

BOSSLASER™

Operators Manual for FTC61 Series Control Panel

608 Trestle Point

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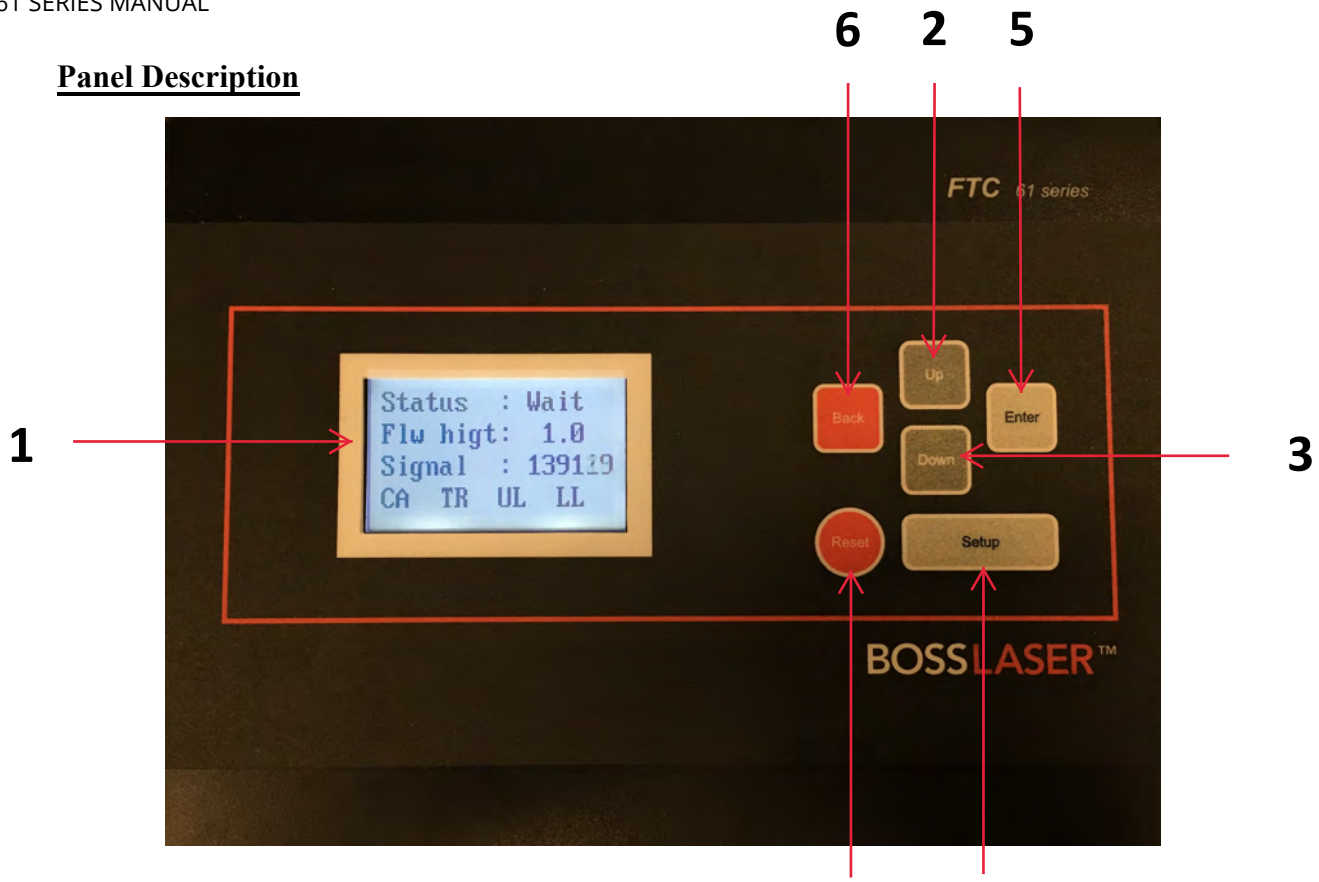
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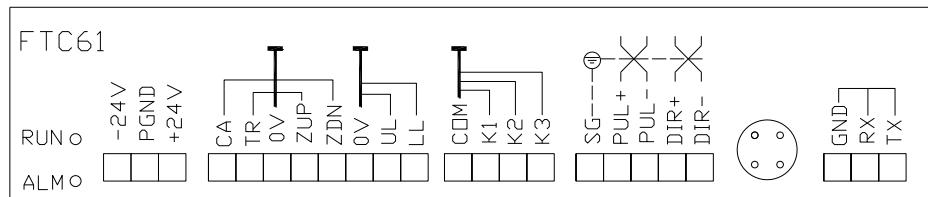
Panel Description



- (1) LCD Screen
- (2) Up Button
- (3) Down Button
- (4) Setup Button
- (5) Enter Button
- (6) Back Button
- (7) Reset Button

Button Description

- **Up Button:** Set the state to control the cursor to move up
 - Follow State - The follow up trimming height
 - Standby State - The control operation of the cutting head up
- **Down Button:** Set the state to control the cursor to move down
 - Follow State - Following the downward trim height
 - Standby State - The control operation of the cutting head down
- **Setup Button:** Enter the setup interface
- **Enter Button:** Confirm the operation
- **Back Button:** Cancel the operation
- **Reset Button:** Reset operation, the reset is pressed, Z-Axis returns to the origin.

Wiring Port Diagram**Port Definition**

- **-24V:** 24V DC input negative
- **PGND:** DC power supply ground
- **+24V:** 24V DC input positive

- **CA:** Calibration / Perforated multiplexed signal. Dry contact signal.
- **TR:** Once connected, the FTC controls cutting head to set the following position / began to follow. Dry contact signal.
 - Connect: Start follow
 - Disconnect: Stop follow. Back to the waiting position.
- **0V:** Input signals in public 0V
- **ZUP:** On the move signals, follow the process
 - Signal connected system controlling the cutting head.
- **ZDN:** To move the signal, follow the process
 - Signal connected system controlling the cutting head down.
- **0V:** Input signals in public 0V
- **UL:** Z-Axis maximum signal. Dry contact output signal.
 - Connect: Upper Limit
 - Disconnected: No Limit
- **LL:** Z-Shaft lower signal. Cutting head dropped to the lowest level.

- **COM:** Output signal of the common terminal. Voltage range: 0 ~ 36 V
- **K1:** Anomaly alarm output signal. Notify CNC system downtime.
 - Connect: System failure
 - Break: Normal
- **K2:** Follow the signal to / Calibration complete. Signal (Closed 1s)
 - Access: Reached the following location
 - Disconnect: No position is to follow
- **K3:** Piercing signal. Dry contact output signal.
 - Access: Reached the hole position
 - Disconnect: "No" to the piercing location

- **SG:** Shielded signal cable
- **PUL (+):** Motor control pulse signal
- **PUL (-):** Motor control pulse signal
- **DIR (+):** Motor direction control signal
- **DIR (-):** Motor direction control signal

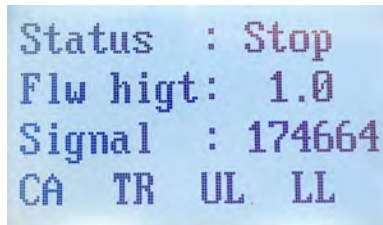
- **Aviation plug:** Capacitance signal.

- **GND:** Computer communication serial port RS232
- **RX:** Computer communication serial port RS232
- **TX:** Computer communication serial port RS232

Light Indicator Descriptions

- **RUN (Green Light)**
 - Flashing: Works properly
 - Often off: System exception
- **ALM (Red Light)**
 - Often off: Works properly
 - Always bright: System alarms

Note: If the system alarm is enabled and want to eliminate it, you will need to reboot.



```

Status : Stop
Flw higt: 1.0
Signal : 174664
CA TR UL LL

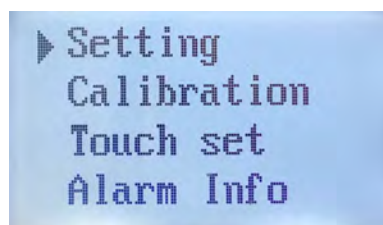
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Main Interface Description

- **Operating Status:** Display controller is currently running.
 - **Emergency Stop:** Follow the process; system. If there are alarms into the emergency stop State. Troubleshooting completed by compound key, the system enters the waiting state
 - **Wait bit:** The system is powered on, first began entering the wait after the completion of State
 - **Perforation:** When a piercing signal (BH) after closure, the system reached the hole position.
 - **Follow-bit:** Follow signals (TR) after closure, the system reached the following locations.
- **Follow the height:** Show follow height
 - The distance between the floating head and the plate
- **Signal Strength:** Displays the current capacitance of signal value.
 - The closer the nozzle is, the smaller the capacitance
- **CA/TR/UL/LL:** Displays the current input signal status.
 - When an input signal is switched, the signal back on the LCD will display " * ". The input signal is disconnected when a " * " disappears.

Setting Interface

Press the "set" key to go to the "settings" as shown in the following picture:



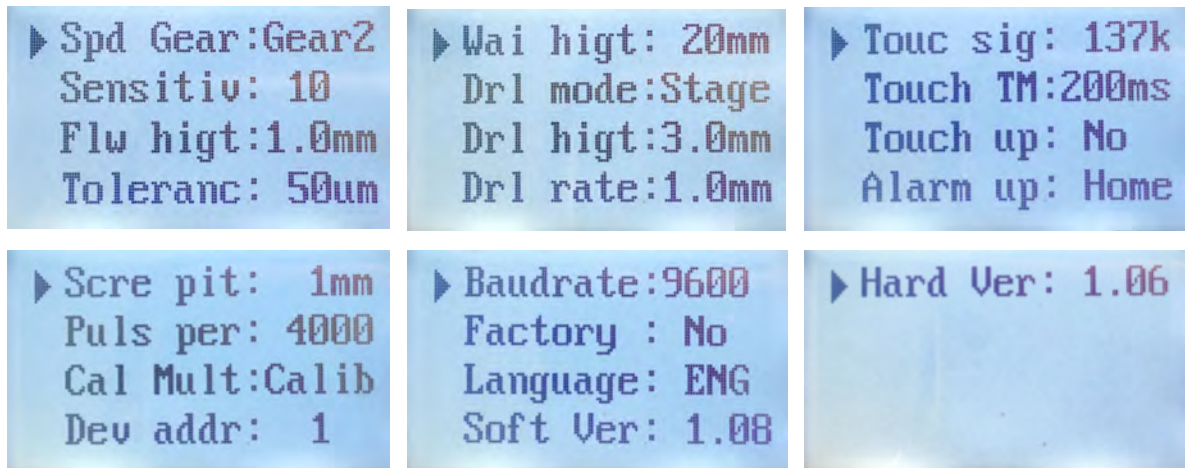
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▶ Setting
Calibration
Touch set
Alarm Info

```

Parameters Configuration

Select "configuration" and press "confirm" button, enter the parameters. FTC61 parameters, the user can up / down arrow key to page, select the parameter you want to set, followed so as to achieve the best results.



Parameters Description

- **Speed Stalls:** Set the speed of the follower
 - **Factory settings:** Third gear
 - **Optional settings:** One file to six files
 - *The higher the gear, the faster the speed. With a stepper motor, it is recommended to select the second gear speed.*
- **Sensitivity Level:** Set the sensitivity level of the follower reaction
 - **Factor settings:** 10
 - **Optional settings:** 1 - 30
 - *The smaller the value, the lower the sensitivity*
- **Follow the Height:** Set the following height
 - **Factor settings:** 1.0mm
 - **Optional settings:** 0.4 - 5.0mm
 - *Process adjustment*
- **Follow the Tolerance:** The parameter is followed by the accuracy of the response
 - **Factor settings:** 50um
 - **Optional settings:** 0 - 500um
 - *The larger the value, the more stable the results will follow, but poorer repeatability; significantly cutting the zigzag sense. **It is recommended to set at/ between 50 to 150.***
- **Waiting for Height:** Set the cutting head to follow the completion of the docking height.
 - **Factor settings:** 20mm
 - **Optional settings:** 10-99mm
- **Perforation Method:** Set the punch mode
 - **Factor settings:** Segmented perforation
 - **Optional settings:** Segment perforation / progressive perforations
- **Perforation Height:** Set the hole height
 - **Factor settings:** 3.0mm
 - **Optional settings:** 1.0 - 5.0mm

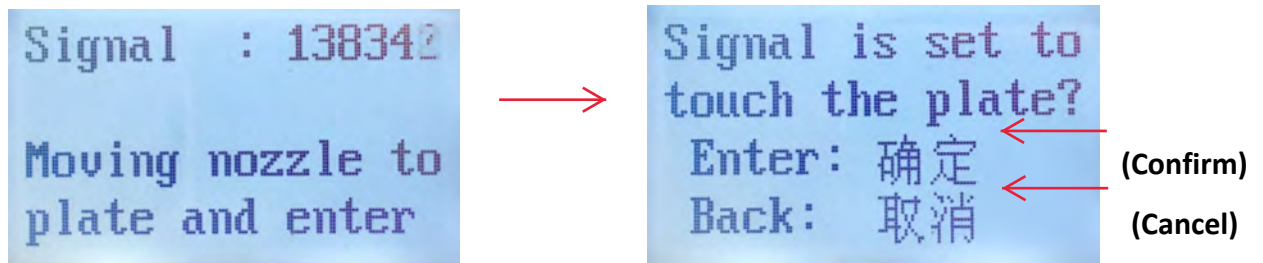
- **Perforation Speed: Set the punching speed**
 - **Factor settings:** 1.0mm
 - **Optional settings:** 0.1 - 9.9mm
 - *Progressive perforation is effective*
- **Touch Board Signal: Set the signal size when touching the board.**
 - **Factor settings:** 1K
 - **Optional settings:** 1 - 499K
 - *The value must be slightly larger than the actual touch panel signal; can not easily be changed*
- **Hit Board Delay: Set the duration of the collision plate**
 - **Factor settings:** 200ms
 - **Optional settings:** 10 - 500ms
 - *The metal sheet touches the contact duration for more than the value.*
- **Touch Up the Board:** In the waiting position, jogs when the touch board signal once, the Z-Axis immediately lifts a distance to avoid the workpiece and objects.
 - **Factor settings:** No
 - **Optional settings:** Yes / No
 - *This parameter is invalid in the following state.*
- **Alarm Lift:** In the following state when the touch panel has alarm FTC61 Z-Axis corresponding to the operation made.
 - **Factor settings:** Back to the original
 - **Optional settings:** Back to the original / Waiting / Follow
 - *Back to the original point. **Wait:** return to wait bit. **Follow:** Z Axes continue to follow*
- **Screw Pitch:** Set screw pitch (Z-Axis)
 - **Factor settings:** 10mm
 - **Optional settings:** 1 - 50mm
 - *The setting must match Z actual screw pitch consistent.*
- **Per Revolution:** Set the motor subdivision
 - **Factor settings:** 4000
 - **Optional settings:** 400 - 10000
 - *The set value must be consistent with the Z-Axis motion control drive.*
- **Calibration Multiplexing:** Set the input signal for the calibration / perforation
 - **Factor settings:** Calibration
 - **Optional settings:** Calibration / Perforation
 - *Optional input CA. Calibration / Perforation signal.*
- **Device Address:** Set the local address
 - **Factor settings:** 1
 - **Optional settings:** 1 - 99
- **Communication:** Set the communication rate
 - **Factor settings:** 9600
- **Restore Factory:** Enable the factory reset function
 - **Factor settings:** No
 - **Optional settings:** Yes / No
 - *Select "Yes," the system parameters restore factory settings*
- **Language Selection:** Set the display language
 - **Factory settings:** Chinese
 - **Optional settings:** Chinese / English
 - *Support Chinese / English display*

Floating Head Calibration

Select the floating head calibration. Press the Enter key. The system starts to automatically calibrate.

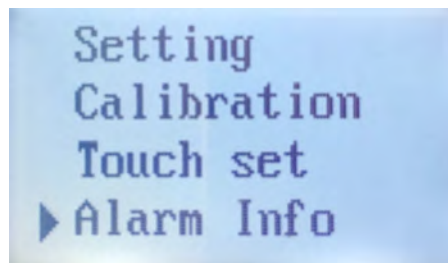
Touch Panel Settings

Select the touch panel set. Press OK key. Enter the setting interface; when floating head shift to plate press Enter after exposure setting. The current signal is set to signal touch plate.



Alarm Information

The alarm information mainly records the contents of the product alarm (as shown below).



Automatic Calibration and Follow-Up Control Function

FTC61 capacitance formed between the metal workpiece and the laser nozzle is measured by a dedicated integrated chip and a small capacitance measurement **AD** conversion circuit. Capacitance using the following formula to calculate the distance between the nozzle and the workpiece, thereby floating the Z-Axis real-time control, to ensure that the relative distance between the nozzle and the workpiece constant. The calculation formula is...

$$C = \frac{\epsilon S}{d}$$

where,

- **C**: Capacitance
- **ε**: Dielectric Constant
- **S**: Laser machining nozzle member and the metal alignment area
- **d**: The distance between the laser nozzle and the metal workpiece

FTC61 supports automatic calibration function and the process is quick and easy.

Distance Measurement and Signal Detection Function Parameter

- **Capacitance Detection Range**
 - 0.5pF ~ 1nF
- **Capacitance Detection Accuracy**
 - $\pm 0.01\text{pF}$
 - Related to the working environment
- **Distance Measurement Range**
 - 0.4mm ~ 5.0mm
 - The structure of the laser nozzle
- **Distance Measurement Accuracy**
 - 0.01mm
 - For stationary leveling workpieces
- **Sampling Frequency**
 - 2kHz
 - 2000 times per second
- **ADC Accuracy**
 - 12 bit
 - Detection range: 0V ~ 3.3V

Segmented Perforation Function

The perforation function is mainly used in the cutting of thick plates, which can effectively control the probability of bursting in the cutting process and improve the cutting quality.

FTC61 provides a way to "punch" signal input, all the way through the hole in the signal output. When the CNC system closes the perforation signal, the FTC61 controller controls the floating head to reach the perforation position (the height can be set) and begin perforation.

Input Signal Detection Function

For closer cooperation with the laser system, the FTC61 extends the 6-way dry contact signal input detection while completing the closed-loop control. It can be used for signal detection such as calibration (CA) / perforation (BH), follow (TR), move up (ZUP), move down (ZDN), upper limit (UL), and lower limit (LL).

Switch Signal Detection Parameters

- **Calibration (CA) / Perforation (BH):** Dry contact input signal, connected to valid
 - Enter the dry contact signal
 - **Calibration Signal ON:** Starts the floating head calibration.
 - **Punching Signal ON:** Start punching
 - **Break:** Stop perforation.
 - This signal needs to be turned on before the following signal
- **Follow (TR):** Dry contact input signal, connected to valid
 - When there is a follower signal, control the cutting head to reach the following height. Disconnect stops and returns to the wait bit.
- **Movable Point (ZUP):** Dry contact input signal, connected to valid
 - The signal is turned on and the system controls the cutting head to lift.
- **Jogging Lower (ZDN):** Dry contact input signal, connected to valid
 - The signal is turned on and the system controls the cutting head to drop.
- **Upper Limit (UL):** Dry contact input signal, connected to valid
 - When the upper limit signal is inputted, the display "upper limit" indicator light is on and the cutting head stops moving upward and can be moved down or reset by manual operation to separate the cutting head from the upper limit.
- **Lower Limit (LL):** Dry contact input signal, connected to valid
 - When the lower limit signal is inputted, the display "lower limit" prompt is on and the "hard limit alarm" is displayed. At the same time, the alarm output port K1 and COM are connected. The user can customize the alarm output port K1 COM to connect with a CNC system.

Abnormal Alarm Protection Function

FTC61 controller failure may occur during the actual work of both sound alarm and prompt protection measures, can effectively prevent the misuse harm to staff and equipment. Mainly include: upper limit alarm, lower limit alarm, soft lower limit alarm, collision board alarm, dropped alarm.

Alarm List

- **Hard Lower Limit Alarm**
 - **Triggering conditions:** Z-Axis touch travel limit switches
 - **Release Method:** Control the cutting head to move up to the normal mechanical displacement range
- **Touch Board Alarm**
 - **Triggering conditions:** (1) Metal sheet (or body) collision cutting head duration exceeds the set value. (2) The signal transmission line is not connected to the control box.
 - **Release Method:** (1) The system is in the waiting state position **three** seconds after the alarm disappears. (2) Acknowledgment signal transmission line control box, connected between the amplifier correctly.
- **Signal change is small**
 - **Triggering conditions:** The amount of signal change during calibration is too small (less than 200).
 - **Release Method:** Check the ground condition is good, to ensure that the amplifier, capacitor sensor nozzle connection fastening.

Observe All Safety Precautions

To ensure the safety of the person and the equipment, please follow the instructions on the equipment and all the safety precautions described in the manual when operating and maintaining the equipment. The "Safety Warnings," "Cautions" and "Descriptions" matter in the manual do not represent all the safety matters that should be followed and only as a supplement to all safety precautions.

Comply with Local Regulations and Regulations

When operating the equipment, observe local regulations and specifications.

Personnel Requirements

Personnel responsible for the maintenance and operation of the equipment must be read and operated with the necessary information and safety precautions before operating and maintaining the equipment.

Daily Maintenance

- Regularly check the coaxial cable connection (for tightness) between the capacitive sensing element (nozzle) and the FTC. If it's loosen or not tight, it should be tighten, otherwise it will affect the measurement results.
- Regularly check the capacitance sensor (nozzle) oxidation and wear. Severe oxidation or wear should be replaced promptly, otherwise it will affect the measurement results.
- Regularly check the status of the FTC indicator. If the ALM light is lit, it indicates that the FTC part has failed.
- Regularly do the floating head calibration once a day.

Troubleshooting

- **Problem:** The motor is running but the drive structure does not move.
 - **Possible Causes:** The connection between the motor and the drive structure is loose.
 - **Approach:** Check the connection between the motor and the drive structure after the system is powered down.

- **Problem:** The cutting head runs in the opposite direction to normal logic.
 - **Possible Causes:** The direction of the control signal DIR signal is reversed or a signal is not connected firmly. Between the motor and the drive AB.
 - **Approach:** After the system is powered down, adjust the connection between the motor and the drive.

- **Problem:** The system can not control the cutting head to follow the specified height after entering the normal working condition.
 - **Possible Causes:** The system does not detect a follow-up signal.
 - **Approach:** Check whether the laser switch signal output of the laser system is normal. Is this signal properly connected to the FTC port?

- **Problem:** After the system has entered the normal working condition, close the follower signal (TR), cut the head up, or shake up and down.
 - **Possible Causes:** (1) The capacitor signal line connection loose. (2) The motor driver line is loose. (3) The signal strength has abnormal changes. (4) The workpiece is in poor contact with the amplifier housing.
 - **Approach:** Check if the connection between the capacitor signal cable and the cutting head is loose. Check whether the connection between the capacitor signal cable and the preamplifier is loose. Check whether the motor driver cable is loose and the resistance of the workpiece and the amplifier shell should be less than 2 ohms. If the signal strength changes abnormally, please re-calibrate.

- **Problem:** The system follows the height deviation from the set value too far.
 - **Possible Causes:** The screw pitch / per revolution is not the same as the actual value.
 - **Approach:** Set the screw pitch / per revolution to the actual value setting.

- **Problem:** Cutting head in the follow-up height up and down the shock.
 - **Possible Causes:** (1) FTC and metal processing parts bad grounding. (2) Nozzle and metal parts short circuit. (3) The nozzle and the FTC coaxial cable connection loosening. (4) Follow the tolerance set too small.
 - **Approach:** (1) Check whether the FTC grounding point with the metal processing parts connected well. (2) Check the capacitance sensor (nozzle) is short with metal parts (3) Check the capacitance sensor (nozzle) and the FTC coaxial cable is connected between the fastening. (4) Will be set to follow the tolerance.

- **Problem:** The cutting head has overshoot before being followed.
 - **Possible Causes:** (1) The motor rigidity is insufficient. (2) The motor speed is too fast.
 - **Approach:** (1) Adjust the motor drive rigidity or current. (2) Reduce the speed stalls

Troubleshooting (cont.)

- **Problem:** When the floating head is calibrated, it indicates that the sensor has failed
 - **Possible Causes:** (1) The signal transmission line / capacitor radio frequency line bad. (2) Ceramic ring contact bad. (3) The front amplifier is damaged.
 - **Approach:** (1) Replace the signal transmission line / capacitor radio frequency line after re-calibration. (2) Re-install the ceramic ring. To ensure that the nozzle and the ceramic ring connected closely (measuring capacitance signal line and copper nozzle resistance should be less than 10 ohms and stable resistance without fluctuations). (3) Replace the preamplifier re-calibration.

- **Problem:** Floating head calibration failed
 - **Possible Causes:** The Z-Axis is at the upper limit
 - **Approach:** Re-calibrated from the upper limit

- **Problem:** Floating head is displayed as "Poor"
 - **Possible Causes:** (1) FTC and metal processing parts bad grounding. (2) Other inductive load interference
 - **Approach:** Check the equipment grounding. (2) Stay as far away as possible from large inductive loads, such as a high-power motor, high-power air conditioning, etc.

- **Problem:** The touch panel signal is not detected.
 - **Possible Causes:** Floating head and the workpiece is not grounded, or poor grounding. Ceramic ring contact is bad.
 - **Approach:** Check the grounding conditions of each part (measuring capacitance signal line and copper nozzle resistance should be less than 10 ohms and stable resistance without fluctuations).

- **Problem:** Close the "COM" and "TR" after the cutting head does not follow the action.
 - **Possible Causes:** (1) Bad contacts with "COM" and "TR." (2) "Running Status" shows "Emergency Stop." (3) The motor driver alarm or line contact is bad.
 - **Approach:** (1) Check whether the switch is normal or does not have a bad contact. (2) Press the FTC61 "Reset" button to cancel the alarm.