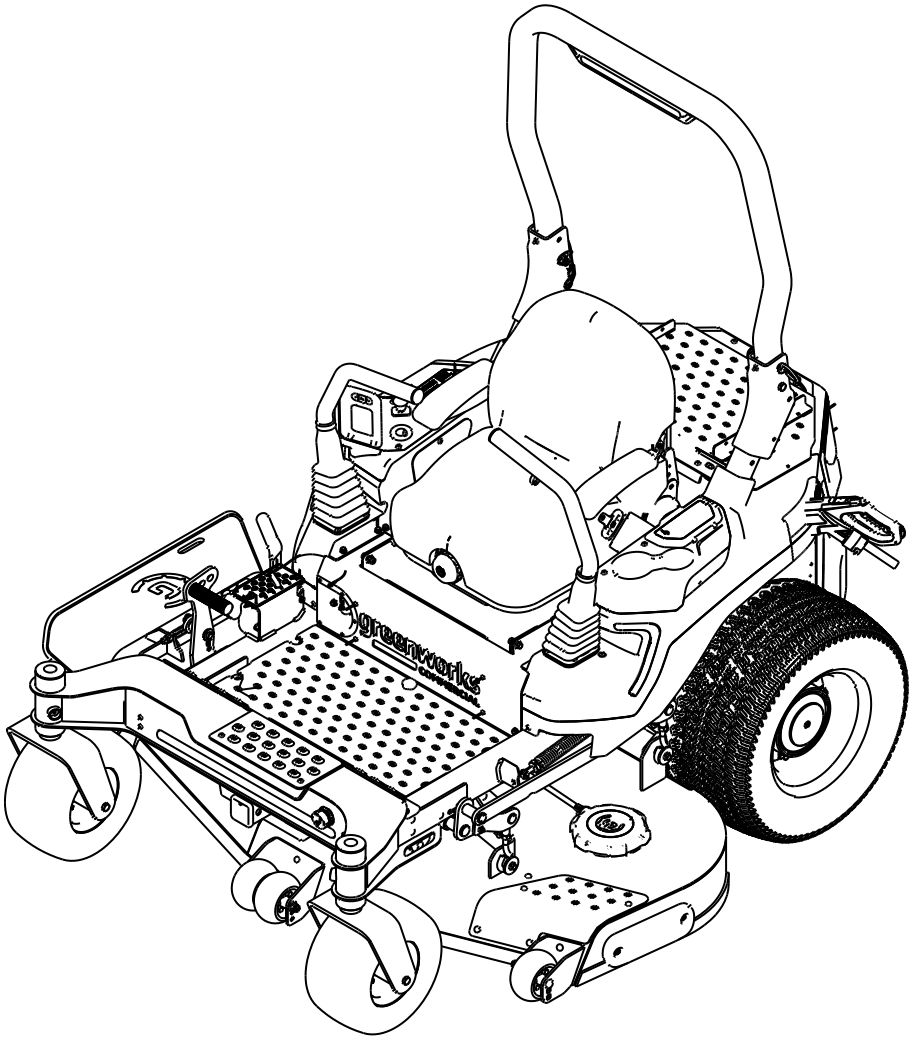
greenworks® COMMERCIAL

OZ960 / OZ952 / OZ948 / ZTC152

Service Manual



WARNING:

Undertaking repairs to gardening tools can be hazardous. Use correct tools and safety devices noted in the manual and obey all the instructions. Do not proceed until you are confident that you understand all steps and can complete the repair work. Some repairs must only be performed by a qualified technician.

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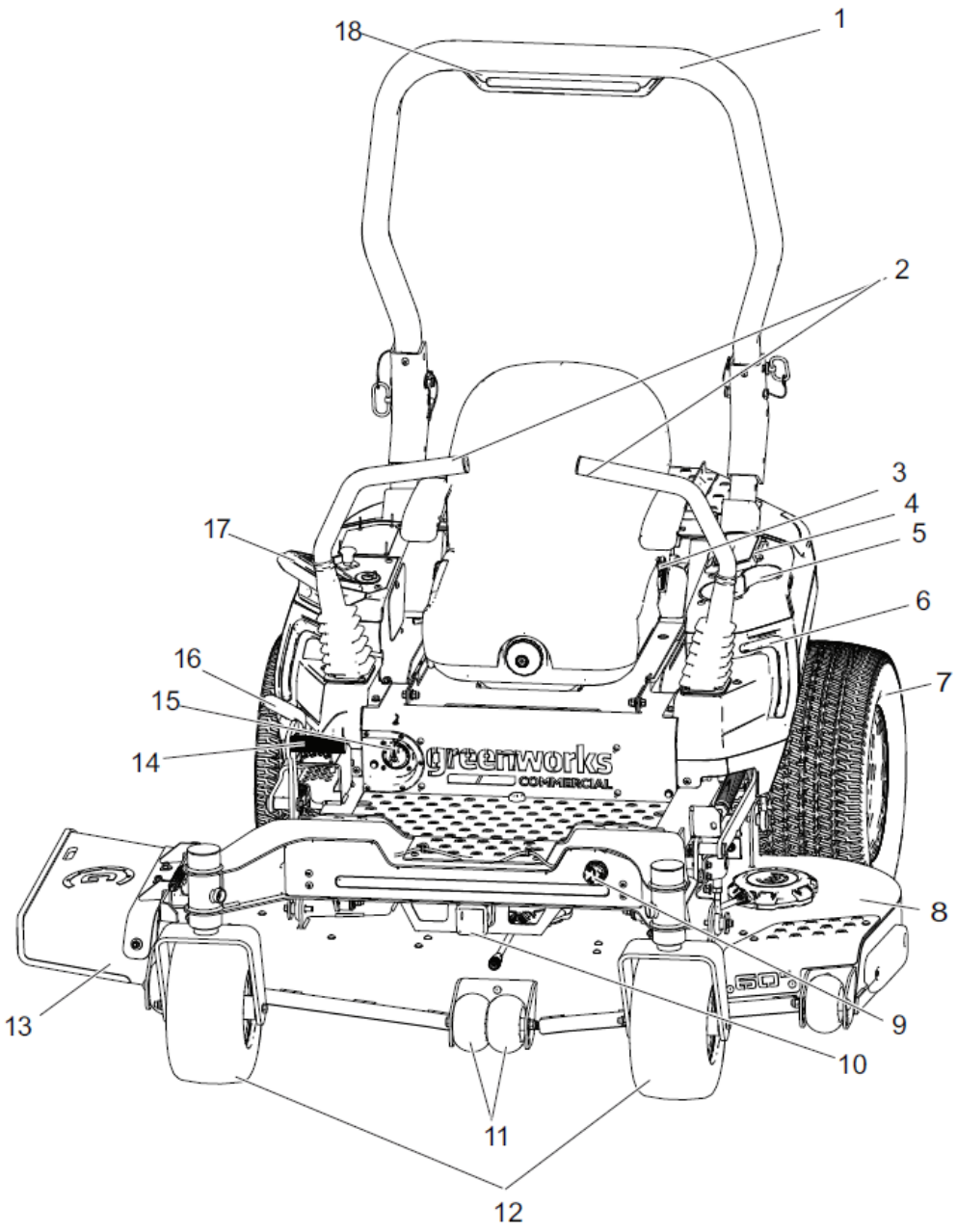
1. Component Location



1. ROPS (Roll Over Protective Structure)
2. Steering control levers
3. Safety belt
4. USB port
5. Cup holder
6. Waring light
7. Drive wheel
8. Deck
9. ETO socket
10. Attachment port
11. Anti-scalp wheels
12. Front wheels
13. Discharge chute
14. Foot pedal
15. Service switch
16. Height adjustment lever
17. Control panel
18. Warning light

1.1 Terminology

Abbr.	Full term
BMS	Battery Management System
CAN	Controller Area Network
CRC	Cyclic Redundancy Check
EMR	Emergency Reverse
ETO	Electrical Take Off
HPD	High Pedal Disable
HW	Hardware
LOS	Limited Operating Strategy
NMT	Network Management Transmission
NV	Non-Volatile
OS	Operating System
PC	Personal Computer
PDO	Process Data Object
PTO	PTO Switch
SW	Software
VCL	Vehicle Control Language
KSI	Key Switch Ignition

2. Maintenance Safety

2.1 Before Maintenance and Repair

1. Switch the power button to OFF.
2. Remove the key and store it in a safe place.
3. Turn the Contact Breaker Switch to the OFF (0) position.
4. Lift the seat and remove the battery cables (P+P-C+C-) from the battery. (Allow 30 seconds for the system to be de-energized).
   Note: It is recommended that you install a Lockout/Tagout device on the red cable (P+).
5. If performing maintenance on the 82V electrical system, confirm the system is de-energized by using a digital voltmeter reading DC (V) and placing the black test lead on the (B-) connection at the right wheel controller, and the red test lead on the (B+) connection at the main fuse to verify the absence of voltage.
6. Now that you have confirmed the system is de-energized, you can move forward with the maintenance and repair of the 82V electrical system.

2.2 Warnings

1. All disassembly, replacement, repair, and maintenance operations must be performed by professional technicians who have read this manual.
2. For the ease of quick disassembly and maintenance, you are advised to: before disassembly, put the machine in a suitable work area; prepare the necessary disassembly tools beforehand; remove the bolts in an appropriate order; put the disassembled parts in a clean work area.
3. In addition to obeying the conventional procedures for most repairing processes, there are some other special reminders:

- Before any maintenance work, turn the Contact Breaker Switch to the OFF (0) position, and if necessary, disconnect the main power supply of the mower.
- Do not put dangerous (flammable or explosive) items on the battery compartment.
- When replacing sharp and dangerous parts such as blades, protective gloves or other protective measures must be used.
- No operations shall be carried out before all the moving parts have come to a standstill.
- To avoid any personal injury or death, make sure that no one other than the maintenance technician is near the mower under repair or touches the mechanical parts by accident.

4. When replacing the left or right drive motor during the maintenance process, be sure to lift the rear wheels off the ground. Follow on motor self-learning guidelines defined in service manual and ensure that the self-learning process is successful.

   When replacing the left or right drive controller, you need to reflash these controllers' program first, then perform the drive motor self-learning process and ensure that the self-learning process is successful.

3. Winterize Maintenance

1. **Pressure wash mower with caution.**
   Wear proper PPE (Personal Protective Equipment) before service, such as safety glasses and gloves. Unplug the power cord from the outlet before starting any maintenance or cleaning to reduce risk of electric shock. Turn off and remove key fob before servicing or cleaning. Unexpected operation of the mower may result in serious personal injury.

   The best tool to clean battery/electrical compartment is vacuum cleaner. **DO NOT** spray battery/electronics compartment with water. Clean battery/electronics compartment with compressed air or blower if vacuum cleaner is not available. It is OK to pressure wash an electrical zero turn but requires caution:

- Avoid Electrical Components: Direct high-pressure water can damage electrical components, connectors, and wiring. Cover these parts or avoid spraying them directly.
- Use Low Pressure: If you need to clean the mower, use a low-pressure setting to reduce the risk of damage. It is safer to use a garden hose with a gentle spray and mild detergent for cleaning. Before cleaning the deck - raise the front of the machine and use jack stands to support the mower.
- Keep Distance: Maintain a safe distance between the pressure washer nozzle and the mower to prevent damage from the force of the water.
- Dry Thoroughly: Ensure the mower is thoroughly dried after washing to prevent any moisture-related issues with the electrical components.

2. **Remove internal dirt and debris manually first and then by vacuum (blowing is not recommended).**

3. **Check for loose or damaged mechanical components, tighten or replace as needed.** Especially bolts for blades and nuts for wheels. Follow torque guidelines defined in Service Manual.

4. **Check and adjust tire pressure.** Follow tire pressure guidelines defined in Operator Manual or Service Manual.

5. **Check, clean and test brakes .**

- Locate left and right electro-magnetic brakes on drivetrain. Check if there is any damage, loose, rust, dust, foreign material (for example rock get stuck in brake which may affect brake function). Remove foreign material and clean if necessary.
- Park the vehicle on flat ground, release both left and right brakes, push the vehicle to see whether it can be moved easily. The purpose of this test is to make sure vehicle can be moved in case of break down.
- Park the vehicle on 20^0 slope to see whether brake function is normal.
- Follow on electromagnetic brake release guidelines defines in service manual.

6. **Lubricate all pivot points. Use light oil or spray lubricant to lubricate the deck-lift pivots, platform pivots of stand-on mowers etc.**

7. **Sharpen or replace mower blades.**

8. **Adjust deck leveling and cutting height.**
   Follow on deck heigh adjustment guidelines defines in service manual.
9. **Touch up paint if needed.**

10. **Ensure all safety labels are in place, replace as needed.** Check dealer portal to find service parts information.

4. Electrical System

4.1 Errors

4.1.1 Error list

The CANBUS system takes actions to protect the user and the machine when it detects an issue. When it acts to turn off the vehicle or a component, it indicates that an error occurs and the error code is shown on the digital display. Each electrical error has a letter code followed by a number.

The first letter describes the system that caused the error:

Letter	Meaning
BMS	Battery Error Code
BC	Battery Charger Error Code
TR	Right Wheel Motor Controller Error Code
TL	Left Wheel Motor Controller Error Code
ML	Left Blade Motor Controller Error Code
MM	Middle Blade Motor Controller Error Code
MR	Right Blade Motor Controller Error Code
AT	Attachment Controller Error Code
DS	Display Screen Error Code

Most errors are quickly corrected by noting what caused the issue, restarting the machine (cycle key switch / ignition [KSI]) and changing how the operator uses the machine.

Use the chart below to find the solution for immediate fix during operation.

4.1.2 Error code

Table 1 Display Screen Error Code

Error Codes	Error	Immediate Fix Solution during Operation
DS 11	Display CAN Communication Abnormal	• Check that the contact breaker switch is set to “I” / ON. • Check if the CAN communication wire on the display or the right wheel motor controller is well connected. • Restart the mower. • If persistent, please refer to troubleshooting section for error code DS 11. • If error persists after completing the above Inspections, contact dealer for after-sales service.

Error Codes	Error	Immediate Fix Solution during Operation
DS 12	Right Wheel Controller CAN Communication Abnormal	• Please check the maintenance switch is set to “I” / ON condition. • Please check if the CAN wire on the display or the right wheel motor controller is well connected. • Please restart the vehicle. • If persistent, please refer to troubleshooting section for error code DS 12. • If error persists after completing the above Inspections, contact dealer for after-sales service.
DS 13	BMS CAN Communication Abnormal	• Please check if the CAN wire on the Battery is well connected. • If persistent, please refer to troubleshooting section for error code DS 13. • If error persists after completing the above Inspections, contact dealer for after-sales service.

Table 2 BMS Error Codes

Error Code	Error Type	Immediate Fix Solution during Operation
BMS 11	Battery Discharging Slight Overtemp	• Vehicle has been put into a state of reduced performance while cooling. Once temperature is back within standard range, the error will automatically clear and normal operation will resume. • If persistent, please refer to troubleshooting section for error code BMS 11. • If error persists after completing the above Inspections, contact dealer for after-sales service.
BMS 12	Battery Discharging Severe Overtemp	• Vehicle has been disabled while cooling. Once temperature is back within standard range, the vehicle can be restarted to clear the error and resume operation. • If persistent, please refer to troubleshooting section for error code BMS 12. • If error persists after completing the above Inspections, contact dealer for after-sales service.
BMS 13	Battery Discharging Slight Undertemp	• Vehicle has been put into a state of reduced performance while warming. Once temperature is back within standard range, the error will automatically clear and normal operation will resume. • If persistent, please refer to troubleshooting section for error code BMS 13. • If error persists after completing the above Inspections, contact dealer for after-sales service.
BMS 14	Battery Discharging Severe Undertemp	• Vehicle has been disabled while warming. • Warming can take up to 6 hours. • Once temperature is back within standard range, the vehicle can be restarted to clear the error and resume normal operation. • If persistent, please refer to troubleshooting section for error code BMS 14. • If error persists after completing the above Inspections, contact dealer for after-sales service.

Error Code	Error Type	Immediate Fix Solution during Operation
BMS 15	Battery Cells Slight Temperature Difference	• Vehicle has been put into a state of reduced performance while cell temperatures return to normal. Once temperature is back within standard range, the error will automatically clear and normal operation will resume. • If persistent, please refer to troubleshooting section for error code BMS 15. • If error persists after completing the above Inspections, contact dealer for after-sales service.
BMS 16	Battery Cells Severe Temperature Difference	• Vehicle has been disabled while cell temperatures return to normal. • This can take up to 6 hours. • Once temperature is back within standard range, the vehicle can be restarted to clear the error and resume operation. • If persistent, please refer to troubleshooting section for error code BMS 16. • If error persists after completing the above Inspections, contact dealer for after-sales service.
BMS 17	Battery Cells Slight Overvoltage	• Please stop charging. This action should correct and clear the error automatically. • If persistent, please refer to troubleshooting section for error code BMS 17. • If error persists after completing the above Inspections, contact dealer for after-sales service.
BMS 18	Battery Cells Severe Overvoltage	• Please stop charging. • If persistent, please refer to troubleshooting section for error code BMS 18. • If error persists after completing the above Inspections, contact dealer for after-sales service.
BMS 19	Battery Cells Slight Undervoltage	• Please stop using the mower and begin charging. • Once mower has been charged and cell voltage is within standard range, the error will automatically clear. The mower is put into a state of reduced performance while error is present. • If persistent, please refer to troubleshooting section for error code BMS 19. • If error persists after completing the above Inspections, contact dealer for after-sales service.
BMS 21	Battery Cells Severe Undervoltage	• Please stop using the vehicle and begin charging it. • If persistent, please refer to troubleshooting section for error code BMS 21. • If error persists after completing the above Inspections, contact dealer for after-sales service.
BMS 23	Insulation Resistance Severe Insufficient	• Please discontinue use of the vehicle. • If persistent, please refer to troubleshooting section for error code BMS 23. • If error persists after completing the above Inspections, contact dealer for after-sales service.
BMS 24	Battery Discharge Slight Overcurrent	• Vehicle has been put into a state of reduced performance while discharge current high. Attempt to reduce vehicle load. Once current is back within standard range, the error will automatically clear and normal operation will resume.

Error Code	Error Type	Immediate Fix Solution during Operation
		• If persistent, please refer to troubleshooting section for error code BMS 24. • If error persists after completing the above Inspections, contact dealer for after-sales service.
BMS 25	Battery Discharge Severe Overcurrent	• Vehicle has been disabled. Attempt to reduce vehicle load. Once discharge current is back within standard range, the vehicle can be restarted to clear the error and resume operation. • If persistent, please refer to troubleshooting section for error code BMS 25. • If error persists after completing the above Inspections, contact dealer for after-sales service.
BMS 26	Battery Cells Voltage Slight Difference	• Please charge vehicle. This action should correct and clear the error. • If persistent, please refer to troubleshooting section for error code BMS 26. • If error persists after completing the above Inspections, contact dealer for after-sales service.
BMS 27	Battery Cells Voltage Severe Difference	• Please discontinue use of the vehicle and begin charging. • If persistent, please refer to troubleshooting section for error code BMS 27. • If error persists after completing the above Inspections, contact dealer for after-sales service.
BMS 28	Battery Slight Overvoltage	• Please stop charging. This action should correct and clear the error automatically. Vehicle is put into a state of reduced performance while error is present. • If persistent, please refer to troubleshooting section for error code BMS 28. • If error persists after completing the above Inspections, contact dealer for after-sales service.
BMS 29	Battery Severe Overvoltage	• Please stop charging. • If persistent, please refer to troubleshooting section for error code BMS 29. • If error persists after completing the above Inspections, contact dealer for after-sales service.
BMS 31	Battery Slight Undervoltage	• Please charge vehicle. This action should correct and clear the error automatically. Vehicle has been put into a state of reduced performance while cell voltages are different. • If persistent, please refer to troubleshooting section for error code BMS 31. • If error persists after completing the above Inspections, contact dealer for after-sales service.
BMS 32	Battery Severe Undervoltage	• Please discontinue use of the vehicle, and begin charging. • If persistent, please refer to troubleshooting section for error code BMS 32. • If error persists after completing the above Inspections, contact dealer for after-sales service.
BMS 33	Battery Charging Slight Overtemp	• Charging performance reduced while temperature is high. Once temperature is within standard range error will automatically clear and normal charging operation will resume.

Error Code	Error Type	Immediate Fix Solution during Operation
		• If persistent, please refer to troubleshooting section for error code BMS 33. • If error persists after completing the above Inspections, contact dealer for after-sales service.
BMS 34	Battery Charging Severe Overtemp	• Please stop charging and allow unit to cool down. • If persistent, please refer to troubleshooting section for error code BMS 34. • If error persists after completing the above Inspections, contact dealer for after-sales service.
BMS 35	Charging Port Slight Overtemp	• Charging performance reduced while temperature is high. Once temperature is within standard range error will automatically clear and normal charging operation will resume. • If persistent, please refer to troubleshooting section for error code BMS 35. • If error persists after completing the above Inspections, contact dealer for after-sales service.
BMS 36	Charging Port Severe Overtemp	• Please stop charging and allow charge port to cool down. Check for any debris that may be in charging port or plug and clear if present. • If persistent, please refer to troubleshooting section for error code BMS 36. • If error persists after completing the above Inspections, contact dealer for after-sales service.
BMS 37	Discharging B+ Contactor Welded	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code BMS 37. • If error persists after completing the above Inspections, contact dealer for after-sales service.
BMS 38	Battery B- Contactor Welded	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code BMS 38. • If error persists after completing the above Inspections, contact dealer for after-sales service.
BMS 39	Battery Charging Contactor Welded	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code BMS 39. • If error persists after completing the above Inspections, contact dealer for after-sales service.
BMS 41	Battery Heater Contactor Welded	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code BMS 41. • If error persists after completing the above Inspections, contact dealer for after-sales service.
BMS 42	Battery Current Sensor Abnormal	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code BMS 42. • If error persists after completing the above Inspections, contact dealer for after-sales service.
BMS 43	Battery Sampling Chip Abnormal	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code BMS 43. • If error persists after completing the above Inspections, contact dealer for after-sales service.

Error Code	Error Type	Immediate Fix Solution during Operation
BMS 44	Battery Cell Open Circuit	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code BMS 44. • If error persists after completing the above Inspections, contact dealer for after-sales service.
BMS 45	Master and Slave chips Abnormal	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code BMS 45. • If error persists after completing the above Inspections, contact dealer for after-sales service.
BMS 47	Charger CAN Communication Timeout	• Please attempt to reinsert and ensure charging connector is fully seated. Ensure use of a known good charger. • If persistent, please refer to troubleshooting section for error code BMS 47. • If error persists after completing the above Inspections, contact dealer for after-sales service.
BMS 48	Battery Precharge Failed	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code BMS 48. • If error persists after completing the above Inspections, contact dealer for after-sales service.
BMS 49	Battery 12V Abnormal	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code BMS 49. • If error persists after completing the above Inspections, contact dealer for after-sales service.
BMS 51	Battery Heater Abnormal	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code BMS 51. • If error persists after completing the above Inspections, contact dealer for after-sales service.
BMS 52	Battery CC2 Detection Abnormal	• Please attempt to reinsert and ensure charging connector is fully seated. Ensure use of a known good charger. Check for any debris that may be in charging port or plug and clear if present. • If persistent, please refer to troubleshooting section for error code BMS 52. • If error persists after completing the above Inspections, contact dealer for after-sales service.
BMS 53	Battery B+ Contactor Coil Short	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code BMS 53. • If error persists after completing the above Inspections, contact dealer for after-sales service.
BMS 54	Battery B- Contactor Coil Short	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code BMS 54. • If error persists after completing the above Inspections, contact dealer for after-sales service.
BMS 55	Battery Precharge Contactor Coil Short	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code BMS 55. • If error persists after completing the above

Error Code	Error Type	Immediate Fix Solution during Operation
		Inspections, contact dealer for after-sales service.
BMS 56	Battery Charge Contactor Coil Short	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code BMS 56. • If error persists after completing the above Inspections, contact dealer for after-sales service.
BMS 57	Battery Heating Contactor Coil Short	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code BMS 57. • If error persists after completing the above Inspections, contact dealer for after-sales service.
BMS 58	Battery Continuous Discharge Overcurrent	• Vehicle has been put into a state of reduced performance while discharge current high. Attempt to reduce vehicle load. Once current is back within standard range, the error will automatically clear and normal operation will resume. • If persistent, please refer to troubleshooting section for error code BMS 58. • If error persists after completing the above Inspections, contact dealer for after-sales service.

Table 3 Battery Charger Error Codes

Error Code	Error Type	Immediate Fix Solution during Operation
BC 12	Input Power Overvoltage	• Please stop charging and restart charger. Ensure use of a known good charger. • If persistent, please refer to troubleshooting section for error code BC 12. • If error persists after completing the above Inspections, contact dealer for after-sales service.
BC 13	Output Undervoltage	• Please stop charging and restart charger. Ensure use of a known good charger. • If persistent, please refer to troubleshooting section for error code BC 13. • If error persists after completing the above Inspections, contact dealer for after-sales service.
BC 14	Output Overvoltage	• Please stop charging and restart charger. Ensure use of a known good charger. • If persistent, please refer to troubleshooting section for error code BC 14. • If error persists after completing the above Inspections, contact dealer for after-sales service.
BC 15	Output Overcurrent	• Please stop charging and restart charger. Ensure use of a known good charger. • If persistent, please refer to troubleshooting section for error code BC 15. • If error persists after completing the above Inspections, contact dealer for after-sales service.
BC 16	Charger Overtemp	• Charger performance reduced while temperature is high. Once temperature is within standard range error will automatically clear and normal charging operation will resume. • If persistent, please refer to troubleshooting section for error code BC 16.

Error Code	Error Type	Immediate Fix Solution during Operation
		• If error persists after completing the above Inspections, contact dealer for after-sales service.
BC 17	Output Short Circuit	• Please discontinue charging. Ensure use of a known good charger. • If persistent, please refer to troubleshooting section for error code BC 17. • If error persists after completing the above Inspections, contact dealer for after-sales service.
BC 18	Battery Output Reversed	• Please discontinue charging. Ensure use of a known good charger. • If persistent, please refer to troubleshooting section for error code BC 18. • If error persists after completing the above Inspections, contact dealer for after-sales service.
BC 19	No Battery Output Voltage	• Please attempt to reinsert and ensure charging connector is fully seated. Ensure use of a known good charger. Check for any debris that may be in charging port or plug and clear if present. • If persistent, please refer to troubleshooting section for error code BC 19. • If error persists after completing the above Inspections, contact dealer for after-sales service.
BC 21	Non-Load	• Please attempt to reinsert and ensure charging connector is fully seated. Ensure use of a known good charger. Check for any debris that may be in charging port or plug and clear if present. • If persistent, please refer to troubleshooting section for error code BC 21. • If error persists after completing the above Inspections, contact dealer for after-sales service.
BC 22	CAN Communication Abnormal	• Please attempt to reinsert and ensure charging connector is fully seated. Ensure use of a known good charger. Check for any debris that may be in charging port or plug and clear if present. If these actions for not correct the error, discontinue use of the vehicle and contact dealer for after-sales service.
BC 23	Internal Communication Abnormal	• Please attempt to reinsert and ensure charging connector is fully seated. Ensure use of a known good charger. Check for any debris that may be in charging port or plug and clear if present. If these actions for not correct the error, discontinue use of the vehicle and contact dealer for after-sales service.
BC 24	Charger CC1 Abnormal	• Please attempt to reinsert and ensure charging connector is fully seated. Ensure use of a known good charger. Check for any debris that may be in charging port or plug and clear if present. If these actions for not correct the error, discontinue use of the vehicle and contact dealer for after-sales service.

Table 4 Right Wheel Motor Controller Error Codes

Error Code	Error	Immediate Fix Solution during Operation
TR 12	Right Wheel Motor Controller Overcurrent	• Please restart vehicle and attempt to reduce load. Vehicle is disabled while error is present.

		• If persistent, please refer to troubleshooting section for error code TR 12. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TR 13	Right Wheel Motor Controller Current Sensor Abnormal	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code TR 13. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TR 14	Right Wheel Motor Controller Precharge Failed	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code TR 14. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TR 15	Right Wheel Motor Controller Severe Undertemp	• Please ensure ambiet temperature is above -40° F and restart vehicle. • If persistent, please refer to troubleshooting section for error code TR 15. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TR 16	Right Wheel Motor Controller Severe Overtemp	• Please allow motor controller to cool and restart vehicle. Attempt to reduce load on right wheel. • If persistent, please refer to troubleshooting section for error code TR 16. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TR 19	Right Wheel Motor Controller Speed Limit Supervision	• Right wheel speed is faster than vehicle max speed. Please restart vehicle and ensure vehicle is operating withing standard speed range. • If persistent, please refer to troubleshooting section for error code TR 19. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TR 1A	Right Wheel Motor Not Stopped	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code TR 1A. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TR 1D	Right Wheel Motor Controller Reset Rejected	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code TR1D. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TR 1E	Right Wheel Motor Short	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code TR 1E. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TR 22	Right Wheel Motor Controller Overtemp Cutback	• Vehicle has been put into a state of reduced performance while motor controller temperature high. Attempt to reduce vehicle load and allow controller to cool. Once temperature is back within standard range, restart the vehicle and normal operation will resume. • If persistent, please refer to troubleshooting section for error code TR 22. • If error persists after completing the above

		Inspections, contact dealer for after-sales service.
TR 25	Right Wheel Motor Controller Ext 5V Supply Failure	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code TR 25. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TR 26	Right Wheel Motor Controller Ext 12V Supply Failure	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code TR 26. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TR 28	Right Wheel Motor Slight Overtemp	• Vehicle has been put into a state of reduced performance while motor temperature high. Attempt to reduce vehicle load and allow motor to cool. Once temperature is back within standard range, restart the vehicle and normal operation will resume. • If persistent, please refer to troubleshooting section for error code TR 28. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TR 29	Right Wheel Motor Temperature Sensor Abnormal	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code TR 29. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TR 31	Main Contactor Coil Driver Short /Open	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code TR 31. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TR 36	Right Wheel Motor Sin/Cos Encoder Abnormal	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code TR36. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TR 37	Right Wheel Motor Phase Open	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code TR 37. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TR 38	Main Contactor Welded	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code TR 38. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TR 39	Main Contactor Did Not Close	• Please restart vehicle. If error persists, contact dealer for after-sales service and discontinue use of the vehicle. Vehicle is disabled while error is present.
TR 3A	Right Wheel Motor Controller Setup Needed	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code TR 3A. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TR 41	Right Throttle Wiper High	• Please check throttle connection and restart vehicle. If error persists, contact dealer for after-sales service

		and discontinue use of the vehicle. Vehicle is disabled while error is present.
TR 42	Right Throttle Input Abnormal	• Please check throttle connection and restart vehicle. • If persistent, please refer to troubleshooting section for error code TR 42. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TR 43	Right Pot2 Wiper High	• Please check throttle connection and restart vehicle. • If persistent, please refer to troubleshooting section for error code TR 43. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TR 46	Right Wheel Motor Controller NV Memory Failure	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code TR 46. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TR 51	Display CAN Communication Abnormal	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code TR 51. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TR 52	Left Wheel Motor Controller CAN Communication Abnormal	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code TR 52. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TR 53	Mower Initial State Detection Abnormal	• The right parking switch is not in parked position. Please return the right lever to the park position to enable operation. • The left parking switch is not in parked position. Please return the left lever to the park position to enable operation. • The PTO Switch (Blade Switch) is not in OFF position. Please ensure PTO switch is pressed into the off position. To enable operation. • Right side throttle lever is not in neutral position. Please ensure right throttle lever is in neutral position to enable operation. • Left side throttle lever is not in neutral position. Please ensure left throttle lever is in neutral position to enable operation. • If persistent, please refer to troubleshooting section for error code TR 53. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TR 55	BMS CAN Communication Abnormal	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code TR 55. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TR 56	Operator Presence Detection Abnormal	• The operator is not in the correct operating position. Please ensure you are in the correct operating position to resume operation.

		• Right side throttle lever is not in neutral position. Please ensure right throttle lever is in returned to park position to resume operation • Left side throttle lever is not in neutral position. Please ensure left throttle lever is in returned to park position to resume operation. • If persistent, please refer to troubleshooting section for error code TR 56. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TR 58	Right Blade Motor Controller CAN Communication Abnormal	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code TR 58. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TR 5A	Limp Home Mode Has Been Activated	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code TR 5A. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TR 5B	Right Parking Brake Manually Disengaged and Not Reset	• Detected right parking brake is not engaged. Please re-engage parking brake. • If persistent, please refer to troubleshooting section for error code TR 5B. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TR 61	GPS Module CAN Communication Abnormal	• Please restart vehicle. If error persists, contact dealer for after-sales service and discontinue use of the vehicle. Vehicle is disabled while error is present.
TR 63	Left Blade Motor Controller CAN Communication Abnormal	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code TR 63. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TR 64	Second Left Blade Motor Controller CAN Communication Abnormal	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code TR 64. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TR 65	Middle Blade Motor Controller CAN Communication Abnormal	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code TR 65. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TR 66	Second Right Blade Motor Controller CAN Communication Abnormal	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code TR 66. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TR 67	Blade Speed Exceeds Limit	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code TR 67. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TR 73	Right Wheel Motor Stall Detected	• Please restart vehicle and attempt to reduce load.

		• If persistent, please refer to troubleshooting section for error code TR 73. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TR 77	Right Wheel Motor Controller Supervision Abnormal	• Please restart vehicle. If error persists, contact dealer for after-sales service and discontinue use of the vehicle. Vehicle is disabled while error is present.
TR 79	Right Wheel Motor Controller Supervision Input Check	• Please restart vehicle. If error persists, contact dealer for after-sales service and discontinue use of the vehicle. Vehicle is disabled while error is present.
TR 83	Right Wheel Motor Controller Internal Hardware	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code TR 83. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TR 87	Right Wheel Motor Controller Motor Characterization Error	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code TR 87. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TR A1	Rear ETO Contactor Coil Driver Short/Open	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code TR A1. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TR A2	Right Wheel Motor Controller EM Brake Driver Short/Open	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code TR A2. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TR A3	Front ETO Contactor Coil Driver Short/Open	• Please check front ETO port and ensure it is free of debris and restart vehicle. • If persistent, please refer to troubleshooting section for error code TR A3. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TR A4	Auto power off Contactor Coil Driver Short/Open	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code TR A4. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TR A9	Right Wheel Motor Controller Coil Supply	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code TR A9. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TR B1	Right Wheel Motor Cortroller Analog 1 Out of Range	• Please check throttle connection and restart vehicle. If error persists, contact dealer for after-sales service and discontinue use of the vehicle. Vehicle is disabled while error is present.
TR D2	Right Wheel Motor Controller Phase PWM Mismatch	• Please restart vehicle and attempt to reduce load. Vehicle is disabled while error is present. • If persistent, please refer to troubleshooting section for error code TR D2. • If error persists after completing the above Inspections, contact dealer for after-sales service.

Table 5 Left Wheel Motor Controller Error Codes

Error Code	Error	Immediate Fix Solution during Operation
TL 12	Left Wheel Motor Controller Overcurrent	• Please restart vehicle and attempt to reduce load. Vehicle is disabled while error is present. • If persistent, please refer to troubleshooting section for error code TL 12. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TL 13	Left Wheel Motor Controller Current Sensor Abnormal	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code TL 13. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TL 14	Left Wheel Motor Controller Precharge Failed	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code TL 14. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TL 15	Left Wheel Motor Controller Severe Undertemp	• Please ensure ambient temperature is above -40° F and restart vehicle. • If persistent, please refer to troubleshooting section for error code TL 15. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TL 16	Left Wheel Motor Controller Severe Overtemp	• Please allow motor controller to cool and restart vehicle. Attempt to reduce load on left wheel. • If persistent, please refer to troubleshooting section for error code TL 16. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TL 19	Left Wheel Motor Controller Speed Limit Supervision	• Left wheel speed is faster than vehicle max speed. Please restart vehicle and ensure vehicle is operating withing standard speed range. • If persistent, please refer to troubleshooting section for error code TL 19. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TL 1A	Left Wheel Motor Not Stopped	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code TL 1A. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TL 1D	Left Wheel Motor Controller Reset Rejected	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code TL 1D. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TL 1E	Left Wheel Motor Short	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code TL 1E. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TL 22	Left Wheel Motor Controller Overtemp Cutback	• Vehicle has been put into a state of reduced performance while motor controller temperature high. Attempt to reduce vehicle load and allow controller to

Error Code	Error	Immediate Fix Solution during Operation
		cool. Once temperature is back within standard range, restart the vehicle and normal operation will resume. • If persistent, please refer to troubleshooting section for error code TL 22. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TL 25	Left Wheel Motor Controller Ext 5V Supply Failure	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code TL 25. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TL 26	Left Wheel Motor Controller Ext 12V Supply Failure	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code TL 26. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TL 28	Left Wheel Motor Slight Overtemp	• Vehicle has been put into a state of reduced performance while motor temperature high. Attempt to reduce vehicle load and allow motor to cool. Once temperature is back within standard range, restart the vehicle and normal operation will resume. • If persistent, please refer to troubleshooting section for error code TL 28. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TL 29	Left Wheel Motor Temperature Sensor Abnormal	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code TL 29. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TL 31	Main Contactor Coil Driver Short /Open	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code TL 31. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TL 36	Left Wheel Motor Sin/Cos Encoder Abnormal	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code TL 36. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TL 37	Left Wheel Motor Phase Open	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code TL 37. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TL 38	Main Contactor Welded	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code TL 38. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TL 39	Main Contactor Did Not Close	• Please restart vehicle. If error persists, contact dealer for after-sales service and discontinue use of the vehicle. Vehicle is disabled while error is present.

Error Code	Error	Immediate Fix Solution during Operation
TL 3A	Left Wheel Motor Controller Setup Needed	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code TL 3A. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TL 41	Left Throttle Wiper High	• Please check throttle connection and restart vehicle. If error persists, contact dealer for after-sales service and discontinue use of the vehicle. Vehicle is disabled while error is present.
TL 42	Left Throttle Input Abnormal	• Please check throttle connection and restart vehicle. • If persistent, please refer to troubleshooting section for error code TL 42. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TL 43	Left Pot2 Wiper High	• Please check throttle connection and restart vehicle. • If persistent, please refer to troubleshooting section for error code TL 43. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TL 46	Left Wheel Motor Controller NV Memory Failure	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code TL 46. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TL 52	Right Wheel Motor Controller CAN Communication Abnormal	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code TL 52. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TL 5A	Internal communication failure	• Please restart vehicle. If error persists, contact dealer for after-sales service and discontinue use of the vehicle. Vehicle is disabled while error is present.
TL 5B	Left Parking Brake Manually Disengaged and Not Reset	• Detected left parking brake is not engaged. Please re-engage parking brake. • If persistent, please refer to troubleshooting section for error code TL 5B. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TL 73	Left Wheel Motor Stall Detected	• Please restart vehicle and attempt to reduce load. • If persistent, please refer to troubleshooting section for error code TL 73. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TL 77	Left Wheel Motor Controller Supervision Abnormal	• Please restart vehicle. If error persists, contact dealer for after-sales service and discontinue use of the vehicle. Vehicle is disabled while error is present.
TL 79	Left Wheel Motor Controller Supervision Input Check	• Please restart vehicle. If error persists, contact dealer for after-sales service and discontinue use of the vehicle. Vehicle is disabled while error is present.
TL 83	Left Wheel Motor Controller Internal Hardware	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code TL 83. • If error persists after completing the above

Error Code	Error	Immediate Fix Solution during Operation
		Inspections, contact dealer for after-sales service.
TL 87	Left Wheel Motor Controller Motor Characterization Error	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code TL 87. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TL A2	Left Wheel Motor Controller EM Brake Driver Coil Short/Open	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code TL A2. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TL A3	Deck Linear Actuator Driver Coil Short/Open	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code TL A3. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TL A4	Deck Linear Actuator Driver Coil Short/Open	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code TL A4. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TL A9	Left Wheel Motor Controller Coil Supply	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code TL A9. • If error persists after completing the above Inspections, contact dealer for after-sales service.
TL B1	Left Wheel Motor Controller Analog 1 Out of Range	• Restart Vehicle. Make sure the wire of potentiometer is in good condition. • Replace a new potentiometer.
TL D2	Left Wheel Motor Controller Phase PWM Mismatch	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code TL D2. • If error persists after completing the above Inspections, contact dealer for after-sales service.

Table 6 Left Blade Motor Controller Error Codes

Error Code	Error	Immediate Fix Solution during Operation
ML 11	Left Blade Motor Controller Hardware Overvoltage or Overcurrent	• Please reduce the blade load and restart the vehicle. Check that blades are free of debris. Blades are disabled while error present. • If persistent, please refer to troubleshooting section for error code ML 11. • If error persists after completing the above Inspections, contact dealer for after-sales service.
ML 12	Left Blade Motor Controller Overcurrent	• Please reduce the blade load and restart PTO. Check that blades are free of debris. Blades are disabled while error present. • If persistent, please refer to troubleshooting section for error code ML 12. • If error persists after completing the above Inspections, contact dealer for after-sales service.
ML 13	Left Blade Motor Controller Overvoltage	• Please restart PTO to clear error. Blades are disabled while error present.

Error Code	Error	Immediate Fix Solution during Operation
		• If persistent, please refer to troubleshooting section for error code ML 13. • If error persists after completing the above Inspections, contact dealer for after-sales service.
ML 14	Left Blade Motor Controller Undervoltage	• Please restart PTO to clear error. Blades are disabled while error present. • If persistent, please refer to troubleshooting section for error code ML 14. • If error persists after completing the above Inspections, contact dealer for after-sales service.
ML 15	Current Parameter Mismatch Error	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code ML 15. • If error persists after completing the above Inspections, contact dealer for after-sales service.
ML 16	Left Blade Motor Phase Open	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code ML 16. • If error persists after completing the above Inspections, contact dealer for after-sales service.
ML 17	Left Blade Motor Controller Severe Overtemp	• Please reduce the blade load. Allow controller to cool and restart vehicle. Check that blades are free of debris. Blades are disabled until unit restart. • If persistent, please refer to troubleshooting section for error code ML 17. • If error persists after completing the above Inspections, contact dealer for after-sales service.
ML 18	Left Blade Motor Controller EEPROM Abnormal	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code ML 18. • If error persists after completing the above Inspections, contact dealer for after-sales service.
ML 21	Left Blade Motor Stall Detected	• Please reduce the blade load and restart the PTO. Check that blades are free of debris. Blades are disabled while error present. • If persistent, please refer to troubleshooting section for error code ML 21. • If error persists after completing the above Inspections, contact dealer for after-sales service.
ML 22	Left Blade Motor System Start Failure	• Please reduce the blade load and restart the PTO. Check that blades are free of debris. Blades are disabled while error present.
ML 23	Left Blade Motor Controller Precharge Failed	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code ML 23. • If error persists after completing the above Inspections, contact dealer for after-sales service.
ML 24	CAN Communication with Right Wheel Motor Controller Abnormal	• Please restart vehicle. If error persists, contact dealer for after-sales service and discontinue use of the vehicle. Blades are disabled while error is present.
ML 26	Left Blade Motor Controller MOSFET Abnormal	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code ML 26. • If error persists after completing the above

Error Code	Error	Immediate Fix Solution during Operation
		Inspections, contact dealer for after-sales service.
ML 27	Left Blade Motor Controller Temperature Sensor Abnormal	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code ML 27. • If error persists after completing the above Inspections, contact dealer for after-sales service.
ML 28	Left Blade Motor Controller Self-Check Abnormal	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code ML 28. • If error persists after completing the above Inspections, contact dealer for after-sales service.

Table 7 Middle Blade Motor Controller Error Codes

Error Code	Error	Immediate Fix Solution during Operation
MM 11	Middle Blade Motor Controller Hardware Overvoltage or Overcurrent	• Please reduce the blade load and restart the vehicle. Check that blades are free of debris. Blades are disabled while error present. • If persistent, please refer to troubleshooting section for error code MM 11. • If error persists after completing the above Inspections, contact dealer for after-sales service.
MM 12	Middle Blade Motor Controller Overcurrent	• Please reduce the blade load and restart PTO. Check that blades are free of debris. Blades are disabled while error present. • If persistent, please refer to troubleshooting section for error code MM 12. • If error persists after completing the above Inspections, contact dealer for after-sales service.
MM 13	Middle Blade Motor Controller Overvoltage	• Please restart PTO to clear error. Blades are disabled while error present. • If persistent, please refer to troubleshooting section for error code MM 13. • If error persists after completing the above Inspections, contact dealer for after-sales service.
MM 14	Middle Blade Motor Controller Undervoltage	• Please restart PTO to clear error. Blades are disabled while error present. • If persistent, please refer to troubleshooting section for error code MM 14. • If error persists after completing the above Inspections, contact dealer for after-sales service.
MM 16	Middle Blade Motor Phase Open	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code MM 16. • If error persists after completing the above Inspections, contact dealer for after-sales service.
MM 17	Middle Blade Motor Controller Severe Overtemp	• Please reduce the blade load. Allow controller to cool and restart vehicle. Check that blades are free of debris. Blades are disabled until unit restart. • If persistent, please refer to troubleshooting section for error code MM 17. • If error persists after completing the above Inspections, contact dealer for after-sales service.

Error Code	Error	Immediate Fix Solution during Operation
MM 18	Middle Blade Motor Controller EEPROM Abnormal	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code MM 18. • If error persists after completing the above Inspections, contact dealer for after-sales service.
MM 21	Middle Blade Motor Stall Detected	• Please reduce the blade load and restart the PTO. Check that blades are free of debris. Blades are disabled while error present. • If persistent, please refer to troubleshooting section for error code MM 21. • If error persists after completing the above Inspections, contact dealer for after-sales service.
MM 22	Middle Blade Motor System Start Failure	• Please reduce the blade load and restart the PTO. Check that blades are free of debris. Blades are disabled while error present.
MM 23	Middle Blade Motor Controller Precharge Failed	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code MM 23. • If error persists after completing the above Inspections, contact dealer for after-sales service.
MM 24	CAN Communication with Right Wheel Motor Controller Abnormal	• Please restart vehicle. If error persists, contact dealer for after-sales service and discontinue use of the vehicle. Blades are disabled while error is present.
MM 26	Middle Blade Motor Controller MOSFET Abnormal	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code MM 26. • If error persists after completing the above Inspections, contact dealer for after-sales service.
MM 27	Middle Blade Motor Controller Temperature Sensor Abnormal	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code MM 27. • If error persists after completing the above Inspections, contact dealer for after-sales service.
MM 28	Middle Blade Motor Controller Self-Check Abnormal	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code MM 28. • If error persists after completing the above Inspections, contact dealer for after-sales service.

Table 8 Right Blade Motor Controller Error Codes

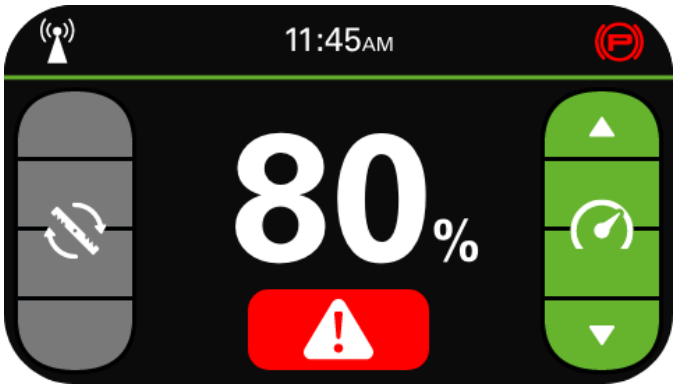
Error Code	Error	Immediate Fix Solution during Operation
MR 11	Right Blade Motor Controller Hardware Overvoltage or Overcurrent	• Please reduce the blade load and restart the vehicle. Check that blades are free of debris. Blades are disabled while error present. • If persistent, please refer to troubleshooting section for error code MR 11. • If error persists after completing the above Inspections, contact dealer for after-sales service.
MR 12	Right Blade Motor Controller Overcurrent	• Please reduce the blade load and restart PTO. Check that blades are free of debris. Blades are disabled while error present. • If persistent, please refer to troubleshooting section for error code MR 12.

Error Code	Error	Immediate Fix Solution during Operation
		• If error persists after completing the above Inspections, contact dealer for after-sales service.
MR 13	Right Blade Motor Controller Overvoltage	• Please restart PTO to clear error. Blades are disabled while error present. • If persistent, please refer to troubleshooting section for error code MR 13. • If error persists after completing the above Inspections, contact dealer for after-sales service.
MR 14	Right Blade Motor Controller Undervoltage	• Please restart PTO to clear error. Blades are disabled while error present. • If persistent, please refer to troubleshooting section for error code MR 14. • If error persists after completing the above Inspections, contact dealer for after-sales service.
MR 16	Right Blade Motor Phase Open	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code MR 16. • If error persists after completing the above Inspections, contact dealer for after-sales service.
MR 17	Right Blade Motor Controller Severe Overtemp	• Please reduce the blade load. Allow controller to cool and restart vehicle. Check that blades are free of debris. Blades are disabled until unit restart. • If persistent, please refer to troubleshooting section for error code MR 17. • If error persists after completing the above Inspections, contact dealer for after-sales service.
MR 18	Right Blade Motor Controller EEPROM Abnormal	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code MR 18. • If error persists after completing the above Inspections, contact dealer for after-sales service.
MR 21	Right Blade Motor Stall Detected	• Please reduce the blade load and restart the PTO. Check that blades are free of debris. Blades are disabled while error present. • If persistent, please refer to troubleshooting section for error code MR 21. • If error persists after completing the above Inspections, contact dealer for after-sales service.
MR 22	Right Blade Motor System Start Failure	• Please reduce the blade load and restart the PTO. Check that blades are free of debris. Blades are disabled while error present.
MR 23	Right Blade Motor Controller Precharge Failed	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code MR 23. • If error persists after completing the above Inspections, contact dealer for after-sales service.
MR 24	CAN Communication with Right Wheel Motor Controller Abnormal	• Please restart vehicle. If error persists, contact dealer for after-sales service and discontinue use of the vehicle. Blades are disabled while error is present.
MR 26	Right Blade Motor Controller MOSFET Abnormal	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code MR 26 • If error persists after completing the above Inspections, contact dealer for after-sales service.

Error Code	Error	Immediate Fix Solution during Operation
MR 27	Right Blade Motor Controller Temperature Sensor Abnormal	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code MR 27 • If error persists after completing the above Inspections, contact dealer for after-sales service.
MR 28	Right Blade Motor Controller Self-Check Abnormal	• Please restart vehicle. • If persistent, please refer to troubleshooting section for error code MR 28 • If error persists after completing the above Inspections, contact dealer for after-sales service.

4.2 Reading the Error Code (on the Display Screen)

See 3.4.2 Display screen for detailed information.



4.2.1 Reading the Error Code (Controller Status LEDs)

If the display screen is damaged and the error code cannot be read, the operator can obtain the error code by observing the error codes issued by the controller status LEDs.

4.2.1.1 Traction Drive Controller

DIAGNOSTICS

Diagnostics information can be obtained as following: by observing the error codes issued by the Status LEDs.

The status indicator is a translucent window on the cover, which blinks red and yellow LEDs. Its illumination indicates the following information:

Status LEDs	Indication
Off	Controller is not powered on, or is severely damaged.
Slow yellow blinking	Controller is operating normally.

Status LEDs	Indication
Solid yellow or orange	Controller is in flash program mode, or corrupted software is preventing the unit from completing the startup sequence (boot process).
Red/yellow flashing pattern	Error code, review the error table.
Solid red	Internal hardware error detected by the supervisor or primary microprocessor, or the controller has no software loaded.

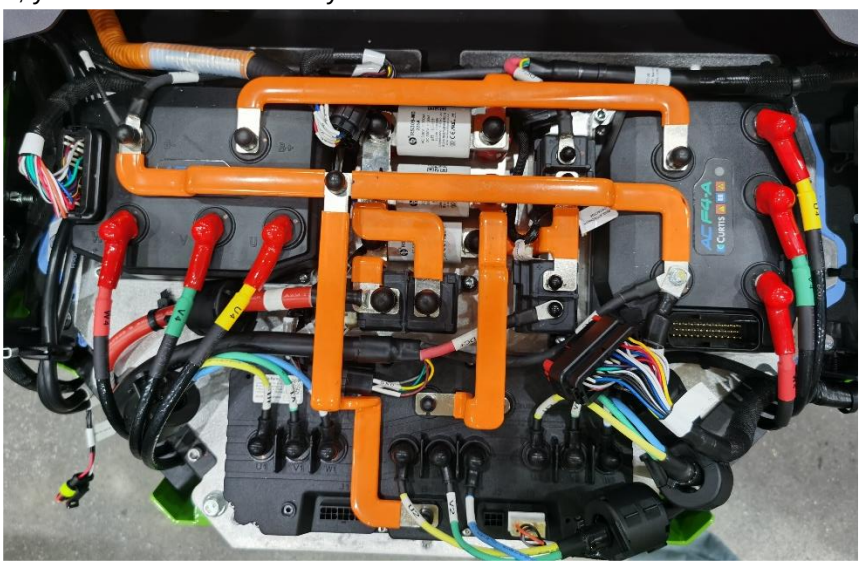
EXAMPLE:

Error Code	Fault Location	Error Description	
TL 1A	Left Wheel Motor Controller	The controller will “flash” the red LED 1-times, followed by yellow LED 10-times	LEDs x1 x10
MR 11	Right Blade Motor Controller	The controller will “flash” the red LED 1-times, followed by yellow LED 1-times	LEDs x1 x1

4.3 Program Update

4.3.1 Modifying the Node ID

1. Make sure the vehicle is power off and unplug the right wheel motor connector (left wheel motor stays plugged-in).
2. Note: The initial CAN NODE ID are 26、27 and 28、29. but in our control system we define left traction controller as 28 and 29. when you replace the left traction controller, you need to modify the CAN NODE ID. But when you replace the right one, you do not need to modify the CAN NODE ID.



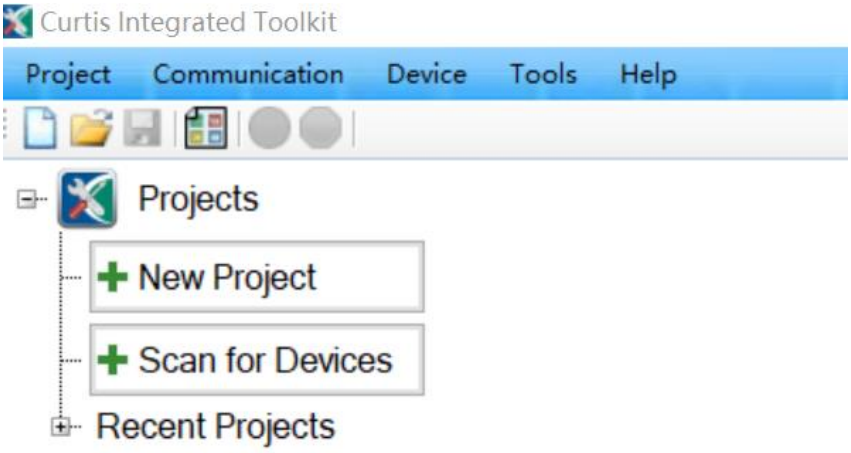
3. Press the power button to power on the vehicle.

Power off

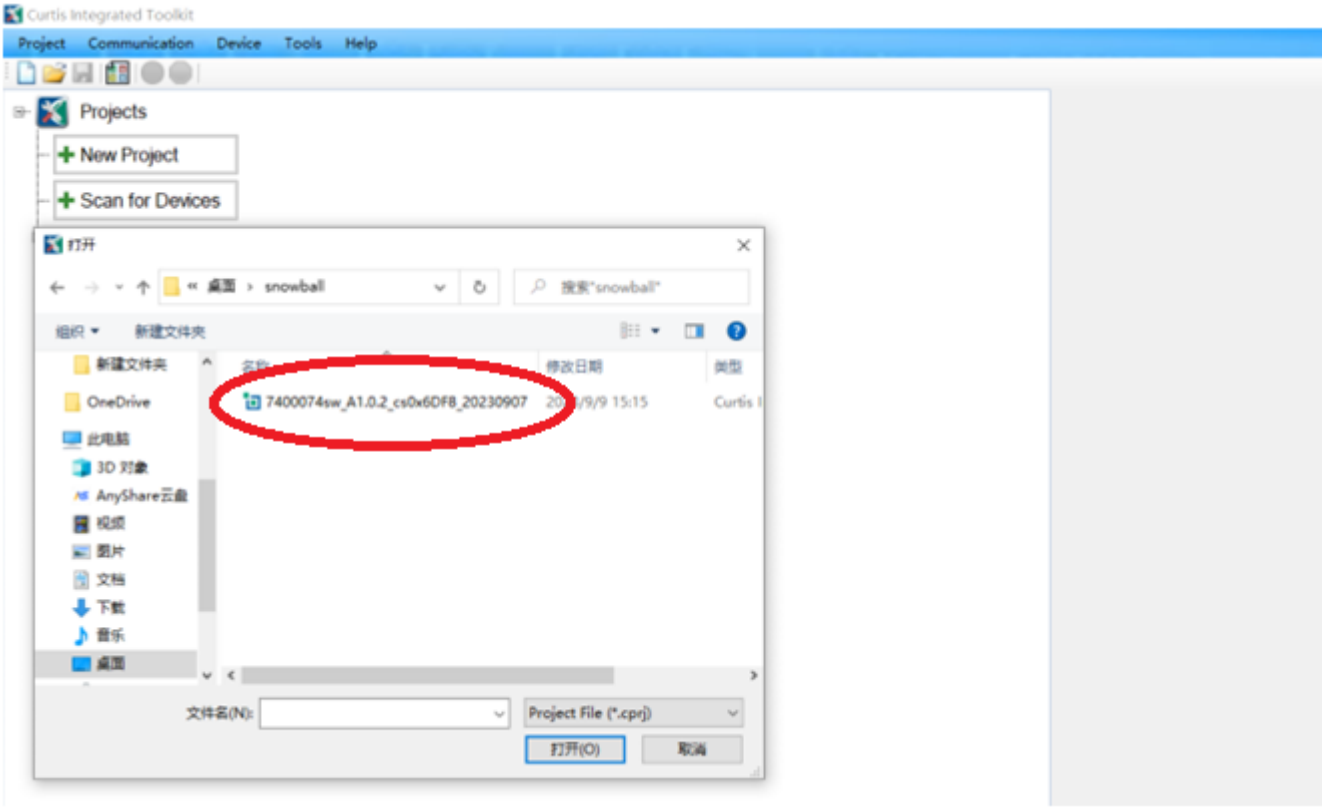
Power on

4. Double click the "Curtis Integrated Toolkit" icon on the desktop. Write the new program in the open "Curtis Integrated Toolkit".

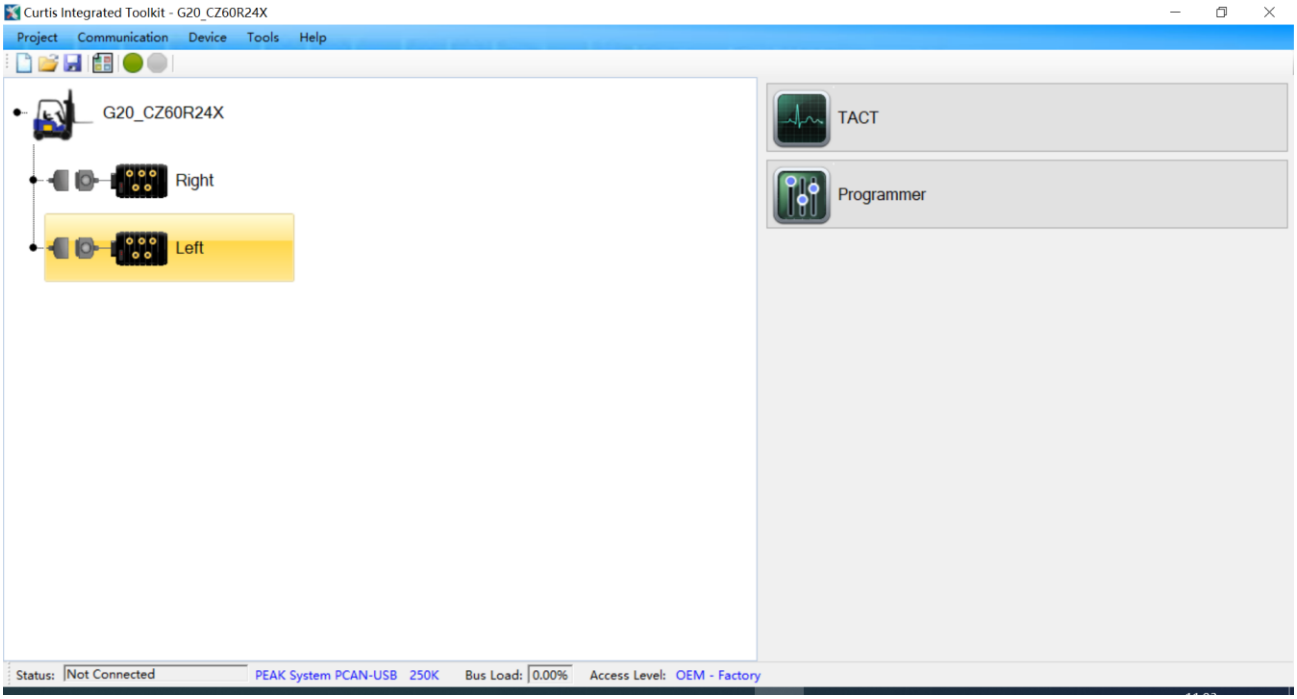
5. Click "Open project".



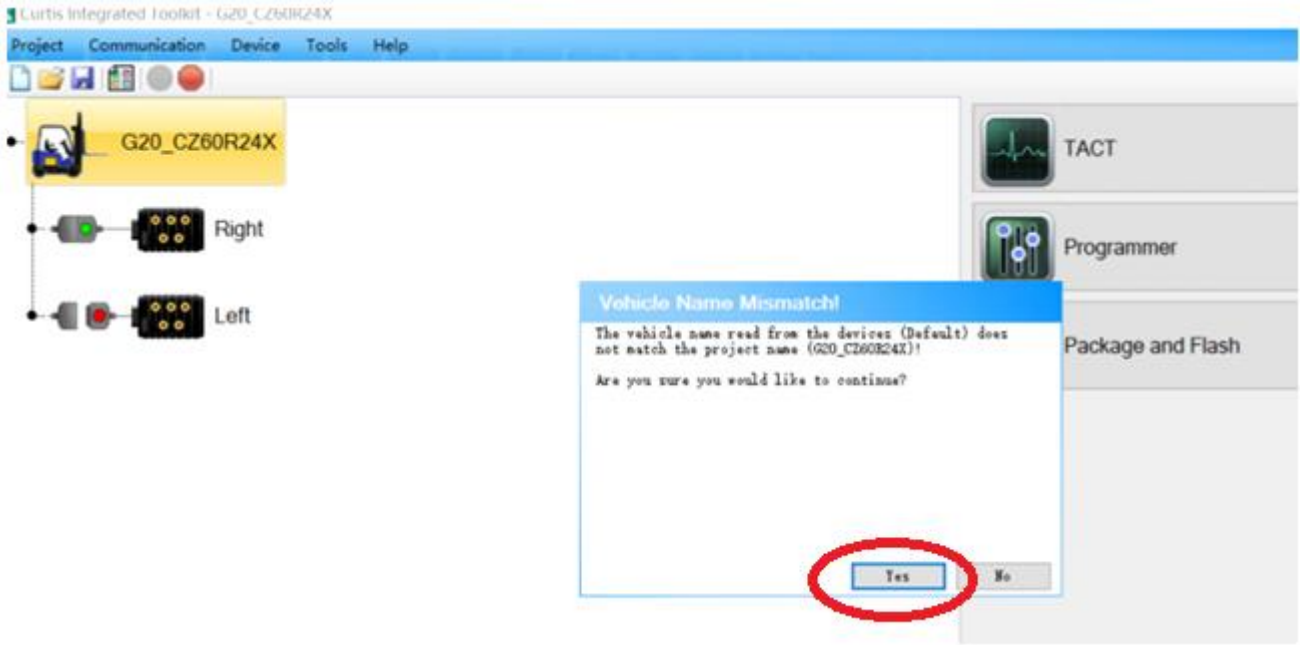
6. Find the project that you want to open.
7. Double click the project.



8. When the project is open, the icons are grey.

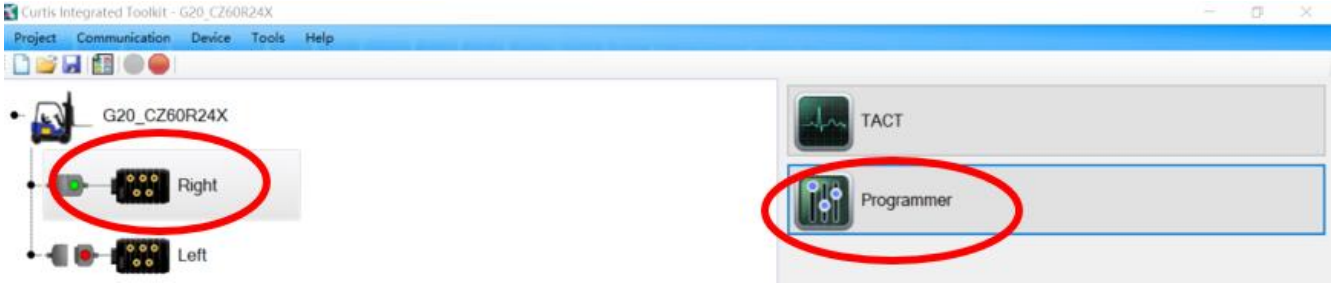


9. Then click “yes”.

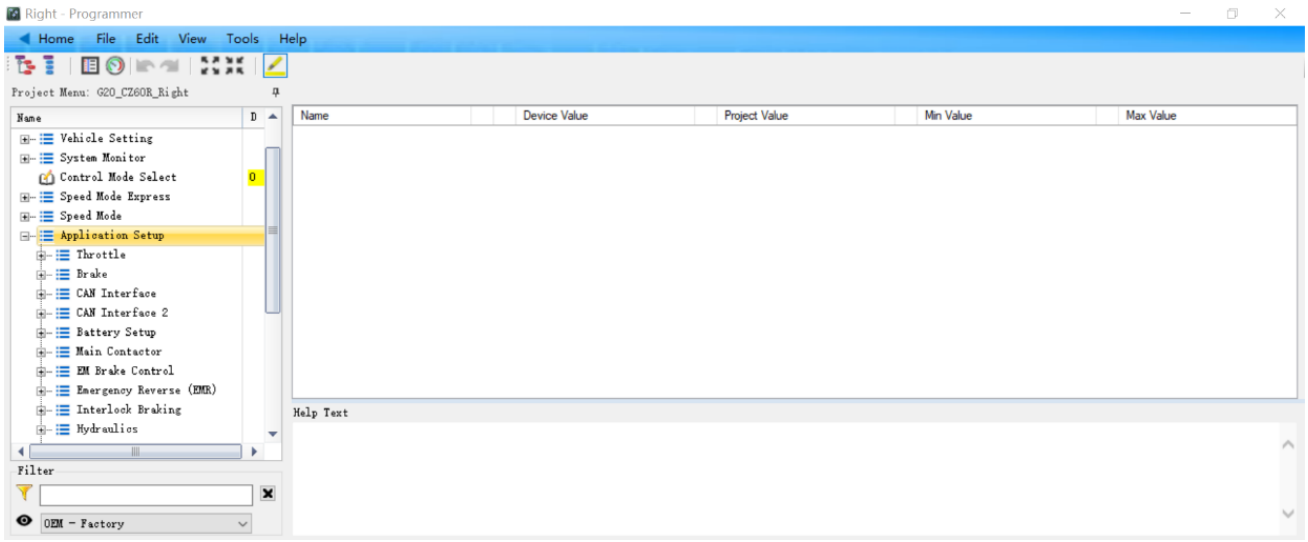


10. Click the green "Connect" icon.

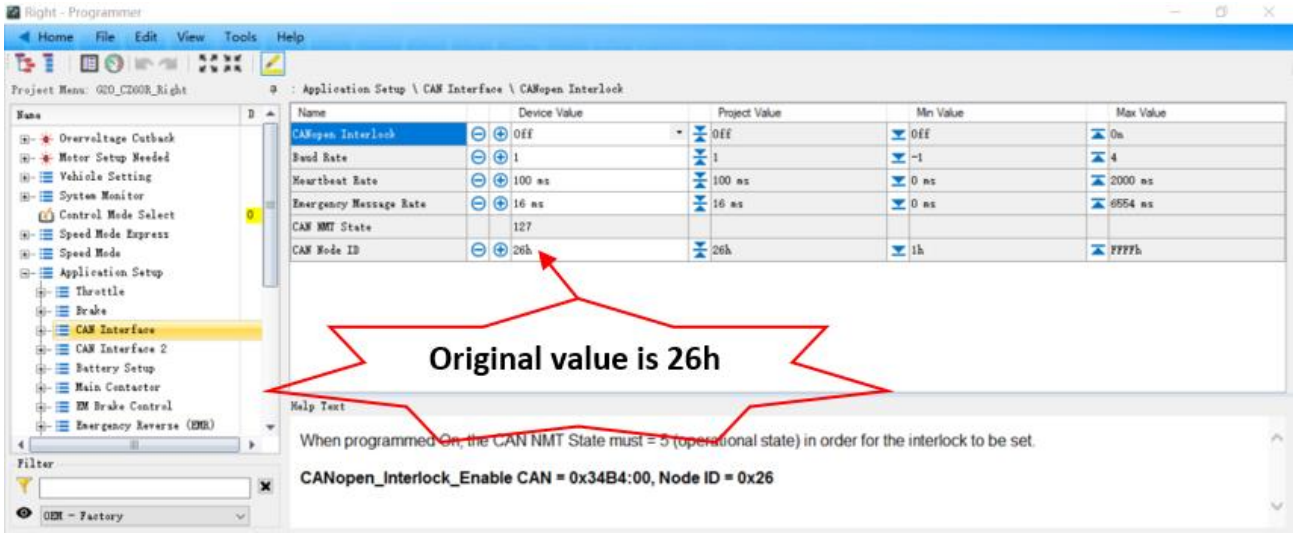
11. Click the "Right" node and click the "Programmer".



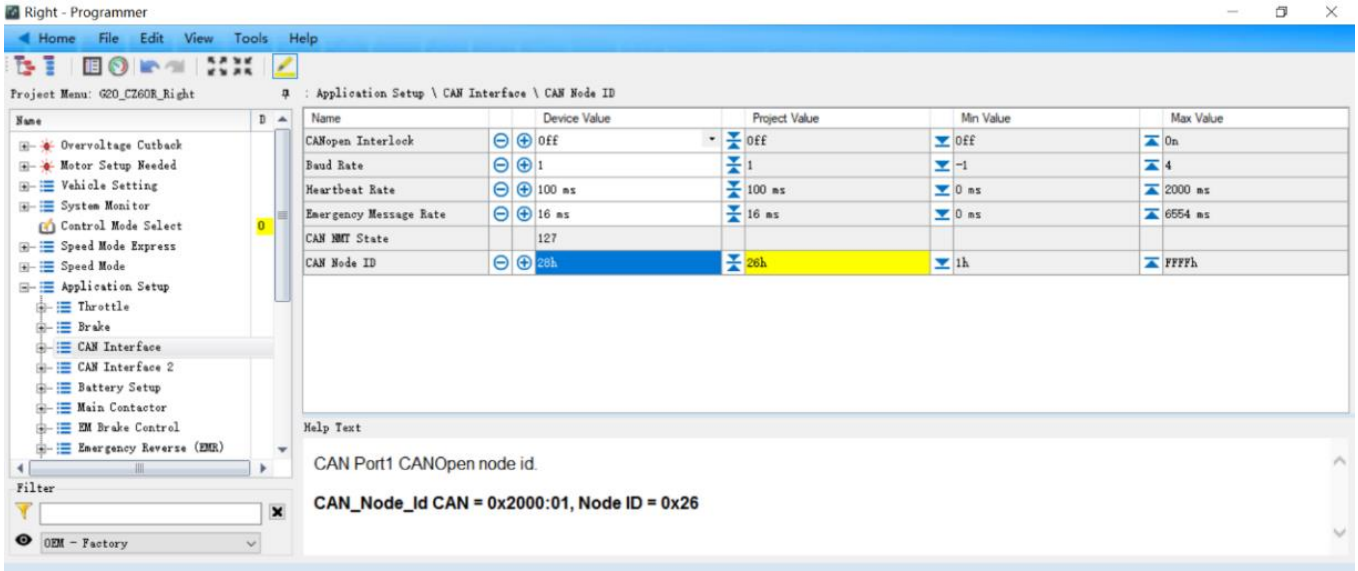
12. Click open "Right Programmer > Application Setup" structure and you can see "CAN Interface" and "CAN Interface 2".



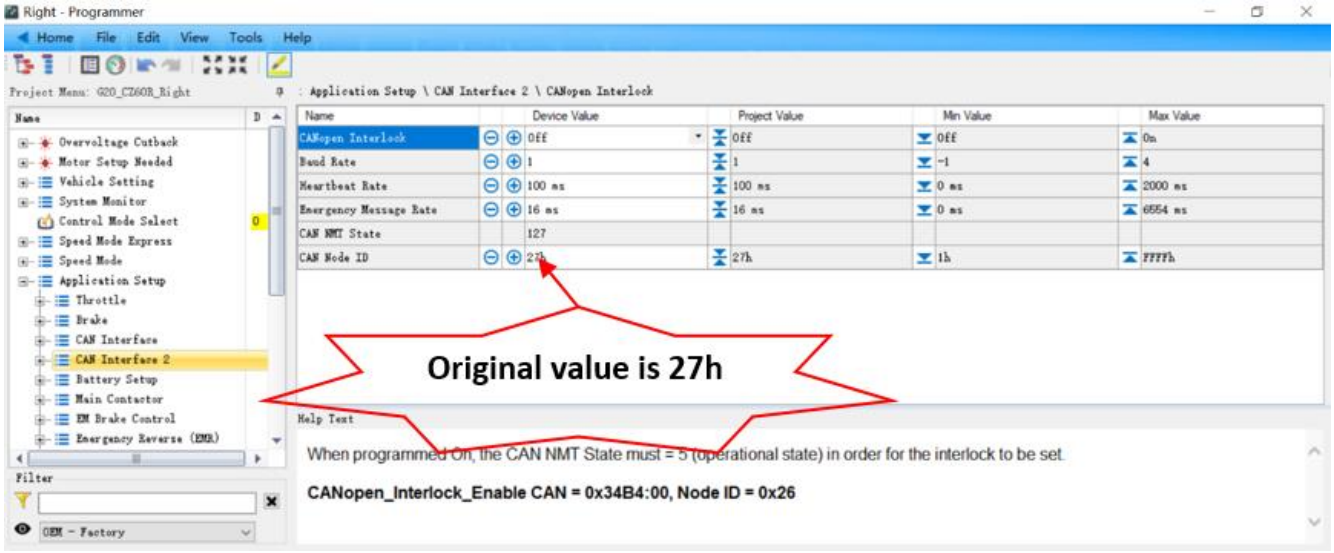
13. Double click the "CAN Interface" and you can see "CAN Node ID" on the right.



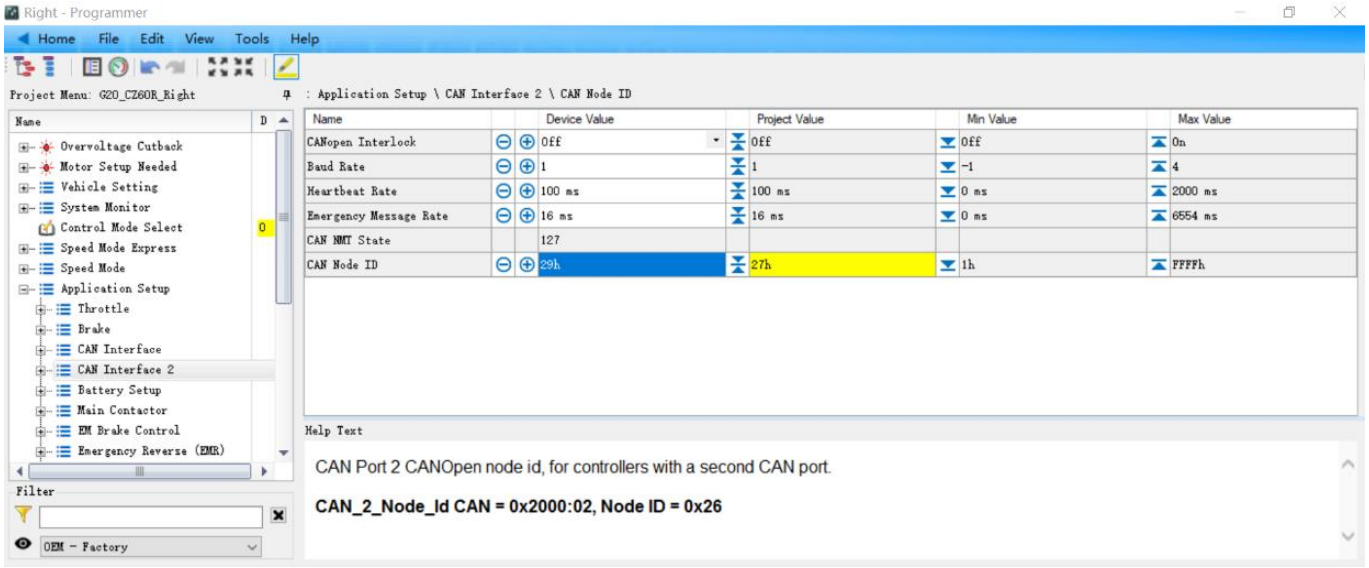
14. Modify the CAN Node ID device value from the original "26h" to "28h", then press "Enter" on your keyboard.



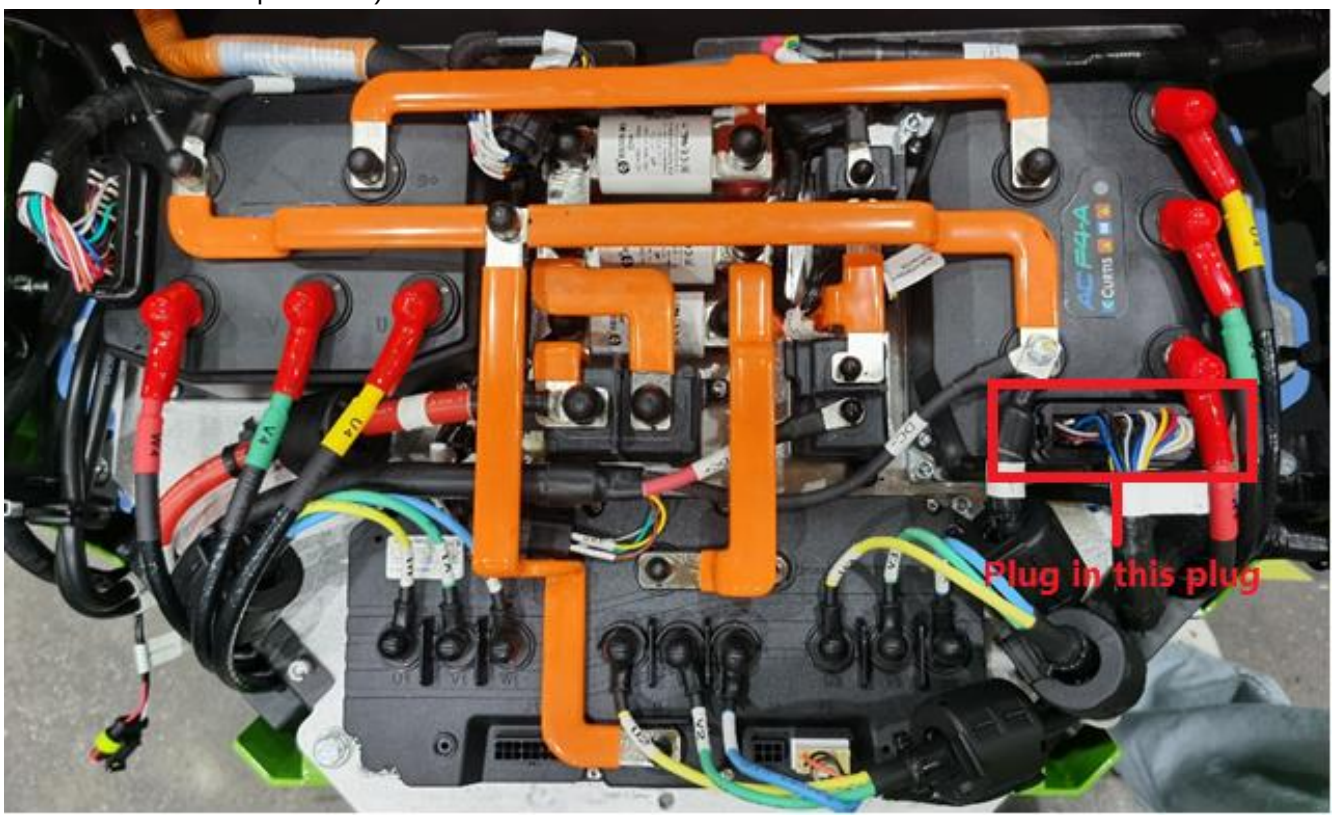
15. Double click the "CAN Interface 2" and you can see "CAN Node ID" on the right.



16. Modify the CAN Node ID device value from original "27h" to "29h", then press "Enter" on your keyboard.

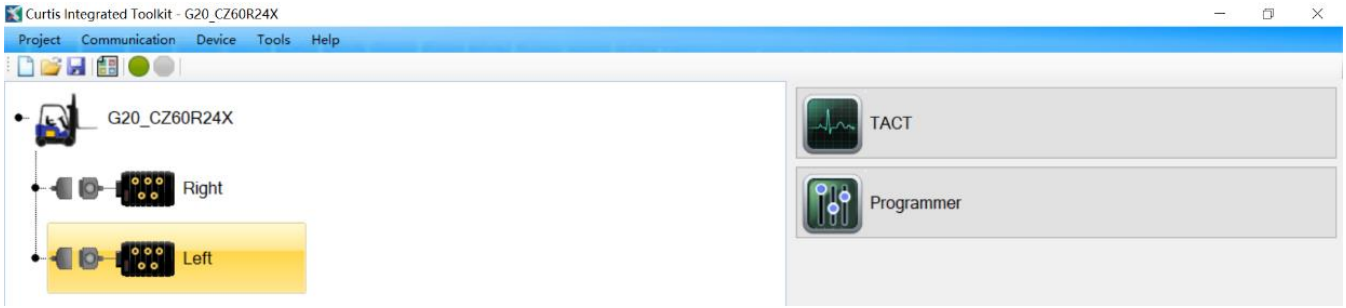


17. Press the power button to power off the vehicle. When the vehicle power is completely off, plug in the right wheel motor connector and then power on the vehicle. (NOTE: Every time you plug in or plug out this connector, make sure the vehicle is power off.)

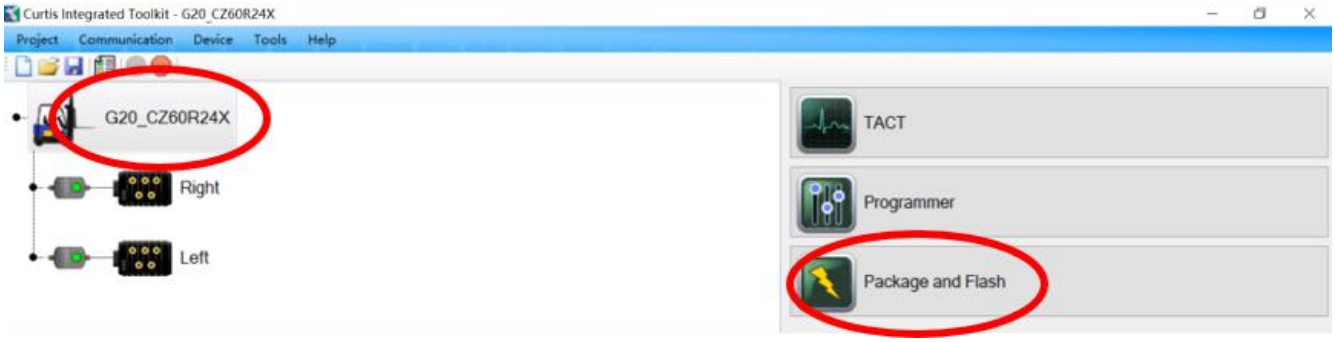


4.3.2 3-Update Program and OS

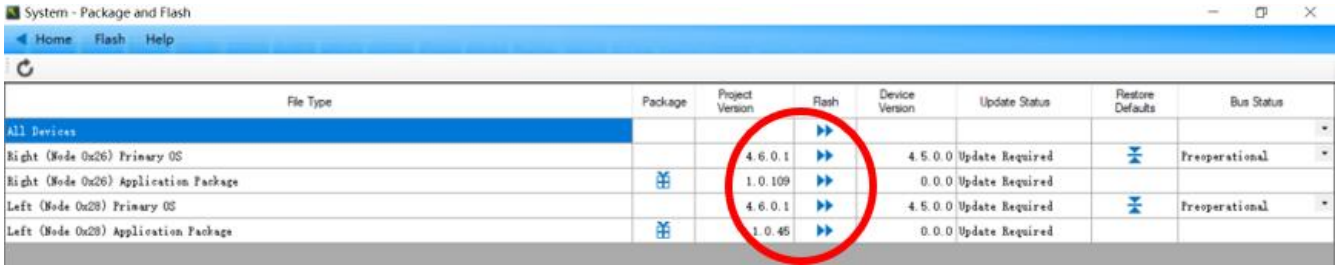
1. When power on reset, click the green "Connect" icon.



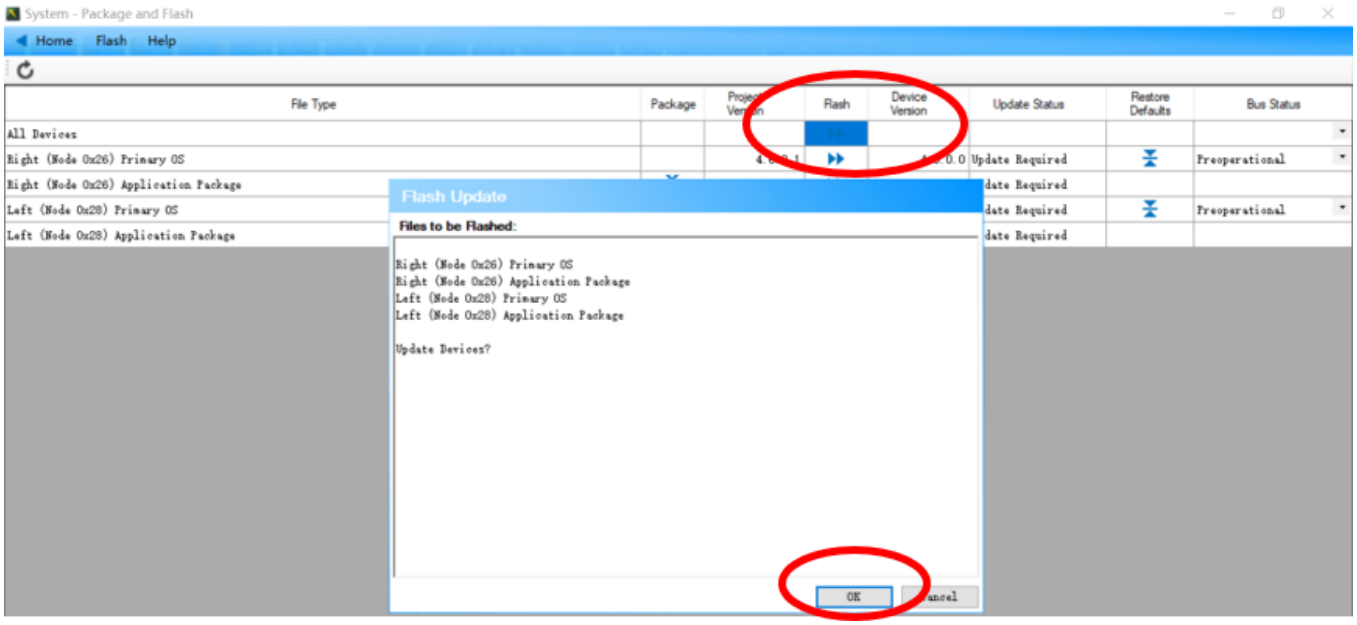
2. Click "G20_CZ60R24X" and click "Package and Flash".



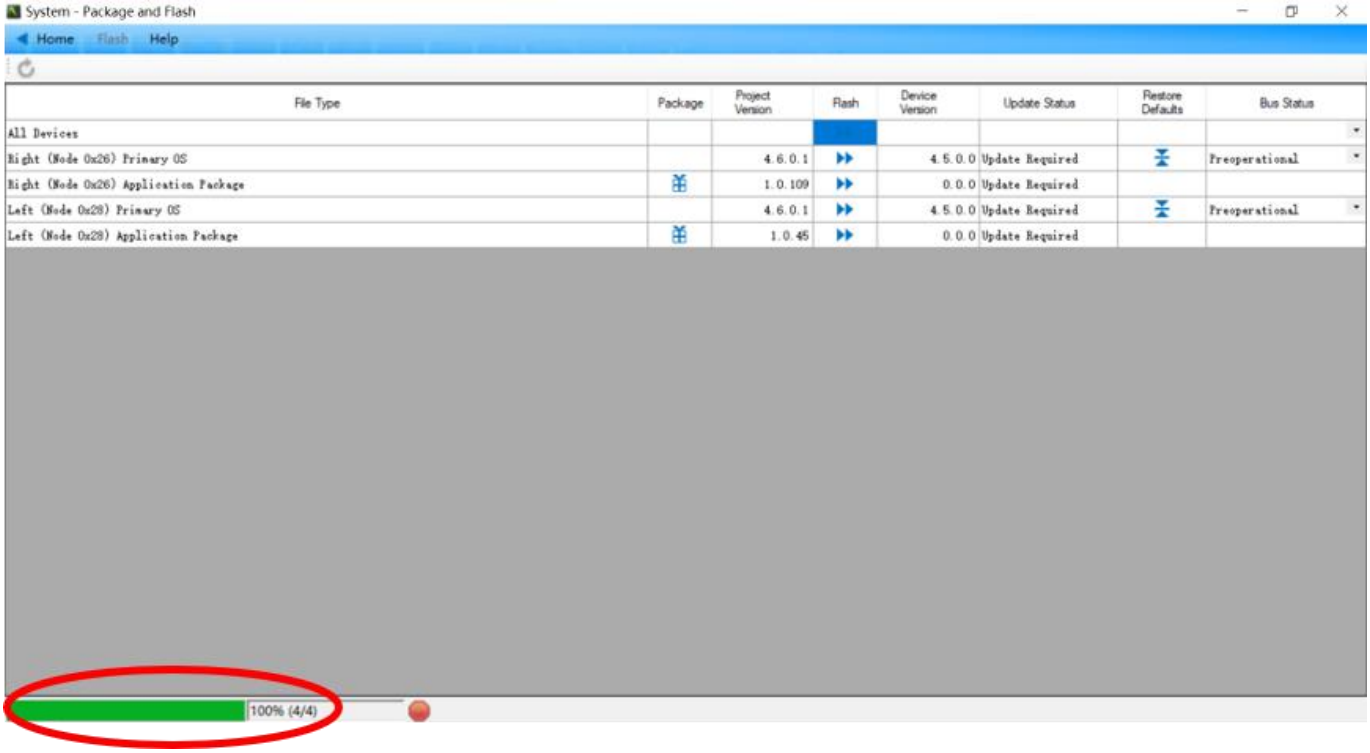
3. Check the "Device Version" and the "Project Version", then select what you want to update (OS and application program).



4. If this is the first time, choose to update "All Devices" and click "OK".



5. When the status bar shows 100%, it indicates the update is complete.



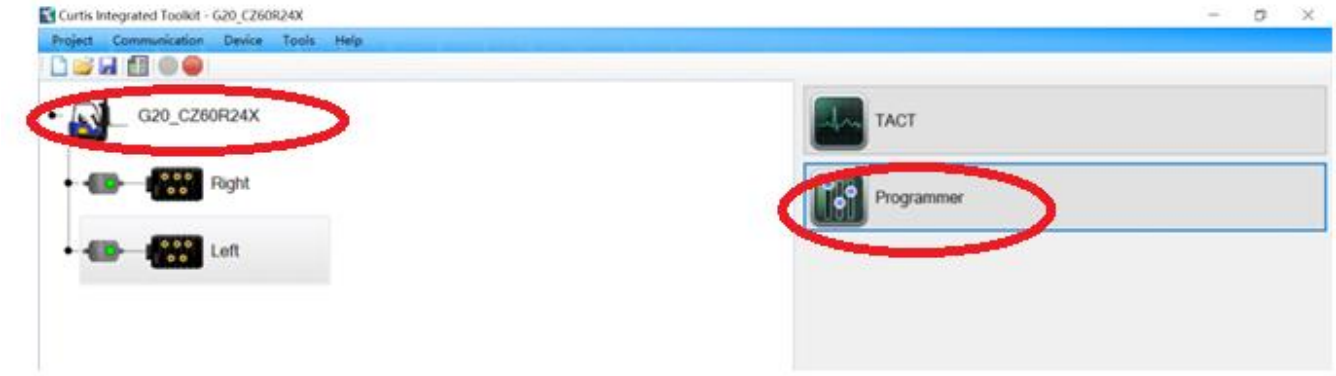
6. Power on to reset.

4.3.3 Motor Self-learning

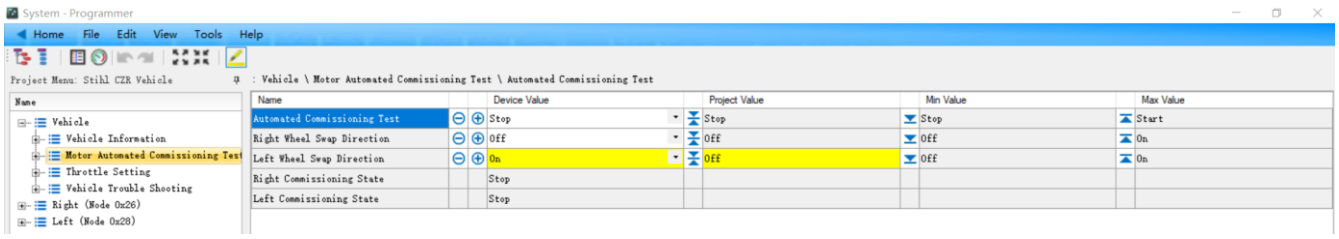
1. Lift the mower using a forklift and keep the wheels off the ground before the motor self-learning. This helps avoid personal injury. Only after completing the self-learning procedures of two drive motors, you can remove the forklift.

2. Keep the acceleration lever in middle position, at the same time parking state.

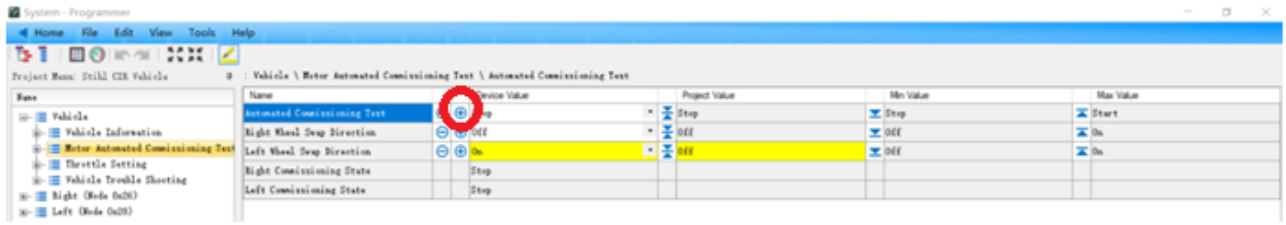
3. Click “G20_CZ60R24X” then Click “programmer”.



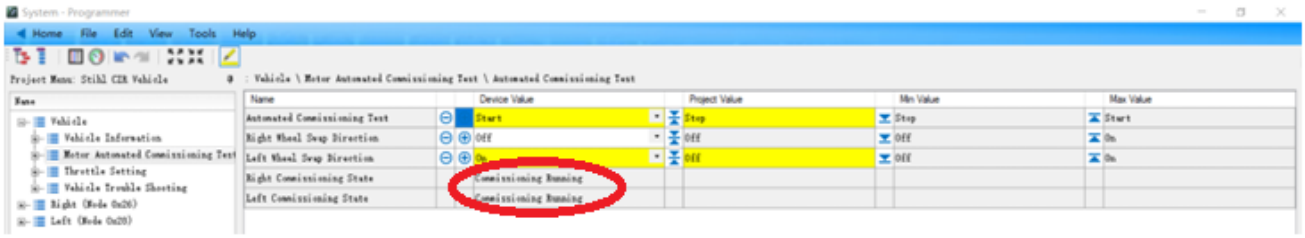
4. Find the path “Vehicle->Motor Automated commissioning test”, then click “Motor Automated commissioning test”,you can see right information.



5. Click the “+” , vehicle driving motor start the commissioning test, you just need to wait.



6. “Commissioning running” means the commissioning test is ongoing.

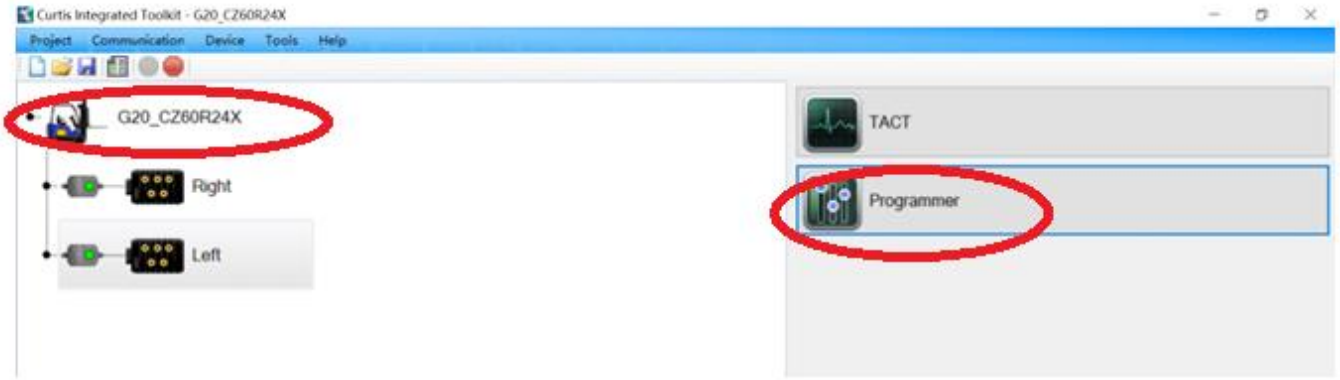


7. “Commissioning completed” means the commissioning test is completed. the you can restart the mower.

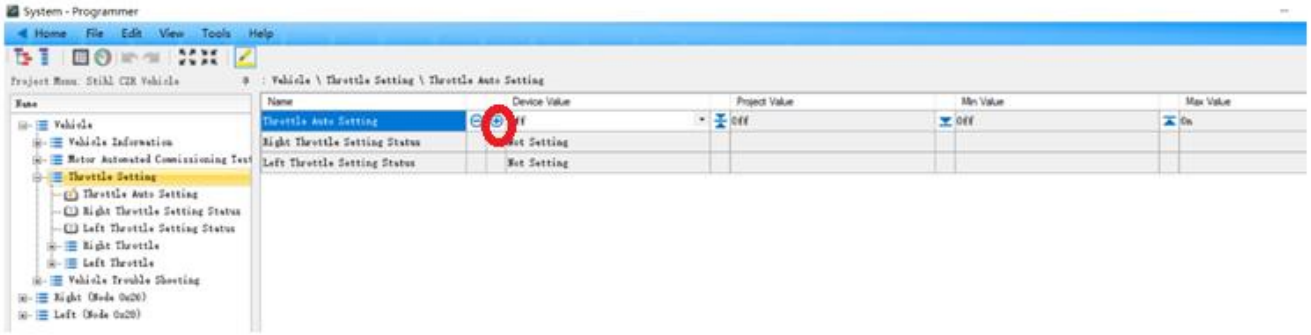
4.3.4 Reading Appropriate Device Value

1. Keep the acceleration lever in middle position, at the same time non-parking state.

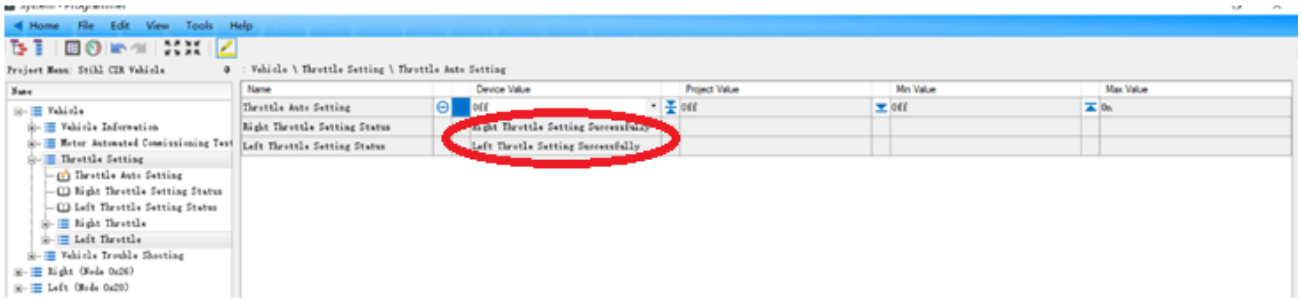
2. Click “G20_CZ60R24X”then Click “programmer”.



3. Click “Throttle Setting”, then click“+”.

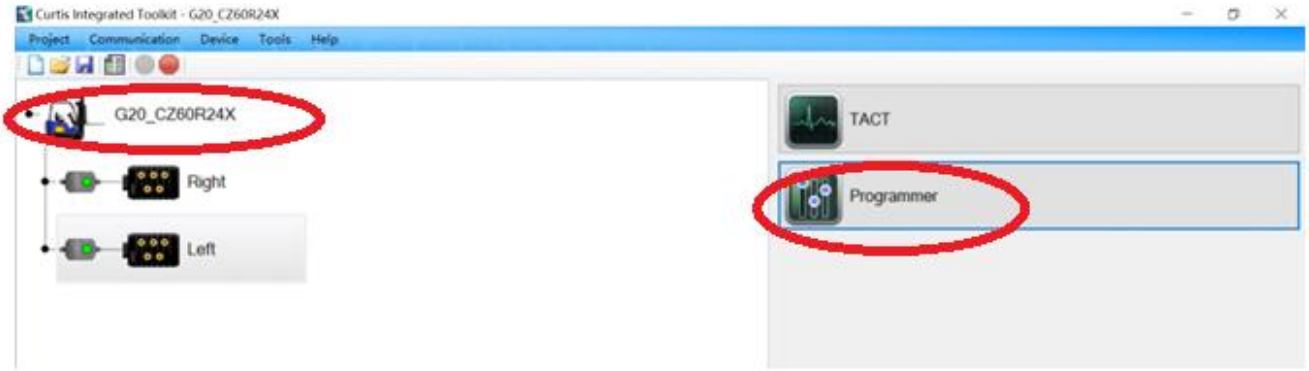


4. Display “Right Throttle Setting Successfully” and “Left Throttle Setting Successfully”, the value is successfully read.

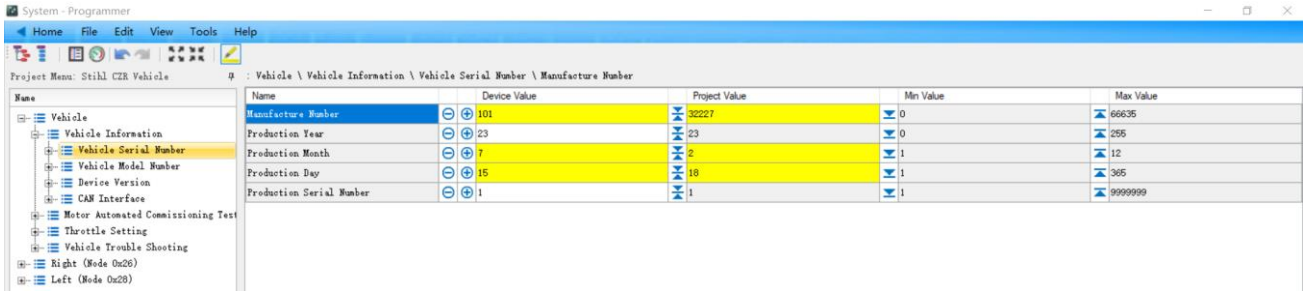


4.3.5 SN Code Entry

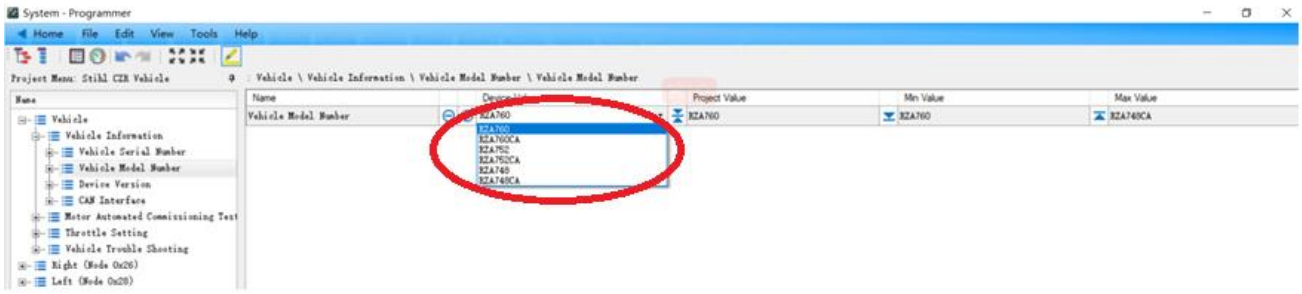
1. Click “G20_CZ60R24X”then Click “programmer”.



2. Find the path “Vehicle->Vehicle Serial Number”, then click” Vehicle Serial Number” , in the right page you can enter the SN number.



3. Find the path “Vehicle->Vehicle Model Number”, then click” Vehicle Model Number” ,in the right page you can select the Vehicle Model Number you need.



4.4 Electrical Components

4.4.1 Switches

Switches either open a circuit to stop current flow or close and allow current to flow through.

- A normally open (NO) switch prevents current flow until the switch is actuated, completing the circuit, and allowing current to flow through it. An example is a light switch - the lights are off until the switch is actuated, and the lights go on.
- A normally closed (NC) switch allows current to flow until the switch is actuated, breaking the circuit, and stopping current flow through it.

The switches are selected with reference to their nominal current (the contacts must be of sufficient size to carry the required current), rated voltage and type of actuation (pressure switches, traction, rotation, momentary contact or microswitches).

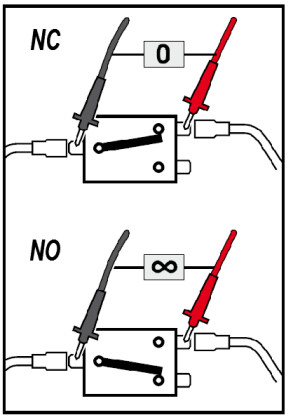
NOTE:

Before doing an electrical test, make sure that the connections to the switches are stable and that the switch is actuated correctly (Safety switches may need adjustment in order to be actuated correctly).

IMPORTANT:

During the checking process, remove the switches from their respective circuits, unplugging the connectors. If the cables are left in place, the machine components or the meters can be damaged.

Normally Open Switch Test



To test a normally closed switch

Connect the Ohmmeter between the switch terminals.

- The meter should indicate an open circuit (infinite resistance «∞»).

Activate the switch.

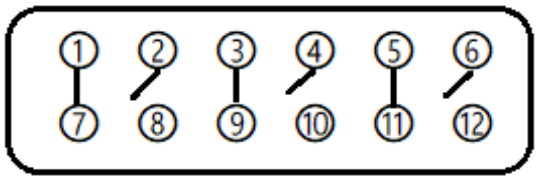
- The Ohmmeter should indicate a closed circuit (zero resistance «0»). This indicates the switch is operating properly.
- Variation from test results described above indicates a defective switch.

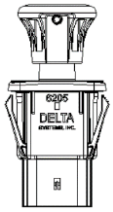
The diagrams show the connections of the electrical components in different situations.

NOTE:

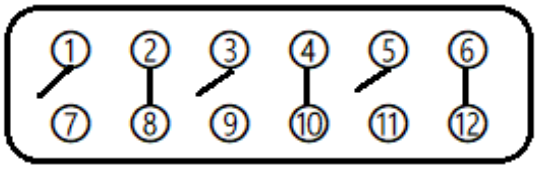
The continuous line indicates the electrical continuity of the circuit. All switches are shown from the rear.

PTO SWITCH



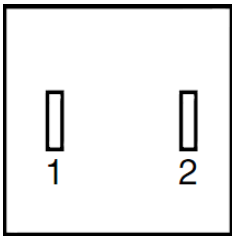


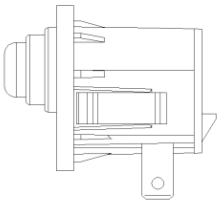
CIRCUITS SHOWN WITH THE KNOB IN THE UP POSITION



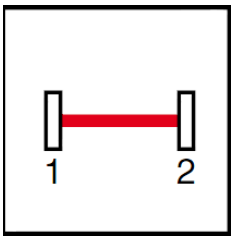
CIRCUITS SHOWN WITH THE KNOB IN THE DOWN POSITION

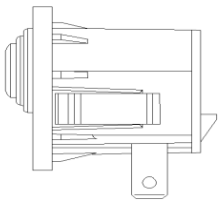
PARK SWITCH





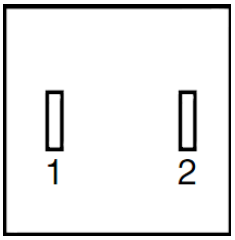
ELECTROMAGNETIC BRAKE ON

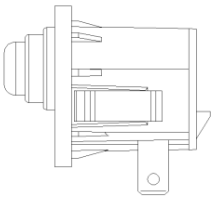




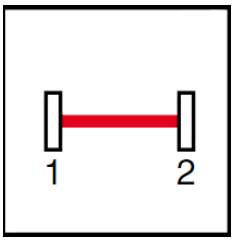
ELECTROMAGNETIC BRAKE OFF

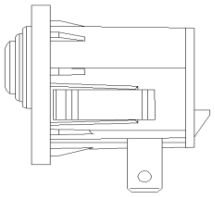
SEAT SWITCH





OPERATOR NOT SEATED





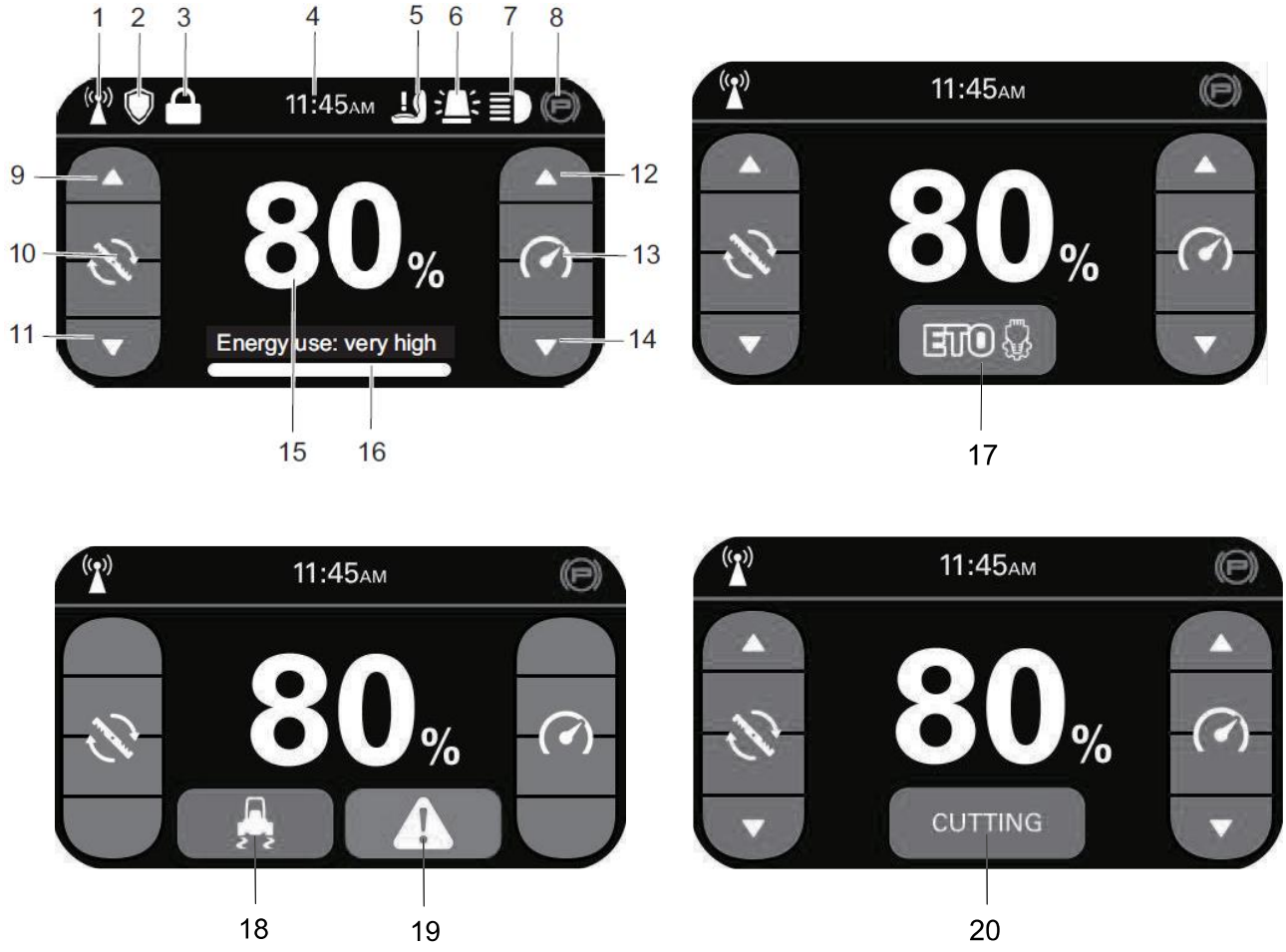
OPERATOR SEATED

POWER OFF

POWER ON

4.4.2 Display Screen

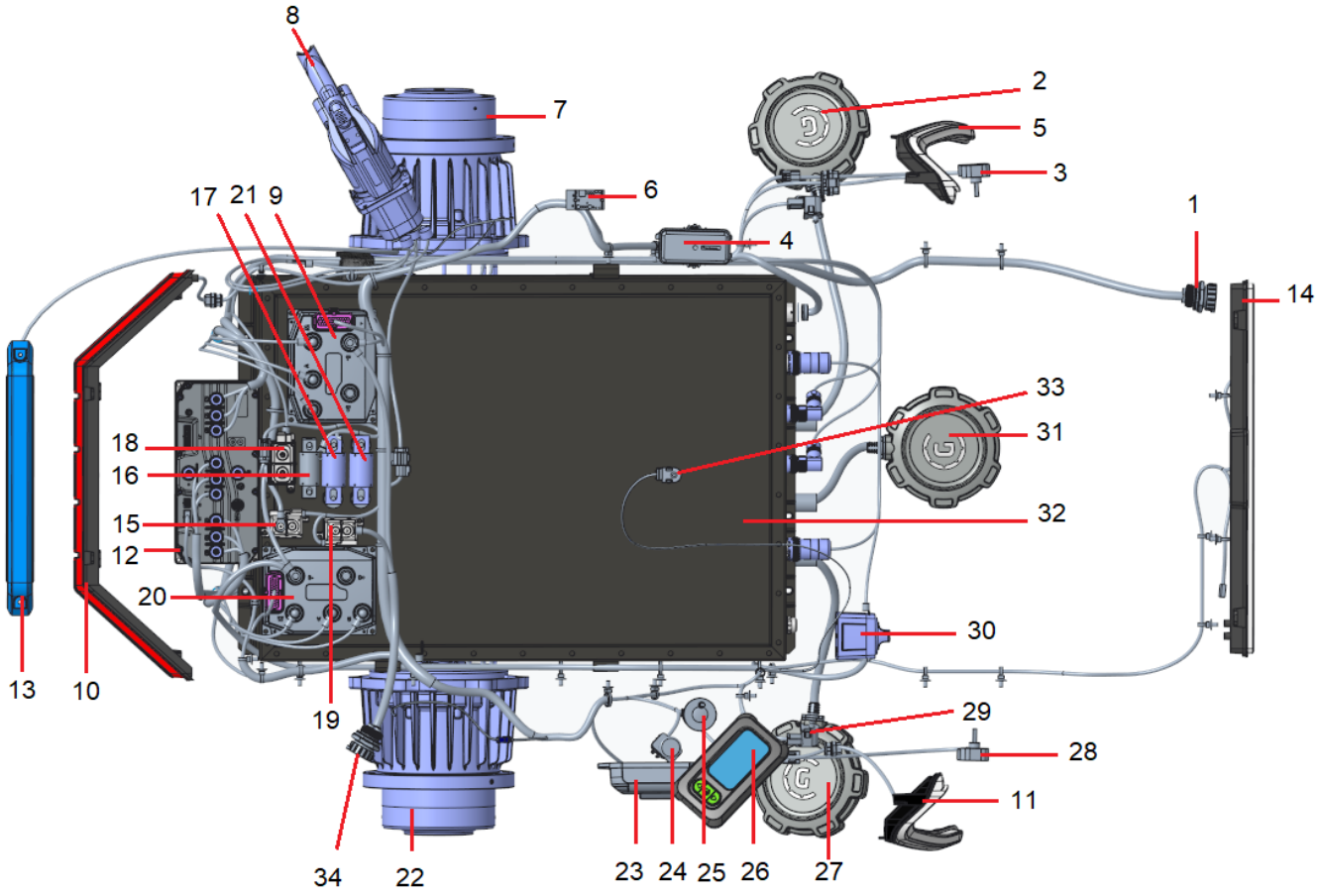
The function of the digital display, located on the control panel, is to provide electrical system information to the operator. It gives detailed information in the form of pattern, codes and number.



#	Name	Function
1		**4G GPS Signal**
2		**Security feature is active.**
3		**Screen-lock. The touch screen‘s function is disabled.**
4	**11:45 AM**	**Time**
5		**User presence needed to operate product.**
6		**Warning light is on.**
7		**LED Light is on.**

8		**The parking brake is engaged.**
9		**Increase blade speed. Each time you touch the screen button, the blade speed will raise a level. When the speed reaches the hightest level, the touch button can't adjust any more.**
10		**Blade speed**
11		**Decrease blade speed. Each time you touch the screen button, the blade speed will reduce a level. When the speed reaches the lowest level, the touch button can't adjust any more.**
12		**Increase driving speed. Each time you touch the screen button, the drive speed will raise a level. When the speed reaches the hightest level, the touch button can't adjust any more.**
13		**Driving speed**
14		**Decrease driving speed. Each time you touch the screen button, the drive speed will reduce a level. When the speed reaches the lowest level, the touch button can't adjust any more.**
15	**80%**	**Battery percentage. When it equals to 5% or less, stop work and charge the battery as soon as possible.**
16	**Energy use**	**Energy use state**
17		**ETO button. Touch to control the attachment power.**
18		**Low traction control button. Touch to change to low traction control mode.**
19		**Error warning. Touch to check the error code and content.**
20	**CUTTING**	**Cutting session. Touch to turn to the cutting session page.**

4.5 Electrical Wiring Diagram



1. Front ETO socket
2. Blade motor-left
3. Accelerator potentiometer-left
4. Fuse Box
5. Light, left body
6. USB charging socket
7. Wheel drive motor-left
8. Fast charging socket
9. Slave controller
10. Tail light
11. Light, right body
12. 3-in-1 blade controller
13. Light, ROPS
14. Light, front frame
15. Main circuit fuse
16. Front ETO loop contactor
17. Attachment circuit fuse
18. Main circuit relay
19. Rear ETO loop contactor
20. Slave controller
21. Attachment circuit fuse
22. Wheel drive motor-right
23. GPS module
24. PTO switch (blade on/off)
25. PBS (power on/off)
26. Digital display
27. Blade motor-right
28. Accelerator potentio meter-right
29. Park switch-right
30. Service switch-contact breaker
31. Blade motor-middle
32. Battery pack
33. Seat switch
34. Rear ETO socket

5. Deck

The deck is the part of the vehicle that carries out mowing work, which comprises the blade, the blade motor and the welded body of the deck. When removing the blade and the blade motor, simply hoist the front section of the machine.

IMPORTANT:

Before removal and installation of the following parts specific to the deck, make sure the key switch of the vehicle is turned off, and, if necessary, turn off the main power supply.

5.1 Blade

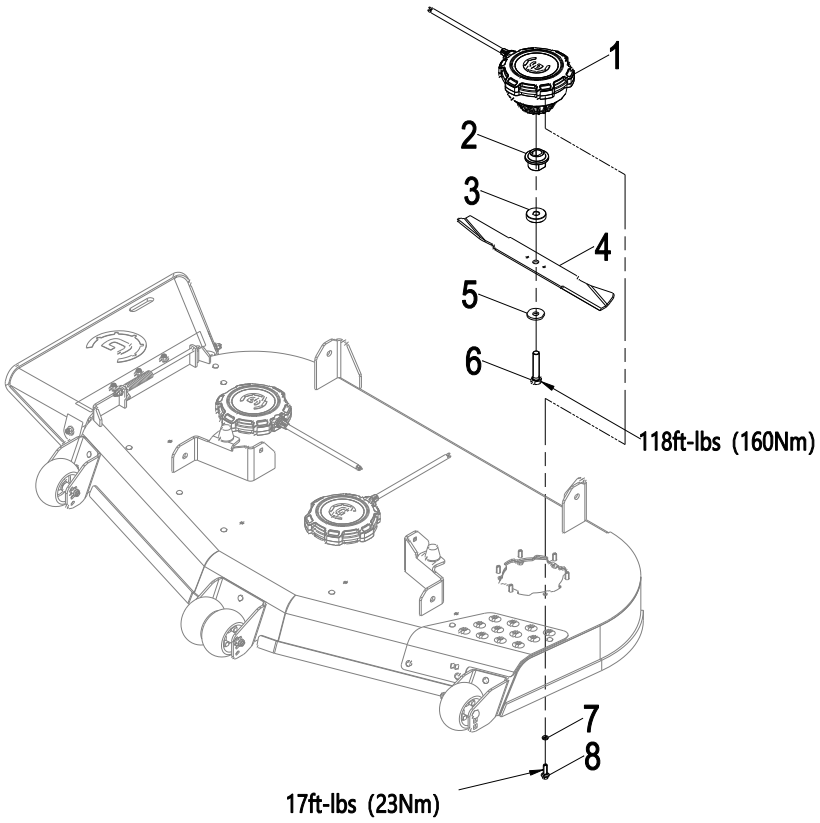


Fig. 1

1. Blade motor
2. Blade holder
3. Spacer
4. Discharge blade (mulching blade)
5. Blade washer
6. Bolt M16*80
7. Spring washer 10
8. Hexagon flange bolt, M10*35

Removal:

1. Using a hoisting tool, hoist the front end of the deck to a certain angle.
2. With protective gloves on, block and secure the end of the blade (4) with wooden block, and loosen the bolt (6) with a 24 mm socket by rotating counterclockwise.
3. Remove the bolt (6), blade washer (5), blade (4), spacer (3), and blade holder (2) in order.

Installation:

1. Put the blade washer (5), blade (4), spacer (3) and blade holder (2) on the bolt (6) in the order shown in the Fig. 1 and manually screw the bolt (6) into the threaded hole of the motor central shaft.
2. With protective gloves on, snap the end of the blade (4) with a wooden block and tighten the bolt (6) with a 24 mm socket by rotating clockwise, with a fastening torque of 114-118 Ft-lb (155-160 Nm).
3. Gently rotate the blade by hand and make sure there is no conflict between the three blades, no conflict between the blades and the deck housing, such that the blades can rotate freely and smoothly.

NOTE:

- The removal and the installation steps for the three blades are the same.
- Discharge blade and mulching blade installation method and procedure are the same.
- Frequently inspect the wear of the blades. Replace in time if a blade is overworn, otherwise it will affect the dynamic balance of the working motor and lead to earlier damage of the blade motor.

5.2 Blade Motor

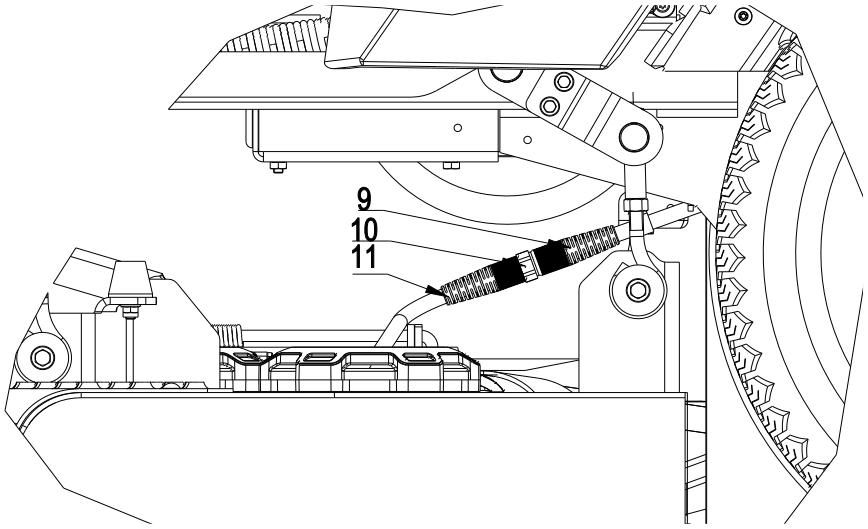


Fig. 2

9. Blade power cord tail clip
10. Fastening nut
11. Motor end tail clip

Removal:

1. Make sure that the Key switch is OFF and turn off the vehicle power supply if necessary.
2. Rotate the fastening nut (10) counterclockwise and make sure the blade power cord tail clip (9) and motor end tail clip are separated.
3. Disconnect the three motor harness connections in the sequence: left, middle and right.

4. Refer to Fig. 1, using a hoisting tool, hoist the front end of the deck to a certain angle.
5. Remove the blade (see 4.1 for detailed steps).
6. Use a 13 mm socket wrench to loosen the bolt (8) by rotating counterclockwise.
7. Remove the bolt (8) and the spring washer (7) altogether. Each motor is fixed with six sets of such bolts.
8. After removing the six sets of bolts (7, 8) for individual motor, remove the blade motor (1) from the deck.

Installation:

1. Put the blade motor (1) into the mounting hole of the deck housing. Rotate the motor until the motor mounting hole aligns with the deck mounting hole.
2. Slip the spring washer (7) onto the bolt (8) in order. Apply thread locker on the end of the thread and manually screw the bolt clockwise into the motor mounting threaded hole. Each motor is fixed by six sets of such bolts.
3. Tighten the bolt (8) clockwise with a 13 mm socket wrench to a tightening torque of 17 Ft-lb (23 Nm). Motor installation is complete.
4. Reversing the steps of motor removal, plug the blade power cord tail clip (9) and motor end tail clip (11) against each other respectively and fasten with the fastening nut (10) as shown in Fig. 2.

NOTE:

- The removal and installation steps for the three blade motors are the same.
- Before removing the harness of the blade controller, turn off the main power supply of the vehicle.
- When installing the blade motor harness, make sure position of each motor (left, middle, right) corresponds with the blade power cord (left, middle, right). Do not reverse the correspondence.

5.3 Setting Anti-scalp Wheels (if equipped)

The anti-scalp wheels are an anti-scalp feature of the deck and not a design to support the weight of the cutting deck.

1. Park the mower on a level surface and set the parking brake.
2. Check tire pressure, adjust if necessary. See tire side wall for proper tire pressures.
3. Make sure the deck is level side-to-side and properly pitched.
4. Raise the cutting deck to the desired height setting.
5. Check the wheels for contact or excessive clearance with the surface below.

NOTE:

The anti-scalp wheels should have between 1/4” (6.25 mm) and 1/2” (12.7 mm) clearance above the ground.

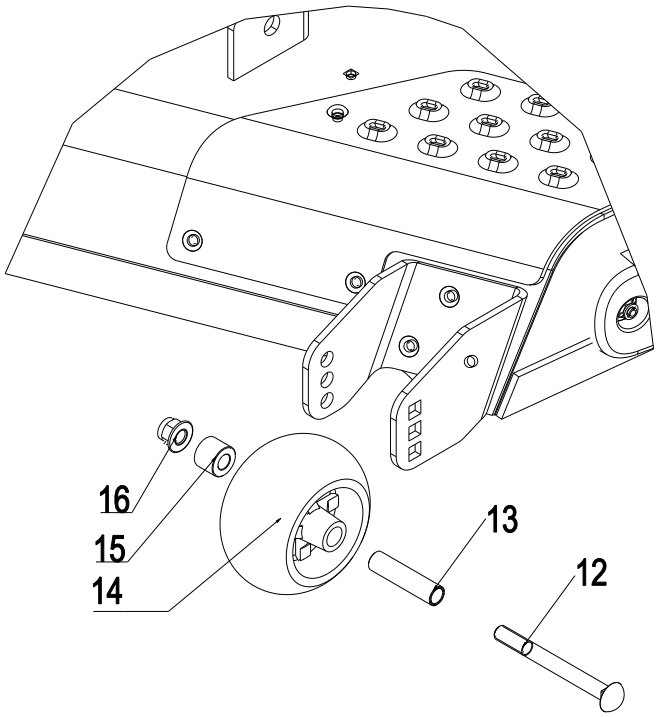


Fig. 3

12. Long bolt
13. Long sleeve
14. Anti-scalp wheel
15. Spacer
16. Nut M12

Removal:

1. Use two 18 mm sockets wrenches to loosen the bolts (12) and nuts (16).
2. Pull out the bolts (12), anti-scalp wheel (14), long sleeve (13), and spacer (15) from the deck welding.

Installation:

1. Install the sleeve (13) into the inner hole of the anti-scalp wheel (14) and put them into the installation gap for deck welding with the mounting holes aligned.
2. Insert the bolt (12) through the mounting holes of deck welding and long sleeve (13) in sequence, then place the spacer (15), continue insert the bolt (12) through the spacer (15), then tighten the nut (16).
3. These anti-scalp wheels are designed to minimize scalping when mowing on rough, uneven terrain. After setting the cutting height, adjust the anti-scalp wheels (A) so they extend below the deck but do not contact the ground. They should always be at least 1/4" to 3/4" (0.6cm to 1.9cm) below the deck (B). With the mower sitting on a flat level surface, the wheel position can be adjusted up or down as needed from 3/4" to 2-1/4" (1.9cm to 5.7cm) from the anti-scalp wheels (A) to the ground.

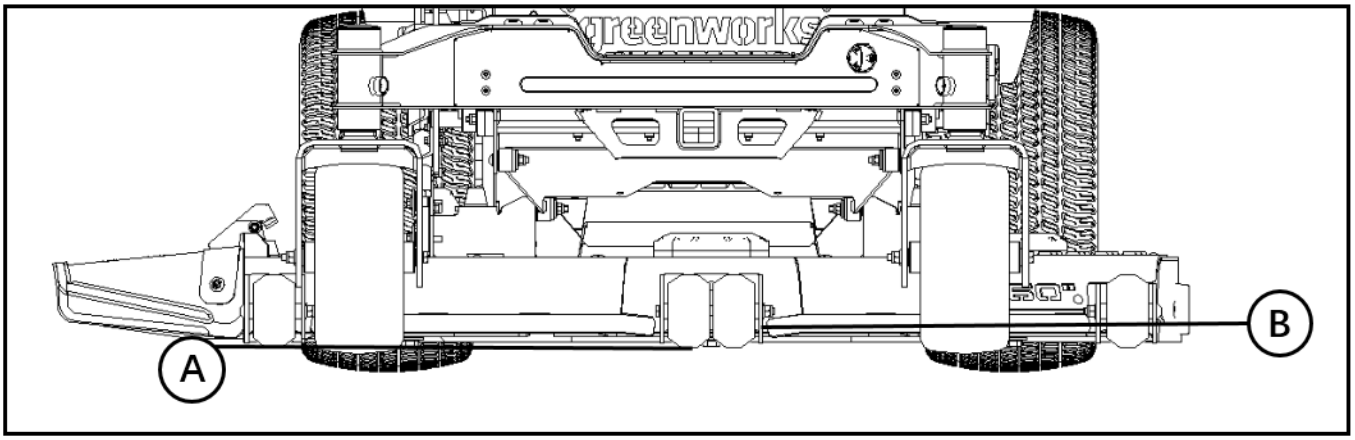


Fig. 4

4. For cutting height over 3.5 inches (90mm) use the bottom hole. The anti-scalp wheels will be effective against scalping.

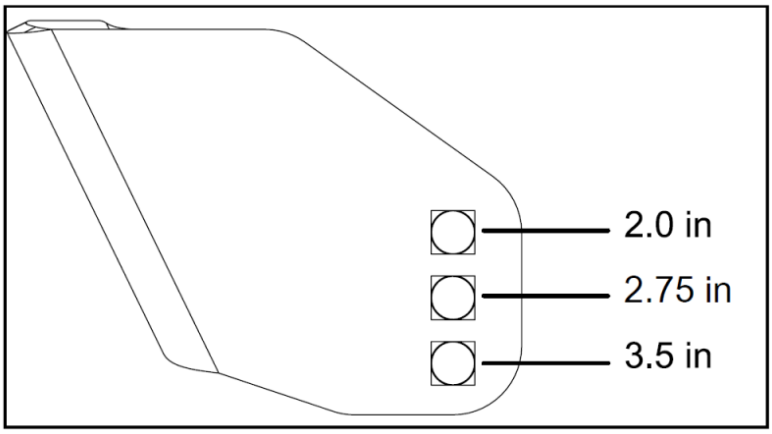


Fig. 5

5. Select a hole so that the wheel is positioned to the corresponding height-of-cut desired.
6. Use two 18 mm wrenches to tighten the bolt (12) and nut (16) to a tightening torque of 70Ft-lb (95 Nm) until the two mounting plates of deck welding tightly clamp the spacer (15) and the sleeve (13). At this point, the anti-scalp wheel (14) can rotate freely, while the spacer (15) and the sleeve (13) cannot.
7. Repeat the adjustment on the other anti-scalp wheels.
8. The installation is complete.

NOTE:

- The removal and installation steps for the anti-scalp wheels in three positions are the same.
- The installation direction for the bolts of the anti-scalp wheels in three positions is shown in the figure. The nuts (16) on both sides are located inside of the deck. No special requirement for the middle position wheel.
- Upon installation, check if the anti-scalp wheels can rotate freely and smoothly.

5.4 Deck Height Adjustment

CAUTION:

Rotating blade is very dangerous. Before adjusting the deck height, make sure the vehicle KEY switch is OFF and turn off the power supply if necessary. When grabbing the blade or working around the blade, the operator usually needs to wear protective gloves to prevent cutting injury.

NOTE:

During the deck height adjustment, anti-scalp wheels must have clearance above the ground.

1. Drive the machine to a level ground and turn off the power source.
2. Check if the left and right tire pressures are correct and make sure they are the same.
3. Using the pedal spool, adjust the deck height to the transport position.
4. Put the deck height limit pin (21) in the 3-inch limit hole as shown in Fig. 8 below.
5. Make sure the blades are positioned as shown in Fig. 6.
6. Use a ruler or a level meter (Fig. 7) to measure the clearance gaps between the tips of three blades and the ground. The blade tip clearance should be 76 mm (±3 mm) above the ground.

If the clearance is off the standard, adjust the blade tip height; if the clearance is correct, adjust the front and rear heights of the blades.

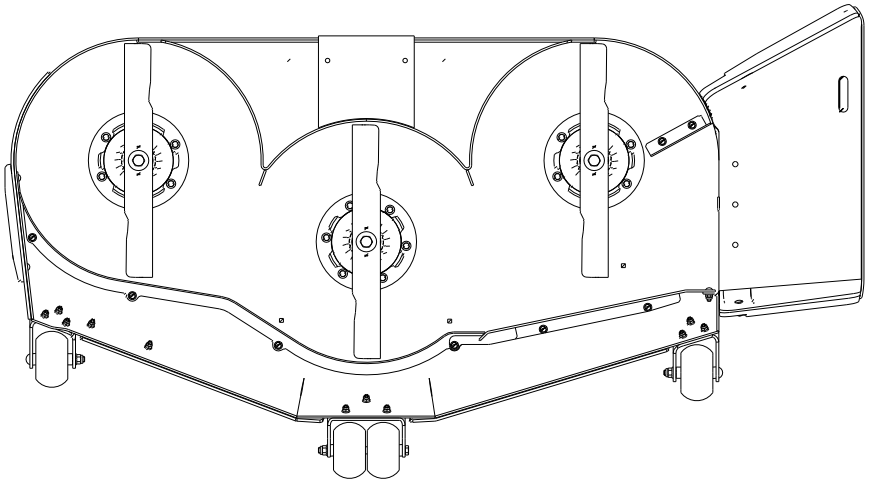


Fig. 6

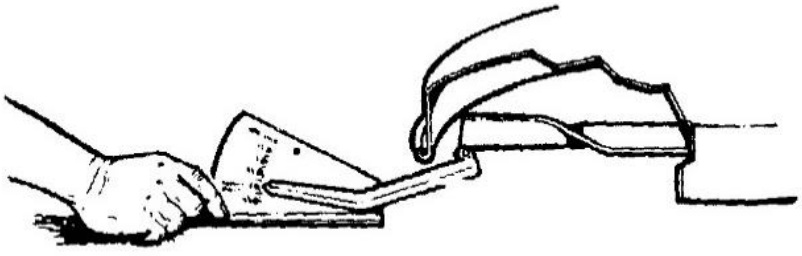


Fig. 7

5.4.1 Blade Tip Height Adjustment

1. Use an 18 mm open-end wrench to loosen the fastening nut (19) at the lower end of the height adjustment lever.
2. Rotate the adjusting screw (18): clockwise to raise and counterclockwise to lower, the blade height. Adjust the blade tip clearance above the ground within the range of 76 mm (±3 mm).
3. When the blade position reaches the required height, tighten the fastening nut (19) to a tightening torque of 22-26 Ft-lb (30-35 Nm).

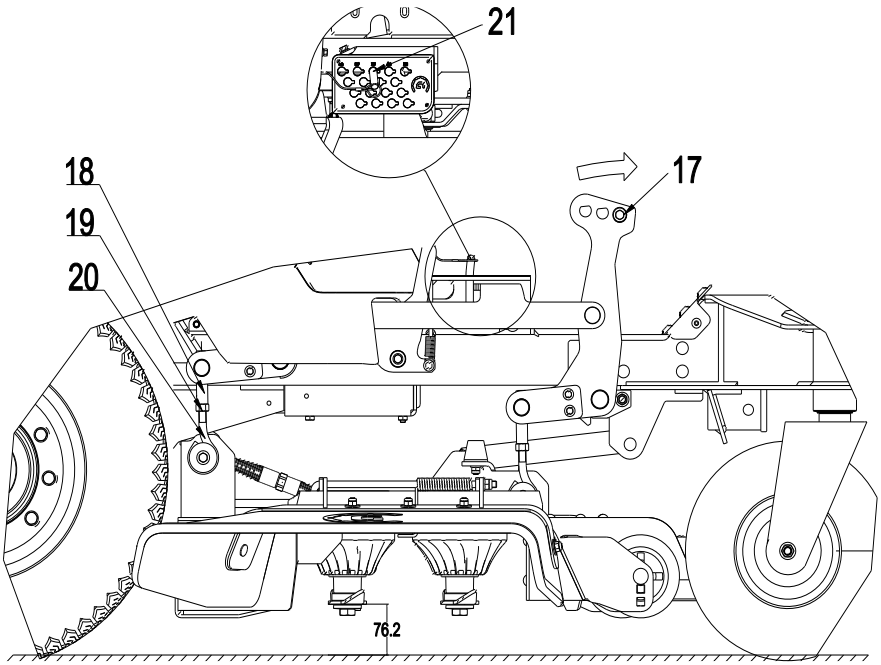


Fig. 8

17. Height adjustment lever pedal shaft
18. Adjusting screw
19. Fastening nut
20. Tie rod
21. Lock lever

5.4.2 Blade Tilt Adjustment

1. Put the deck height at 3 inches (76 mm).
2. Lift the discharge chute and adjust the right blade orientation to the front and rear of the vehicle.
3. Measure the clearance of the front end of the right blade to the ground.
4. Rotate the blade by 180° and measure the rear end of blade tip clearance to the ground.
5. Rotate the adjusting screw to make sure that the height of the blade tip at rear is higher than that of at front, with a 3-6 mm height gap.
6. Repeat the steps above to adjust the heights of middle and left blades.

6. Operation Components

6.1 Steering Control Lever

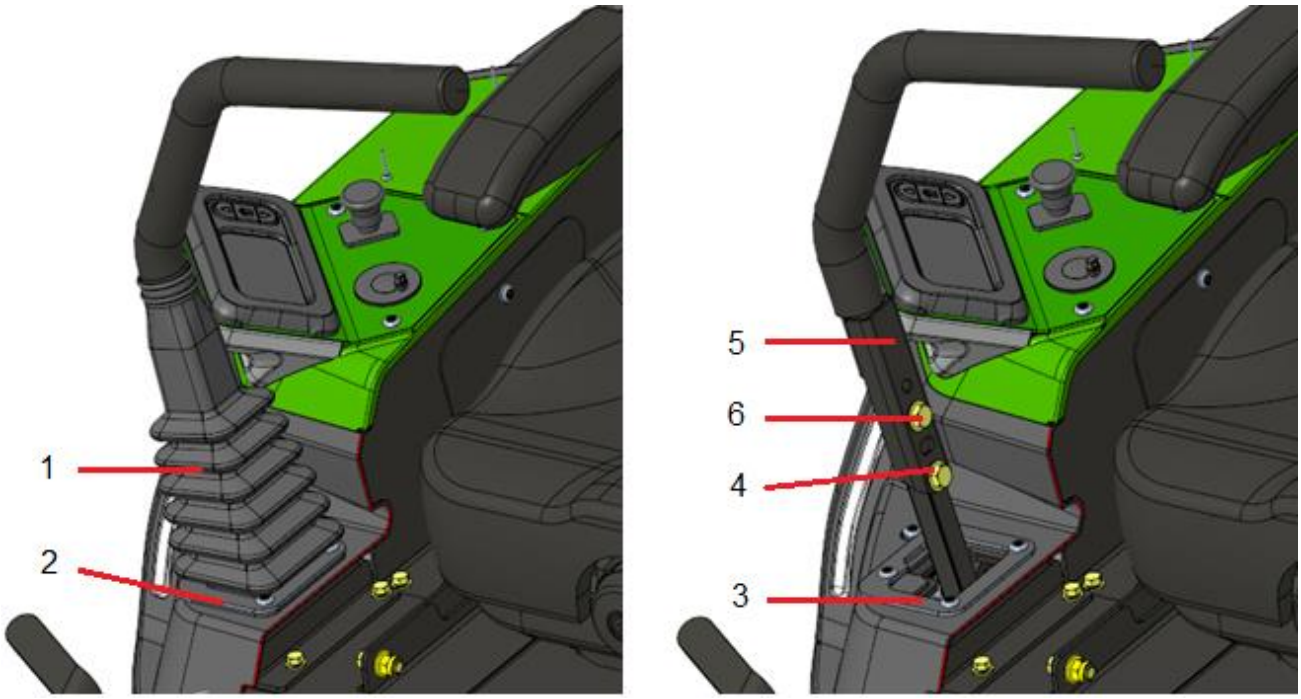


Fig.1

1. Rubber dust cover
2. Screw M6*25
3. Pressing plate
4. Disc spring
5. Steering control lever
6. Bolt M10*25

1. Loosen the screw M6*25 (2) on the pressing plate (3) to release the rubber dust cover (1).
2. Place the steering control lever handle (5) onto the steering control lever and align with the two holes on the mounting plate. The steering control lever has two sets of mounting holes located up and down providing two modes: upper and lower. Install the levers in either mode as needed.
3. Slip the bolt (6) through the mounting holes of the disc spring (4) and the steering control lever (5) and tighten via the inner threads on the steering control lever to a tightening torque of 27.3-55.4 Ft-lb (37-75 Nm).

6.2 Operation Enclosure and Switch Panel

6.2.1 Switch Panel

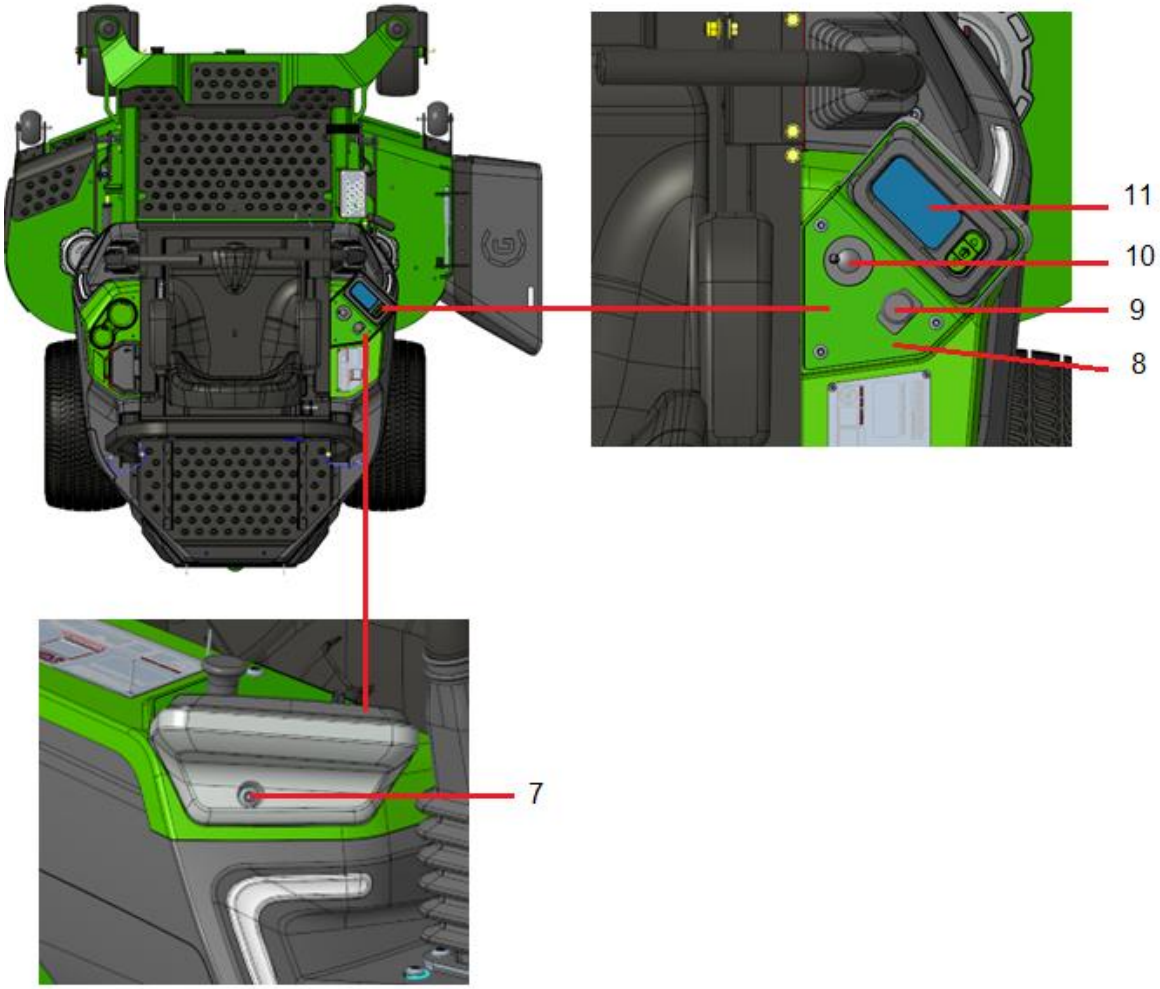


Fig.1

7. Bolt M6*20
8. Control panel
9. PTO switch
10. Key switch (BPS)
11. Display screen

1. Use a T30 hexagonal Torx wrench to remove the four bolts M6*20 (7) shown in the Fig. 1.
2. The harness now connects to the switches and display screen on the control panel (8). Open the control panel carefully and do not drag or pull the harness to prevent damage to the switches and display screen.
3. Disconnect the connections behind the PTO switch (9), key switch (10) and display screen (11).
4. Press the click fastener on control panel with both hands.

NOTE:

During the removal of the display screen (11), insert the screwdrivers from the A/B locations on two sides and apply pressure on the click fastener, and remove the display screen (11) from the control panel (8).

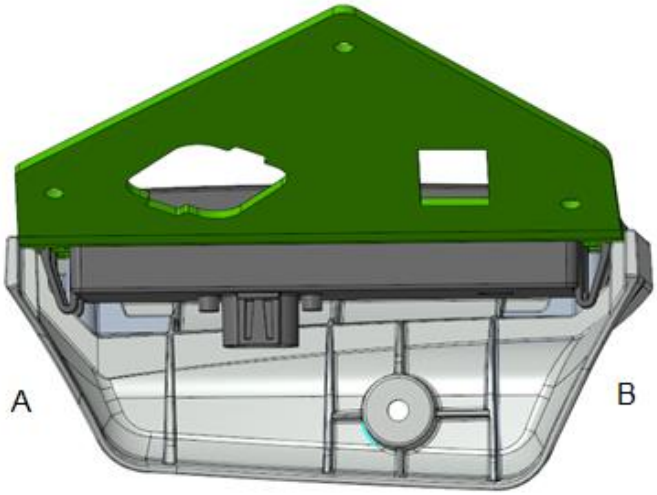


Fig. 2

6.2.2 Operation enclosure

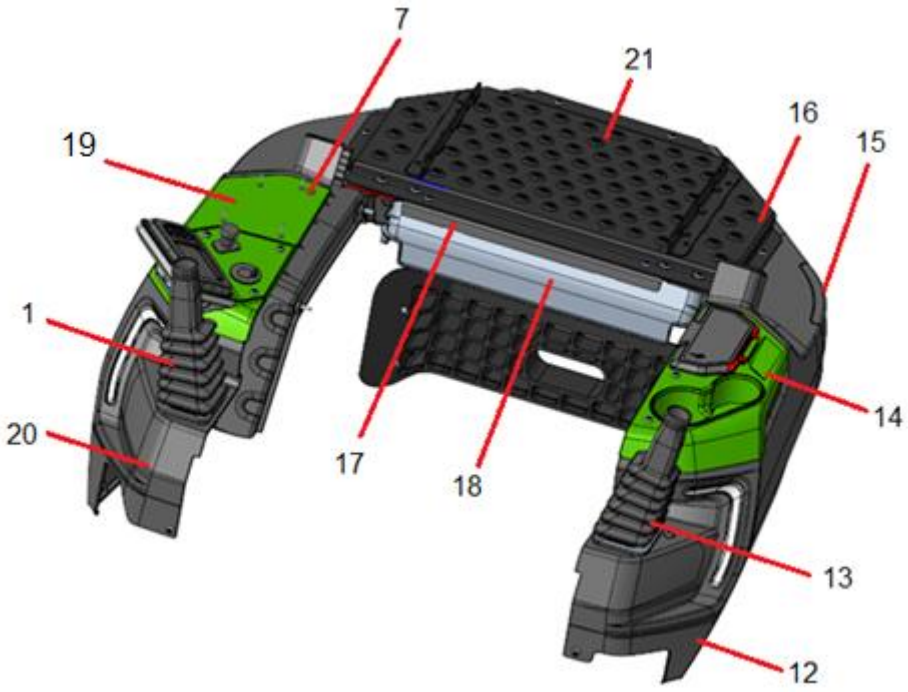


Fig.3

12. Left enclosure
13. Rubber dust cover (left)
14. Left panel
15. Charging port cover
16. Rear cover
17. Controller upper cover
18. Protective cover
19. Right panel
20. Right enclosure
21. Rear plate, CARGO

NOTE:

Installation of the vehicle plastic parts must be in correct sequence.

Removal:

Remove the plastic cover using the steps below.

1. Remove the left and right handles and rubber dust covers (1) and (13), see 5.1 for detailed steps.
2. Use a T30 plum hexagonal wrench to remove the six bolts (7) on the Rear plate, CARGO (21).

Fig. 4

3. Use a T30 plum hexagonal wrench to remove the four bolts (7) on the Controller upper cover (17).

Fig. 5

4. Remove the connector of the rearlight (22).
5. Use a T30 hexagon Torx wrench to remove the five bolts (7) on the rear cover (16)

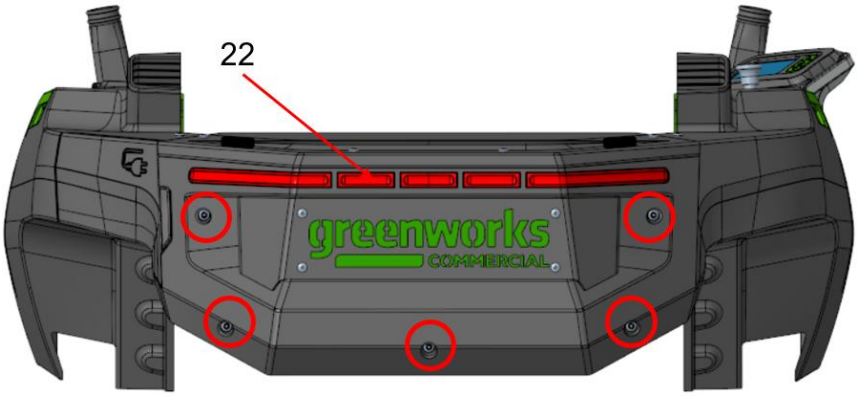


Fig. 6

22. Rearlight

6. Remove the rear cover (16) and the controller upper cover (17).
7. Remove the three bolts on the protective cover (18) as shown in the Fig.7 below.

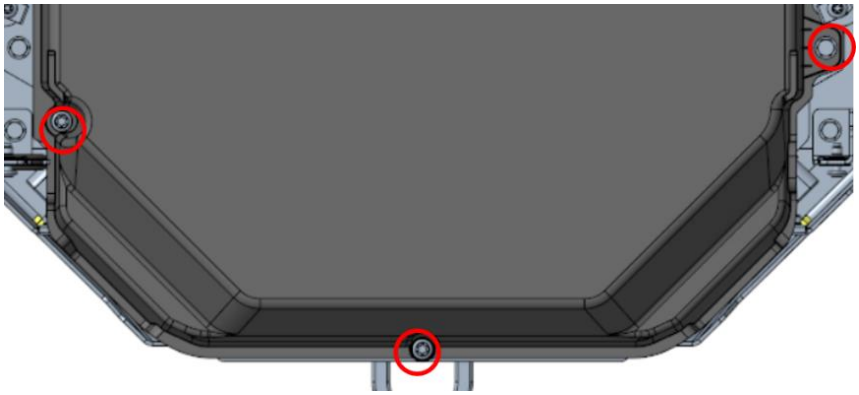


Fig. 7

8. Remove the protective cover (18).
9. Disconnect the C+ / C cable connectors, controller connector, as well as earth wire connector.

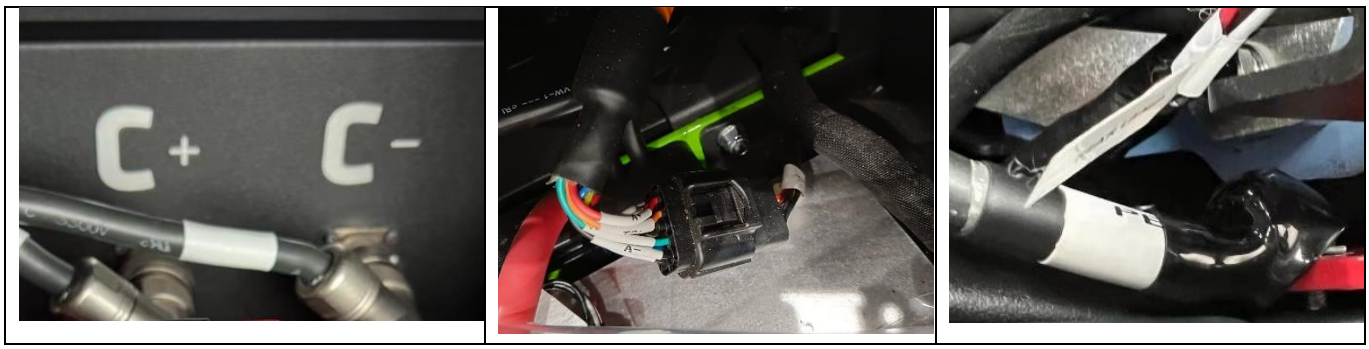


Fig. 8

10. Remove the two bolts (7) on the left panel (14). Open the left panel carefully and do not drag or pull the harness so as to prevent damage to the USB connector or left LED light connector.
11. Disconnect the USB and left LED light plugs.
12. Remove the left panel (14).
13. Remove the remaining three bolts on the left enclosure.
14. Remove the left enclosure (12).
15. Remove the right panel (19) from the right enclosure (20), see 5.2.1 for detailed steps.
16. Remove the remaining three bolts on the right enclosure (20).
17. Disconnect the GPS plugs so as to prevent damage to the GPS cord.
18. Remove the right enclosure.

6.3 Potentiometer

NOTE:

All electrical switch controllers as well as operation controls and battery pack are located inside the plastic covers. Therefore, replacement and maintenance with regard to electrical control components require removing the plastic covers (see 5.2.2 for detailed steps).

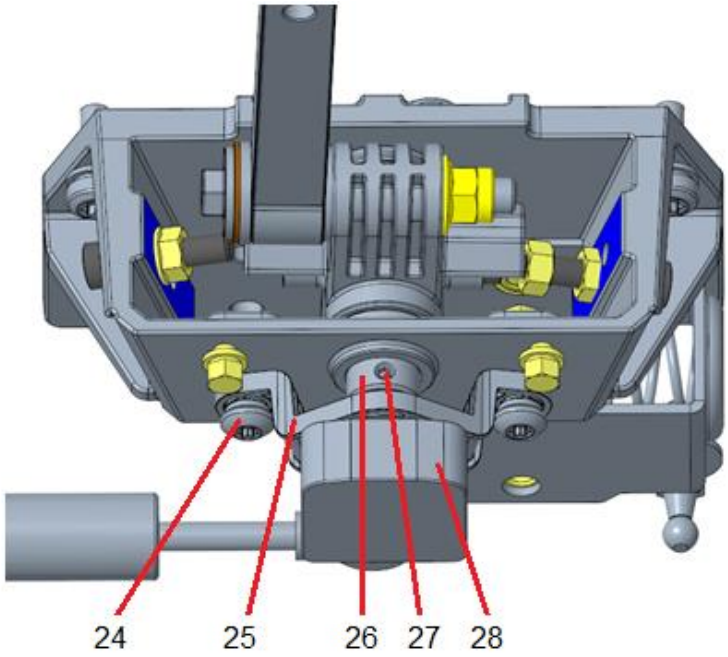


Fig. 9

24. hexalobular socket screw M6*20
25. Potentiometer mounting plate
26. Shaft
27. Set screw
28. Potentiometer

Removal:

1. Potentiometer is installed inside the left and right enclosures. Removal and installation of the potentiometer require completely removing the left and right enclosures, see 5.2.2 for detailed steps.
2. Use a T30 hexagon Torx wrench to remove the two screws (24) by rotating counterclockwise.
3. Use a 3 mm hexagon wrench to remove the set screws (27) by rotating counterclockwise (The set screws are applied with thread locker. If it is difficult to remove, heat with a heater gun).

4. Disconnect the potentiometer harness connection and remove the potentiometer mounting plate (25) together with the potentiometer (28) from the shaft (26).

6.4 Potentiometer voltage adjustment

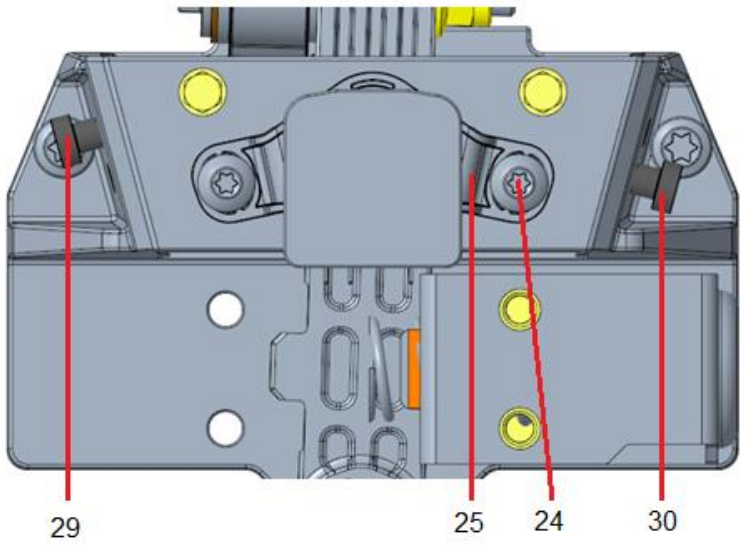


Fig. 10

29. Forward adjusting rod 30. Rearward adjusting rod

6.4.1 Potentiometer voltage measurement

1. Power on the vehicle and make sure the control levers are in the neutral position and at open state.
2. Remove the sems bolt (31) and open the maintenance cover plate (32) on the left and right sides.

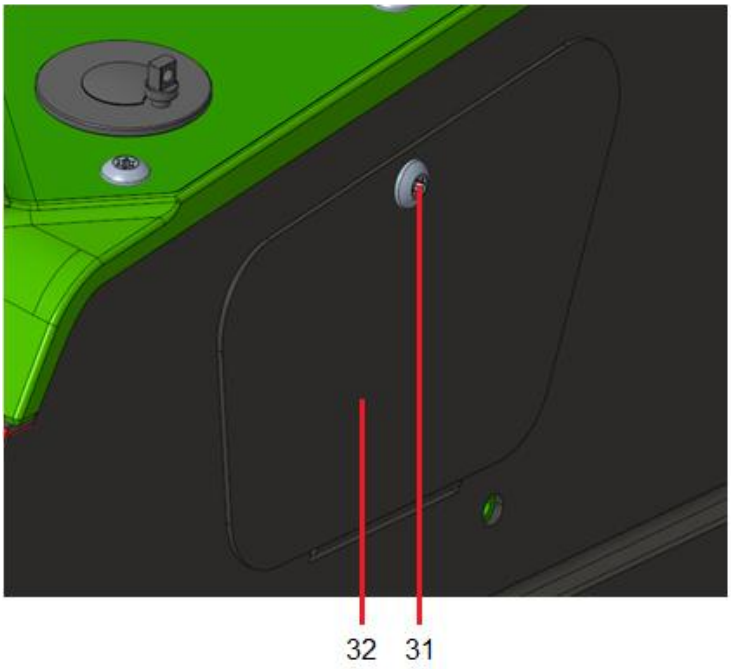


Fig. 11

31. Sems bolt M8*30 32. Maintenance cover plate

3. Connect the handheld encoder to the left and right rear wheel drive commissioning interface on the controller harness respectively. Measure the voltages of the left and right steering control levers at the neutral, foremost and rearmost positions respectively. Compare the measured value to the standard value to check if it deviates or not. The correspondence between the steering control lever positions and standard voltage value ranges are given below:

T: Appropriate device value read by accelerator at initial installation.

Steering control lever position	Forward position	Neutral position	Rearward position
Voltage standard range	(T+2)%~(T+46)%	(T-1)%~ (T+2)%	(T-25)%~(T-1)%

4. If the measured voltage value deviates from the set voltage value, take the steps below to adjust.

6.4.2 Potentiometer voltage adjustment

Neutral position adjustment:

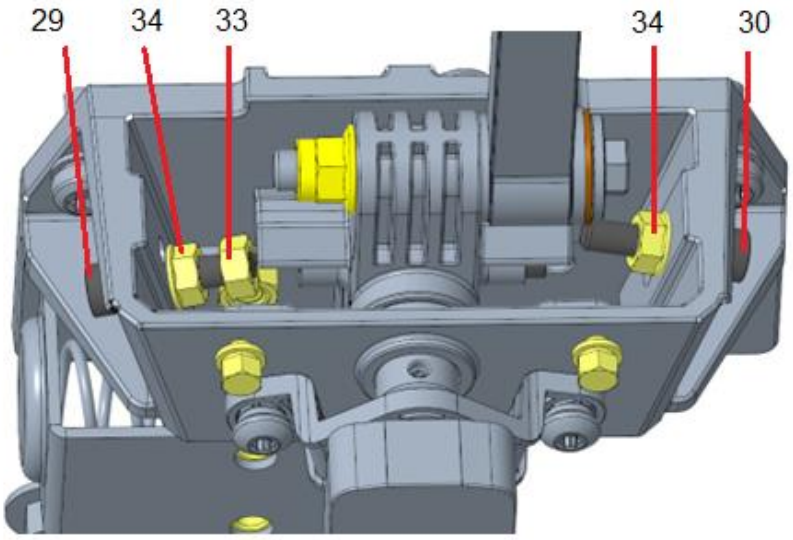


Fig. 12

29. Forward adjusting rod 33. Spacing nut
30. Rearward adjusting rod 34. Tightening nut

Foreward adjustment:

1. Make sure the end face of the spacing nut (33) in front of the operation mount is aligned with that of the forward adjusting rod (29) (if aligned, no need to adjust. Spacing nut (33) should be applied with thread locker).
2. Loosen the tightening nut (34) with a 13 mm open-ended wrench and rotate the forward adjusting rod (29) counterclockwise with a 6 mm Allen key to adjust the end face position of the spacing nut (33).
3. Push the steering control lever forward until the end face of the spacing nut (33) is reached and cannot be pushed further forward.

4. Read the current voltage with a handheld encoder and see if it falls within the standard range of the foremost position. If the value is too small (too big), continue to rotate the forward adjusting rod (29) so that the end face of the spacing nut (33) moves forward (backward), until the voltage is within the standard range.

Rearward adjustment:

1. Make sure the end face of the spacing nut (33) at the rear end of the operation mount is aligned with that of the rearward adjusting rod (30) (if aligned, no need to adjust. Spacing nut (33) should be applied with thread locker).
2. Loosen the tightening nut (34) with a 13 mm open-ended wrench and rotate the rearward adjusting rod (30) counterclockwise with a 6 mm Allen key to adjust the end face position of the spacing nut (33).
3. Push the steering control lever rearward until the end face of the spacing nut (33) is reached and cannot be pushed further rearward.
4. Read the current voltage with a handheld encoder and see if it falls within the standard range of the rearmost position. If the value is too small (too big), continue to rotate the rearward adjusting rod (30) so that the end face of the spacing nut (33) moves forward (backward), until the voltage is within the standard range.
5. One set of forward adjusting rod (29), rearward adjusting rod (30), tightening nut (34), and spacing nut (33) are installed in the front and at the rear of the operation mount, forming the foremost and rearmost spacing mechanics of the steering control lever.

NOTE:

- The adjustment methods for the potentiometers on both sides are exactly the same.

- Potentiometer value of the control enclosures on both sides must be adjusted independently. Because the power must be on during potentiometer voltage adjustment, when adjusting the potentiometer value on one side, you must ensure that the control lever on the other side is in the neutral open position (make sure that the lever touches the station switch). For safety purpose, the rear (drive) wheels of the vehicle can be hoisted off the ground, if necessary.

6.5 Damper

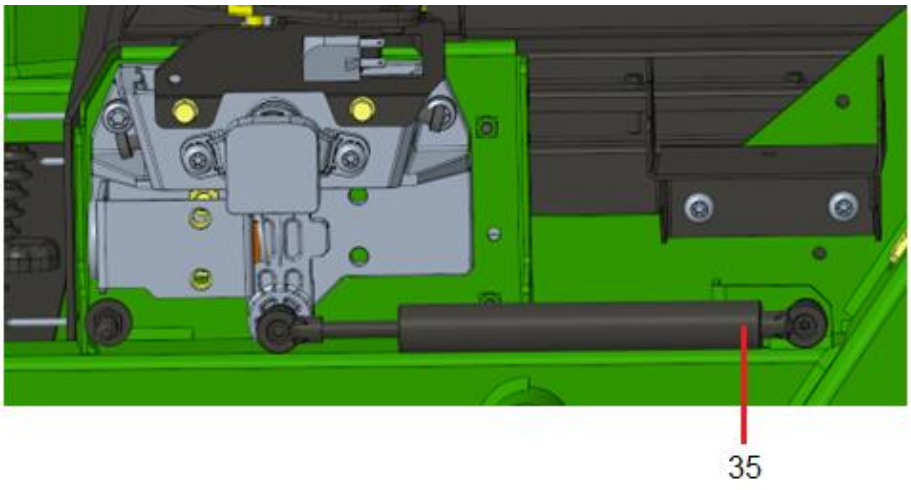


Fig. 13

35. Damper

Removal:

1. Remove the operation enclosure on the side where the damper (35) is located (see 5.2.2 for detailed steps).
2. Use a T40 hexagon Torx wrench to completely loosen the fixing rods at the front and rear ends of the damper (35).
3. Remove the damper (35).

NOTE:

- The steps for removal and installation of dampers (35) on two sides are the same.
- After installing the damper (35), move the control lever back and forth to feel if the damping force is abnormal. Install the operation enclosure in place, if there is no abnormality.

7. Seat

7.1 Seat

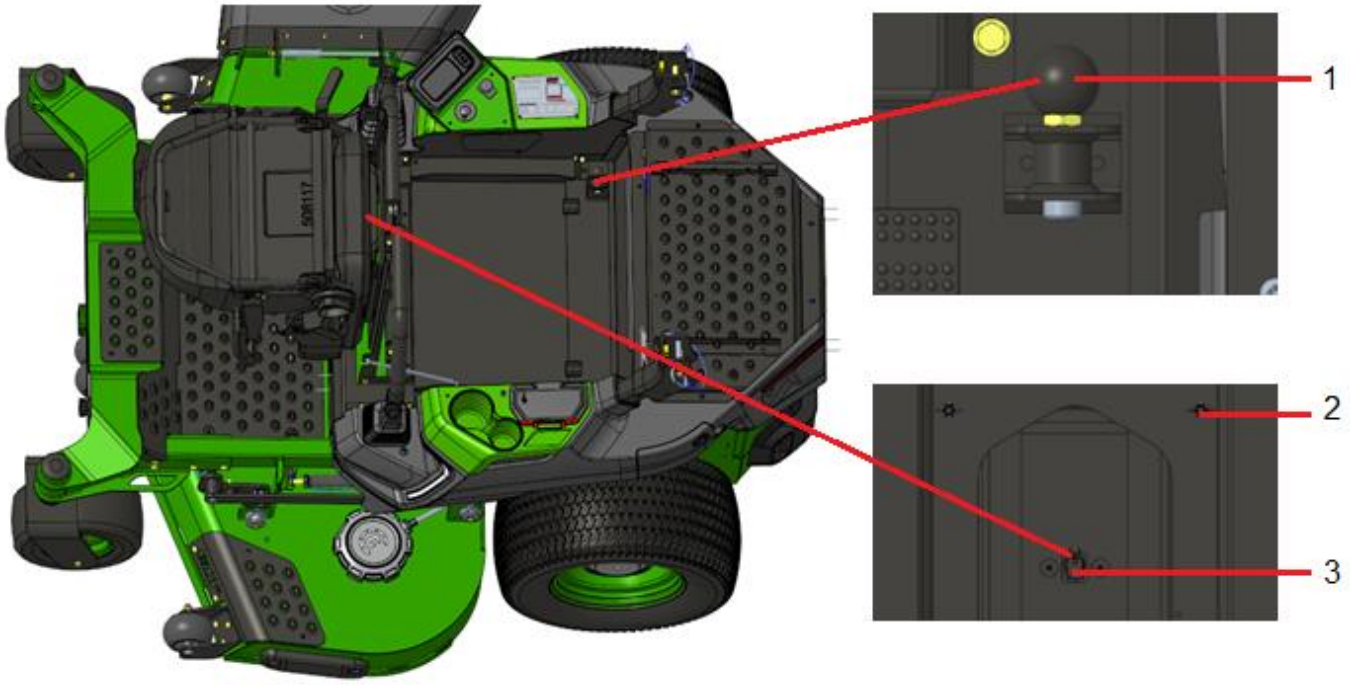


Fig.1

1. Handle ball
2. Seat nut
3. Seat switch

Removal:

1. Pull out the handle ball (1) upward.
2. Hold the upper part of the seat back with hands, turn it forward and disconnect the seat bottom switch (4) connector.
3. Use a 13 mm socket wrench to loosen four seat nuts (3) and remove the plain washers (2).
4. Remove the seat from the seat pan.

Installation:

1. Put the seat on the seat pan and roll it forward together with the seat pan.
2. Intall the plain washers (2) and tighten these four seat nuts (3) with a 13 mm socket wrench. The tightening torque is 17 Ft-lb (23 Nm).
3. Connect the seat bottom switch (4) connector and lay the seat flat.

8. Controllers

8.1 Controller covers

1. Use a T30 hexagon Torx wrench to loosen and remove all six bolts (2).
2. Remove the rear plate (1).

Fig. 1

1. Rear plate (CARGO)
2. Bolt M6*20

3. Dismantle the rear cover (3).

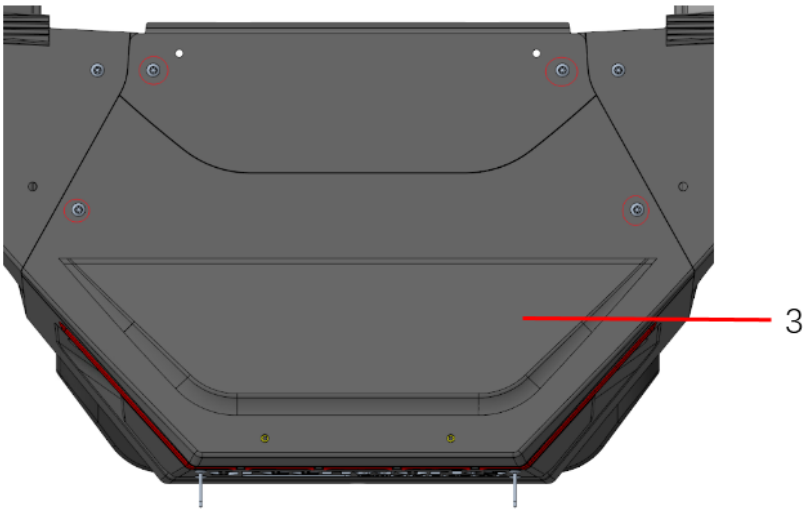


Fig. 2

3. Rear cover

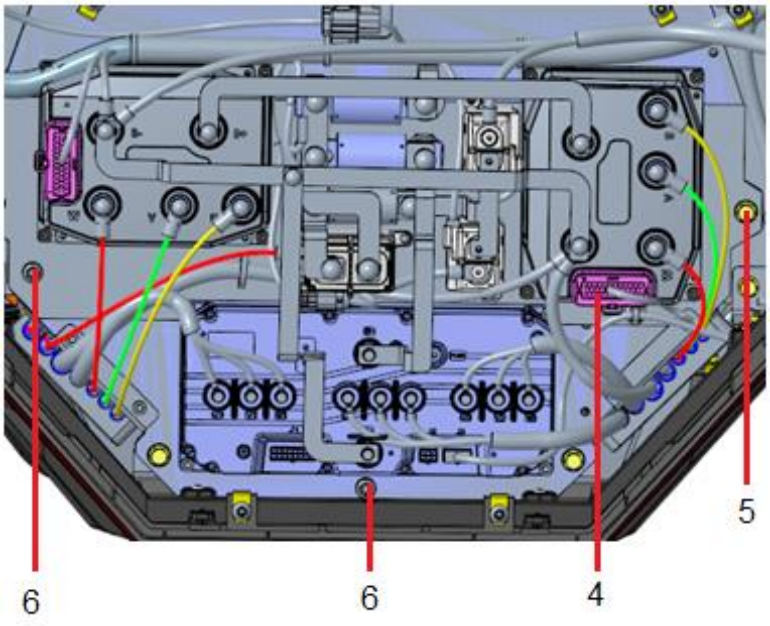


Fig. 3

4. Transparent protective cover
5. Bolt M8*30
6. Bolt M8*16

4. Open the rear cover (3) and you can see the transparent protective cover (4) is installed on the aluminium plate.
5. Remove the bolt M8*30 (5) and two bolts M8*16 (6).
6. Remove the transparent protective cover (4).

Now, you can maintain the electrical parts or replace the electrical components.

8.2 Blade controller and drive controller

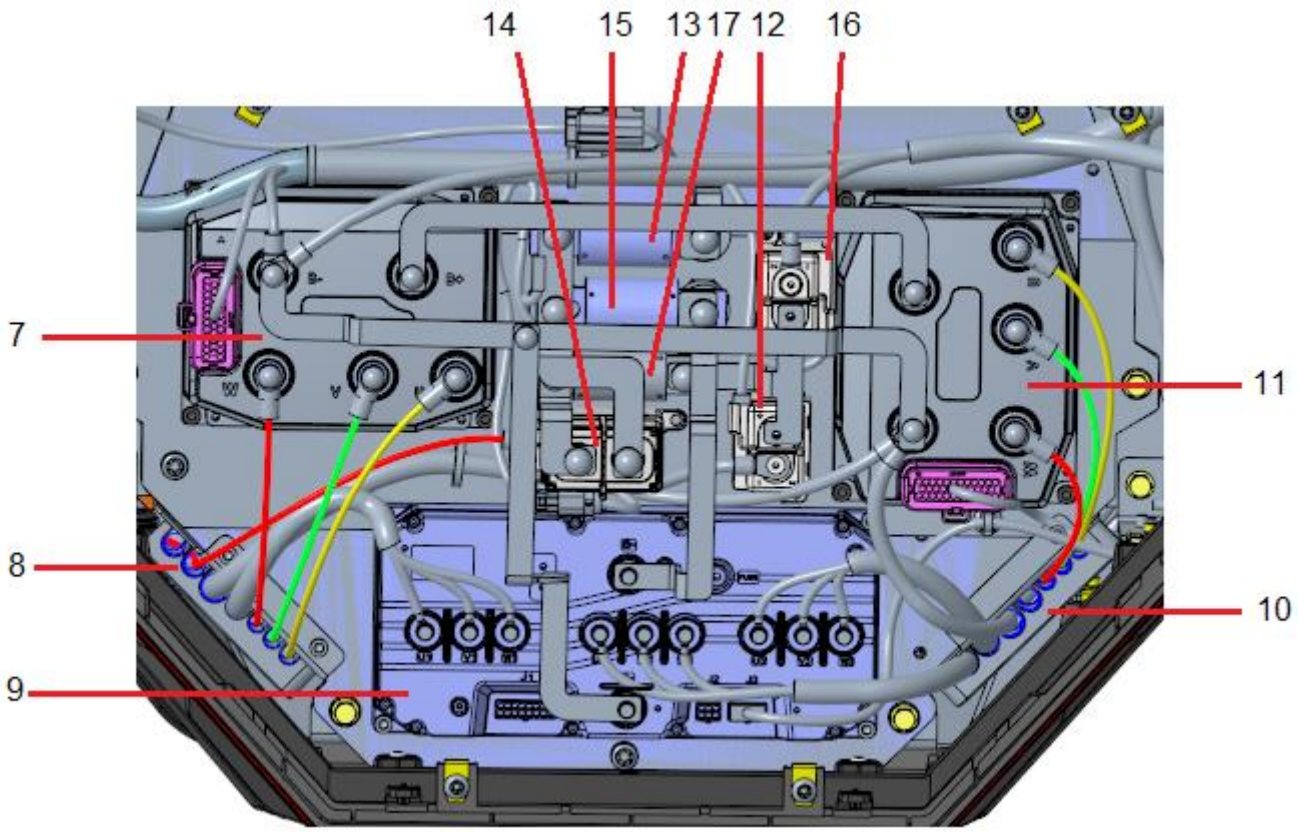


Fig.4

7. Drive controller (slave)
8. Nylon cord clip
9. Blade controller
10. Nylon cord clip
11. Drive controller (master)
12. Relay (120 A)- front ETO
13. Fuse (225A)
14. Relay (300 A)
15. Fuse (250A)
16. Relay (120 A)- rear ETO
17. Fuse (200A)-slave

Removal and Installation of Blade Controller:

1. Use an 8 mm socket wrench to remove the bolts fixing the U, V and W three-phase wires of the blade motor mounted on the blade controller (9).
2. Separate the blade motor three-phase wires from the motor controller. There are three such three-phase wires corresponding with the three blade motors respectively. When installing the blade motor three-phase wires, note that each location must be installed on the corresponding blade controller and that U, V and W three-phase wires must completely correspond with the U, V and W marks on the corresponding blade controller. They should not be connected reversely or incorrectly.
3. Remove the B+/B- on the bronze plate of the blade controller (9).
4. Disconnect the signal connector and you can see that the controller is mounted to the aluminium plate with only four hexagon bolts.
5. Loosen the bolts.
6. Remove the blade controller (9).

NOTE:

Before the blade controller is installed onto the aluminium plate, it is applied with a layer of thermal grease at the bottom. After replacement or repair, during the installation, the thermal grease needs to be reapplied.

1. Thermal grease type LOCTITE TG 100 or type GD900-SY7 (ERP: R0211808-00).
2. Usually, one controller needs one small tube (ERP: R0211808-00) thermal grease.

Removal and Installation of Drive Controller:

1. Use a 10 mm socket wrench to remove the bolts fixing the U, V and W three-phase wires of the drive controllers (7, 11).
2. Separate the drive motor three-phase wires from the drive controller. Two in total, corresponding with left and right drive motors respectively. Installation of drive motor three-phase wires has designated directions. Drive motor on the left side must be installed on the left drive controller and the U, V and W three-phase wires must completely correspond with the U, V and W marks on the corresponding drive controller. They should not be connected reversely or incorrectly.

NOTE:

Before the drive controller is installed onto the aluminium plate, it is applied with a layer of thermal grease at the bottom. After replacement or repair, during the installation, the thermal grease needs to be reapplied.

1. Thermal grease type LOCTITE TG 100 or type GD900-SY7 (ERP: R0211808-00).
2. Usually, one controller needs one small tube (ERP: R0211808-00) thermal grease.

8.3 Relay

Removal:

1. Remove the bronze plate on the relays (12, 14, 16). Use 7 mm socket wrench for the relay (12, 16) and 13 mm socket for the relay (14).
2. Pull out plugs on the relays (12, 14, 16).
3. Use a T25 hexagon wrench to remove the bolt mounting the replays (12, 14, 16) onto the aluminium plate.

8.4 Fuse

1. Use a 13 mm socket wrench to remove the bronze plate on the fuses (13, 15).
2. Fuses (13, 15) can be removed altogether for replacement.

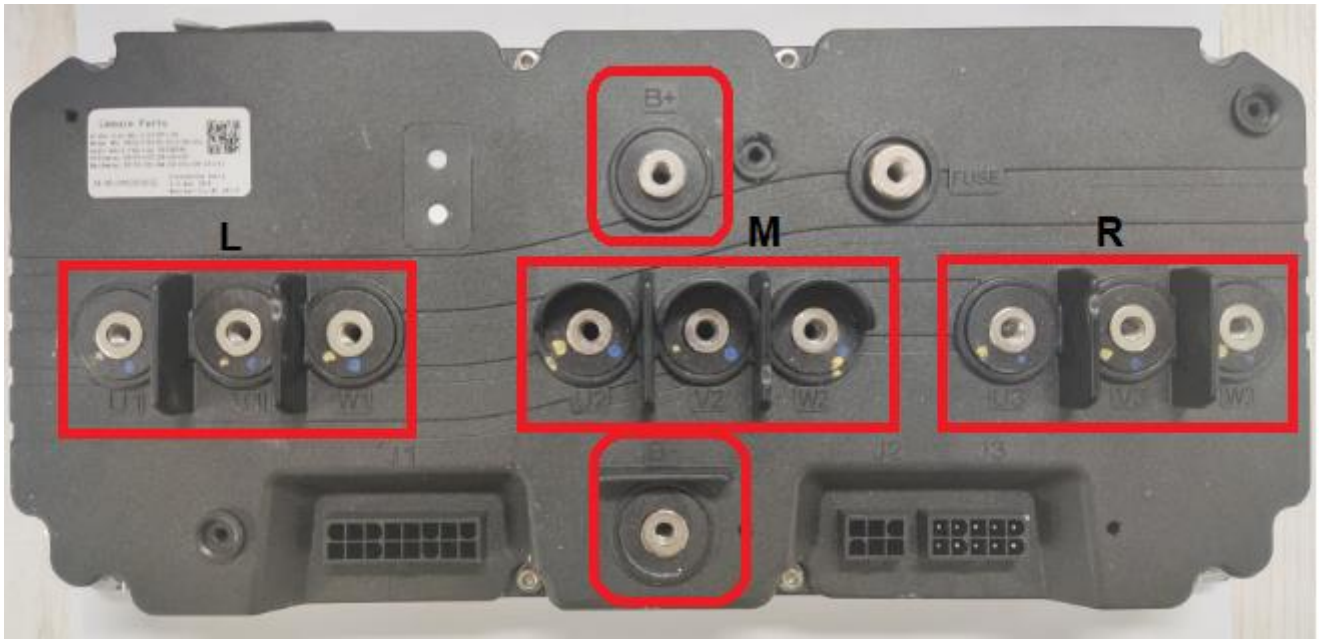
NOTE:

Before the removal and installation, plugging of any harness on the controller parts, as well as the replacement of components, make sure the vehicle battery pack connection to power source is disconnected to prevent electrical shock hazard.

8.5 U/V/W Three-phase Line

1. To connect the blade controller motors, refer to the number markings for the U/V/W three-phase cables. See Fig. 5 for details.
2. As shown in the image, position the sockets so that B+ is facing upwards and B- is facing downwards.

3. Connect the U/V/W three-phase cables for the left, centre and right blade controllers to the left, centre, and right U/V/W sockets respectively.



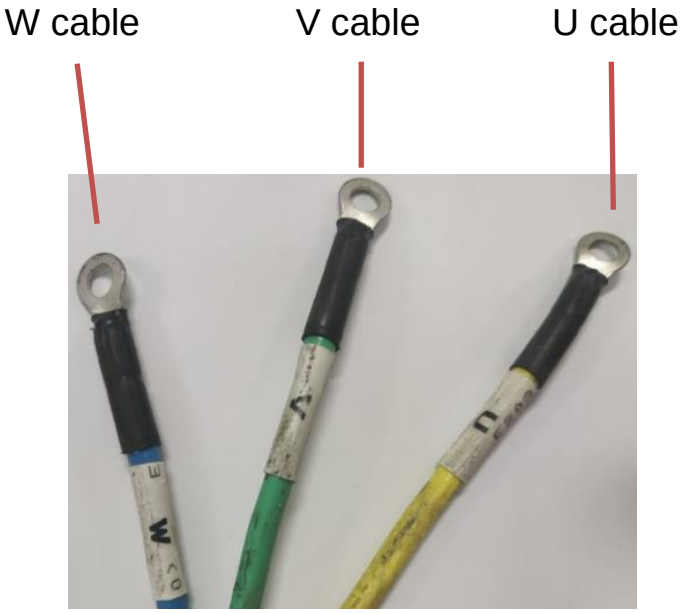


Fig.5

9. Front and Rear wheels, Drive Motor

9.1 Front and Rear Wheels

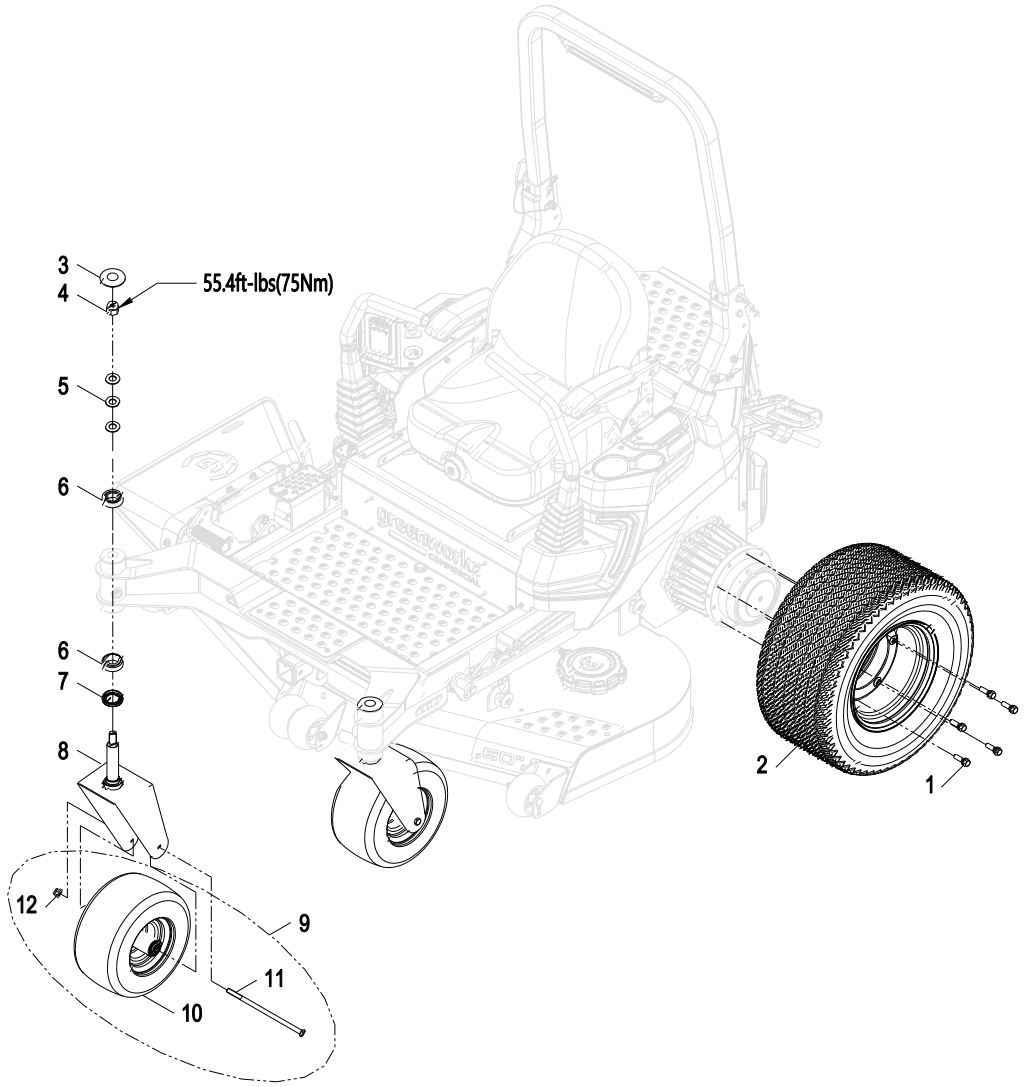


Fig. 1

1. Fastening bolt
2. Rear wheel
3. Dust cap
4. Nut M20
5. Blade washer
6. Tapered roller bearing
7. Shaft seal
8. Front fork welding
9. Front wheel assembly
10. Front wheel
11. Bolt M12*240
12. Nut M12

Removal of Front Wheel:

1. Using a hoisting tool, hoist the front end of the chassis to a certain angle.
2. Loosen and remove the bolt (11) and nut (12) with two 18 mm socket or wrench.
3. Remove the front wheel assembly (9).

Removal of Front Fork:

1. Pry open the dust cap (3) with a screwdriver.
2. Loosen the nut (4) with a 30 mm socket wrench by rotating counterclockwise and remove the nut (4), three blade washers (5), and the inner ring of the upper side bearing (6).
3. Remove the front fork (8), shaft seal (7) and the inner ring of the lower side bearing (6) altogether.

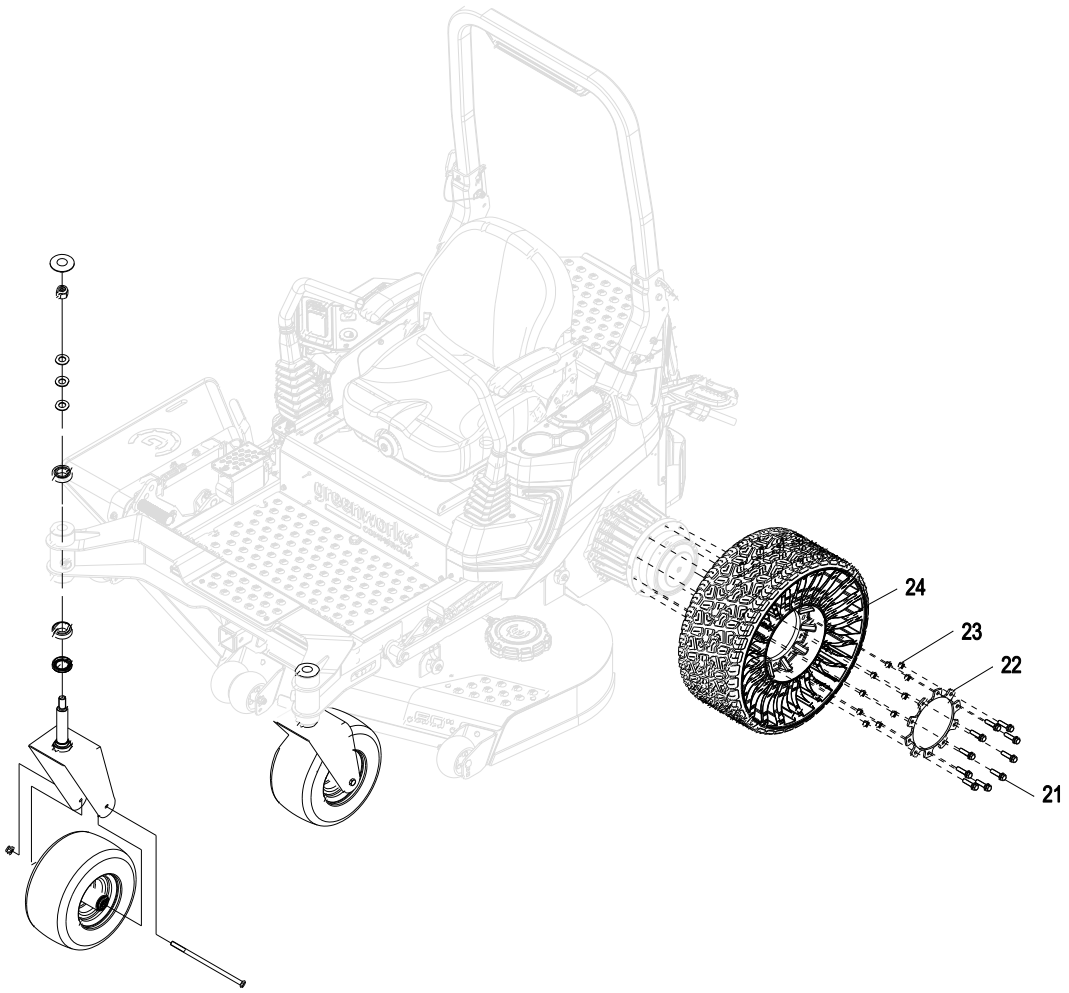
Removal of Rear Wheel:

1. Using a hoisting tool, hoist the rear end of the machine to let the rear wheels off the ground.
2. Remove the four fastening bolts (1) of the rear wheels with a 21 mm socket wrench.
3. Remove the wheels (2).

NOTE:

Tightening torques for the bolts: fastening bolt (1) is 73.8 Ft-lb (100 Nm); the bolt (4) is 55.4 Ft-lb (75 Nm), and the bolt (11) is 14.8 Ft-lb (20 Nm).

9.1.1 Rear Wheels（Michelin Tweels）



21. Bolt M12*50
22. Flange plate
23. Spacer washer
24. Michelin Tweel

Removal of Rear Wheel:

1. Using a hoisting tool, hoist the rear end of the machine to let the rear wheels off the ground.
2. Remove the four fastening bolts (21) of the rear wheels with a 21 mm socket wrench.
3. Remove flange plate (22) and spacer washer (23).
4. Remove the tweels (24).

NOTE:

Tightening torques for the bolts: fastening bolt (21) is 73.8 Ft-lb (100 Nm).

9.2 Drive motor

IMPORTANT:

Before removing the drive motor, disconnect the battery pack power supply and remove the rear wheels.

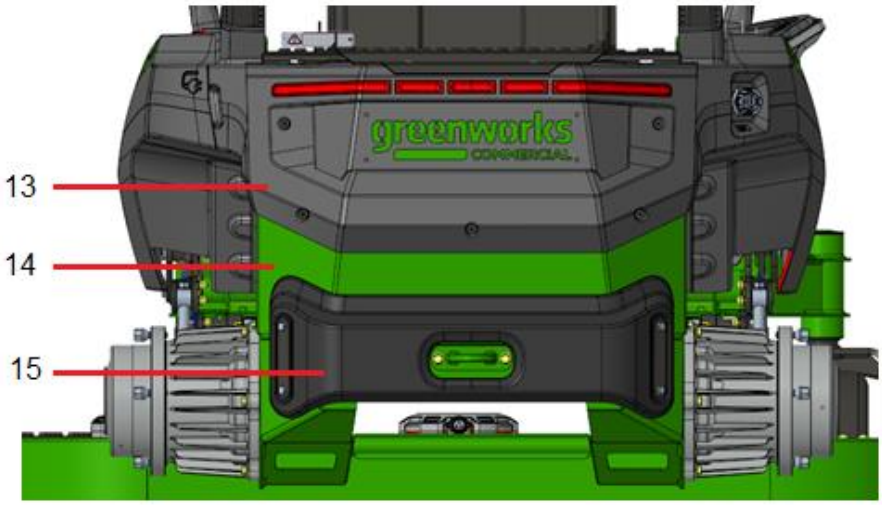


Fig.2

13. Rear cover part
14. Mounting plate
15. Rubber bumper

Removal:

1. Remove the two rear wheels (left and right), see 8.1 for detailed steps.
2. Extend the drive gearbox harness from the aluminum plate to the lower side of the chassis. Because there is not enough space from the rear, in order to make it easier to plug and unplug the harness, remove the rear cover part (13), mounting plate (14) and rubber bumper (15) of the components at the rear.

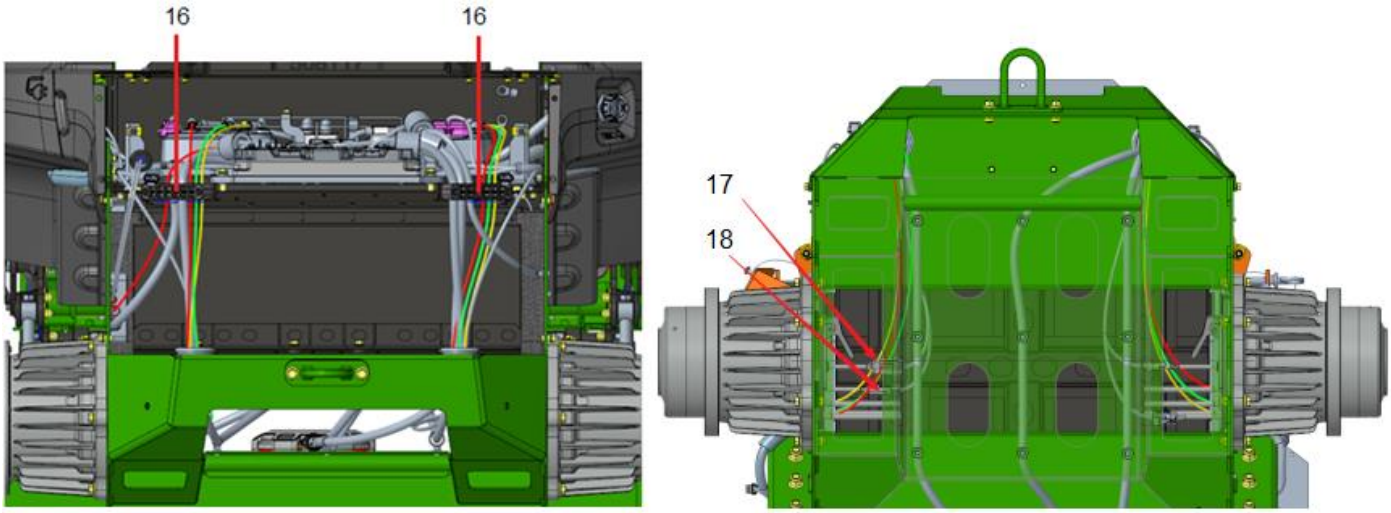


Fig. 3

16. Nylon wire clip
17. Control signal plug
18. Thermal sensor plug

3. Remove the three-phase wire connectors of the drive motor (located inside the transparent protective cover, see 7.2 for detailed steps).
4. Use a 5 mm hexagon wrench remove the nylon wire clips (16) on left and right sides.
5. Disconnect the control signal harness plug (17) and the thermal sensor plug (18) of the drive gearbox from the main harness.
6. Pull out the left and right drive gearbox harnesses from the harness through hole (A/B) at the bottom of the chassis.

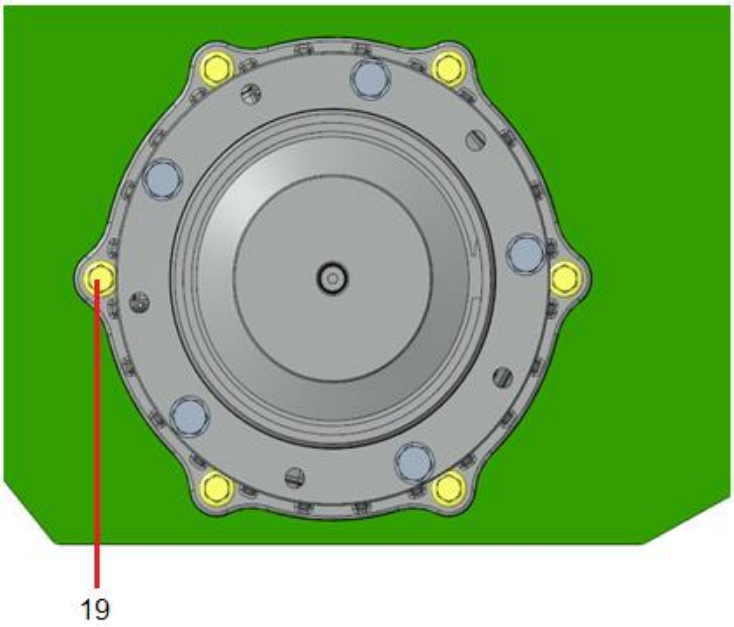


Fig. 4

19.Bolt M10*40

7. Remove the six bolts M10*40 (19) on the drive gearbox. Use 16 mm socket wrench to remove the top two bolts are installed onto the welding nut of the chassis directly. Use a wrench to secure the tightening nuts to remove the remaining four bolts.

9.3 Electromagnetic brake release

When the vehicle is power off (or cannot power on), the motor gearbox is under braking state and the brake cannot be released by turning on the power. If the vehicle needs to be moved or towed, the brake needs to be disconnected. Under such circumstance, you need to manually release the part for a mechanical brake release.

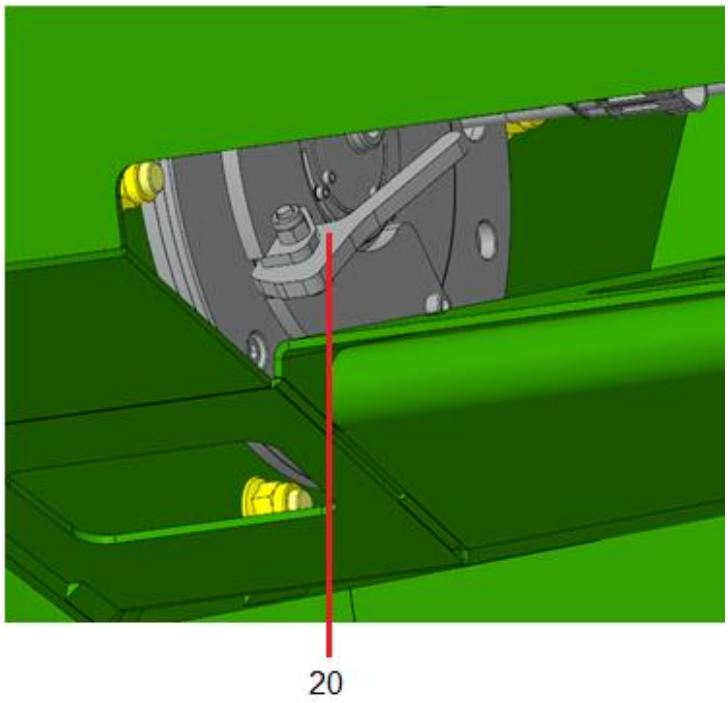


Fig. 5

20. Brake release lever

1. From the rear side of the vehicle, reach the brake release lever and toggle it to the dead centre position and the lever do not rotate further. The brake is now released and the tire on the lever side can move when pushed.
2. Repeat the steps above to release the motor brake on the other side.

10. Battery Pack

Battery pack is the vehicle power output device, providing the vehicle with electrical power. The battery pack of this vehicle is located under the seat. Removal and installation of the battery pack requires using hoisting equipment, therefore, you need to disassemble all the covers on top of the battery pack.

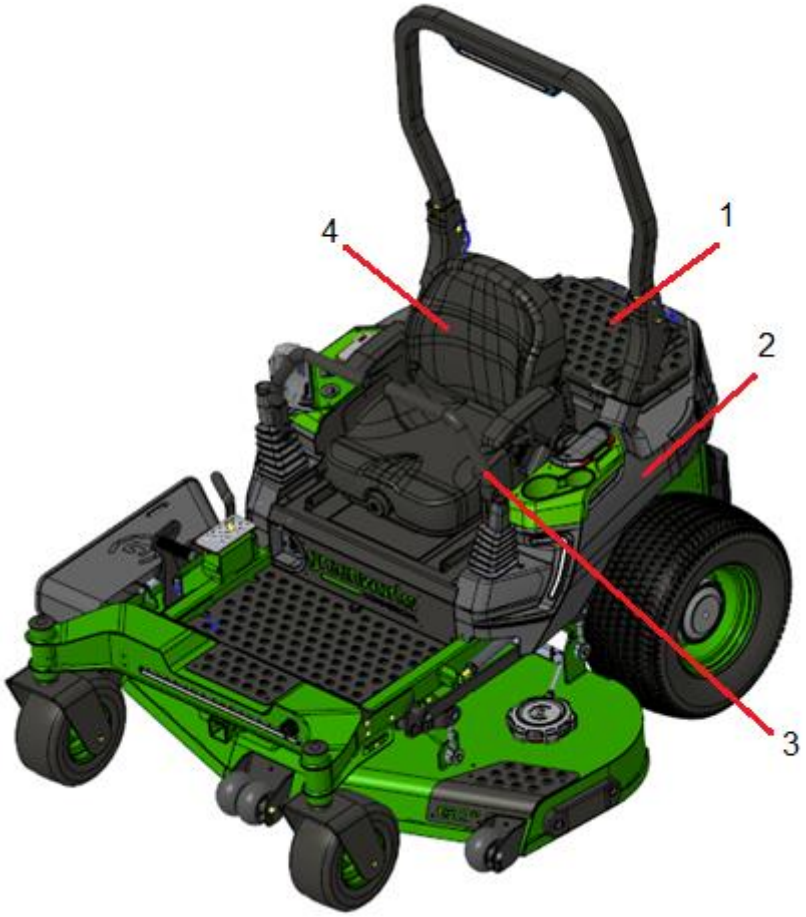


Fig. 1

1. Rear cover
2. Enclosure assembly
3. Steering control lever
4. Seat assembly

1. Remove the rear cover (1).
2. Remove the steering control lever (3), see 5.1 for detailed steps.
3. Remove the enclosure assembly (2), see 5.2.2 for detailed steps.
4. Remove the seat assembly (4), see 6.1 for detailed steps.

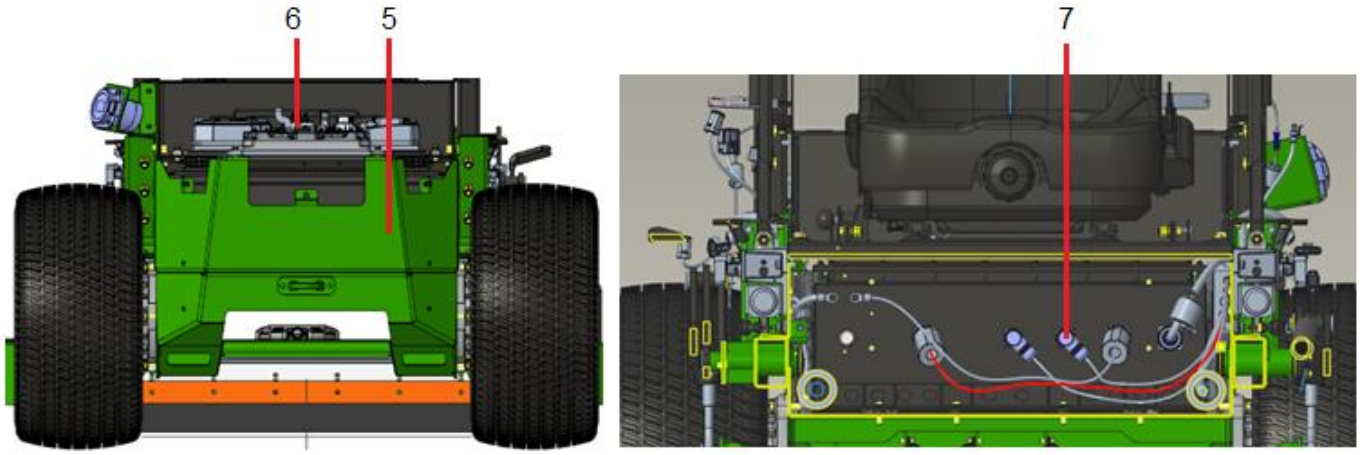


Fig.2

5. Rear mounting plate
6. Controller harness
7. Battery pack harness connector

5. Remove the rear mounting plate (5). This enables disconnection of the battery pack C+/C- connectors.
6. Disconnect the battery pack connections of the vehicle power supply connector, C+/C- connectors as well as signal wire. Five connectors (7) in total.
7. Remove the bronze plate and connectors on the controller, relay, and fuse, see 7.2, 7.3, 7.4 for detailed steps.

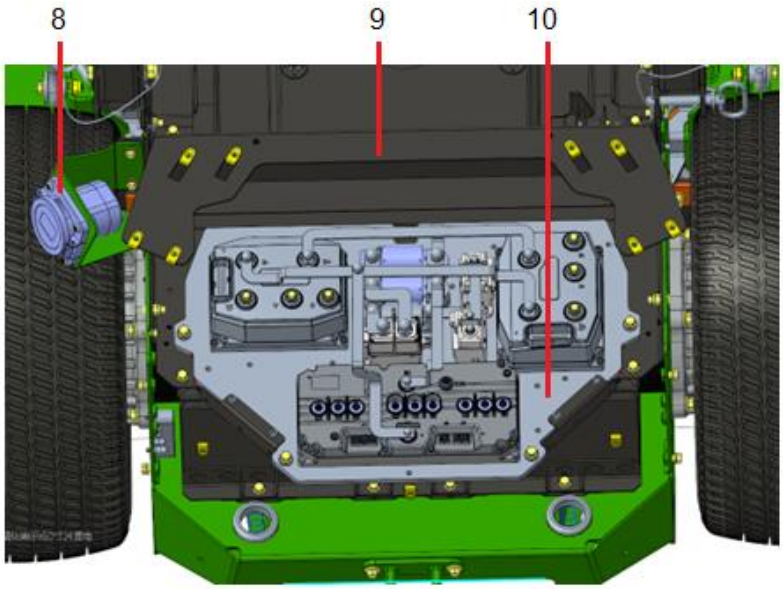


Fig. 3

8. Charging mount
9. Seat rear cover
10. Controller mounting plate

8. After removing the controller harnesses, use a 13 mm socket wrench to remove the right mount plate (10) and the charging mount (8).
9. Remove the four bolts on the seat rear cover (9).
10. Remove the electrical components and aluminium plate altogether.

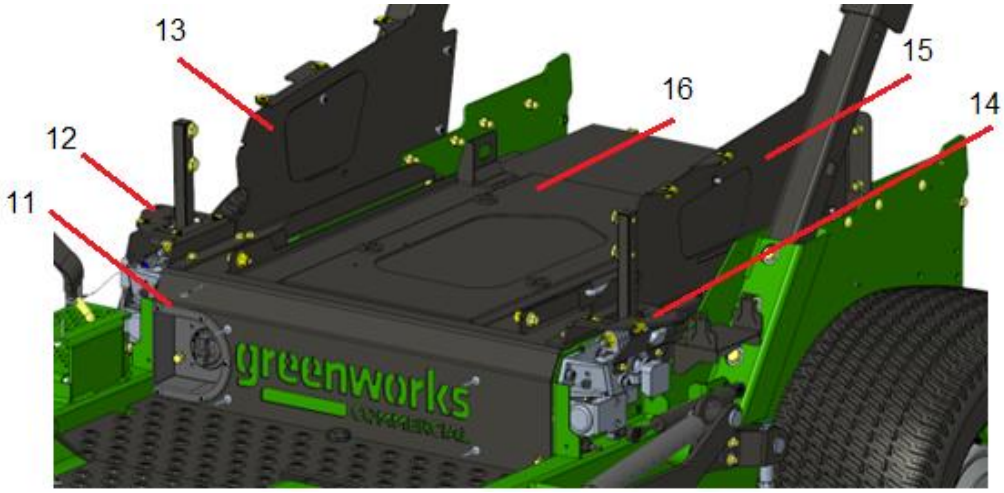


Fig. 4

11. Front cover part
12. Right steering control plate
13. Right connecting bracket
14. Left steering control plate
15. Left connecting bracket
16. Seat pan

11. Dismantle the metal parts of the battery pack in the following order: first step, remove the left and right steering control plates (12, 14); second step, remove the seat pan (16); then remove the front cover part (11); lastly remove the left and right connecting brackets (13, 15).

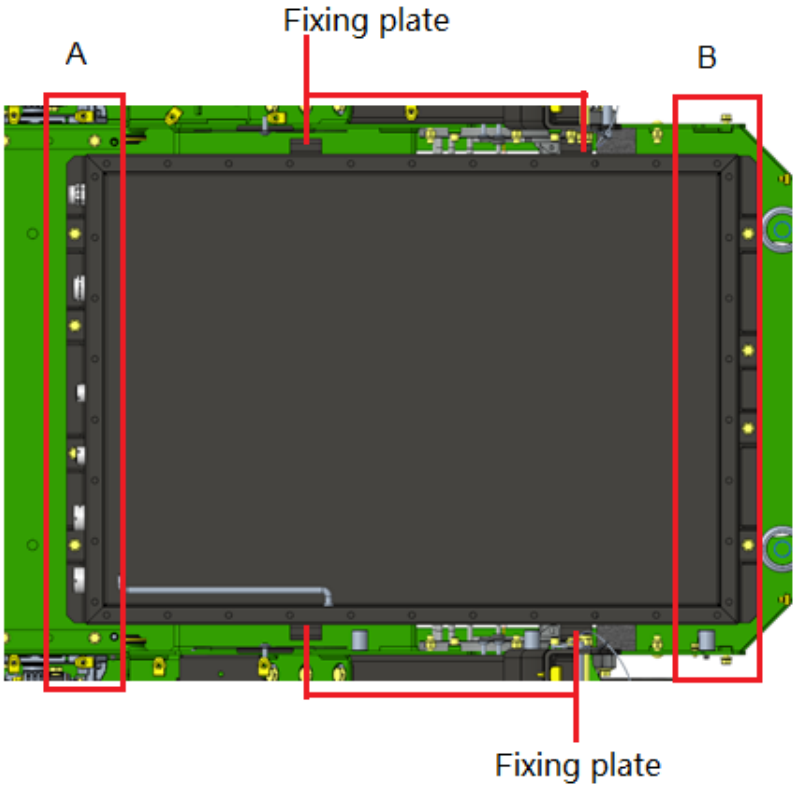


Fig. 5

12. Battery pack is mounted on the chassis welding with ten M8*30 bolts in three areas (A, B and C). Use a 13 mm socket wrench to remove these bolts.

Hoist up the machine using wire ropes to hoist the fixing supports on the left and right of the battery pack.

NOTE:

- Non-professional or untrained personnel do not dismantle the battery pack.
- Professional safe hoisting tool must be used for the removal of the battery pack.

11. GPS

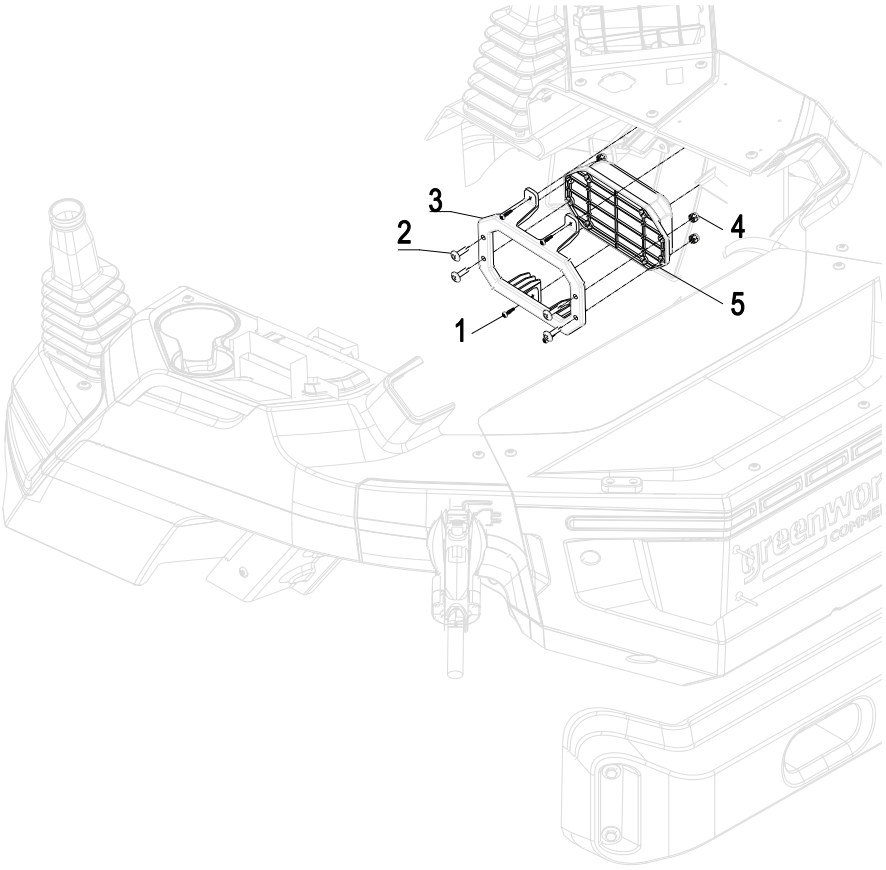


Fig. 1

1. ST4*16-F
2. Bolt M6*25
3. GPS mount
4. Nut M6
5. GPS

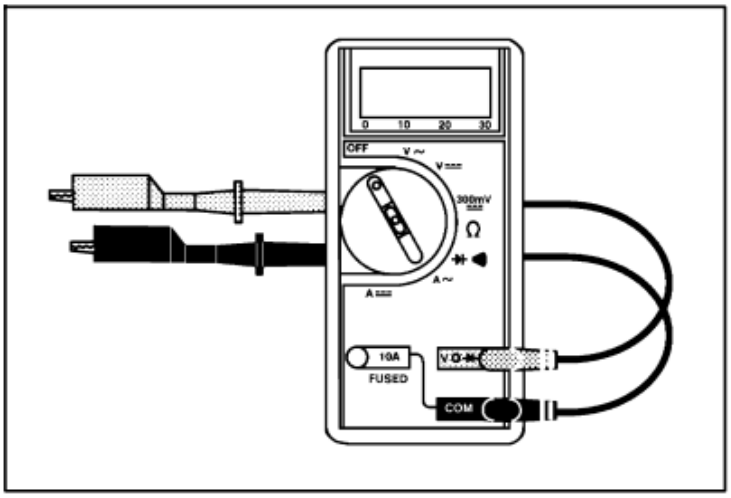
Removal:

1. GPS is installed inside the right enclosure, remove the operation enclosure, see 5.2.2 for detailed steps.
2. Before completely removing the right enclosure, disconnect the GPS connector.
3. Use a T20 hexagon wrench to remove the four bolts (1) fixing the GPS mount (3).
4. Remove the GPS mount (3).
5. Remove the four bolts (2) on the GPS (5).

12. Special Tools

Order special tools from your Distributor. Some tools may also be available from a local supplier.

12.1 Multimeter



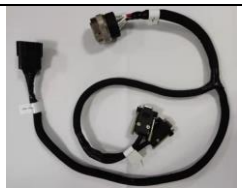
The multimeter can test electrical components and circuits for current, resistance or voltage.

NOTE:

Greenworks recommends the use of a DIGITAL Volt-Ohm-Amp multimeter when testing electrical circuits. The high impedance (internal resistance) of a digital meter in the voltage mode will make sure that excess current is not allowed through the meter. This excess current can cause damage to circuits not designed to carry it.
Prevent Connector Pin Damage by Fluke Test Lead. Remove pin retainer Put test lead on pin and measure. Or use 1mm needle test probe.

Tools	Photo
Fluke Test Lead	
1mm needle test probe	

12.2 Special tools

Tools	Cable to Flash Program	Host Computer Program	Remarks
16-Pin Adaptor		N/A	ERP: R0203075-00
CAN Interface		According to the purpose of each model	ERP: R0203845-00 Download from PEAKCAN website
Debugging Harness		N/A	ERP: R0206840-00
Thermal Grease (Type, GD900-SY7)		N/A	ERP: R0211808-00 Note: make sure thermal grease is still within shelf life – 2 years from packing.

13. Specifications (torque specs)

13.1 Torque specifications

Torque Specification Chart (General Standard Parts)							
Diameter of Thread (mm)	Pitch value of Thread (mm)	Tighten Torque Spec (Mechanical Property of Grade 8.8 for Fasteners components)					
		Standard Value		Max Value		Min Value	
		Nm	Ft-lb	Nm	Ft-lb	Nm	Ft-lb
6	1	9.0	6.6	12.0	8.9	6.0	4.4
8	1.25	23.0	17.0	26.0	19.2	16.0	11.8
8	1	25.0	18.5	28.0	20.7	17.0	12.5
10	1.5	59.0	43.5	75.0	55.4	37.0	27.3
10	1.25	63.0	46.5	79.0	58.3	45.0	33.2
10	1	64.0	47.2	80.0	59.0	46.0	33.9
12	1.75	95.0	70.1	111.0	81.9	73.0	53.9
12	1.5	97.0	71.6	113.0	83.4	75.0	55.4
12	1.25	99.0	73.1	115.0	84.9	78.0	57.6
14	2	160.0	118.1	185.0	136.5	122.0	90.0
14	1.5	180.0	132.8	205.0	151.3	146.0	107.7
16	2	215.0	158.7	245.0	180.8	182.0	134.3
16	1.5	240.0	177.1	270.0	199.3	199.0	146.9
18	2.5	268.0	197.8	298.0	219.9	229.0	169.0
18	1.5	316.0	233.2	346.0	255.4	287.0	211.8
20	2.5	430.0	317.3	470.0	346.9	389.0	287.1
20	1.5	440.0	324.7	480.0	354.2	396.0	292.3

Torque Specification Chart (General Standard Parts)							
Diameter of Thread (mm)	Pitch value of Thread (mm)	Tighten Torque Spec (Mechanical Property of Grade 10.9 for Fasteners components)					
		Standard Value		Max Value		Min Value	
		Nm	Ft-lb	Nm	Ft-lb	Nm	Ft-lb
10	1.5	74.0	54.6	90.0	66.4	52.0	38.4
10	1.25	78.0	57.6	93.0	68.6	63.0	46.5
10	1	80.0	59.0	95.0	70.1	65.0	48.0
12	1.75	140.0	103.3	156.0	115.1	105.0	77.5
12	1.5	142.0	104.8	158.0	116.6	106.0	78.2
12	1.25	145.0	107.0	161.0	118.8	108.0	79.7
14	2	175.0	129.2	200.0	147.6	141.0	104.1
14	1.5	210.0	155.0	235.0	173.4	178.0	131.4
16	2	280.0	206.6	310.0	228.8	200.0	147.6
16	1.5	305.0	225.1	335.0	247.2	240.0	177.1
18	2.5	437.0	322.5	467.0	344.6	380.0	280.4
18	1.5	467.0	344.6	507.0	374.2	397.0	293.0
20	2.5	528.0	389.7	568.0	419.2	450.0	332.1
20	1.5	558.0	411.8	598.0	441.3	475.0	350.6

Torque Specification Chart (General Standard Parts)							
Diameter of Thread (mm)	Pitch value of Thread (mm)	Tighten Torque Spec (Mechanical Property of Grade 4.6 for Fasteners components)					
		Standard Value		Max Value		Min Value	
		Nm	Ft-lb	Nm	Ft-lb	Nm	Ft-lb
6	1	4.0	3.0	5.5	4.1	2.5	1.8
8	1.25	8.0	5.9	11.0	8.1	5.0	3.7
8	1	8.5	6.3	11.5	8.5	5.5	4.1
10	1.5	19.7	14.5	29.7	21.9	14.3	10.6
10	1.25	20.8	15.4	25.8	19.0	16.7	12.3
10	1	21.8	16.1	26.5	19.6	17.0	12.5
12	1.75	37.3	27.5	43.3	32.0	28.0	20.7
12	1.5	38.5	28.4	45.0	33.2	29.0	21.4
12	1.25	39.6	29.2	48.0	35.4	30.0	22.1
14	2	61.2	45.2	75.0	55.4	46.8	34.5
14	1.5	74.6	55.1	92.0	67.9	56.0	41.3
16	2	95.0	70.1	115.0	84.9	73.0	53.9
16	1.5	105.0	77.5	133.0	98.2	76.0	56.1
18	2.5	142.9	105.5	178.0	131.4	107.4	79.3
18	1.5	157.6	116.3	190.0	140.2	124.5	91.9
20	2.5	188.0	138.7	230.0	169.7	135.0	99.6
20	1.5	203.7	150.3	243.0	179.3	149.0	110.0

Torque Specification Chart (General Standard Parts)							
Diameter of Thread (mm)	Pitch value of Thread (mm)	Tighten Torque Spec (Mechanical Property of Grade 5.6 for Fasteners components)					
		Standard Value		Max Value		Min Value	
		Nm	Ft-lb	Nm	Ft-lb	Nm	Ft-lb
6	1	4.5	3.3	6.0	4.4	3.0	2.2
8	1.25	10.6	7.8	14.0	10.3	7.0	5.2
8	1	11.0	8.1	15.0	11.1	8.0	5.9
10	1.5	26.0	19.2	33.0	24.4	19.0	14.0
10	1.25	28.0	20.7	34.0	25.1	22.0	16.2
10	1	29.0	21.4	35.0	25.8	23.0	17.0
12	1.75	45.0	33.2	53.0	39.1	37.0	27.3
12	1.5	47.0	34.7	56.0	41.3	38.0	28.0
12	1.25	50.0	36.9	60.0	44.3	40.0	29.5
14	2	81.0	59.8	95.0	70.1	62.0	45.8
14	1.5	90.0	66.4	105.0	77.5	68.0	50.2
16	2	124.0	91.5	150.0	110.7	98.0	72.3
16	1.5	132.0	97.4	160.0	118.1	101.0	74.5
18	2.5	190.0	140.2	220.0	162.4	161.0	118.8
18	1.5	200.0	147.6	230.0	169.7	165.0	121.8
20	2.5	231.6	170.9	272.0	200.7	190.0	140.2
20	1.5	236.6	174.6	285.0	210.3	197.0	145.4

14. Trouble Shooting and FAQ List

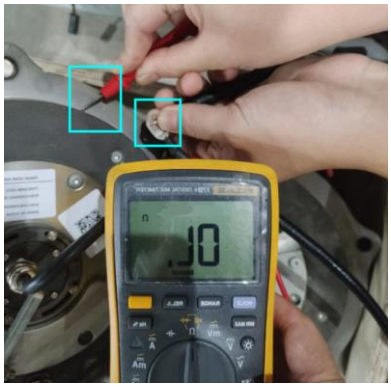
14.1 TR 12/TL 12 Right/Left Wheel Motor Controller Overcurrent

Tool: Multimeter, Computer, Debugging wire, PCAN

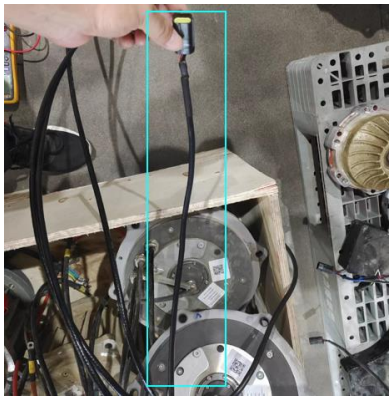


Check:

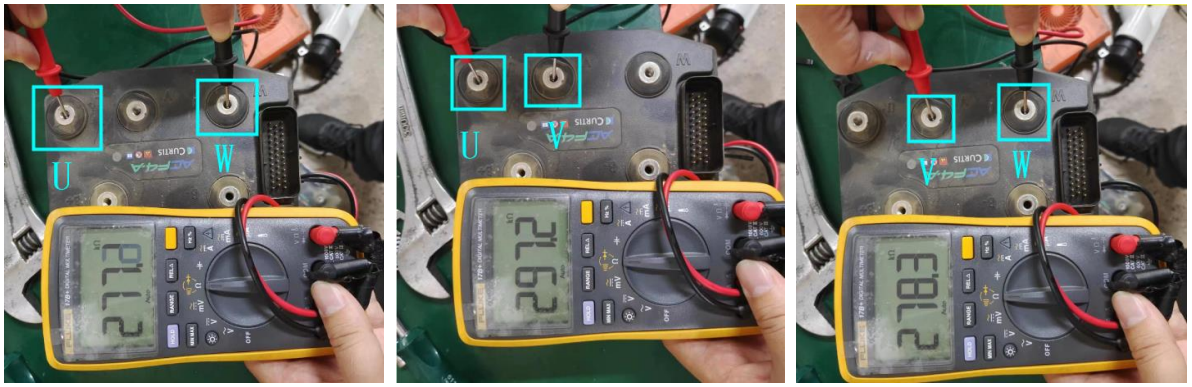
1. Display pop up TR 12/TL 12 fault code.
2. Remove all the load of the vehicle, restart and observe whether the instrument is still reported this fault. If the Fault disappears the cause of the fault is vehicle overload.
3. Check whether the insulation skin of motor U \ V \ W phase wire is broken and copper wire is together at the damage. If the wiring harness is damaged, dispose of the damaged area.
4. Remove the U/V/W phase line of the motor controller. Measure the resistance value between U \ V \ W phases and the motor housing using a multimeter resistance range.



5. If the resistance value is less than 20M Ω, there is a short circuit between the internal winding and the casing of the motor, and the motor needs to be replaced.
6. If the resistance measured by the motor phase line and the housing is infinite, observe whether there is any damage to the outer packaging of the motor encoder's wiring harness. If the wiring harness is damaged, replace the motor encode.



7. If the wiring harness of the motor encoder is intact, measure the resistance value between the controller U \ V \ W phases. If the value displayed on the multimeter is below 10 Ω, it indicates that the diode has broken down and caused a short circuit, and a new motor controller needs to be replaced.



8. If you have replaced a new controller or a new motor, remember to follow the self-learning steps for the motor auto-matching test.

14.2 TR 13/TL 13 Right/Left Wheel Motor Controller Current Sensor Abnormal

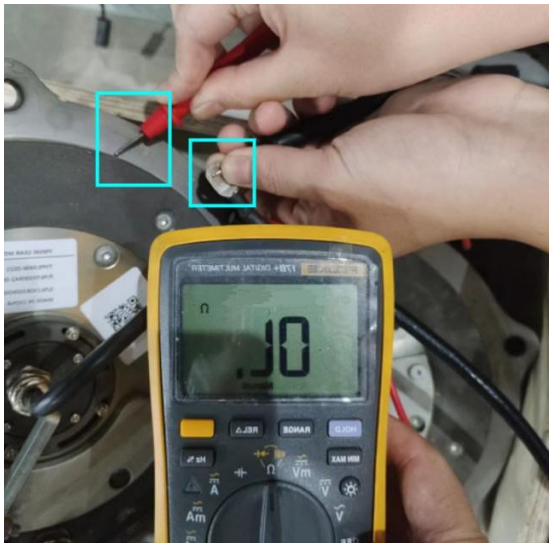
Tool: Multimeter, Computer, Debugging wire, PCAN



Check:

1. Display pop up TR 13/TL 13 fault code.
2. Check whether the insulation skin of motor U \ V \ W phase wire is broken and copper wire is together at the damage. If the wiring harness is damaged, dispose of the damaged area.
3. Remove the U/V/W phase line of the motor controller.

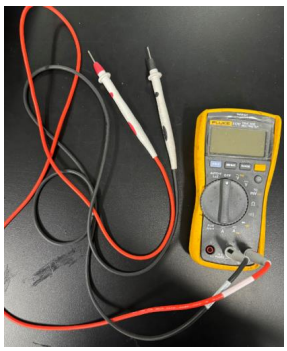
4. Restart the vehicle. If the fault continues to occur, it indicates that the internal current sensor of the motor is damaged and a new motor controller needs to be replaced.
5. If the fault disappears, measure the resistance value between U \ V \ W phases and the motor housing using a multimeter resistance range. If the resistance value is less than 20M Ω, there is a short circuit between the internal winding and the casing of the motor, and the motor needs to be replaced.



6. If you have replaced a new controller or a new motor, remember to follow the self-learning steps for the motor auto-matching test.

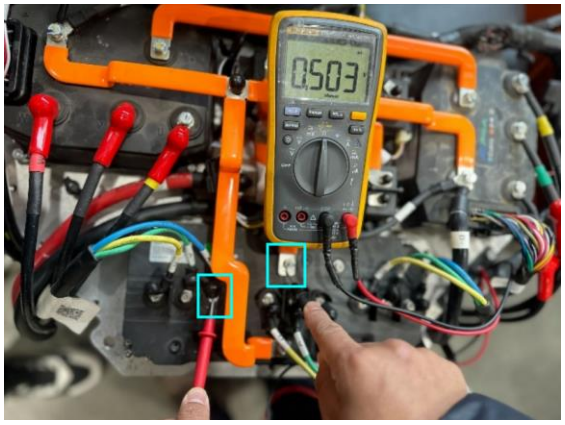
14.3 TR 14/TL 14 Right/Left Wheel Motor Controller Precharge Failed

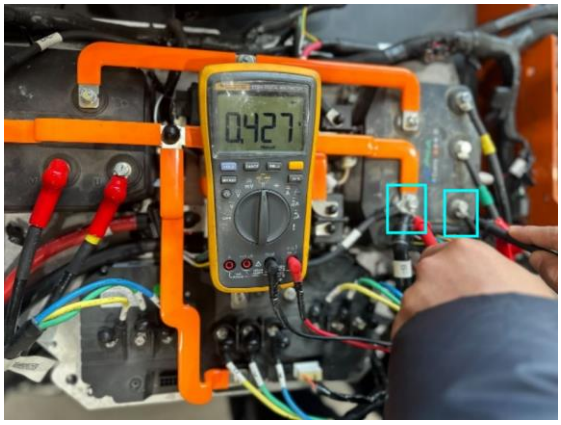
Tool: Multimeter, Computer, Debugging wire, PCAN



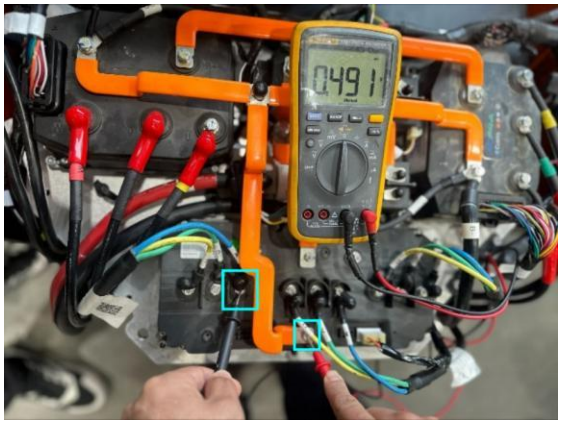
Check:

1. Display pop up TR 14/TL 14 fault code.
2. Keep the vehicle power off state.
3. Set the Multimeter to the diode position and measure the voltage between the U \ V \ W phase and the positive electrode.





4. Set the Multimeter to the diode position and measure the voltage between the U \ V \ W phase and the negative electrode.



5. If the range is 0.45-0.52V, the MOS is normal. Otherwise, it is judged that the MOS is damaged and the controller needs to be replaced.
6. If you have replaced a new controller, remember to follow the self-learning steps for the motor auto-matching test.

14.4 TR 15/TL 15 Right/Left Wheel Motor Controller Severe Undertemp

Tool: Infrared Thermometers, Computer, Debugging wire, PCAN



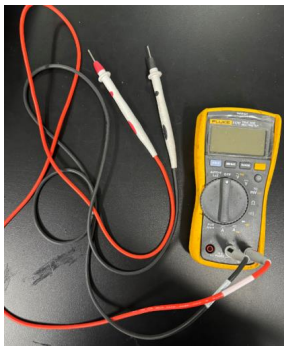
Check:

1. Display pop up TR 15/TL 15 fault code.
2. Check the current ambient temperature. If the ambient temperature is below -40 °C it exceeds the minimum temperature limit. Please wait until the ambient temperature is above -40 °C before using the vehicle.
3. If the ambient temperature is higher than -40 °C, the motor controller temperature 0x502 in the vehicle CAN message can be read through the upper computer, and the message can be compared with the ambient temperature. If the difference is too large, it indicates that the internal temperature sensor of the motor controller is faulty and the controller needs to be replaced.

4. If you have replaced a new controller, remember to follow the self-learning steps for the motor auto-matching test.

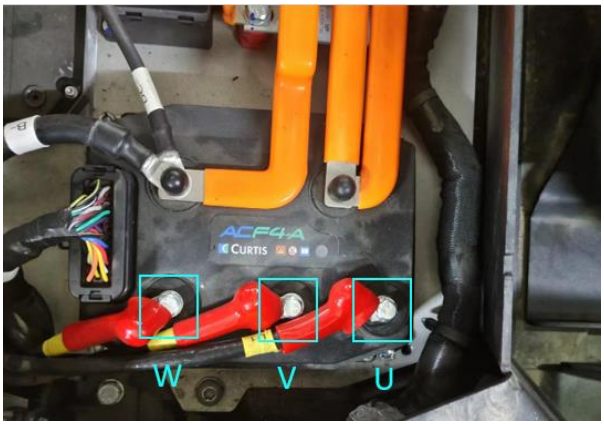
14.5 TR 16/TL 16 Right/Left Wheel Motor Controller Severe Overtemp

Tool: Multimeter, Computer, Debugging wire, PCAN



Check:

1. Display pop up TR 16/TL 16 fault code.
2. Remove all the load of the vehicle, restart and observe whether the instrument is still reported this fault. If the Fault disappears, the cause of the fault is vehicle overload.
3. Restart the vehicle. If the fault continues to occur. Check the connection of the motor U/V/W phase line on the controller and tighten the loose bolts.



4. Restart the vehicle. If the fault continues to occur the motor controller is faulty and the controller needs to be replaced.
5. If you have replaced a new controller, remember to follow the self-learning steps for the motor auto-matching test.

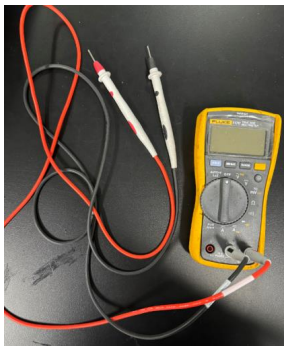
14.6 TR 19/TL 19 Right/Left Wheel Motor Controller Speed Limit Supervision

Check:

1. Display pop up TR 19/TL 19 fault code.
2. Please restart the vehicle.
3. Please make sure that the weight of the vehicle and the driving slope are within the specified range.

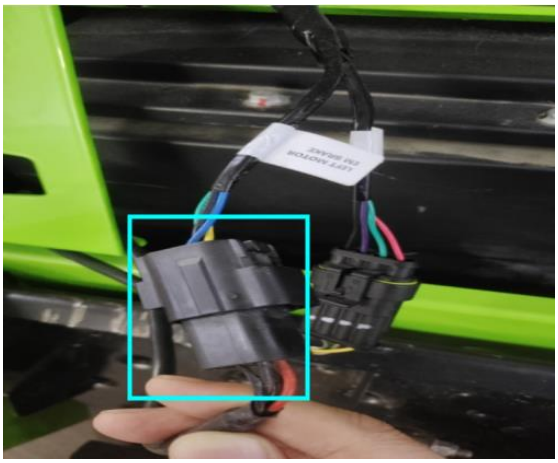
14.7 TR 1A/TL 1A Right/Left Wheel Motor Not Stopped

Tool: Multimeter, Computer, Debugging wire, PCAN

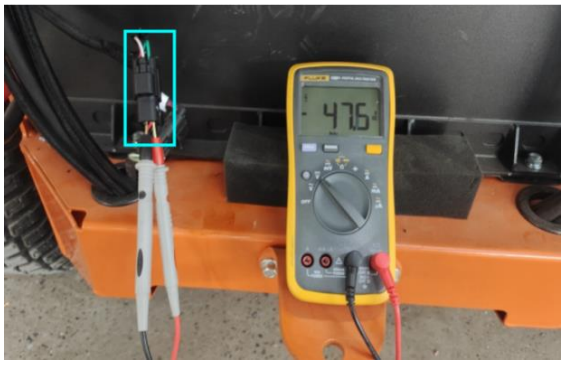


Check:

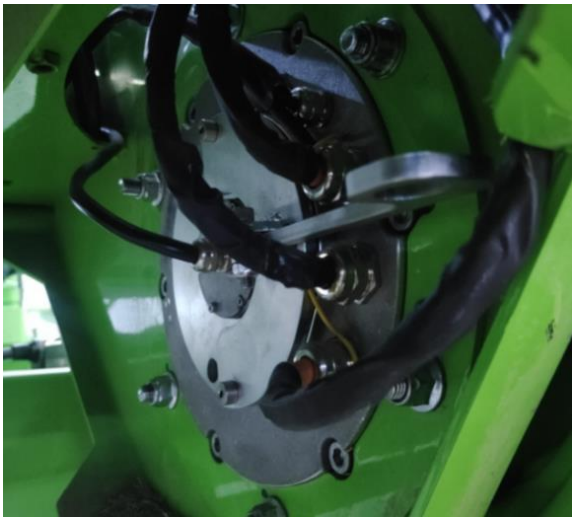
1. Display pop up TR 1A/TL 1A fault code.
2. Please check whether the connector of electromagnetic brake is well connected.



3. Measure the DC voltage of the electromagnetic brake using a multimeter. If the value is proximity 48V But the vehicle is in a stopped state the motor controller is faulty and the controller needs to be replaced.



4. If the vehicle can drive normally, when the vehicle comes to a stop the electromagnetic brake does not work check if the electromagnetic brake release handle is open (The electromagnetic brake of the vehicle is closed in the factory state, If the release handle is tilted up, it indicates that the electromagnetic brake is in the manual release state) if the electromagnetic brake release handle is not opened, the electromagnetic brake is damaged, and the drive motor, needs to be replaced.



5. The electromagnetic brake must be closed manually.
6. If you have replaced a new controller or a new motor, remember to follow the self-learning steps for the motor auto-matching test.

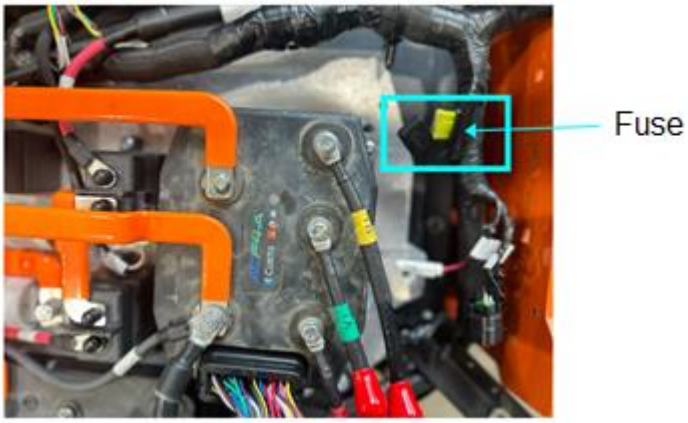
14.8 TR 1D/TL 1D Right/Left Wheel Motor Controller Reset Rejected

Tool: Multimeter, Computer, Debugging wire, PCAN

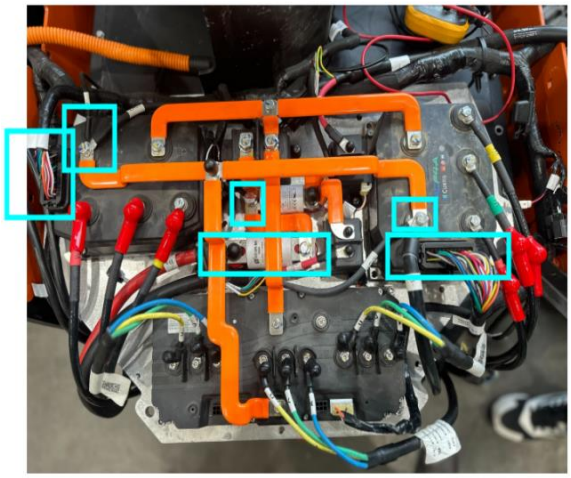


Check:

1. Display pop up TR 1D/TL 1D fault code.
2. Please check whether the fuse on the wiring harness is well plugged as shown in the figure below.



3. Please check whether the connectors are well connected as shown in the below figure.



4. Restart Vehicle.

14.9 TR 1E/TL 1E Right/Left Wheel Motor Short

Tool: Multimeter, Computer, Debugging wire, PCAN



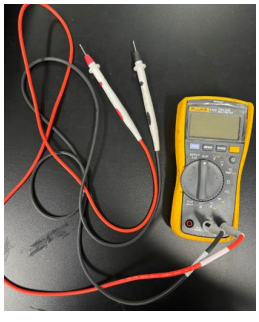
Check:

1. Display pop up TR 1E/TL 1E fault code.
2. Check whether the insulation skin of motor U \ V \ W phase wire is broken and copper wire is together at the damage. If the wiring harness is damaged, dispose of the damaged area.
3. Measure the resistance value between U \ V \ W phases and the motor housing using a multimeter.

4. If there is a resistance value during the test, there is a short circuit between the internal winding and the casing of the motor, and the motor needs to be replaced. (Under normal circumstances, the resistance value of the phase line and the motor housing is infinite.)
5. If you have replaced a new motor, remember to follow the self-learning steps for the motor auto-matching test.

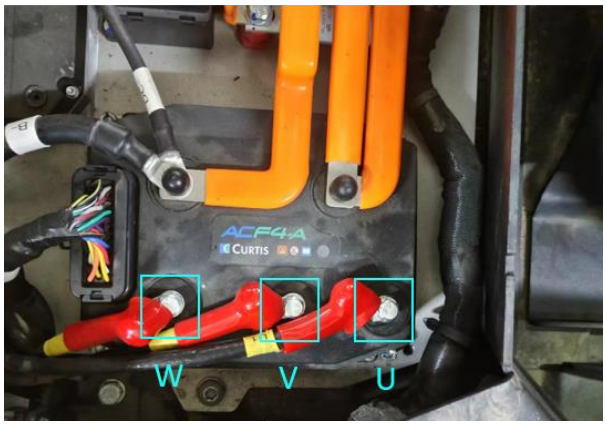
14.10 TR 22/TL 22 Right/Left Wheel Motor Controller Overtemp Cutback

Tool: Multimeter, Computer, Debugging wire, PCAN



Check:

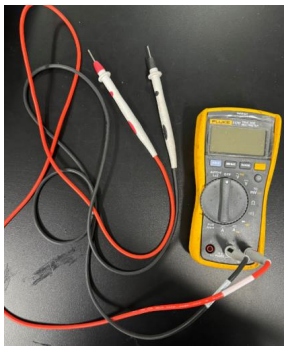
1. Display pop up TR 16/TL 16 fault code.
2. Remove all the load of the vehicle, restart and observe whether the instrument is still reported this fault. If the fault disappears, the cause of the fault is vehicle overload.
3. Restart the vehicle. If the fault continues to occur, check the connection of the motor U/V/W phase line on the controller and tighten the loose bolts.



4. Restart the vehicle. If the fault continues to occur the motor controller is faulty and the controller needs to be replaced.
5. If you have replaced a new controller, remember to follow the self-learning steps for the motor auto-matching test.

14.11 TR 25/TL 25 Right/Left Wheel Motor Controller Ext 5V Supply Failure

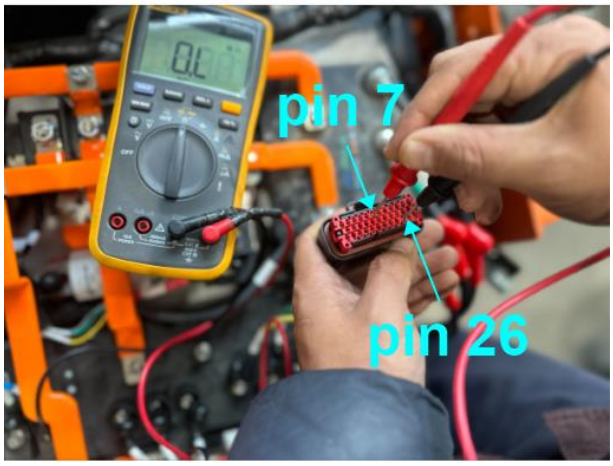
Tool: Multimeter, Computer, Debugging wire, PCAN



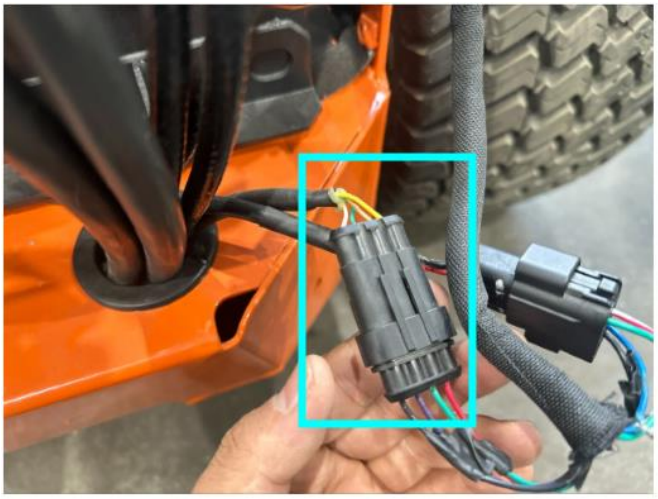
Check:

1. Display pop up TR 25 fault code.
2. Please check whether the encoder is well assembled.

3. Disconnect the connector of the controller and measure the load between of pin 7 and pin 26.



4. If the load is less than 50 ohms. Please check whether the connector of encoder is well connected.



5. If you have reassembled the encoder, remember to follow the self-learning steps for the motor auto-matching test.

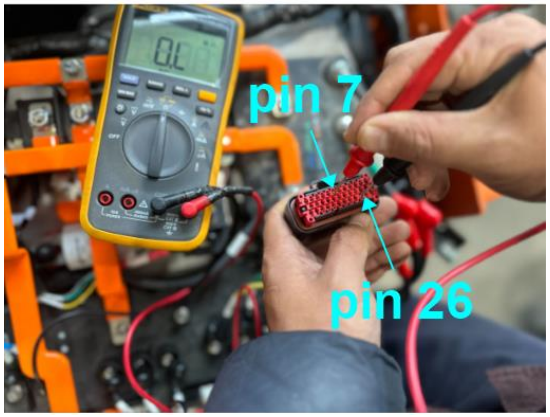
14.12 TR 26/TL 26 Right/Left Wheel Motor Controller Ext 12V Supply Failure

Tool: Multimeter, Computer, Debugging wire, PCAN



Check:

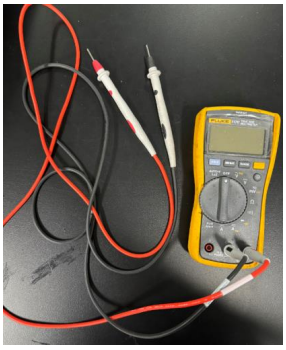
1. Display pop up TR 26 fault code.
2. Disconnect the connector of the controller and measure the load between of pin 7 and pin 27.



3. If the load is less than 60 ohms, please check if the connector harness of the controller is properly connected.

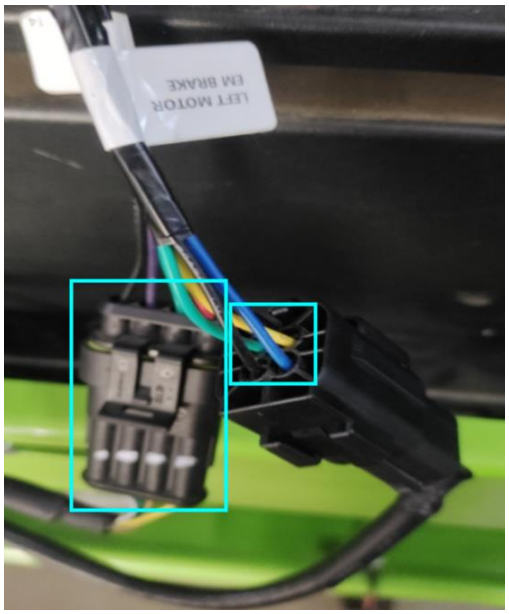
14.13 TR 28/TL 28 Right/Left Wheel Motor Slight Overtemp

Tool: Infrared Thermometers, Multimeter, Computer, Debugging wire, PCAN

Check:

1. Display pop up TR 28 fault code.
2. Remove all the load of the vehicle. Wait for a period of time to restart the vehicle and observe whether the instrument is still reported this fault. If the Fault disappears, the cause of the fault is vehicle overload.
3. Restart the vehicle. If the fault continues to occur. Check the current ambient temperature. Measure the resistance value of the motor temperature sensor.



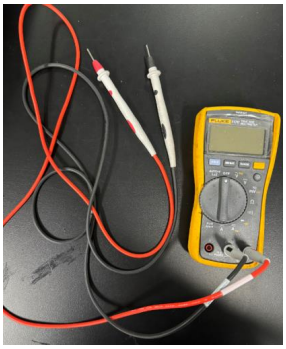
4. Check the table against the actual temperature to see if the resistance value is correct (If at room temperature 25℃ environment, it returns to about 560Ω, it means that the temperature sensor is normal. If the resistance value is above 1282Ω, it indicates that the temperature sensor has been damaged, so the motor must be replaced.)

℃	℉	%/（K）	（Ω）			（K）
			MIN	TYP	MAX	
-40	-40	0.97	294	322	350	±8.85
-30	-22	0.94	327	356	385	±8.76
-20	-4	0.91	361	392	423	±8.7
-10	14	0.88	397	430	463	±8.65
0	32	0.87	434	469	504	±8.61
10	50	0.85	475	512	549	±8.58
20	68	0.82	517	556	595	±8.55
25	77	0.80	540	580	620	±8.54
30	86	0.79	562	603	644	±8.53
40	104	0.78	610	653	696	±8.5
50	122	0.75	659	704	749	±8.46
60	140	0.73	711	758	805	±8.42
70	158	0.67	768	814	860	±8.37
80	176	0.63	827	873	919	±8.31
90	194	0.62	887	935	983	±8.25
100	212	0.62	950	1000	1050	±8.17
110	230	0.62	1011	1068	1125	±8.66
120	248	0.58	1077	1138	1199	±9.17
130	266	0.52	1148	1209	1270	±9.69
140	284	0.51	1215	1282	1349	±10.24
150	302	0.50	1279	1352	1425	±10.8

5. If you have replaced a new motor, remember to follow the self-learning steps for the motor auto-matching test.

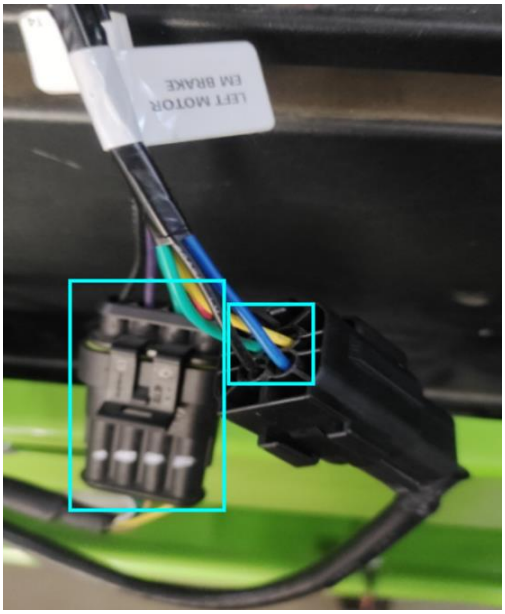
14.14 TR 29/TL 29 Right/Left Wheel Motor Temperature Sensor Abnormal

Tool: Infrared Thermometers, Multimeter, Computer, Debugging wire, PCAN

Check:

1. Display pop up TR 29 fault code.
2. Remove all the load of the vehicle. Wait for a period of time to restart the vehicle and observe whether the instrument is still reported this fault. If the Fault disappears, the cause of the fault is vehicle overload.
3. Restart the vehicle. If the fault continues to occur. Check the current ambient temperature. Measure the resistance value of the motor temperature sensor.

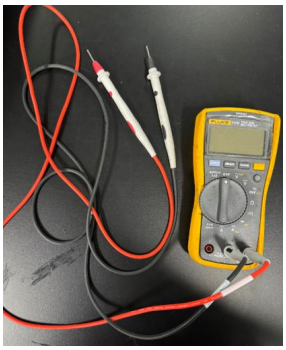
4. Check the table against the actual temperature to see if the resistance value is correct (If at room temperature 25℃ environment, it returns to about 560Ω, it means that the temperature sensor is normal. If the resistance value is above 1282Ω, it indicates that the temperature sensor has been damaged, so the motor must be replaced.)

℃	℉	%/（K）	（Ω）			（K）
			MIN	TYP	MAX	
-40	-40	0.97	294	322	350	±8.85
-30	-22	0.94	327	356	385	±8.76
-20	-4	0.91	361	392	423	±8.7
-10	14	0.88	397	430	463	±8.65
0	32	0.87	434	469	504	±8.61
10	50	0.85	475	512	549	±8.58
20	68	0.82	517	556	595	±8.55
25	77	0.80	540	580	620	±8.54
30	86	0.79	562	603	644	±8.53
40	104	0.78	610	653	696	±8.5
50	122	0.75	659	704	749	±8.46
60	140	0.73	711	758	805	±8.42
70	158	0.67	768	814	860	±8.37
80	176	0.63	827	873	919	±8.31
90	194	0.62	887	935	983	±8.25
100	212	0.62	950	1000	1050	±8.17
110	230	0.62	1011	1068	1125	±8.66
120	248	0.58	1077	1138	1199	±9.17
130	266	0.52	1148	1209	1270	±9.69
140	284	0.51	1215	1282	1349	±10.24
150	302	0.50	1279	1352	1425	±10.8

5. If you have replaced a new motor, remember to follow the self-learning steps for the motor auto-matching test.

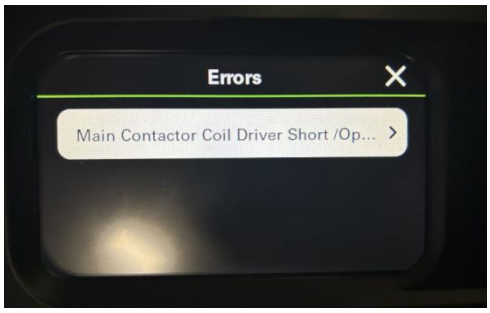
14.15 TR 31/TL 31 Main Contactor Coil Driver Short /Open

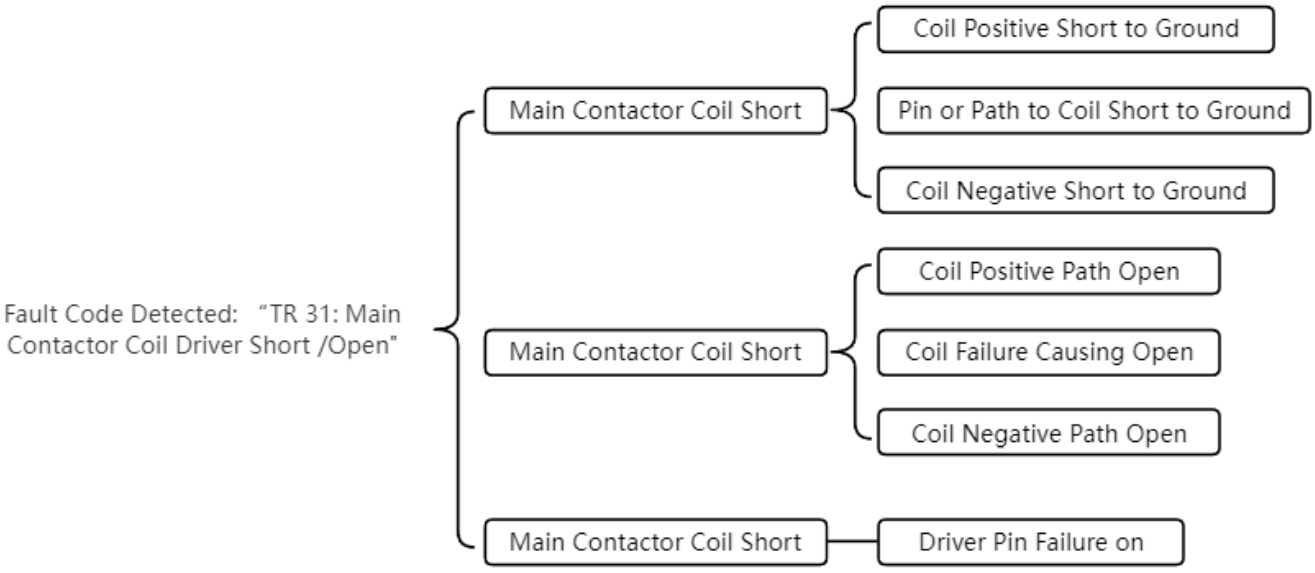
Tool: Multimeter



Possible Cause：

This error is caused when a short or open is detected across the Main Contactor.

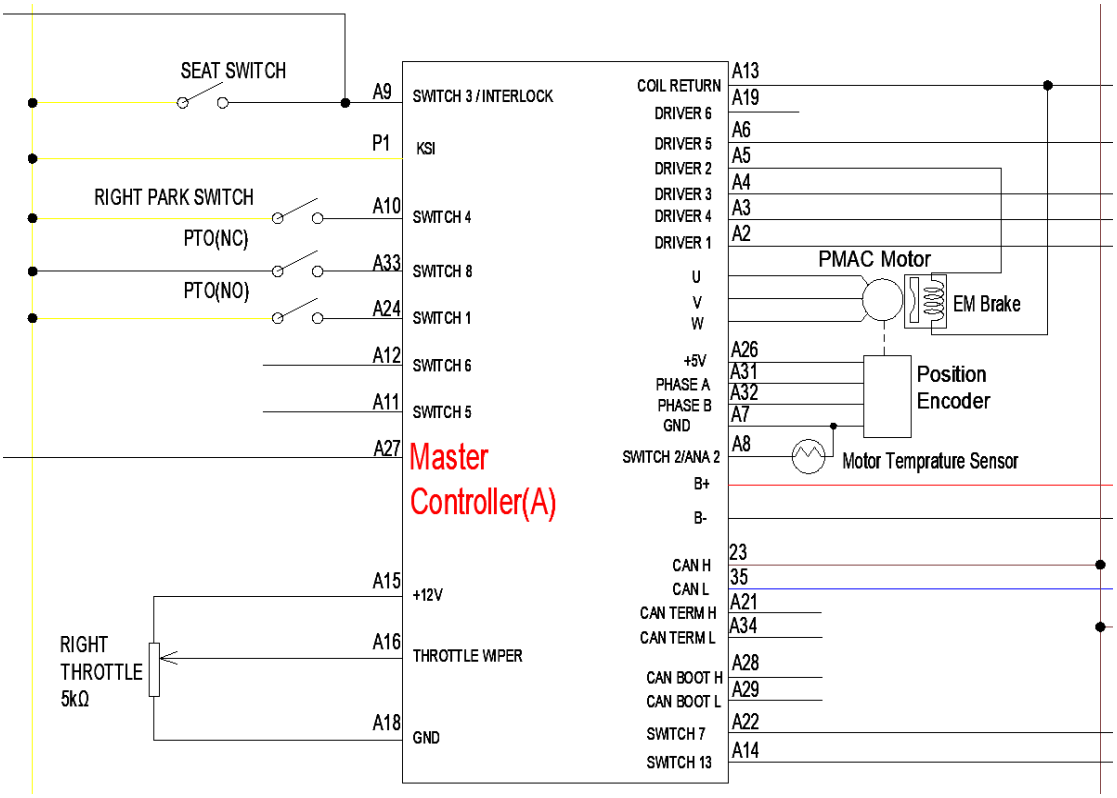


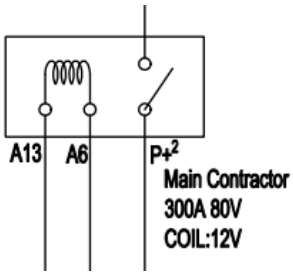


Solution

1. coil short/open check

1) Referencing the wiring diagram, we need to locate the coil for the main relay. Using the wiring diagram, we can trace the main contactor to controller pins A6 (Driver 1) and A13 (Coil Return).

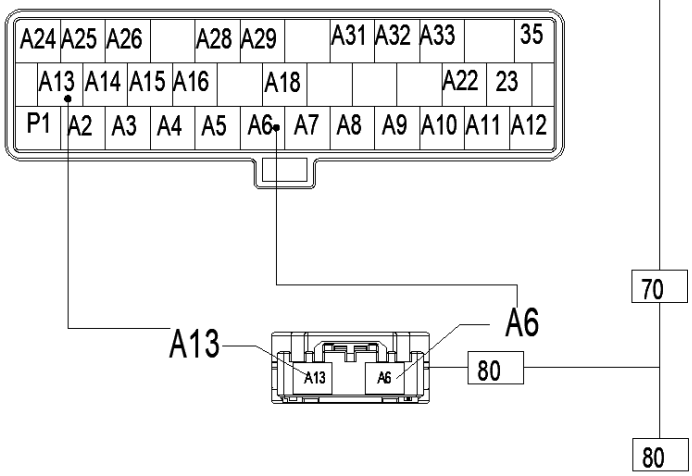

SEAT SWITCH
A9
SWITCH 3 / INTERLOCK
P1
KSI
RIGHT PARK SWITCH
A10
SWITCH 4
PTO(NC)
A33
SWITCH 8
PTO(NO)
A24
SWITCH 1
A12
SWITCH 6
A11
SWITCH 5
A27
Master
Controller(A)
A15
+12V
RIGHT
THROTTLE
5kΩ
A16
THROTTLE WIPER
A18
GND
COIL RETURN
DRIVER 6
DRIVER 5
DRIVER 2
DRIVER 3
DRIVER 4
DRIVER 1
U
V
W
+5V
PHASE A
PHASE B
GND
SWITCH 2/ANA 2
B+
B-
CAN H
CAN L
CAN TERM H
CAN TERM L
CAN BOOT H
CAN BOOT L
SWITCH 7
SWITCH 13
A13
A19
A6
A5
A4
A3
A2
PMAC Motor
EM Brake
A26
A31
A32
A7
A8
Position
Encoder
Motor Temprature Sensor
23
35
A21
A34
A28
A29
A22
A14


A13
A6
P+2
Main Contractor
300A 80V
COIL:12V

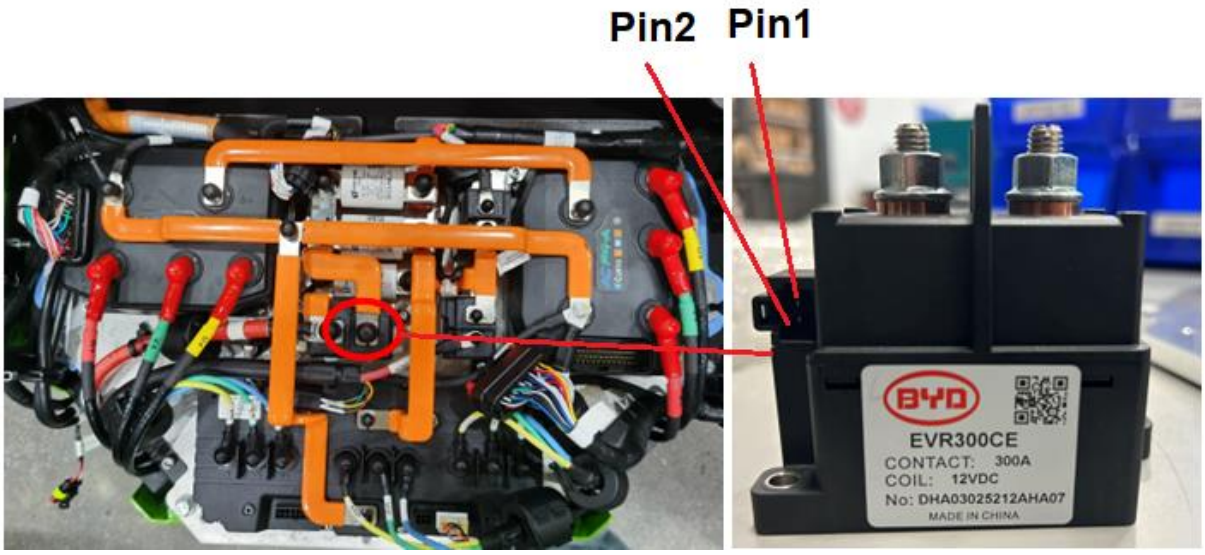
2) Locate the main contactor coil connector and the master controller connector. Find these two devices on the unit. Reference the mower wiring harness and electrical schem.

MAIN CONTACTOR COIL	
Name	Type
Housing	7283-1020
Terminal	7116-4021

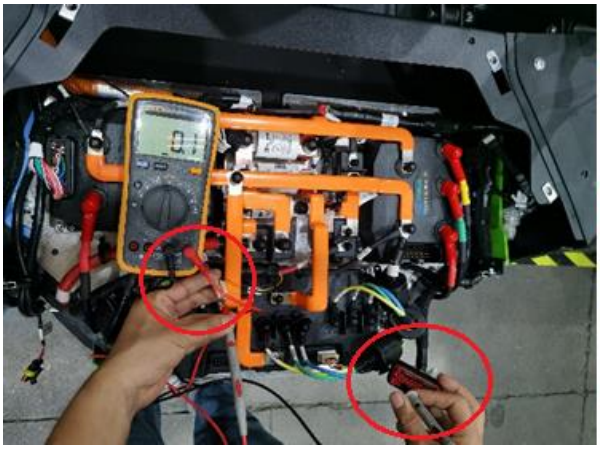
MASTER CONTROLLER A	
Name	Type
Housing	776164-1
Terminal	770520-1



3) Testing Connections Set multimeter to measure resistance Removing the coil connection, measure the resistance across the coil by putting a lead on pins 1 and 2 shown above 15.8Ω means the coil is normal and not open. A large resistance indicates the coil is open and will need to be replaced.



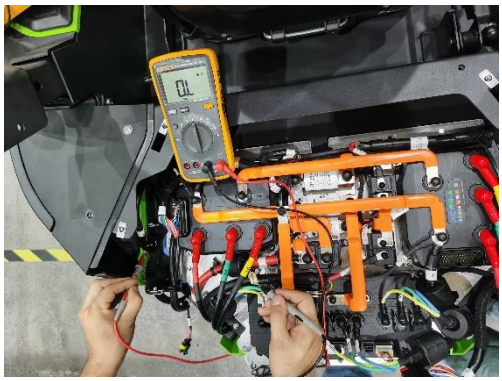
4) Vehicle wiring harness open circuit Check.

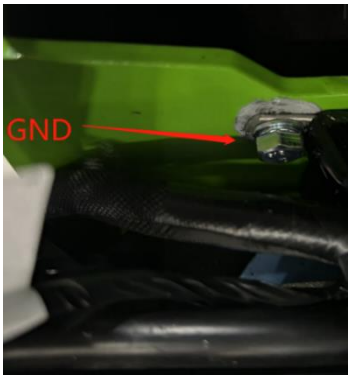



5) Now measure the cable from master controller connector to main contactor coil connector. A resistance around 0.5Ω means the cables are normal and not open. It is important to check the wire color and ensure you are measuring between the correct wires.

6) Check for short circuit between contactor control harnesses.
Disconnect both ends of the connector from the controller and the contactor. Now measure the resistance one lead on A13 and the other on A6. 0L or a large resistance in the Mega ohms means the cables are normal and not shorted to one another.

7) Check contactor control harness for short to ground.

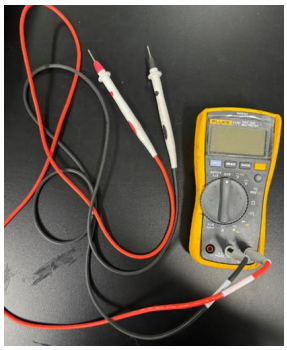




With both ends still disconnected, measure the resistance between the two wires and ground. Use one lead on pin A13 and the other on chassis ground, and then A6 and chassis ground. 0L or a large resistance in the Mega ohms means the cables are normal and not ground. (The reliable grounding of the vehicle body is shown in the above figure)
Note: a loose connection can also result in this error. So, If no issues are found during these tests, ensure that the plugs are well seated.

14.16 TR 36/TL 36 Right/Left Wheel Motor Sin/Cos Encoder Abnormal

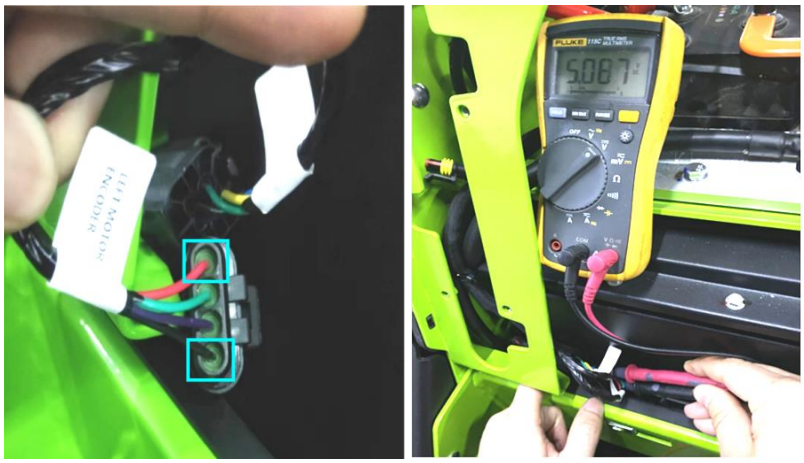
Tool: Multimeter, Computer, Debugging wire, PCAN



Check:

1. Display pop up TR 36 fault code.
2. Check whether the connector joint is secure. Check whether the connector is securely connected.

3. Use a multimeter voltage range to measure the voltage between the red and black wires in Figure 1. If the voltage is below 5V or above 5V, it is determined that the 5V power supply of the controller is faulty and the controller needs to be replaced.



4. If the encoder 5V power supply is normal, but the fault still exists, it is considered that the encoder is faulty. Replace the motor encoder.
5. If you have reassembled the encoder, remember to follow the self-learning steps for the motor auto-matching test.

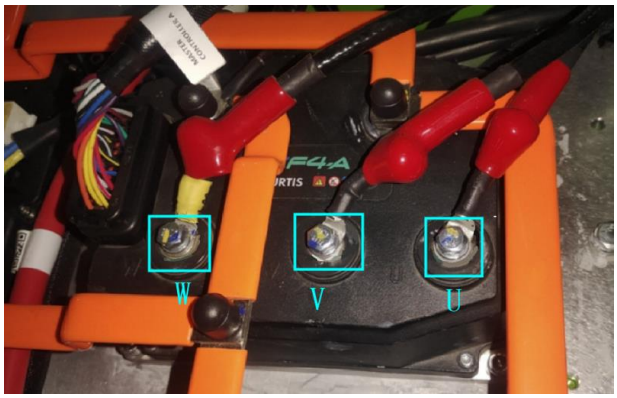
14.17 TR 37/TL 37 Right/Left Wheel Motor Phase Open

Tool: Multimeter, Computer, Debugging wire, PCAN

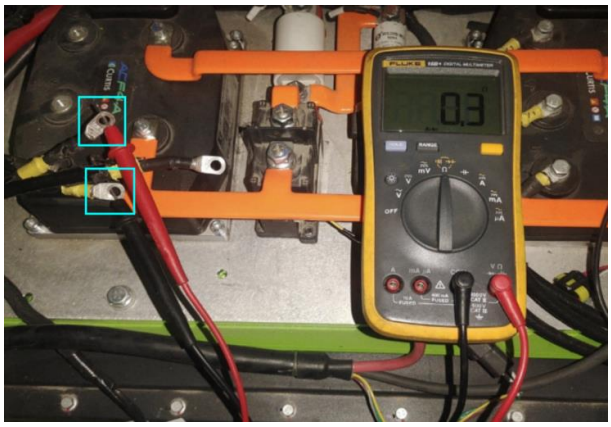


Check:

1. Display pop up TR 37 fault code.
2. Check whether the motor phase line is reliably connected to the controller. Check the positions of the three screws. If they are loose. tighten the loose bolts and Check if screws are found to be damaged. Replace the new screws, if the controller screw hole is damaged and the controller needs to be replaced.



3. Restart the vehicle. If the fault continues to occur measure the resistance value between the motor U \ V \ W phases. If the value displayed on the multimeter is 0 or infinity it means that the motor has been damaged inside and a new blade motor needs to be replaced.



4. If you have replaced a new controller or a new motor, remember to follow the self-learning steps for the motor auto-matching test.

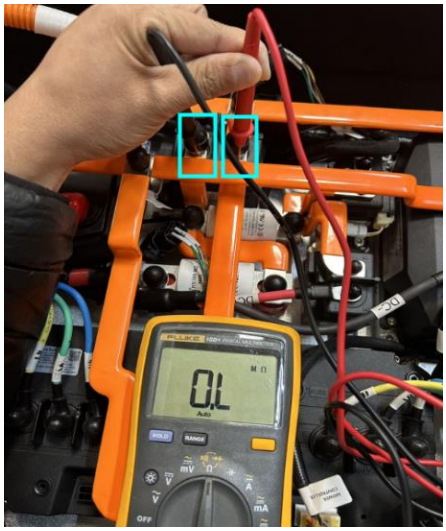
14.18 TR 38/TL 38 Main Contactor Welded

Tool: Multimeter, Computer, Debugging wire, PCAN

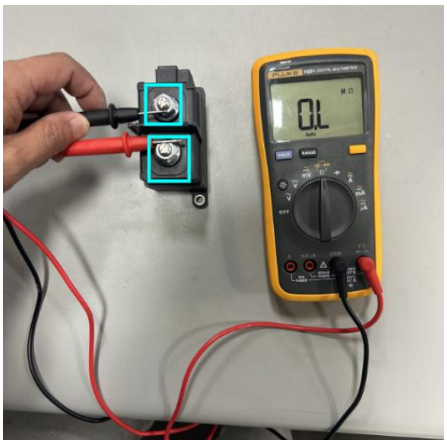


Check:

1. Display pop up TR 38 fault code.
2. Measure the resistance value between the main contactors using a multimeter's resistance range. When the resistance is 0 Ω, it means the contactor is ok. If the value is about 1.5Ω, it means the contactor is exactly welded, you just need to replace the contactor.



3. Tear down the contactor, measure the resistance between these two wiring terminals. when the resistance is 0 Ω, it means the contactor is ok. If the value is about 1.5Ω, it means the contactor is exactly welded, you just need to replace the contactor.



14.19 TR 3A/TL 3A Right/Left Wheel Motor Controller Setup Needed

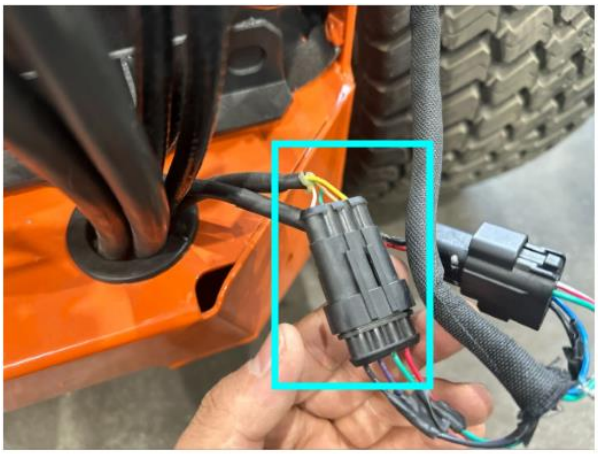
Tool: Computer, Debugging wire, PCAN



Check:

1. Display pop up TR 3A fault code.
2. Please check whether the encoder is well assembled.

3. Please check whether the connector of encoder is well connected.



4. Run the appropriate motor commissioning sequences.
5. If you have reassembled the encoder, remember to follow the self-learning steps for the motor auto-matching test.

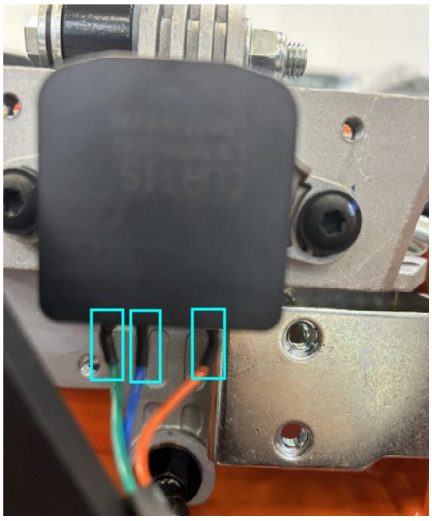
14.20 TR 42/TL 42 Right/Left Throttle Input Abnormal/ LEFT Throttle Input Abnormal

Tool: Multimeter, Computer, Debugging wire, PCAN

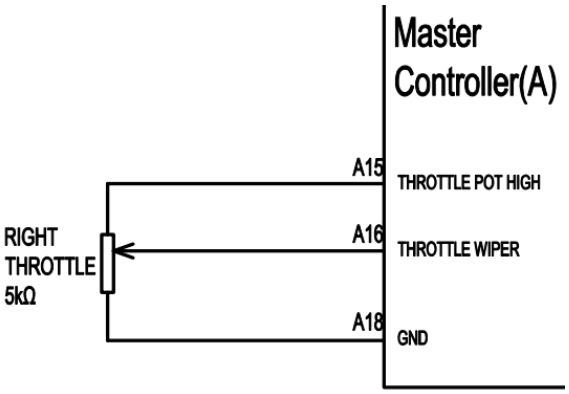


Check:

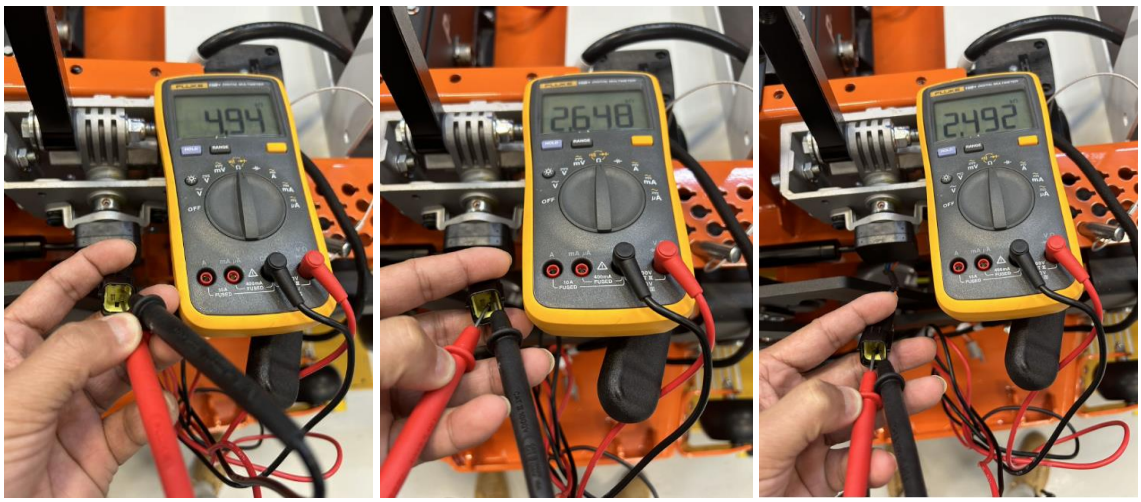
1. Display pop up TR 42 fault code.
2. Check the soldering point of the sensor. Whether there is obverse damage on the root part.



3. Measure the resistance of the throttle sensor, the resistance between A15 and A18 is 5kΩ.In the neutral position the resistance between A15 and A16, the resistance between A18 and A16 are around 2.5kΩ.



4. Measure any of these two pins between A15, A16 and A18，when the resistance is 0 Ω, it means there is something wrong with the sensor, we need to replace the sensor.



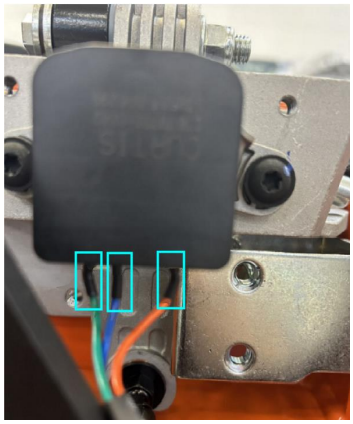
5. If you replace a new potentiometer, please remember to do the auto-matching of throttle.

14.21 TR 43/TL 43 Right/Left Pot2 Wiper High

Tool: Computer, Debugging wire, PCAN

Check:

1. Display pop up TR 43 fault code.
2. Check the soldering point of the sensor. Whether there is obverse damage on the root part.



3. Observe whether there is any damage to the outer packaging of the potentiometer wiring harness. If the wiring harness is damaged, replace the potentiometer.
4. If you replace a new potentiometer, please remember to do the auto-matching of throttle.

14.22 TR 46/TL 46 Right/Left Wheel Motor Controller NV Memory Failure

Tool: Computer, Debugging wire, PCAN


Check:

1. Display pop up TR 46 fault code.
2. Restart Vehicle.
3. If this fault code persists, please replace a new controller. Refer to the maintenance manual for the specific disassembly and assembly steps.
4. If you have replaced a new controller, remember to follow the self-learning steps for the motor auto-matching test.

14.23 TR 52 Left Wheel Motor Controller CAN Communication Abnormal /TL 52 Right Wheel Motor Controller CAN Communication Abnormal

Tool: Multimeter, Computer, Debugging wire, PCAN

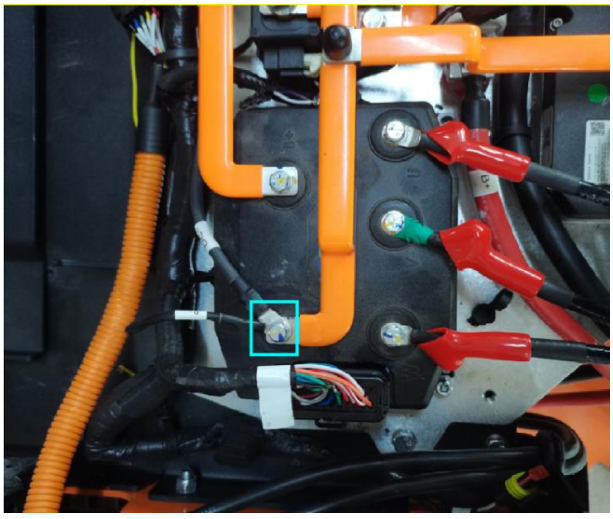


Check:

1. Refer to the maintenance manual to remove the plastic parts, locate the left walking controller, observe the main control indicator light for 20 seconds, and check if the indicator light is flashing.

2. If the indicator light of the left walking controller flashes, it indicates that the power supply of the left walking controller is normal. Check if the left walking controller plug-in is loose, check if the left walking controller plug-in CAN-H and CAN-L have withdrawn the needle, and if there is garbage on the surface of the plug-in, which causes poor contact of the plug-in.

3. If the indicator light of the left walking controller does not flash, it indicates that the power supply of the left walking controller is abnormal. Use a wrench to confirm if the bolts at B - are tight and there are no signs of looseness.



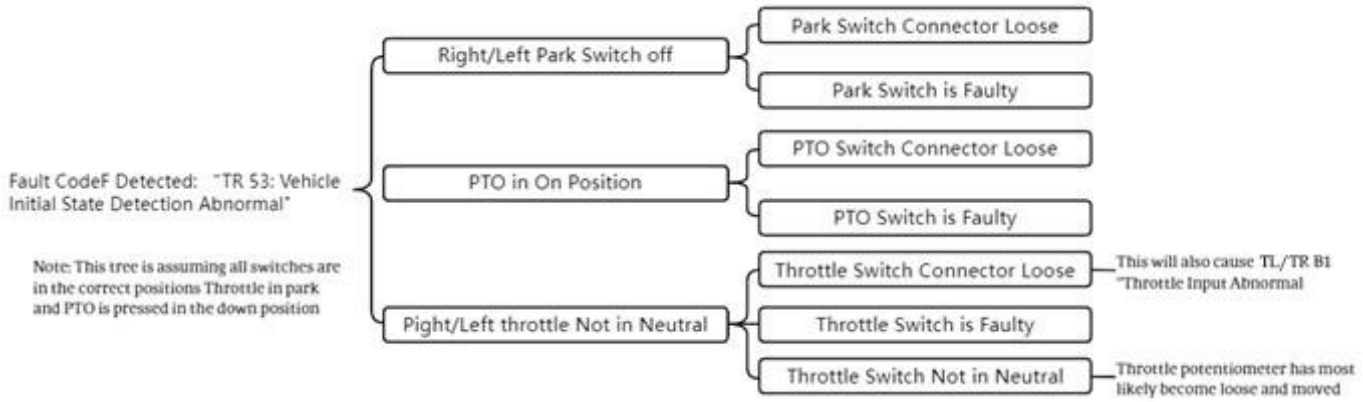
4. If the bolts are tightened, use a multimeter to check if the voltage at point Pin 1 is greater than 70VIf the voltage at Pin 1 is less than 70V, observe whether the terminal at Pin 1 is loose or detached. If everything is normal at (1), replace the left controller.

5. If you have replaced a new controller, remember to follow the self-learning steps for the motor auto-matching test.

14.24 TR 53 Vehicle Initial State Detection Abnormal

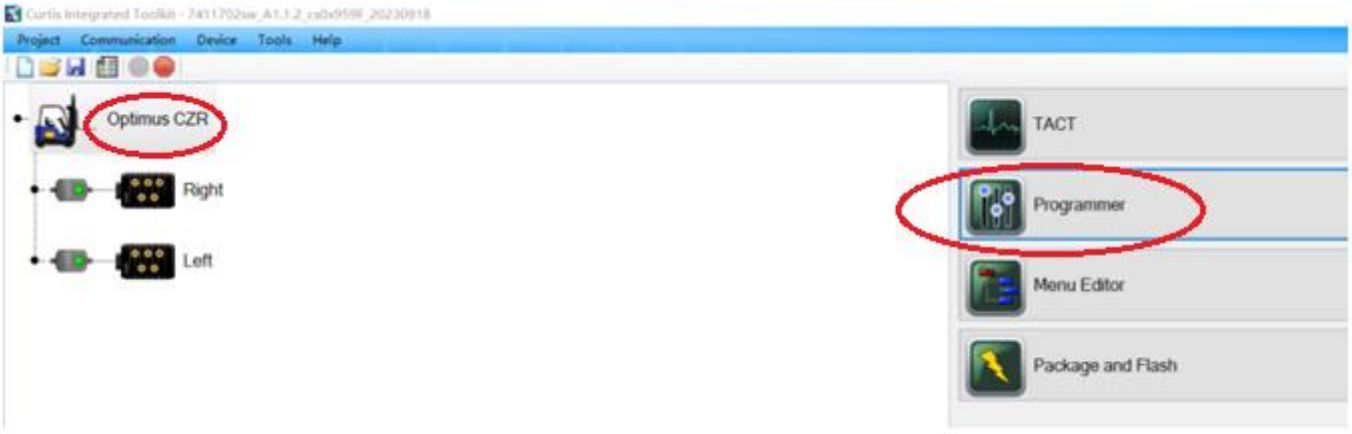
Possible Cause：

This error occurs then one of the vehicles start up checks are found to not be in the correct state.

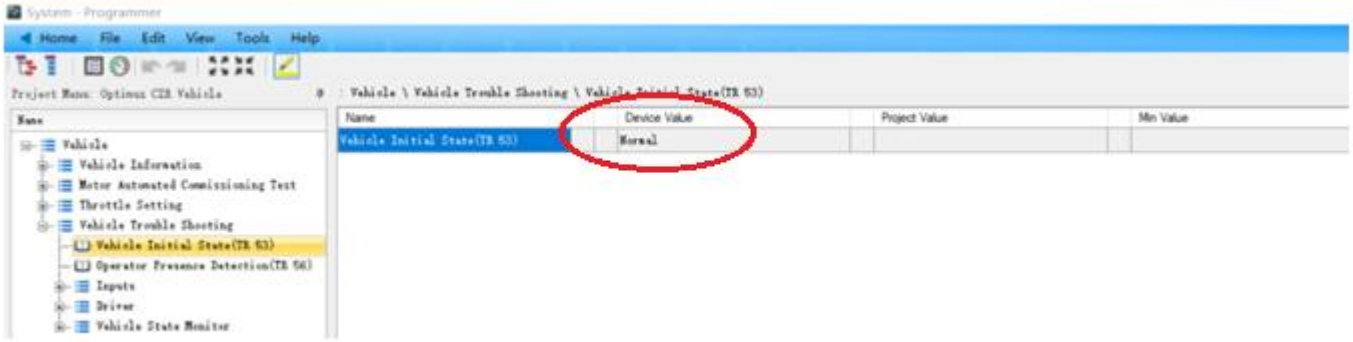


Solution：

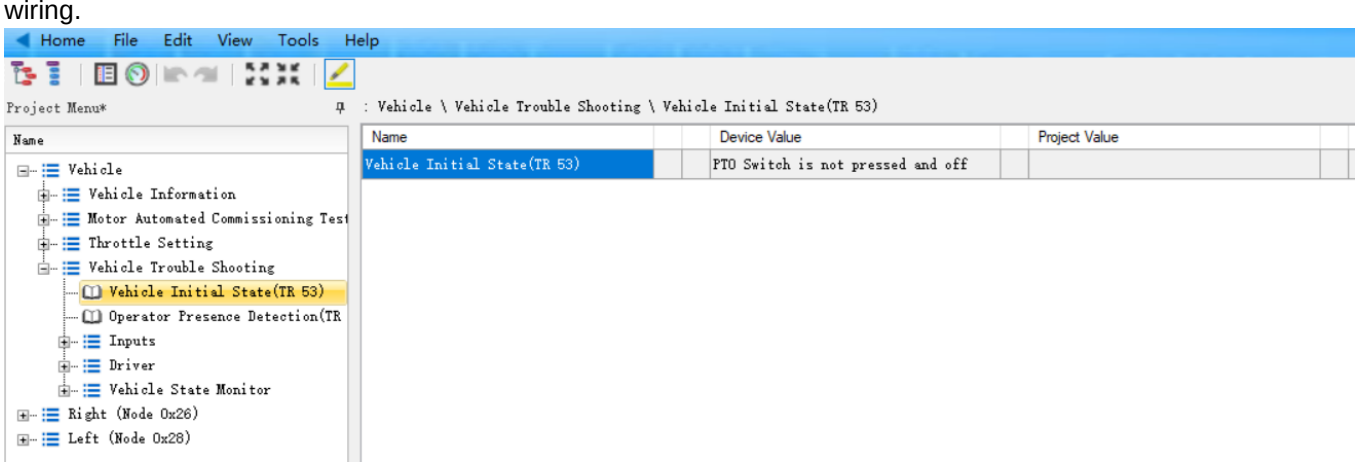
1. Right/Left park switch check.
1) Utilizing Curtis Integrated Toolkit (CIT) we can monitor the values of our switches and throttle.
We will go into the programmer to view the vehicles live values.



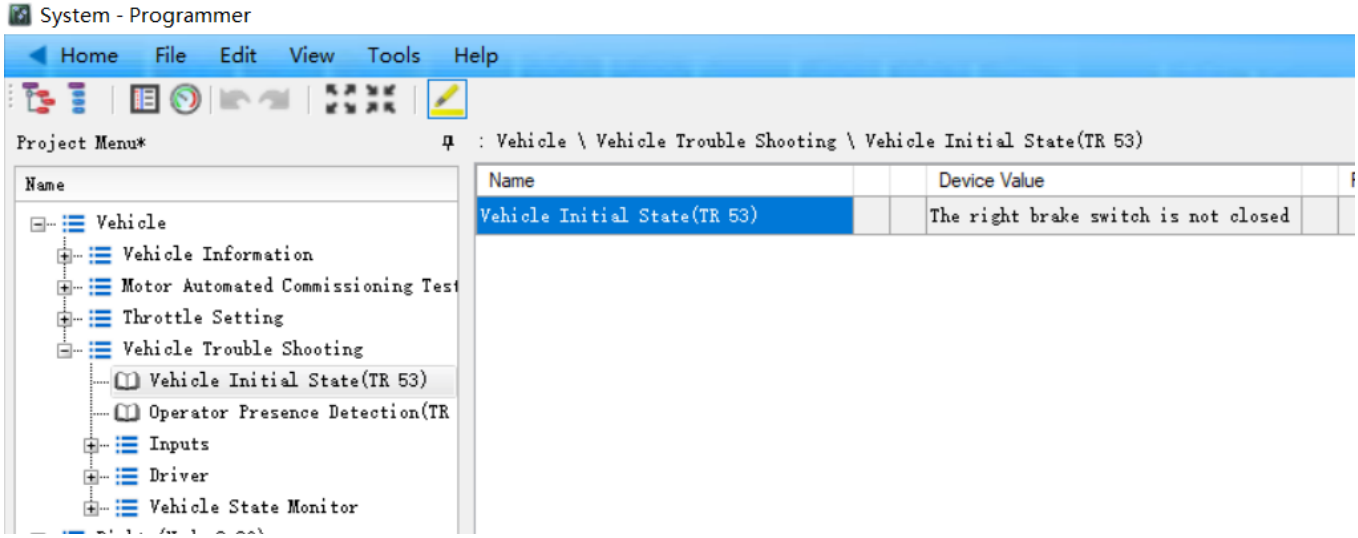
2) Check the Vehicle Initial State parameter under the Vehicle Trouble Shooting tree. If “Normal” is listed, then there is no error detected. Otherwise, this will show the detected issue causing TR 53.



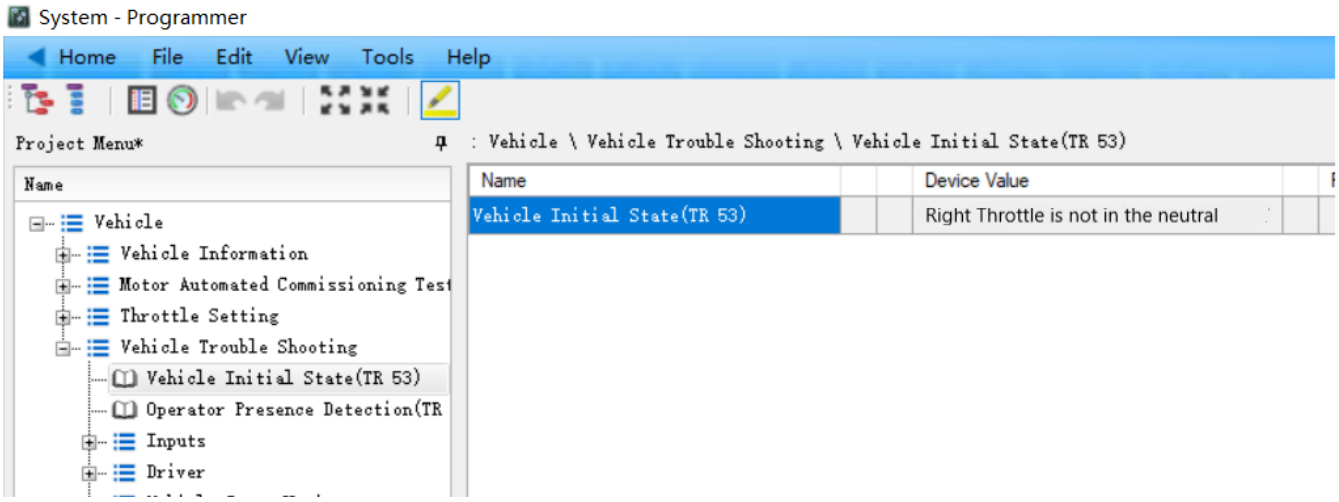
3) Here we can see a value other than normal. The system has detected the PTO switch is not in the OFF position. Ensure the PTO switch is pressed down. If issue persists begin troubleshooting the PTO Switch connection and wiring.



4) Here we can see a value other than normal. The system has detected the Right Park Switch is not in the closed state. Ensure the vehicle is in the park position. If issue persists begin troubleshooting the Right Park Switch connection and wiring. Note: This also applies if the Left Park Switch is listed.



5) Here we see the value other than normal. The system has detected that the Right Throttle is not in the neutral range. Ensure the vehicle is in park position. If issue persists, we will need to check what the throttle values are on the live system.

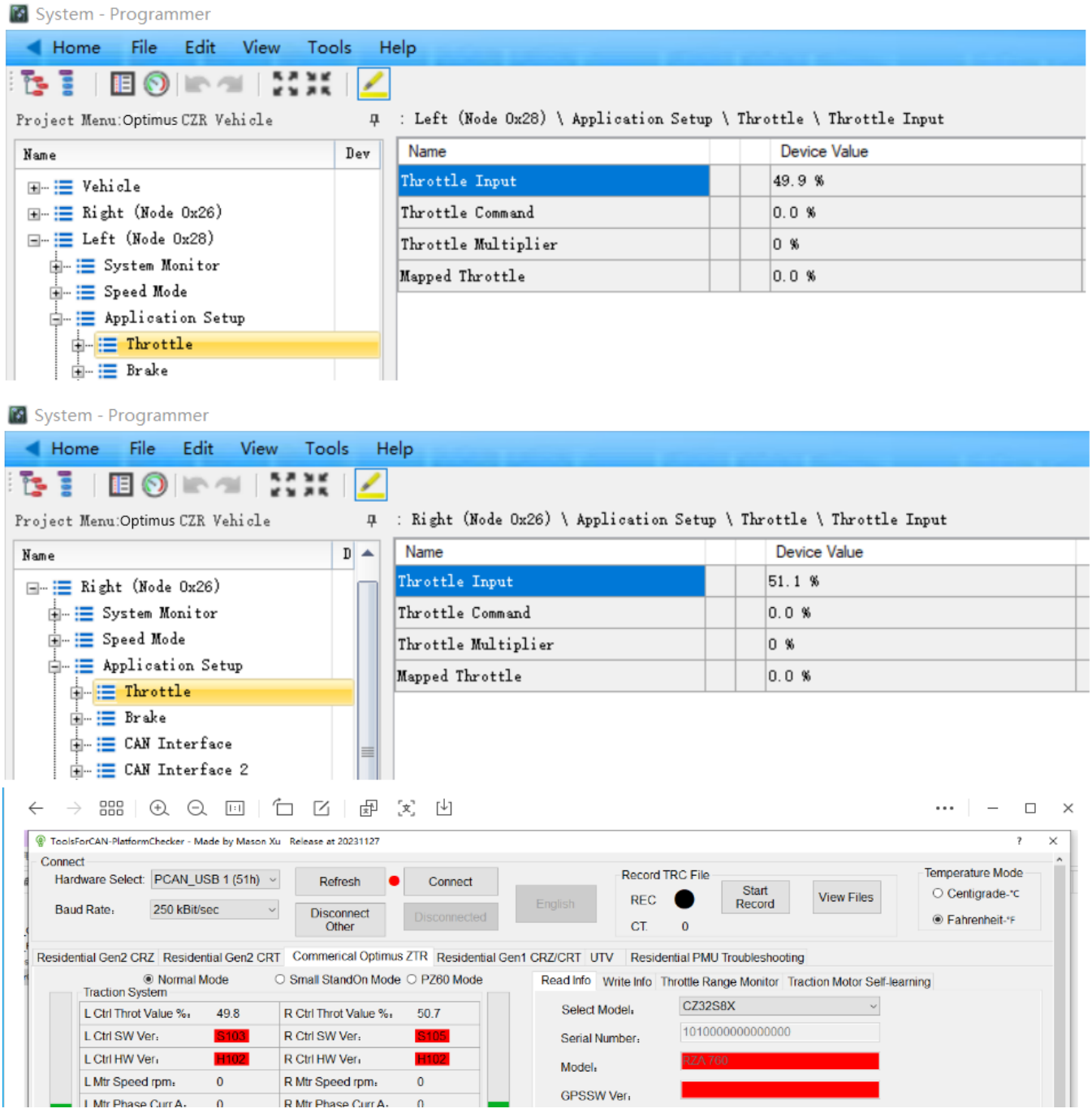


2. Check acceleration sensor is in the neutral position

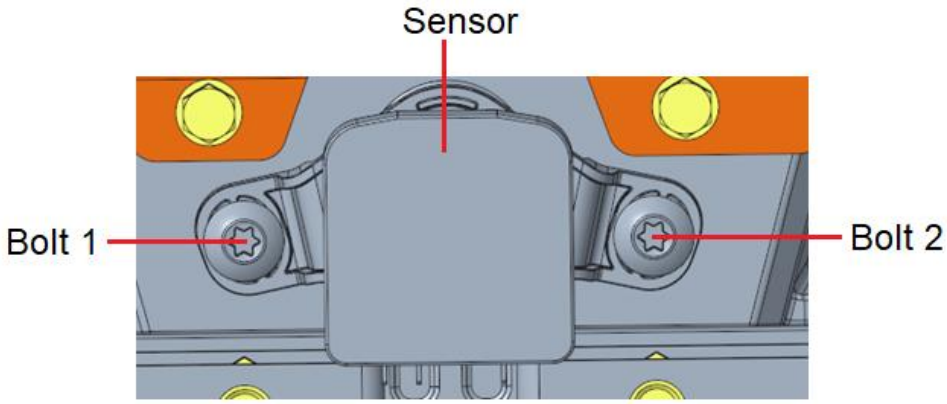
1) Check the neutral position value using either CIT or ToolsForCAN for CIT the path is as follows:

Vehicle->Right->Application Setup->Throttle / Vehicle->Left->Application Setup->Throttle

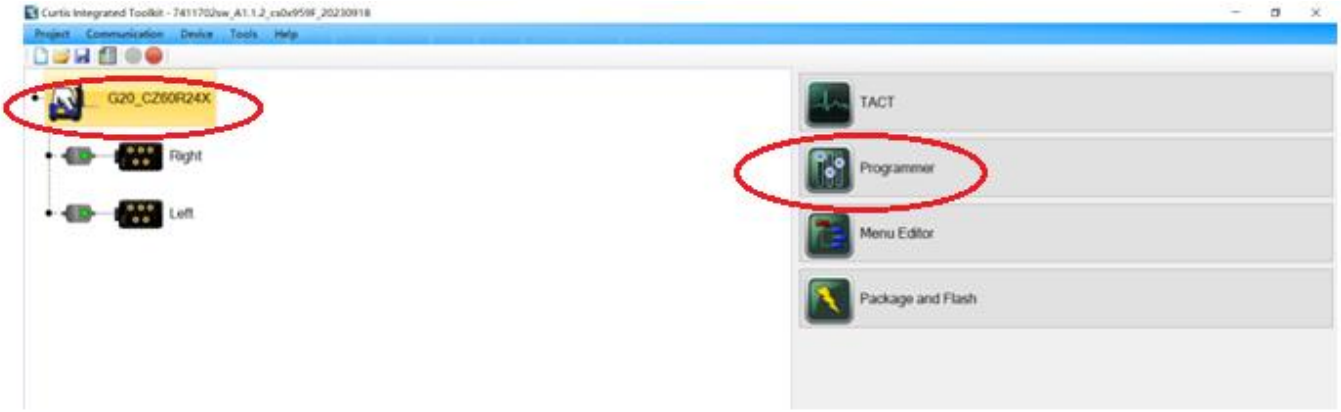
For ToolsForCAN we only need to connect and select our vehicle For Error Code TR 53 to display the Throttle value will read outside of the neutral dead band



2) We need to adjust the neutral position value. Check whether the two bolts are loose. If these two neutral position values are not in the range of 47%- 53% adjust the two bolts while monitoring the Throttle value to ensure it is now withing 47%-53%.If the value is within 47%-53% ensure the bolts are tight and move to auto setting the throttle.

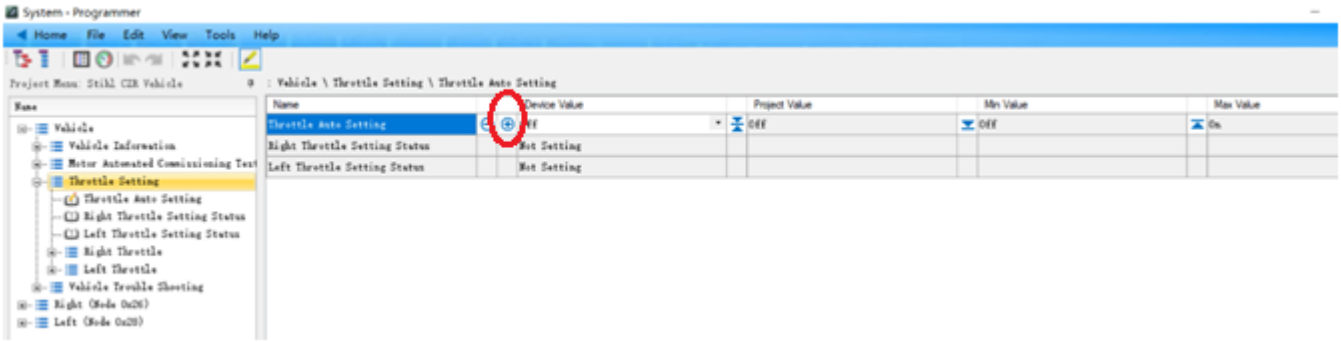


3) Reset the neutral position value (Applies to Ride On and Stand On) Navigate to the vehicle parameters again.

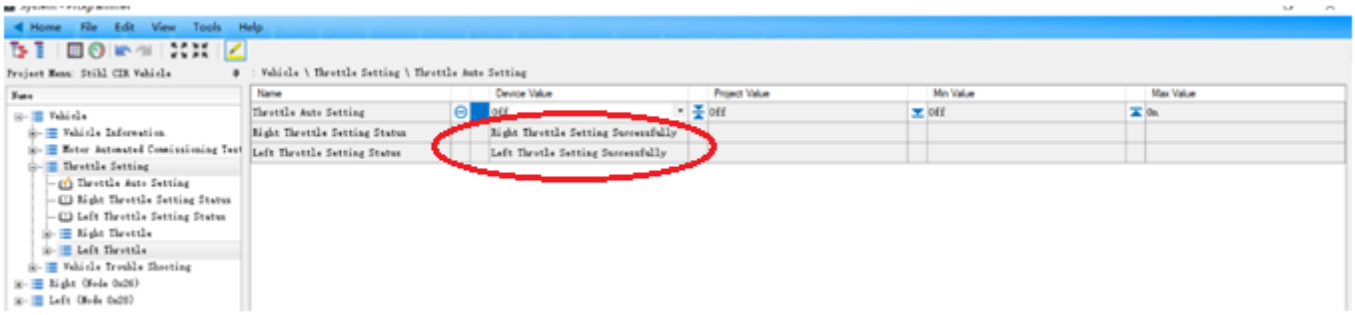


4) Navigate to Vehicle->Throttle Setting.

Now click the + and enable “Throttle Auto Setting”.



The below status indicates the autotune completed without issue.

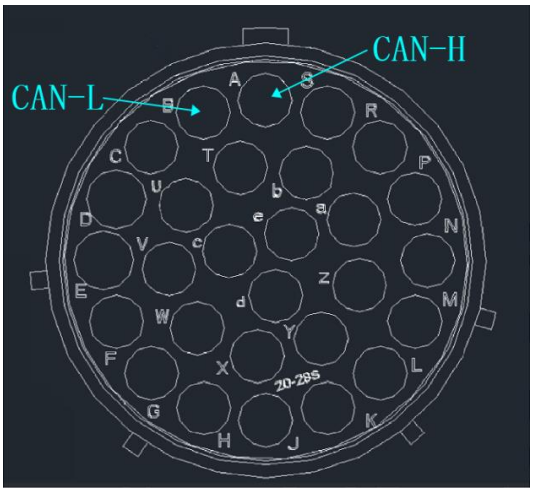


14.25 TR 55 BMS CAN Communication Abnormal

Tool: Multimeter, Computer, Debugging wire, PCAN

Check:

1. Check if the BMS plugin is loose, check if the BMS plugin CAN-H and CAN-L have retracted needles, and if there is any debris on the surface of the BMS plugin, causing poor contact of the plugin.



2. If there is no problem with the battery pack plugin, use a multimeter to check if the CAN-H and CAN-L connections between the right walking controller plugin and the battery pack plugin are conductive. If there is no continuity, replace the main harness of the entire vehicle.

14.26 TR 56 Operator Presence Detection Abnormal

Check:

1. Display pop up TR 56 fault code.
2. The operator is not in the correct operating position. Please ensure you are in the correct operating position to resume operation.
3. Right side throttle lever is not in neutral position. Please ensure right throttle lever is in returned to park position to resume operation.
4. Left side throttle lever is not in neutral position. Please ensure left throttle lever is in returned to park position to resume operation.

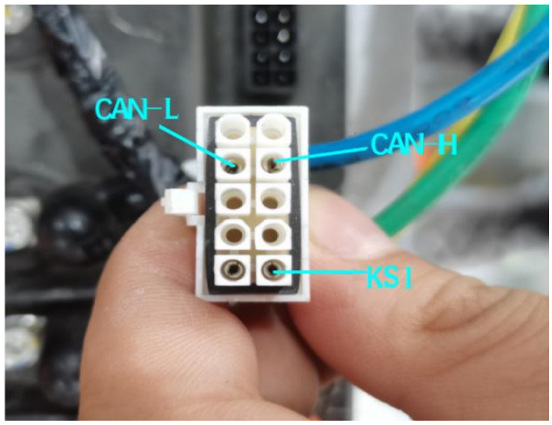
14.27 TR 58 Right Blade Motor Controller CAN Communication Abnormal

Tool: Multimeter, Computer, Debugging wire, PCAN

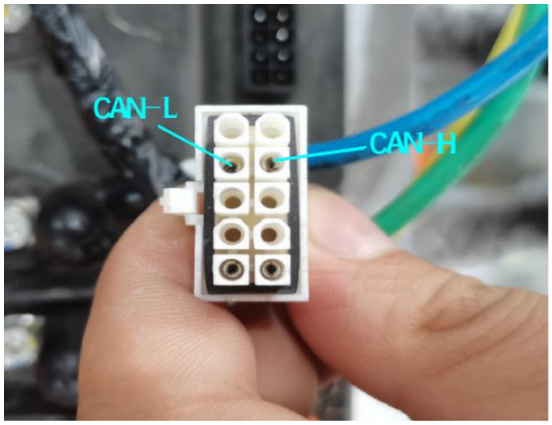


Check:

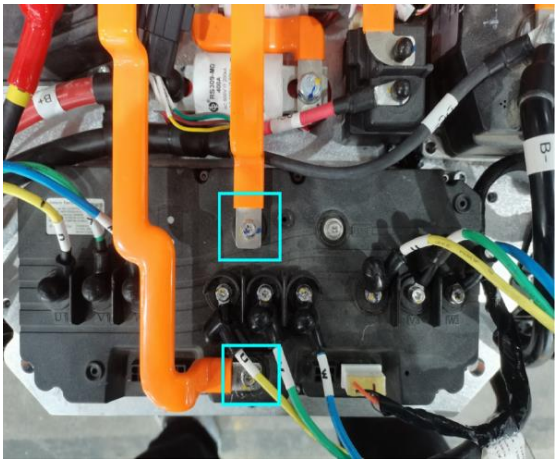
1. Display pop up TR 58/63/65 fault code.
2. Check whether the Trinity cutter controller plug-in is loose, check whether the Trinity cutter controller plug-in CAN-H, KAN-L, KSI, and the three-in-one cutter controller plug-in surface has garbage, resulting in poor contact with the plug-in.



3. If this fault code persists, Use the multimeter to check whether the CAN-H, CAN-L conductivity. If not conductivity, replace the vehicle main line harness.



4. Restart the vehicle. If the fault continues to occur, check the connection line on the controller and tighten the loose bolts.



5. Use the multimeter voltage range to check whether the voltage at the KSI pin is greater than 70V. If less than 70V, replace the main line bundle. If it is greater than 70V, brush the Trinity cutter controller program.
6. Restart the vehicle. If the fault continues to occur replace the Trinity cutter controller.
7. If you have replaced a new controller, remember to follow the self-learning steps for the motor auto-matching test.

14.28 TR 5A Internal communication failure

Tool: Computer, Debugging wire, PCAN

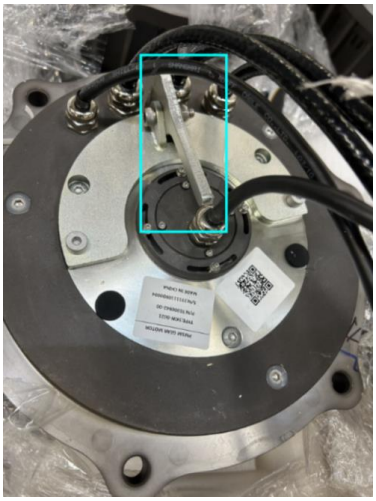
Check:

1. Display pop up TR 5A fault code.
2. Keep the vehicle power off state, check whether wheels can be turned freely.
3. If the wheels cannot rotate, please update the controller program.
4. If this fault code persists, please replace a new controller. Refer to the maintenance manual for the specific disassembly and assembly steps.
5. If you have replaced a new controller, remember to follow the self-learning steps for the motor auto-matching test.

14.29 TR 5B/TL 5B Right/Left Parking Brake Manually Disengaged and Not Reset

Check:

1. Display pop up TR 5B fault code.
2. Please to keep the brake lever at unreleased state.

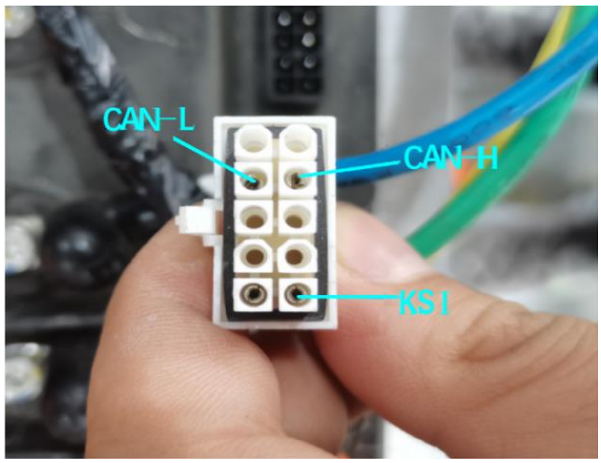


14.30 TR 63 Left Blade Motor Controller CAN Communication Abnormal

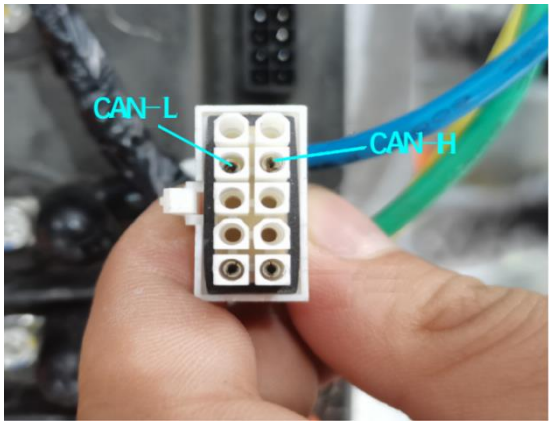
Tool: Multimeter, Computer, Debugging wire, PCAN

Check:

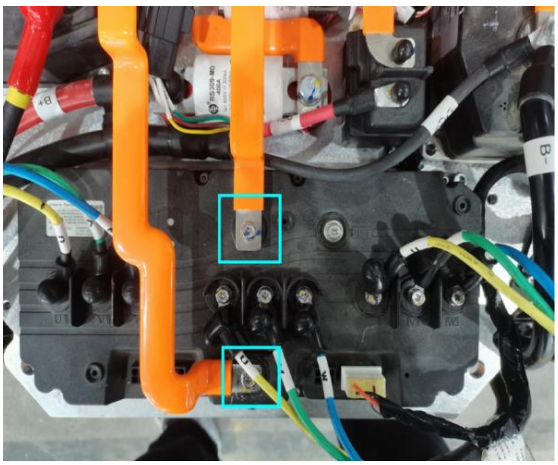
1. Display pop up TR 58/63/65 fault code.
2. Check whether the Trinity cutter controller plug-in is loose, check whether the Trinity cutter controller plug-in CAN-H, KAN-L, KSI, and the three-in-one cutter controller plug-in surface has garbage, resulting in poor contact with the plug-in.



3. If this fault code persists, Use the multimeter to check whether the CAN-H, CAN-L conductivity. If not conductivity, replace the vehicle main line harness.



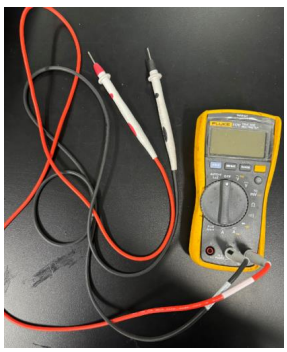
4. Restart the vehicle. If the fault continues to occur,Check the connection line on the controller and tighten the loose bolts.



5. Use the multimeter voltage range to check whether the voltage at the KSI pin is greater than 70V. If less than 70V, replace the main line bundle. If it is greater than 70V, brush the Trinity cutter controller program.
6. Restart the vehicle. If the fault continues to occur replace the Trinity cutter controller.
7. If you have replaced a new controller, remember to follow the self-learning steps for the motor auto-matching test.

14.31 TR 65 Middle Blade Motor Controller CAN Communication Abnormal

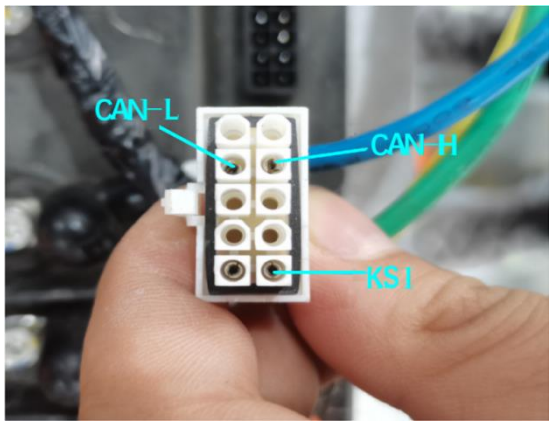
Tool: Multimeter, Computer, Debugging wire, PCAN



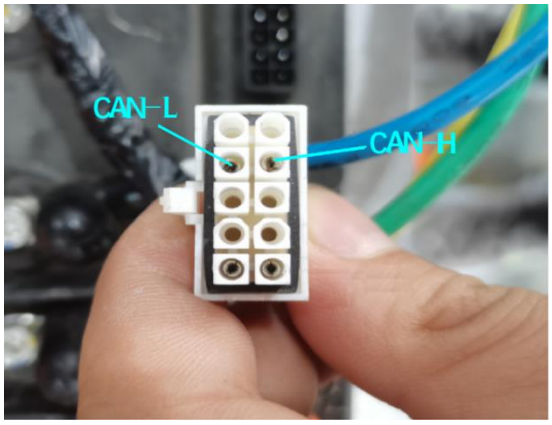
Check:

1. Display pop up TR 58/63/65 fault code.

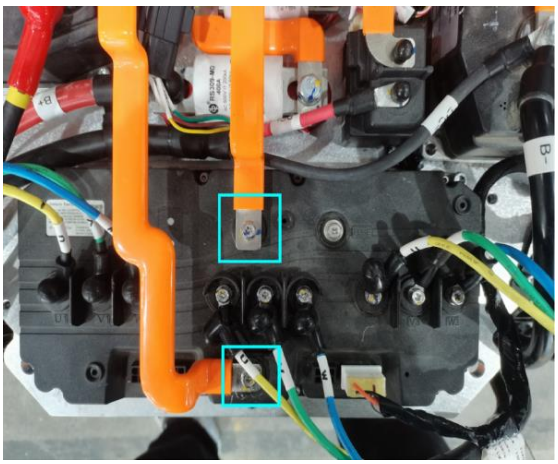
2. Check whether the Trinity cutter controller plug-in is loose, check whether the Trinity cutter controller plug-in CAN-H, KAN-L, KSI, and the three-in-one cutter controller plug-in surface has garbage, resulting in poor contact with the plug-in.



3. If this fault code persists, Use the multimeter to check whether the CAN-H, CAN-L conductivity. If not conductivity, replace the vehicle main line harness.



4. Restart the vehicle. If the fault continues to occur, Check the connection line on the controller and tighten the loose bolts.



5. Use the multimeter voltage range to check whether the voltage at the KSI pin is greater than 70V. If less than 70V, replace the main line bundle. If it is greater than 70V, brush the Trinity cutter controller program.
6. Restart the vehicle. If the fault continues to occur replace the Trinity cutter controller.

7. If you have replaced a new controller, remember to follow the self-learning steps for the motor auto-matching test.

14.32 TR 64/66 Second Left/Right Blade Motor Controller CAN Communication Abnormal

Note, tool and check step refer to 14.31 TR63 details.

14.33 TR 67 Blade speed exceeds limit

Tool: Computer, Debugging wire, PCAN

Check:

1. Display pop up TR 67 fault code.
2. Restart Vehicle.
3. If this fault code persists, please replace a new controller. Refer to the maintenance manual for the specific disassembly and assembly steps.
4. If you have replaced a new controller, remember to follow the self-learning steps for the motor auto-matching test.

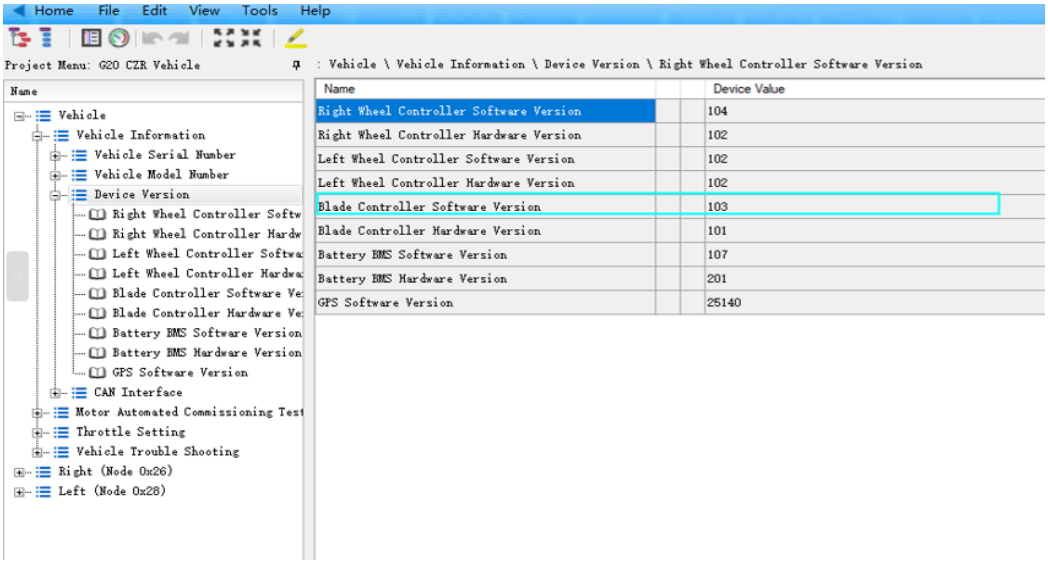
14.34 TR 73/TL 73 Right/Left Wheel Motor Stall Detected

Tool: Computer, Debugging wire, PCAN

Check:

1. Display pop up TR 73/TL 73 fault code.

2. Use the CURTIS controller application Check whether the controller software version is correct，If the version is incorrect, rewrite the correct version.



3. Restart the vehicle. If the fault continues to occur. If this fault code persists, please replace a new blade controller. Refer to the maintenance manual for the specific disassembly and assembly steps.
4. Restart the vehicle. If the fault continues to occur, check whether the motor power is insufficient. If the vehicle in the downhill, due to the motor power is not enough, resulting in motor stall, the Blade Motor needs to be replaced. Refer to the maintenance manual for the specific disassembly and assembly steps.
5. If you have replaced a new controller or a new motor, remember to follow the self-learning steps for the motor auto-matching test.

14.35 TR 83/TL 83 Right/Left Motor Controller Internal Hardware

Tool: Computer, Debugging wire, PCAN

Check:

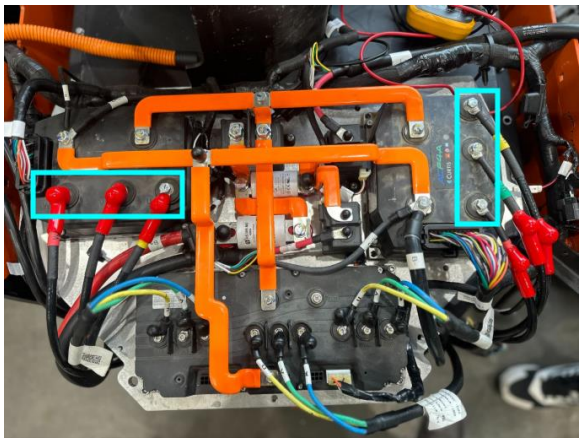
1. Display pop up TR 83 fault code.
2. Restart Vehicle.
3. If this fault code persists, please replace a new controller. Refer to the maintenance manual for the specific disassembly and assembly steps.
4. If you have replaced a new controller, remember to follow the self-learning steps for the motor auto-matching test.

14.36 TR 87/TL 87 Right/Left Wheel Motor Controller Motor Characterization Fault

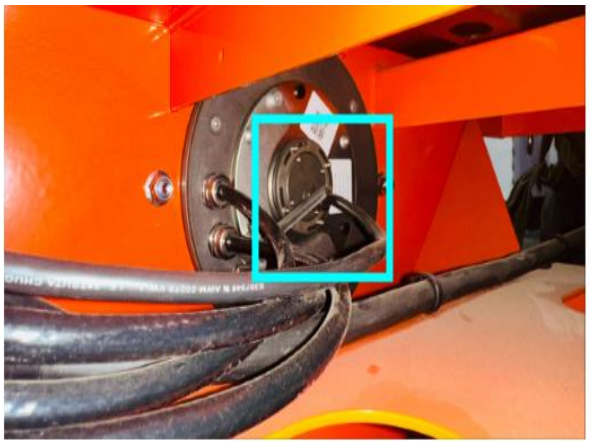
Tool: Computer, Debugging wire, PCAN

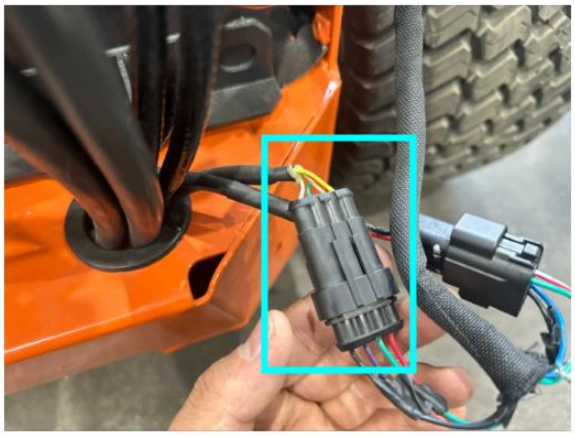
Check:

1. Display pop up TR 87 fault code.
2. Please check that the phases of the motor are well connected to controller.

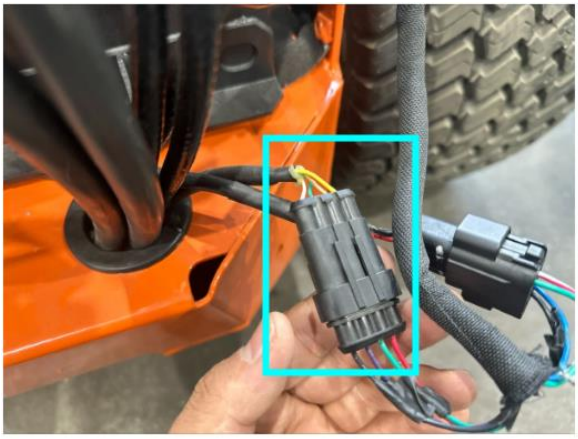


3. Please check that the encoder of the motor is well assembled, including installation and connectors.





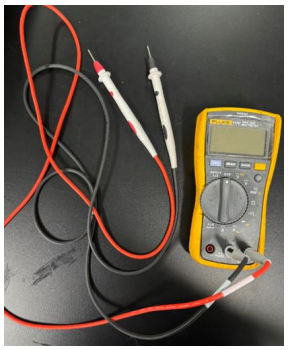
4. Please check whether the connector of encoder is well connected.



5. Run the appropriate motor commissioning sequences.
6. If you have reassembled the encoder, remember to follow the self-learning steps for the motor auto-matching test.

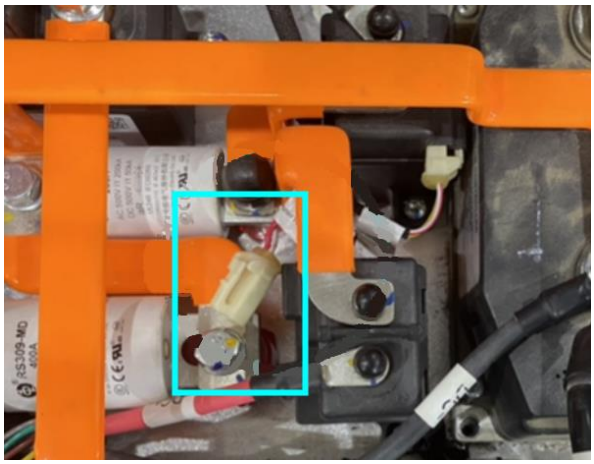
14.37 TR A1/TL A1 Rear ETO Contactor Coil Driver Short/Open

Tool: Multimeter, Computer, Debugging wire, PCAN



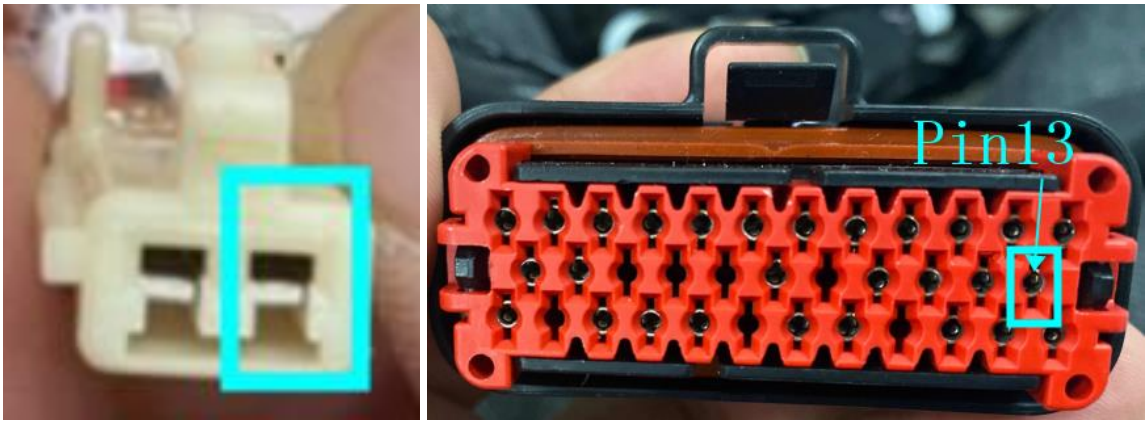
Check:

1. Display pop up TR A1 fault code.
2. First pull out the communication plug-in on the rear ETO relay, check whether the terminal in the connector is out of the pin, if the pin is out, please deal with it, and insert the connector into the relay.

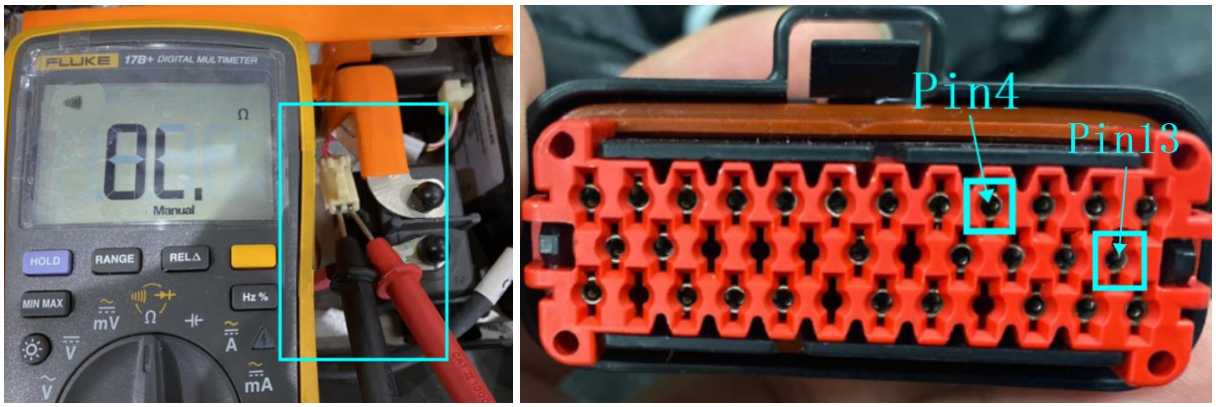



3. Power on the device again, if the fault does not disappear, pull out the main control communication plug-in and the relay, and measure whether the left PIN foot of the connector on the relay is connected to the 4 PIN foot on the main control plug-in.

4. Pull out the main control communication plug-in and the relay, and measure whether the right PIN foot of the connector on the relay is connected to the 13 PIN foot on the main control plug-in.

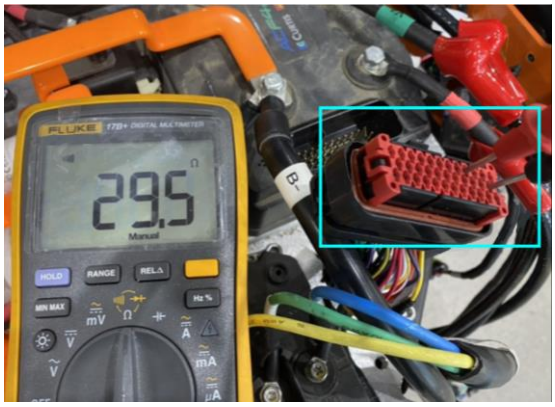
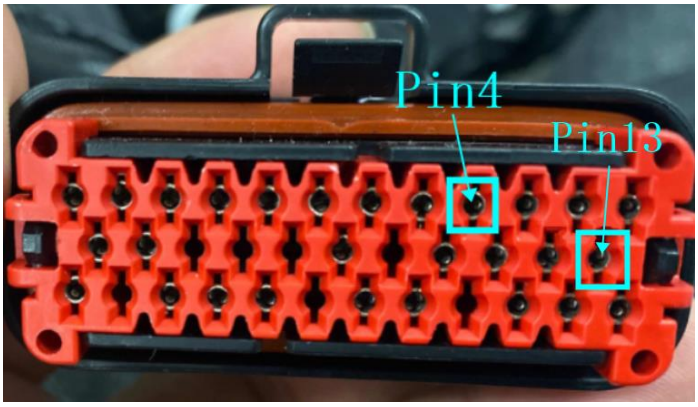


5. Pull out the main control communication plug and the plug on the relay. Use a multimeter to select the on/off gear to measure whether the left and right PIN pins of the connector on the relay are connected, or measure the 4PIN and 13PIN pins on the main control communication plug. If there is a path on both sides.

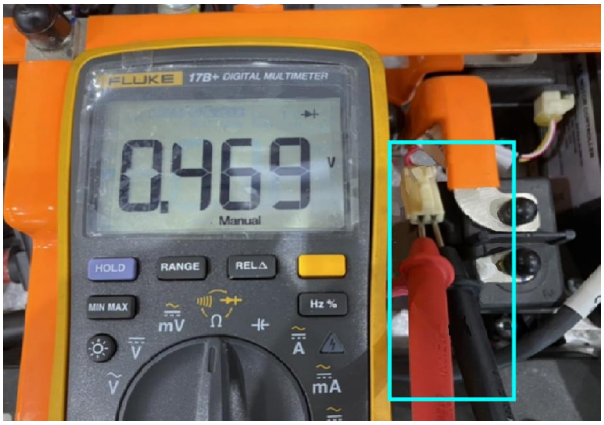


6. If the left and right ends are paths, it means that the main line bundle is damaged and needs to be replaced.

7. The multimeter is set to on-off, plug in the plug-in on the relay, and measure whether the 4 PIN feet and 13 PIN feet on the master communication plug-in are disconnected. If the circuit is open, the front ETO relay is damaged and needs to be replaced.

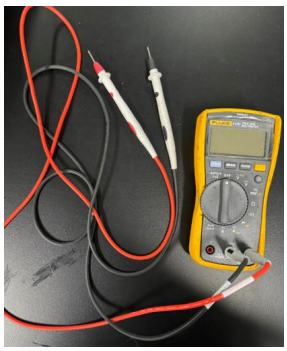
8. Insert the main control communication plug, unplug the relay plug, use a multimeter diode gear, connect the red probe on the left side of the plug, and connect the black probe on the right side of the plug. If there is no value, the controller is damaged and needs to be replaced.



9. If you have replaced a new controller, remember to follow the self-learning steps for the motor auto-matching test.

14.38 TR A2/TL A2 Right/Left Wheel Motor Controller EM Brake Driver Short/Open

Tool: Multimeter, Computer, Debugging wire, PCAN

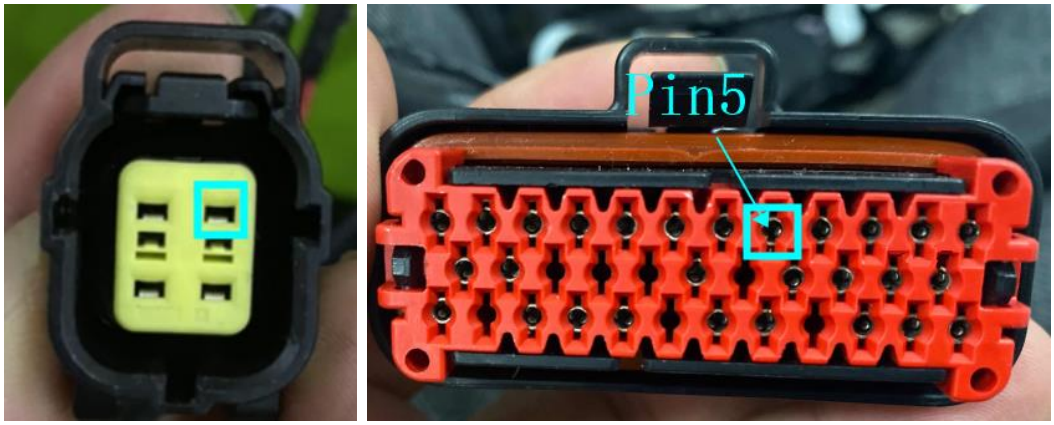


Check:

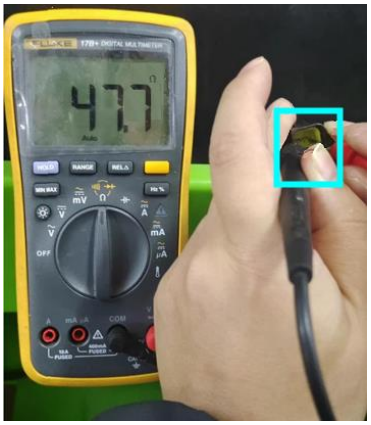
1. Display pop up TR A2 fault code.
2. Pull out the electromagnetic brake communication plug and the main controller communication plug on the right drive motor, check if there is a pin on the connector that returns the PIN, and check if the PIN and the connector can be fixed.

3. Reinsert the plugin and restart the vehicle. If the fault still persists, use a multimeter to turn on and off the gear, and measure whether the left pin in the first row is connected to the 13PIN pin on the main control communication plug.

4. Use a multimeter to turn on and off the gear, and measure whether the pin on the right side of the first row is connected to the 5PIN pin on the main control communication plug.



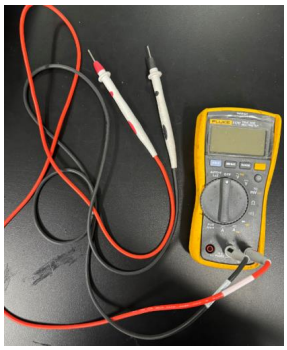
5. Measure the resistance between the left and right pins of the first row of the electromagnetic brake plug on the drive motor using a multimeter in the ohm range. If it does not exist or approaches zero infinitely, it indicates that the electromagnetic brake on the drive motor is damaged and needs to be replaced.

6. If you have replaced a new motor, remember to follow the self-learning steps for the motor auto-matching test.

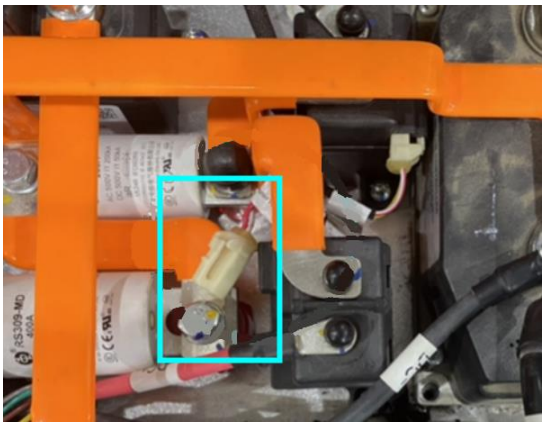
14.39 TR A3/TL A3 Front Front ETO Contactor Coil Driver Short/Open

Tool: Multimeter, Computer, Debugging wire, PCAN



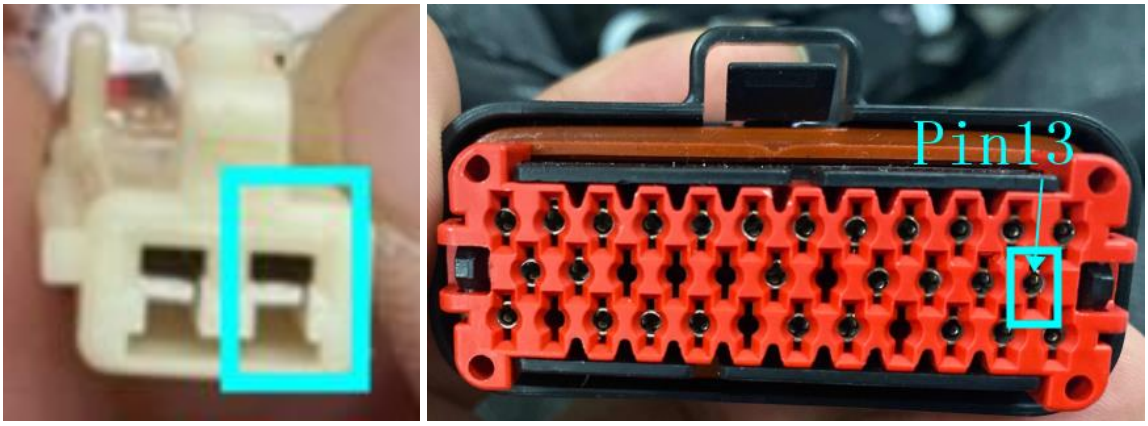
Check:

1. Display pop up TR A3 fault code.
2. First pull out the communication plug-in on the rear ETO relay, check whether the terminal in the connector is out of the pin, if the pin is out, please deal with it, and insert the connector into the relay.

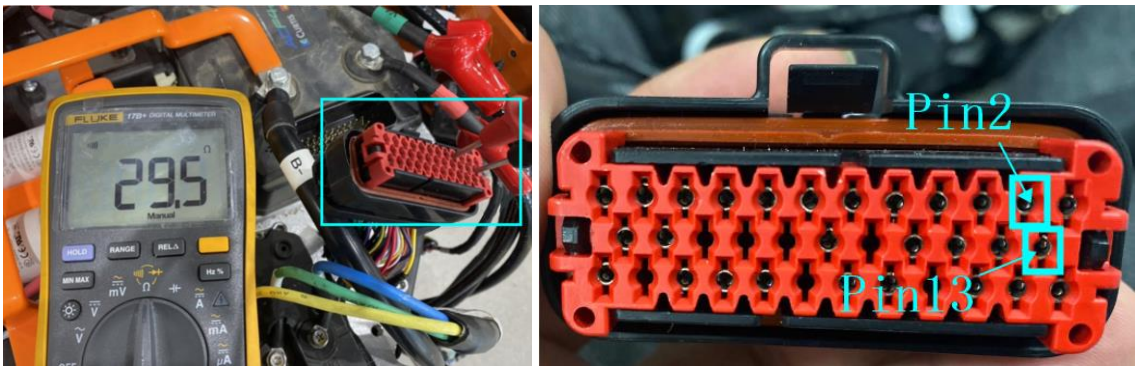



3. Power on the device again, if the fault does not disappear, pull out the main control communication plug-in and the relay, and measure whether the left PIN foot of the connector on the relay is connected to the 4 PIN foot on the main control plug-in.

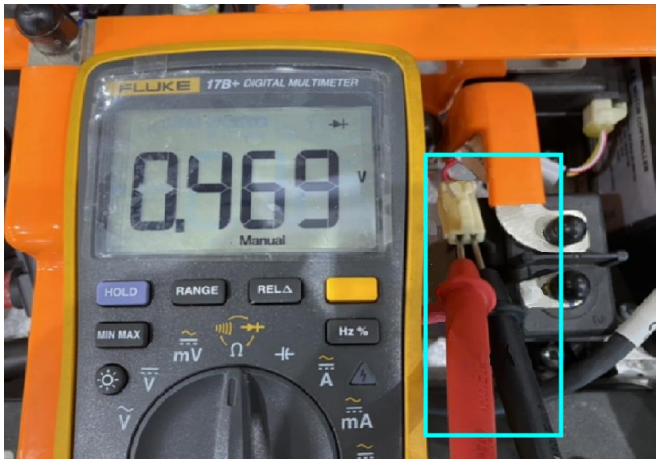
4. Pull out the main control communication plug-in and the relay, and measure whether the right PIN foot of the connector on the relay is connected to the 13 PIN foot on the main control plug-in.



5. The multimeter is set to on-off, plug in the plug-in on the relay, and measure whether the 2 PIN feet and 13 PIN feet on the master communication plug-in are disconnected. If the circuit is open, the front ETO relay is damaged and needs to be replaced.



6. Insert the main control communication plug, unplug the relay plug, use a multimeter diode gear, connect the red probe on the left side of the plug, and connect the black probe on the right side of the plug. If there is no value, the controller is damaged and needs to be replaced.



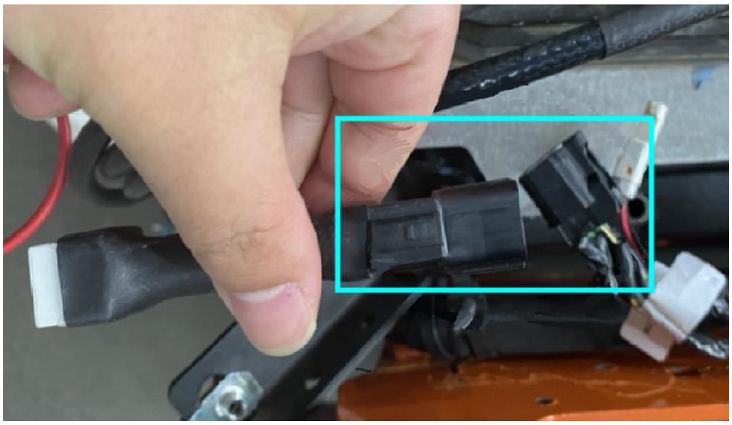
7. If you have replaced a new controller, remember to follow the self-learning steps for the motor auto-matching test.

14.40 TR A4/TL A4 Auto power off Contactor Coil Driver Short/Open

Tool: Multimeter, Computer, Debugging wire, PCAN

Check:

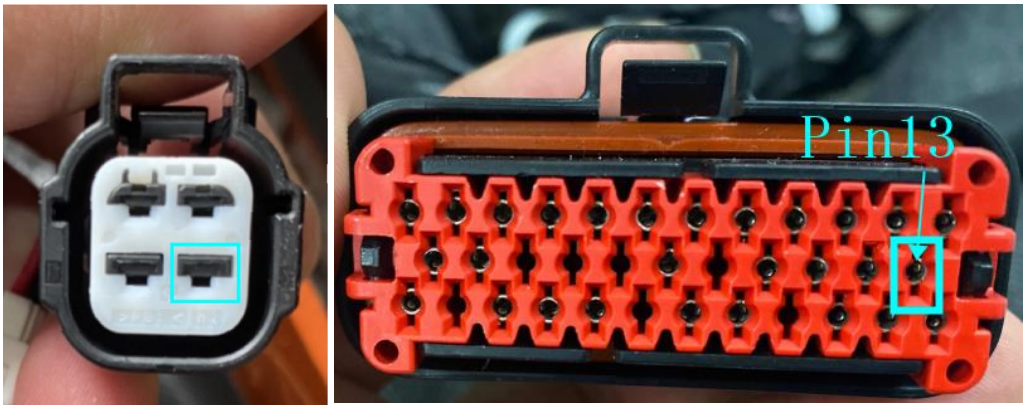
1. Display pop up TR A4 fault code.
2. Unplug the one click start relay from the vehicle wiring harness and check if there is a PIN retraction phenomenon at the terminals in the connector. If there is, reinsert the PIN pin into the connector and check if the terminals still fall off.



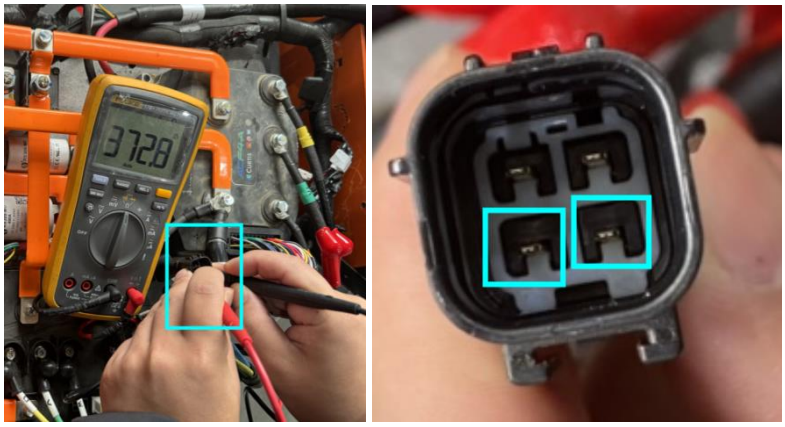
3. Reinsert the plugin and restart the vehicle if the fault still persists. Pull out the communication plug between the relay and the main control, and use a multimeter to turn on and off the gear. Measure whether the left PIN pin

on the second row of the connector between the wire harness end and the relay is connected to the 3PIN pin on the main control communication plug.

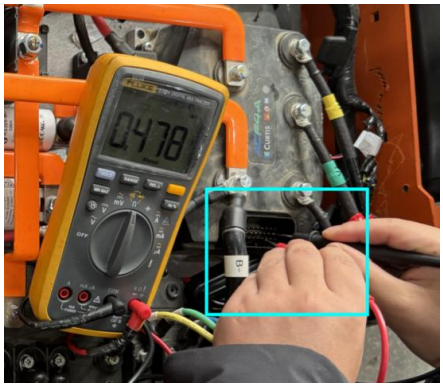
4. Pull out the communication plug between the relay and the main control. Use a multimeter to turn on and off the gear. Measure whether the second row right PIN pin on the connector between the wire harness end and the relay is connected to the 13PIN pin on the main control communication plug.

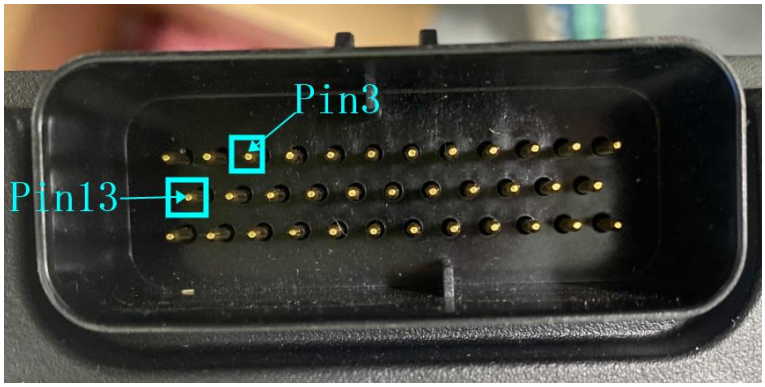


5. Using a multimeter ohmmeter, measure whether there is resistance value on the left and right sides of the second row of the connector on the relay. If not, it indicates that the one click start relay is damaged and needs to be replaced.



6. Unplug the main control communication plugin. Using a multimeter diode range, connect the red probe to pin 3 of the main controller and the black probe to pin 13 of the main controller. If the diode is not present, it indicates that the controller is damaged and needs to be replaced.





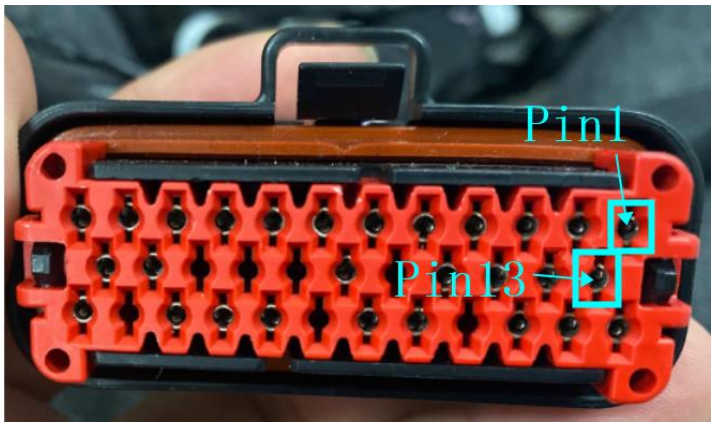
7. If you have replaced a new controller, remember to follow the self-learning steps for the motor auto-matching test.

14.41 TR A9/TL A9 Right/Left Wheel Motor Controller Coil Supply

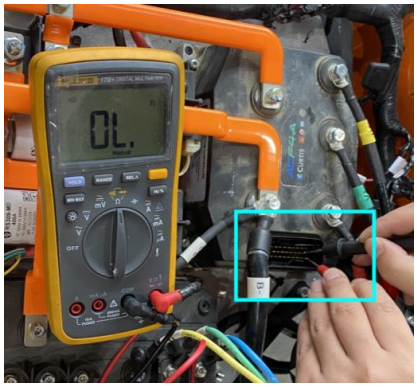
Tool: Multimeter, Computer, Debugging wire, PCAN

Check:

1. Display pop up TR A9 fault code.
2. Unplug the main controller communication plug, use a multimeter to turn on and off the gear, and measure whether pins 1 and 13 on the main controller communication plug are connected. If pins 1 and 13 are connected, there is a problem with the main harness and it needs to be replaced.



3. Use a multimeter to turn on and off the gear. Measure whether pins 1 and 13 on the controller are connected. If pins 1 and 13 on the controller are connected, the main controller is damaged and needs to be replaced.



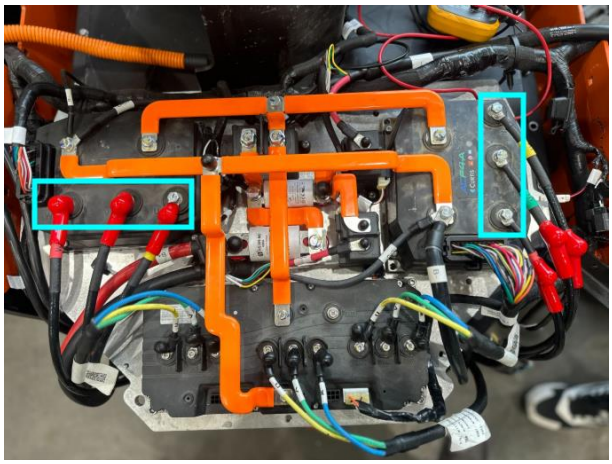
4. If you have replaced a new controller, remember to follow the self-learning steps for the motor auto-matching test.

14.42 TR D2/TL D2 Right/Left Wheel Motor Controller Phase PWM Mismatch

Tool: Computer, Debugging wire, PCAN

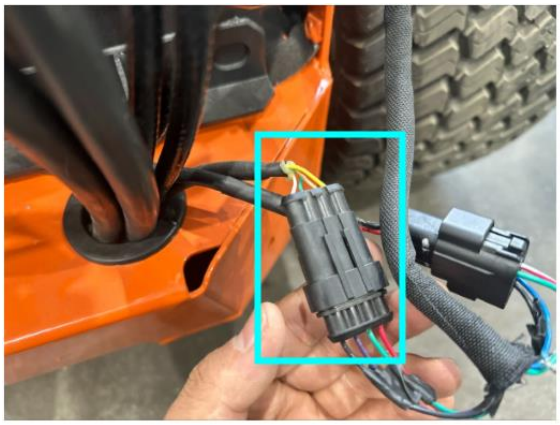
Check:

1. Display pop up TR D2 fault code.
2. Please check that the phases of the motor are well connected to controller.



3. Please check whether the encoder is well assembled.

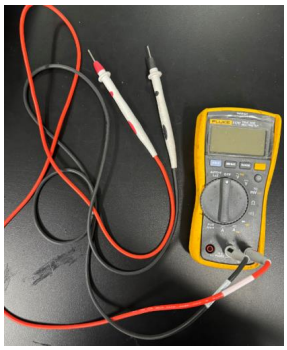
4. Please check whether the connector of encoder is well connected.



5. Run the appropriate motor commissioning sequences.
6. If you have reassembled the encoder, remember to follow the self-learning steps for the motor auto-matching test.

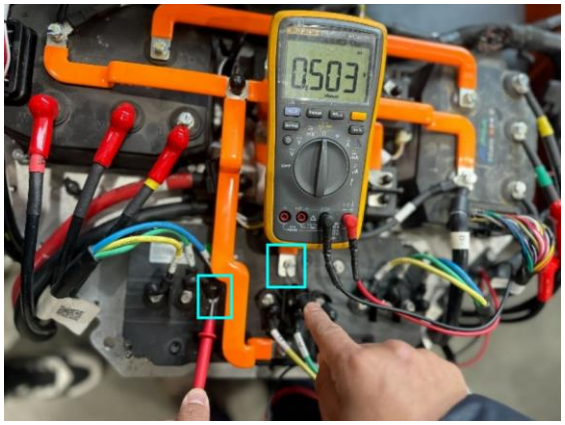
14.43 ML 11 /MM 11 /MR 11 Left/Middle/Right Blade Motor Controller Hardware Overvoltage or Overcurrent

Tool: Multimeter, Computer, Debugging wire, PCAN

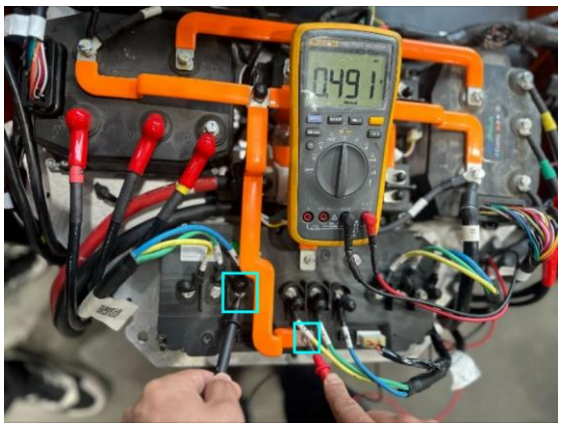


Check:

1. Display pop up ML 11 /MM 11 /MR 11 fault code.
2. If a malfunction occurs when the vehicle is powered on.
3. Set the Multimeter to the diode position and measure the voltage between the U \ V \ W phase and the positive electrode.




4. Set the Multimeter to the diode position and measure the voltage between the U \ V \ W phase and the negative electrode.




5. If the range is 4.7-5.0V, the MOS is normal. Otherwise, it is judged that the MOS is damaged and the controller needs to be replaced. Refer to the maintenance manual for the specific disassembly and assembly steps.
6. If Normal when the vehicle is powered on, Fault occurs after pulling up the PTO switch, keep the vehicle power off state. Check for foreign objects under the header.
7. Raise the header and manually move the blades to check if the motor can rotate smoothly. If the motor is noticeably stuck, it is necessary to replace the cutter motor.

8. If you have replaced a new controller or a new motor, remember to follow the self-learning steps for the motor auto-matching test.

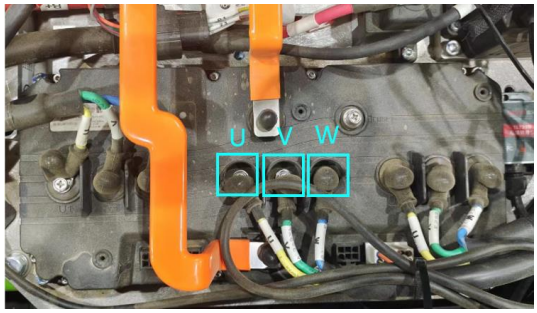
14.44 ML 12/MM 12/MR 12 Right/Middle/Left Blade Motor Controller Overcurrent

Tool: Multimeter, Computer, Debugging wire, PCAN

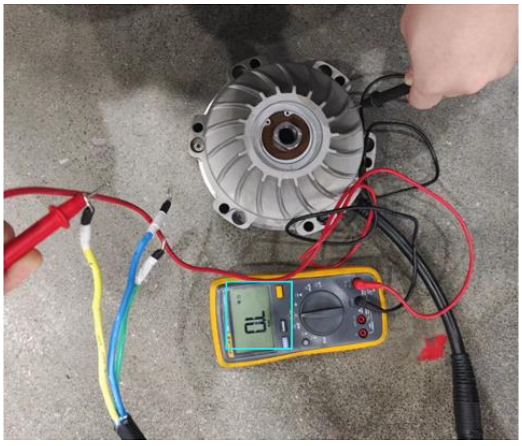


Check:

1. Display pop up ML 12/MM 12/ML 12 fault code.
2. Move the vehicle to an open area without grass, restart the cutter motor. If the Fault disappears, the cause of the fault is the controller heating caused by the overload of the cutter motor, should be reduce mowing density.
3. Check whether the insulation skin of motor U \ V \ W phase wire is broken and copper wire is together at the damage. If the wiring harness is damaged, dispose of the damaged area.
4. Remove the U/V/W phase line of the motor controller. Measure the resistance value between U \ V \ W phases and the motor housing using a multimeter resistance range.



5. If the resistance value is less than 20M Ω, there is a short circuit between the internal winding and the casing of the motor, and the motor needs to be replaced.
6. If the resistance measured by the motor phase line and the housing is infinite, observe whether there is any damage to the outer packaging of the motor encoder's wiring harness. If the wiring harness is damaged, replace the motor encode.

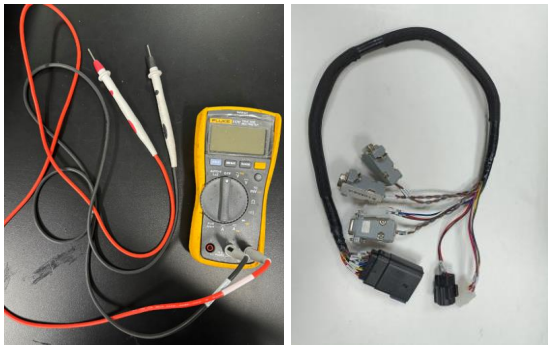


7. If the wiring harness of the motor encoder is intact, measure the resistance value between the controller U \ V \ W phases. If the value displayed on the multimeter is below 10 Ω, it indicates that the diode has broken down and caused a short circuit, and a new motor controller needs to be replaced.

8. If you have replaced a new controller or a new motor, remember to follow the self-learning steps for the motor auto-matching test.

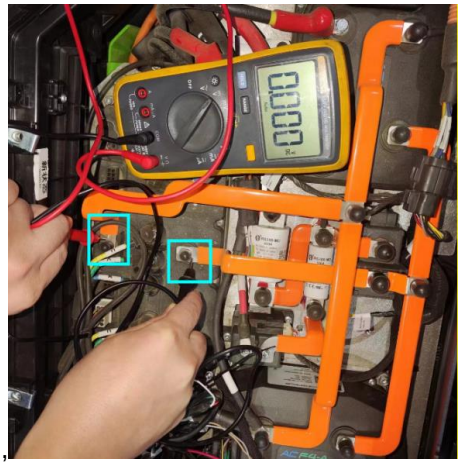
14.45 ML 13/MM 13/MR 13 Left/Middle/Right Blade Motor Controller Overvoltage

Tool: Multimeter, Computer, Debugging wire, PCAN



Check:

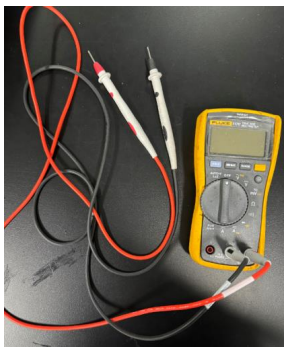
1. Display pop up ML 13/MM 13/MR 13 fault code.
2. Restart Vehicle.
3. If this fault code persists, Vehicle power on Please use a multimeter to measure the bus DC voltage of the controller.



4. If the value displayed on the multimeter is less than 96V, it indicates that the internal voltage sensor of the motor controller is faulty and the controller needs to be replaced. Refer to the maintenance manual for the specific disassembly and assembly steps.
5. If the value displayed on the multimeter is greater than 96V, it indicates a battery failure and the battery system needs to be checked.

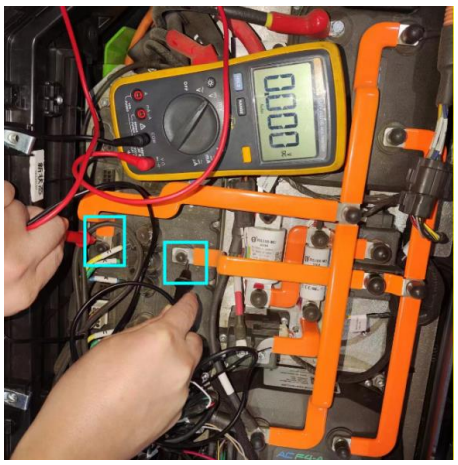
14.46 ML 14/MM 14/MR 14 Left/Middle/Right Blade Motor Controller Undervoltage

Tool: Multimeter, Computer, Debugging wire, PCAN



Check:

1. Display pop up ML 14/MM 14/MR 14 fault code.
2. Restart Vehicle.
3. If this fault code persists, Please use a multimeter to measure the bus DC voltage of the controller.



4. If the value displayed on the multimeter is greater than 72V, it indicates that the internal voltage sensor of the motor controller is faulty and the controller needs to be replaced. Refer to the maintenance manual for the specific disassembly and assembly steps.
5. If the value displayed on the multimeter is less than 72V, it indicates a battery failure and the battery system needs to be checked.

14.47 ML 15 Current Parameter Mismatch Fault(Second vehicle model)

Tool: Multimeter, Computer, Debugging wire, PCAN

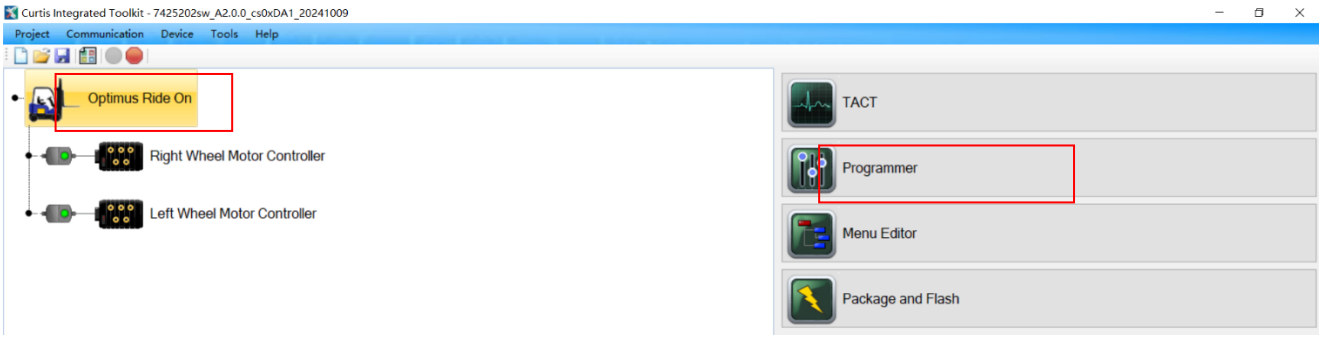


Fault description: Model NO. choosed to flash blade controller parameter does not match with actual vehicle.

Immediate fix solution: please check whether the model no. you choose to flash blade controller parameter is correspond to the vehicle Model NO.

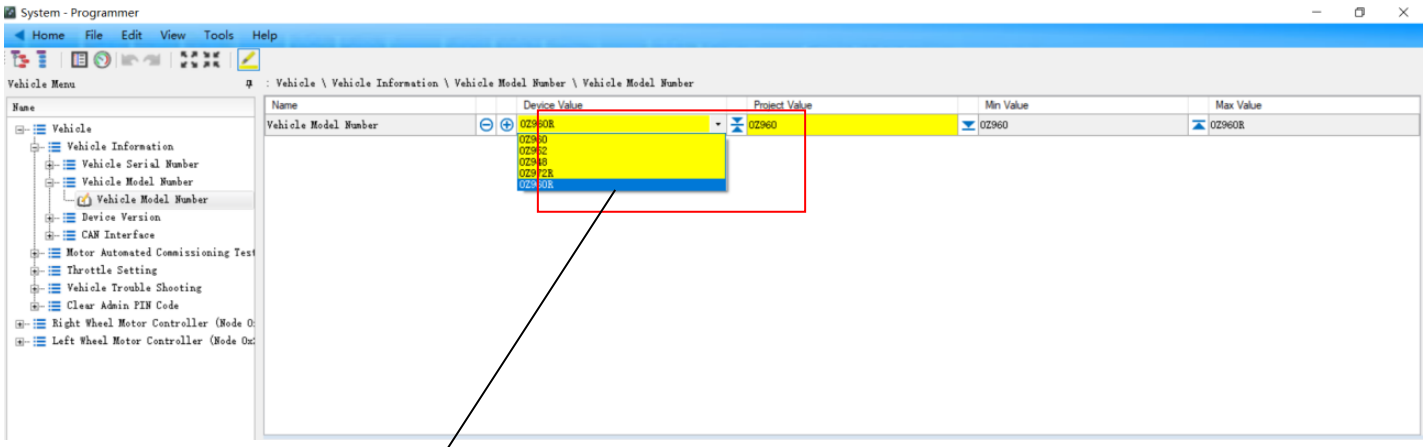
1. Step 1 Confirm vehicle model number.

According following route: Optimus->Programmer.



2. Step2 confirm Model NO.

According Vehicle->Vehicle information-> Vehicle Model Number, the model No. should match with Blade controller.

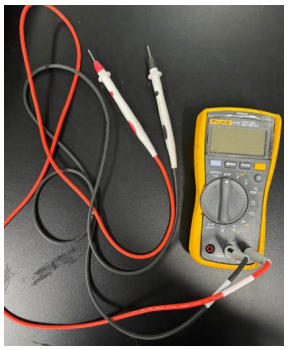


When you flash corresponding Blade controller program. If the Vehicle NO. is correct, but theTL15 fault code is still exist, you can just need to reflash the Blade controller. You need follow the following rules.

OZ960/OS960/OZ960R	OZ960
OZ952/OS952	OZ952
OZ948/OS948	OZ948
OZ972R	OZ972R

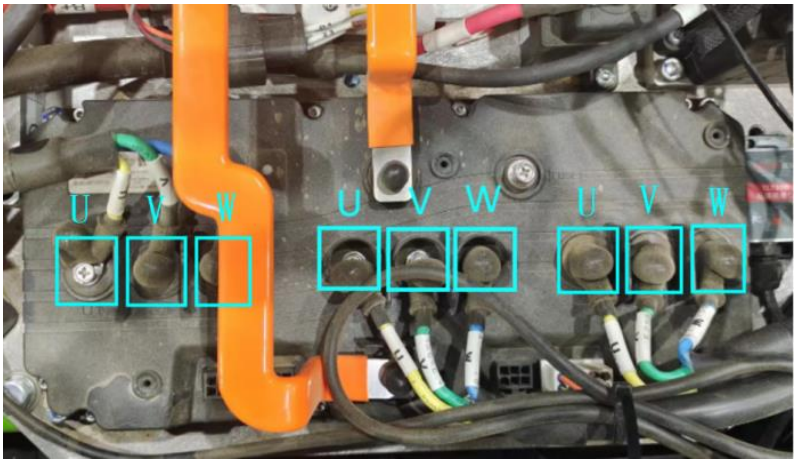
14.48 ML 16/MM 16/MR 16 Left/Middle/Right Blade Motor Phase Open

Tool: Multimeter, Computer, Debugging wire, PCAN



Check:

1. Display pop up ML 16/MM 16/MR 16 fault code.
2. Check whether the motor phase line is reliably connected to the controller. Check the positions of the six screws. If they are loose. tighten the loose bolts and Check if screws are found to be damaged. Replace the new screws, if the controller screw hole is damaged and the controller needs to be replaced.

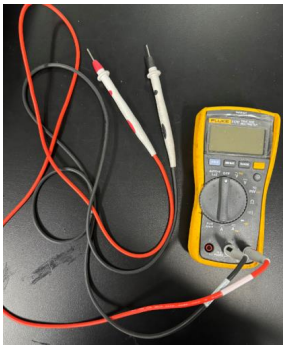


3. Restart the vehicle. If the fault continues to occur measure the resistance value between the motor U \ V \ W phases. If the value displayed on the multimeter is 0 or infinity it means that the motor has been damaged inside and a new blade motor needs to be replaced.

4. If you have replaced a new controller or a new motor, remember to follow the self-learning steps for the motor auto-matching test.

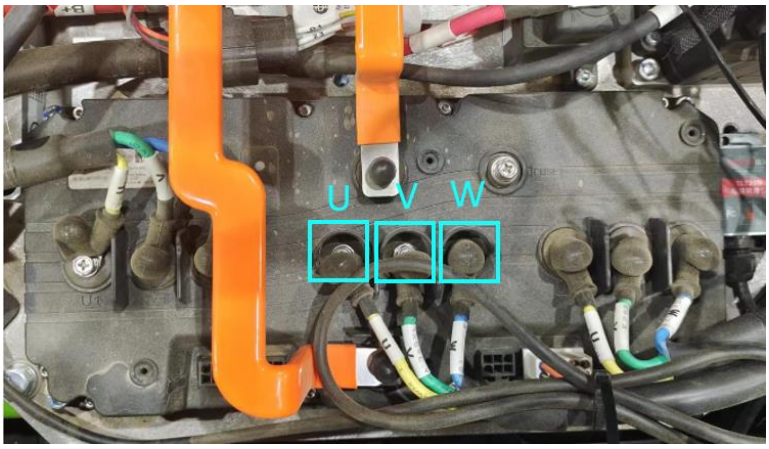
14.49 ML 17/MM 17/MR 17 Left/Middle/Right Blade Motor Controller Severe Overtemp

Tool: Infrared Thermometers, Multimeter, Computer, Debugging wire, PCAN

Check:

1. Display pop up ML 17/MM 17/MR 17 fault code.
2. Move the vehicle to an open area without grass, restart the cutter motor. If the Fault disappears, the cause of the fault is the controller heating caused by the overload of the cutter motor, should be reduce mowing density.
3. Restart the vehicle. If the fault continues to occur, check the connection of the motor U/V/W phase line on the controller and tighten the loose bolts.

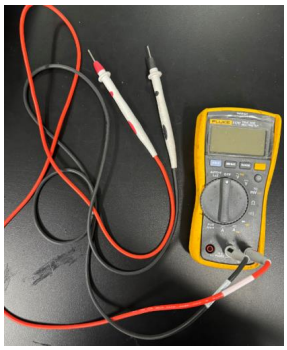


4. Restart the vehicle. If the fault continues to occur, measure the temperature of the blade controller, and read the feedback temperature of the blade control through the upper computer ToolsForCAN-PlatformChecker for comparison. If the difference is significant it indicates that the internal temperature sensor of the controller is faulty and needs to be replaced with a new cutting blade controller.

5. If you have replaced a new controller, remember to follow the self-learning steps for the motor auto-matching test.

14.50 ML 18 /MM 18 /MR 18 Left/Middle/Right Blade Motor Controller EEPROM Abnormal

Tool: Multimeter, Computer, Debugging wire, PCAN



Check:

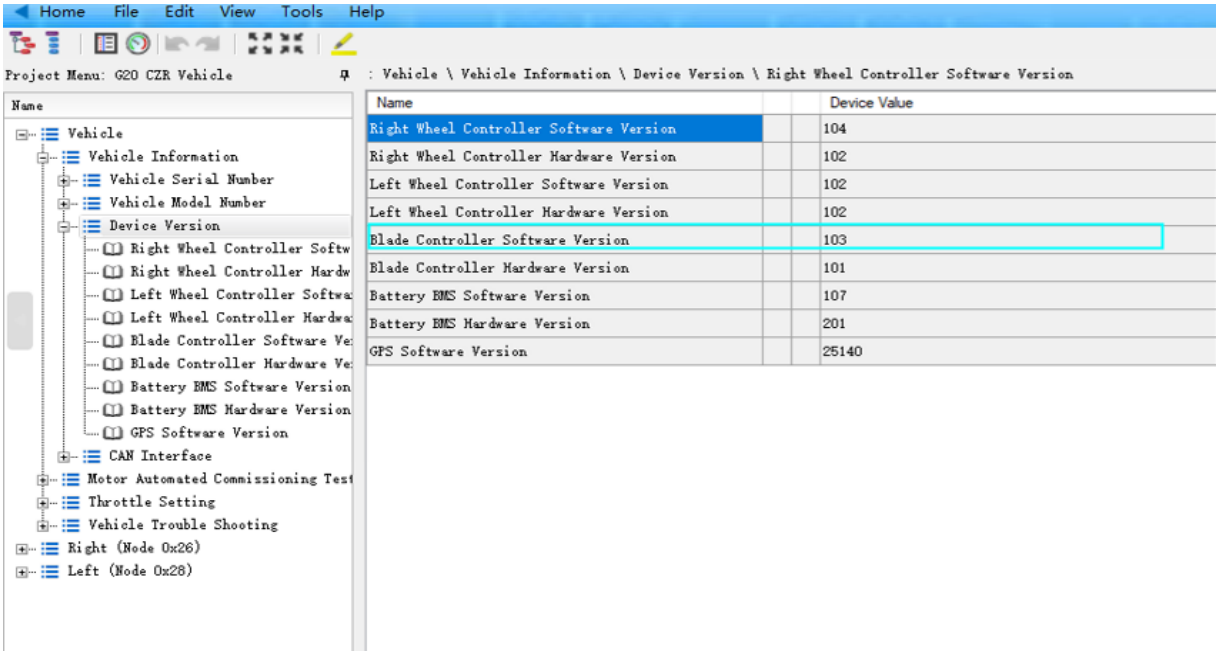
1. Display pop up ML 18/MM 18/MR 18 fault code.
2. Restart Vehicle.
3. If this fault code persists, please replace a new blade controller. Refer to the maintenance manual for the specific disassembly and assembly steps.
4. If you have replaced a new controller, remember to follow the self-learning steps for the motor auto-matching test.

14.51 ML 21 /MM 21 /MR 21 Left/Middle/Right Blade Motor Stall Detected

Tool: Computer, Debugging wire, PCAN


Check:

1. Display pop up ML 21 /MM 21 /MR 21 fault code.
2. Use the CURTIS controller application Check whether the controller software version is correct，If the version is incorrect, rewrite the correct version.



3. Restart the vehicle. If the fault continues to occur. If this fault code persists, please replace a new blade controller. Refer to the maintenance manual for the specific disassembly and assembly steps.
4. Restart the vehicle. If the fault continues to occur, check whether the motor power is insufficient. If the vehicle in the downhill, due to the motor power is not enough, resulting in motor stall, the Blade Motor needs to be replaced. Refer to the maintenance manual for the specific disassembly and assembly steps.
5. If you have replaced a new controller or a new motor, remember to follow the self-learning steps for the motor auto-matching test.

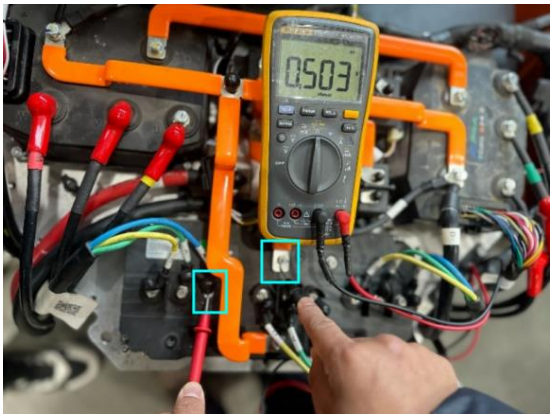
14.52 ML 23/MM 23/MR 23 Left/Middle/Right Blade Motor Controller Precharge Failed

Tool: Multimeter, Computer, Debugging wire, PCAN

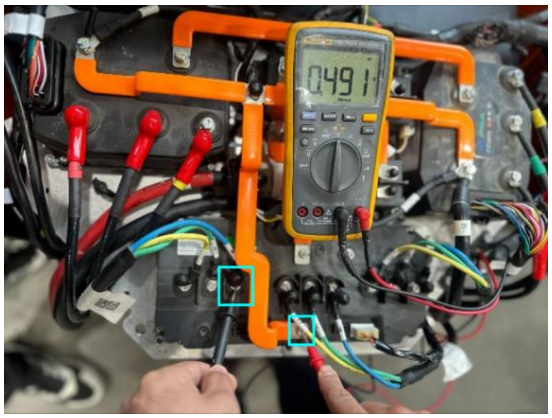


Check:

1. Display pop up ML 23/MM 23/MR 23 fault code.
2. Keep the vehicle power off state.
3. Set the Multimeter to the diode position and measure the voltage between the U \ V \ W phase and the positive electrode.



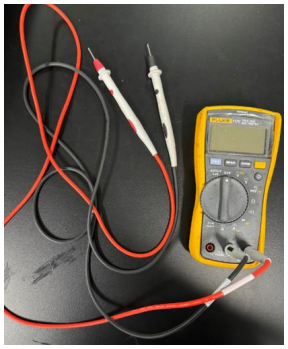

4. Set the Multimeter to the diode position and measure the voltage between the U \ V \ W phase and the negative electrode.




5. If the range is 0.45-0.52V, the MOS is normal. Otherwise, it is judged that the MOS is damaged and the controller needs to be replaced. Refer to the maintenance manual for the specific disassembly and assembly steps.
6. If you have replaced a new controller, remember to follow the self-learning steps for the motor auto-matching test.

14.53 ML 26/MM 26/MR 26 Left/Middle/Right Blade Motor Controller MOSFET Abnormal

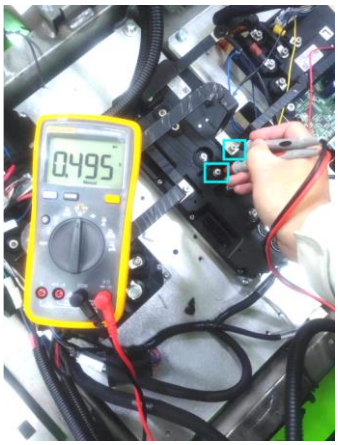
Tool: Multimeter, Computer, Debugging wire, PCAN



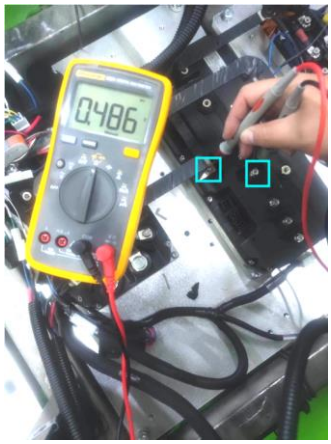
Check:

1. Display pop up ML 26/MM 26/MR 26 fault code.
2. Keep the vehicle power off state.

3. Set the Multimeter to the diode position and measure the voltage between the U \ V \ W phase and the positive electrode.



4. Set the Multimeter to the diode position and measure the voltage between the U \ V \ W phase and the negative electrode.



5. If the range is 4.7-5.0V, the MOS is normal. Otherwise, it is judged that the MOS is damaged and the controller needs to be replaced. Refer to the maintenance manual for the specific disassembly and assembly steps.
6. If you have replaced a new controller, remember to follow the self-learning steps for the motor auto-matching test.

14.54 ML 27/MM 27/MR 27 Left/Middle/Right Left Blade Motor Controller Temperature Sensor Abnormal

Tool: Computer, Debugging wire, PCAN

Check:

1. Display pop up ML 27/MM 27/MR 27 fault code.
2. Restart Vehicle.
3. If this fault code persists, please replace a new blade controller. Refer to the maintenance manual for the specific disassembly and assembly steps.
4. If you have replaced a new controller, remember to follow the self-learning steps for the motor auto-matching test.

14.55 ML 28/MM 28/MR 28 Left/Middle/Right Blade Motor Controller Self-Check Abnormal

Tool: Computer, Debugging wire, PCAN


Check:

1. Display pop up ML 28/MM 28/MR 28 fault code.
2. Restart Vehicle.
3. If this fault code persists, please replace a new blade controller. Refer to the maintenance manual for the specific disassembly and assembly steps.
4. If you have replaced a new controller, remember to follow the self-learning steps for the motor auto-matching test.

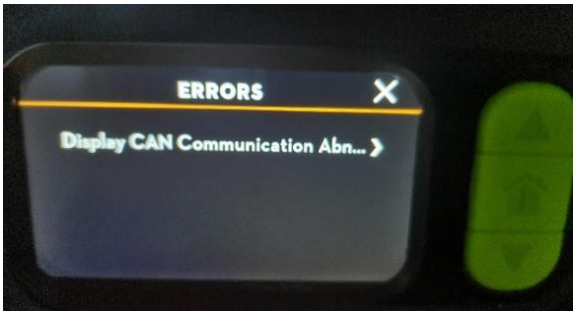
14.56 DS 11 Abnormal Display CAN Communication(First vehicle model)

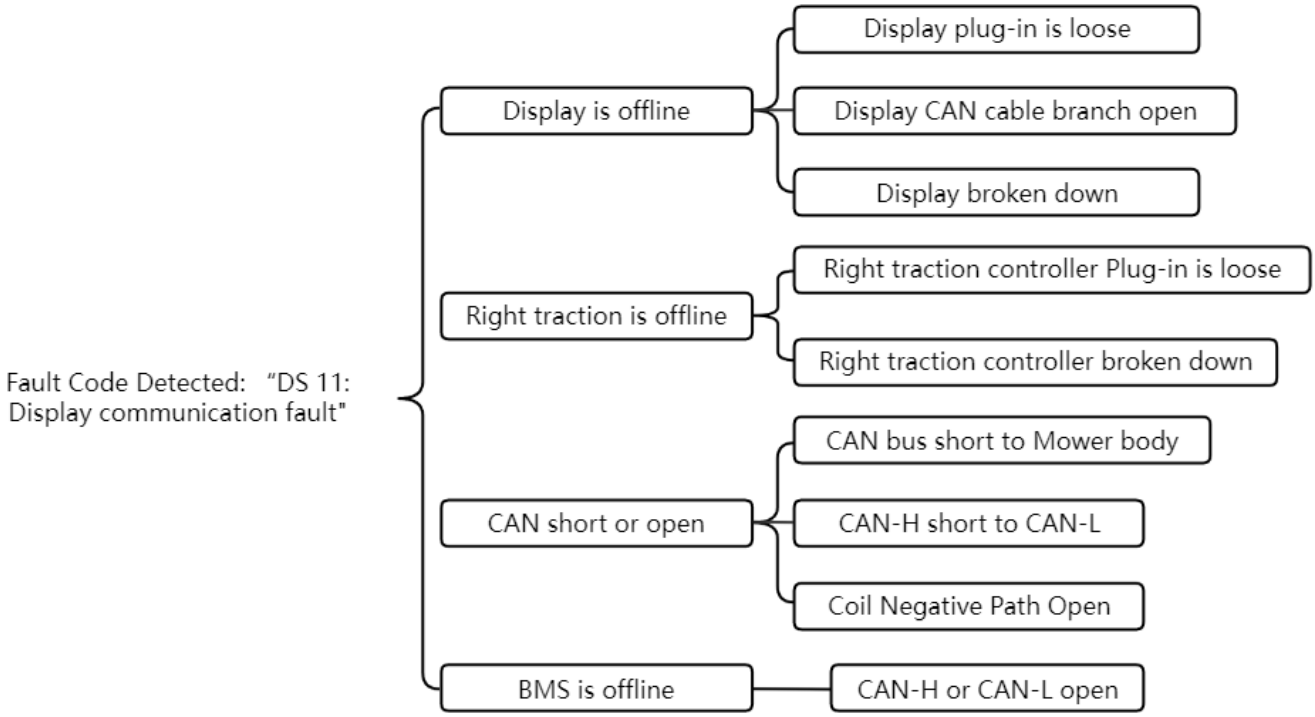
Tool: Multimeter, Computer, Debugging wire, PCAN



Possible Cause：

This error means display lose communication with right traction controller. there are seven main possibilities could cause this error code.

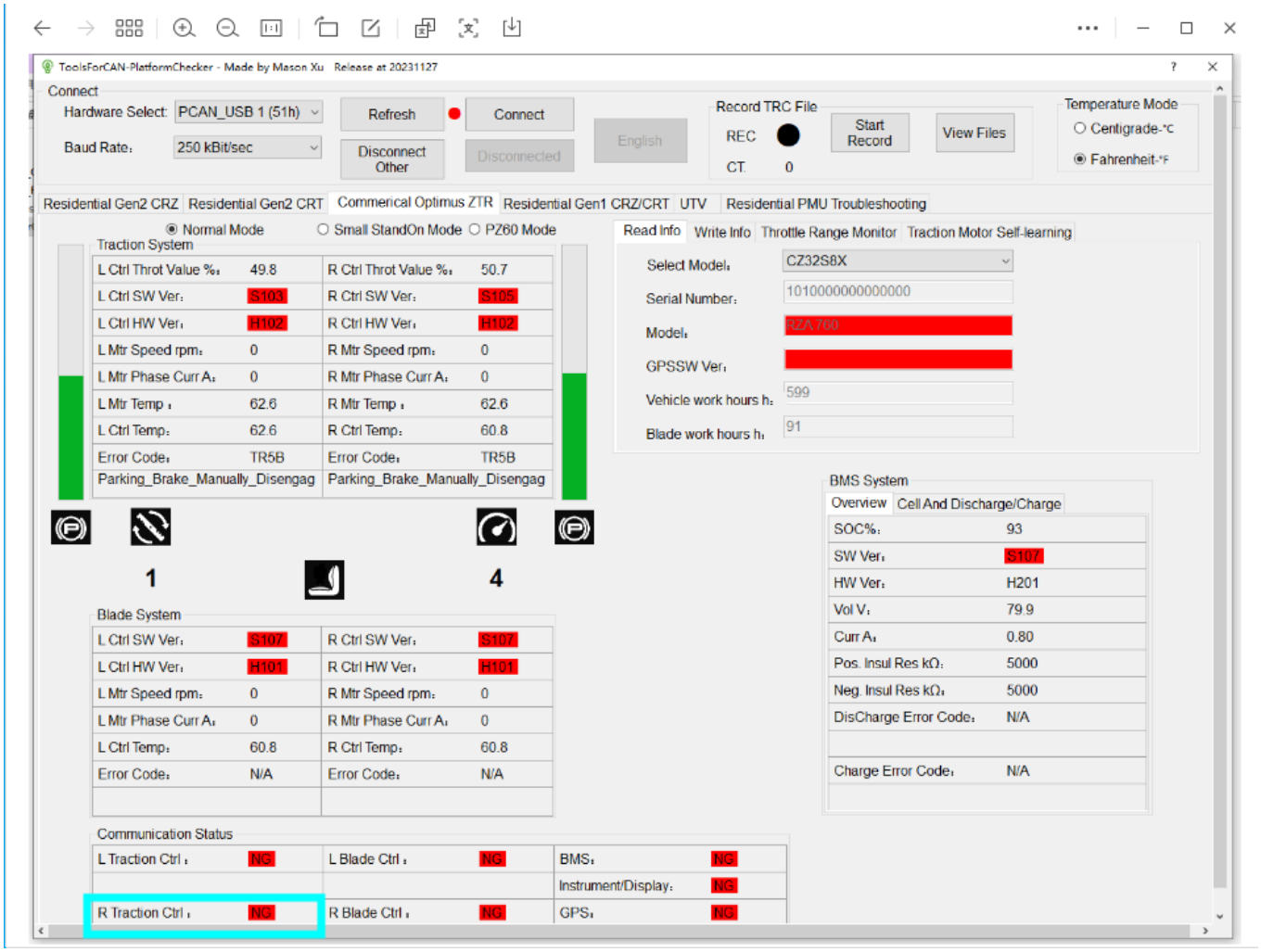




Solution：

1. ToolsForCAN Communication Check.

1) Connect to the vehicle using P-CAN tool and open software (Tools For CAN-Platform Checker) .
2) Query what components are online or offline (OK-online, NG-offline).



If a component is offline, then we can tell the error exist in that component, refer to following steps to inspect and repair. If all components are offline then we have a whole system communication issue.

2. Display is offline check.
1) Try to normally operate the mower and see if it can move forward or backward normally. If mower can move forward or backward normally, refer to following steps to fix:

2) Check whether the display plug-in is loose. Check if display plug-in CAN-H and CAN-L has pin withdrawing. Check whether there is trash causing poor contact of the plug-in.

3) Use the multimeter to check whether display plug-in CAN-H and CAN-L is well connected. If not, need to replace main wire harness of whole machine. If yes, need to replace display. (refer to service manual for details).

3. Right controller is offline check.
1) Observe main controller indicator light for 20 seconds, If light flashes, then we can tell power supply of the main control is normal→Check whether main controller plug-in is loose. Check if main controller plug-in CAN-H and CAN-L has pin withdrawing. Check whether there is trash causing poor contact of the plug-in.

If main controller plug-in is normal, use multimeter to check whether CAN-H and CAN-L of display and main controller plug-in is well connected. Check whether there is a circuit break. If it not, replace the entire main wire If light does not flash, then we can tell power supply of the main controller is abnormal. Refer to following steps to inspect and repair:

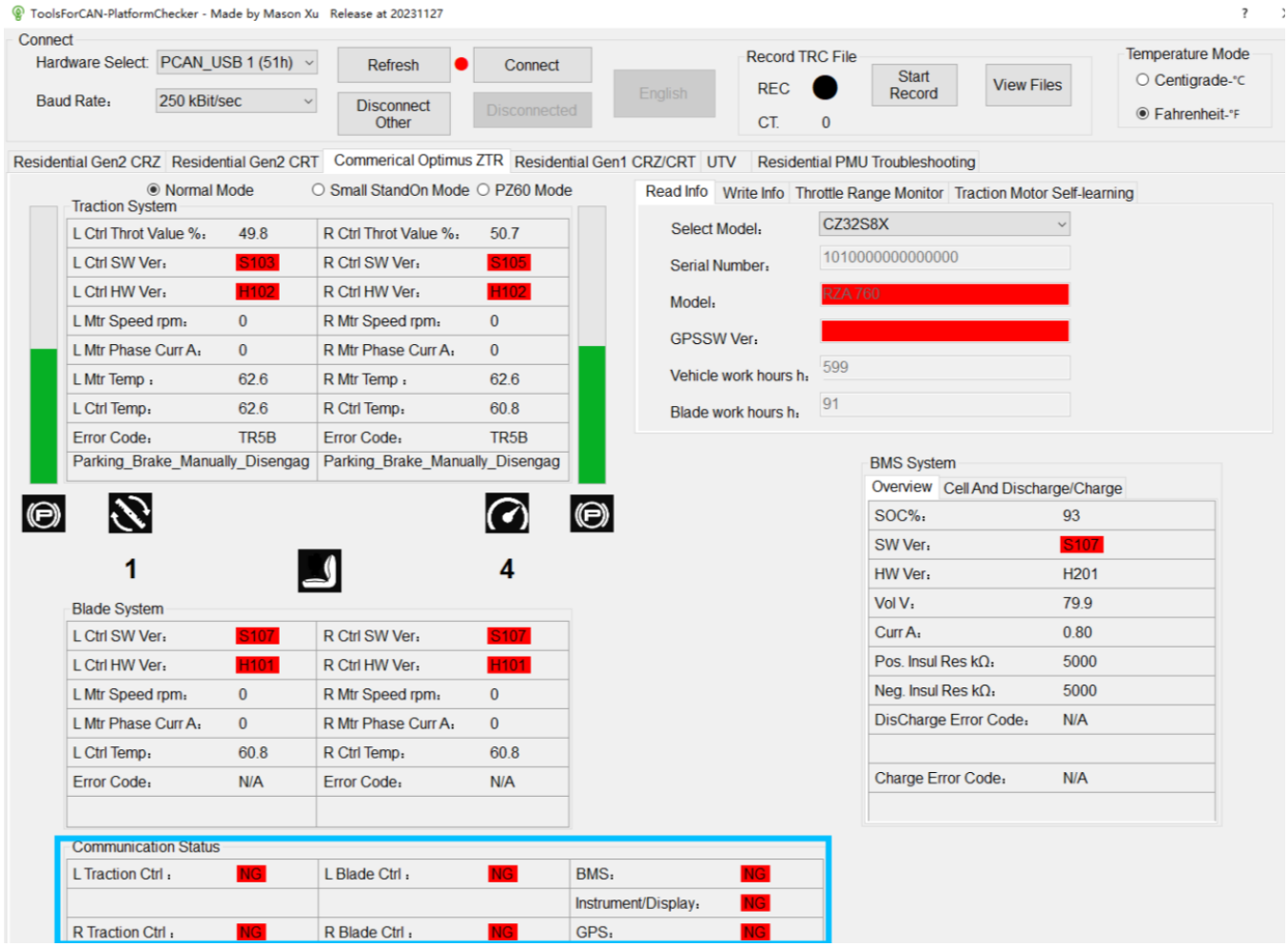
2) Use a wrench to confirm that three bolts circled in blue below are fastened.

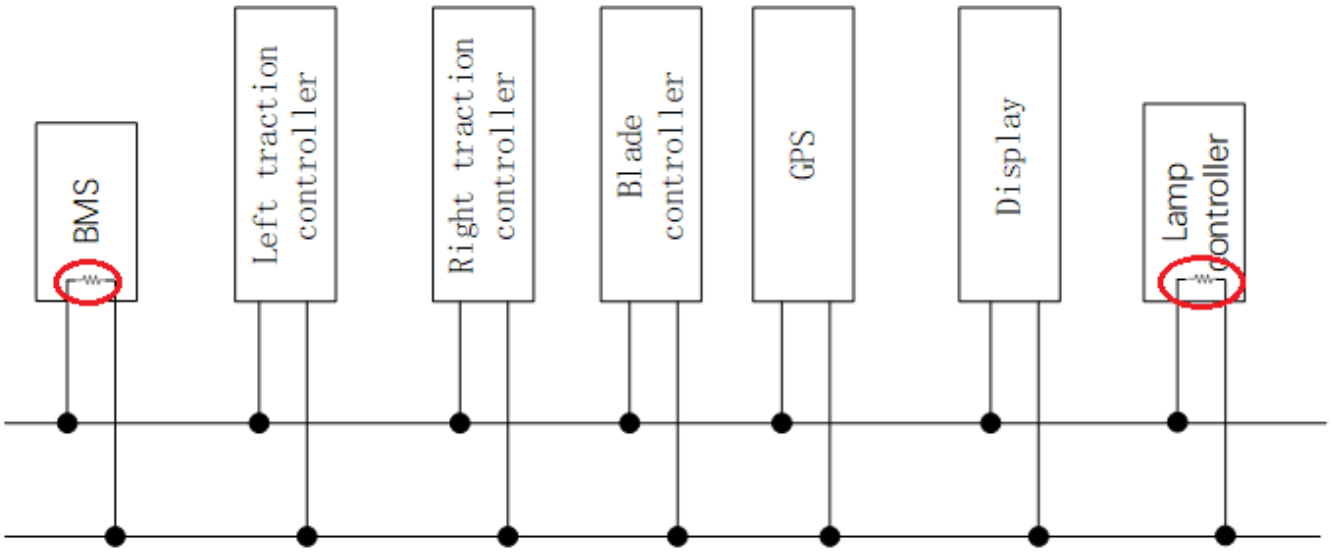
3) Then use DC voltage range of multimeter to detect whether the ground voltage in these three places is above 70V.

If detected voltage at point (1) is under 70V, please overhaul battery pack power supply. (There is issue for the battery high voltage supply). If detected voltage at point (1) is above 70V, while that at point (2) is under 70V, please replace 400A fuse between bolt (1) and (2).

If detected ground voltage at point (1), (2), (3) ,(4)all above 70V, while that at point (5) is under 70V, refer to following steps to inspect and repair: Firstly, check whether the fuse at point (6) is loose, as circled below; If fuse at point (6) is fastened, use multimeter current on/off gear to inspect whether the fused is damaged. Replace if the 20A fuse is damaged; If the fuse is well, please replace main controller wire harness , If detected ground voltage at point (1), (2), (3), (4), (5) all above 70V, check whether pin4 is loose. If pin4 is normal, the right controller broken down.

4) Open software Tools For CAN-Platform Checker ToolsForCAN-PlatformChecker If all components show “NG→offline”, then we most likely have a short circuit between CAN-H and CAN-L.





OPTIMUS Z CANBUS NETWORK TOPOLOGY

NOTE: there are two terminal resistances (each of them is 120Ω), one is in BMS, the other one is in lamp controller.

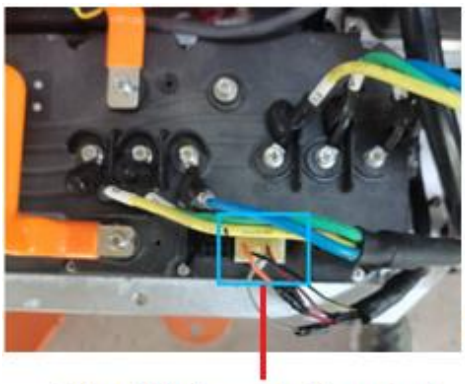
4. CAN bus short or open check.

Always hold multimeter to test the resistance between CAN-H and CAN-L of debugging port, unplug all plug-ins with CAN communication in turn, when you unplug one device such left side light, the resistance turn from around 1.5Ω to around 60 Ω .as so to locate whether it's short circuit between main control wire harness CAN-H & CAN-L, or it's short circuit between certain part's CAN-H & CAN-L.

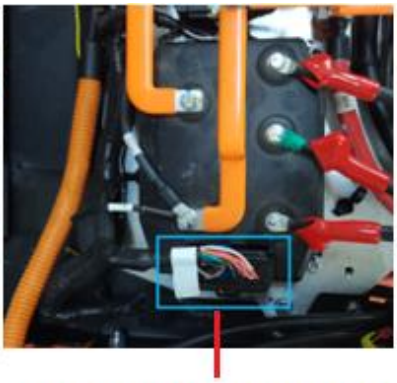
Left side light plug-in

Display plug-in

GPS plug-in

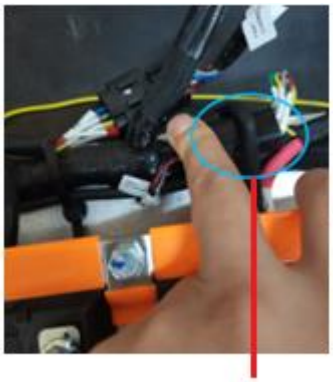


3-in-1 blade controller plug-in



Right drive controller plug-in

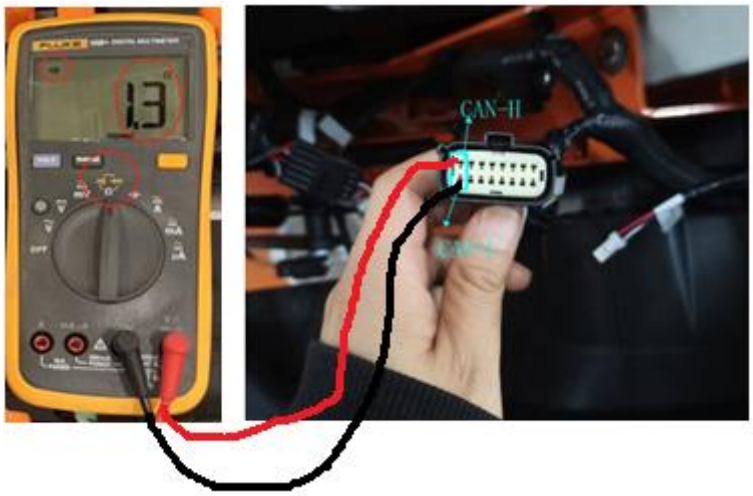
Front ETO plug-in



Rear ETO plug-in

BMS plug-in

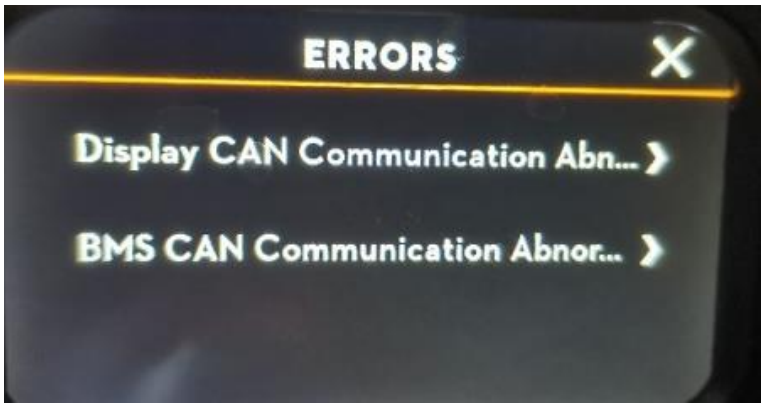
1) Keep the multimeter to test the resistance value between CAN-H and CAN-L. then we need to unplug the device connector one by one at the same time, we need to observe the resistance value.
2) When we first unplug the BMS connector (there is a 120 Ω terminal resistance inside), if the measure resistance turn from around1.5 Ω to 120 Ω. the BMS cause the short. When Step2: the measure resistance is about 1.5 Ω, the short still exists.

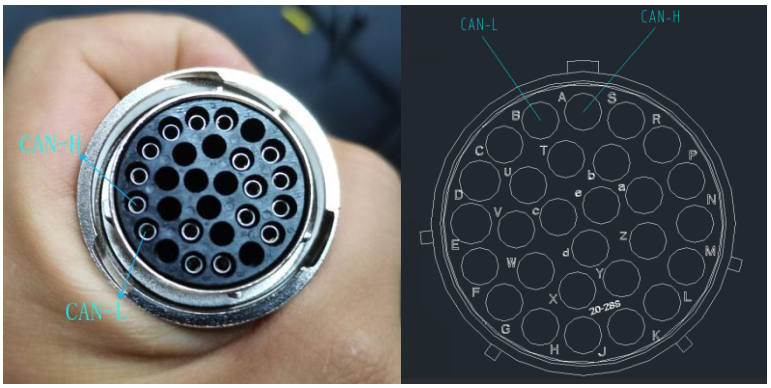


3) unplug the front lamp plug (lamp controller inside with a 120 Ω terminal resistance), if the measure resistance turn from around1.5 Ω to10k Ω 50k Ω. The BMS cause the short. When the measure resistance is about 1.5 Ω, the short is still exist.
4) unplug the device connectors one by one, if the measure resistance turn from around1.5 Ω to k Ω. the device you just unplug cause the short. When the measure resistance is about 1.5 Ω, it means the short is still exist. So the harness cause the short between CAN_H and CAN_L.

5. BMS is offline check

1) Check whether BMS plug-in is loose. Check if BMS plug-in CAN-H and CAN-L has pin withdrawing. Check whether there is trash causing poor contact of the plug-in.

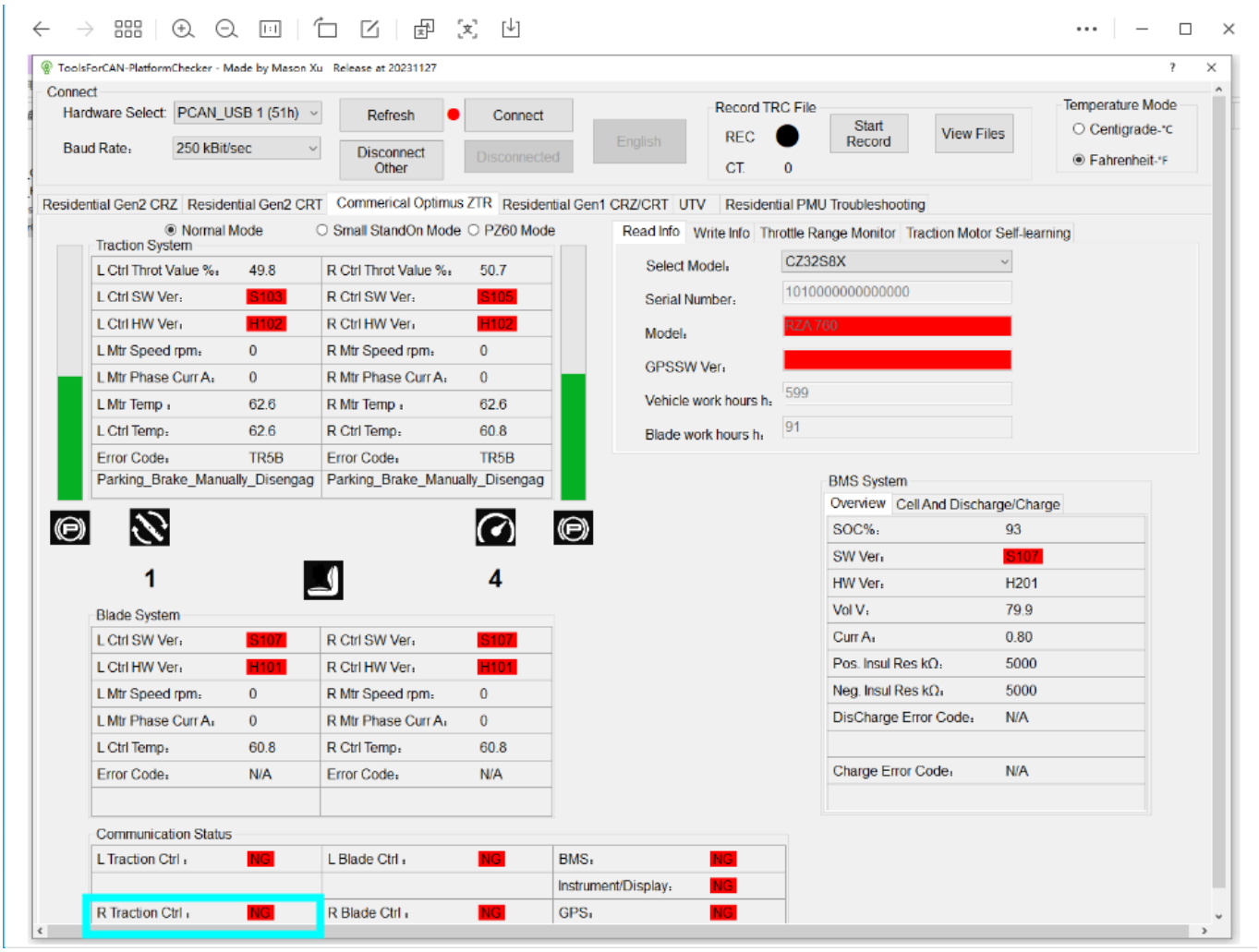




2) Use the multimeter to check whether CAN-H and CAN-L of display plug-in and BMS plug is not open. Resistance should measure around 1.3 Ω. If very large value found, then open is detected and wiring harness will need to be replaced.

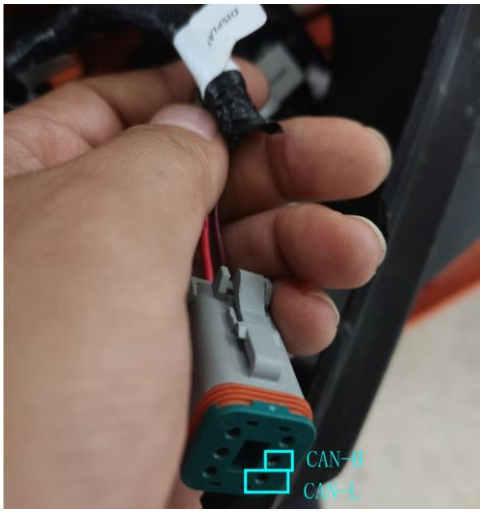
14.57 DS 12 Right Wheel Controller CAN Communication Abnormal

1. If the vehicle cannot move forward or backward normally. ToolsForCAN-PlatformChecker Use P-CAN, open the software, and check whether the main controller is online (displaying "OK" means online; displaying "NG" means not online). If it is not online, it can be determined that the main controller is partially faulty.

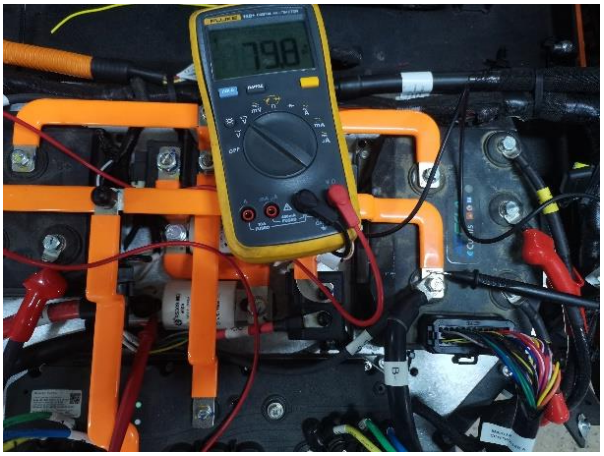
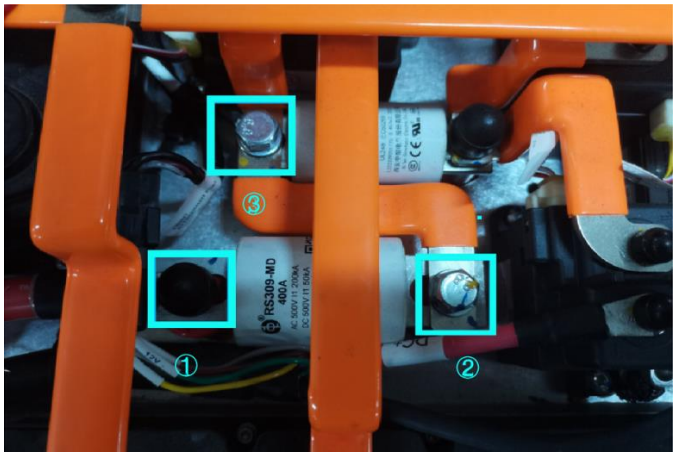


2. Observe the main control indicator light for 20S seconds to see if the indicator light flashes. If the main controller indicator light flashes, it means that the main control power supply is normal. Check whether the main controller plug-in is loose, and check whether the CAN-H and CAN-L pins of the main control plug-in are withdrawn. Is there any garbage on the surface of the plug-in, causing poor plug-in contact.


3. If the main control plug-in is normal, use a multimeter to check whether CAN-H and CAN-L of the instrument plug-in and the main control plug-in are connected and whether there is an open circuit. If there is no continuity, replace the vehicle's main wiring harness.

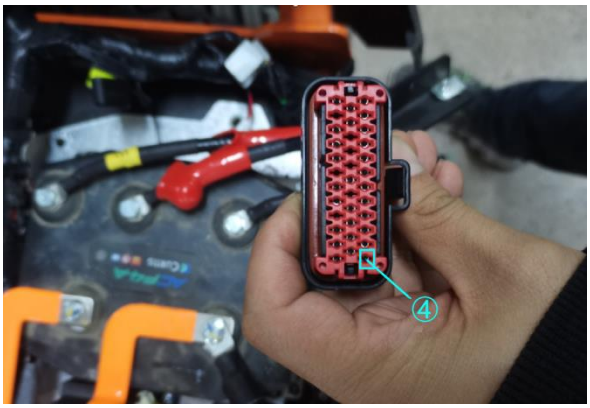


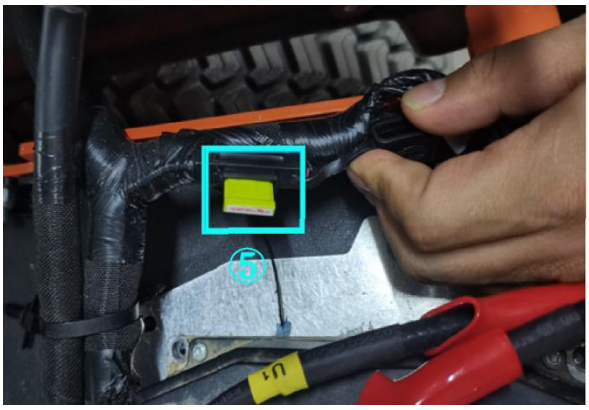
4. If the indicator light of the main controller does not flash, it means that the power supply of the main controller is not normal. First use a wrench to confirm that the three bolts ①, ② and ③ are tightened and there is no sign of looseness. If the bolts are tight, use the DC voltage range of the multimeter to check whether the voltage to ground at ①, ② and ③ is greater than 70V.

5. If the voltage at point ① is less than 70V, the power supply of the battery pack needs to be inspected.

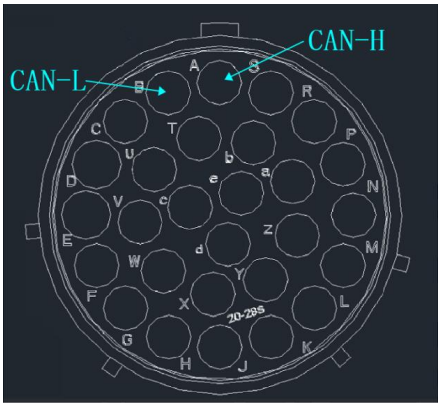
6. If the voltage at ① is greater than 70V and the voltage at ② is less than 70V, the 400A fuse between bolts ①and ② needs to be replaced.
7. If the voltage at ①, ② and ③) is greater than 70V and the voltage at ④ is less than 70V,First check whether the ⑤-20A fuse is loose. If it is normal, use a multimeter to check whether the 20A fuse is damaged; if it is damaged, replace the 20A fuse. If ⑤-20A fuse is normal, replace the main control harness.



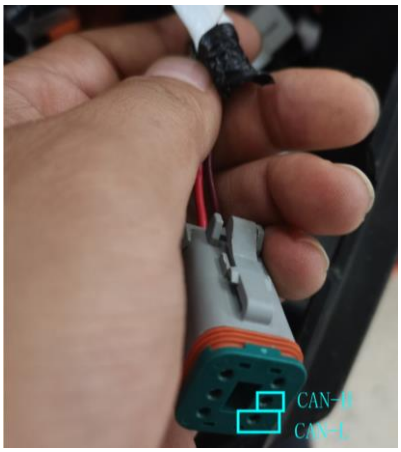


14.58 DS 13 BMS CAN Communication Abnormal

1. Check whether the BMS plug-in is loose, check whether the BMS plug-in CAN-H and CAN-L pins are withdrawn, and whether there is garbage on the surface of the BMS plug-in, causing poor plug-in contact.



2. If there is no problem with the battery pack plug-in, use a multimeter to check whether the CAN-H and CAN-L of the instrument plug-in and the battery pack plug-in are connected. If there is no continuity, replace the vehicle's main wiring harness.



14.59 BC 11 Input Power Undervoltage

Check:

1. Display pop up BC 11 fault code.
2. Restart charge.
3. Check whether the grid voltage is abnormal.

14.60 BC 12 Input Power Overvoltage

Check:

1. Display pop up BC 12 fault code.
2. Restart charge.
3. Check whether the grid voltage is abnormal.

14.61 BC 13 Output Undervoltage

Check:

1. Display pop up BC 13 fault code.
2. Restart charge.
3. Check whether the load voltage is abnormal.

14.62 BC 14 Output Overvoltage

Check:

1. Display pop up BC 14 fault code.
2. Restart charge.
3. Check whether the load voltage is abnormal.

14.63 BC 15 Output Overcurrent

Check:

1. Display pop up BC 15 fault code.
2. Restart charge.
3. Check whether the charging loop current is abnormal and whether there is an output short circuit phenomenon.

14.64 BC 16 Charger Overtemp

Check:

1. Display pop up BC 16 fault code.
2. When the internal temperature dropped to 69℃ (156 ℉), the charger automatically resumed charging.
3. Charger performance reduced while temperature is high. Once temperature is within standard range fault will automatically clear and normal charging operation will resume.

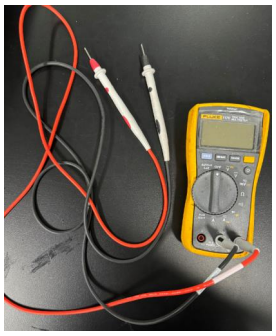
14.65 BC 17 Output Short Circuit

Check:

1. Display pop up BC 17 fault code.
2. Please discontinue charging. Ensure use of a known good charger. If this does not correct the fault, contact after-3.sales service.

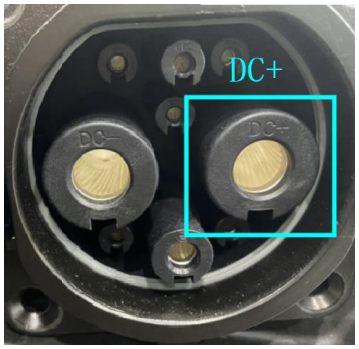
14.66 BC18 Battery Output Polarity Reversal

Tool: Multimeter

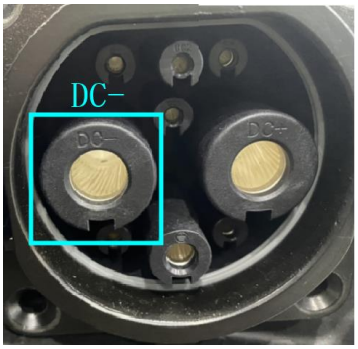


Check:

1. Display pop up BC 18 fault code.
2. Check whether the positive and negative electrodes of the charging socket correspond to the positive and negative electrodes connected to the battery pack.
3. Select the multimeter, remove the C + connector from the battery pack, and measure whether the C + connector and the positive electrode of the charging socket DC + are turned on.



4. Select the multimeter, remove the C-connector from the battery pack, and measure whether the C-connector and the charging socket negative electrode DC-go on.



14.67 BC 19 No Battery Output Voltage

Check:

1. Display pop up BC 19 fault code.
2. Restart the charger, and reinsert charger plug.
3. Check for any debris that may be in charging port or plug and clear if present. If these actions for not correct the fault, discontinue use of the vehicle and contact after-sales service.

14.68 BC 21 Non-Load

Check:

1. Display pop up BC 21 fault code.
2. Restart the charger, and reinsert charger plug.
3. Check for any debris that may be in charging port or plug and clear if present. If these actions for not correct the fault, discontinue use of the vehicle and contact after-sales service.

14.69 BMS 11 Battery Discharging Slight Overtemp

Check:

1. Display pop up BMS 11 fault code.
2. Vehicle has been put into a state of reduced performace while cooling. Once temperature is back within standard range, the fault will automatically clear and normal operation will resume.

14.70 BMS 12 Battery Discharging Severe Overtemp

Check:

1. Display pop up BMS 12 fault code.
2. Power off.
3. Waiting 30 min.
4. Restart the vehicle.

14.71 BMS 13 Battery Discharging Slight Undertemp

Check:

1. Display pop up BMS 13 fault code.
2. Vehicle has been put into a state of reduced performace while cooling. Once temperature is back within standard range, the fault will automatically clear and normal operation will resume.

14.72 BMS 14 Battery Discharging Severe Undertemp

Check:

1. Display pop up BMS 14 fault code.
2. Power on.
3. Waiting 30 min.

4. Restart the vehicle.

14.73 BMS 15 Battery Cells Slight Temperature Difference

1. Display pop up BMS 15 fault code.
2. Vehicle has been put into a state of reduced performace while cell temperatures return to normal. Once temperature is back within standard range, the fault will automatically clear and normal operation will resume.

14.74 BMS 16 Battery Cells Severe Temperature Difference

Check:

1. Display pop up BMS 16 fault code.
2. Power off.
3. Waiting 6 hours.
4. Restart the vehicle.

14.75 BMS 17 Battery Cells Slight Overvoltage

Check:

1. Display pop up BMS 17 fault code.
2. Stop charging.
3. Normal driving.

14.76 BMS 18 Battery Cells Severe Overvoltage

Check:

1. Display pop up BMS 18 fault code.
2. Stop charging.
3. Restart the vehicle.
4. Normal driving.

14.77 BMS 19 Battery Cells Slight Undervoltage

Check:

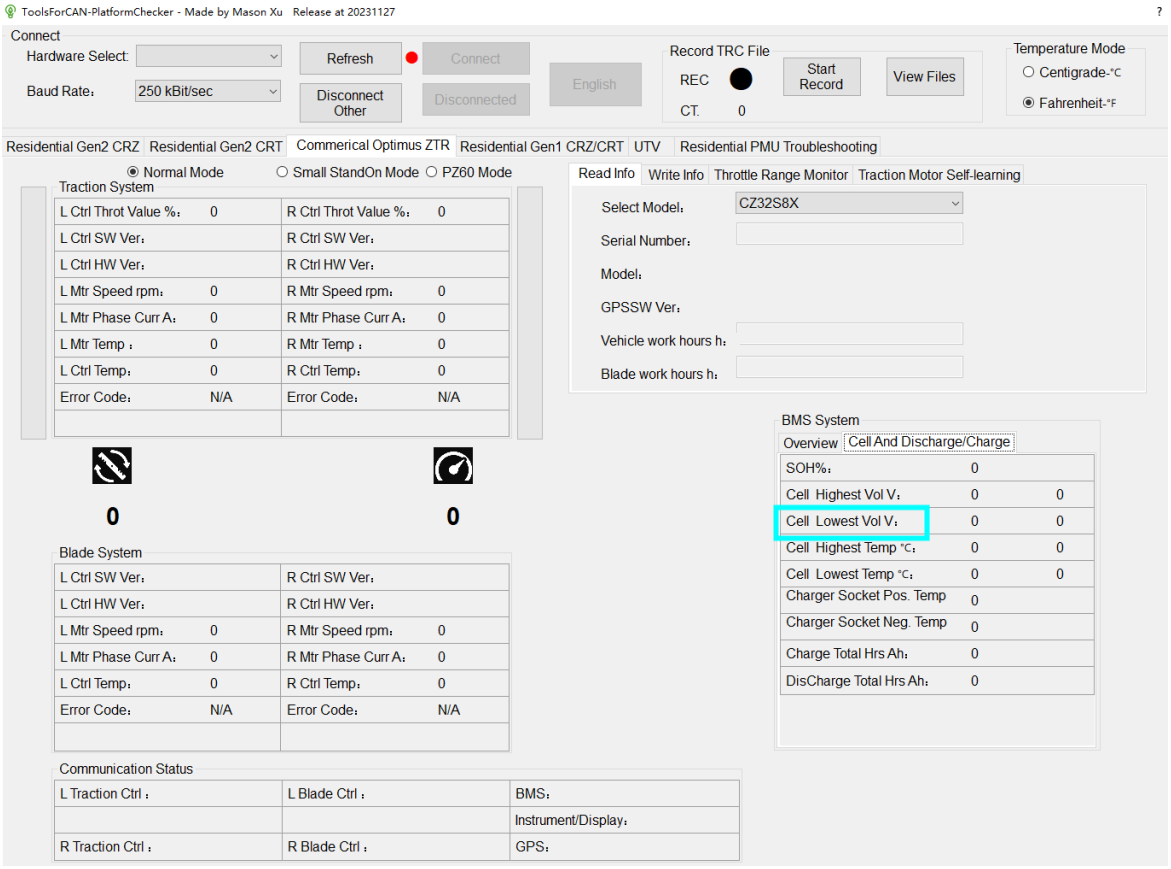
1. Display pop up BMS 19 fault code.
2. Reduce load.
3. Charging.

14.78 BMS 21 Battery Cells Severe Undervoltage

Tool: Computer, Debugging wire, PCAN , Charger

Check:

1. Display pop up BMS 21 fault code.
2. Connect to host computer View computer interface.



3. If cell lowest voltage＜1.8V，Replace the battery pack.
4. If Battery Cells Voltage Difference less than1.5V, Update BMS maintenance program, if Start Charging, Minimum cell voltage is charged to 3V or maximum cell voltage to 3.6V cutoff. Update normal program.
5. If Battery Cells Voltage Difference less than 600mv, charge normally to 100%SOC. Battery Cells Voltage Difference greater than 600mv, Replace the battery pack.
6. If Battery Cells Voltage Difference greater than1.5V, Replace the battery pack.

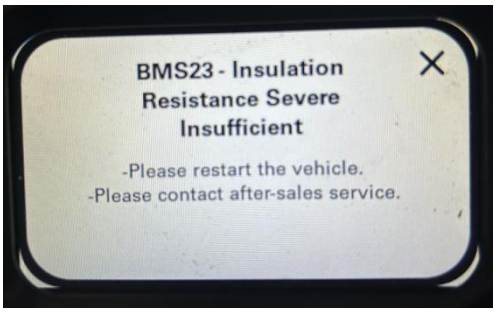
7. 2V＜cell lowest voltage＜2.5V, Shielded battery voltage difference fault, normal charge.
8. 2.5V＜cell lowest voltage, Battery Cells Voltage Difference greater than 600mv, Replace the battery pack.

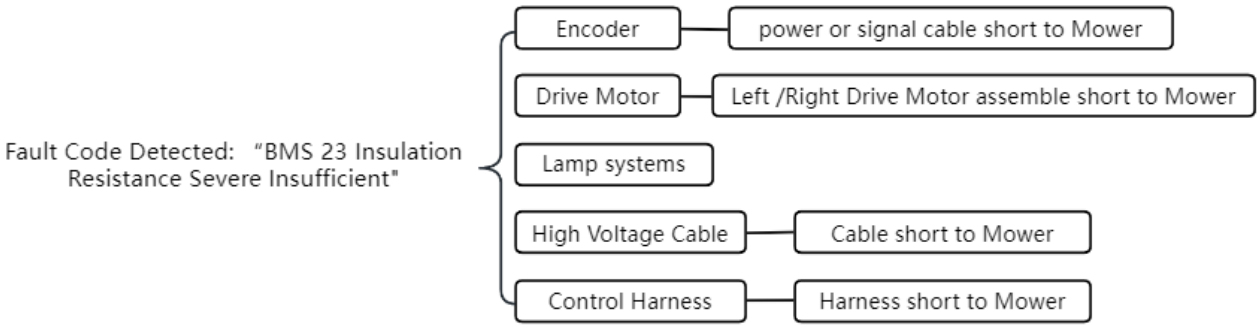
14.79 BMS 23 Insulation Resistance Severe Insufficient

Tool: insulation resistance meter

Possible Cause：

This error occurs when the vehicles BMS system has detected a severe insulation error.





Solution：

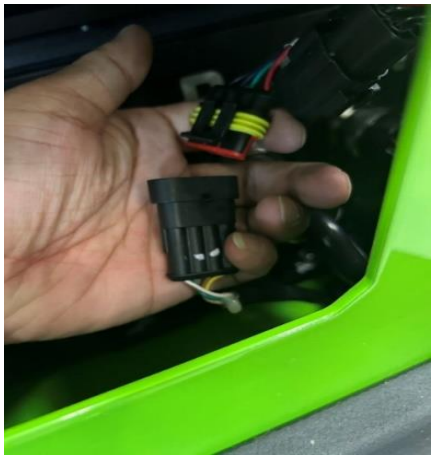
1. Encoder check

When BMS 23 error appears, we need to check whether left encoder or right encoder cause the BMS23 error.

(This is essential if the encoder rework has not been completed on the unit.)

1) First power off the Mower.
2) Then disconnect then left encoder.
3) Finally, power on the machine. If the error code disappears, then the left encoder is causing BMS 23. If the BMS 23 error is still present, plug in the left encoder and then repeat the above 3 steps for the right encoder. If

the error disappears, it is the right encoder. If still present repeat the above 3 steps with both encoders disconnected. If BMS 23 disappears, both encoders are at error.



2. Traction motor check

Now we will measure if the right or left motor is causing BMS23.

1) Disconnect all 3 motor leads.
2) Measure any motor lead to chassis ground. We should measure OL or a resistance in the Mega ohms. If we see a value lower like to the right, we are measuring a short to ground.

3. Lamp check

Measure whether the lamps (different Mower have different lamps, but the method remains the same) is causing the BMS23 error.

1) When there is a BMS23 error code, first switch off the unit.
2) Keep one of the lamp connector unconnected.

3) Switch on the unit, if the BMS23 is disappeared, it means the lamp you just unplug cause the error.
4) If the error still exists, then move to the next lamp and repeat the previous 3 steps.

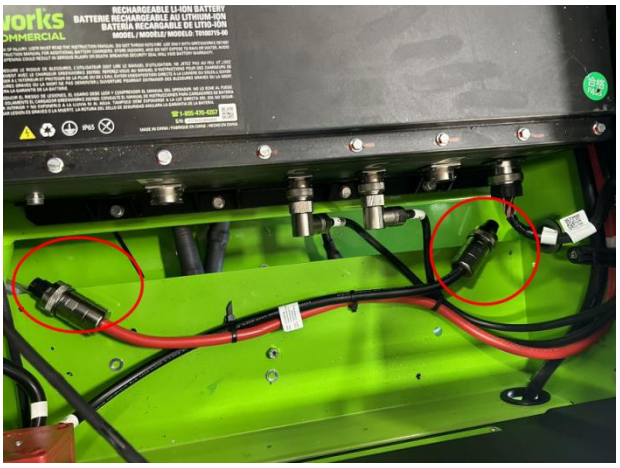
If the error disappears during this process, then the last lamp unplugged is at error. If all lamps have been unplugged and error is still present the lamps are not the cause of the error.

NOTE: Every time before you unplug the lamp connector, you need to first power cycle the unit.

4. High voltage cable check

Battery Positive and Negative Cable Check.

1) Disconnect both ends of the high voltage battery cable. (Disconnect at the battery, and at the control board)



2) Now measure the resistance of each cable to chassis ground. If the measured value is OL or in theMega ohms then no ground short found. If the value is below this then a ground short has been found.

If the measured value is OL or in the Mega ohms then no ground short found. If the value is below this then a ground short has been found.

5. Battery system check

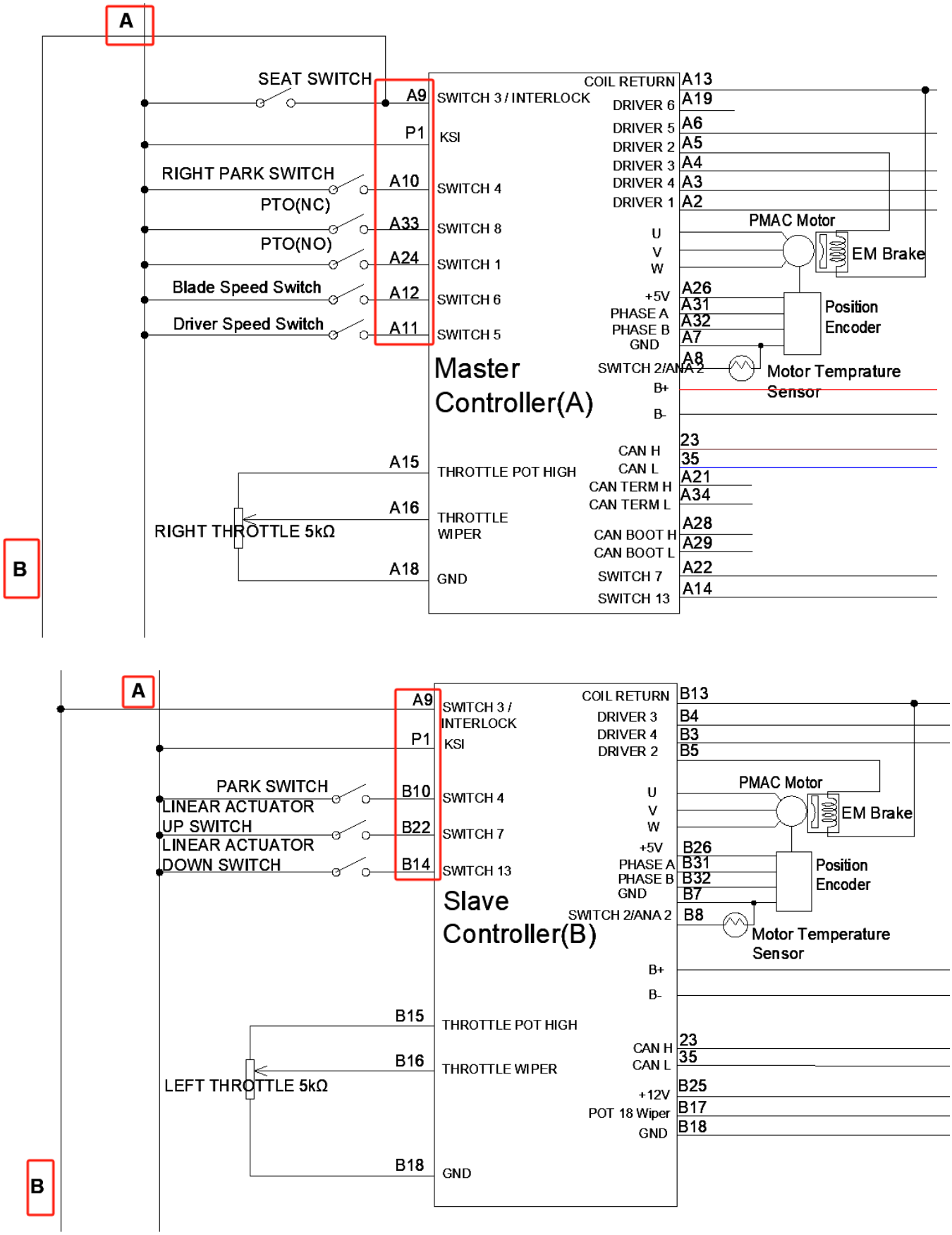
Battery positive and battery negative cable check If battery positive and battery negative cable is OK.

1) Plug the Battery Positive and Negative connector into battery.

2) With the cables connected at the battery measure the resistance. From the other end of each battery cable to chassis ground. If the measured value is OL or in the Mega ohms then no ground short found. If the value is below this then a ground short has been found.

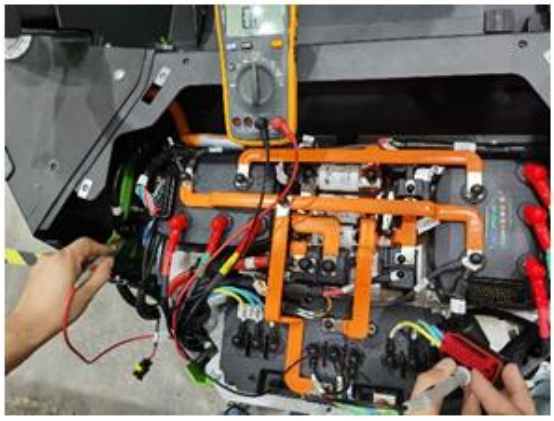
6. Control Harness check

If high voltage cable short to chassis ground, BMS23 will occur. As you see in the following drawings, the red line A, B lines are all High voltage(80V), when these cables short to Ground, BMS23 occurs.


A
SEAT SWITCH
A9
SWITCH 3 / INTERLOCK
P1
KSI
RIGHT PARK SWITCH
A10
SWITCH 4
PTO(NC)
A33
SWITCH 8
PTO(NO)
A24
SWITCH 1
Blade Speed Switch
A12
SWITCH 6
Driver Speed Switch
A11
SWITCH 5
Master Controller(A)
COIL RETURN
A13
DRIVER 6
A19
DRIVER 5
A6
DRIVER 2
A5
DRIVER 3
A4
DRIVER 4
A3
DRIVER 1
A2
PMAC Motor
U
V
W
EM Brake
+5V
A26
PHASE A
A31
PHASE B
A32
GND
A7
Position Encoder
SWITCH 2/ANA 2
A8
Motor Temprature Sensor
B+
B-
CAN H
23
CAN L
35
CAN TERM H
A21
CAN TERM L
A34
CAN BOOT H
A28
CAN BOOT L
A29
SWITCH 7
A22
SWITCH 13
A14
A15
THROTTLE POT HIGH
A16
THROTTLE WIPER
RIGHT THROTTLE 5kΩ
A18
GND
B

A
A9
SWITCH 3 / INTERLOCK
P1
KSI
PARK SWITCH
B10
SWITCH 4
LINEAR ACTUATOR UP SWITCH
B22
SWITCH 7
LINEAR ACTUATOR DOWN SWITCH
B14
SWITCH 13
Slave Controller(B)
COIL RETURN
B13
DRIVER 3
B4
DRIVER 4
B3
DRIVER 2
B5
PMAC Motor
U
V
W
EM Brake
+5V
B26
PHASE A
B31
PHASE B
B32
GND
B7
Position Encoder
SWITCH 2/ANA 2
B8
Motor Temperature Sensor
B+
B-
B15
THROTTLE POT HIGH
CAN H
23
B16
THROTTLE WIPER
CAN L
35
LEFT THROTTLE 5kΩ
+12V
B25
POT 18 Wiper
B17
GND
B18
B18
GND
B

1) Mower switch off.
2) Unplug right and left traction controller connector.
3) Right control lever and left control lever release to park. push the PTO switch (A24 is a normally close switch).
4) Measure the resistance value between pin A10 and Mower ground.



5) Measure the A11, A12(B12), A33 by the same way.

Using previous method, measure A24、A33 、 A11 、 A12.

1) Keep unit powered off.
2) Pull PTO switch (A24 is a normally open switch).
3) Put right control lever and left control lever to park.
4) Measure the resistance value between pin A24 and Mower ground. If the measured value is OL or in the Mega ohms, then no ground short found. If the value is below this then a ground short has been found, and the control harness will need replacing.

According to the above measuring method, measure P1.

1) Keep unit powered off.
2) Directly measure the resistance value between P1 and chassis ground.

If the measured value is OL or in the Mega ohms then no ground short found.

If the value is below this then a ground short has been found and the control harness will need replacing

14.80 BMS 24 Battery Discharge Slight Overcurrent

Check:

1. Display pop up BMS 24 fault code.
2. Reduce load.

14.81 BMS 25 Battery Discharge Severe Overcurrent

Check:

1. Display pop up BMS 25 fault code.
2. Reduce load.
3. Restart the vehicle.

14.82 BMS 26 Battery Cells Voltage Slight Difference

Check:

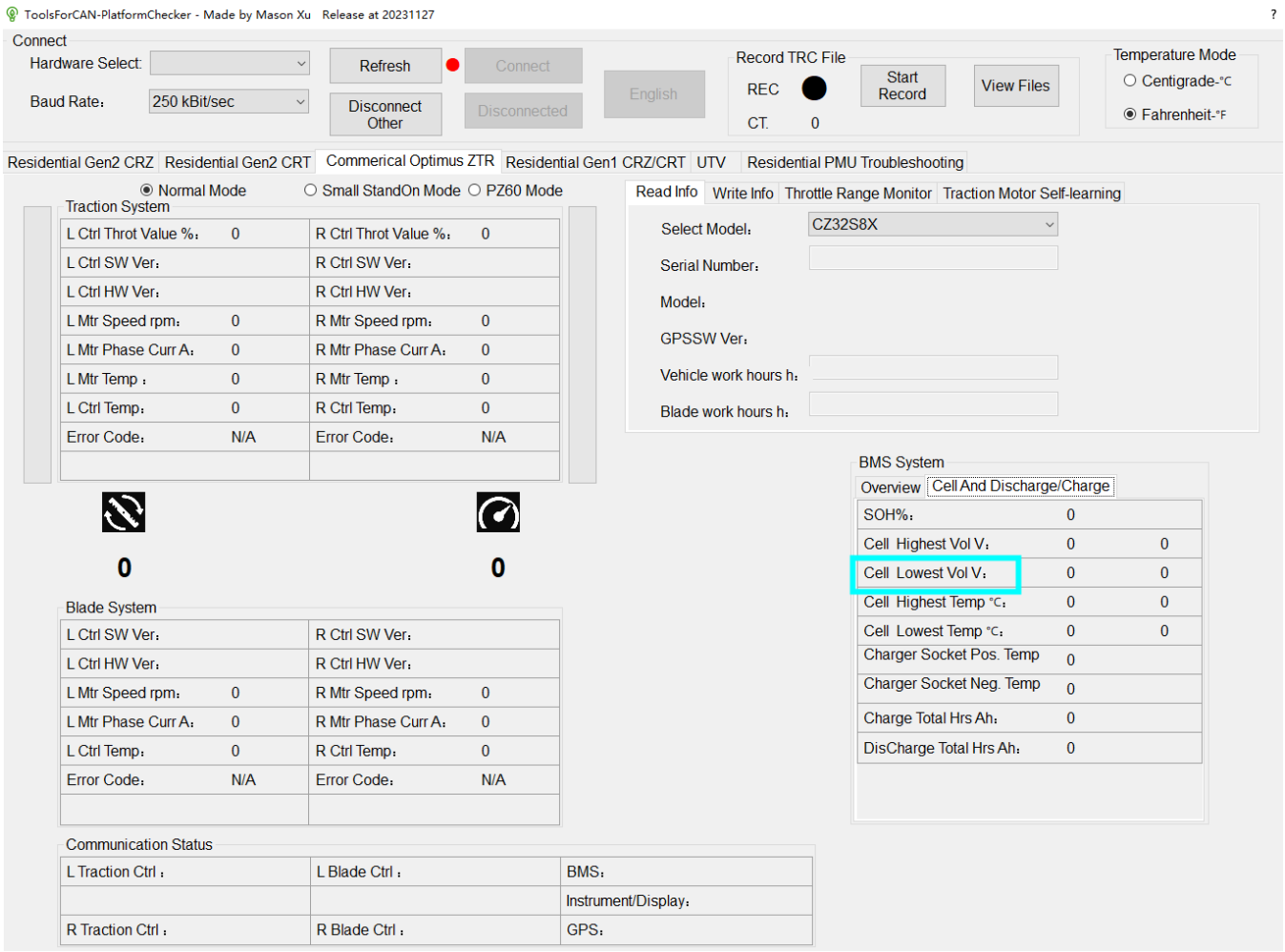
1. Display pop up BMS 26 fault code.
2. Reduce load.
3. Charging.

14.83 BMS 27 Battery Cells Voltage Severe Difference

Tool: Computer, Debugging wire, PCAN, Charger

Check:

1. Display pop up BMS 27 fault code.
2. Connect to host computer View computer interface.



3. If cell lowest voltage＜1.8V，Replace the battery pack.

4. If Battery Cells Voltage Difference less than1.5V, Update BMS maintenance program, Start Charging, Minimum cell voltage is charged to 3V cutoff. Update normal program, Battery Cells Voltage Difference less than 600mv, charge normally to 100%SOC. Battery Cells Voltage Difference greater than 600mv, Replace the battery pack.
5. If Battery Cells Voltage Difference greater than1.5V, Replace the battery pack.
6. If 2V＜cell lowest voltage＜2.5V, Shielded battery voltage difference fault, normal charge.
7. If 2.5V＜cell lowest voltage, Battery Cells Voltage Difference greater than 600mv, Replace the battery pack.

14.84 BMS 28 Battery Slight Overvoltage

Check:

1. Display pop up BMS 28 fault code.
2. Stop charging.
3. Normal driving.

14.85 BMS 29 Battery Severe Overvoltage

Check:

1. Display pop up BMS 29 fault code.
2. Stop charging.
3. Restart the vehicle.
4. Normal driving.

14.86 BMS 31 Battery Slight Undervoltage

Check:

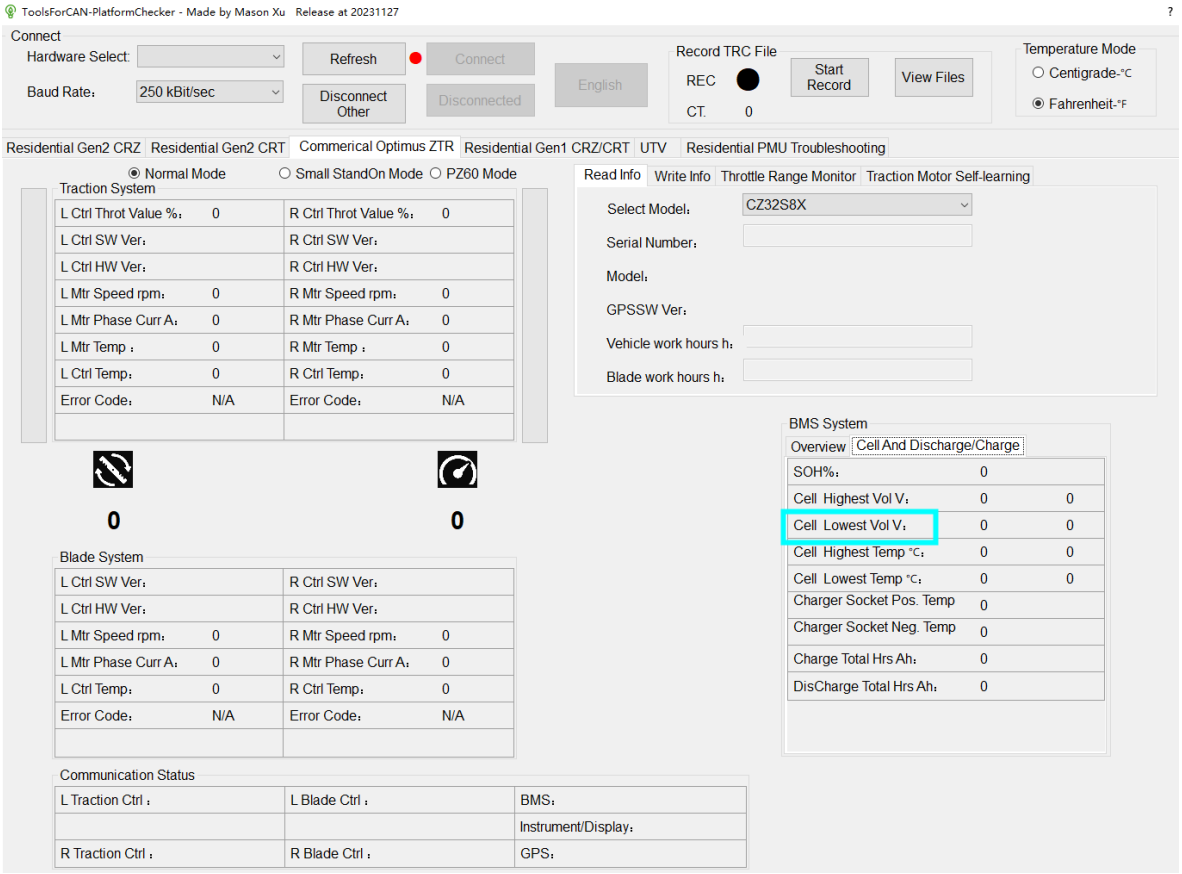
1. Display pop up BMS 31 fault code.
2. Reduce load.
3. Charging.

14.87 BMS 32 Battery Severe Undervoltage

Tool: Computer, Debugging wire, PCAN , Charger

Check:

1. Display pop up BMS 32 fault code.
2. Connect to host computer View computer interface.



3. If cell lowest voltage＜1.8V，Replace the battery pack.
4. If Battery Cells Voltage Difference less than1.5V, Update BMS maintenance program, Start Charging, Minimum cell voltage is charged to 3V cutoff. Update normal program, Battery Cells Voltage Difference less than 600mv, charge normally to 100%SOC. Battery Cells Voltage Difference greater than 600mv, Replace the battery pack.
5. If Battery Cells Voltage Difference greater than1.5V, Replace the battery pack.
6. If 2V＜cell lowest voltage＜2.5V, Shielded battery voltage difference fault, normal charge.
7. If 2.5V＜cell lowest voltage, Battery Cells Voltage Difference greater than 600mv, Replace the battery pack.

14.88 BMS 33 Battery Charging Slight Overtempt

Check:

1. Display pop up BMS 33 fault code.
2. Request half the current limit.
3. The charger output current drops by half.
4. Temperature is within standard range fault will automatically clear and normal charging operation will resume.

14.89 BMS 34 Battery Charging Severe Overtempt

Check:

1. Display pop up BMS 34 fault code.
2. Stop Charging.
3. Waiting the unit to cool down.
4. Recharge.

14.90 BMS 35 Charging Port Slight Overtemp

Check:

1. Display pop up BMS 35 fault code.
2. Request half the current limit.
3. The charger output current drops by half.
4. Temperature is within standard range fault will automatically clear and normal charging operation will resume.

14.91 BMS 36 Charging Port Severe Overtemp

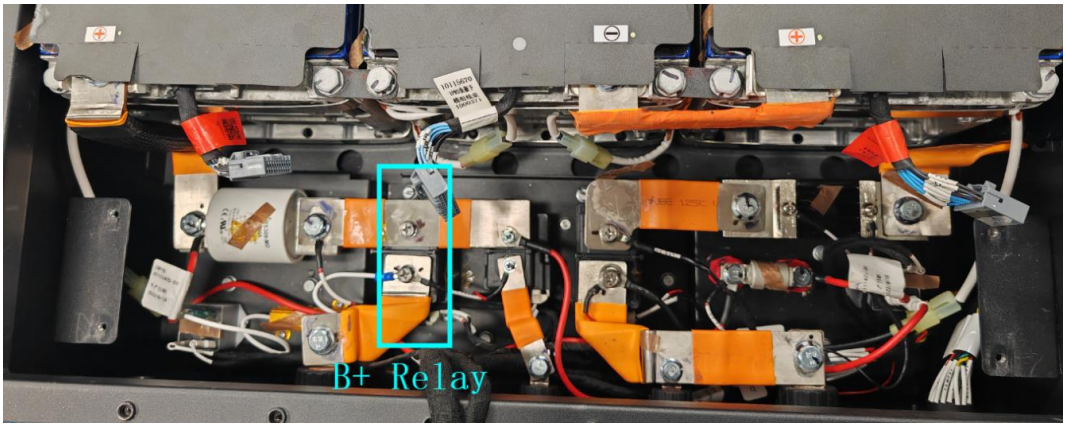
Check:

1. Display pop up BMS 36 fault code.
2. Stop Charging.
3. Waiting the unit to cool down.
4. Recharge.

14.92 BMS 37 Discharging B+ Contactor Welded

Check:

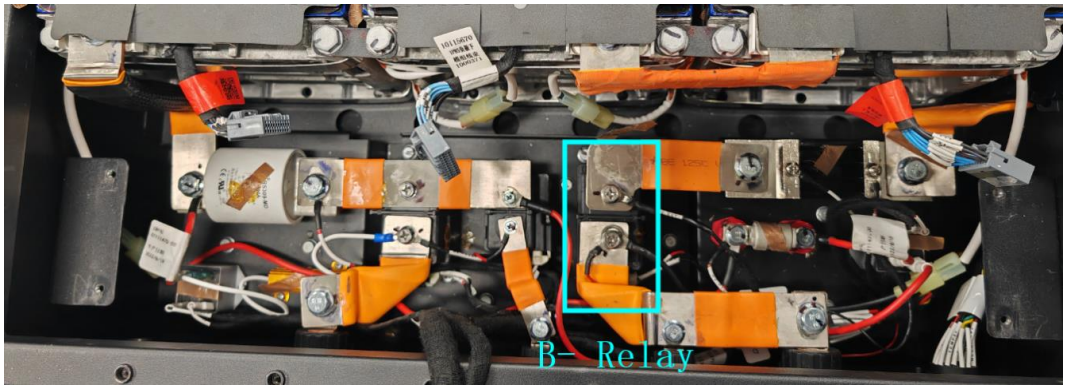
1. Display pop up BMS 37 fault code.
2. Discontinue Use if restart doesn't fix.
3. Remove the battery box cover Replace the battery pack discharge B+ relay.



14.93 BMS 38 Discharging B- Contactor Welded

Check:

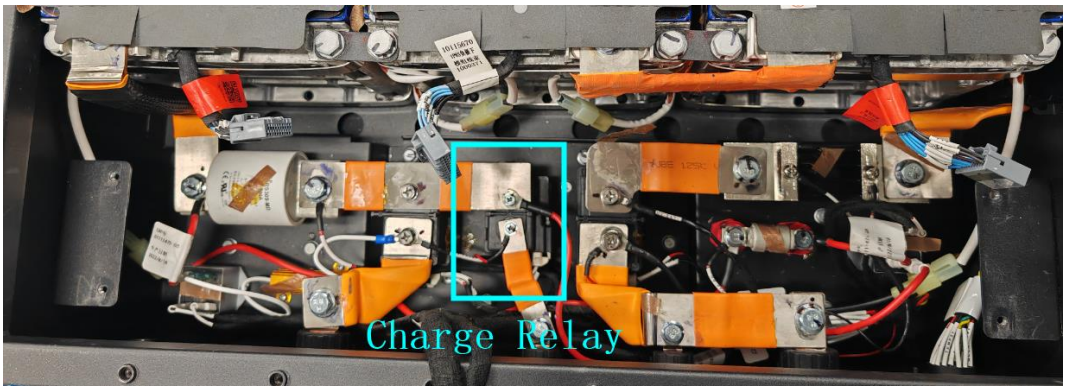
1. Display pop up BMS 38 fault code.
2. Discontinue Use if restart doesn't fix.
3. Remove the battery box cover Replace the battery pack discharge B- relay.



14.94 BMS 39 Battery Charging Contactor Welded

Check:

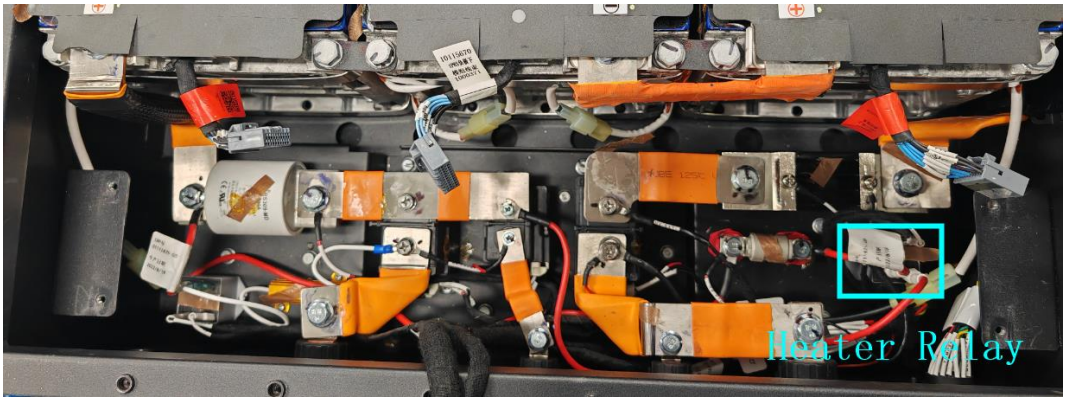
1. Display pop up BMS 39 fault code.
2. Discontinue Use if restart doesn't fix.
3. Remove the battery box cover Replace the battery pack charge relay.



14.95 BMS 41 Battery Heater Contactor Welded

Check:

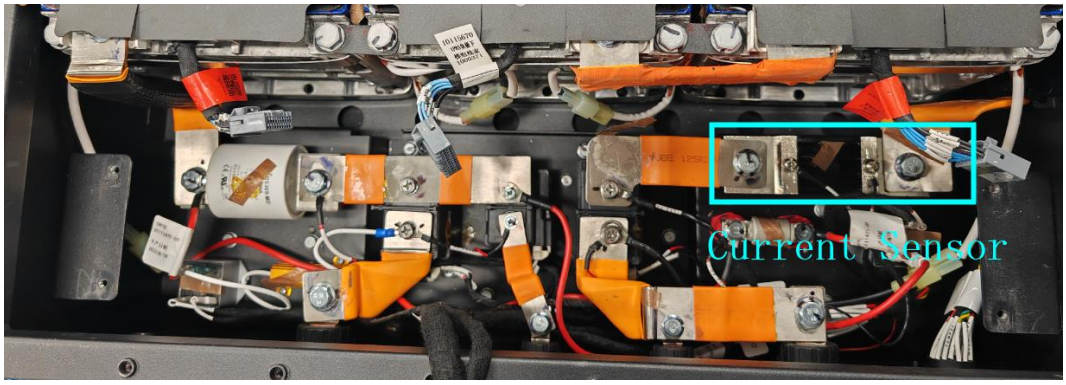
1. Display pop up BMS 41 fault code.
2. Discontinue Use if restart doesn't fix.
3. Remove the battery box cover Replace the battery pack heater relay.



14.96 BMS 42 Battery Current Sensor Abnormal

Check:

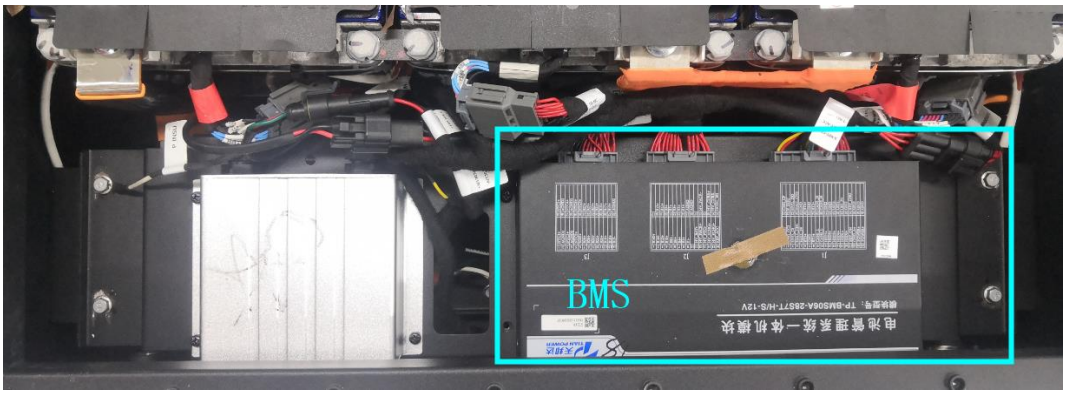
1. Display pop up BMS 42 fault code.
2. Discontinue Use if restart doesn't fix.
3. Remove the battery box cover. Replace the battery pack Current Sensor.



14.97 BMS 43 Battery Sampling Chip Abnormal

Check:

1. Display pop up BMS 43 fault code.
2. Discontinue Use if restart doesn't fix.
3. Remove the battery box cover Replace the battery pack BMS.

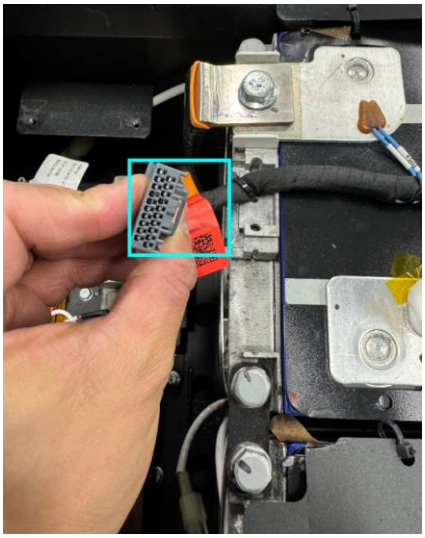


14.98 BMS 44 Battery Cell Open Circuit

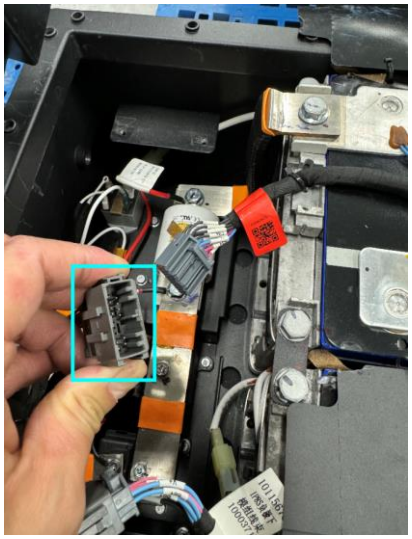
Check:

1. Display pop up BMS 44 fault code.
2. Discontinue Use if restart doesn't fix.
3. Remove the battery box cove Check whether the cable on the module is disconnected, no disconnected.

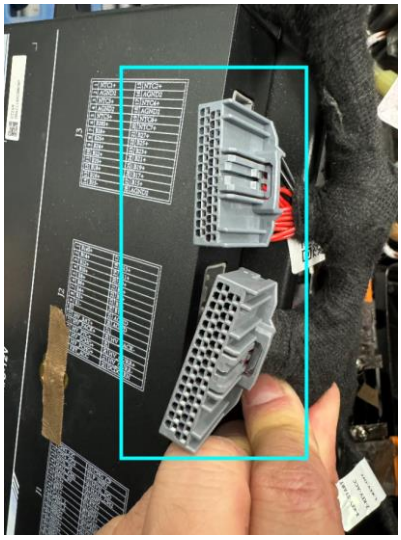
4. Check whether the module connector is burned black.



5. Check whether the BMS module connector is burned black.



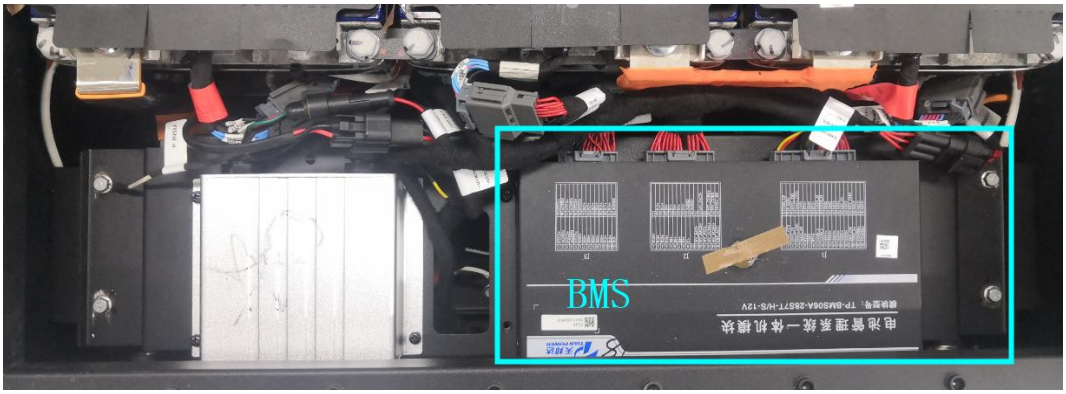
6. Check whether the BMS connector is burned black, if no burned black, BMS damage, Replace the battery pack BMS.



14.99 BMS 45 Master and Slave chips Abnormal

Check:

1. Display pop up BMS 45 fault code.
2. Discontinue Use if restart doesn't fix.
3. Remove the battery box cover Replace the battery pack BMS.

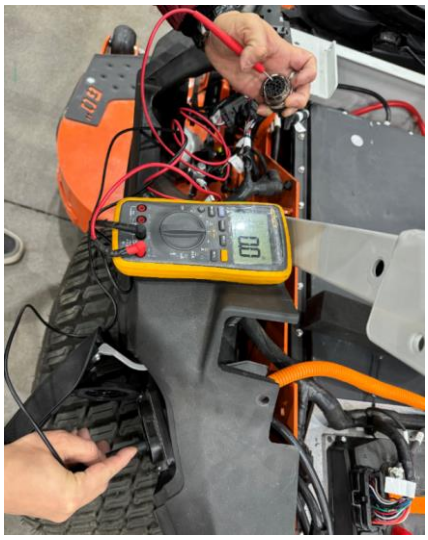


14.100 BMS 47 Charger CAN Communication Timeout

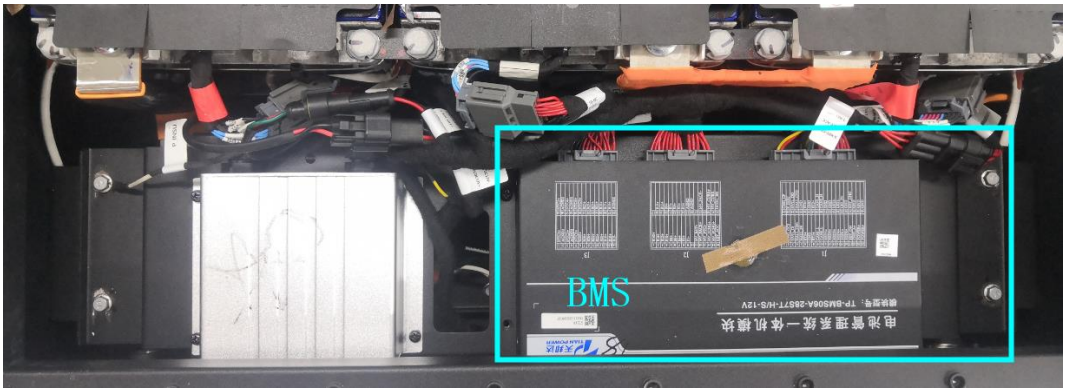
Tool: multimeter

Check:

1. Display pop up BMS 47 fault code.
2. Set the multimeter to resistance, Check whether the CAN between the battery communication port and the charging base is properly connected. If Displays 0Ω，Replace the charge.



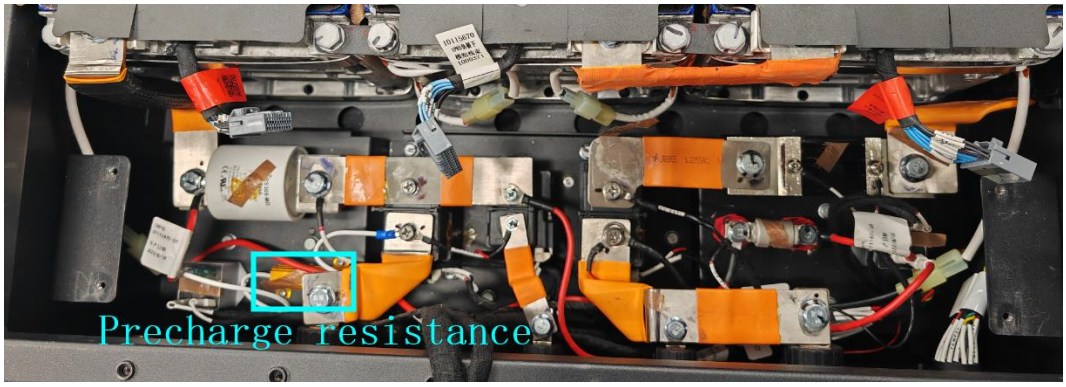
3. If Battery cannot be charged, Remove the battery box cover, Replace the BMS.



14.101 BMS 48 Battery Precharge Failed

Check:

1. Display pop up BMS 48 fault code.
2. Discontinue Use if restart doesn't fix.
3. Remove the battery box cover Replace the battery pack precharge resistance.



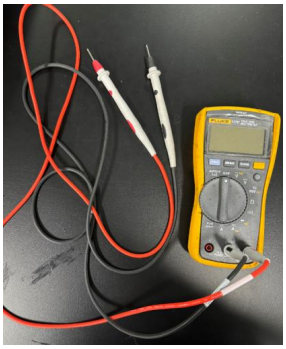
14.102 BMS 49 Battery 12V Abnormal

Check:

1. Display pop up BMS 49 fault code.
2. Discontinue Use if restart doesn't fix.
3. Remove the battery box cover Replace the battery pack DC/DC power.

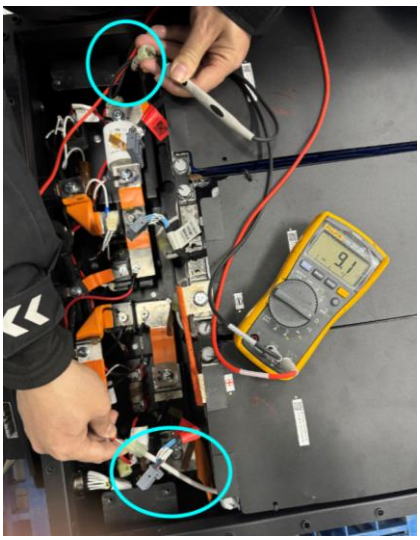
14.103 BMS 51 Battery Heater Abnormal

Tool: multimeter

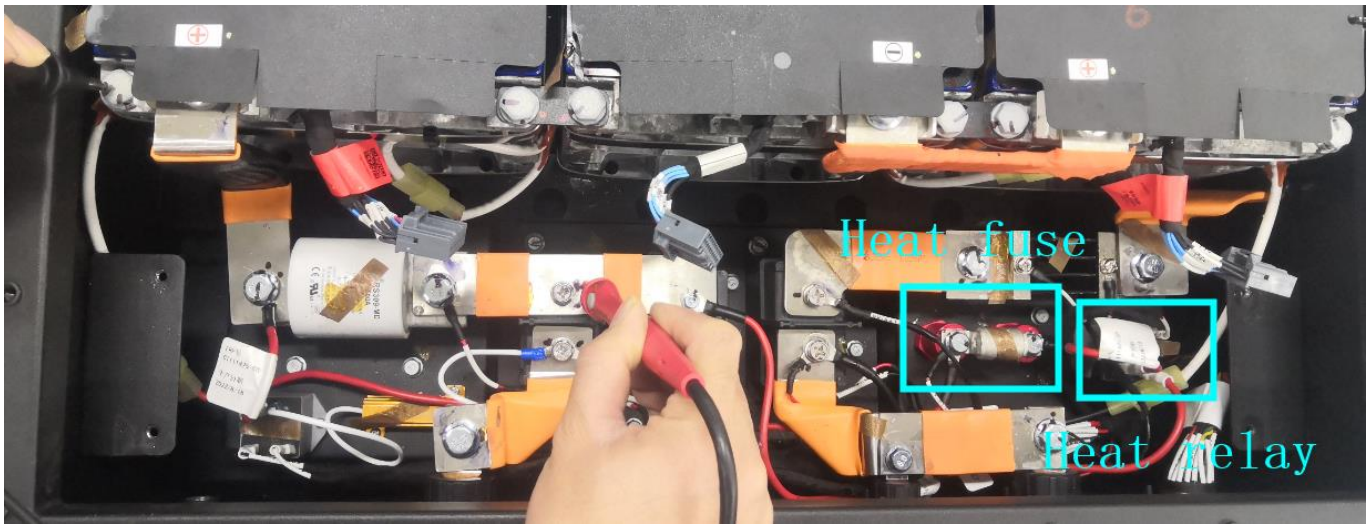


Check:

1. Display pop up BMS 51 fault code.
2. Check the resistance of the battery heating film, The normal range is 9 to 11,if no, heating film damge.

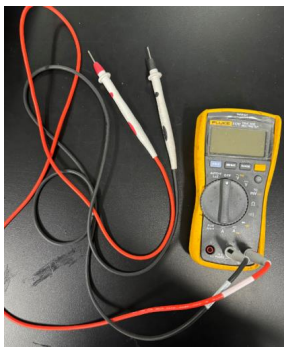


3. Check heat relay and heat fuse, Heating relay and heating fuse intact, Replace the battery pack BMS.



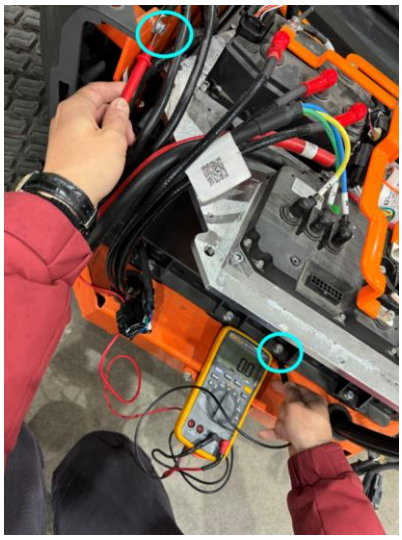
14.104 BMS 52 Battery CC2 Detection Abnormal

Tool: multimeter



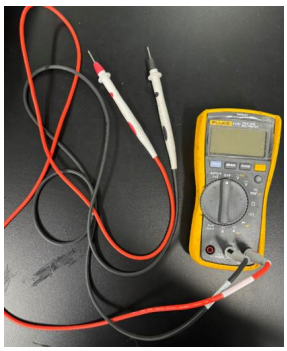
Check:

1. Display pop up BMS 52 fault code.
2. Check that the grounding cable on the charging base is properly connected to the frame If no 0 is displayed, reconnect the ground cable.



14.105 BMS 53 Battery B+ Contactor Coil Short

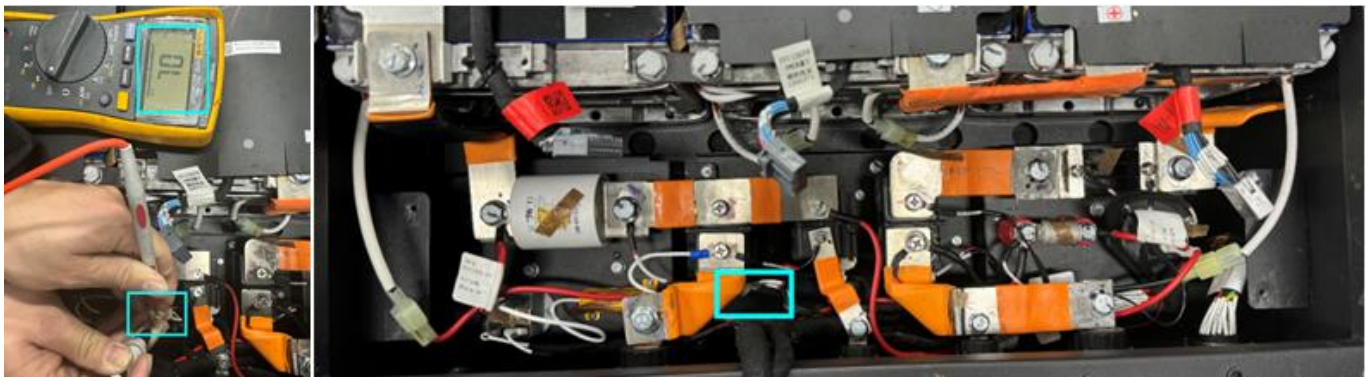
Tool: multimeter



Check:

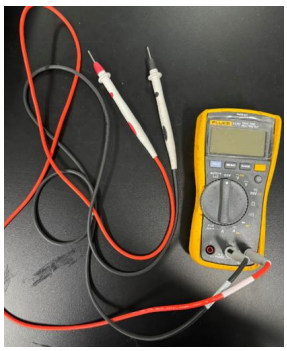
1. Display pop up BMS 53 fault code.

2. Check the coil of the B+ relay, OL not shown, relay damage, Replace B+ relay.



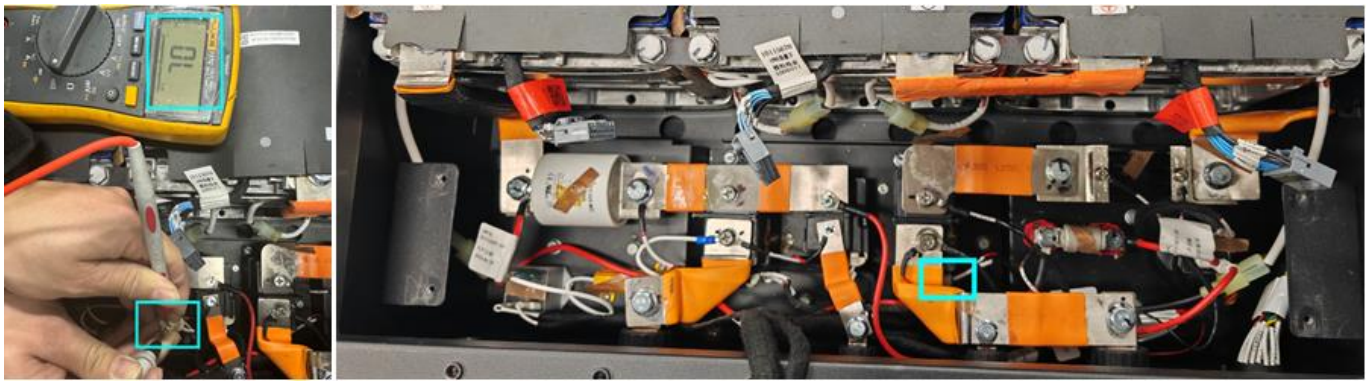
14.106 BMS 54 Battery B- Contactor Coil Short

Tool: multimeter



Check:

1. Display pop up BMS 54 fault code.
2. Check the coil of the B- relay, OL not shown, relay damage, Replace B- relay.

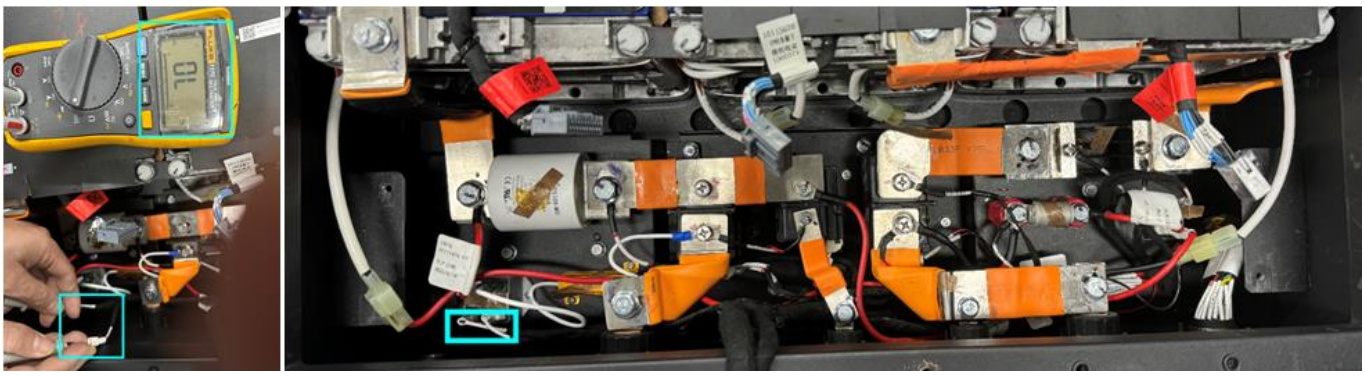


14.107 BMS 55 Battery Precharge Contactor Coil Short

Tool: multimeter

Check:

1. Display pop up BMS 55 fault code.
2. Check the coil of the Precharge relay, OL not shown, relay damage, Replace Precharge relay.

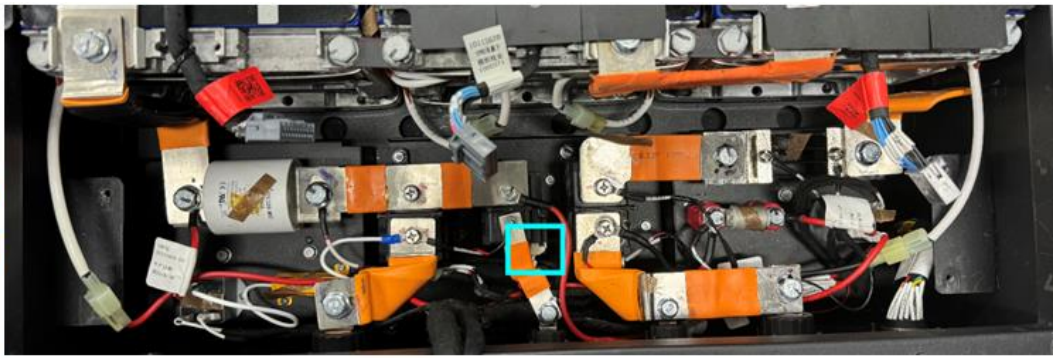


14.108 BMS 56 Battery Charge Contactor Coil Short

Tool: multimeter

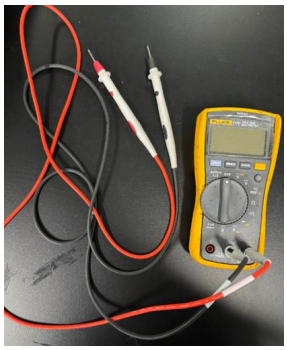
Check:

1. Display pop up BMS 56 fault code.
2. Check the coil of the charge relay, OL not shown, relay damage, Replace charge relay.

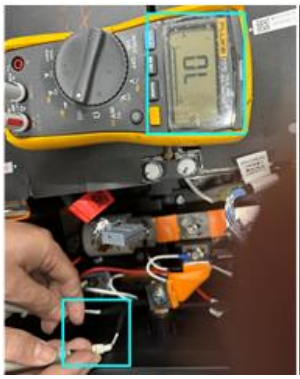
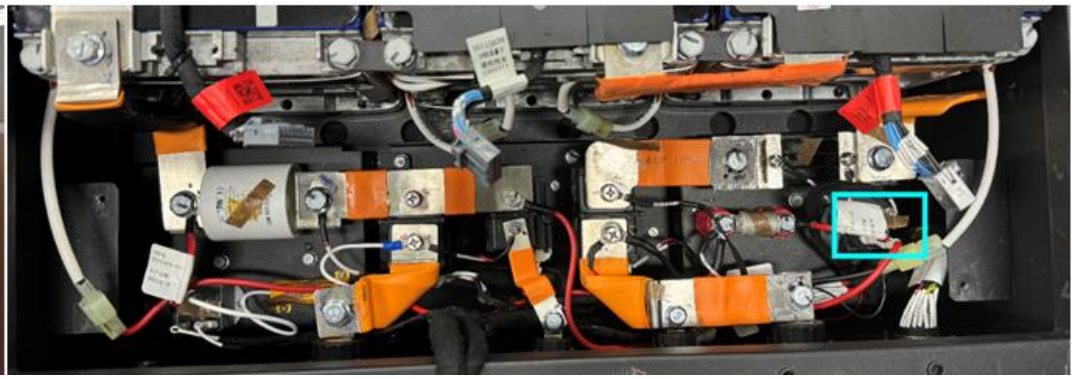
14.109 BMS 57 Battery Heating Contactor Coil Short

Tool: multimeter



Check:

1. Display pop up BMS 57 fault code.
2. Check the coil of the heating relay, OL not shown,relay damage, Replace heating relay.

14.110 BMS 58 Battery Continuous Discharge Overcurrent

Check:

1. Display pop up BMS 58 fault code.
2. Reduce load.