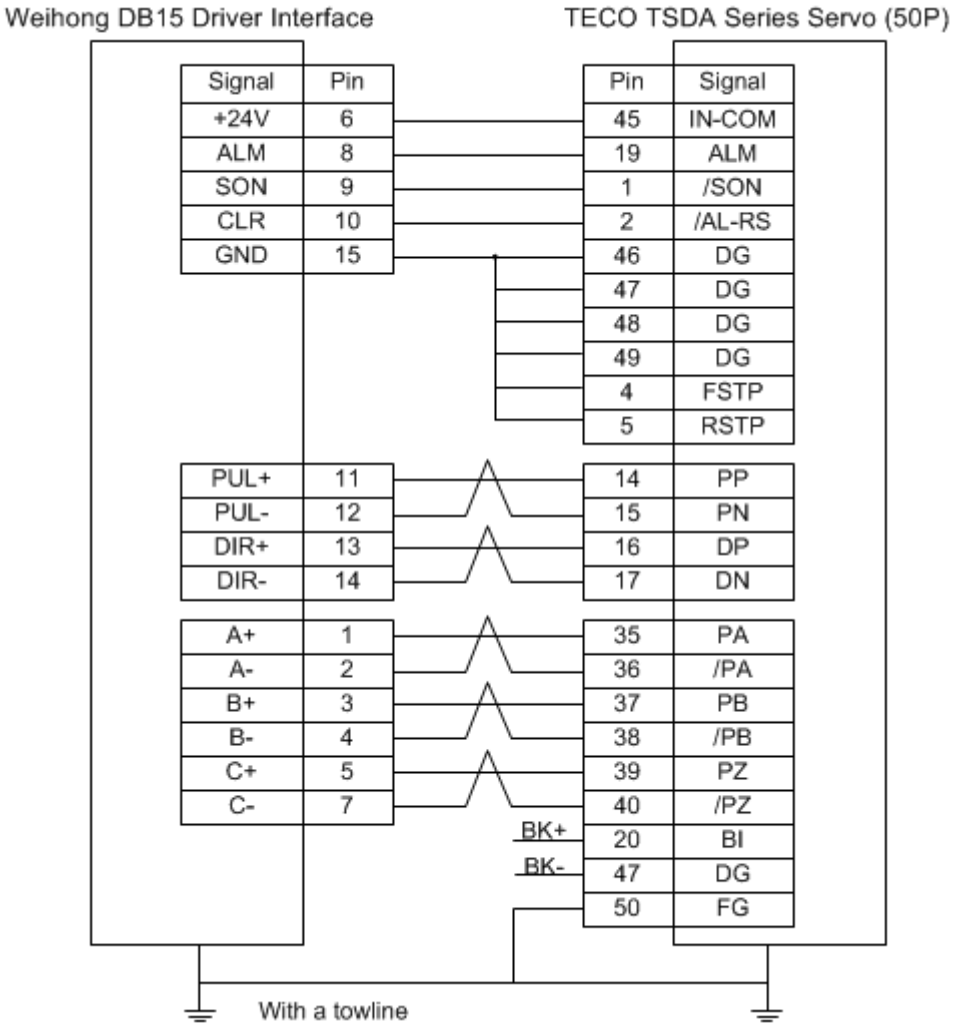
The wiring diagram is as follows:



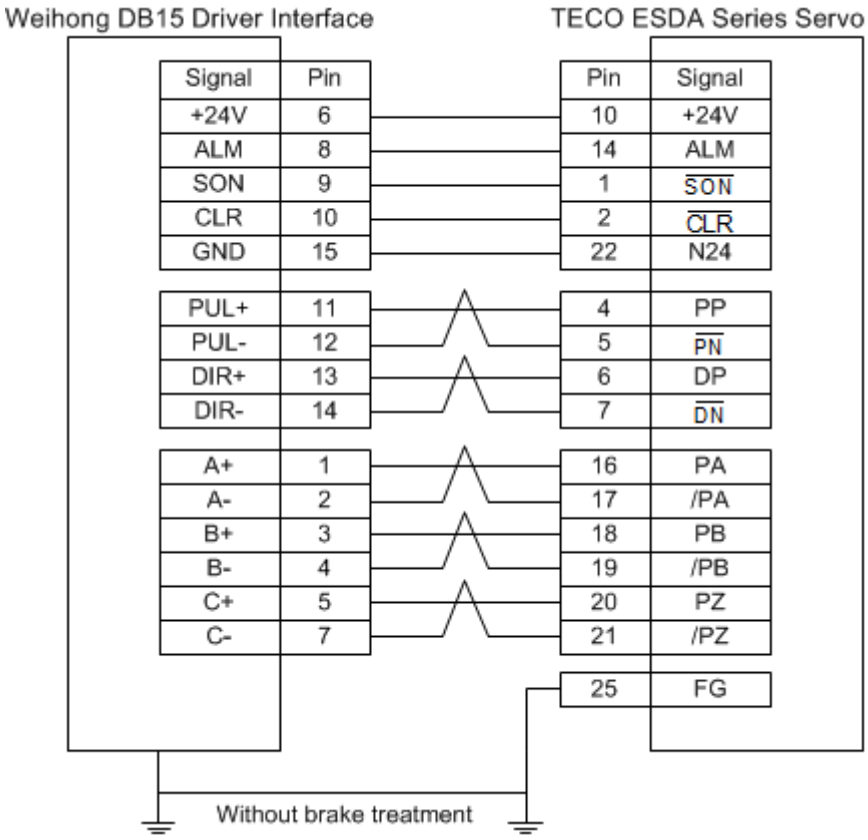
6.4.2.9 Wiring Diagram of TECO Servo Drive

The wiring diagram is as follows:

- TSDA series



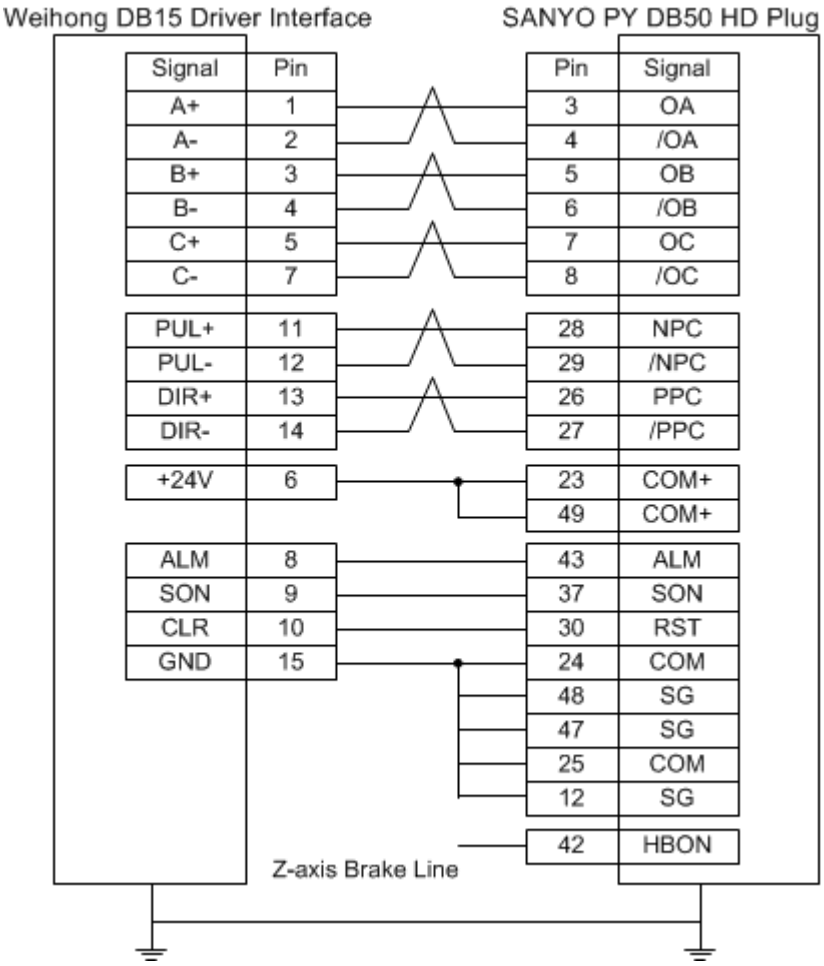
- ESDA series


Weihong DB15 Driver Interface
TECO ESDA Series Servo
Signal
Pin
Pin
Signal
+24V
6
10
+24V
ALM
8
14
ALM
SON
9
1
SON
CLR
10
2
CLR
GND
15
22
N24
PUL+
11
4
PP
PUL-
12
5
PN
DIR+
13
6
DP
DIR-
14
7
DN
A+
1
16
PA
A-
2
17
/PA
B+
3
18
PB
B-
4
19
/PB
C+
5
20
PZ
C-
7
21
/PZ
25
FG
Without brake treatment

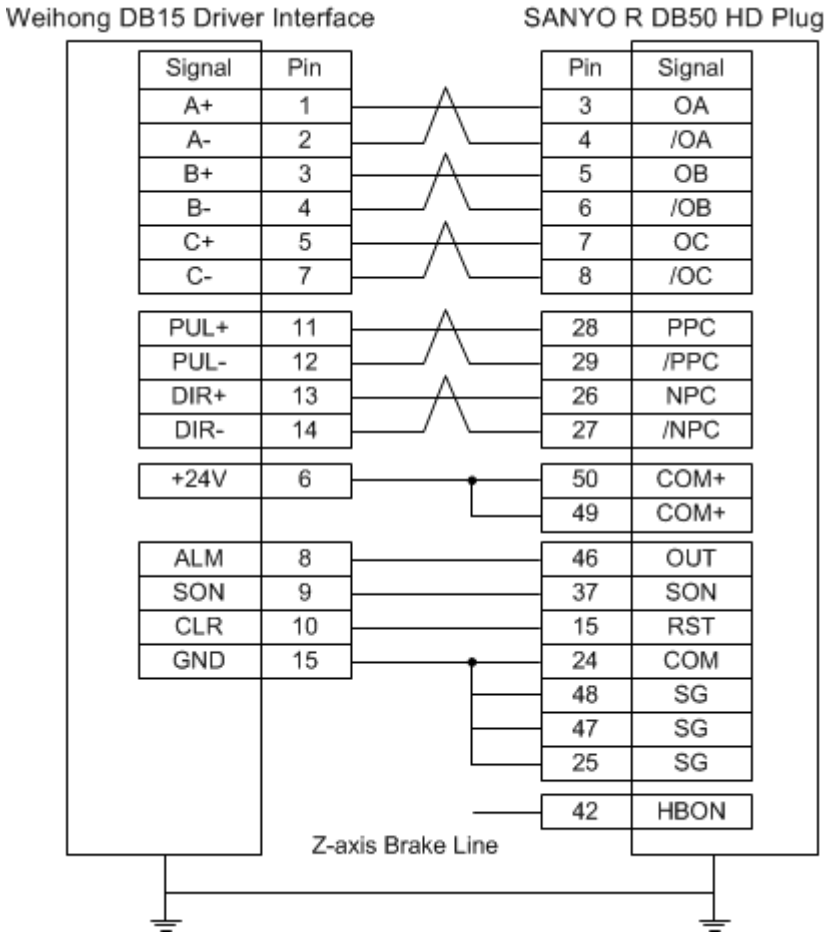
6.4.2.10 Wiring Diagram of SANYO Servo Drive

The wiring diagram is as follows:

- PY series

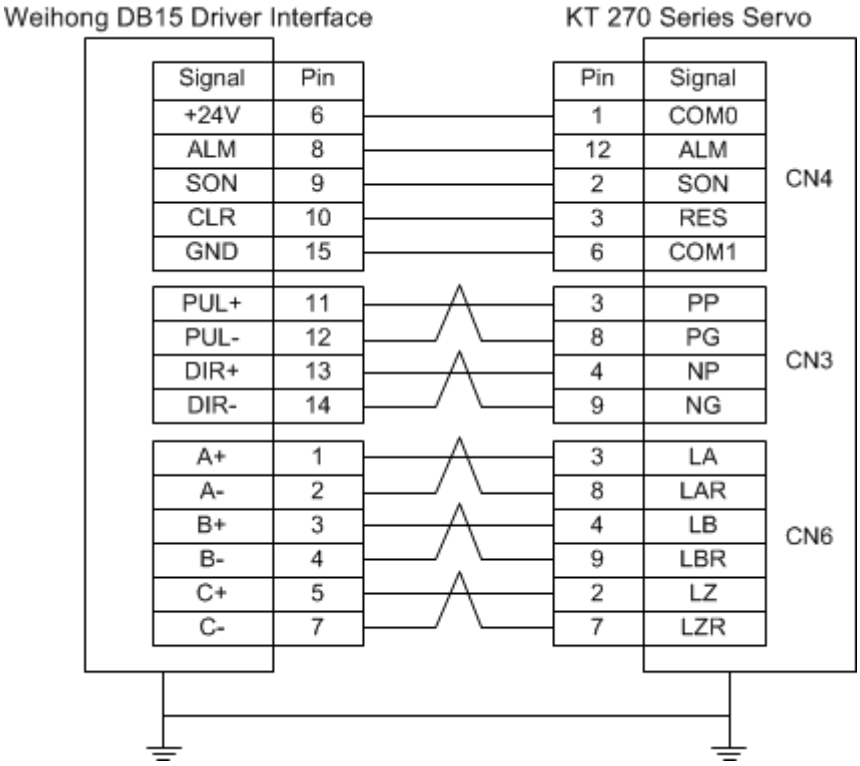


- R series


Weihong DB15 Driver Interface
SANYO R DB50 HD Plug
Signal
Pin
Pin
Signal
A+ 1 3 OA
A- 2 4 /OA
B+ 3 5 OB
B- 4 6 /OB
C+ 5 7 OC
C- 7 8 /OC
PUL+ 11 28 PPC
PUL- 12 29 /PPC
DIR+ 13 26 NPC
DIR- 14 27 /NPC
+24V 6 50 COM+
49 COM+
ALM 8 46 OUT
SON 9 37 SON
CLR 10 15 RST
GND 15 24 COM
48 SG
47 SG
25 SG
42 HBON
Z-axis Brake Line

6.4.2.11 Wiring Diagram of KT270 Servo Drive

The wiring diagram is as follows:



6.4.3 Wiring Diagram of the Drive (in Velocity Control Mode)

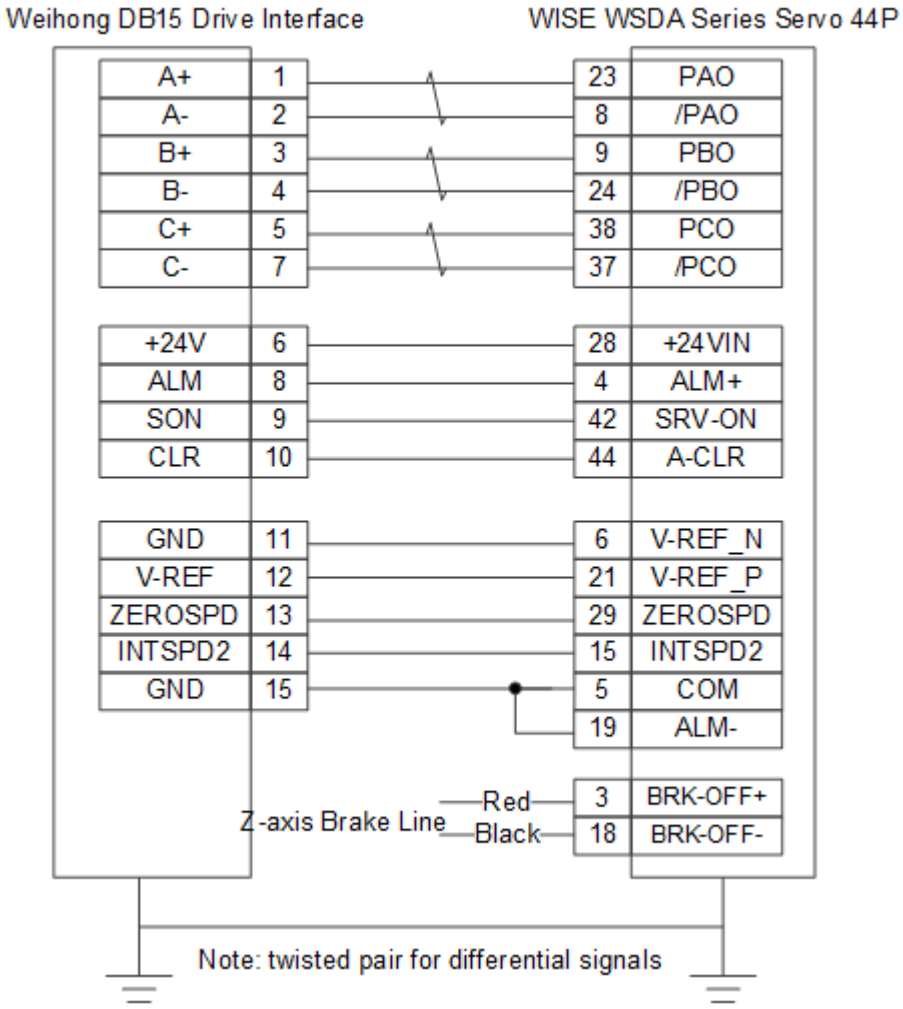
Please select the wiring diagram according to the brand of your servo drive:

- WISE Servo Drive
- YASKAWA Σ-7 Servo Drive
- Fuji Servo Drive

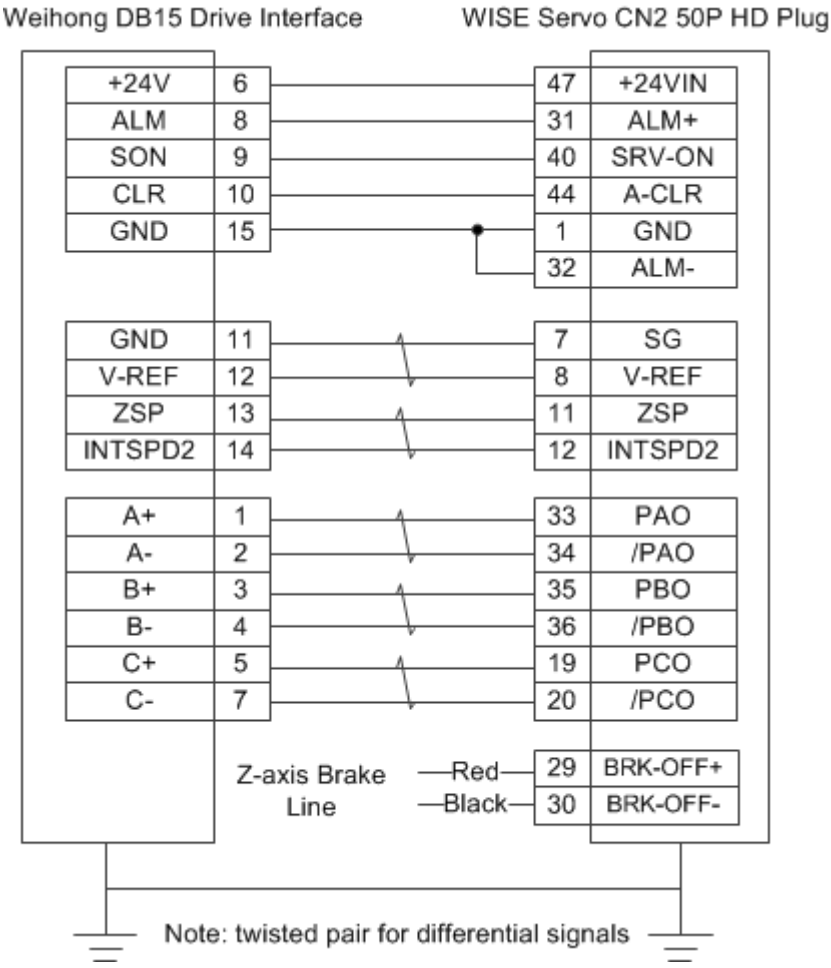
6.4.3.1 Wiring Diagram of WISE Servo Drive

The wiring diagram is as follows:

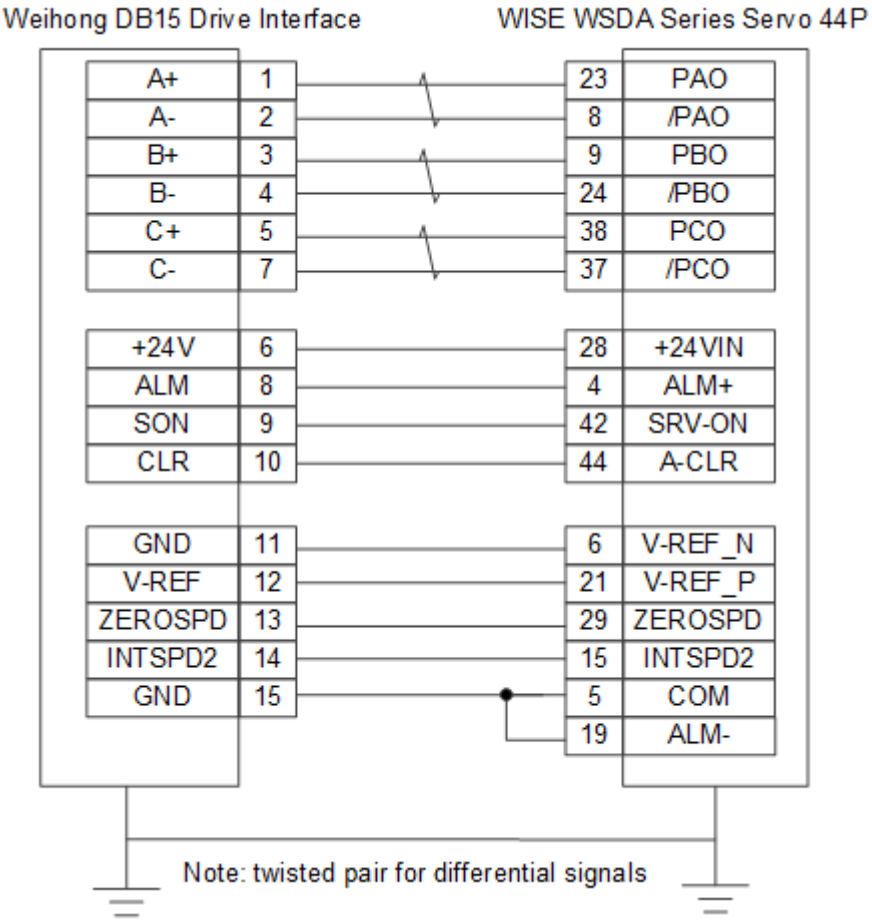
- With brake lines (44P interface)



- With brake lines (50P HD plug)

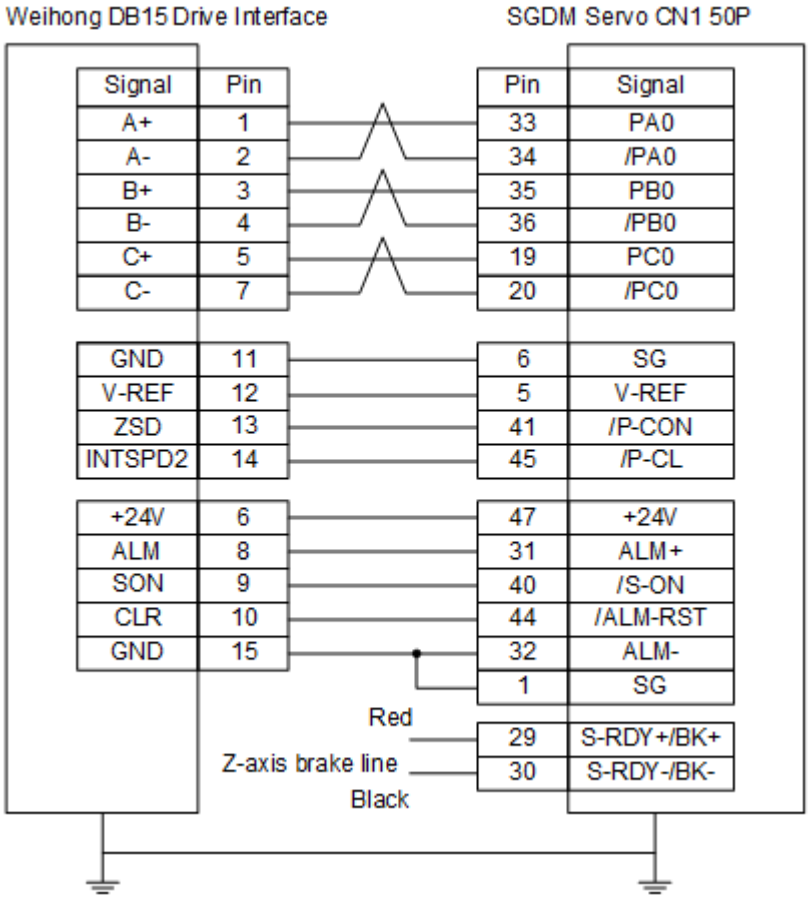


- Without brake lines (44P interface)



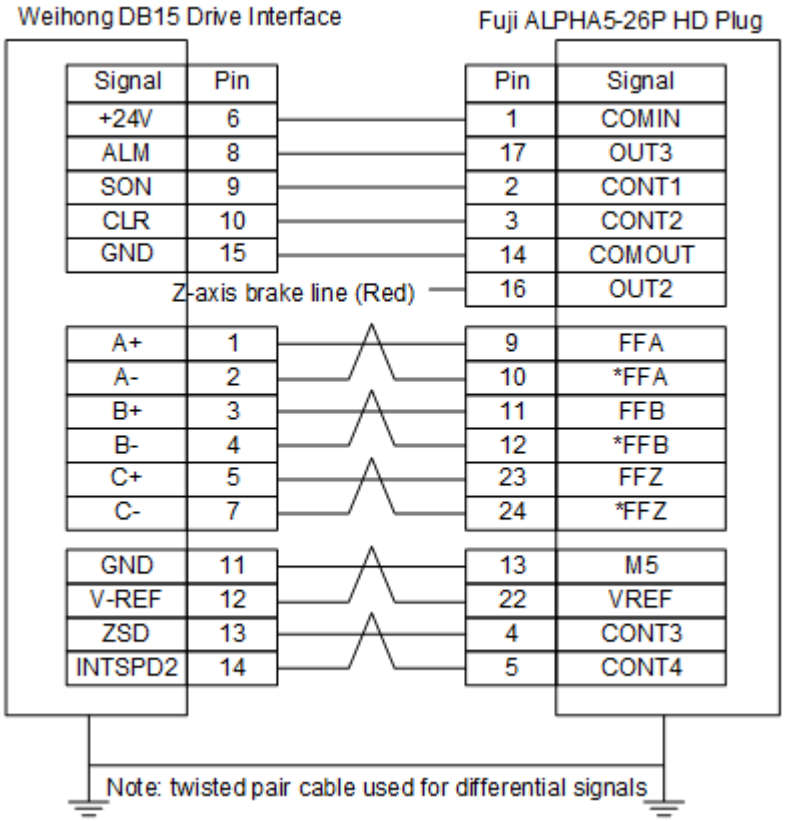
6.4.3.2 Wiring Diagram of YASKAWA Σ-7 Servo Drive

The wiring diagram is as follows:



6.4.3.3 Wiring Diagram of Fuji Servo Drive

The wiring diagram is as follows:



SPECIALIZED / CONCENTRATED / FOCUSED

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