E21 Installation Manual

(Version: V1.09)

ESTUN AUTOMATION CO., LTD

— Total Solution Supplier

Contents

Preface

Target reader

This manual guides the following operators to install, configure and maintain the E21 press break numerical control device:

● Machine tool operators

● Installation and maintenance personnel

Range of application

Installation and maintenance personnel can install and operate this device properly by referring to this manual.

Regulation

The design of E21 press brake machine numerical control device complies with the following grade standard:

● Grade standard of EMC test:

  – GBT 17626.2-2006 Electromagnetic compatibility (EMC) - Testing and measurement techniques - Electrostatic discharge immunity test.

    Grade 3; contact discharge ±4KV; air discharge ±8KV.

  – GBT 17626.4-2008 Electromagnetic compatibility - Testing and measurement techniques - Electrical fast transient/burst immunity test

    Grade 3; power port ±2KV; communication port ±1KV.

  – GBT 17626.3-2006 Electromagnetic compatibility - Testing and measurement techniques - Radiated radio-frequency electromagnetic field immunity test

    Grade strength: 10V/m; criteria: Grade A.

  – GB/T 17626.8-2006 Electromagnetic compatibility(EMC) -   Testing and measurement techniques - Power frequency magnetic field immunity test

    30A/m; 50～60HZ; criteria: Grade A.

  – RE Test, reference standard EN55011

    Execute CLASS A standard.

● Environmental test standard

- Low temperature; refer to JB-T 8832-2001 General requirements for numerical control device of machine tools, 0 ℃, 2hours. Low temperature store -20℃. Criteria: normal start up, normal operation.
- High temperature, refer to JB-T 8832-2001 General requirements for numerical control device of machine tools, 40 ℃, 2hours. High temperature store 55℃. Criteria: normal operation.
- Constant temperature wet, refer to JB-T 8832-2001 General requirements for numerical control device of machine tools, 40 ℃, humidity 93%~95%, 2 hours. Criteria: normal operation.
- Vibration impact, refer to JB-T 8832-2001 General Requirements for numerical control device of machine tools.

Personnel

Only **authorized and properly trained person** is allowed to operate this equipment. Any person without necessary training is not allowed to use this control system, not even for temporary use.

Area of responsibility distributed for personnel participating in installing, operating and servicing equipment shall be stipulated explicitly and be confirmed eligible.

Chapter 1 Specification

1.1 Display

LCD display

Dimension of display window: 54.38mm*54.38mm

Dot matrix: 160*160

Status light

Green indicates running

Red indicates stop

1.2 Internal memory

Capable of storing 40 programs, each program includes 25 steps at most.

1.3 Electrical specification

POWER

Input voltage: DC24V±10%

Rated current: 1A

INPUT

Input voltage: DC24V±10%

Maximum input current: 10mA

OUTPUT

External voltage: DC24V±10%

Maximum current: 70mA

Encoder power

Output voltage: DC12V±5%

Allowable maximum output current: 500mA

Absolute temperature

Working temperature: 0～40℃

Storage temperature: -20～55℃

Encoder specification

Power supply: DC 12V

Incremental encoder: single-ended output, with Z/C phase

Output: voltage-type

Chapter 2 Installation

2.1 Announcements before installation

- Power supply must be off during installation and wiring.

- Serious damage to the equipment may be caused by misconnection of power supply terminals, improper connection of in-out lines and output line short circuit. Therefore, before turning on the power supply, check the connection of input output grounding and power supply wire.

- Grounding terminal of E21 digital control device must be grounded in correct way, with low impedance lower than 0.3Ω.

- Do not dismantle the device without authorization so as to avoid malfunction.

- Electrical components inside the digital device are very sensitive to static electricity, therefore do not put foreign matters or make them fall to the inside of digital control device or touch the control circuit.

- Please install E21 digital control device in safe region. Avoid high temperature, and direct sunlight, moisture and splash of oil drops or water.

- Do not use this device in place of high temperature, moisture condensation, dust, oil smoke, conductive dust, corrosive gas or flammable gas.

2.2 Installation space and direction

Generally, E21 bending machine digital control device is embedded on control panel, keep a distance of 65mm from its neighboring components and damper (shell) on up and down, right and left, to facilitate operator install and maintain the device.

2.3 Installation environment

- Place free from water, vapor, dust or oily dust.

- Place free from flammable, explosive or corrosive gas.

- Place free from interference of strong electromagnetism or noise.

- Ambient temperature is between 0℃ - 40℃. When ambient temperature is over 40℃, please put it in well-ventilated place.

- Relative humidity is under 90%RH.

2.4 Installation dimension

The installation method is panel mounting. Installation dimension and drawings are

shown in Figure 2-1.
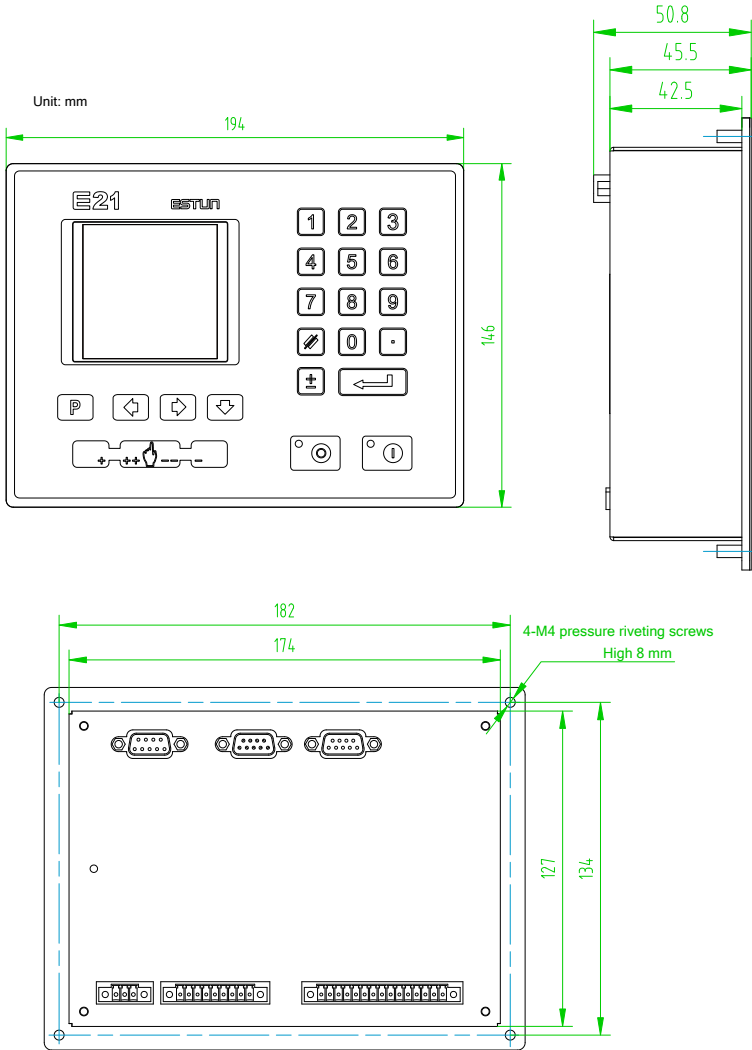
Figure 2-1 Panel Installation Dimension

2.5 Installation layout

2.5.1 Layout of rear panel

Rear panel block diagram is as shown in Figure 2-2, consisting of power port (POWER), input port (INPUT), output port (OUTPUT), encoder port (X, Y), and communication port (COMM).

Figure 2-2 Rear panel layout

2.5.2 Rear panel port description

Rear panel port description is as shown in Table 2-1.

Table 2-1 Rear panel port description

Socket number	External port name	External port description
CN1	POWER	Input terminal of the device power.
CN3	OUTPUT	13 pin. 24VDC, maximum drive capability 70mA, opto-coupler isolation, maximum withstanding voltage 40V.

Socket number	External port name	External port description
CN2	INPUT	7 pin. 24VDC, maximum load 10mA, opto-coupler isolation, maximum withstanding voltage 40V.
CN5	X-ENCODER	Incremental encoder is 12V single-ended output, with pulse frequency up to 100KHz. Meanwhile, the port supplies power externally (as input power of encoder). The rated voltage is 12V, rated current 150mA, and ripple voltage no higher than 100mV.
CN6	Y-ENCODER	Incremental encoder is 12V single-ended output, with pulse frequency up to 100KHz. Meanwhile, the port supplies power externally (as input power of encoder), rated voltage 12V, rated current 150mA, ripple voltage no higher than 100mV.
CN4	RS232	For updating the device software.

2.5.3 Overall wiring scheme

Overall wiring scheme is as shown in Figure 2-3.

Figure 2-3 Overall wiring schemes
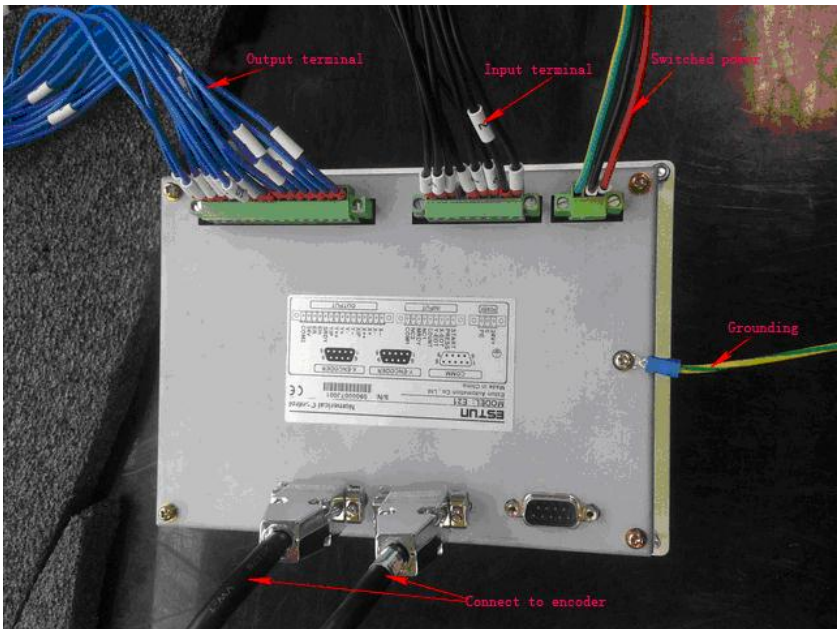
2.5.4 Electrical wiring scheme

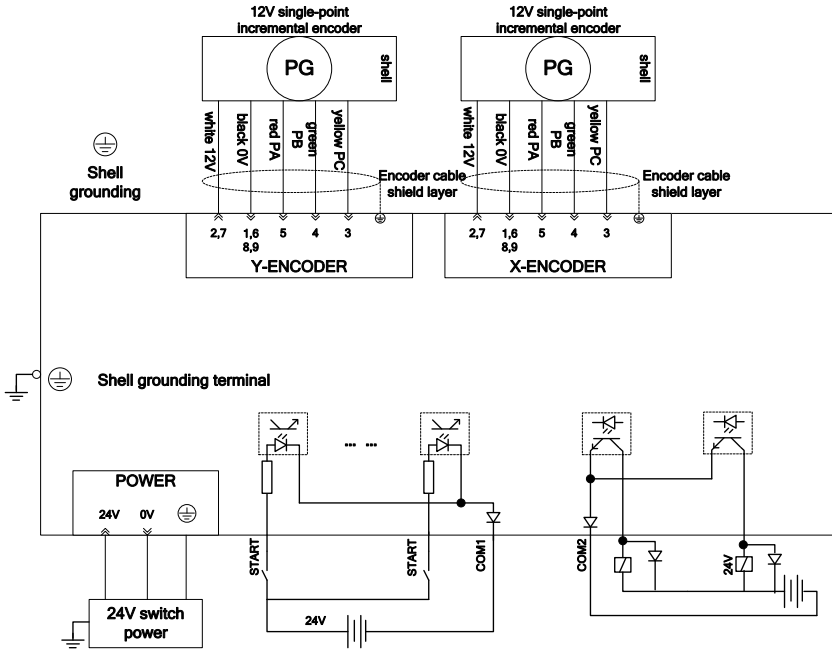Electrical wiring scheme is as shown in Figure 2-4.

Figure 2-4 Electrical wiring schemes

It is recommended to use the relay which contains diode on coil, avoid high voltage damage the circuit when cutting inductive load.

Shield layer of the encoder cable shall be connected to ground, which is the metal housing of the product, with low resistor.

2.6 Definition of device interface

2.6.1 Definition of power interface

Definition of terminal is as shown in Table 2-2.

Table 2-2 Description of power terminal

Terminal No.	Signal	Description
1	24V	Input terminal of device power, connect to DC +24V.
2	0V	Input terminal of device power, connect to DC 0V.
3	PE	PE

2.6.2 Definition of input interface

Pin definition is as shown in Table 2-3.

Table 2-3 Definition of external output terminal

Terminal No.	Signal	Description
1	Start	Step change signal, DC +24V signal input, connect to upper dead point signal generally, beam return to upper dead point, +24V signal is connected, system receive step change signal, system callout the next program and execute the program.
2	Press	Back gauge retraction, signal, DC +24V signal input, avoid interfering work piece by gauge device during work. System X/Y axis positioning is finished, and slider gets away from upper dead point. When slide just press against sheet, retraction signal is connected. Back gauge will yield some distance to direction of up counting (yield distance is determined by program retraction value), avoid interference by back gauge and work piece. When bending is finished and slide return, back gauge will return from yield position.
3	X-EOT	X-axis reference point signal, DC +24V signal input, connect to rear limit signal generally. When gauge touches reference point switch, +24V signal is connected.

Terminal No.	Signal	Description
4	Y-EOT	Y-axis reference point signal, DC +24V signal input, connect to low limit signal of Y-axis block generally. Block touches reference point switch, +24V signal is connected.
5	Count	Retain
6	NC	Retain
7	MRDY	The pump signal must be connected to DC 24V when the machine is normally running.
8	NC	Retain
9	COM1	Common port of system input signal must be connected to 0V of I/O power.

2.6.3 Definition of external output interface

Terminal definition is as shown in Table 2-4.

Table 2-4 Definition of external output terminal

Terminal No.	Signal	Description
1	X——	X axis high speed reversal
2	X—	X axis low speed reversal
3	X+	X axis low speed forward
4	X++	X axis high speed forward
5	XIP	X axis in position
6	Y——	Y axis high speed reversal
7	Y—	Y axis low speed reversal
8	Y+	Y axis low speed forward
9	Y++	Y axis high speed forward
10	YIP	Y axis in position
11	SRDY	System is ready to output
12	EH	End of holding time
13	ER	End of decompression
14	IN24V	Connect 24V+ of external IO power

Terminal No.	Signal	Description
15	COM2	Common port of system output signal must connect to 0V of I/O power supply.

2.6.4 Definition of encoder interface

Encoder interface is DB-9 plug (female), definition of terminal is as shown in Table 2-5.

Table 2-5 Definition of encoder terminal

Communication mode	Incremental encoder terminal					
Pin No.	3	4	5	1, 6	8, 9	2, 7
Signal definition	C	B	A	GND	NC	12V

[Note] GND of encoder cable can be connected to any pin among 1, 6, 8, and 9.

VCC of encoder cable can be connected to either 2 or 7.

2.6.5 Definition of communication interface

The device has integrated RS232 and RS485 serial interface, and the port adopts DB-9 plug (male).

[Note] The RS232 used for upgrading device software only.

Terminal definition is as shown in Table 2-6.

Table 2-6 Definition of communication terminal

Communication Mode	RS232		RS485		-	
Pin	2	3	8	9	5	1, 4, 6, 7
Definition	TXD	RXD	RS485A	RS485B	GND	NC

Chapter 3 Parameter Description of Machine Tool

3.1 Enter parameter page

Steps to entering parameter page are as below.

Step 1 Power on, and press P two times to enter Programming Constant page, as shown in Figure 3-1. On this page, program constant can be set.

CONST	
mm/inch:	0
中文/English:	1
Release Time:	0.30
Pulse Time:	0.200
Version:	1.11

✐: 0: mm 1:inch

Figure 3-1 Program Constant page

Step 2 Move the cursor to parameter **mm/inch** or **中文/English**, and input the password **14789**, press ⏎ to enter Parameter Setting page, as shown in Figure 3-2.

PARAMETER

1. SYSTEM PARA
2. X AXIS PARA
3. Y AXIS PARA
4. BACKUP/LOAD

✐: Press 'NUM' Enter

Figure 3-2 Parameter Setting page

Step 3 Select "1. System Parameter", then press ⏎ to enter system Parameter Setting page, as shown in Figure 3-3.

SYS PARA	1/ 1PG
X-digits:	1
Y-digits:	2
X-safe:	10.0
Y-safe:	5.00
Step delay:	0.5
Count Select:	0
LDP Enable:	0

✐: Range: 0~3

Figure 3-3 System Parameter Setting page

> **<Note>:** You can directly enter Teach Page by input password "1212" and press ⏎
>
> on Program Constant page.

Step 4 Input password **36987** on the **CONST** page to enter Motor-Speed Detection page, as

shown in Figure 3-4.

```
┌─────────────────────────────┐
│                             │
├─────────────────────────────┤
│                             │
│        1.X Motor Dec.       │
│        2.Y Motor Dec.       │
│                             │
│                             │
│                             │
│                             │
│  🖉:                        │
└─────────────────────────────┘
```
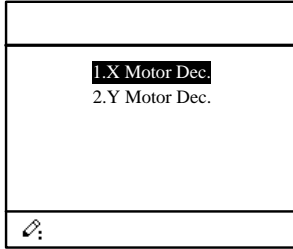
Figure 3-4 Motor-Speed Detection page

Press Up-Arrow key or Down-Arrow key to enter X-axis page or Y-axis page. For

details, see the parameter description of Motor-Speed Detection

```
┌─────────────────────────────┐
│                     1/2 PG  │
├─────────────────────────────┤
│ X-Motor Det. En.:        1  │
│ X. Det. Time.:        9.99  │
│ X-axis V1:        9999.999  │
│ X-axis V2:        9999.999  │
│ X-axis V3:        9999.999  │
│                             │
│                             │
│  🖉:                        │
└─────────────────────────────┘
```

Figure 3-5 X-axis Motor-Speed Detection page

----End

3.2 Parameter Description

The parameter description is as shown in Table 3-1.

Table 3-1 Parameter specification

Name	Default value	Range	Description
X-digits	1	0~3	Decimal digits indicated by X axis parameter
Y-digits	2	0~3	Decimal digits indicated by Y axis parameter

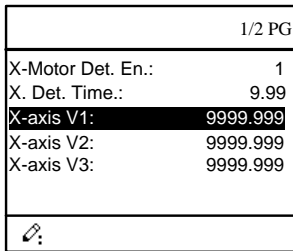| Name	Default value	Range	Description
mm/inch	0	0 or 1	• 0: Metric • 1: inch
中文/English	0	0 or 1	• 0: Chinese • 1: English
Release Time	0.3	0~99.99s	Interval between valid yield signal and unloading output when system starts.
Pulse Time	0.20	0.00~1.00s	The duration of the pulse signal.
X-safe	10	0~9999.999mm	Keep low speed within this range
Y-safe	5	0~9999.999mm	Keep low speed within this range
Step delay	0.5	0~99.99s	Interval between valid step change signal and system executing step change.
Count Select	0	0 or 1	• 0: UDP, when the slider leaves the UDP, the count increases by 1. • 1: EH, when one process has been done, the count increases by 1.
LDP Enable	0	0 or 1	• 0: Disable • 1: Enable
Transducer	0	0 or 1	• 0: Vacon • 1: Shihlin
X-tea.in	10	Between soft lim.	Input current X axis position when teach enable.
Y-tea.in	10	Between soft lim.	Input current Y axis position when teach enable.

Name	Default value	Range	Description
X-Enable	1	0 or 1	• 0:disable • 1:enable
Encoder Dir.	0	0 or 1	• 0:decreasing • 1:increasing
Teach. En.	1	0 or 1	• 0:disable, enable the orientation function. • 1:enable, enable the teaching function.
Ref. Pos.	500	0~9999.999mm	Position displayed when X axis reference point is found.
X-Min	10	0~9999.999	Minimum position of X axis;
X-Max	500	0~9999.999	Maximum position of X axis;
MF	40	1~99999999	X axis multiple factor, for conversion between pulse and millimeter.
DF	1	1~99999999	X axis divide factor, for conversion between pulse and millimeter.
Stop Dis.	1	0~9999.999mm	Advance stop range. Motor stops and carries out inertial motion when enter this range.
Tolerance	0.2	0~99.999mm	Position tolerance, in position signal is output when reaching this range.
Overrun En.	1	0 or 1	• 0:disable, orientation is bilateral. • 1:enable, orientation is unilateral.
Over.Dis.	10	0~9999.999mm	Over travel distance, valid when positioning both sides

Name	Default value	Range	Description
Repeat Enable	0	1~99999999	• 0:disable • 1:enable
Repeat Time	0.5	0~99.99s	Interval of back gauge reposition when repeat position
Mute Dis.	10	0~9999.999mm	Conversion distance between high speed and low speed. Motor lowers speed when enter this range.
Stop Time	0.5	0~99.99s	Back gauge reaches advance stop range. Due to inertia, back gauge will not stop immediately after motor stops. The time for back gauge to stop.
OT Time	0.5	0~99.99s	Interval between back gauge reach over travel position and input motor signal.
Drive Mode	1	0 or 1	• 0: common motor • 1: single-frequency converter
High freq.	100%	0~100	Frequency percent in the high-speed mode. This value is valid only when **X drive mode** is set to frequency converter. High frequency = this value $\times$ the fixed frequency In general, the fixed frequency is 50Hz.

Name	Default value	Range	Description
Low freq.	10%	0~100	Frequency percent in the low-speed mode. This value is valid only when **X drive mode** is set to frequency converter. Low frequency = this value $\times$ the fixed frequency In general, the fixed frequency is 50Hz.

[Note] The parameter description of X-axis and Y-axis are the same.

If the **Vacon** transducer is used, the parameter setting for communicating E21 device is as below:

E21 Communication	Parameter Setting of Vacon
Protocol：Modbus RTU	P2.1 → 1
Baud Rate: 9600bps	P3.3 → 3
Data Bit: 8bit	P2.2 → 1
Parity check：None	P2.3 → 1
Stop Bit: 1 stop_bit	P2.4 → 5
Message Protocol: 1.8.N.1 (Modbus, RTU)	P2.7 → 0

If the **Shihlin** transducer is used, the parameter setting for communicating E21 device is as below:

E21 Communication	Parameter Setting of Shihlin
	P.79 → 3
Protocol：Modbus RTU	P.32 → 1
Baud Rate: 9600bps	P.33 → 0
Data Bit: 8bit	P.36 → 1
Parity check：Even	P.52 → 1
Stop Bit: 1 stop_bit	P.53 → 9999
Message Protocol: 1.8.E.1 (Modbus, RTU)	P.153 → 1
	P.154 → 4

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The parameter description of Motor-Speed Detection is as shown in Table 3-1.

Table 3-1 Parameter description of Motor-Speed Detection

Name	Default	Range	Description
X-Motor Det. En.	0	0 or 1	Whether to enable the Motor-Speed Detection function. • 0: Disabled • 1: Enabled
X. Det. Time	0.5	0~9.99s	The cycle detection time of X-axis motor or inverter. According to this setting value, the system sampling and calculating the speed of motor or inverter.
X-axis V1	6	0~9999.999mm/s	X-axis motor begins to accelerate from 0 to the detection end, if the average speed $V_0 < V_1$, the system alarms. Please configure this value according to the actual using. This parameter applies to both motor and inverter.
X-axis V2	10	0~9999.999mm/s	X-axis motor begins to accelerate from Low-speed to the detection end, if the average speed $V_1 \leqslant V_0 < V_2$, the system alarms. Please configure this value according to the actual using. This parameter applies to only the inverter.
X-axis V3	20	0~9999.999mm/s	X-axis motor begins to accelerate from High-speed to the detection end, if the average speed $V_2 \leqslant V_0 < V_3$, the system alarms. Please configure this value according to the actual using. This parameter applies to only the inverter.
X-axis T1	0.5	0~9.99s	X-axis motor begins to accelerate from 0 to the detection end. It will not detect the motor speed in this setting value. This parameter applies to only the motor.
X-axis T2	0.5	0~9.99s	X-axis motor begins to accelerate from Low-speed to the detection end. It will not detect the motor speed in this setting value. This parameter applies to only the inverter.

Name	Default	Range	Description
X-axis T3	0.5	0~9.99s	X-axis motor begins to accelerate from High-speed to the detection end. It will not detect the motor speed in this setting value. This parameter applies to only the inverter.

[Note]   The parameter description of X-axis and Y-axis are the same.

Chapter 4 Diagnosis

> ⚠️ **CAUTION**
>
> When diagnosis is in progress, do not start oil pump.

4.1 Enter diagnosis page

This system provides diagnosis tests for input, output, keyboard, FRAM, encoder and LCD, etc. Steps to enter diagnosis page are as follows:

Step 1 Power on, the device displays the single-step programming page, Stop Indicator lights.

Step 2 Press **P** twice to enter programming constant page, input password **5656**, press ⬅ to enter diagnosis page, as shown in Figure 4-1.

```
            DIAGNOSE
      1. IN      DIAG.
      2. OUT     DIAG.
      3. KEY     DIAG.
      4. FRAM    DIAG.
      5. Enc.    DIAG.
      6. LCD     DIAG.
   ✎:
```

Figure 4-1 Diagnosis page

4.2 Input diagnosis

When you enter the **DIAGNOSE** page, select **1. IN DIAG.** to enter **IN DIAG.** page, as shown in Figure 4-2.

[Operation Guide] Switching the relay, the device will receive the input signal, and the corresponding port icon will light, which indicates that this input port is normal.

```
            IN  DIAG.

      ST.   ☐      Y-R  ☐

      PRE   ☐      CNT  ☐

      X-R   ☐      RDY  ☐

   ✎:
```

Figure 4-2 Input diagnosis page

4.3 Output diagnosis

When you enter the **DIAGNOSE** page, select **2. OUT DIAG.** to enter **OUT DIAG.** page,

as shown in Figure 4-3.

[Operation Guide] Using the **Arrow Key** to move the cursor to the corresponding port

icon, and then press ⊞, the relay switch will beat, and the icon will light, which

indicates that this output port is normal.

```
┌─────────────────────────────────┐
│           OUT DIAG.             │
├─────────────────────────────────┤
│  X--  □   Y--  □    SDY □        │
│  X-   □   Y-   □    EH  □        │
│  X+   □   Y+   □    ER  □        │
│  X++  □   Y++  □                 │
│  XIP  □   YIP  □                 │
├─────────────────────────────────┤
│  ✎: Please press `±`            │
└─────────────────────────────────┘
```

Figure 4-3 Output diagnosis page

4.4 Keyboard diagnosis

When you enter the **DIAGNOSE** page, select **3. OUT DIAG.** to enter **KEY DIAG.** page,

as shown in Figure 4-4.

[Operation Guide] Press any key, the screen will display corresponding key name.

```
┌─────────────────────────────────┐
│           KEY  DIAG.            │
├─────────────────────────────────┤
│                                 │
│          The key is：            │
│                                 │
│             Enter               │
│                                 │
│                                 │
├─────────────────────────────────┤
│  ✎:                             │
└─────────────────────────────────┘
```

Figure 4-4 Keyboard diagnosis page

4.5 FRAM diagnosis

When you enter the **DIAGNOSE** page, select **4. FRAM DIAG.** to enter **FARM DIAG.**

page, as shown in Figure 4-5.

[Operation Guide] Press ⊞, the page displays "Diagnosing". When the diagnosis is

success, the page will display "The result is: OK". However, if the page long displays

"Diagnosing", it indicates the memory is failure. You should press P to back, and

check the hardware.

```
┌─────────────────────────────┐
│         FRAM DIAG.          │
├─────────────────────────────┤
│                             │
│      Press `±` to start     │
│                             │
│                             │
│                             │
├─────────────────────────────┤
│  ✎:                         │
└─────────────────────────────┘
```

Figure 4-5 Storage diagnosis page

4.6 Encoder diagnosis

When you enter the **DIAGNOSE** page, select **5. ENC. DIAG.** to enter **ENC. DIAG.**

page, as shown in Figure 4-6.

[Operation Guide] Rotating (X-axis and Y-axis) encoder, the corresponding C-pulse

will change (jump between 0 and 1), which indicates the encoder port is normal.

```
┌─────────────────────────────┐
│         ENC. DIAG.         │
├─────────────────────────────┤
│  Encoder1:          0       │
│  Encoder1 C:        0       │
│  Encoder2:          0       │
│  Encoder2 C:        0       │
│                             │
├─────────────────────────────┤
│  ✎:                         │
└─────────────────────────────┘
```
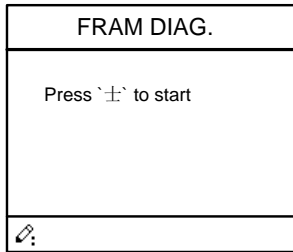
Figure 4-6 Encoder diagnosis page

4.7 LCD diagnosis

When you enter the **DIAGNOSE** page, select **6. LED DIAG.** to enter **LED DIAG.** page,

as shown in Figure 4-7.

[Operation Guide] Press ⊞, the device will star to diagnose the LCD. To stop the

diagnosis, press P.

```
┌─────────────────────────────┐
│         LCD DIAG.           │
├─────────────────────────────┤
│                             │
│      Press `±` to start     │
│                             │
│                             │
│                             │
├─────────────────────────────┤
│ ✎:                          │
└─────────────────────────────┘
```
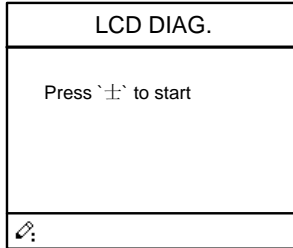
Figure 4-7 LCD diagnosis page

4.8 Communication diagnosis

When you enter the **DIAGNOSE** page, press **Right-Arrow Key** to enter the second

page, and select **2. Com. DIAG.** to enter **Com. DIAG.** page, as shown in Figure 4-8.

[Operation Guide] To achieve this function, you should use two connected

devices. Using the communication cable to connect the devices, and enter the **Com.**

DIAG. page both of them. Press 🔘 on anyone device (as the **receiver**), the

receiver page displays "Diagnosing", and then press ⊞ on the other device (as the

transmitter), the **receiver** page displays "The result is: OK", which indicates the

communication is normal. Then, **switch the receiver and transmitter to operate**

again according to the above procedure.

```
┌─────────────────────────────┐
│         Com. DIAG.          │
├─────────────────────────────┤
│                             │
│     Press  ±´to send        │
│     Press ∴´to Recie        │
│                             │
│                             │
├─────────────────────────────┤
│ ✎:                          │
└─────────────────────────────┘
```
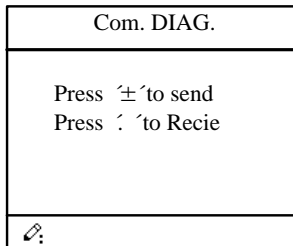
Figure 4-8 Communication diagnosis page

Chapter 5 Commissioning

⚠ CAUTION

> When commissioning, watch carefully whether motor runs normally or
>
> mechanical impacts may be caused. If necessary, cut down motor power
>
> immediately to avoid accident.

5.1 Preparation before Commissioning

- Check E21 power line, ground wire, input/output signal wire and encoder plug for reliable and accurate connection.

- Check whether output voltage of 24V switch power is normal or not.

- Check power supply and ground wire before power on the system.

- Enter diagnostic page, check system input signal. When there is input signal, the corresponding input indication is filled; otherwise, input signal is not connected.

- Enter diagnostic page, check system output signal. When there is output signal, the corresponding output indication is filled. If machine tool fails to operate normally, check electrical parts of the machine tool.

5.2 Procedure

5.2.1 System parameter setting

X-Axes parameter setting

X axis parameter set (Refer to parameter specification for details)

- X-Enable = 1 (X-axis is enabled)
- Encoder Dir. = 0 (decreasing direction)
- Teach. En. = 0 (X-axis homing is enabled)
- Ref. Pos. = 10.00
- X-Min: 10.00 (the minimum value of the X-axis position)
- X-Max: 500.00 (the maximum value of the X-axis position, determined by gauge length)
- MF: 40
- DF: 1
- Stop Time: 0.20
- Tolerance: 0.02

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- Over.Dis.: 5.00

- Repeat Enable: 1

- Repeat Time: 1.00

- Stop Dis.: 100

- Mute Dis.: 4000

- Overrun En.: 0 (Bilateral orientation is enabled)

Y-Axis parameter setting

Y-axis parameter setting: the method is similar to the setting of X axis parameter

5.2.2 Action commissioning

- Press "+" to observe whether X axis moves backward. If the moving direction is opposite, then adjust phase sequence of X axis motor.

- Make sure whether counting direction of encoder is correct. If it is incorrect, revise Parameter-encoder direction.

- Press "-"and "++--"to make sure whether opposite direction moving and high speed moving is correct.

- Make sure whether front and rear limit function in correct way.

5.2.3 Precision commissioning

- When **Repeat Enable** is 0: utilize single step procedure, to modify X axis setting position from big to small. Press "Running" key to move X axis from back to front. If the location after positioning beyond the setting location, then the **Stop Dis.** parameter will be decreased; otherwise, the **Stop Dis.** parameter will be increased. This process may be adjusted many times until the difference between actual location and setting location is less than 0.1.

- When **Repeat Enable** is 0: utilize single step procedure, to modify X axis setting position from big to small. Press "Running" key to move X axis from back to front. If the location after positioning beyond the setting location, then the **Over.Dis.** parameter will be decreased; otherwise, the **Over.Dis.** parameter will be increased. This process may be adjusted many times until the difference between actual location and setting location is less than 0.1.

- When **Repeat Enable** is 1: over travel enable shall be set to 1, setting over travel distance shall exceed advance stop range. Start system, and observe whether system will return to over travel distance and start to position after fail to reach tolerance range in completion of positioning.

5.2.4 Counting commissioning

Edit multistep program on programming page (setting number of work piece is over 1, single step is excluded), press "Start", depress pedal to dry running when X, Y axis are in position (note Y axis position and pressure), observe whether counting has increased; if no change occurs, check whether **Start** signal wires are correctly and reliably connected to the system.

5.2.5 Retreat commissioning

Edit single-step program on programming page (retreat value is 5mm), press "Start", depress pedal to dry running when X-axis, Y-axis are in position (note Y-axis position and pressure).observe whether there is retreat and the retreat sequence is correct. If problem is found, check whether **Press** signal wire (IN2) is correctly and reliably connected to the system, and whether yield distance (Dx value) set is correct and reasonable.

5.2.6 Teach function commissioning

When the above procedures are finished, roughly correct actual position of X and Y axis by teach function. Edit single step program to carry out actual processing, measure dimension of the processed work piece, then correct scale error by teach function.

Chapter 6 Maintenance

6.1 Instructions to maintenance

In order to use this system safely and properly, follow the instructions.

- When power is on or system operates normally, do not open cover plate or panel as it may damage the components.
- Professionals shall do Wiring and inspection.
- Do not touches IC pin or contact of joint.
- Do not place system on metal product that may cause power leakage, or on wood, plastic or vinyl product, which has static electricity.
- If self-diagnosis error occurs to the system, determine details in accordance with warning instructions and eliminate causes to error. Ensure safety. Rerun when warning is removed. (Refer to Appendix 1 Warning list and instructions)
- Before operation, determine and adjust program and each parameter.
- Do not add voltage values excluded in operating manual on any binding post. Otherwise damage or breakage may be caused.
- Do not misconnect terminals. Otherwise, damage or breakage may be caused.
- Do not mistake polarity (+/-). Otherwise, damage or breakage may be caused.
- Control line and communication cable shall not be together with or close to principal line and power harness. Their distance between each other shall be over 100mm during installation.

6.2 Routine inspection

For routine inspection, please refer to **Table 6-1**.

Table 6-1 Routine inspection

No.	Inspection item	Standard content	Standard specification	Treatment
1	Basic installation status of the system	Check set screw for loosening, and check seal for drop.	Be installed properly.	Fasten screw.
2	IO port connection status	Check IO port connection for loosening	Correct wiring.	Correct wiring.

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No.	Inspection item	Standard content	Standard specification	Treatment
3	Connection status	Check terminal screw for loosening	Screw is not loose	Fastening terminal screw.
4	LED display status	Check whether LED display is correct.	LED (green) indicate system running, LED (red) indicate system stop.	-

6.3 Periodic inspection

Items which require once or twice inspection every 6 months or 1 year are listed below.

In case of equipment removal or reconstruction, or any changes to wiring, inspection is

also required. Please refer to **Table 6-2** for inspection content.

Table 6-2 Periodic inspection content

No.	Inspection item		Standard content	Standard specification	Treatment
1	Surrounding environment	Ambient temperature	Measure by thermometer, humid meter, and measure whether corrosive gas exists.	0~40℃	-
		Ambient humidity		5~95%RH	
		Air		No corrosive gas	
2	Voltage		Voltage among terminals 24V DC	20~29V DC	Change power supply

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No.	Inspection item			Standard content	Standard specification	Treatment
3	Install	Tension, mobility		Mobile module	Module must be installed securely.	Secure the screw. If CPU and I/O module loses, fasten them by screws.
		Dust and foreign matter attachment		Visual observation	No dust or foreign matter is allowed.	Remove and clean.
4	Connection status	Tightness of terminal screw		Rotate by screwdriver	No loosening	Screw
		Whether compression type terminal is close		Visual inspection	Compression type terminal must be fixed between proper intervals.	Adjust
		Tightness of joint		Visual inspection	No loosening	Tighten screw
5	Relay			Multimeter, visual inspection	Whether contact pull-in is normal. Coil resistance	Replace relay.

Chapter 7 Appendix

7.1 External power description

⚠ CAUTION
Output voltage of some switch power supply can be adjusted. Before use, output voltage must be adjusted within the above-mentioned range; otherwise, internal circuit of the controller may be damaged.

It is recommended to use two 24V power supplies, one for supplying power to the system, the other for supplying power to input/output terminal.

Two DC power supplies shall be isolated safely from AC power grid (switch-mode power supply is recommended), and comply with EN60950 standard. Ensure safe isolation and avoid electric shock.

System power supply: rated voltage 24V±10%, rated current no less than 1A.

Power supply connected to OUTPUT, INPUT terminals: rated voltage 24V±10%, rated current no less than 1.0A (when all IO ports are in conducting state, maximum current required is 1.0 A).

7.2 Grounding design

7.2.1 Ground classification in equipment cabinet

Ground in equipment cabinet is divided into three categories:

● Signal ground: for example, signal reference in E21 controller;

● Shield ground: the shield layer of communication cable can prevent the system from external interference and hinder internal noise interfere other equipment. The ground shield layer connected to be called shield ground must connect to protective ground.

● Protective ground: shield ground of each equipment inside the cabinet is connected somewhere, such as grounding bar. The grounding bar connects to earth.

If signal ground and protective ground of the equipment are not directly connected but isolated by high resistance return circuit, then this is floating ground equipment. Floating ground equipment can isolate power interference, improve system immunity from interference significantly and ensure reliable and stable operation.

7.2.2 Equipment grounding design

E21Internal circuit grounding

E21 is floating ground equipment. The signal ground is isolated from ground by high resistance return circuit (LC filter network, optical coupler, RC network).

To avoid static electricity accumulation by system or high frequency interference, signal ground is usually connect to the ground by RC net.

RC network of E21 is integrated inside the product with one end connect to signal ground, and the other end connect to ground (three pins of POWER terminal), as shown in **Figure 7-1**.
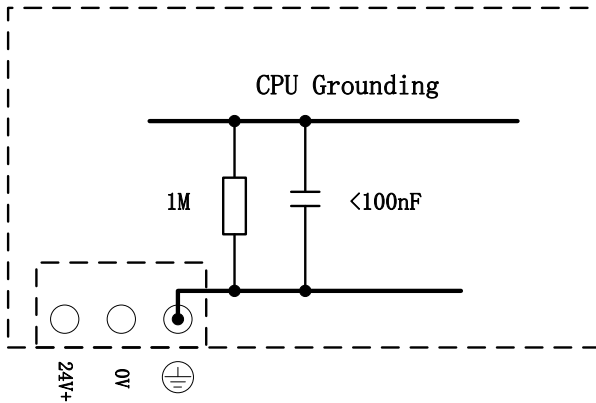

Figure 7-1 Internal Grounding Diagram

E21Chasis grounding

E21 enclosure is conductive metal, and must be low resistance grounding, which can effectively reduce short circuit or danger caused by system fault. Low resistance grounding can also significantly reduce external interference to system or system interference to the outside.

Principal measures of E21 enclosure grounding are: there is a grounding terminal outside of enclosure. The terminal must be grounded, with grounding resistance no higher than 0.3 ohm.

Power terminal grounding

There is a PE pin on power terminal. This pin must ground well, and ground resistance is no higher than 0.3ohm.

Cable shield layer grounding

If encoder cable has shield layer, both ends of the shield layer must ground well, suppress external interference effectively, and enhance system reliability. Do not pigtail the shield layer.

For cable shield layer grounding, if ground potentials of both ends are not equal, it will result in current in shield layer. In such case, treat the ground and lower potential difference.

7.3 Protective measures

7.3.1 Measures to ensure electromagnetic compatibility

E21 and its components are specially designed for industrial environment with strong electromagnetic compatibility. But when install and operate, take possible interference by the outside into account, and improve reliability and stability of the system.

Common external interference sources

- High inductive load, such as contactor and relay. Strong electromagnetic interference will be generated at the cut-off moment;
- Frequency converter, servo driver and motor will generate strong electromagnetic interference.

Ways to interfere coupling

Ways to interfere coupling are shown in **Table 7-1**.

Table 7-1 Ways to interfere coupling

Coupling mode	Cause	Typical cases
Direct electric coupling	Two or more circuits use one guide line	Many equipment share one power supply; Electrostatic discharge, etc.
Capacity coupling	Capacity coupling will generate between any two conductors.	When cables are laid in parallel, especially when strong and weal current are in parallel, strong current will affect weak current.

Coupling mode	Cause	Typical cases
Inductive coupling	Changing current flows through current loop.	Transformer; Contactor and relay pull-in or disconnect; High frequency signal cable, etc.
Radio frequency coupling	Space electromagnetic field makes guide line generate induced voltage current.	-

Measures to ensure electromagnetic compatibility

- Low resistance grounding: make sure uncharged metal parts (such as enclosure, shield layer) are ground well. Earth conductor connects to grounding bar inside cabinet. Grounding bar shall connect the ground by low resistance, anti-corrosion and make sure good electrical conductivity;

- Cabling in correct way

  – Cables must be sorted: high-tension line, power line, encoder cable, and signal line (such as input and output cable).

  – Cables of different kinds shall lie separately and keep distance to the greatest extent, high-tension line in particular. Do not lie together with power line, encoder cable and signal line.

  – Encoder cable shall be kept away from power line and signal line to the largest extent.

- Connect to shield layer correctly

  – Encoder cable shall have shield layer. Both ends of shield layer must connect to protective ground.

  – Connected area of shield layer and protective ground shall be as low as possible. Do not twist the shield layer into a rope. Connect to protective ground.

  – The smaller resistance between shield layer and protective ground, the better.

- Other requirement

  – Inductive load, frequency converter and servo driver inside the cabinet shall be kept away from power line, encoder cable and signal line.

  – Earth potential difference between different equipment is the smaller the better, theoretically, zero is the best.

7.3.2 Instructions to E21 electromagnetic capability installation

- E21 may be installed outside the cabinet. If work environment is poor, keep E21 close to cabinet as much as possible;

- Metal housing shall connect to protective ground via earth conductor, and ground resistance shall be no higher than 0.3 ohm;

- Cabinet must be ground well to avoid personal injury or death caused by electricity leakage;

- Power line, encoder cable and signal line must be away from strong current and inductive load. Do not lay in parallel;

- Signal line (I/O port cable) is the shorter the better. If long distance wiring is required, try to keep away from strong interference source;

- Two 24V power supplies are recommended, one for supply power to internal circuit, the other for IO port power supply.

- Encoder cable uses shield line. The shield layer and metal housing connect to each other in large area. Try to avoid "pigtail" connection.

7.3.3 Install freewheeling diode on relay

When inductive load is cutoff, instant high voltage will generate, such as coil and contactor of relay.

To avoid damage to system circuit by high voltage, necessary protection measures must be taken.

E21 output port load is DC relay, protective measures are as follows:

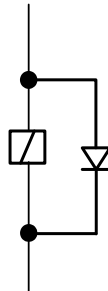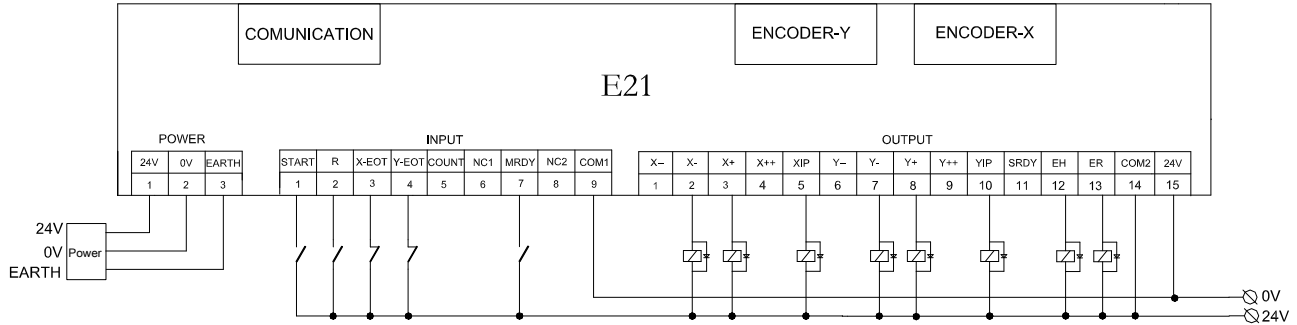Add bleeder diode on coil, clamp voltage on both ends of coil. But some off-delay will be caused.

Figure 7-2 Relay coil connect freewheel diode

7.4 Demonstration of AC Asynchronies motor wiring

Demonstration of AC asynchronism motor wiring is as shown in the following figure.

COMMUNICATION	
2	TXD
3	RXD
5	GND
8	RS485A
9	RS485B
Others	NC
Shell	EARTH

ENCODER	
1, 6	GND
2, 7	12V
3	CZ
1	A
5	B
8, 9	NC
Shell	EARTH

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