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Chapter one Introduction to Punch Automatic Feeder

1.1 System Introduction

With the development of machine vision technology in the field of industrial automation, embedded CNC products with image processing functions are becoming more and more popular among customers. It adopts machine vision technology, stable automatic control algorithm and accurate motion execution mechanism in this system so as to meet the production requirements under the industrial site environment.

This product is a kind of punch automatic feeder with solid aluminum alloy frame, lead screw operation mode, fast, stable and accurate servo motor and convenient operation. During practical mass processing and production, this product can replace manual operation and improve the efficiency and automation degree of the production.

The punch automatic feeder is mainly composed of two parts: motion control part and motion execution part. The motion control part is for the automatic processing process of the workpiece. The motor control part includes industrial control computer, motion control card, camera, numerical control special software. The motion execution part is for moving the workpiece into appointed positions. The motion execution part includes servo motor, actuator and turning lathe.

The following figure is the external view of the punch automatic feeder.
1.2 **System Features**

**Camera features**
- High pixel
- Solid full metal shell and cable locking devices
- Hot plug available

**Motion control features**
- Automatic tool control to complete shooting, movement, punching, zero returning and other movements
- Manual tool control to complete inching movement and tender movement
- Set different gears with manual control of the tender running of the tool as per the parameter values
- Unconditionally give scram order to the tool no matter it is under automatic mode or manual mode
- Manual tool control to complete timely zero returning
- Manually order the punch to complete one time of punching

**Imaging displaying features:**
- Real-time display of the status and debugging information of the current input port and output port
- Real-time display of the location information concerning the tool movement
- Display of the workpiece figure after shooting layout and the coordinate the mouse is pointed to
- Real-time display of the workpiece processing status during punching
- Real-time display of the picture when debugging the camera
- Configurable common parameters, encryption parameters and camera parameters to be confirmed or recovered in case of any parameter revision

**Mechanical Features:**
- Solid aluminum alloy frame for the tool.
- Ball screw drive mechanism adopted to control the lateral movement of the tool.
- High-power servo motor and encoder driving methods adopted for the tool driving device.

1.3 **Technical Index**

- Number of control axes: 2-axis linkage
- Control accuracy: 10000 Pulse/mm
- Control mode: pulsed quantity control
- Coordinate range: ±999.99 mm
- Max pulse frequency: 100kHz
- Max operating speed: 50000mm/min
- Camera resolution ratio: 1944(V)*2592(H)
- Camera pixel: 5 mega-pixel
- Camera sensor: 1/2.5” rolling shutter CMOS
- System working power: DC +6V~30V DC power input AC 200~240V
- System working environment: temperature 0℃ to +50℃; relative humidity 10-80%@40℃ (no condensation)
Chapter two Operation Interface

The operation interface is used for human-machine interaction. Understanding the function and effect of the operation interface will lead to a comprehensive understanding of the whole system and will be more convenient. Below we will introduce operation interfaces that users use frequently.

2.1 Starting up Interface

When connecting the power, the system will enter into the starting up interface as shown in Fig. 2.1.

Fig. 2.1 Startup Interface (change to a figure)

When starting up, some preparations will be made in the system for the operation of the procedure:

First step: build log files.

The log files are used to record some special states in the system operation. When the system fails to run normally, the corresponding reasons can be checked through reading such files.

Second step: Load the parameters. It will display “parameter initialization is successful” if it loads successfully; it will report “parameter initialization is failed, No: figure” if it loads unsuccessfully. The figure is the error number and different error numbers represent different error messages (see Appendix - Error Message List for Parameter Loading). If the parameter initialization fails, it cannot enter into the main interface. Please find the parameter setup errors according to the error message and restart the system after revision.

Third step: Initialization of the camera. It will display “camera initialization is successful” if it opens successfully; otherwise it will report “camera initialization is failed” and you need to check whether the camera connection is ok. For example, whether the wiring between the camera and the industrial personal computer and whether the drive of the camera is installed. Restart the system after debugging.

Fourth step: Initialization of the motion control card. It will display “axis card initialization is successful” if the initialization of the axis card is successful; otherwise it will report “axis card initialization is failed”. If the initialization is failed, check whether the cable is loose and restart the system after debugging.

Fifth step: It means the program initialization finishes till it appears “please click any button” and it will enter into the main interface if clicking any button or waiting some time.

2.2 Main Interface

When clicking any button to begin the procedure, it will enter into the main operation interface (shown in Fig. 2.2.1). The main interface is the major interface used by users. In this interface, it includes the basic operation required for users. For general operators, being familiar with the main interface is enough.
The main interface is composed of give regions: 1 workpiece figure display area; 2 IO status display area; 3 tool coordinate display area; 4 manual control panel area; 5 right and bottom operating button areas. Each area is marked in the main interface.
2.2.1 Workpiece Figure Display Area

This area is used to display the basic size of the workpiece to be processed, the edge distance of the workpiece and the space between workpieces. See it in the following Fig. 2.2.2.

![Workpiece Figure Display Area](image)

**Fig. 2.2.2  Workpiece Figure Display Area**

- **自动** (Automatic)
- **手动** (Manual)
- **冲完成** (Punching completion)
- **拍照开始** (Start shooting)
- **拍照完成** (Complete shooting)
- **启动** (Start)
- **停止** (Stop)
- **尺寸** (Size)
- **边距** (Margin)
- **间距** (Spacing)
- **回零** (Zero returning)
- **关闭系统** (System shutdown)
- **设置** (Setting)
- **监控** (Monitor)
- **自动/手动** (Automatic/manual)
- **清零** (Zero clearing)

2.2.2 IO Status Display Area

This area is used to display some general IO states. After the system successfully starts and enters into the main interface, if it runs normally, this area will be as shown in Fig. 2.2.1; if there is any signal such as limit or scram, this area will be as shown in Fig. 2.2.3. The green symbol of “●” means the signal is triggered and the red symbol of “●” means the signal is not triggered. In Fig. 2.2.3, it means the current system is under scram state.
2.2.3 Tool Coordinate Display Area

This area is used to display the present coordinate. In Fig. 2.2.2, the present coordinate displayed is 0.00, 0.00. The value for this area will vary with the movement of the tool.

2.2.4 Manual Control Panel Area

This area includes five buttons: top button, bottom button, left button, right button and mode switch button (the middle button). The manual button includes continuous running mode and steady mode.

When the middle icon is as shown in Fig. 2.2.4, it means the tool is under continuous running mode. Pressing one of the other four buttons, the tool will continuously move toward the specified direction till the button loosens. When the middle icon is as shown in Fig. 2.2.5, it means the manual movement mode of the current tool is fixed length mode. Pressing one of the other four buttons, the tool will move a fixed length toward the specified direction. The distance unit is millimeter. There are several data modes: 0.10mm, 0.50mm, 1.00mm, 5.00mm and 100.00mm. For example, if the data is 0.10, the displacement distance with fixed length is 0.10mm, 0.5mm, 1mm, 5mm and 100mm in order.
2.2.5 Operating Button Area

The bottom four buttons in this area are used to set the motion states and parameters of the tool. The right three buttons are used to control the motion of the tool.

[F4 setting]: Parameter setting. The general parameters, encrypting parameters, axis parameters and camera parameters of the system can be set.

[F5 monitor]: System monitoring. It can enter into the input port debugging, output port debugging and camera debugging.

[F7 manual/automatic]: Manual/automatic swift. It is used to swift the control state of the system. When powering on, it is manual control state by default for the system.

[F8 zero clearing]: Coordinate zero clearing. It is used to set the current position of the tool as zero.

[F9 start]: Start running. Begin shooting, layout, graphical display, moving workpieces, punching workpieces, zero returning and other operations. It is only valid to the automatic mode.

[F10 stop]: Stop. Stop the current operation under manual or automatic mode.

[Home pause]: Pause. This button will only work under automatic mode. It is used to pause the current automatic process. Click the start button to continue operation after the pause of required.

[End zero returning]: Manual zero returning to make the tool back to the position with the coordinate of (0.00, 0.00).

2.2.6 Introduction to Buttons on Main Interface

There are two ways to click the button. The first way is to directly click it on the touch screen and the other way is to click the corresponding shortcut key of the key on the keyboard. The letter before the button represents the corresponding shortcut key of the button. For example, when we need to click the monitor button, we can not only click the monitor button on the touch screen, but also can press the F5 key on the keyboard and the interface will jumps to the monitor interface.

The normal user does not need to make keyboard operation. Using the touch screen operation directly or using the buttons on the control console for operation.

There are two states for the button. The first state is normal state. Under normal state, the buttons can be pressed. The second state is dimmed state. Under dimmed state, the buttons cannot be operated and the corresponding shortcut keys cannot work.

In the main interface as shown in Fig. 2.2.1, the start button and pause button are in dimmed state, as
the current motion mode is manual and these two buttons can work only when under automatic mode. When we click the button [F7 manual/automatic], the system will switch to automatic state and these two buttons will present normal state, while the manual control panel area will present dimmed state. See it in Fig. 2.2.6.

Fig. 2.2.6  Main Interface (normal state)

Automatic  manual  punching completion  start shooting

Complete shooting  start  stop  size  margin  spacing  zero returning  system shutdown  setting

Monitor  automatic/manual  zero clearing


2.3 Parameter Setting Interface

The system operation needs proper parameters, which are used to set up some states for the system operation, such as tool operating speed, acceleration and tool throat depth. When pressing the button [F4 setting] in the main interface or the shortcut key F4 on the keyboard, the window will swift to the parameter setting interface, where the system parameters can be set.

The parameter interface includes two kinds of parameters – general parameters and encryption parameters. Click the buttons [F1 general] and [F3 encryption] and then the swift can be made between such two parameter interfaces. The Fig. 2.3 is the organizational structure of the parameter setting interface. If you want to enter into the setting interface of the axis parameters, you need to click [F4 parameter setting] →[F2 encryption setting] →[F2 axis parameter].
2.3.1 General Parameter Interface

In the general parameter setting interface, it includes the basic parameters needed to be set by users. When the system switches to the parameter setting interface, it will display the general parameter setting interface by default. See it in Fig. 2.3.1.

![General Parameter Interface](image)

- 自动速度 automatic speed
- 手动速度 manual speed
- 自动模式 automatic mode
- 冲模形状 die shape
- 圆模具半径 diameter of round mold
- 异形件路径 path of special parts
- 异形件旋转角度 rotation angle of special parts
- 套料模式 jacking mode
- 条形工件宽度 bar-type workpiece width
- 条形件 Y 坐标补偿 Y coordinate offset for bar-type workpiece
**General parameter description:**

- **Automatic speed:** The motion speed of the tool under automatic mode. Parameters (unit: mm/min) from 0.01 to 50000 can be input with 2 valid digits.
- **X axis manual speed:** The motion speed of the X axis under manual mode. The min value is 0.01 and the max value depends on the max manual speed (in the encryption parameters, unit: mm/min) with 2 valid digits.
- **Y axis manual speed:** The motion speed of the Y axis under manual mode. The min value is 0.01 and the max value depends on the max manual speed (in the encryption parameters, unit: mm/min) with 2 valid digits.
- **Automatic mode:** When clicking this menu, there will be two options – succession and single step. Succession refers to the state of the tool in the continuous punching workpieces and single step refers that one time of punching for one time of manual order. This mode is mainly used for the debugging of machines and molds.
- **Die shape:** It refers to the shape of the mold of the workpieces processed and it includes two options – round parts and special parts.
- **Diameter of round mold:** It refers to the inner diameter of the mold blade.
- **Path of special parts:** Under the mode of punching special parts, place the special parts to be punched in specific path in specific file format.
- **Jacking mode:** There are four jacking modes in this menu - bar-type single-line, bar-type against the top, bar-type against both sides and irregular jacking mode. The former three kinds of modes are used for punching astragal material and corresponding modes can be selected as required. The irregular jacking mode is used to punch irregular panel veneer.
- **Bar-type workpiece width:** This option will be used when punching astragal material and it is used to set up the width of the astragal material.

**2.3.2 Encryption Parameter Interface**

Set up the parameters as encryption parameters and it needs passwords when modifying these parameters. In this system, the encryption parameters are divided into three types: general encryption parameters, axis encryption parameters and image encryption parameters.

**General Encryption Parameters**

When clicking the button [F3 encryption], it will jump to general encryption parameter interface.
Fig. 2.3.2  General Encryption Parameters

Language: System language setting
Number of axes: number of axes driven by the system (2 axles for feeder)
Automatic acceleration: The motion acceleration of the tool under automatic mode. Parameters (unit: mm/s²) from 0.01 to 10000 can be input with 2 valid digits.
Automatic deceleration: The motion deceleration of the tool under automatic mode. Parameters (unit: mm/s²) from 0.01 to 10000 can be input with 2 valid digits.
Tool throat depth: Parameters (unit: mm) from 1 to 1000 can be input.
Layout spacing: Parameters (unit: mm) from 0 to 1000 can be input.
Layout margin: Parameters (unit: mm) from 0 to 1000 can be input with 2 valid digits.
Punch X coordinate: The distance between the punch and the lower left marker in the direction of X axis. 2 valid digits.
Punch Y coordinate: The distance between the punch and the lower left marker in the direction of Y axis.

General encryption parameter description:

- Language: System language setting
- Number of axes: number of axes driven by the system (2 axles for feeder)
- Automatic acceleration: The motion acceleration of the tool under automatic mode. Parameters (unit: mm/s²) from 0.01 to 10000 can be input with 2 valid digits.
- Automatic deceleration: The motion deceleration of the tool under automatic mode. Parameters (unit: mm/s²) from 0.01 to 10000 can be input with 2 valid digits.
- Tool throat depth: Parameters (unit: mm) from 1 to 1000 can be input.
- Layout spacing: Parameters (unit: mm) from 0 to 1000 can be input.
- Layout margin: Parameters (unit: mm) from 0 to 1000 can be input with 2 valid digits.
- Punch X coordinate: The distance between the punch and the lower left marker in the direction of X axis. 2 valid digits.
- Punch Y coordinate: The distance between the punch and the lower left marker in the direction of Y axis.
Shooting overtime: Maximum duration allowed to be consumed for shooting and jacking. Parameters (unit: s) from 0.1 to 5 can be input with 1 valid digit.

Manual pulse time: Duration of manual pulse time. Parameters (unit: s) from 0.1 to 5 can be input with 1 valid digit.

Punching overtime: Maximum duration allowed to be consumed for each punching. Parameters (unit: s) from 0.1 to 5 can be input with 1 valid digit.

Workpiece blowing time: Blowing duration for each punching.

Distance between continuous punches: Max distance of the continuous punches of the tool.

**Axis Encryption Parameters**

Click [F2 axis] in the general encryption parameter interface and it will jump to the axis encryption parameters.

---

**Fig. 2.3.3 Axis Encryption Parameters**

Axis name: axis name  脉冲当量: pulse equivalent  是否需要回零: whether to return zero
回零方式: zero returning way  回零速度: zero returning speed  二次回零速度: secondary zero returning speed
回零偏置: zero returning offset  最大加速度: max. acceleration
最大减速度: max. deceleration  最大速度: Max. speed  X 轴: X axis  Y 轴: Y axis
取消: cancel  确认: confirm

**Axis encryption parameter description:**

- Axis name: The axis name is unchangeable.
- Pulse equivalent: Parameters (unit: pulse) from 1 to 100000 can be input with 6 valid digits.
Whether to return zero:
Zero returning way: 0 represents one time of zero returning and 1 represents two times of zero returnings.
Zero returning offset: 2 valid digits with unit of mm.
Zero returning speed: The min. value is 0.1 and the max. value is determined by the max. manual speed. 2 valid digits with unit of mm/min.
Max. acceleration: Parameters (unit: mm/s^2) from 0.01 to 1000 can be input with 2 valid digits.
Max. deceleration: Parameters (unit: mm/s^2) from 0.01 to 1000 can be input with 2 valid digits.
Max. speed: The max. motion speed under manual mode. Parameters (unit: mm/min) from 0.01 to 500 can be input with 2 valid digits.

Image Encryption Parameter Interface

The image encryption parameters are used to set up technical parameters related with image processing. The detailed information concerning image encryption parameters will be introduced in the chapter regarding image parameter setting.

2.4 Monitoring interface

Monitoring interface is used to display real-time system input and output status. During normal operation, it is mainly used for debugging the input and output. When it press the main interface [F5 monitoring ] button, the system will jump to the monitor screen. System input includes an input switch, camera input. The output includes the output switch. Organization chart of control interface shown below.
F5 System Monitoring

F1 Input monitor

F2 Monitor output

F1 Open
F2 Close
F3 Open all inputs
F4 Close all the input
F8 Return to the input monitoring interface

F3 Camera monitoring

F1 Open the Camera
F2 Turn off the camera
F3 Save pictures
F8 Return to the input monitoring interface

F8 Return to the main interface

Figure 2.4 Organizational structure of monitoring interface
2.4.1 Input monitoring interface

When the system jumps to the monitor screen, the default display is the input monitoring interface, as shown in figure. State of the input and the main screen displays the input and output status display area are the same, where green indicates the trigger, and the red is not triggered. The color change with the change of outside actual input circumstances. In the commissioning phase, simply turn trigger each input, it can check whether the systems are working properly or not.

![Image of input monitoring interface]

- 系统急停 system emergency stop
- Y 轴回零 Y axis back to zero
- Y 负限位状态 Y Negative limit state
- 远程暂停 remote pause
- 冲完成 dash complete
- 远程手动 X- Remote manual X-
- F1 输入 input
- F3 图像 image

2.4.2 Output monitoring interface

- 远程手动 Remote manual
- Y 正限位状态 Y positive limit state
- 远程启动 remote start
- 加紧信号输入 stepped signal input
- 远程手动 X+ Remote manual X+
- 远程手动 Y+ Remote manual Y+
- F2 输出 output
- F8 返回 return
When click 【F2 output】button, the system will jump to the output interface. In the output interface, it not only can real-time monitoring of the state of the output, but also can set the state of the output. As long as we select the corresponding output, then click the interface below the operation button, it can achieve the appropriate action.

Such as the current "blowing workpiece" output signal is turned off. Now, it can open. The first step is click "blowing the workpiece " line in the interface. The second step, click on the bottom of the 【F1 open】button. Such " blow workpiece" outlet will be opened for some time. After the output will be shut down. With this method, it can check the output is working properly or not. Output interface is shown below.

![Figure 2.4.2 Output monitoring interface](image)

图 2.4.2 输入监控界面

冲信号 dash signal 吹起信号 blow signal 滚夹闭合信号 Rolling clip closing signal
打开 open 关闭 close 全部打开 open all 全部关闭 close all 返回 back

**2.4.3 Image monitoring interface**

Image monitoring interface is used to display the data obtained by the camera. we can open and close this interface. With this interface, it can adjust the height, focus, exposure and other camera parameters. Interface is shown in Figure
Figure 2.4.3 Image monitoring interface
Chapter Three Basic Operations

Punch automatic feeding system has two control modes, manual mode and automatic modes. Press 【F7 manual / automatic 】 button to switch these two modes in the main interface. In the main interface of input and output display area, when the manual mode and automatic mode indicator color is green“●”, which indicates that the current is in motion mode.

Figure 3.0.1 manual mode
Figure 3.0.2 automatic mode

3.1 Manual mode

In manual mode, the user can manually control the position of the mobile lathe, and back to zero.

Press 【End return to zero】 button, allows the machine back to the zero point.

The main interface of the manual panel is shown in Figure 3.1.0, which is used to manually control the machine’s position. The middle button is mode selection button, for switching the manual shift vehicle movement patterns. Four directional buttons for controlling the workpiece toward the front, back, left, right movement in four directions.

Motions mode manually shift the car divide into continuous movement mode and fixed length movement mode. On continuous movement mode, hold down the button does not move, this time turning movement in that direction until the release direction buttons lathe stopped moving. Under fixed-length mode, simply press the arrow button (no long press), this time turning the moving distance of a fixed length in this direction after the stop. Turning move a value from the solid by a manual shift car gear fixed-length decision.
3.1.0 Manual control panel

Description: Shortcut for mode selection button is keyboard 【F11】，shortcut keys for four directional control button, respectively of the keyboard of 【↑】、【↓】、【→】、【←】.

3.1.1 Continuous movement mode

Touch the middle of the manual control panel mode select button, when appears Figure 3.1.1, the manual control mode is the continuous movement mode. At this point, hold the control button down in one direction, lathe would have been moving in this direction. The coordinates manually panel above the display area will show the exact location of the current lathe until the release control button in the direction of the lathe was stopped.

Tip : In the jog mode, when the lathe is already running, the other buttons will be grayed out.

3.1.2 Fixed length movement mode

Press the manual control panel in the middle of the mode selector button, when appears similar Figure 3.1.2, the manual control mode is fixed length movement mode. In the fixed length mode select button, which prompts the current length in gear. For example 0.01mm shown in Figure 3.1.2 show: At this point in a direction button is pressed, the lathe will move in that direction 0.01mm machine coordinates manually top of the panel will produce 0.01mm displacement in that direction.

3.2 Automatic control machine
In automatic mode, it can be completed pictures, sets of materials, processing, discharge and a series of processes. Automatic process need to meet the conditions of zero current point. When the conditions are not satisfied, the interface will pop up a dialog box.

Figure 3.2.1 Tip for a return to zero, if it click OK, the machine will perform the operation back to zero. If you cancel, it close the current dialog box.

![Diagram](image)

Figure 3.2.2 Tip for a return to zero

3.2.1 Automatic process

If everything is ready, after press 【F9 to start】 , the system runs automatically. Machine moved a distance first, moving to photograph area, started taking pictures. Distance from moving to photograph areas set by the parameter.

After moving to the area to take pictures, "Capture Start " before the indicator will turn green. As shown in Figure 3.2.3.
After taking photographs, the system will capture the image processing, and automatic nesting. After completion of nesting, "Capture complete" indicator will turn green. "Capture Start" indicator light turns red. As shown in Figure 3.2.4. After the camera is complete, the system will move to the workpiece machining area, and red gun start punching. After punching a hole every time, "dash complete" indicator will change from red to green once. As shown in Figure 3.2.5.

Processing is completed, then the "Capture complete" indicator turns red. Then, the machine will move to the designated coordinates back to zero after releasing the workpiece. Throw the workpiece coordinate is set by parameters. Figure 3.2.6 ~ 3.2.9 is performed automatically during screenshot of the main interface.
3.2.7 Automatic Screenshot 2
3.2.8 Automatic Screenshot 3

自动 automatic 手动 manual 冲完成 dash complete 拍照开始 camera start
拍照完成 camera complete 尺寸 size 边距 edge distance 间距 separation distance
请回零 please return to zero 回零 return to zero 关闭系统 turn off the system 设置 set
监控 monitor 手动 manual 清零 zero clearing
3.2.2 Stop and pause during automatic process

In automatic mode, pressing 【F10 to stop】 is to stop the machine currently automated processes. During automatic operation, 【F9 start】 is grayed out, as shown in Figure 3.2.8. Stop 【F9 start】 button in the normal state. "Capture complete " light is red.

In automatic mode, press 【Home Pause】 to pause the current movement, if it want to continue running, press the start button. In the pause mode 【F9 Start】 button also in a normal state, but " camera complete " indicator is green. Pause mode is shown in Figure 3.2.10.

![Figure 3.2.10 Pause state](image)

自动 automatic 手动 manual 冲完成 dash complete 拍照开始 camera start 拍照完成 camera complete 尺寸 size 边距 edge distance 间距 separation distance 请回零 please return to zero 回零 return to zero 关闭系统 turn off the system 设置 set 监控 monitor 手动 manual 清零 zero clearing
### 3.3.3 Handling error state during operation

Handling error state during operation including limit, stop, take pictures overtime, punching timeout errors. When an error state, the input and output of the main interface display will show the current error status.

1. When the machine limit error occurs, it can manually set the motion mode, mobile lathe, letting the machine out of the limit state.

2. When the machine stop error occurs, the process is triggered to stop the event, then reset the emergency stop switch. When the machine take pictures overtime error occurs, it means that the system is not completed within the specified time automatic nesting. In this case, continue point 【F9 start】 button will clear the error, and start the automatic cycle. If the camera out error persists, check the parameter settings set the value of this parameter "Capture Timeout" is too small.

3. When the machine dash overtime error occurs, indicating that the set is not completed punching action. Check whether the machine actually punch a hole finish or not. Dash completion signal input port if there are problems.

4. If it press the start button, appear a " Can not find markers " message box. As shown in Figure 3.2.11. The reason is not the area scaling parameter settings. Regional scale parameter modification step will be mentioned in the following sections.
Chapter four Image parameter settings

Image processing module is one of an important module in automatic feeding systems. Image module parameter settings need to take into account the implementation of the stability and efficiency of the system.

4.1 Area ratio parameter setting

By "main interface" 【F4 Setup】 【F3 encryption】 【F3 image】 【F8 Next】, enter the area ratio of the parameter setting interface. Regional scale parameter is used to set the image processing, markers the detection range and scope of image processing.

x1, x2, y1, y2 four buttons is set the detection range of the marker. Parameter setting requirements, four markers located in the four corners area of four lines of the points.

Bottom button set parameters 0.99. Do not change easily.

Parameter settings methods:
1. Click to modify parameters.
2. Click the location on the screen parameter lines. Position line will change with the click changed position.
3. Click next step, after saving.
4.2 Save and restore the image parameters

When the image parameters set up, it will enter into conservation and restoration parameters total page, shown in Figure 4.1.

Before pressing key to revocation flip rotate the camera configuration parameters, modify the operating parameters of the camera area ratio, the inherent distortion coefficient matrix and parameter values.

Press key before modifying the rotation after flipping the camera configuration parameters, camera detection area ratio parameters, the intrinsic parameter matrix and the distortion coefficient values are all stored in the parameter value file punch.ini in.
Chapter Five Electrical Wiring

5.1 Control part of wiring

Control section is connected via usb cable and network cable. Camera connected via usb cable with the IPC. Motion control card connected via Ethernet interface and IPC. The figure below shows connection diagram.

**Figure 4.1 Recovery camera parameters**

- last step  
- cancel  
- ok
Motion control card interface definitions

Defined input

<table>
<thead>
<tr>
<th>INPUT</th>
<th>Description</th>
<th>Pin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limit</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Positive limit (NC)</td>
<td>IN5</td>
</tr>
<tr>
<td></td>
<td>Negative limit (NC)</td>
<td>IN6</td>
</tr>
<tr>
<td>Start</td>
<td>Normally open</td>
<td>IN7</td>
</tr>
<tr>
<td>Pause</td>
<td>Normally open</td>
<td>IN8</td>
</tr>
<tr>
<td>Stop</td>
<td>Normally open</td>
<td>IN9</td>
</tr>
<tr>
<td>Stamping complete signal</td>
<td>Normally open</td>
<td>IN12</td>
</tr>
<tr>
<td>---------------------------</td>
<td>---------------</td>
<td>------</td>
</tr>
<tr>
<td>Manual X + Mobile (reserved)</td>
<td>Normally open</td>
<td>IN13</td>
</tr>
<tr>
<td>Manual X- move (reserved)</td>
<td>Normally open</td>
<td>IN14</td>
</tr>
<tr>
<td>Hand control Y + Mobile (reserved)</td>
<td>Normally open</td>
<td>IN15</td>
</tr>
<tr>
<td>Y- manual movement (reserved)</td>
<td>Normally open</td>
<td>IN16</td>
</tr>
<tr>
<td>Emergency Stop</td>
<td>Normal close</td>
<td>IN0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>24V+input</th>
<th>24V</th>
</tr>
</thead>
<tbody>
<tr>
<td>24V- (common terminal) input</td>
<td>GND</td>
</tr>
</tbody>
</table>

**Output definition:**

<table>
<thead>
<tr>
<th>OUTPUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manual punch output signal Normally open OUT0</td>
</tr>
<tr>
<td>Blown gaskets output signal Normally open OUT1</td>
</tr>
</tbody>
</table>

**Motor drive definition:**

There are six axis motor drive 0 to 5.

The system axis motor drive is specified by the parameters of the file system on the motion control card. When a motor drive is damaged, it can be easily replaced.

**Motor drive definition:**

<table>
<thead>
<tr>
<th>Pin No.</th>
<th>Pulse output mode name</th>
<th>Encoder name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PUL1+(Differential pulse+)</td>
<td>EA1+(differential encoder+)</td>
</tr>
<tr>
<td>2</td>
<td>PUL1-(Differential pulse-)</td>
<td>EA1-(differential encoder-)</td>
</tr>
<tr>
<td>3</td>
<td>DIR1+(direction difference +)</td>
<td>EB1+(differential encoder+)</td>
</tr>
<tr>
<td>4</td>
<td>DIR1-(direction difference -)</td>
<td>EB1-(differential encoder-)</td>
</tr>
<tr>
<td>5</td>
<td>Internal 0V</td>
<td>Internal 0V</td>
</tr>
<tr>
<td>6</td>
<td>EZ1+(differential encoder+)</td>
<td>EZ1-(differential encoder-)</td>
</tr>
<tr>
<td>7</td>
<td>Internal+ 5V power supply</td>
<td>Internal + 5V power supply</td>
</tr>
<tr>
<td>9</td>
<td>PUL0+(Differential pulse+)</td>
<td>EA0+(differential encoder+)</td>
</tr>
<tr>
<td>10</td>
<td>PUL0-(Differential pulse-)</td>
<td>EA0-(differential encoder-)</td>
</tr>
<tr>
<td>11</td>
<td>DIR0+(direction difference +)</td>
<td>EB0+(differential encoder+)</td>
</tr>
</tbody>
</table>
5.2 Moving parts of wiring

Moving parts of presses Appendix electrical wiring schematics.

Chapter six Installation and commissioning and routine maintenance

6.1 Input and output debugging

After the on-site equipment is installed, start the system, from the main interface to enter the control interface." The main interface → F5 monitor. First input and output debugging. Sequentially trigger each input and output, and check whether the corresponding input port indicator has changed or not, if there is action in the output.

6.2 Camera debugging

When enter the camera monitoring interface, open the camera. Adjust the height of the camera holder, camera exposure, focus, fresh image. Pictures table is full this camera monitoring interface.

6.3 Mechanical part of daily maintenance

1 Adjust the feed platform, making it in the same mold level of die. When the front and rear positions in the Y direction forward movement to the limit, just does not hit the lower mold die prevail. Left and right directions to the actual situation of the placement, the whole fixed.

2 Rail and screw periodic oiling, ( screw Cycle 7 days, whichever visual guide ). Kept clean to maintain smooth cylinder guides to ensure normal operation of equipment.

3 high frequency equipment operation site, to check for loose screws regularly ( such as rail screws).

4 camera working platform fixed height below the material is placed beneath the platform, placed all around the actual situation.

5 Air pressure required value work 0.5Mpa, regularly clean the air filter.

6 Job complete machine clean every day, troubleshoot mechanical, whether electrical abnormalities.
Chapter seven appendix

7.1 Parameter loading error information table

<table>
<thead>
<tr>
<th>Error No.</th>
<th>Parameter loading error information table</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Failed to open or parse the parameter values file</td>
</tr>
<tr>
<td>2</td>
<td>Failed parsing integer</td>
</tr>
<tr>
<td>3</td>
<td>Unable to find the corresponding number of parameters in the parameter definition file</td>
</tr>
<tr>
<td>4</td>
<td>In the configuration file parsing options fail</td>
</tr>
<tr>
<td>5</td>
<td>The options are empty</td>
</tr>
<tr>
<td>6</td>
<td>Conversion profiles display a parameter name failed</td>
</tr>
<tr>
<td>7</td>
<td>Conversion profile of a Parameter Unit failure</td>
</tr>
<tr>
<td>8</td>
<td>Converting a parameter profile minimum failure</td>
</tr>
<tr>
<td>9</td>
<td>Converting a parameter configuration file maximum failure</td>
</tr>
<tr>
<td>10</td>
<td>Failure to convert a parameter value</td>
</tr>
<tr>
<td>11</td>
<td>Configuration file is a parameter of the lack of information on a number, a total of 10</td>
</tr>
<tr>
<td>12</td>
<td>Failure to convert a parameter default values, parameter returns the number of</td>
</tr>
<tr>
<td>13</td>
<td>Configuration parameters are not found in the configuration file in value</td>
</tr>
<tr>
<td>14</td>
<td>A parameter is not legitimate, because usually beyond the scope of values</td>
</tr>
<tr>
<td>15</td>
<td>Pointer dependent error</td>
</tr>
</tbody>
</table>

7.2 Punch electrical schematics.

Punch control schematic ( manual ).pdf
送料状态显示器 Feeding status display
运动控制卡 Motion Control Card
步进驱动器 Stepper Drives

工控机主机 IPC host
伺服驱动器 Servo drives
7.3 Punch the gas circuit diagram

The main gas source

空气过滤器 air filter

冲料气缸 Outshoot cylinder

吹气气缸 air blowing cylinders

冲料电磁阀 Purge solenoid valve

吹气电磁阀 Blowing solenoid valve

消音器 silencer

Product number

<table>
<thead>
<tr>
<th>Specifications Model</th>
<th>Types</th>
<th>Size of the opening into the mold</th>
<th>Minimum length of feed</th>
<th>The maximum width of the feed</th>
<th>Applicable punch tonnage</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>BC-A1-G T300</td>
<td>A1 Type</td>
<td>143mm</td>
<td>340mm</td>
<td>300mm</td>
<td>Punch 16/10 / 6.3 / 5 tons can be used</td>
<td>Rollers 350mm wide (for a total width of less than 600 punch, float height.)</td>
</tr>
<tr>
<td>BC-A2-G T500</td>
<td>A2 Type</td>
<td>141mm</td>
<td>430mm</td>
<td>500mm</td>
<td>Punch 16/10 / 6.3 / 5 tons can be used</td>
<td>Rollers 550mm wide (for a total width of less than 600 punch, float height.)</td>
</tr>
<tr>
<td>BC-B1-G T300</td>
<td>B1 Type</td>
<td>221mm</td>
<td>450mm</td>
<td>300mm</td>
<td>Punch 20/25 tons can be used</td>
<td>Rollers 350mm wide (for a total width within 600-840 punch, float height.)</td>
</tr>
<tr>
<td>BC-B2-G T500</td>
<td>B2 Type</td>
<td>219mm</td>
<td>460mm</td>
<td>500mm</td>
<td>Punch 20/25 tons can be used</td>
<td>Rollers 550mm wide (for a total width within 600-840 punch, float height.)</td>
</tr>
<tr>
<td>Model</td>
<td>Type</td>
<td>Width (mm)</td>
<td>Height (mm)</td>
<td>Punch Capacity</td>
<td>Rollers Width (mm)</td>
<td></td>
</tr>
<tr>
<td>-------------</td>
<td>------</td>
<td>------------</td>
<td>-------------</td>
<td>----------------</td>
<td>-------------------</td>
<td></td>
</tr>
<tr>
<td>BC-C-GT 300</td>
<td>C Type</td>
<td>293</td>
<td>540</td>
<td>300</td>
<td>Punch 40 tons can be used</td>
<td>Rollers 350mm wide (for 63 tons punch, float height)</td>
</tr>
<tr>
<td>BC-D-GT 300</td>
<td>D Type</td>
<td>100</td>
<td>230</td>
<td>300</td>
<td>Punch 10 / 6.3 / 5 tons can be used</td>
<td>Rollers 350mm wide (for a total width of less than 600 punch, float height, punch scrap-based)</td>
</tr>
</tbody>
</table>

**Explanation:**
1. Above model is standard, when ordering please choose the most similar standard.
2. So the standard model, the punch plate thickness not exceeding 3mm.
3. Particular requirements need to submit a written request and pay for text captions.