titancontrollers

Instruction Manual

TITAN X

1000A Peak IP65 Rated

Titan Controller
User Instruction Manual

High-performance Universal FOC Motor Controller

The Field-Oriented Control (FOC) power system delivers high electrical output.

Improper use can cause severe personal injury, death, or equipment damage.

WARNING:

- **Carefully read this entire manual BEFORE installing or operating the controller!**
- **Strictly follow all safety instructions and operating procedures.**
- **Titancontrollers assumes no responsibility for injury, damage, or loss resulting from failure to follow these instructions or product misuse.**
- **Hardware and software versions, as well as product appearance, may vary across different batches.**
- **This product is strictly prohibited for use in modified electric vehicles on public roads.**
- **Please comply with local laws and regulations!**

Installation Process

1. Wiring instruction and pin function definition

(1) Power Supply and Motor Wiring

U/V/W: motor phase wires (Arbitrary wiring)

B+: battery positive B-: battery negative

(2) Functional wires

Wire Diagram Functionality

1. LCD-TXD: Controller UART transmit data to the LCD screen. (Titan LCD Only)
2. LCD-RXD: Controller UART receive data from the LCD screen. (The signal level is inverted)
3. LCD 12Vpower supply: (Titan LCD Only)
4. Ground wire.
5. B+: Battery positive voltage signal. Note: This port is signal-only and cannot supply current. It is used solely to trigger the throttle switch.
6. Knob signal: 5V input for the wheelie control knob. Used to switch wheelie mode on/off and adjust the wheelie angle range.
7. Ignition Switch: Connect to either controller Pin 5 or B+. Supplies power to the controller. Input voltage range: 40V ~ 135V.
8. Aircraft/ Encoder PWM: Motor encoder PWM signal or Model aircraft electric tuning signal port.
9. P Mode Input: To activate this function, release the throttle, press this button (yellow button), short press for kinetic energy recovery, long press to switch to P gear.
10. Ground wire.
11. Hall/Encoder A: No.11 to No.15 are motor Hall/encoder port.
12. Hall/Encoder B: No.11 to No.15 are motor Hall/encoder port.
13. Hall/Encoder Z: No.11 to No.15 are motor hall/encoder port.
14. Temperature input signal wire
15. Hall/Encoder 5V power supply: 5V supply with a maximum current of no more than 50mA.
16. Fan PWN Signal

17-18 Reserved

19. Brake signal wire: if high brake is set, 12V is effective; if low brake is set, grounding is effective, and it is forbidden to exceed 15V.
20. Ground wire.
21. Low gear switch: low gear or downshift operation.
22. High gear switch: high gear or upshift operation.
23. Ground wire.
24. L-Brake Signal wire: Connects to E-brake lever. Input voltage range: 0-5V.
25. L-Brake 5V Power: 5V power supply for the E-brake lever. Maximum current: 50mA.
26. Ground wire.
27. Throttle signal wire: Controls motor speed or torque. Input voltage range: 0–5V.
28. Throttle 5V power: 5V power supply for the throttle grip. Maximum current: 50mA.
29. Ground wire.
30. Reverse signal wire: After the motor fully stops, long-press this line to switch to Reverse Mode.

Wire Harness Definition

LCD

- TXD
- RXD
- Power Supply
- Ground Wire

Speed Control Signal

- Fan PWM

Ignition Switch

- B+
- Ignition

Brake Signal

- Brake cutoff Signal
- Ground Wire

Switch-Left

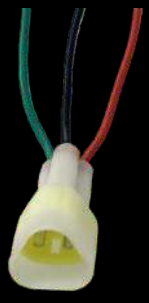
- Wheelie knob Signal
- Reverse
- E-Brake signal
- 5V
- Ground wire

Hall Encoder

- Encoder A
- Encoder B
- Encoder Z
- Encoder PWM
- Encoder Temp
- Encoder power Supply Ground wire

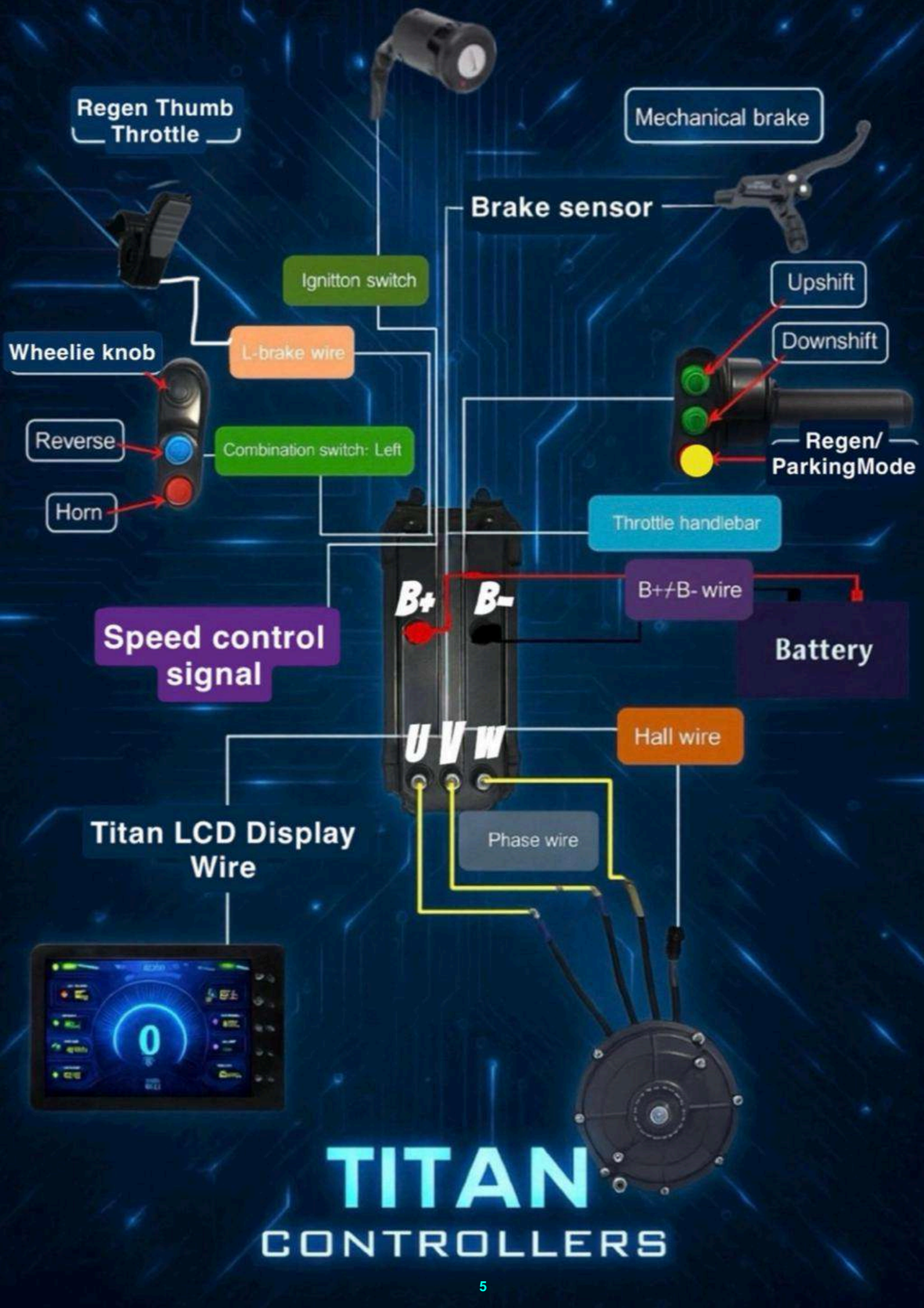
Switch-Right

- Regen/P gear
- Low gear
- High gear
- Ground wire



Throttle Lever

- Throttle
- Signal 5V
- Ground wire


Regen Thumb Throttle
Mechanical brake
Brake sensor
Ignitton switch
Upshift
Downshift
Wheelie knob
L-brake wire
Reverse
Combination switch: Left
Regen/ ParkingMode
Horn
Throttle handlebar
B+
B-
B+/B- wire
Speed control signal
Battery
U V W
Hall wire
Titan LCD Display Wire
Phase wire
TITAN
CONTROLLERS

Important Notes

1.RC/Encoder PWM： If using RC model PWM signals, encoder input is not supported. You can only choose either encoder PWM or RC PWM, not both at the same time.

2.L-brake Lever： If L-brake is required, we recommend you use our L-brake lever, which can partially replace the mechanical rear brake.

3.PWM Speed Control: The system will automatically adjust fan speed based on controller temperature to balance noise and cooling performance.

4.TITAN LCD: When installing the controller for the first time, you must use the TITAN LCD for parameter setup. After initial configuration, the controller can operate without the display.

5.Ignition input: Wire 5 is B+, and connecting it to wire 7 will power on the controller system.

6.All function wiring should be performed under professional guidance to prevent incorrect connections that may lead to system failure.

7.Max phase current: Do not exceed the motor's saturation current. Excessive phase current can cause magnetic saturation, which manifests as jerky or noisy operation under heavy load or sudden acceleration. Bus current should typically not exceed 0.8times the phase current, and actual limits depend on motor characteristics.

8.The controller housing is conductive metal. Take extra care during wiring to ensure the copper terminal lugs do not contact the metal casing.

9.Before the motor self-learning, the motor or rear wheel must be suspended to ensure that the motor is in a free rotating state.

10.For encoder motors, check whether your encoder supports 5V input. Different encoder types may require different supply voltages.

11.Keep the controller away from any magnetic objects. Strong magnetic fields may interfere with controller operation.

12.When using regenerative braking or L-braking, set the max operating voltage and regen current correctly. The controller’s max regen current must not exceed the BMS’s charging current limit.

13.Please refer to the detailed description inside the LCD screen for the function of various parameters. Setting incorrect parameters may lead to abnormal operation.

14.If the battery suddenly shuts down under low voltage, you should raise the minimum battery voltage, typically recommended at 3.2V per cell.

15.When using a hub motor with L-brake or regen, ensure the motor axle is securely clamped using an interference-fit anti-rotation plate to prevent looseness.

16.Do not charge the battery to over voltage protection, once the battery is protected and use the kinetic energy recovery function will cause the controller over voltage.

17. If you want to change the rotation direction of the motor, you can set the reverse and restart, then the motor will do self-learning

Controller Protection Instructions

1. The controller's zero-speed start current is limited to 75% ofthe peak phase current—for example, a 1000A controller can output up to 750A during startup—and if the stall current cannot meet the required phase current, a controller with a higher peak current should be selected.

2. When the controller remains in a stall condition for an extended period, it will gradually reduce the output current. After several seconds, the current may drop to as low as 40%.Do not keep the controller in a stalled state for a long time.

3. When the controller temperature exceeds 45°C, it will start to reduce current linearly:

- At 75°C → current reduced to 80%
- Above 75°C → rapid current reduction
- At 87°C → a hardware overheat fault is triggered and output is shut down

The controller's sustained output power depends on effective heat dissipation.

4. Over voltage protection fault and low voltage protection fault are triggered when the set value of 4V is exceeded.
It usually does not happen. If it happens, please check whether there is a problem with the battery, such as the battery suddenly shuts down charging or discharging.

5. All signal wires, including 5V and 12V outputs, are equipped with protection circuits.

Brief contact
with high voltage (up to 150V) will not cause damage. However, prolonged or repeated contact with high voltage is not covered under warranty and may lead to signal line failure.

6. The 72V controller supports an actual input voltage range of 40V–90V. The 120V version controller supports 40V–137V.

Please be aware of the difference between nominal and actual battery voltages.
For example, a 21S battery has a nominal voltage of 77V, but a maximum voltage of 88.2V.

Do not exceed the controller’s rated voltage range at any time, whether at the lowest or highest battery voltage

Motor Self-Learning

Note: this procedure must be followed during first-time setup!

1.After connecting allwiring, carefully double-checkthat all connections are correct.Thenpower onthe controller
andturn onthe ignition switch.

2:On the display, change tothe “option” interface.Modify parameters according to the following instructions.

- Motor rated current: Set an appropriate value based on your motor. A typical default is 200A. If the value is too low, the self-learning process may fail.

- Minimum battery voltage: according to the battery voltage, generally recommended as 3.2* battery series number.

- Maximum battery voltage: according to the battery voltage, generally recommended as 4.2* battery series.

- Brake signal level: Select high brake for active-high braking signal. Select low brake for active-low braking signal. If not connected, select disable

- Motor sensor: Hall motor selects the Hall mode, encoder motor selects the encoder mode. Long-press the M button to save all modified parameters. The system will automatically restart.

- Make sure the motor is in a floating, free-spinning state (e.g., for scooters, place the vehicle on its center stand).

- Switch to self-learning interface, and long press M button for motor self-learning.

- If motor identification fails, check the wiring and parameter settings. If the LCD shows "Motor

- Identification Successful", press M. The LCD will automatically restart and proceed to the next
- step.

- After restarting, press M, switch to the Real-time data display and confirm that the data shown is normal.

- Check all signal inputs, such as L-brake, throttle, and other connected wires.

- Observe the data on display. Press buttons and test inputs to ensure proper response.

- Gently twist the throttle to confirm that the motor spins normally. If abnormal, check the wiring and settings again.

Once the above steps are completed, the controller is successfully installed and ready for normal use. You may adjust other parameters as needed.

3. Torque Mode is recommended for scooters. Speed Mode is recommended for off-road vehicles. The throttle response and feel will differ depending on the selected mode.

Wheelie Mode Tuning Instructions

The gyroscope is built in the controller, and there are requirements for the installation position of the controller.

Incorrect installation will result in wheelie mode not functioning properly.

- The TITAN logo must face upward, and the front ofthe logo must point toward the bike's front.
- Do not mount the controller with the TITAN logo facing sideways toward the side of the bike!

1. Wheelie Mode Requires LCD + Wheelie Knob

- The wheelie function requires both the TITAN LCD and the wheelie knob.
- Reason: Only the official TITAN display shows the real-time gyroscope status. If the gyroscope is not functioning properly, the system cannot control wheelie angle accurately.
- The knob adjusts the wheelie angle, and the steady-state wheelie angle differs at different speeds.
- For safety, wheelie mode is only enabled when both accessories are detected.

2. BMS Charge Current Requirements

- The BMS charge current limit must be set above 200A, make sure the current does not exceed the maximum current allowed by the battery's protection board.
- The TITAN controller's "battery charge current" must be: less than the BMS charge current limit but bigger than 200A
- This two current is used only when the wheelie angle exceeds the balance point, and the motor applies braking to maintain equilibrium. It is a short burst and will not harm the battery.

3. Maximum Battery Voltage

- The "Maximum Battery Voltage" setting must match the BMS's maximum voltage limit.
- The regenerative braking system limits the bus voltage based on this setting.
- Incorrect configuration may trigger BMS cut-off protection, causing risk during riding.

4. Battery Full — Wheelie Mode Disabled

- If the battery is fully charged, wheelie mode cannot be activated.
- The battery voltage must drop at least 3V before activation.
- Reason: Regenerative braking is not possible at full charge. If the wheelie angle exceeds balance point, the braking force may be insufficient, leading to unstable or failed wheelies.

5. Wheelie Current Setting

500A is recommended for e-bike, and a larger current is required for pedal electric motor. This is used to maintain the stability of the wheelie angle. It is recommended to open 1000A for pedal, but it should be selected according to the specifications of the motor, and too high current will lead to abnormal motor.

6. Wheelie Direction Selection & CTRLAngle-0°

- After completing the above setup, go to the Wheelie Direction Selection setting, choose direction
- to verify. Then long-press the "M" button to restart. Use the kickstand to keep the bike still.
- After restarting, perform CTRLAngle-0° by long-pressing the "M" button again.
- Once restarted, the display will show 0 degrees

Tilt the bike left/right to verify ifthe angle is correct.(Angle variation should remain within 10)

- Next, lift the bike forward/backward by at least 15 cm (or ensure the front wheel is 15 cm higher than the rear wheel). The angle on the display should be positive and increasing.
- If the results do not meet the above certification standards, then:
- Re-enter the wheelie direction interface
- Select other direction,long press M restart
- Repeat this test process until the angle readings are correct.

7. Wheelie Current Setting

This current is used to maintain the wheelie balance angle.To determine the correct value:While stationary, quickly twist the throttle and observe the current at which the front wheel lifts off the ground—set this value as your Wheelie Power Current.

8. Minimum and Maximum Wheelie Angle

- You can set Minimum/maximum Wheelie Angle by yourself
- The wheelie knob adjusts the actual angle within this range based on its rotation percentage.
- Just twist the throttle normally to enter and maintain a wheelie. The throttle still can work freely and independently.

9. Wheelie Knob (quick access to wheelie)

- Once the knob is connected, rotating it upward in any interface will directly enter the wheelie mode
- To enter Assist Mode(for experienced riders)

Quickly toggle the wheelie knob back and forth to the top position within three seconds to enter Wheelie Assist Mode.

The assist mode is an anti-wheelie mode with minimal controller intervention.
If you have followed all the above steps and still cannot successfully configure wheelie mode, please contact our authorized dealer.

Critical Fault Troubleshooting

Common Faults & Solutions:

1: Short circuit protection: check whether the phase wire is short circuit to the metal housing, or the motor is short circuit.

2: Motor over temperature: The motor has overheated, or check whether the temperature sensor type setting is correct.

3: Over voltage protection: Check whether the BMS has disabled charging, or if the maximum battery voltage parameter is set correctly.

4: Under voltage protection: Inspect whether the battery power supply is functioning properly.

5: Controller over temperature: maybe controller is under excessive load, make sure proper cooling and heat dissipation.

6: Controller fault: You can try to restart or OTA upgrade the firmware. If it still doesn't work, you need to return to the factory for maintenance.

7: Motor saturation: if the motor magnetic field is saturated, the phase current needs to be reduced (retained).

8: Over current protection: check whether the phase current exceeds the motor saturation current.

9: Throttle fault: Check the throttle wiring and confirm ifthe connector is loose or damaged.

10: Phase wire short circuit: If this error appears immediately after powering on, it likely means a MOSFET is damaged or a phase wire is shorted. You need to return to the factory for maintenance.

Sensor Faults & Solutions:

1. Hall Sensor Fault: Check for loose connections, broken wires, or incorrect pinout on the Hall sensor interface or re-running the motor self-learning process.

2.Encoder Fault: Inspect the encoder wiring for loose contacts, breaks, or incorrect connections.
If the issue does not fall into the above categories, switch to the Real-Time Data Display and analyze the parameters to locate the problem.

For example, in case of a Hall fault, try slowly rotating the motor by hand and observe if all three Hall signal voltages toggle correctly.

If Motor Speed or Power Output is Abnormally Low:

Check the following parameters carefully, as each can affect motor performance and output power:

- Motor temperature
- Battery voltage
- Gear level (High/Mid/Low)
- Throttle responsiveness
- Throttle input voltage
- Set phase current
- Bus current(battery discharge current)
- Controller temperature

Careful analysis of these data points will help identify the root cause ofreduced motor performance.

TITAN LCD Instructions

1. Brightness Adjustment: Except for the parameter settings interface, press the + or - buttons to adjust the brightness. There are a total of 4 brightness levels available.

2. Interface Switching-M: The M button can switch any interfaces. In the parameter settings, you can set the default startup interface. Long-press the M button also can save settings parameter. The settings will be automatically saved and applied after reboot.

3. Communication Issue Warning：If the interface stays on the startup screen for more than 5 seconds, it indicates a communication issue. Please check the wiring and connectors.

4. Controller Fault Handling：If you encounter a controller fault during use, first switch the LCD screen to the Real-Time Data Display interface. Analyze the problem through this interface. If the problem cannot be analyzed, contact the agent/dealer for handling.

5. IP68: TITAN LCD is fully waterproof, so it will not get wet even if it is washed by heavy rain, but the plug cannot be soaked in water.

6. All controller signal wires are protected against burning, but the TITAN LCD does not have burn protection. Incorrect wiring or exposure to high voltage is not covered under warranty.

7. The LCD screen wire harness has limited tensile strength. When installing on the bike, be cautious. Frequent turning of the handlebars may cause wire harness pulling or compression, leading to damage.

8. Long-press the M button can reset odometer.

LCD Screen Specifications

3.1 inch LCD screen, resolution 800*480, brightness 1200 Nits.
5.0 inch LCD screen, resolution 800*480, brightness 2000 Nits.
7.0 inch LCD screen, resolution 800*480, brightness 2500 Nits.

Controller Initial Wiring Precautions

1. Ensure the copper terminals are facing upward and check that motor and battery wires are undamaged to prevent sparking during bumps.

2. TITAN logo must face upward, the direction arrow must point toward the front of the bike, and the controller must be securely fixed.

3.All signal wire connections must be strong, and any damaged wires must be repaired by soldering.

4. Set the motor rated current between 150A and 250A, matching motors from 3000W to 25000W peak power.

5. The battery's minimum and maximum working voltages must be set according to the instructions to avoid danger.

6. Torque Cruise Mode requires a connected brake cutoff or electronic brake to ensure safe operation.

7. For mid-drive motors with Hall sensors, select and save the correct pole pairs before motor parameter identification.

8. After setting parameters, long-press the M key under motor rated current to save, reboot, and ensure the motor is unloaded (free-spinning).

9. Switch to the Real-Time Data Display and verify each connected button or control responds correctly.

10. If everything is normal, long-press M button under parameter Identification interface, and avoid any operation during identification.

11. If motor identification fails, check wiring or parameters; ifsuccessful, you can continue setup.

12. Adjust gear phase currents according to motor size—for example, around 600A for a 3000W motor and around 1600A for a 17000W motor.

13. A gear speed setting of 100% means no field weakening, and settings above 100% apply field weakening up to 200%.

14. If the drive mode is switched to speed mode, the throttle response for each gear should be initially set around 10, then gradually increased.

Wheelie Function Tuning Method

1. Controller Installation： Follow the installation requirements in Point 2 above. Ensure the motor is unloaded and able to spin freely (typically with the scooter placed on the center stand).

2. Battery charging current settings： The battery charge current limit must be set above 200A, make sure the current does not exceed the maximum current allowed by the battery's protection board.

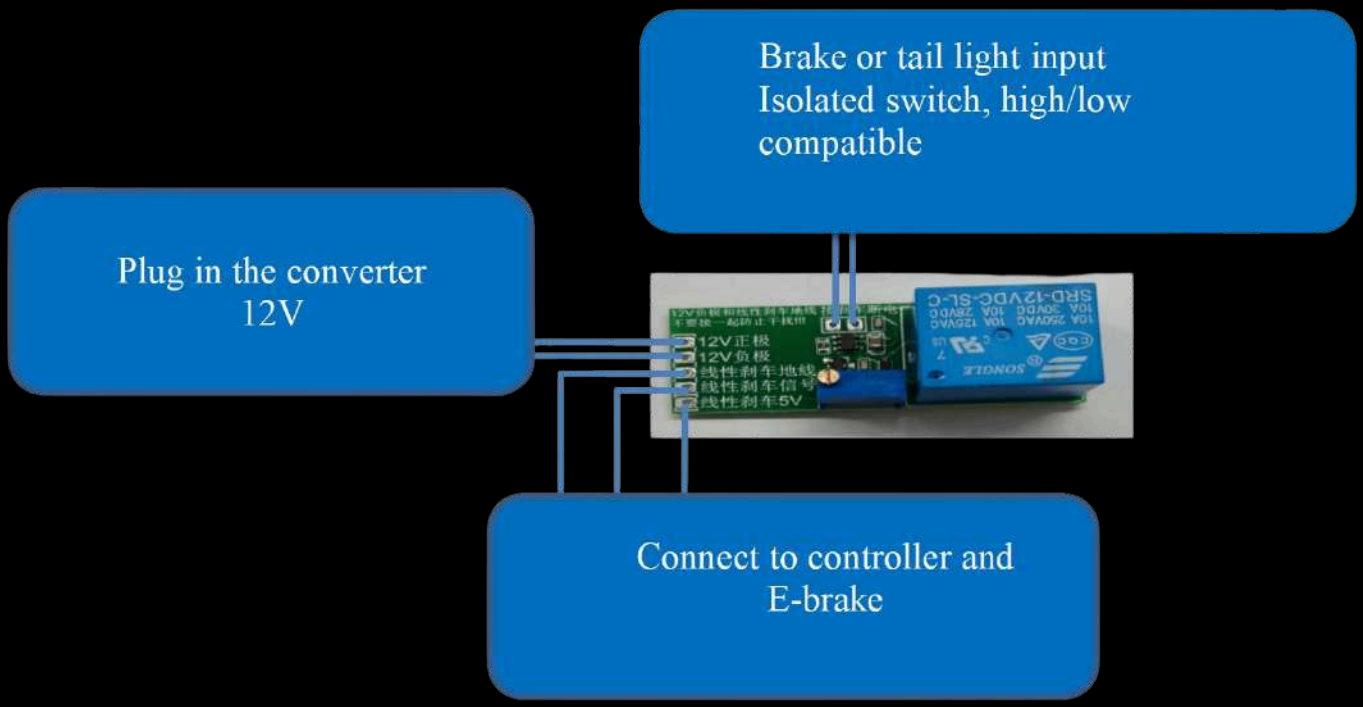
3. In the parameter settings menu, set the wheelie current to at least 500A for E-bikes and higher for scooters, but always below the motor's saturation current.

4. After reboot, select the correct wheelie direction by ensuring the TITAN logo faces upward, the arrow points toward the front, then long-press M to save while the bike is completely still.

5. After restarting, perform CTRLAngle-0 by long-pressing the "M" button again. Tilt the bike left/right to verify if the angle is correct.(Angle variation should remain within 10)
Next, lift the bike forward/backward by at least 15 cm (or ensure the front wheel is 15 cm higher than the rear wheel). The angle on the display should be positive and increasing.

6. If the results do not meet the above certification standards, then:Re-enter the wheelie direction interface, Select other direction,long press M restart, Repeat this test process until the angle readings are correct.

Electronic brake taillight light up module wiring method



Technical Specifications

Model / Parameter	S801100	S120650	S1201500
Rated voltage	48V -80V	48V-120V	48V-120V
Rated power	Water 32kW / Air 16kW	Water 30kW / Air 15kW	Water 60kW /Air 30kW
Peak phase current	1100A	650A	1 500A
Continuous bus	450A (heat dissipation)	250A (heat dissipation)	500A(heat dissipation)
Peak power (10s)	80V * 770A= 61.6kW	120V * 453A= 54.3kW	120V * 1050A = 126.0kW
Dimensions	196mm * 98mm * 74mm	196mm * 98mm * 74mm	226mm * 169mm * 70mm
Weight	1 .7kg	1 .7kg	3.5kg
Power tubes	30 TOLL packages	30 TOLL packages	72 TOLL packages
SC current	±1400A, response time 5us	±900A, response time 5us	±2100A, response time 5us
Regen method	throttle recovery/ brake power-off recovery/linear electronic braking		
Max RPM	200,000 RPM (1 pair) 50,000 RPM (4 pairs) 12,500 RPM (16 pairs)		
Waterproof	10M water resistant, high pressure water gun protection		
Working temp	Normal operating temperature range-40℃~75℃ , over 75 ℃ quickly reduce the current		
Work efficiency	Typical value 99%, efficiency above 96% at peak power (test condition: 100% throttle)		
Motor compatibility	Accurate motor self-learning algorithm, one-click identification of parameters		
CTRL response time	Respond 1000 times per second with a delay of 1ms		

Technical Specifications - Models coming soon

Model / Parameter	S80650	S1201000	S1203000
Rated voltage	48V -80V	48V-120V	48V-120V
Rated power	Water 18kW / Air 9kW	Water 42kW / Air 21kW	Water 120kW / Air 60kW
Peak phase current	650A	1 000A	3000A
Continuous bus	250A (heat dissipation)	400A (dissipation related)	1000A (heat dissipation)
Peak power (10s)	80V * 455A= 36kW	120V * 700A= 84kW	120V * 2100A= 252kW
Dimensions	TBC	TBC	226mm * 316mm * 70mm
Weight	1 .5kg	2.8kg	7kg
Power tubes	20 TOLL packages	48 TOLL packages	144 TOLL packages
SC current	±1000A, response time 5us	±1500A, response time 5us	±4500A, response time 5us
Regen method	throttle recovery/ brake power-off recovery/ linear electronic braking		
Max RPM	200,000 RPM (1 pair) 50,000 RPM (4 pairs) 12,500 RPM (16 pairs)		
Waterproof	10M water resistant, high pressure water gun protection		
Working temp	Normal operating temperature range-40℃~75℃ , over 75 ℃ quickly reduce the current		
Work efficiency	Typical value 99%, efficiency above 96% at peak power (test condition: 100% throttle)		
Motor compatibility	Accurate motor self-learning algorithm, one-click identification of parameters		
CTRL response time	Respond 1000 times per second with a delay of 1ms		