

# TOPCNC TC55V Instruction Manual



**TOPCNC Automation Technology Co., Ltd.**

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## 1. Product Introduction

TC55E is an upgrading version of TC55. It is equipped with 3.5 inch color screen, RS 485 communication, Chinese/English Switch, and USB connection. Boot picture can be set as pictures or company name as you will. It is highly reliable, highly accurate, low noise and easy to use.

## 2. Technical Specifications

Minimum data unit 0.001 mm

Maximum data size  $\pm 99999.999\text{mm}$

Maximum Speed: 9000mm/min (pulse is 0.001mm)

Maximum pulse output frequency 150KHz

Axis 1-4 (X,Y,Z,C)

X,Y,Z,C axis can conduct linear interpolation, X,Y can do circular interpolation.

Electric Gear: numerator :1-99999 denominator: 1-99999

System main functions are automatic, manual, program editing, system parameters, self-check, settings, etc.

Maximum 480 commands each program

USB Connection and upgrade

Stop and Start of Spindle motor

PLC Extension

I/O Extension

Isolated I/O port

Self defining of I/O port

Chinese/English panel display

Free boot picture setting

## 3. Conversational Programming Code

Conversational programming method, automatically lead you to finish programming.

### 3.1 Programming Function Introduction

Programming Code	Interpretation
Incremental	Incremental Programming
Absolute	Absolute Programming
Pause	Pause unless certain condition is met, then skip to command called
Output	Define on and off of output port, ex. Stop and start of spindle motor
Repeat	Go back to command called and repeat
Clockwise	Clockwise circular interpolation (Incremental programming)
Counter-clockwise	Counter Clockwise interpolation(Incremental programming)

Delay	Define the time of delay
Judge	Judge if certain condition is met and skip to command called
Skip	Whenever this command is executed, unconditionally skip to command called .
Fast	Fast positioning
Machine Zero	Go back to machine zero
Speed	Axis move at certain speed, and will stop when certain condition met
Register	When this command is executed, the number on main interface and manual interface will be set to this number.
Count	When this command is executed, the number on main interface and manual interface will increase by 1 or decrease by 1.
Subprog Call	Subprogram Called
Subprog Start	Subprogram Started
Subprog End	Subprogram Ended
Coordinate	Set the current position as new coordinates
End	When the commands can not be read, it will be considered as “End”.
Coordinating	This command is similar with Judge, when certain condition of coordinates is met, it will skip to command called.
PLC Judge	When certain condition of PLC register value is met, it will skip to command called.
PLC Set	Set Register address and value

### 3.2 Programming Example

#### 3.2.1 Start to program


X axis motor first run 10mm, 500mm/min, then output port 1 is connected, then wait for the signal of input port 1, when the signal of input port 1 is detected, output port 1 is off.

Main Interface

Choose “Prog”

Then choose “New”

A new file is created, with interface showing “n 1 End File---- Tab:0”


Press “” to find “Incremental”

Then the interface will be

N001 Incremental File----

Tab:0 X:0.000 Y:0.000 Z:0.000 C:0.000 F:0

Move the up and down arrow, to take the cursor go to X, and input 10, then go to F, input 500

Press “” to create n2 command,

**After finishing all the programming it should be like this:**

n001 Incremental File-----

Tab:0 X:10 Y:0.000 Z:0.000 C:0.000 F:500

n002 Output File----

Tab: 0 OutputPort:1 Status: 1 (this blank can only be filled 1 or 0, change by using






n003 Paus File----

Tab:0 InputPort:1 Cond:0 LineCall: 0

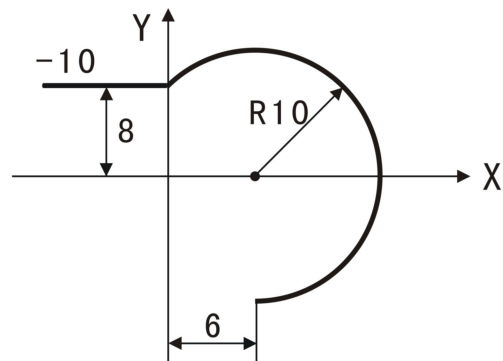
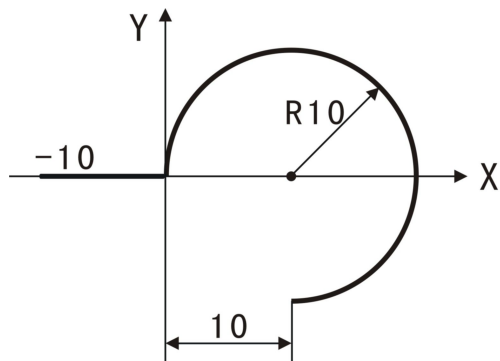
n004 Output File-----

Tab: 0 Oup Pt: 1 Status: 0

n005 End File----

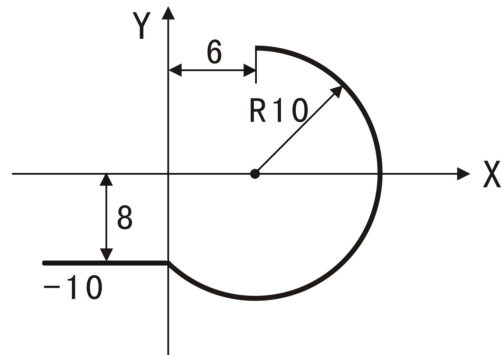
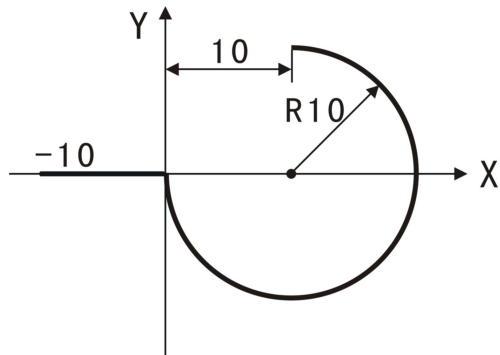
Press “” or “” to examine if it is right, then press “”, then press “Save”Key.

### 3.2.2Circular Interpolation



Left: n1 Incremental X 10.000 Y 0  
n2 Clockwise X 10.000 Y-10.000 R-10

Right: n1 Incremental X 10.000 Y 0  
n2 Clockwise X 6.000 Y-18.000 R-10



Left: n1 Incremental X 10.000 Y 0

n2 Counter-clockwise X 10.000 Y 10.000 R-10

Right: n1 Incremental X 10.000 Y 0

n2 Counter-clockwise X 6.000 Y 18.000 R-10

How to draw a full circle whose diameter is 50mm.

n1 Clockwise X100 Y0 R50

n2 Counter-clockwise X-100 Y0 R50

### 3.3 Parameter Set

**\*\*Before the setting of parameters, please log in. Par-User-User code-123456**

#### 3.3.1 Control Parameters

Language: Choose English or Chinese

External IO: the I/O port number can be extended using TC55-KA(not included in TC55 package) to 30/24.

External PLC: PLC TC4616(not included in TC55 package) can be extended.

X axis Reference Point: In manual operation, long press 1 to clear the coordinates and show this value; or in machine zero, after hit the switch, it will show this value.

X Axis Numerator (1-99999)

X Axis Denominator (1-99999)

Y axis Reference Point: In manual operation, long press 2 to clear the coordinates and show this value; or in machine zero, after hit the switch, it will show this value.

Y Axis Numerator (1-99999)

Y Axis Denominator (1-99999)

Z axis Reference Point: In manual operation, long press 3 to clear the coordinates and show this value; or in machine zero, after hit the switch, it will show this value.

Z Axis Numerator (1-99999)

Z Axis Denominator (1-99999)

C axis Reference Point: In manual operation, long press 6 to clear the coordinates and show this value; or in machine zero, after hit the switch, it will show this value.

C Axis Numerator (1-99999)

C Axis Denominator (1-99999)

Speed+Time(ms): time use for motor to reach F speed.

Jog+No.(um): in manual operation, increment for jogging.

X Gap(um): X axis adjusting gap(to make it more precise)

Y Gap(um): Y axis adjusting gap(to make it more precise)

Z Gap(um): Z axis adjusting gap(to make it more precise)

C Gap(um): C axis adjusting gap(to make it more precise)

X ZeroStart: Choose on or off to choose whether the system will first go back to mechanical zero after booting.

Y ZeroStart: Choose on or off to choose whether the system will first go back to mechanical zero after booting.

Z ZeroStart: Choose on or off to choose whether the system will first go back to mechanical zero after booting.

C ZeroStart: Choose on or off to choose whether the system will first go back to mechanical zero after booting.

Press enter to choose on or off

**The following function can only be used when Sell Code logged in**

- Pro Edit: choose hide will make user unable to edit program.
- ProShow: choose hide will make user unable to see programs
- TimeLock: after sell code logged in, Para Set-UserMgmt-Sys Veri to set 8digit code to lock the system

### **Setting of Electronic Gear Ratio**

Setting the electronic gear is to set different data unit for different machines. Different axis of the same machine can be set based on different unit. For example, axis A can be set as mm, axis B can be set as angle, and axis C can be set as round.

How to set the numerator and denominator of electronic gear ratio:

Pulse needed for the motor to turn one round to the same direction

Distance moved when the motor turn one round to the same direction(μm)

Numerator and denominator both should be integer between 1 and 99999.

Ex. 1 Screw Transmission

Stepper motor stepping is 5000, or servo motor 5000 pulse/round, screw pitch is 6mm, reduction ratio is 1:1, then,

$$5000 \rightarrow 5$$

$$6*1000*1.0 \rightarrow 6$$

Ex. 2 Rack and Pinion

Stepper motor stepping is 6000, or servo motor 6000 pulse/round, gear teeth number is 20,  $m=p/\pi=2$ , then

$$6000 \rightarrow 1 \rightarrow 107 \rightarrow 107$$

$$1000*20*2*3.14159265 \rightarrow 20.943951 \rightarrow 2241.00276 \rightarrow 2241$$

### Ex. 3 Rotary Angle

Stepper motor stepping is 5000, or servo motor 5000 pulse/round, reduction ratio is 1:30, then,

$$5000*30 \rightarrow 5$$

$$360*1000 \rightarrow 12$$

### 3.3.2 Speed Parameters

Hsped-X: The highest speed of x axis motor. When the system is operating, speed will not exceed this number no matter what F you set.

Hsped-Y: The highest speed of Y axis motor. When the system is operating, speed will not exceed this number no matter what F you set.

Hsped-Z: The highest speed of Z axis motor. When the system is operating, speed will not exceed this number no matter what F you set.

Hsped-C: The highest speed of C axis motor. When the system is operating, speed will not exceed this number no matter what F you set.

StartSpd(mm/min)Speed during Speed+Time

Man Hspd: Manual high speed

Man Lspd: Manual low speed

Jog Spd: Jog speed

BZHSpd:Go to machine zero at high speed.

BZLSpd:Go back to machine zero first at high speed, through zero switch and move back at low speed. Finally slider will stop on the switch.

BZMode:two modes to go back to machine zero, trough switch or not. Through switch: slider will stop on switch. Not trough switch: Slider will stop before the switch.

X+ Coor:X axis positive limit coordinates

X-Coor:X axis negative limit coordinates

Y+ Coor:Y axis positive limit coordinates

Y-Coor:Y axis negative limit coordinates

Z+Coor:Z axis positive limit coordinates

Z-Coor:Z axis negative limit coordinates

C+Coor:C axis positive limit coordinates

C-Coor:C axis negative limit coordinates

## 4. Auto Run

Auto Run: press this automatically operate programs opened last time.

Dry: Press the key and it become negative display, then press Auto Run to start running without load.

Step: Positive display means consecutive operation. Negative display means operate command by command. When it is negative display, press Actl Run once, one command will be executed.

Stop: Press this to end the program and go back to the first line of the command.


## 5. Manual

**Speed:** Negative display means manual high speed, positive display means manual low speed. Define manual high speed and manual low speed in Parameters-Speed-Man Hspd/Lspd.

**Jog:** Negative display means jog. Press direction key to jog once. Jog amount is set in Parameters-Control-Jog+No.; Jog speed will be set in Parameters-Speed-Jog Spd

**Program Zero:** Press this key all axis go back to reference point at highest speed. Define the highest speed in Parameters-Speed.

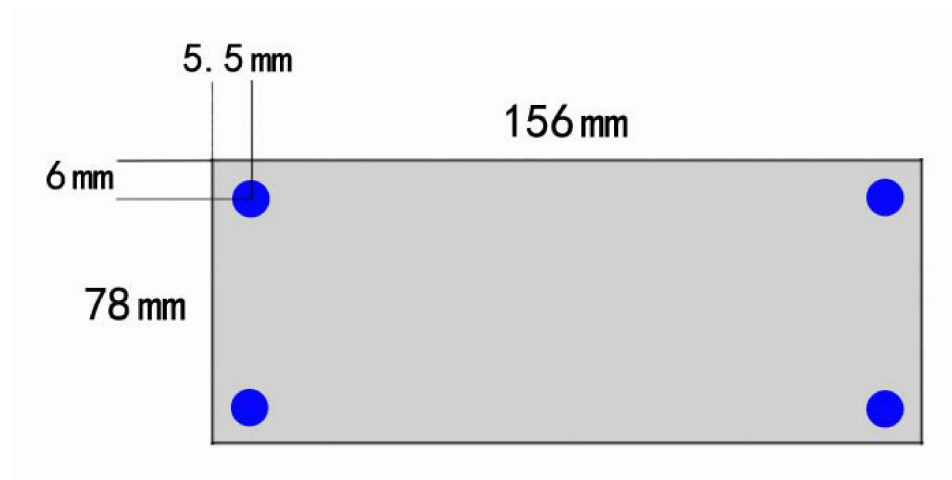
### Note: Machine Zero

Machine zero key is in the panel , press this key, then press direction key of an axis, this axis will go back to machine zero at high speed, after touching the switch, this axis will move at low speed(This machine zero mode is trough switch). Define high speed and low speed of go back to machine zero in Parameters-Speed. Define machine zero in I/O-System.

Press key 1 to return X axis coordinates to reference point, Press key 3 to return Y axis coordinates to reference point, Press key 3 to return Z axis coordinates to reference point, Press key 6 to return C axis coordinates to reference point. Define reference point in Parameters-Control.

Define the mode of going back to machine zero in Parameters-Speed-BZMode.

## 6. Installation Size

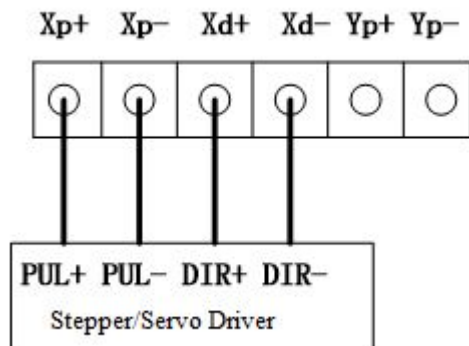




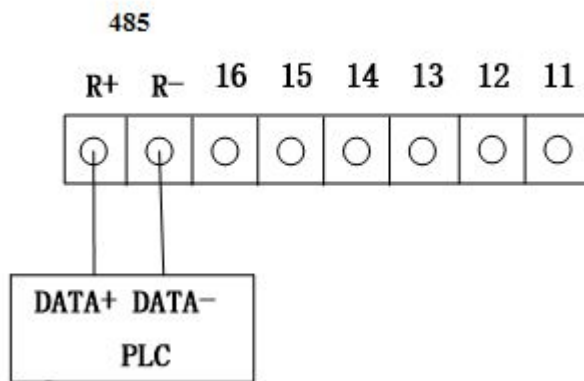
## Reference 1 Wiring Definition

X Axis	XP+	X axis pulse positive output
	XP-	X axis pulse negative output
	XD+	X axis direction positive output
	XD-	X axis direction negative output
Y Axis	YP+	Y axis pulse positive output
	YP -	Y axis pulse negative output
	YD+	Y axis direction positive output
	YD-	Y axis direction negative output
Z Axis	ZP+	Z axis pulse positive output
	ZP -	Z axis pulse negative output
	ZD+	Z axis direction positive output
	ZD-	Z axis direction negative output
C Axis	CP+	C axis pulse positive output
	CP-	C axis pulse negative output
	CD+	C axis direction positive output
	CD-	C axis direction negative output
Output	01~08	Output 01-08,Connect to power 24V+ through Relay or solenoid valve
Input	01~16	Connect to power 24V- through machine or switch
485	R+	485 connect DATA+
	R-	485 connect DATA-
System Power	24V	System Power Supply+
	0V	System Power Supply-
IO Power	V	I/O Power Supply+
	G	I/O Power Supply-
	USB	Downloading Port
	Encoder	Used to make special machine controller (This controller do not support encoder unless customer specially said they need it)
	I/O Extension	Connect to I/O extension connection

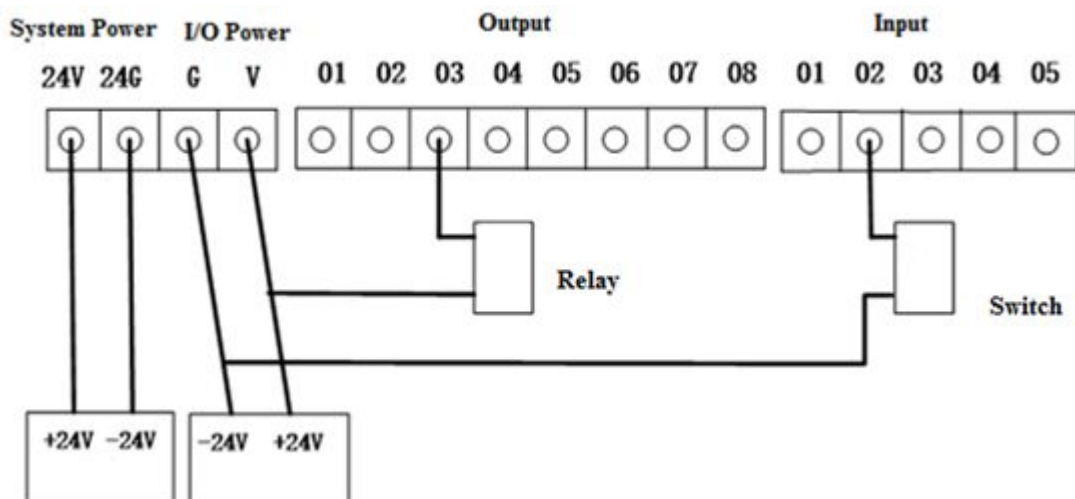
1. Connect with servo or stepper driver



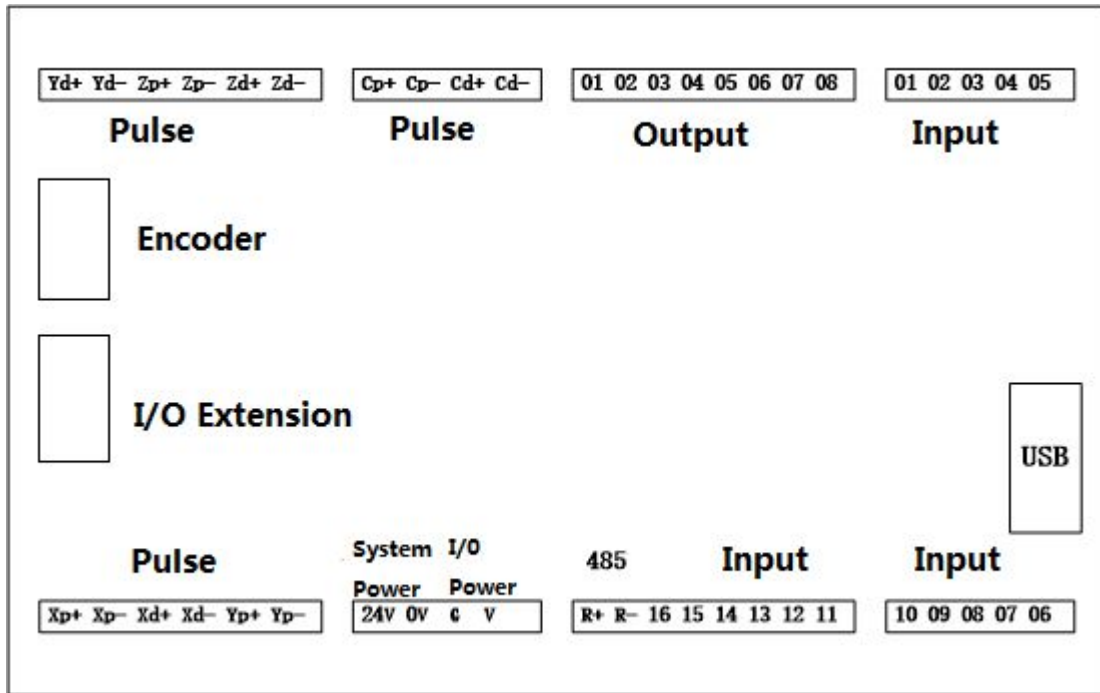
2. Connect with PLC



3. Connect with Power Supply



#### 4. Connection Layout



## Reference 2 I/O Port

### 1. System Set

This function enable user to set various kind of switch easily. Define the I/O port according following form. Press I/O key on the panel to enter this interface.

Functions	Interpretation	Methods
X Axis Lim+	X axis Positive limit setting	External Big switch is needed to finish external control. External switch is connected in the way of normal open. Press Shift to change <i>off</i> into <i>on</i> , and choose N.O.(Normal Open). Then choose the IO Port number.  Note: For safety consideration, limit and emergency stop input is usually set as N.C.(Normal Close).
X Axis Lim-	X axis Negative limit setting	
Y Axis Lim+	Y axis Positive limit setting	
Y Axis Lim-	Y axis Negative limit setting	
Z Axis Lim+	Z axis Positive limit setting	
Z Axis Lim-	Z axis Negative limit setting	
C Axis Lim+	C axis Positive limit setting	
C Axis Lim-	C axis Negative limit setting	
AlerInpu	Alert Input	
EmStInpu	Emergency Stop Input	
X 0	X axis zero switch setting	
Y 0	Y axis zero switch setting	
Z 0	Z axis zero switch setting	
C 0	C axis zero switch setting	
OutStart	Outside(External) Start Switch Setting	
Out EmSt	Outside(External) Emergency Stop Setting	
Spd+Inpu	Speed Increase Outside Switch	
Spd-Inpu	Speed Decrease Outside Switch	
OutPt 1-8	External input port control output port	

### 2. Jog Set

This function is normally used in manual adjusting parameters of machine to reach a optimal situation.

Functions	Interpretation	Methods
Man X+	X axis clockwise spinning outside manual switch	Choose on or off Choose N(Negative) or P(Positive)
Man X-	X axis counter clockwise spinning outside manual switch	
X HSup	X axis high speed up	

X HSdown	X axis high speed down	
X LSup	X axis low speed up	
X LSdown	X axis low speed down	
Man Y+	Y axis clockwise spinning outside manual switch	
Man Y-	Y axis counter clockwise spinning outside manual switch	
Y HSup	Y axis high speed up	
Y HSdown	Y axis high speed down	
Y LSup	Y axis low speed up	
Y LSdown	Y axis low speed down	
Man Z+	Z axis clockwise spinning outside manual switch	
Man Z-	Z axis counter clockwise spinning outside manual switch	
Z HSup	Z axis high speed up	
Z HSdown	Z axis high speed down	
Z LSup	Z axis low speed up	
Z LSdown	Z axis low speed down	
Man C+	C axis clockwise spinning outside manual switch	
Man C-	C axis counter clockwise spinning outside manual switch	
C HSup	C axis high speed up	
C HSdown	C axis high speed down	
C LSup	C axis low speed up	
C LSdown	C axis low speed down	
X ZeroSt	X axis Machine zero external manual switch	
Y ZeroSt	Y axis Machine zero external manual switch	
Z ZeroSt	Z axis Machine zero external manual switch	
C ZeroSt	C axis Machine zero external manual switch	
Auto UI	Auto operation UI	
Manual UI	Manual operation UI	
Prog Zero	All axis go back to Program zero	

## Reference 2 Q&A

### **Is TC55V a G code based controller?**

A: No. It is a conversational programming based controller. You do not need to understand G code to use it. Instead of G00, it uses Fast Positioning. And you program by filling blank.

### **Can I change the boot picture of this controller?**

A: Yes, you can use a software provided by us to change by yourself, or you can send us 320\*240 pixel picture and we will load the picture before sending to you.

### **Can this controller receive feedback from an encoder.**

A: No. The basic product can not receive feedback from an encoder, but we can develop for customer.

### **Can this controller support Condition Input?**

A: Yes. You can use the program code Judge.

How do we have more I/O port?

A: We have extension board which will add the I/O ports to 32 and 24.