Swivel Control System

User Manual

Version: 17-inch

(Applicable to SMC5008, SMC5004, and SMC50C Series)

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Chapter 1 Operation Interface

1 Programming Page

The Programming page allows users to design programs for parameters related to their specific product requirements during production. This primarily involves the utilization of instructions, axes, cylinders, and probes. The Programming page is shown in Figure 3-1.

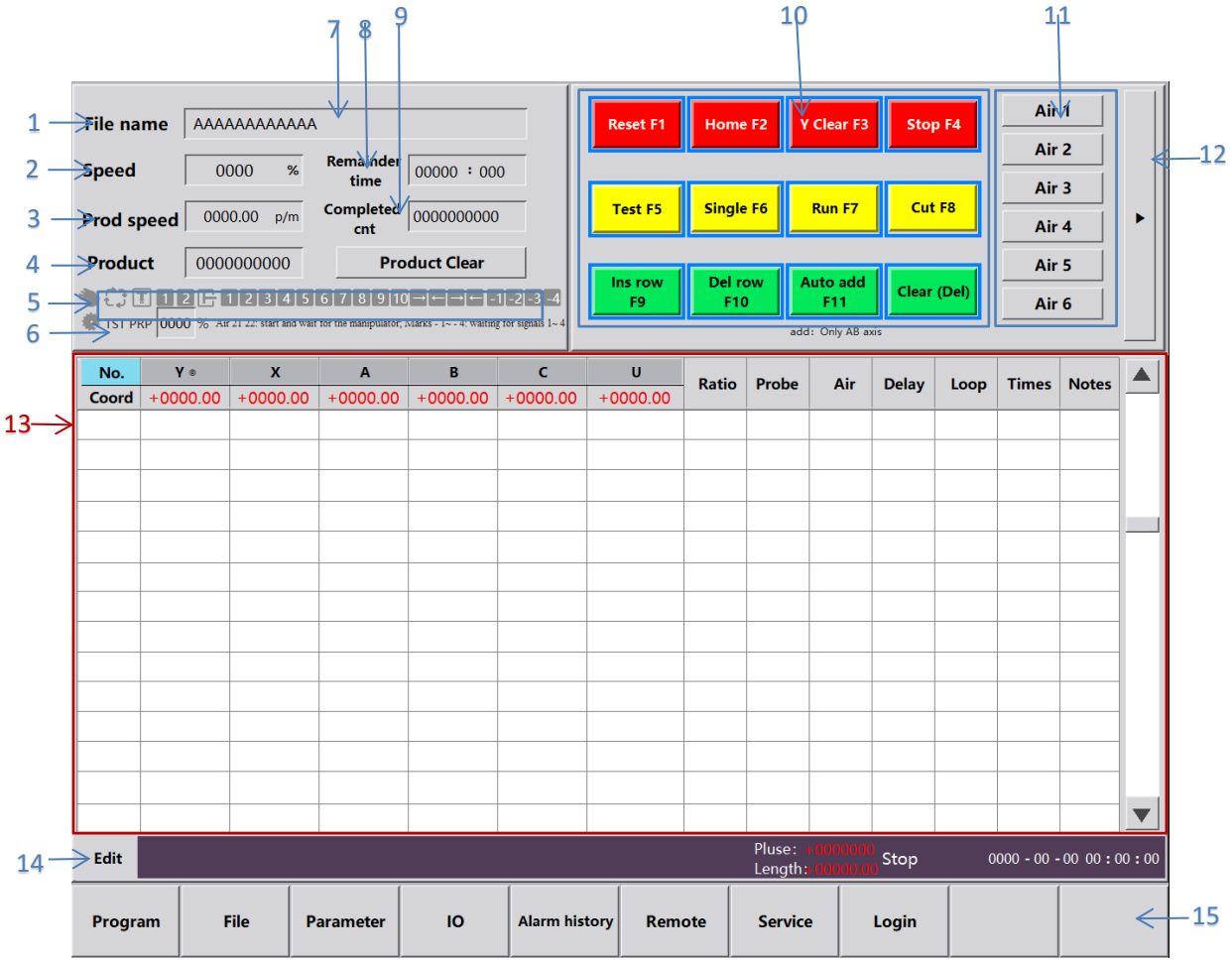

Figure 3-1 Programming Page

1 File name

- This displays the file name of the currently saved program. If the current program has not been saved, only the file index number will be shown. The number preceding the first underscore from left to right in the file name represents the current program number.

2 Speed

- Sets the production speed for automatic operation of the equipment. The speed range is 0-300%. A higher value results in a faster production speed,

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while a lower value results in a slower production speed.

3 Prod speed

- Displays the production capacity per minute (PPM) during automatic operation of the equipment. The PPM is calculated based on an average, so slight fluctuations in the displayed PPM during production are normal.

4 Product

- Sets the total quantity of products to be produced during automatic operation. When the production count reaches the set quantity, the equipment will stop and an alarm will be triggered. This alarm can be cleared by resetting the completed quantity to zero and then pressing the Reset or Stop button, or by directly restarting the system. If the total quantity is set to 0, the equipment will continuously produce without a limit.

5 Cylinder Status Bar

- Used to display the on/off status of cylinders. -1 to -4 represent the waiting states for signals 1 to 4, commonly used for interlocking with other mechanical equipment. On: Displayed in green. Off: Displayed in gray.

6 TST PRP

- Displays the current speed value of the knob when in Test Mode. In Test Mode, if the knob is at the 0 position, the handwheel can be rotated clockwise to control the operating speed of the equipment, often used to verify the correctness of the program.

7 Remainder time

- Displays the remaining time required to complete the preset production quantity. The number on the left represents hours, and the number on the right represents minutes.

8 Completed cnt

- Displays the quantity of products that have been produced. When the completed quantity is greater than or equal to the preset quantity, the system will generate an alarm. This alarm can be cleared by resetting the completed quantity to zero and pressing the Reset button.

9 Product Clear

- Clears the completed production quantity. Clearing during operation is invalid; please perform the clearing operation when the machine is not running.

10 Operation Button Area

- Note: The letter on the far right of the button serves as the shortcut key for this function.
- Reset F1: When the current system generates an alarm, pressing this button will clear the alarm after the triggering conditions have been resolved.
- Home F2: This initiates the homing sequence for all axes. Pressing this button will bring up the homing dialog box.
- Y Clear F3: After pressing the button, the Y-axis coordinate of the wire feeder will be reset to zero.
- Stop F4: When pressed in automatic operation mode, the system will transition to the stop state after completing the current product. When

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pressed in homing or handwheel mode, the system will immediately switch to the stop state.

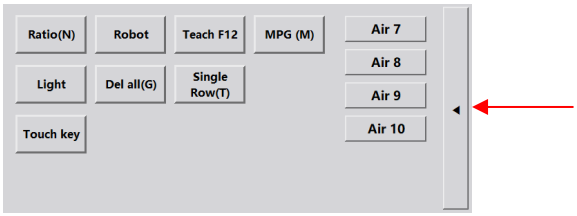
- Test F5: Runs the program in test mode. This is used to verify the program's correctness and allows for real-time control of the processing speed via the adjustment knob. When the knob speed ratio is set to 0, the processing speed can be controlled by rotating the handwheel.
- Single F6: Pressing this button will cause the equipment to stop after producing one product.
- Run F7: After pressing this button, and if there are no alarms, the equipment will enter automatic production mode. Please ensure the external environment is safe before starting the equipment.
- Cut F8: Pressing this button will bring up the wire cutting dialog box. Then, pressing the space bar will execute the wire cutting action.
- In the dialog box, you can set parameters such as cutter position, wire feeding length, and speed. If the system is in handwheel mode before cutting, the wire feeding action will be skipped, and the cutting action will be executed directly.
- Ins row F9: Inserts a blank line at the current cursor position.
- Del row F10: Deletes the row data in the table selected by the cursor.
- Auto add F11: Enabling this button will activate the cumulative operation for the programming table.
- Clear (Del): Clears the data in the cell selected by the cursor.

11 Cylinder Manual Operation Buttons

Manually open or close the cylinders. Operating the cylinders in automatic operation mode has no effect.

12 Operation Area Page Navigation

Press the page navigation buttons to view more operation buttons. As shown below:



- **Ratio(N):** Pressing this button will magnify the distance the axis moves per handwheel increment according to the system's set magnification ratio.
- **Robot:** Manually turns the robot start signal on or off.
- **Teach F12:** Pressing this button inputs the current axis coordinates into the specified cell.
- **MPG (M):** Pressing this button switches the system to MPG mode, allowing you to switch between MPG Y ~ MPG U states by moving the cursor in the table. This operation is invalid in automatic operation mode.
- **Light:** Turns the equipment lighting on or off.
- **Del all(G):** Clears all data in the table. Exercise caution as this action is

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irreversible.

- **Touch key:** Opens the virtual touch keyboard.
- **Air *:** Manually opens or closes cylinders 7 and 8. Operating the cylinders in automatic operation mode has no effect.

13 Programming Table

Used for programming the product production process.

- No.

  The current program line number. If it is empty, it indicates that the current line of the program is invalid.

- Y\X\A\B\C\U

  The target coordinate positions for each axis to move to.

- 13.3 Ratio

  Sets the running speed for a single line. If this item is not set, the program will run at the set speed for the current part number.

- 13.4 Probe

  Sets the probe number to be detected for the current line.

- 13.5 Air

  Controls the opening or closing of a specified cylinder. A positive number opens the cylinder, and a negative number closes it.

- 13.6 Delay

  The pause time after the execution of the current line of the program, in units of 0.001 seconds.

- 13.7 Loop

  Enter 1 to indicate the start of a loop; enter the number of loop repetitions in the “Repetitions” column of the same row.

  Enter 9 to indicate the end of a loop.

- 13.8 Times

  Sets the number of repetitions for the loop execution, effective when in the same row as the loop start command (1).

- 13.9 Notes

  Commonly used to mark the function of this section of the program for better readability. You can freely enter values from 0 to 999.

  Note: Special values -1 to -4 indicate waiting for input signals 1 to 4 on this line.

- 13.10 Scroll bar

  You can click on the top, middle, or bottom of the scroll bar to control the table to page up, page down, or scroll down by one line (+1) respectively.

14 Status bar

- When the system generates an alarm, this is used to display the specific alarm information and date information.
- Displays the current operating status of the equipment, such as MPG, Start, Test, Homing, etc.

15 Bottom menu bar

- Description from left to right

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- Program\ File\ Parameter\ IO\ Alarm history\ Remote\ Service\ Login

2 Program Directory Page

The file storage page displays the program file names, file numbers, and the status of the corresponding files currently stored in the system. You can perform operations such as reading, saving, and deleting selected files. When there are many files, you can use the scroll bar to browse. The file storage page is shown in Figure 3-2.

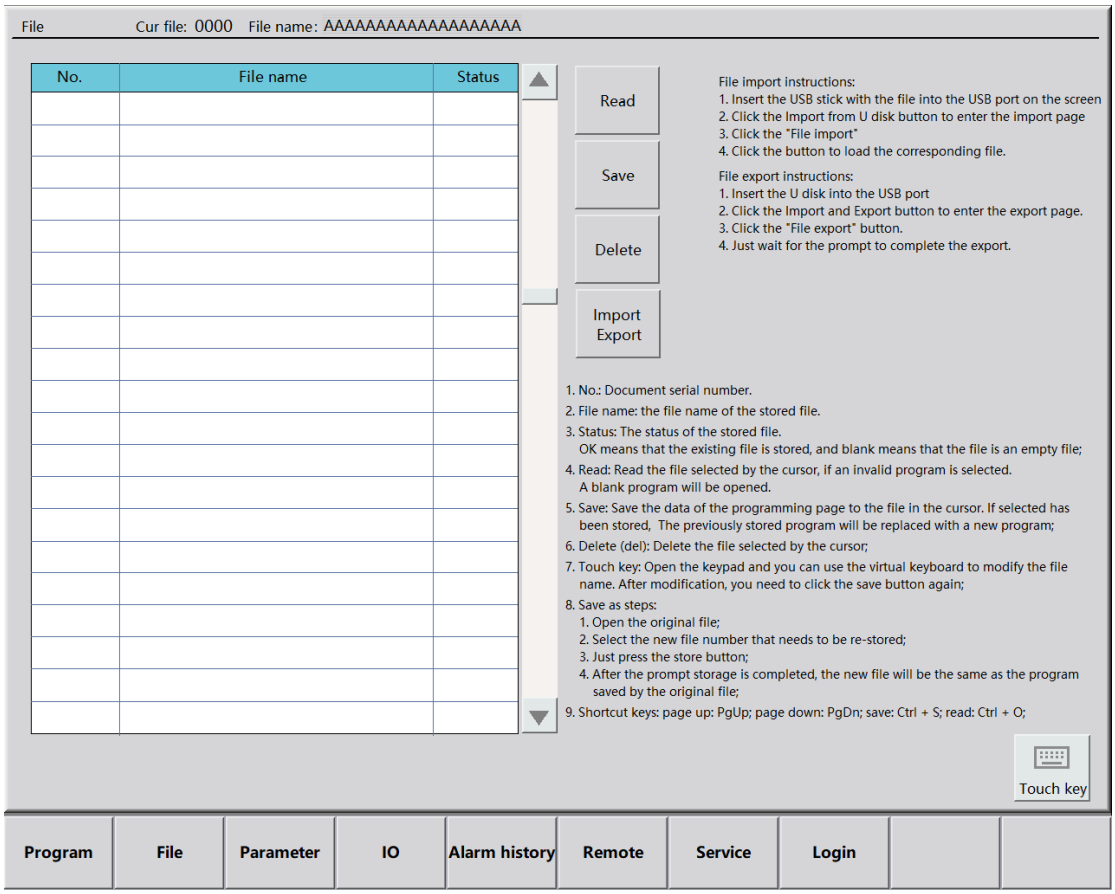

Figure 3-2 File Storage Page

- A total of 2000 files can be stored.
- You can click the scroll bar at the top or bottom to page up or down, or use the up and down arrow keys to move the cursor and navigate through pages.
- No.: Displays the file number.
- File Name: The file identifier for the data saved by the user.
- Status: The current file status. “OK” indicates that the stored data is valid, while a blank space indicates that there is no valid data.
- To read a file, first select the file you want to read, and then press the “Read” button.

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- To save a file, first select the file you want to save to, and then press the “Save” button.
- To delete a file, first select the file you want to delete, and then press the “Delete” button.
- Import/Export: This function is used to import and export files (via USB drive). Clicking it will take you to the system upgrade page where you can perform the specific operations.

3 Parameter Setting Page

The parameter page provides configuration areas for some commonly used working parameters, making it convenient for users to perform relevant configurations during production, and thus better complete production tasks. As shown in Figure 3-3.

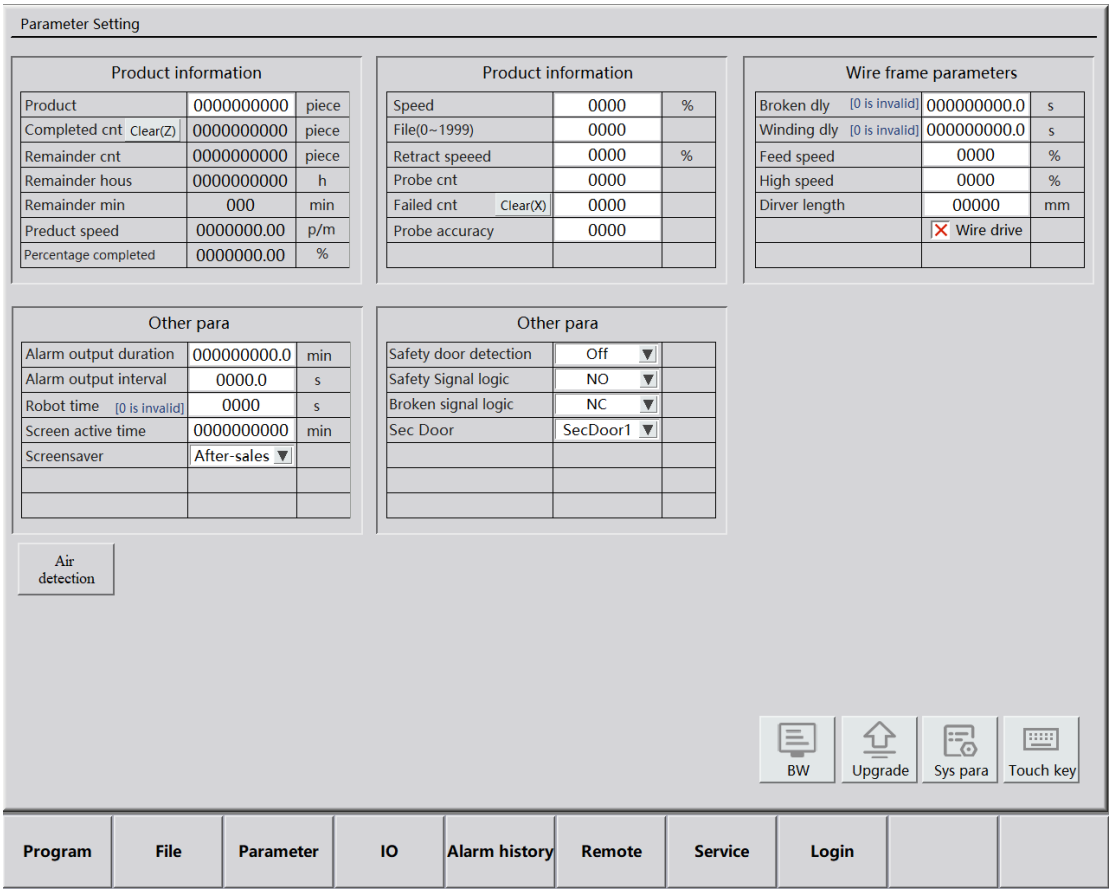

Figure 3-3 Parameter Page

Product information:

- Product: The total number of workpieces to be produced.
- Completed cnt: The number of workpieces that have been produced.
- Remainder cnt: The remaining number of unprocessed workpieces.

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- Remainder hous: The remaining production processing hours.
- Remainder min: The remaining production processing minutes.
- Preduct speed: The equipment's production output per minute.
- Percentage completed: The percentage of the total planned production that has been completed.

Product information:

- Speed: The processing speed of the equipment.
- File(0~1999): The program number for product processing, ranging from 0 to 1999.
- Retract speeed: The speed at which the tool device retracts.
- Probe cnt: The maximum number of allowed probe failures.
- Failed cnt: The count of probe failures that have already occurred.
- Probe accuracy: Sets the sensitivity of the probe signal. 1~8, the smaller the value, the faster the response.

Wire frame parameters:

- Broken dly: When the Break line signal duration exceeds this parameter, a Break line fault alarm will be triggered. Setting to 0 disables this function.
- Winding dly: When the Break line duration exceeds this parameter, a Break line fault alarm will be triggered. Setting to 0 disables this function.
- Feed speed: During automatic operation, the rotation speed of the wire pay-off rack.
- High speed: The speed at which the wire pay-off rack rotates when the wire pay-off lever is pulled up.
- Dirver length: The wire pay-off rack will only rotate when the length of the wire feeding Y-axis exceeds this set value. Setting it to 0 disables this function.
- Wire drive: Enables or disables the wire pay-off rack control function.

Other para:

- Alarm output duration: The duration for which the alarm output signal is maintained. The output is automatically turned off when the set time is reached.
- Alarm output interval: The time interval between the on and off states of the alarm output signal. Setting it to 0 disables it.
- Robot time: Maximum waiting time for the robot to complete the signal; if the signal is not received within the set time, an alarm will be triggered.
- Screen active time: The time after which the screen automatically enters sleep mode or displays the screensaver when there is no operation.
- Screensaver: The options available are “After-sales” and “Alarm”.

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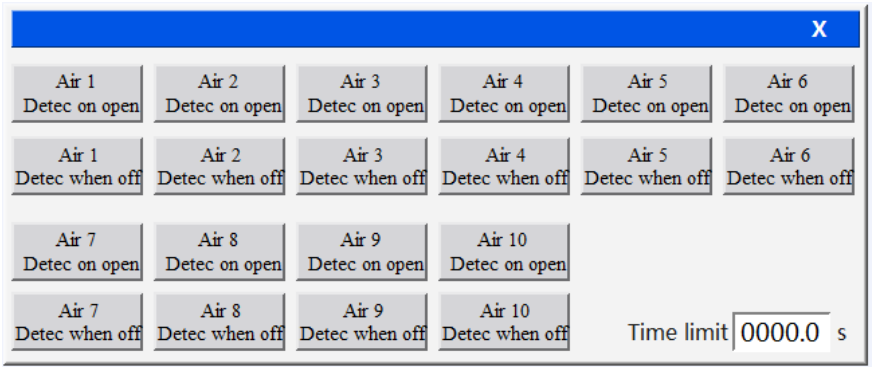
- Safety door detection: Enables or disables the safety door detection function.
- Safety Signal logic: Selects the type of safety door anomaly signal: Normally Open (NO) or Normally Closed (NC).
- Broken signal logic: The options available are “Security Gate 1” and “Security gates 1 and 2”; regardless of the selection, ensure that the corresponding points are configured in the I/O page.
- Number of security doors: Selects the type of broken-wire fault signal: Normally Open (NO) or Normally Closed (NC).
- BW: Enters the Bus Parameter Settings page.
- Upgrade: Enters the System Update page.
- Sys para: Enters the System Parameter Settings page. Login with “Machine Builder” privileges or higher is required for operation.
- Touch key: Enables or disables the virtual touch keyboard.

Air detection: After clicking, the following window will pop up, allowing for the testing of each cylinder’s advance and retract confirmation. When testing is enabled, a time limit must be set; exceeding this limit will trigger an alarm and machine halt.



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4 System Upgrade Page

The system upgrade page is mainly provided for system maintenance personnel, after-sales/software engineers to upgrade the system. To use it, you need to insert a USB drive and place the corresponding upgrade file or parameter file in the root directory of the USB drive… The system upgrade page is shown in Figure 3-4.

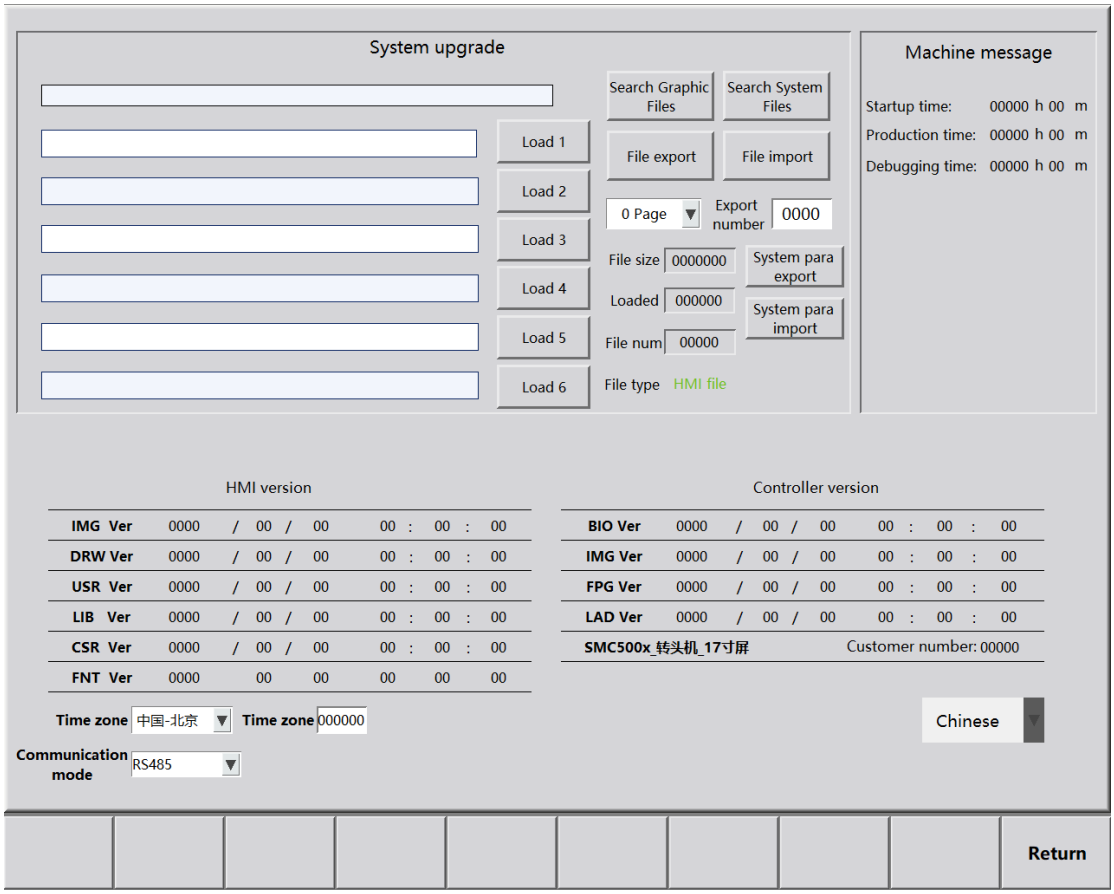

Figure 3-4 System Upgrade Page

- Search Graphic Files: This button is used to search for display upgrade files.
- Search System Files: This button is used to search for host upgrade files.
- File import/export: Imports mold parameters from a USB drive to the system, or exports mold parameters to a USB drive.
- System para import/export: Imports system parameters from a USB drive to the system, or exports system parameters to a USB drive.
- Load:* After the search is completed, clicking the Load button will load the corresponding file.

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5 System Parameter Page 1 - Encoder Parameters

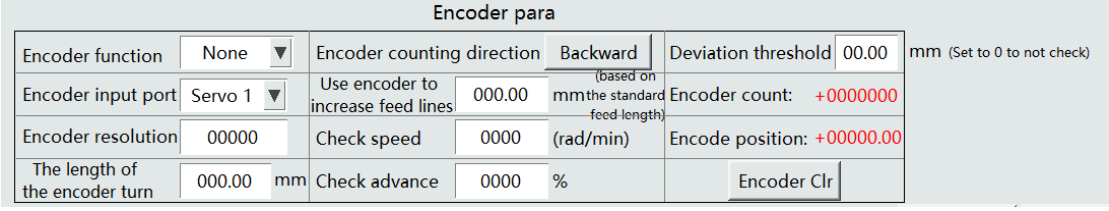

Figure 3-5 Encoder Parameters

- Encoder function: This option has two states: Enabled and Disabled.
- Encoder input port: This option has 8 servo ports to choose from.
- Encoder resolution: Fill in according to the actual resolution of the encoder.
- The length of the encoder turn: Fill in according to the physical distance corresponding to one revolution of the encoder.
- Encoder counting direction: Select the counting direction corresponding to the encoder.
- Use encoder to increase feed lines: Total wire feeding length = encoder-based wire feeding + programming table wire feeding. When the total wire feeding is completed, if the feedback length has not reached the target, an alarm will be triggered. If the feedback length reaches the target length before the wire feeding is completed, the wire feeding will stop immediately. The essential purpose of the additional wire feeding is to ensure that the wire feeding distance is sufficiently long, and this parameter should be set much larger than the machine error.
- Check speed: The speed of the axis after it moves to the “Check Advance” position.
- Check advance: The position that triggers the “Check Speed” function.
- Deviation threshold: The maximum allowed deviation. If this threshold is exceeded, an alarm will be triggered, and the machine will stop. Setting it to 0 disables the check.
- Encoder count: Pulse count.
- Encode position: The current physical position of the encoder.
- Encoder Clr: Resets the encoder count to 0.

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Chapter 2 Instruction Description and Examples

In this chapter, we will learn about all the instructions involved in this system and understand how to use the programming table.

Note that the programming in this example tutorial may differ from actual production programming. We are here only to understand how to use the programming table.

Comprehensive Example

N	Y	X	A	B	C	U	Ratio	Probe	Air	Delay	Loop	Times	Notes
0	100												
1		5.00	20.00				50		2	3	1	5	
2	50.00	15.00	50.00										
3	10		0						-2		9		
4													

Explanation of Table Name:

- The leftmost side of the table is the line number. The programming table executes sequentially, starting from line 0.
- Y, X, A, B, and C represent the axes.
- Ratio: The running speed of the current line. If not set, it will run according to the “Speed” setting on the parameter setting page.
- Probe: The probe number used in the current line.
- Air: The cylinder number used in the current line. A positive number opens the cylinder, and a negative number closes it.
- Delay: The waiting time after the current line finishes before executing the next line.
- Loop: When using a loop, the loop column needs to be set to 1 and 9. Setting it to 1 indicates the starting line of the loop, and setting it to 9 indicates the ending line of the loop.
- Times: The repetitions column represents the number of loop repetitions.
- Notes: The signal used in the current line: -1 to -4 for external signals, 21 for the robot signal.

Table Operation Instructions:

- Line 0: The Y-axis moves to the position of 100.
- Line 1: The axes in this line move at a speed of 50%. The X-axis moves to

the position of 5, while the A-axis moves to the position of 20; cylinder 2 is opened; a delay of 3 seconds is set before executing the next line; the loop start flag 1 and the number of repetitions 5 are set.

- Line 2: The Y-axis moves another 50, while the X and A axes move 15 and 50 respectively.
- Line 3: The Y-axis moves another 10, and the A-axis returns to the origin; cylinder 2 is closed; the loop end flag 9 is set.
- End of operation.

Chapter 4 Electrical Connections

1 Electrical Connection Instructions

The electrical connections primarily consist of three parts: the main controller, the wire feeder, and the handwheel.

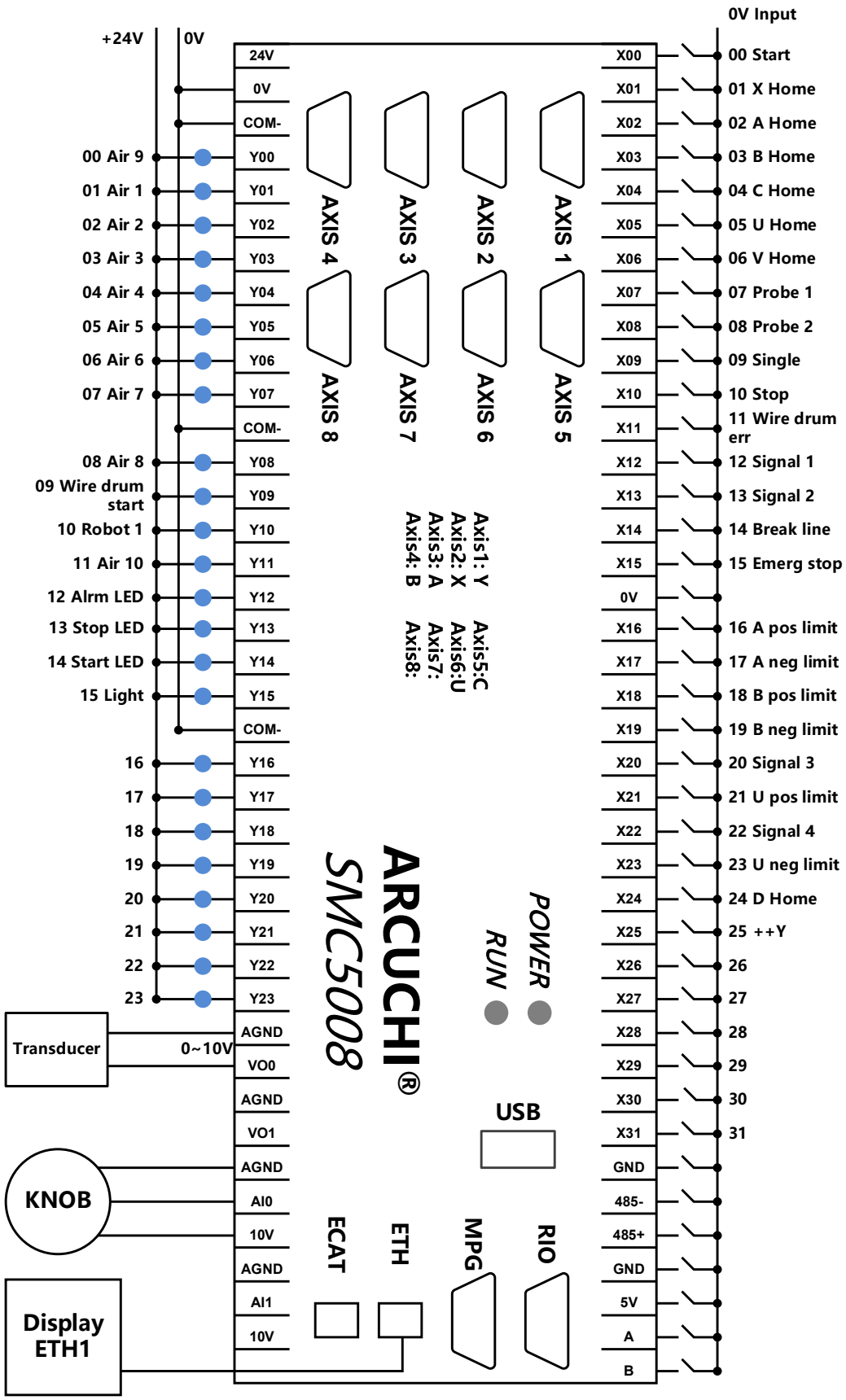
The servo wiring sequence is explained as follows:

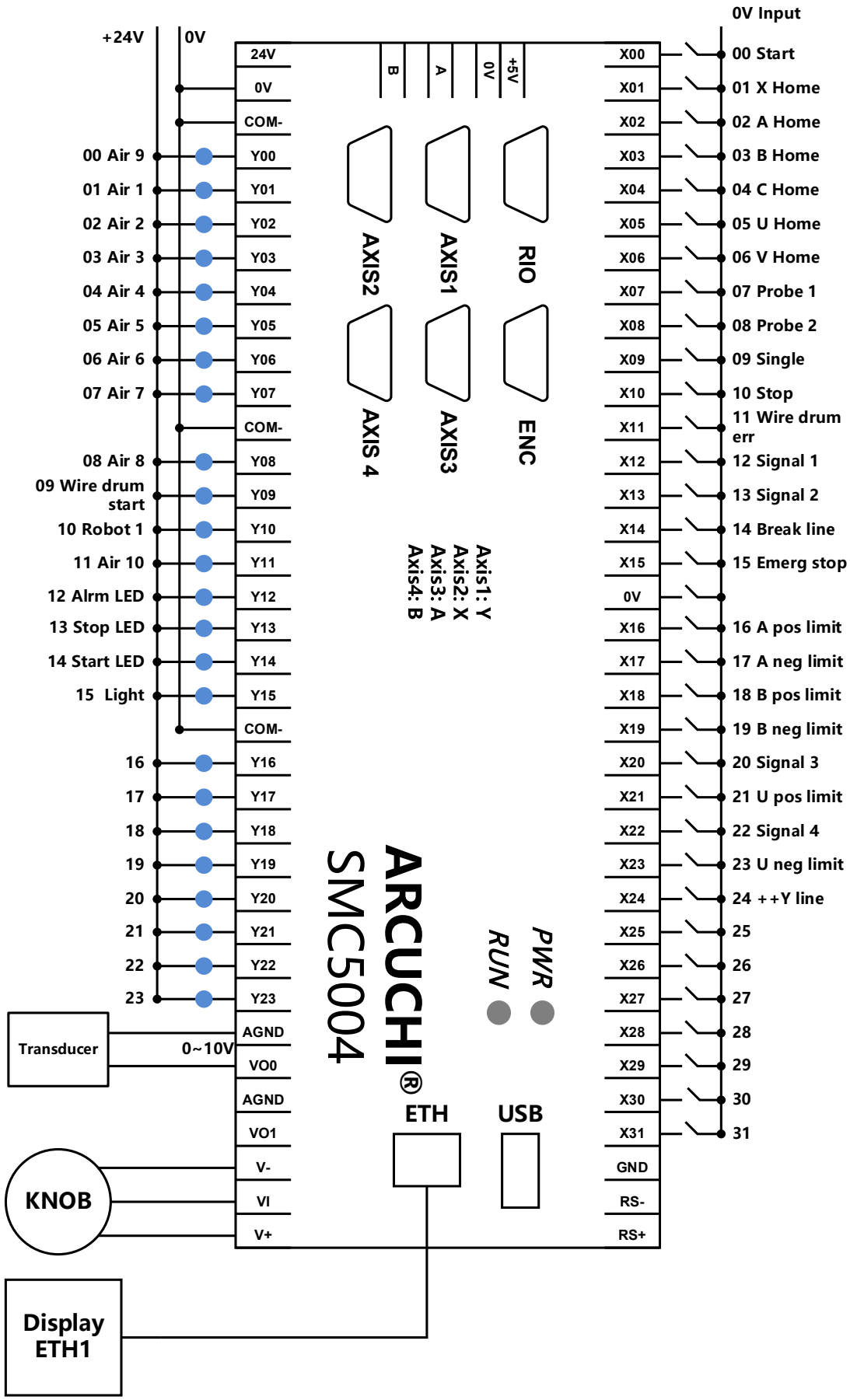
SMC5008		SMC5004
AXIS 1: Y	AXIS 5: C	AXIS 1: Y
AXIS 2: X	AXIS 6: U	AXIS 2: X
AXIS 3: A	AXIS 7:	AXIS 3: A
AXIS 4: B	AXIS 8:	AXIS 4: B

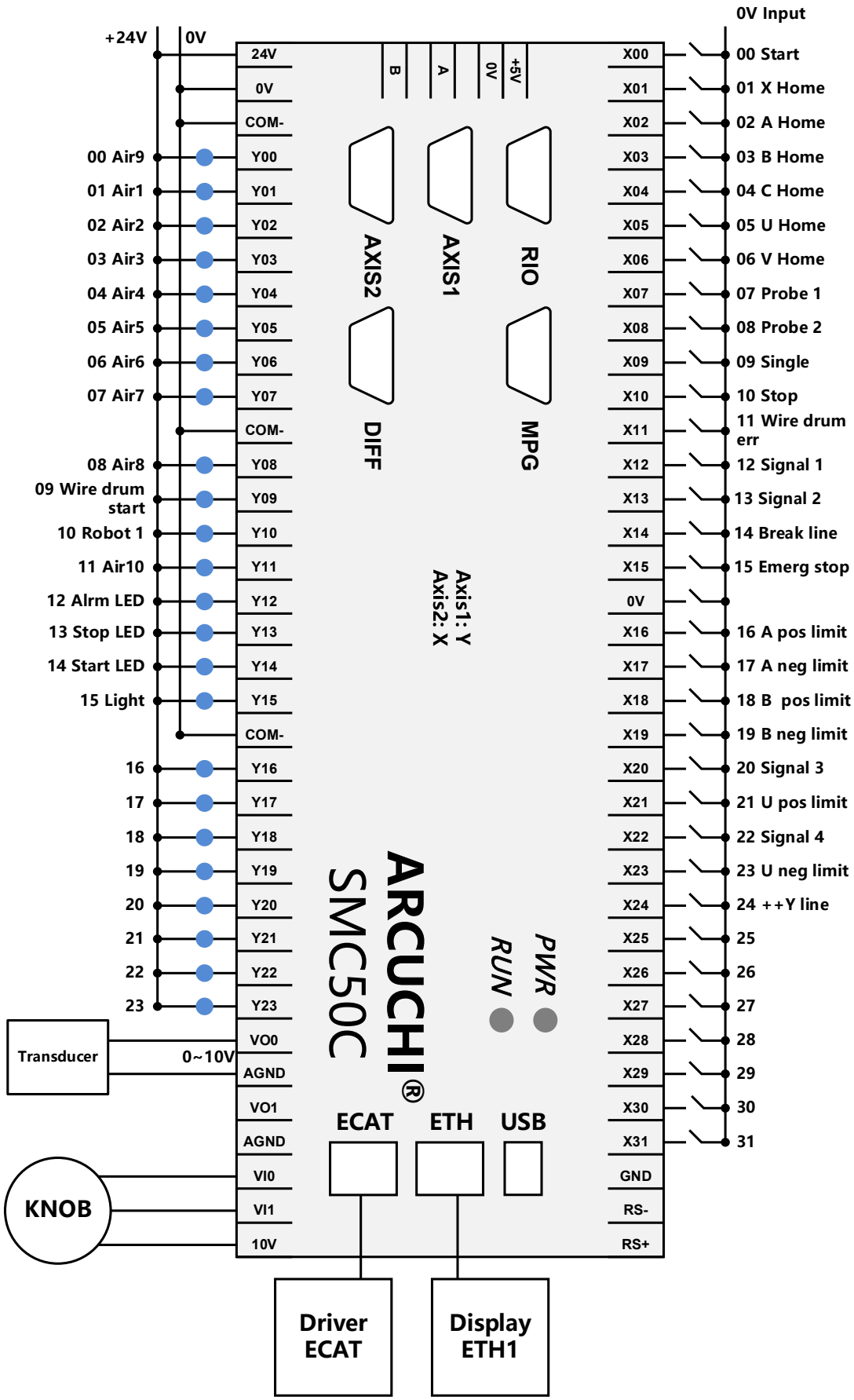
SMC50C
AXIS 1: Y
AXIS 2: X

Note: The SMC50C is a bus version; the default settings are as shown in the table above. To modify these settings, navigate to System Page 2 and configure the “Pulse Port” numbers.

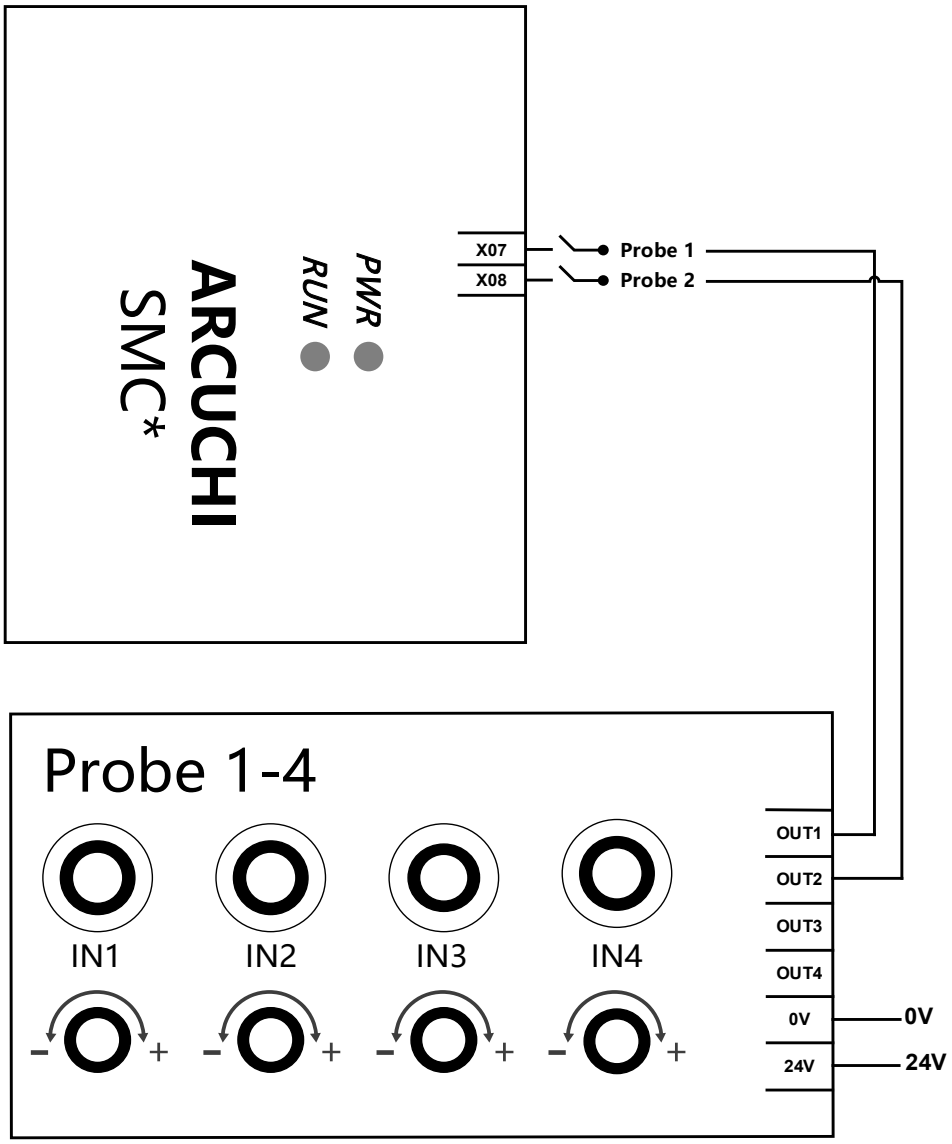
2 SMC


+24V
0V
0V Input
24V
0V
COM-
Y00
Y01
Y02
Y03
Y04
Y05
Y06
Y07
COM-
Y08
Y09
Y10
Y11
Y12
Y13
Y14
Y15
COM-
Y16
Y17
Y18
Y19
Y20
Y21
Y22
Y23
AGND
VO0
AGND
VO1
AGND
AI0
10V
AGND
AI1
10V
00 Air 9
01 Air 1
02 Air 2
03 Air 3
04 Air 4
05 Air 5
06 Air 6
07 Air 7
08 Air 8
09 Wire drum start
10 Robot 1
11 Air 10
12 Alrm LED
13 Stop LED
14 Start LED
15 Light
16
17
18
19
20
21
22
23
Transducer
0~10V
KNOB
Display ETH1
AXIS 4
AXIS 3
AXIS 2
AXIS 1
AXIS 8
AXIS 7
AXIS 6
AXIS 5
Axis1: Y
Axis2: X
Axis3: A
Axis4: B
Axis5:C
Axis6:U
Axis7:
Axis8:
ARCUCHI®
SMC5008
POWER
RUN
USB
ECAT
ETH
MPG
RIO
X00
X01
X02
X03
X04
X05
X06
X07
X08
X09
X10
X11
X12
X13
X14
X15
0V
X16
X17
X18
X19
X20
X21
X22
X23
X24
X25
X26
X27
X28
X29
X30
X31
GND
485-
485+
GND
5V
A
B
00 Start
01 X Home
02 A Home
03 B Home
04 C Home
05 U Home
06 V Home
07 Probe 1
08 Probe 2
09 Single
10 Stop
11 Wire drum err
12 Signal 1
13 Signal 2
14 Break line
15 Emerg stop
16 A pos limit
17 A neg limit
18 B pos limit
19 B neg limit
20 Signal 3
21 U pos limit
22 Signal 4
23 U neg limit
24 D Home
25 ++Y
26
27
28
29
30
31


0V Input
+24V
0V
24V
0V
COM-
00 Air 9
01 Air 1
02 Air 2
03 Air 3
04 Air 4
05 Air 5
06 Air 6
07 Air 7
COM-
08 Air 8
09 Wire drum start
10 Robot 1
11 Air 10
12 Alrm LED
13 Stop LED
14 Start LED
15 Light
COM-
16
17
18
19
20
21
22
23
Y00
Y01
Y02
Y03
Y04
Y05
Y06
Y07
Y08
Y09
Y10
Y11
Y12
Y13
Y14
Y15
Y16
Y17
Y18
Y19
Y20
Y21
Y22
Y23
B
A
0V
+5V
AXIS2
AXIS1
RIO
AXIS 4
AXIS3
ENC
Axis1: Y
Axis2: X
Axis3: A
Axis4: B
ARCUCHI®
SMC5004
PWR
RUN
ETH
USB
Transducer
0~10V
AGND
VO0
AGND
VO1
V-
VI
V+
KNOB
Display
ETH1
X00
X01
X02
X03
X04
X05
X06
X07
X08
X09
X10
X11
X12
X13
X14
X15
0V
X16
X17
X18
X19
X20
X21
X22
X23
X24
X25
X26
X27
X28
X29
X30
X31
GND
RS-
RS+
00 Start
01 X Home
02 A Home
03 B Home
04 C Home
05 U Home
06 V Home
07 Probe 1
08 Probe 2
09 Single
10 Stop
11 Wire drum err
12 Signal 1
13 Signal 2
14 Break line
15 Emerg stop
16 A pos limit
17 A neg limit
18 B pos limit
19 B neg limit
20 Signal 3
21 U pos limit
22 Signal 4
23 U neg limit
24 ++Y line
25
26
27
28
29
30
31

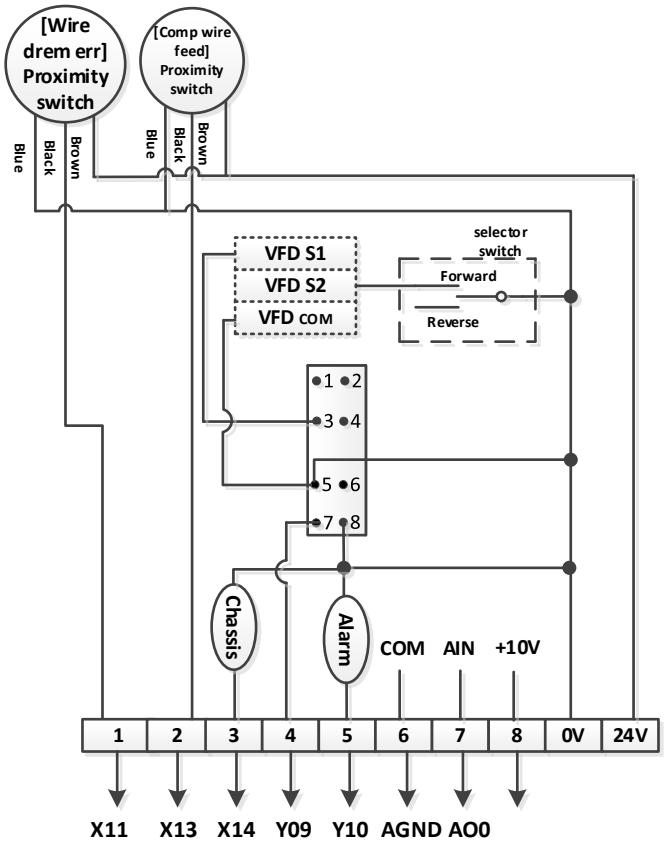

+24V
0V
0V Input
24V
0V
COM-
Y00
Y01
Y02
Y03
Y04
Y05
Y06
Y07
COM-
Y08
Y09
Y10
Y11
Y12
Y13
Y14
Y15
COM-
Y16
Y17
Y18
Y19
Y20
Y21
Y22
Y23
VO0
AGND
VO1
AGND
VI0
VI1
10V
B
A
0V
+5V
AXIS2
AXIS1
RIO
DIFF
MPG
Axis1: Y
Axis2: X
ARCUCHI®
SMC50C
PWR
RUN
ECAT
ETH
USB
X00
X01
X02
X03
X04
X05
X06
X07
X08
X09
X10
X11
X12
X13
X14
X15
0V
X16
X17
X18
X19
X20
X21
X22
X23
X24
X25
X26
X27
X28
X29
X30
X31
GND
RS-
RS+
00 Air9
01 Air1
02 Air2
03 Air3
04 Air4
05 Air5
06 Air6
07 Air7
08 Air8
09 Wire drum start
10 Robot 1
11 Air10
12 Alrm LED
13 Stop LED
14 Start LED
15 Light
16
17
18
19
20
21
22
23
00 Start
01 X Home
02 A Home
03 B Home
04 C Home
05 U Home
06 V Home
07 Probe 1
08 Probe 2
09 Single
10 Stop
11 Wire drum err
12 Signal 1
13 Signal 2
14 Break line
15 Emerg stop
16 A pos limit
17 A neg limit
18 B pos limit
19 B neg limit
20 Signal 3
21 U pos limit
22 Signal 4
23 U neg limit
24 ++Y line
25
26
27
28
29
30
31
Transducer
0~10V
KNOB
Driver ECAT
Display ETH1

3 Probe

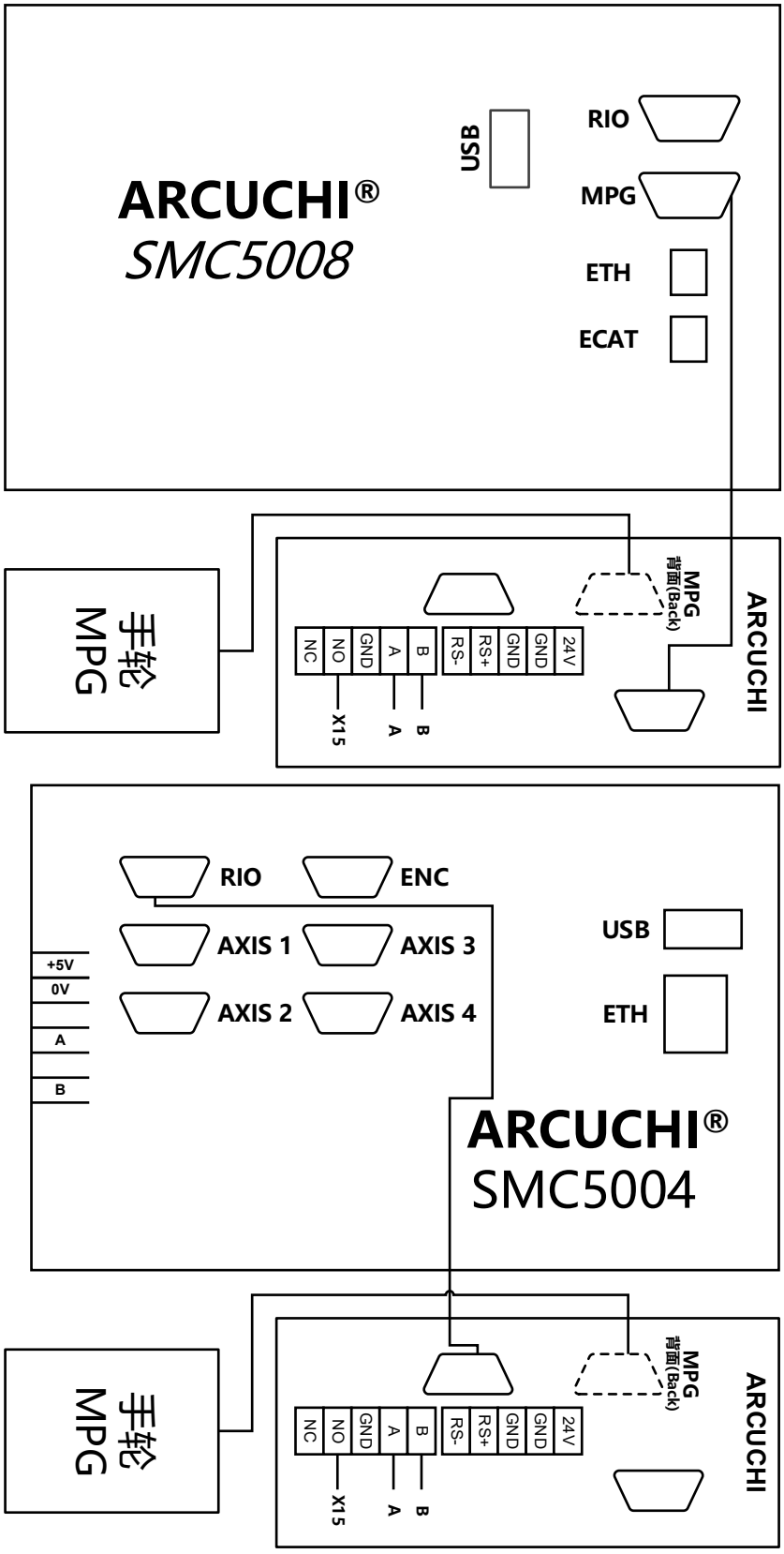

ARCUCHI
SMC*
RUN
PWR
X07
X08
Probe 1
Probe 2
Probe 1-4
IN1
IN2
IN3
IN4
OUT1
OUT2
OUT3
OUT4
0V
24V
0V
24V

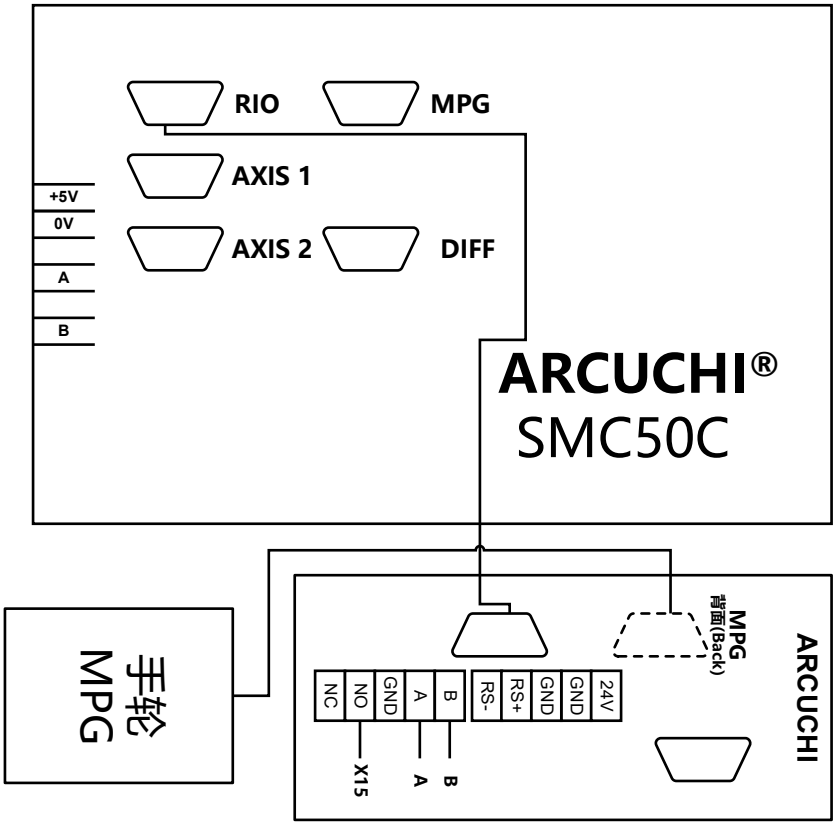
4 Wire Feeder

When using the wire feeder's integrated controls, ensure proper wiring. Specifically, connect the Compensation Wire (X13) to 0V, connect the Broken-Wire Fault (X14) to the chassis, and also connect the 0V of the switching power supply to the chassis.



5 Handwheel Expansion Board Wiring




RIO
MPG
AXIS 1
AXIS 2
DIFF
+5V
0V
A
B
ARCUCHI®
SMC50C
手轮
MPG
ARCUCHI
MPG
背面(Back)
NC
NO
GND
A
B
RS-
RS+
GND
GND
24V
X15
A
B

6 Keypad Layout of Handwheel

		倍率 MFO	教导 Teach
Y	X	A	B
C	U	V	
剪断 CUT	测试 TEST	▲	确认 ENTER
送线清零 Y CLR	◄	▼	►

Note: Double-click the CUT button to execute the cutting operation.