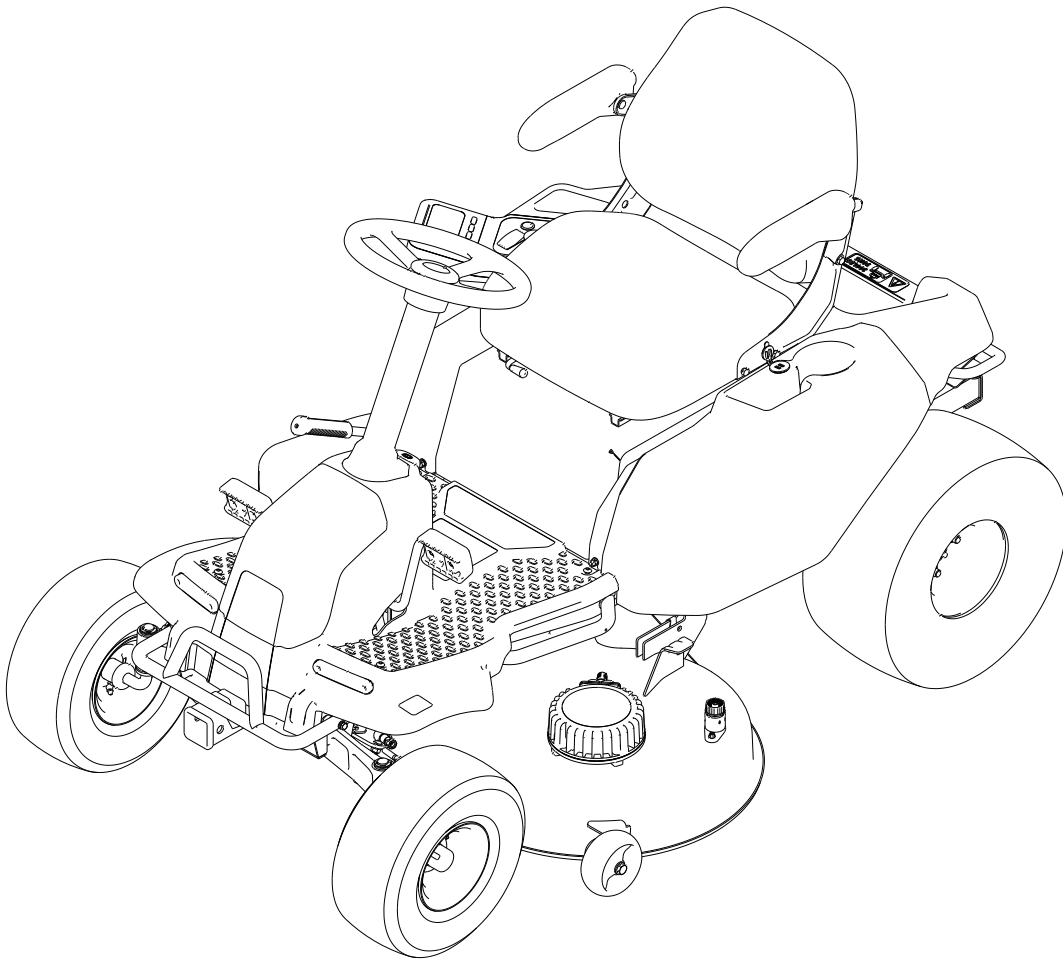


greenworks[®]

Model No. CRT42 SN 101 YYMMDD XXXXXXXX Service Manual



WARNING:

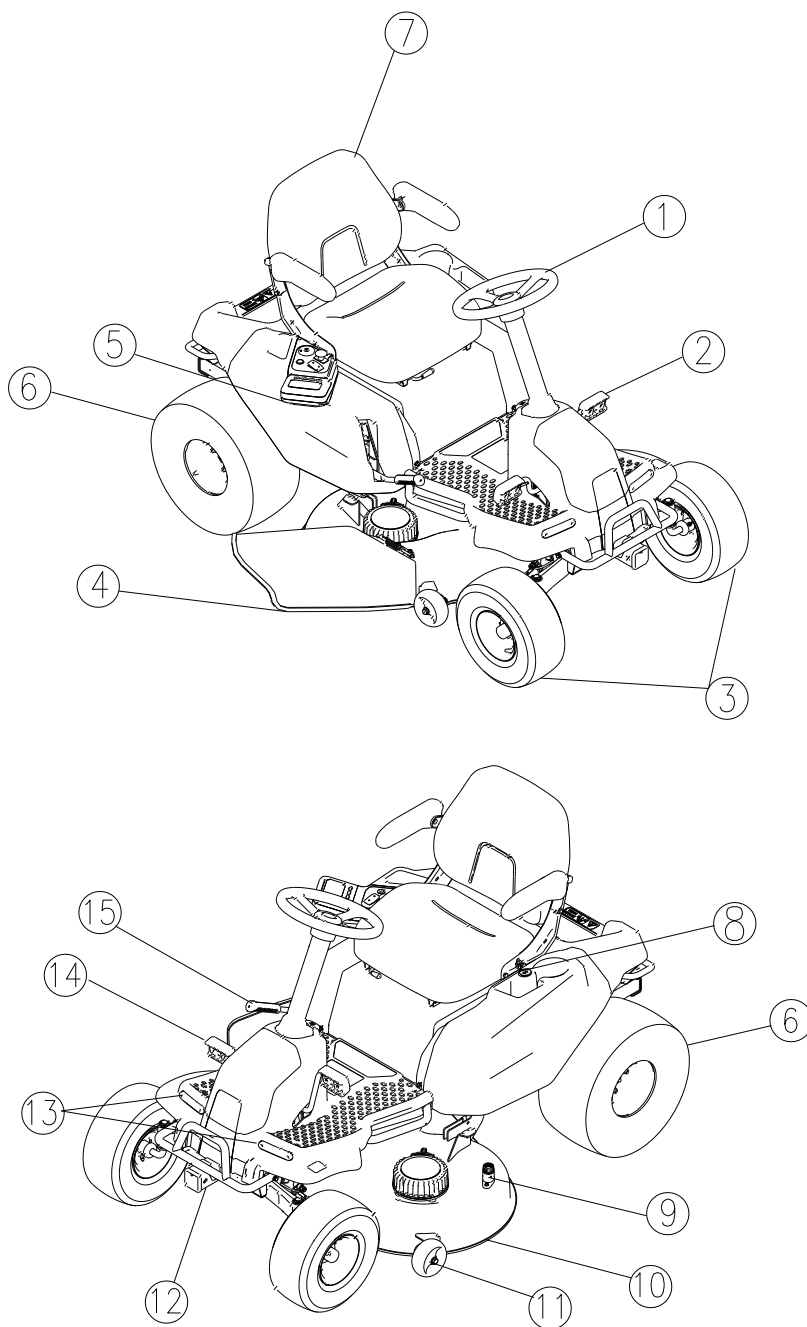
Undertaking repairs to gardening tools can be hazardous. Use correct tools and safety devices noted in the manual and obey all the instructions. Do not proceed until you are confident that you understand all steps and can complete the repair work. Some repairs must only be performed by a qualified technician.

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1. Component Location



- | | |
|--------------------|---------------------------------|
| 1. Steering wheel | 9. Cleaning port |
| 2. Brake pedal | 10. Deck |
| 3. Front wheel | 11. Anti-scalp wheel |
| 4. Discharge chute | 12. Bumper |
| 5. Switch panel | 13. LED light |
| 6. Rear wheel | 14. Throttle pedal |
| 7. Seat | 15. Height adjustment component |
| 8. USB port | |

1.1 Terminology

Abbr.	Full term
CAN	Controller Area Network
HW	Hardware
PC	Personal Computer
PTO	PTO Switch
SW	Software
KSI	Key Switch Ignition

2. Warnings

- 2.1. All disassembly, replacement, repair, and maintenance operations must be performed by professional operators who have read this manual.
- 2.2. 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.
- 2.3. In addition to obeying the conventional procedures for most repairing processes, there are some other special reminders:
 - Before any maintenance work, the start switch must be turned off, and if necessary, disconnect the main power supply of the vehicle.
 - 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 operator is near the vehicle under repair or can touch the mechanical parts by accident.

3. Electrical System

3.1 Errors

3.1.1 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 a 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	System
D	Display
C	Charger
TR	Right traction motor and traction controller of right part
TL	Left traction motor and traction controller of left part
PMU	Power Management Unit
MR	Right blade motor and blade controller of right part
ML	Left blade motor and blade controller of left part
V	Vehicle

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.

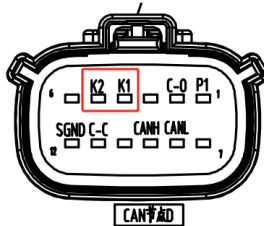
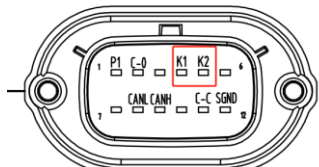
3.1.2 Error Code

System	Error code	Error type	Solutions																																			
Power management unit	PMU 1	Overcurrent-Level1	The PMU load is too high. The error will automatically resolve itself when the load drops.																																			
	PMU 2	Overtemperature-Level1	Stop the vehicle for a period of time to allow it to cool down, if the fault still have after restarting, replace the battery compartment.																																			
	PMU 3	Overtemperature in feedback module-Level1	The error will automatically resolve itself when the temperature drops.																																			
	PMU10	PMU loop fault	- At least one channel in the battery compartment is unable to discharge, but the performance will not decrease, vehicle still can be worked. - If you feel a decrease in mowing performance with this fault code, the battery compartment should be replaced.																																			
	PMU11	PMU minor fault	There have occurred a over-current (Level 1) or over-temperature (Level 1) fault. The vehicle's performance will be limited with this code, but this fault can be restored, no need to pay attention.																																			
	PMU12	PMU major fault	Check: Use "ToolsForCAN" to identify the detail fault - "PreCharge Function Error" of PMU12 PMU FAULT LIST PART1 <table> <tr> <th>Function</th><th colspan="3">Status</th></tr> <tr> <td>Avg Curr Overcurr</td><td>☒ 0: Normal</td><td>☐ 1: Avg Curr L1</td><td>☐ 2: Avg Curr L2</td></tr> <tr> <td>PMUNeg_MOSOvertemp</td><td>☒ 0: Normal</td><td>☐ 1: OvertempL1</td><td>☐ 2: OvertempL2</td></tr> <tr> <td>Peak Curr Overcurr</td><td>☒ 0: Normal</td><td>☐ 1: Error</td><td>☐ 3: NTCErr</td></tr> <tr> <td>Feedback Curr Overcurr</td><td>☒ 0: Normal</td><td>☐ 1: Error</td><td></td></tr> <tr> <td>PreCharge Function</td><td>☐ 0: Normal</td><td>☒ 1: Error</td><td></td></tr> <tr> <td>PMUSoftware Auth</td><td>☒ 0: Normal</td><td>☐ 1: Error</td><td></td></tr> <tr> <td>PMU Undervoltage Error</td><td>☒ 0: Normal</td><td>☐ 1: Error</td><td></td></tr> <tr> <td>PMU Overvoltage Error</td><td>☒ 0: Normal</td><td>☐ 1: Error</td><td></td></tr> </table> - Adjust the dial position of a multimeter to the diode position to measure the diode value of the controller's B+ and B- (Red lead to black wire, black lead to red wire). - If the value is approximately equal to $0.7 \pm 0.2V$, you should replace a new battery box. - Otherwise follow the steps. Correct value should be approximately equal to $0.7 \pm 0.2V$ - Disconnect the controller B+ and B- wires and use a multimeter to measure the diode value (Red lead to negative electrode, black lead to positive electrode).	Function	Status			Avg Curr Overcurr	☒ 0: Normal	☐ 1: Avg Curr L1	☐ 2: Avg Curr L2	PMUNeg_MOSOvertemp	☒ 0: Normal	☐ 1: OvertempL1	☐ 2: OvertempL2	Peak Curr Overcurr	☒ 0: Normal	☐ 1: Error	☐ 3: NTCErr	Feedback Curr Overcurr	☒ 0: Normal	☐ 1: Error		PreCharge Function	☐ 0: Normal	☒ 1: Error		PMUSoftware Auth	☒ 0: Normal	☐ 1: Error		PMU Undervoltage Error	☒ 0: Normal	☐ 1: Error		PMU Overvoltage Error	☒ 0: Normal	☐ 1: Error
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System	Error code	Error type	Solutions
			a. If the value is approximately equal to $0.7 \pm 0.2V$, you should replace the DC-DC. b. Otherwise replace the controller.  <i>Correct value should be approximately equal to $0.7 \pm 0.2V$</i>
	PMU13	PMU no available battery	1. Make sure that the inserted batteries are correct, not mixed with different voltage platform. 2. Replace the battery compartment.
	PMU 32	Overcurrent-Level2	The PMU load is too high. Restart the power supply.
	PMU 33	Hardware overcurrent	The PMU load is too high. Restart the power supply.
	PMU 34	Feedback overcurrent	Restart the power supply.
	PMU 35	Overtemperature-Level2	Stop the vehicle for a period of time to allow it to cool down, if the fault still have after restarting, replace the battery compartment.
	PMU 36	Undervoltage	1. Charge the batteries. 2. Make sure the battery compartment on the correct platform is used. 3. Replace the battery compartment.
	PMU 37	Overvoltage	1. Make sure the battery compartment on the correct platform is used. 2. Replace the battery compartment.
	PMU 38	Power supply output failure	Disconnect the power harness from battery compartment: a. If the fault code disappeared, follow the "PMU12" trouble shooting guide to find the detail issue. b. Otherwise, replace the battery compartment.
	PMU 39	Overtemperature in feedback module-Level2	Wait until the temperature drops, then restart the power supply.
	PMU 40	Power resistor overtemperature in feedback module	Wait until the temperature drops, then restart the power supply.
	PMU 41	No battery pack available	1. Make sure that the inserted batteries are correct, not mixed with different voltage platform. 2. Replace the battery compartment.
	PMU 42	Battery pack low temperature	Ensure that the ambient temperature is above $32^{\circ}F$ ($0^{\circ}C$).
	PMU 43	Battery pack communication error	Replace the battery pack.

System	Error code	Error type	Solutions
	PMU 44	Microcontroller self-test error	Restart the power supply and contact your distributor for a solution.
	PMU 45	Battery pack high temperature	Wait until the temperature drops, then restart the power supply.
	PMU 46	Relay (MOS) error	Replace the battery compartment.
	PMU 47	Pre-charge error	Follow the "PreCharge Function Error" of PMU12 trouble shooting guide to find the detail issue.
	PMU 48	Pre-charge hardware error	Replace the battery compartment.
	PMU 49	Negative MOSFET temperature sensor error	Replace the battery compartment.
	PMU 50	Feedback MOS temperature sensing error	1. Restart the vehicle. 2. PMU hardware failure, please replace the PMU.
	PMU 51	Driver voltage error in feedback module	1. Restart the vehicle. 2. PMU hardware failure, please replace the PMU.
	PMU 52	Current sensor error	Replace the battery compartment.
	PMU 53	Power resistor driver error in feedback module	Contact your distributor for a solution.
	PMU 54	Busbar current BIAS	Contact your distributor for a solution.
	PMU 55	CAN hardware error	Contact your distributor for a solution.
	PMU 56	Other error	Restart the power supply.
	PMU 57	KSI Pre-MOS error	Replace the battery compartment.
	PMU 59	KSI MOS error	Replace the battery compartment.
	PMU 61	Battery pack 1 does not match	1. Make sure that the inserted battery in cabin 1 is correct, not mixed with different voltage platform. 2. Replace the battery compartment.
	PMU 62	Battery pack 2 does not match	1. Make sure that the inserted battery in cabin 2 is correct, not mixed with different voltage platform. 2. Replace the battery compartment.
	PMU 63	Battery pack 3 does not match	1. Make sure that the inserted battery in cabin 3 is correct, not mixed with different voltage platform. 2. Replace the battery compartment.
	PMU 64	Battery pack 4 does not match	1. Make sure that the inserted battery in cabin 4 is correct, not mixed with different voltage platform. 2. Replace the battery compartment.
	PMU 65	Battery pack 5 does not match	1. Make sure that the inserted battery in cabin 5 is correct, not mixed with different voltage platform. 2. Replace the battery compartment.
	PMU 66	Battery pack 6 does not match	1. Make sure that the inserted battery in cabin 6 is correct, not mixed with different voltage platform. 2. Replace the battery compartment.
	PMU 67	Abnormal charging status	1. Check if the charger's input plug is properly plugged in. 2. Check if the vehicle can be powered on and worked properly:

System	Error code	Error type	Solutions
			a. Can't be powered on and worked, then replace the battery compartment. b. Otherwise, replace the charge socket.
Vehicle	V 14	Reverse mowing operation sequence incorrect	1. When you need to mow in reverse, please press the reverse mowing button. 2. There is a short circuit inside the button, replace the button. 3. Replace the controller (Combination of blades and traction).
	V 15	Vehicle self-test error	1. Before starting the vehicle, check that the brake is in the engaged position. 2. Before starting the vehicle, set the blade switch to the off position and check if the blade switch is connected correctly. 3. Before starting the vehicle, place the DNR (Drive-Neutral-Reverse) switch in the N (Neutral) position. 4. Check that the connector under the seat is connected properly. 5. Do not press the cruise control button when starting the vehicle. 6. Do not tread the accelerator pedal when starting the vehicle.
	V 16	Operation sequence incorrect	Return the accelerator pedal and blade switch to the initial position. If the fault cannot be restored normally, check the accelerator. a. If the throttle sensor is abnormal, replace the throttle sensor directly. b. If there is no abnormality with the throttle sensor, check whether the blade switch is functioning normally. If it is not normal, replace the blade switch.
	V 17	SPI communication error	Replace the controller (Combination of blades and traction).
	V 18	Accelerator error	Check: Use "ToolsForCAN" to read the value of potentiometer - 1. If the value is larger than 4.6 or smaller than 0.2, replace the right/left potentiometer. 2. Replace the controller (Combination of blades and traction). 3. Replace the control harness.
	V 21	PMU CAN communication error	1. Check the pins of connector of the battery compartment side: ① If the pins of the traction controller are bent or retracted, if can be fixed, try to fix them. ② Replace the battery compartment.

System	Error code	Error type	Solutions																					
			<table><tr><th colspan="3">BATTERY 12 LOGIC</th></tr><tr><th>供应商</th><th>名称</th><th>型号</th></tr><tr><td rowspan="3">MOLEX</td><td>外壳</td><td>334721206</td></tr><tr><td>端子</td><td>330122002</td></tr><tr><td>盲堵</td><td>343450001</td></tr></table> 2. Check the pins of the connector of the harness side: ① If the pins of are bent or retracted, if can be fixed, try to fix them. ② Replace the control harness. <table><tr><th>供应商</th><th>名称</th><th>型号</th></tr><tr><td rowspan="3">MOLEX</td><td>外壳</td><td>477259010</td></tr><tr><td>端子</td><td>330000002</td></tr></table>	BATTERY 12 LOGIC			供应商	名称	型号	MOLEX	外壳	334721206	端子	330122002	盲堵	343450001	供应商	名称	型号	MOLEX	外壳	477259010	端子	330000002
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供应商	名称	型号																						
MOLEX	外壳	477259010																						
	端子	330000002																						
	V 22	Blade switch signal abnormal	Check that the blade switch is connected properly, and then return the switch to its initial position.																					
V 23	Seat switch abnormal	1. Check if the connector of the seat switch is connected well. 2. Check the pins of connector of the controller's side: ① If the pins of the controller are bent or retracted, if can be fixed, try to fix them. ② Replace the controller (Combination of blades and traction). 3. Check the pins of the connector of the harness side: ① If the pins of are bent or retracted, if can be fixed, try to fix them. ② Replace the control harness. 4. Replace the seat switch.																						
V24	Insufficient battery packs available, functionality may be limited	Please insert more battery packs.																						
V 27	Seat switch abnormal	Check that the connector under the seat is connected properly, and then restart the power supply.																						
Traction controller	T 11	Overvoltage	Check if the battery pack is compatible with the vehicle. a. If the battery pack is not compatible, it needs to be replaced with a matching one. b. If the above method does not resolve the issue, the battery compartment will be replaced directly.																					
	T 12	Undervoltage	1. Charge the batteries.																					

System	Error code	Error type	Solutions
			- Make sure the controller on the correct platform is used. - Flash the right firmware to the traction controller. 60V and 80V platform have different firmware. - Replace the controller (Combination of blades and traction).
	T 13	Controller self-test error	Replace the controller (Combination of blades and traction).
	T 14	Drive motor stalled	Turn off the power, use a jack to lift the vehicle's rear wheels, disengage the foot parking brake, try to rotate the rear wheels. - If the wheel can't be rotated, replace the traction motor. - Otherwise replace the controller (Combination of blades and traction). 
	T 15	Motor encoder error	Check if the Hall sensor connector of the controller is properly connected. - If the connection is abnormal, adjust the motor's Hall sensor connector and then restart the system. - If the connection is normal, replace the controller (Combination of blades and traction).
	T 16	Controller driver circuit error	Replace the controller (Combination of blades and traction).
	T 17	Drive part of controller overtemperature	Stop the vehicle for a period of time to allow it to cool down, if the fault still have after restarting, replace the controller (Combination of blades and traction).
	T 18	Drive motor overheat	Stop the vehicle for a period of time to allow it to cool down, if the fault still have after restarting, follow the steps below. - Check if the Hall sensor connector of the controller is properly connected. - If the connection is abnormal, adjust the motor's Hall sensor connector and then restart the system. - If the connection is normal, replace the controller (Combination of blades and traction).
	T 21	Temperature sensor of the drive motor abnormal	Check if the Hall sensor connector of the controller is properly connected. - If the connection is abnormal, adjust the motor's Hall sensor connector and then restart the system. - If the connection is normal, replace the controller (Combination of blades and traction).
	T 22	Drive part of controller hardware overcurrent	The load is too high. Please reduce the load and try operating the vehicle again.

System	Error code	Error type	Solutions
			2. If the fault still exists even during normal operation, replace the controller (Combination of blades and traction). 3. Replace the traction motor.
	T 23	Pre-charge error	Disconnect the controller's B+ and B- wires and use a multimeter to measure the diode value (Red lead to negative electrode, black lead to positive electrode). a. If the value is approximately equal to $0.7\pm0.2V$, you should replace the DC-DC. b. Otherwise replace the controller.  <i>Correct value should be approximately equal to $0.7\pm0.2V$</i>
	T 25	Drive software overcurrent	1. The load is too high. Please reduce the load and try operating the vehicle again. 2. If the fault still have even during normal operation, replace the controller (Combination of blades and traction). 3. Replace the traction motor.
	T 26	Drive MOS error	Replace the controller (Combination of blades and traction).
	T 27	Motor phase loss	1. Check if the motor wires are properly connected. ① If there is a break in the wire or the wire has come loose, reconnect the wires properly. ② To test if the motor is functioning normally, use a multimeter to measure the motor phase lines. 2. If both the motor wires and the motor are normal, then replace the drive controller.
	T 28	Drive controller overtemp	Stop the vehicle for a period of time to allow it to cool down, if the fault still have after restarting, replace the controller (Combination of blades and traction).
Left blade controller and motor	ML 3	Blade software overcurrent	Swap the M5 terminals of left and right blade motors' phase harness (Totally six screws). a. If still have ML3 fault code, replace the controller (Combination of blades and traction). b. If fault code change to MR3, you should replace the left blade motor.
	ML 4	Blade motor stalled	1. Turn off the power, try to rotate the left side blade. a. If the wheel can't be rotated, replace the left blade motor. b. Otherwise follow the steps below. 2. Swap the M5 terminals of left and right blade motors' phase harness (Totally six screws). a. If still have ML4 fault code, replace the controller (Combination of blades and traction).

System	Error code	Error type	Solutions
			b. If fault code change to MR4, you should replace the left blade motor.
	ML 6	Blade MOS error	Replace the controller (Combination of blades and traction).
	ML 7	Blade motor phase loss	Swap the M5 terminals of left and right blade motors' phase harness (Totally six screws). a. If still have ML7 fault code, replace the controller (Combination of blades and traction). b. If fault code change to MR7, you should replace the left blade motor.
	ML 9	Blade controller overtemperature	Stop the vehicle for a period of time to allow it to cool down, if the fault still have after restarting, replace the controller (Combination of blades and traction).
	ML 14	Blade hardware overcurrent error	Swap the M5 terminals of left and right blade motors' phase harness (Totally six screws). a. If still have ML14 fault code, replace the controller (Combination of blades and traction). b. If fault code change to MR14, you should replace the left blade motor.
	ML 15	Blade failed to start	1. Check if the connector of the blade switch is connected well. 2. Check the pins of connector of the controller's side: ① If the pins of the controller are bent or retracted, if can be fixed, try to fix them. ② Replace the controller (Combination of blades and traction). 3. Check the pins of the connector of the harness side: ① If the pins of are bent or retracted, if can be fixed, try to fix them. ② Replace the control harness. 4. Replace the blade switch.
Right blade controller and motor	MR 3	Blade software overcurrent	Swap the M5 terminals of left and right blade motors' phase harness (Totally six screws). a. If still have MR3 fault code, replace the controller (Combination of blades and traction). b. If fault code change to ML3, you should replace the right blade motor.
	MR 4	Blade motor stalled	1. Turn off the power, try to rotate the right side blade. a. If the wheel can't be rotated, replace the right blade motor. b. Otherwise follow the steps below. 2. Swap the M5 terminals of left and right blade motors' phase harness (Totally six screws). a. If still have MR4 fault code, replace the controller (Combination of blades and traction). b. If fault code change to ML4, you should replace the right blade motor.
	MR 6	Blade MOS error	Replace the controller (Combination of blades and traction).
	MR 7	Blade motor phase loss	Swap the M5 terminals of left and right blade motors' phase harness (Totally six screws). a. If still have MR7 fault code, replace the controller (Combination of blades and traction).

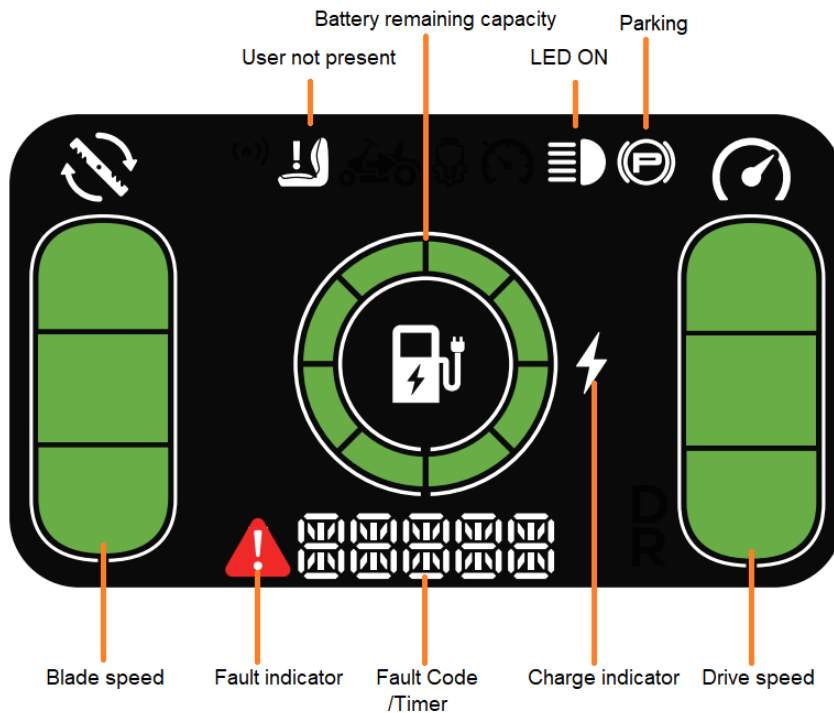
System	Error code	Error type	Solutions
			b. If fault code change to ML7, you should replace the right blade motor.
	MR 9	Blade controller overtemperature	Stop the vehicle for a period of time to allow it to cool down, if the fault still have after restarting, replace the controller (Combination of blades and traction).
	MR 14	Blade hardware overcurrent error	Swap the M5 terminals of left and right blade motors' phase harness (Totally six screws). a. If still have MR14 fault code, replace the controller (Combination of blades and traction). b. If fault code change to ML14, you should replace the right blade motor.
	MR 15	Blade failed to start	1. Check if the connector of the blade switch is connected well. 2. Check the pins of connector of the controller's side: ① If the pins of the controller are bent or retracted, if can be fixed, try to fix them. ② Replace the controller (Combination of blades and traction). 3. Check the pins of the connector of the harness side: ① If the pins of are bent or retracted, if can be fixed, try to fix them. ② Replace the control harness. 4. Replace the blade switch.
Display	D 1	Battery compartment (PMU) communication error	1. Check whether the connectors of the display and PMU are connected properly. 2. Replace the display. 3. Replace the PMU.
	D 2	CAN Timeout with left traction controller	1. Check whether the connectors of the display and left traction controller are connected properly. 2. Replace the display. 3. Replace the PMU.
	D 3	CAN Timeout with right traction controller	1. Check whether the connectors of the display and right traction controller are connected properly. 2. Replace the display. 3. Replace the PMU.
	D 4	CAN Timeout with left blade controller	1. Check whether the connectors of the display and blade controller are connected properly. 2. Replace the display. 3. Replace the blade controller.
	D 5	CAN Timeout with blade controller	1. Check whether the connectors of the display and blade controller are connected properly. 2. Replace the display. 3. Replace the blade controller.
	D 6	CAN Timeout with right blade controller	1. Check whether the connectors of the display and blade controller are connected properly. 2. Replace the display. 3. Replace the blade controller.
Charger	C 3	Charger output low voltage protection	1. Restart the charger; 2. Replace the charger; 3. Replace the PMU.
	C 4	Charger output high voltage protection	1. Restart the charger; 2. Replace the charger; 3. Replace the PMU.

System	Error code	Error type	Solutions
	C 5	Charger output overcurrent protection	1. Restart the charger; 2. Replace the charger; 3. Replace the PMU.
	C 6	Charger overtemperature protection	1. The temperature of the charger is too high. Wait for the charger to cool down, and then restart the charger; 2. Replace the charger; 3. Replace the PMU.
	C 7	Abnormal input protection	1. Check if the connection of AC plug is stable; 2. Replace the charger.
	C 8	No battery voltage detected	1. Check if the connection of power harness between charger and battery compartment is stable; 2. Replace the charger; 3. Replace the PMU.
	C 9	CAN timeout error - PMU	1. Check if the connection of signal harness between charger and battery compartment is stable; 2. Replace the charger; 3. Replace the PMU.

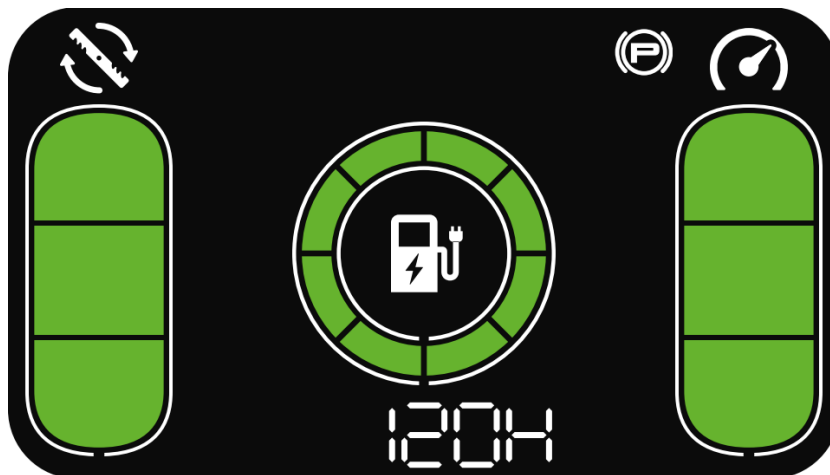
3.2 Reading the Error Code (on the Display Screen)

There are three types of display as follows:

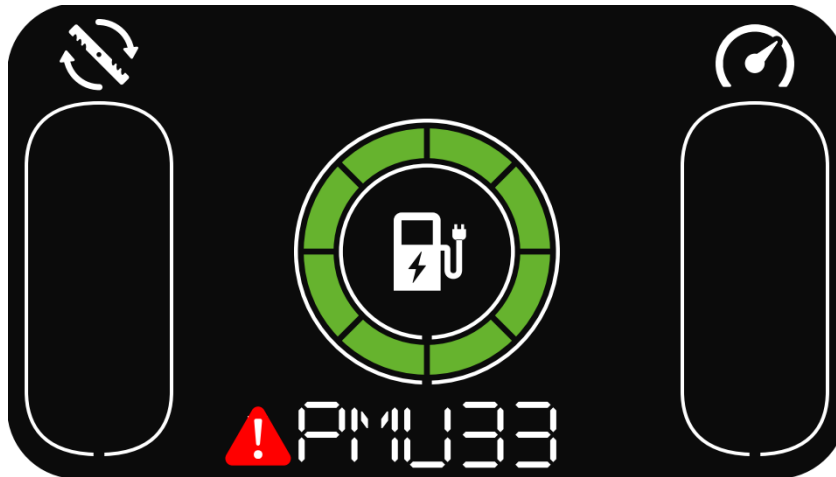
3.2.1 Type 1



When an error occurs, the error indicator will be displayed on the screen. Then the “Error Code/Timer” will show the error codes, if there have multiple error codes at the same time, the error codes will be displayed cyclically.

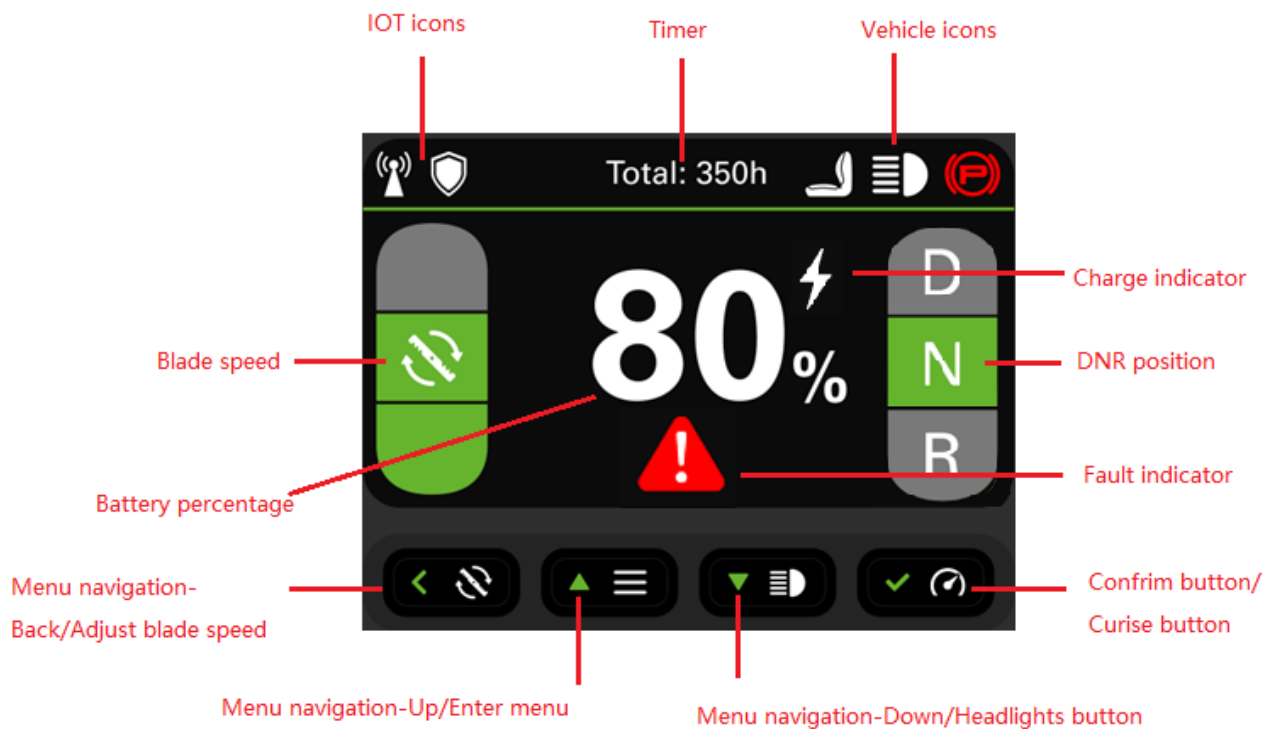


When there without error indicator, the area of “Error Code/Timer” will show the totally working time of this unit, for example, the value of “120H” on the picture above means this unit have already been using for 120 hours.

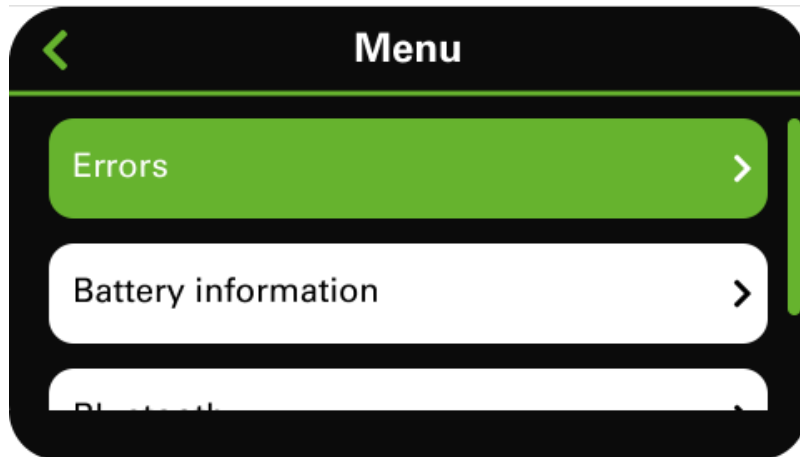


When there with error indicator, the area of “Error Code/Timer” will show the error codes, for example, the value of “PMU33” on the picture above means this unit has an error, and the code is “PMU33”. For more detailed methods, please refer to solutins mentioned above.

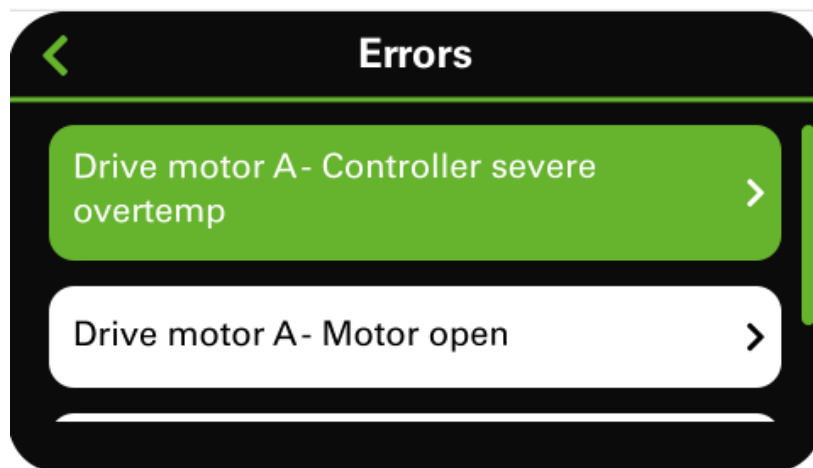
3.2.2 Type 2



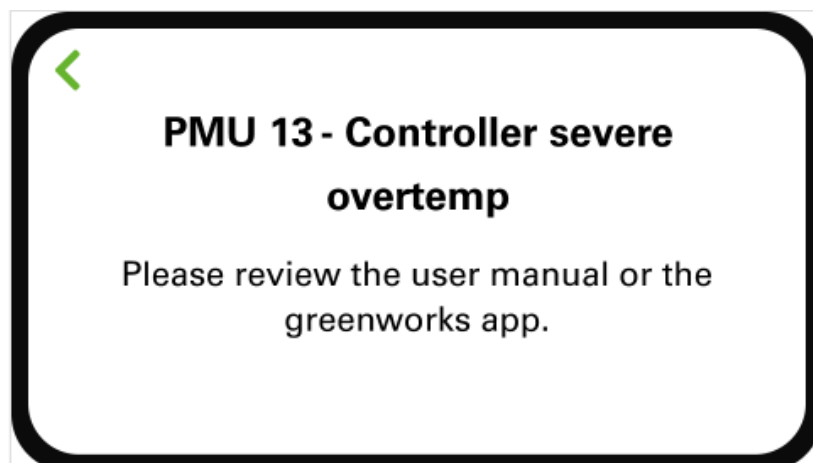
When an error occurs, the error indicator will be displayed on the screen. Please press the “Menu navigation - Up/Enter menu” button to enter the menu page.



1. Use "Menu navigation - Up/Down" button to select "Errors", then press "Confirm button/Adjust driving speed" button to enter the error list.

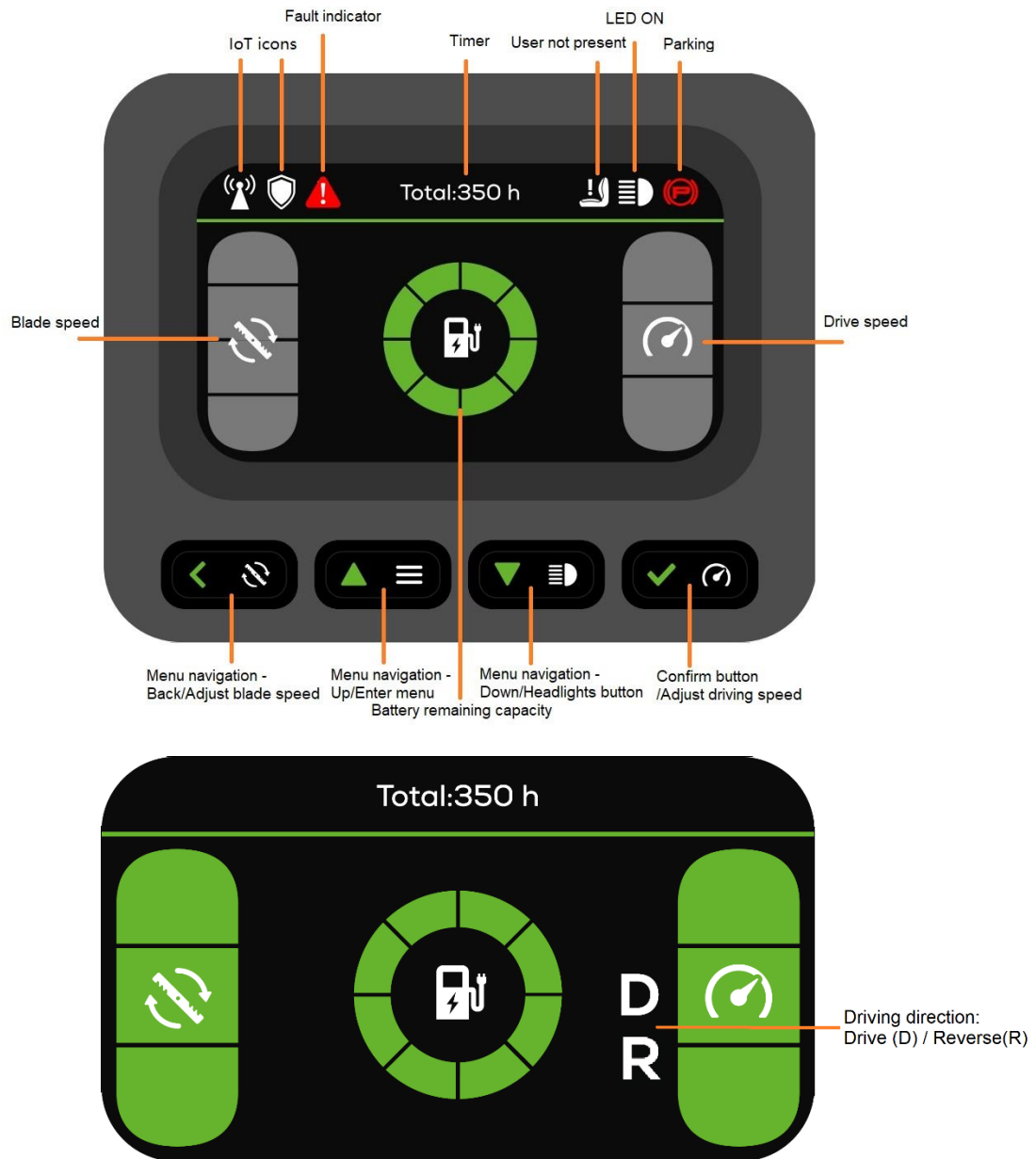


2. Use "Menu navigation - Up/Down" button to select which item you want to check (if there are multiple errors), then press "Confirm button/Adjust driving speed" button to enter the details.

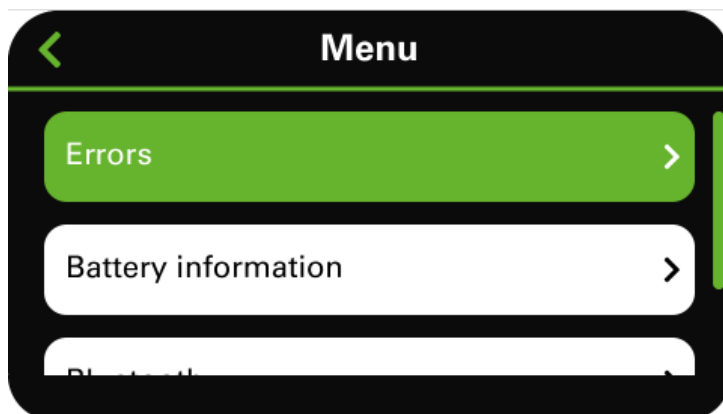


3. This page provides quick troubleshooting, for more detailed methods, please refer to solutions mentioned above.

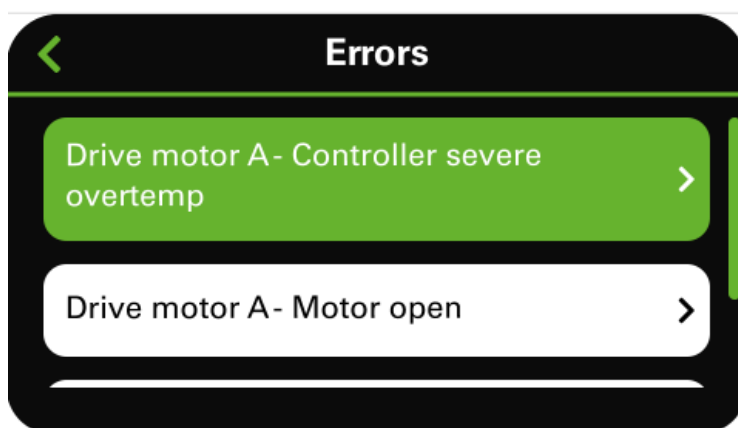
3.2.3 Type 3



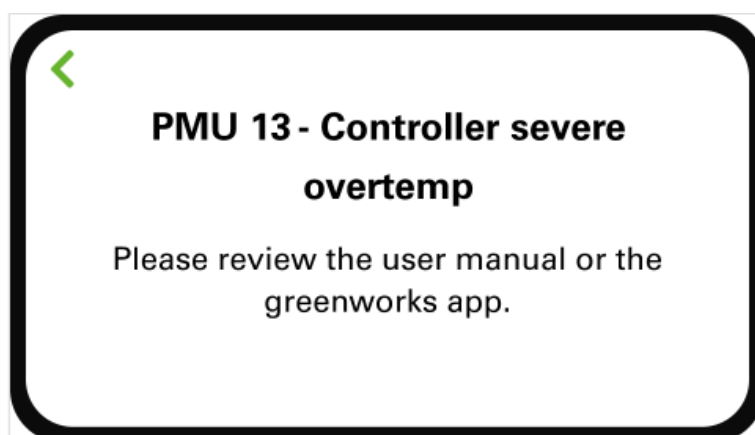
When an error occurs, the error indicator will be displayed on the screen. Please press the “Menu navigation - Up/Enter menu” button to enter the menu page.



Use “Menu navigation - Up/Down” button to select “Errors”, then press “Confirm button/Adjust driving speed” button to enter the error list.



Use “Menu navigation - Up/Down” button to select which item you want to check (if there are multiple errors), then press “Confirm button/Adjust driving speed” button to enter the details.



This page provides quick troubleshooting, for more detailed methods, please refer to solutions mentioned above.

3.3 Electrical Components

3.3.1 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. An example is an ignition switch that grounds the magneto when in the OFF position (completing the circuit) but opens the circuit when in the ON position allowing the engine to operate.

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:

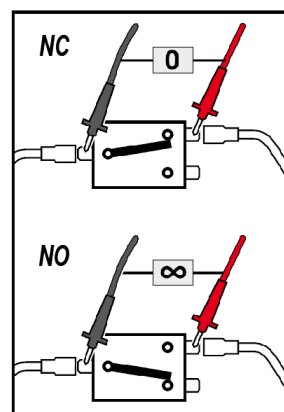
During the checking process, remove the switches from their respective circuits, unplugging the connectors. If the cables are left in place, the machine components or the meters can be damaged.

Normally Open Switch Test

To test a normally closed switch

1. Connect the Multimeter between the switch terminals.
 - The meter should indicate an open circuit (infinite resistance).
2. Activate the switch.
 - The Multimeter should indicate a closed circuit (zero resistance). This indicates the switch is operating properly.
 - Variation from test results described indicates a defective switch.

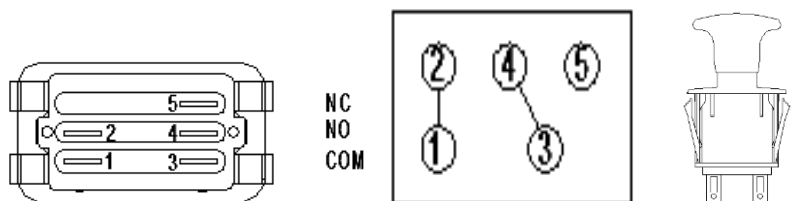
The diagrams show the connections of the electrical components in different situations.



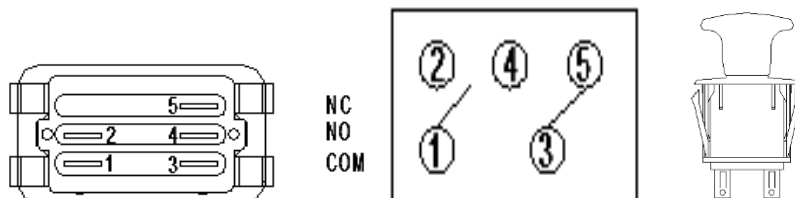
NOTE:

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

PTO SWITCH – TYPE 1

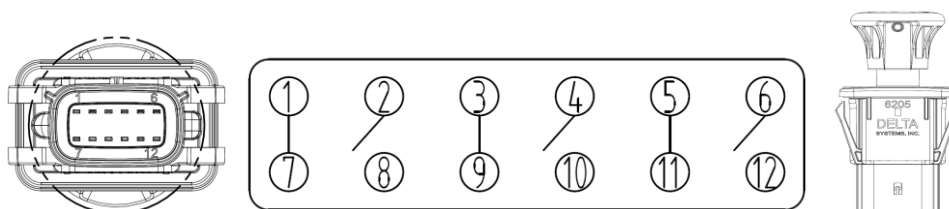


CIRCUITS SHOWN WITH THE KNOB IN THE UP POSITION

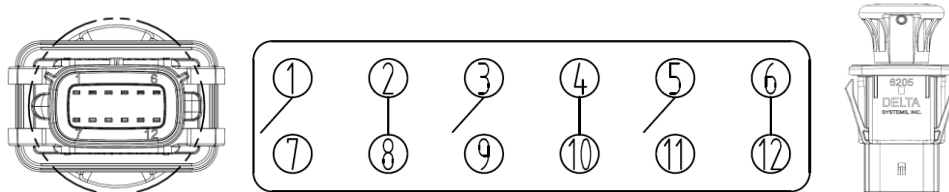


CIRCUITS SHOWN WITH THE KNOB IN THE DOWN POSITION

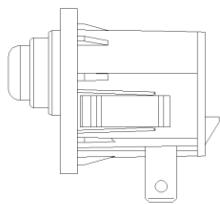
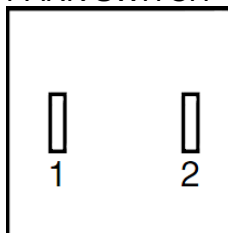
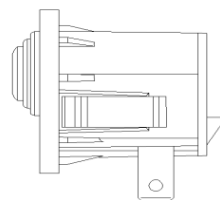
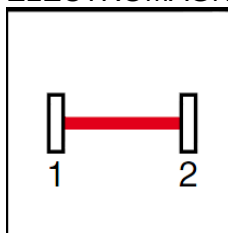
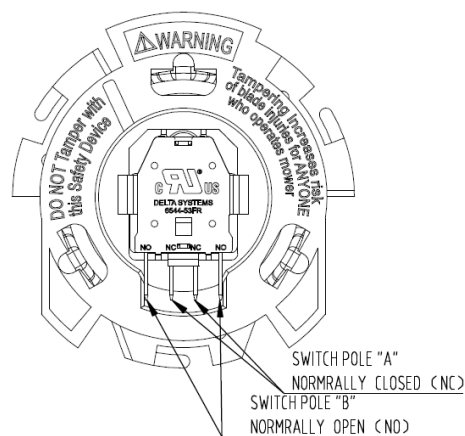
PTO SWITCH – TYPE 2



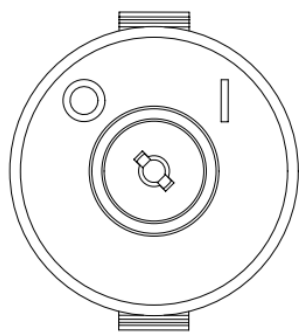
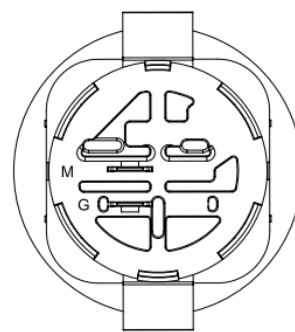
CIRCUITS SHOWN WITH THE KNOB IN THE UP POSITION



CIRCUITS SHOWN WITH THE KNOB IN THE DOWN POSITION

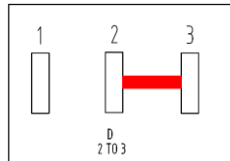
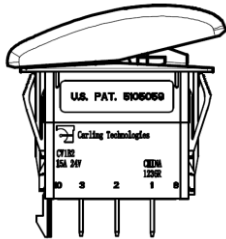
PARK SWITCH**ELECTROMAGNETIC BRAKE ON****ELECTROMAGNETIC BRAKE OFF****SEAT SWITCH**

SWITCH POLE 'A' TO TRACTION
CONTROLLER (OFF)
SWITCH POLE 'B' TO TRACTION
CONTROLLER (NO)

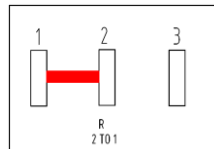
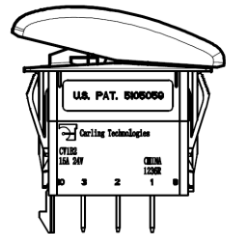
KEY SWITCHFRONT VIEWBACK VIEW

POSITION	ROTATION	FUNCTION	CONTACT
1	0°	OFF	OPEN
2	90°	ON	M+G

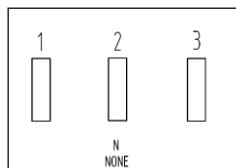
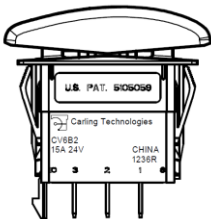
DNR SWITCH



DRIVE

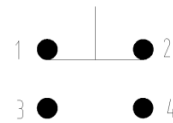


REVERSE

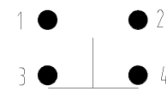


NEUTRAL

REVERSE MOWING BUTTON

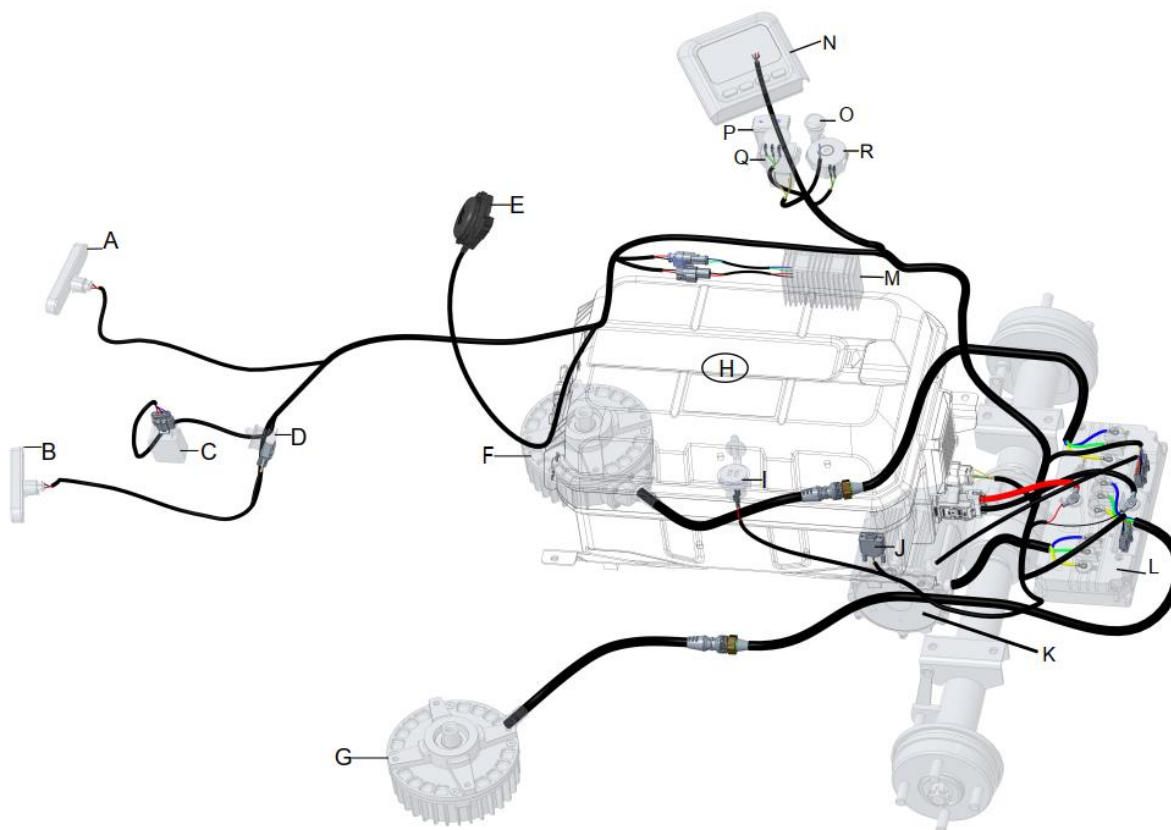


CONTACT OPEN



BUTTON IS PRESSED DOWN AND CONTACT IS CLOSED
PRESS AND RELEASE THE BUTTON TO TURN ON THE REVERSE MOWING FUNCTION

3.3.2 Electrical Wiring Diagram



A	Right LED Light	J	Debug Port
B	Left LED Light	K	Traction Motor and Gearbox Assembly
C	Potentiometer	L	Controller
D	Parking Switch	M	12 Volt Power Converter
E	Seat Switch	N	Instrument
F	Right Blade Motor	O	Reserve Moving Button
G	Left Blade Motor	P	DNR Switch
H	Battery Pack Assembly	Q	PTO Switch
I	USB	R	Key Switch

3.4 Use “ToolForCAN” to Read Information from the Unit and Diagnosis the Unit

3.4.1 Open the Software and Connect to the Unit

1. Open the software of “ToolsForCAN” that on your laptop.
2. Click the “English” button to switch to the English version (If need).
3. Make sure you have already connected the CAN Interface (R0203845-00) to your laptop, the “Hardware Select” will show deerror after connecting the CAN Interface (“PCAN_USB 1(51h)”) and please make sure the “Baud Rate” setting is “250kBit/sec”, then click the “Connect” button to connect the CAN Interface.

Connect

Hardware Select: PCAN_USB 1 (51h) Refresh Connect

Baud Rate: 250 kBit/sec Disconnect Other Disconnect English

4. Connect to the debug port that marked as “J” in chapter 3.4.

3.4.2 Select the Model You Want to Connect

Read Info

Select Model: CRT428 0

Clear Time Count On Display

3.4.3 Traction System Area Instruction

Traction System	
Ctrl POT Value V:	0
Ctrl SW Ver:	S101
Ctrl HW Ver:	P101
Mtr Speed rpm:	20494
Mtr Bus Curr A:	24
Mtr Temp :	78.8
Ctrl Temp:	96.8
Error Code:	N/A

1. Ctrl POT Value V: Potentiometer value.
2. Ctrl SW Ver: Controller software version, if not match, will be flashed and showed as red background.
3. Ctrl HW Ver: Controller hardware version, if not match, will be flashed and showed as red background.
4. Mtr Speed rpm: Traction motor speed.
5. Mtr Bus Curr A: Traction motor bus current.
6. Mtr Temp: Traction motor temperature.
7. Ctrl Temp: Controller temperature.
8. Error Code: Error code of traction system.

3.4.4 Blade System Area Instruction

Blade System			
L Ctrl SW Ver:	S000	R Ctrl SW Ver:	S000
L Ctrl HW Ver:	H000	R Ctrl HW Ver:	H000
L Mtr Speed rpm:	0	R Mtr Speed rpm:	0
L Mtr Bus Curr A:	0	R Mtr Bus Curr A:	0
L Ctrl Temp:	0	R Ctrl Temp:	0
Error Code:	N/A	Error Code:	N/A

1. Ctrl SW Ver: Controller software version, if not match, will be flashed and showed as red background.
2. Ctrl HW Ver: Controller hardware version, if not match, will be flashed and showed as red background.
3. Mtr Speed rpm: blade motor speed.
4. Mtr Bus Curr A: blade motor bus current.
5. Ctrl Temp: Controller temperature of the left and right side.
6. Error Code: Error codes of blade system.

3.4.5 Communication Status

Communication Status				
	L Blade Ctrl :	NG	PMU:	NG
			Instrument/Display:	NG
R Traction Ctrl :	NG	R Blade Ctrl :	NG	

1. R Traction Ctrl: CANBUS state of the traction controller, if communicate state is good, will show "OK", otherwise will show "NG", and with red background.
2. L Blade Ctrl: CANBUS state of the blade controller, if communicate state is good, will show "OK", otherwise will show "NG", and with red background.
3. R Blade Ctrl: CANBUS state of the blade controller, if communicate state is good, will show "OK", otherwise will show "NG", and with red background.
4. PMU: CANBUS state of the PMU, if communicate state is good, will show "OK", otherwise will show "NG", and with red background.
5. Instrument/Display: CANBUS state of the display, if communicate state is good, will show "OK", otherwise will show "NG", and with red background.

3.4.6 Discharge Info

Discharge Info	Charge Info	
SW Ver:	S456	Discharge Channel 1
HW Ver:	H403	Discharge Channel 2
Vol V:	57.7	Discharge Channel 3
Curr A:	0	Discharge Channel 4
Temp :	69.8	● Discharge Channel 5
Avl Curr :	55	Discharge Channel 6
Error Code:	N/A	

3.4.7 Charge Info

Discharge Info	Charge Info	
PMU Side		Charger Side
Query Vol V:	50.0	Output Vol V: N/A
Query Curr A:	2.0	Output Curr A: N/A
CHG Status:	Stop	HW Error: N/A
Battery Num.:	1	CHG Overtem: N/A
'd CHG Num.:	0	Input Vol Error: N/A
Vol Plt V:	60	Start Status: N/A
Fully CHG:	Un-Full	Comm Status: N/A
No Error CHG:	Un-Full	Fully CHG DC: N/A
Sleep Delay:	No Dealy	Status Code: N/A
Hdsk Status:	Normal	N/A

3.4.7.1 PMU Side

1. Query Vol V: Query voltage of the PMU.
2. Query Curr A: Query current of the PMU.
3. CHG Status: Charging status of the PMU.
4. Battery Num: Totally battery number in the battery box.
5. 'd CHG Num: The battery number that can be charged in the battery box.
6. Vol Plt V: Voltage platform of the PMU.

7. Fully CHG: Fully charged flag of the PMU.
8. No Error CHG: Fully charged flag of no error code batteries in the PMU.
9. Sleep Delay: Sleep delay flag of the PMU.
10. Hdsh Status: Handshake status of the PMU and charger, if have error, will be showed as red background.

3.4.7.2 Charger Side

1. Output Vol V: Output voltage of the charger.
2. Output Curr A: Output current of the charger.
3. HW Error: Hardware error of the charger, if have error, will be showed as red background.
4. CHG Overtem: Over-temperature error of the charger, if have error, will be showed as red background.
5. Input Vol Error: Input voltage error of the charger, if have error, will be showed as red background.
6. Start Status: Start status of the charger.
7. Comm Status: Communicate status of the charger, if have error, will be showed as red background.
8. Fully CHG DC: Fully charged disconnect flag of the charger.
9. State Code: State code of the charger, see below for detailed information.

BC0: Idle

BC1: Fully Charged

BC2: Charging

BC3: Output_Undervoltage

BC4: Output_Overvoltage

BC5: Output_Overcurrent

BC6: Charger Overtemperature

BC7: Input Voltage Abnormal

BC8: Battery Voltage Undetected

BC9: PMU Communicate Error

BC10: PMU Error

4. 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, lift the front section of the machine.

IMPORTANT:

Before removal and installation of the following parts specific to the deck, make sure the mower is powered off.

4.1 Blade

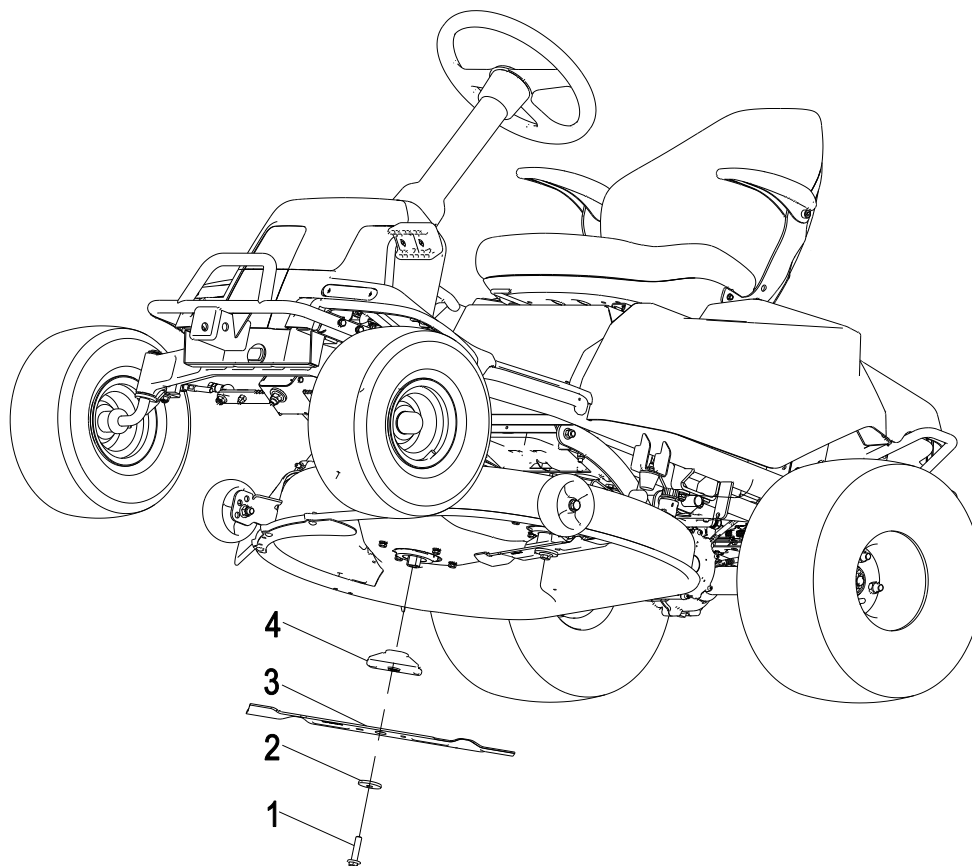
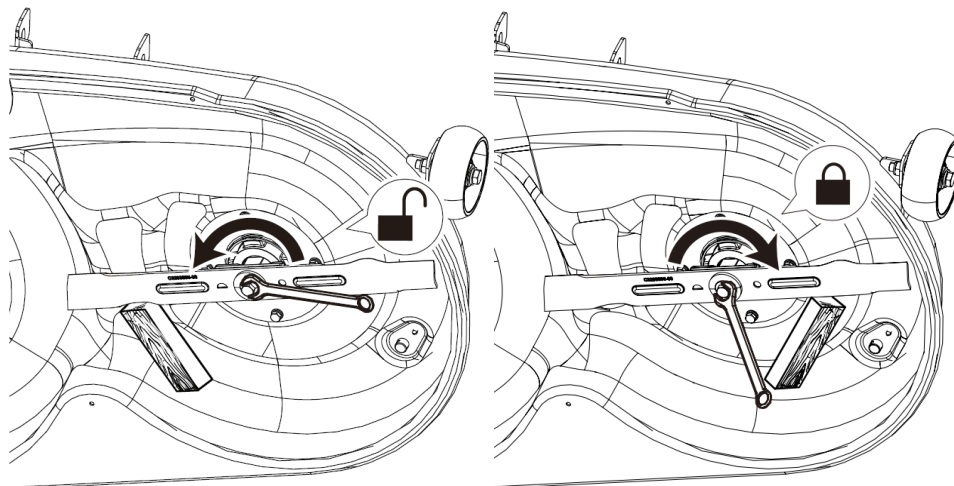


Fig. 1

- | | |
|--------------------|---|
| 1. Bolt 7/16-14UNC | 3. 2-in-1 blade (discharge and mulching blade) or grass blade |
| 2. Disc spring | 4. Blade holder |

Removal:

1. Using a lifting tool, lift the front end of the deck for easier access to the blades. Ensure the mower is secure before working underneath it.
2. Place a block of wood between the blade and the deck to prevent it from spinning while you work.



3. Loosen the bolt (1) with a 16 mm socket by rotating counterclockwise.
4. Remove the bolt (1), disc spring (2), blade (3), and the blade holder (4) in order.

Installation:

1. Put the disc spring (2), blade (3), and the blade holder (4) on the bolt (1) in the order as shown in the Fig. 1 and screw the bolt (1) into the threaded hole of the motor shaft.
2. With protective gloves on, hold the end of the blade (3) with one hand and tighten the bolt (1) with a 16 mm socket by rotating clockwise, with a fastening torque of 90-100 N•m (66~74 Ft-lbs).
3. Gently rotate the blade, make sure that no conflict between the two blades, no conflict between the blades and the deck housing, such that the blades can rotate freely and smoothly.

NOTE:

- Frequently inspect the wear of the blades. Replace in time if a blade is worn, otherwise it will affect the dynamic balance of the working motor and lead to earlier damage of the blade motor.
- Make sure the mower is secured when it is lifted and while working on it.
- Removal and installation steps for grass blade are same as those of 2-in-1 blade (discharge and mulching blade).

4.2 Blade Motor

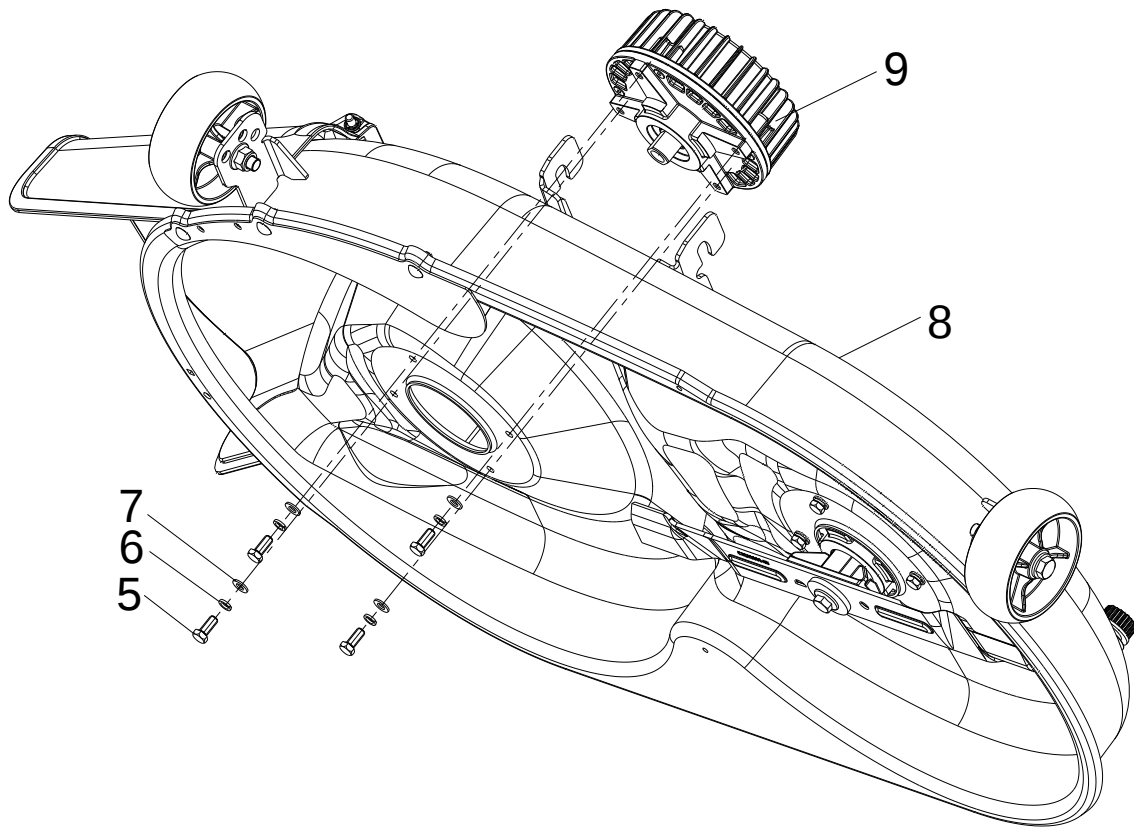


Fig. 2

- | | | | |
|----|--------------------------|----|-------------|
| 5. | Bolt 5/16-18UNC | 8. | Deck |
| 6. | Spring washer $\Phi 8.1$ | 9. | Blade motor |
| 7. | Flat washer $\Phi 8$ | | |

Removal:

1. Make sure the mower is powered off.
2. Pull out the motor wire plug (10).

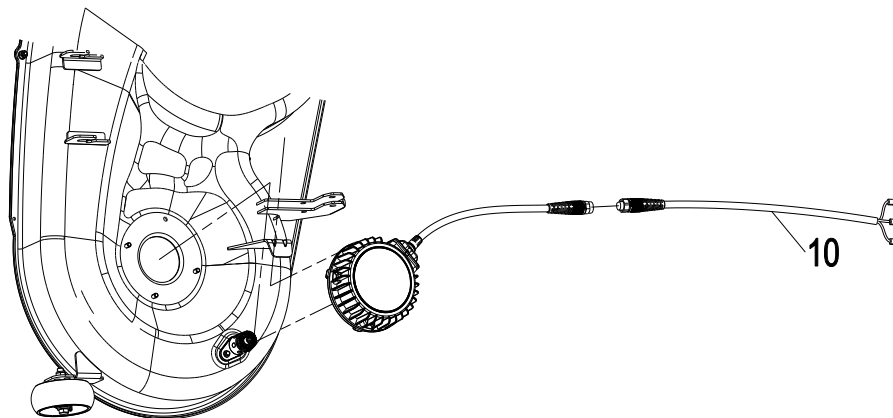


Fig. 3

10. Blade motor wire plug

3. Using a hoisting tool, lift the front end of the deck to a certain angle.
4. Remove the blade (**see 4.1 for detailed steps**).
5. Use a 13 mm socket wrench to loosen the bolt (5) by rotating counterclockwise.
6. Remove the bolt (5), spring washer (6), and the flat washer (7) altogether. Each motor is fixed with four sets of such bolts.
7. Remove the blade motor (9) from the deck.

Installation:

1. Put the blade motor (9) into the mounting hole of the deck housing. Rotate the motor until the motor mounting hole is aligned with the deck mounting hole.
2. Slip the flat washer (7) and the spring washer (6) onto the bolt (5) in order. Apply thread locker on the end of the thread and manually screw the bolt clockwise into the threaded installation hole of the motor. Each motor is fixed by four sets of bolts.
3. Tighten the bolt (5) clockwise with a 13 mm socket wrench to a tightening torque of 10-15 N•m (7~11 Ft-lbs). Motor installation is complete.
4. Refer to the reverse operation steps of motor removal, install the blade, tighten the wiring harness fixing bolts, and install the three-phase wire and the hall sensor harness of the blade controller.

NOTE:

- The removal and installation steps for the two 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 wire plug into the blade motor, do not reverse the correspondence between the motor (left and right) in each position and the blade controller (left and right).

4.3 Anti-Scalp Wheel

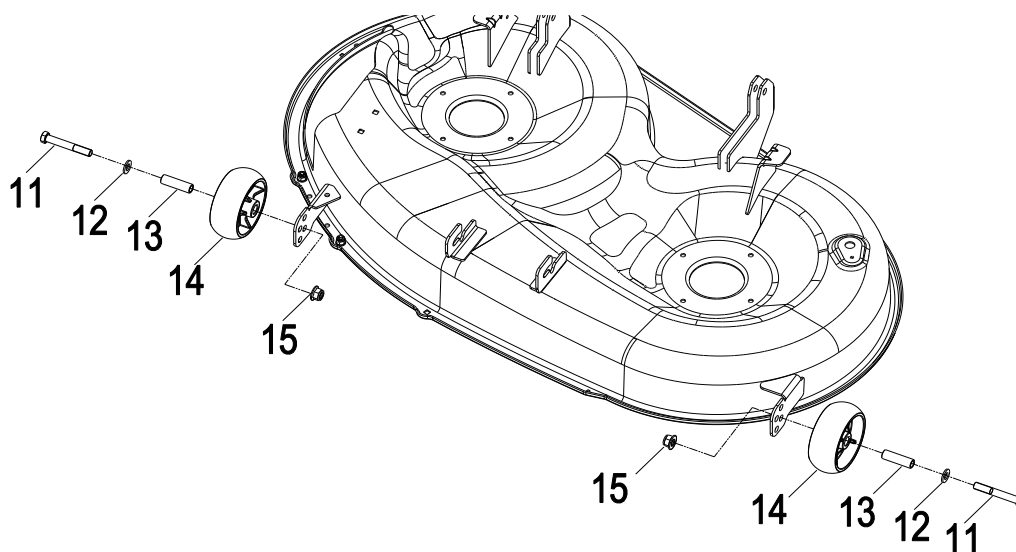


Fig. 4

- | | |
|-------------------------|---------------------|
| 3. Hex head bolt M12×80 | 6. Anti-scalp wheel |
| 4. Flat washer, Φ12 | 7. Locking nut M12 |
| 5. Roller sleeve | |

Removal:

1. Use two 18 mm sockets wrenches to loosen the bolts (11) and nuts (15).
2. Pull out the bolts (11).
3. Remove the flat washer (12), the roller wheel (14), and the roller sleeve (13) from the deck weldment.

Installation:

1. Install the sleeve (13) into the inner hole of the roller (14) and put them into the installation gap for deck, with the mounting holes aligned.
2. Insert the bolt (11) through the mounting holes of the flat washer (12), the roller sleeve (13) and the deck in order, then tighten the nut (15).
3. Use two 18 mm socket wrenches to tighten the bolts (11) and nuts (15) with a tightening torque of 45-50 N•m (33~37 Ft-lbs). The roller (14) can then rotate freely, while the sleeve (13) cannot.
4. The installation is complete.

NOTE:

- The removal and installation steps for the two anti-scalp wheels are the same.
- The installation direction for the bolts of the two rollers is shown in the figure. The nuts (15) on both sides are located on the inside of the deck.
- Upon installation, check if the rollers can rotate freely and smoothly.

4.4 Cutting Height Adjustment

Before adjusting the height of the blade, make sure that the tire pressure meets the standards below.

Rear wheels	Front wheels
8-10 PSI	24-26 PSI

4.4.1 Deck Levelling

1. Drive the machine to a level ground, put the deck height adjustment lever in the lowest position, which is 1.5-inch position hole (as shown in Fig.5 below).
2. Use an 18 mm open-end wrench to loosen the two adjusting nuts at the upper end of the height adjustment rod.
3. Loosen the hexagon flange nut (17) and adjust the end nut (16) and the nut (18): clockwise to lift and counterclockwise to lower the blades.
4. Use a tape measure to measure the clearance above the ground at the four corners of the deck (A, B, C, D in Fig.5)
5. Use two 18 mm open-end wrenches to roughly adjust the two nuts (16) and (18) to lift A, B, C, and D off the ground at roughly the same height.
6. The rear two positions (B, D) are allowed to be slightly higher than the front two positions (A, C), with a height difference no more than 5 mm. The height difference between the left and right positions A, B and C, D shall be less than 2 mm. The deck can be regarded as levelled within such standard.

NOTE:

After the deck is preliminarily levelled, do not immediately tighten the adjusting nut (17).

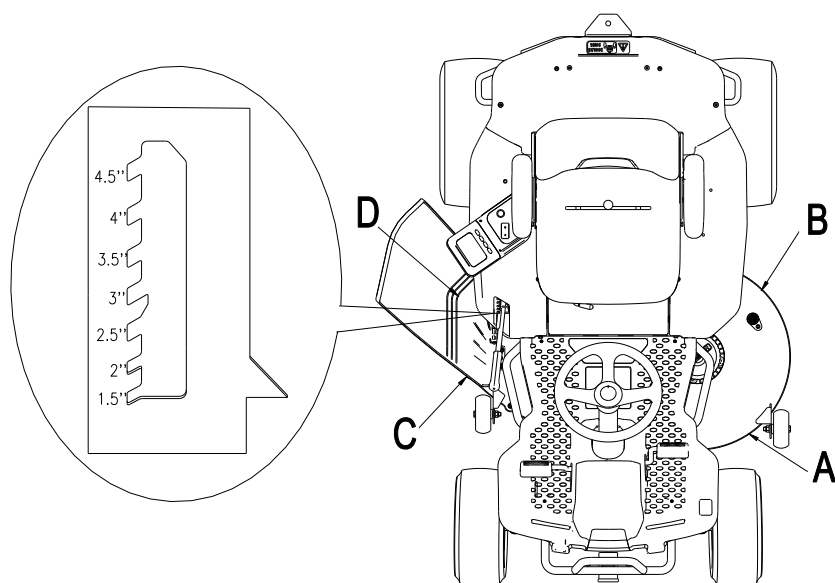


Fig. 5

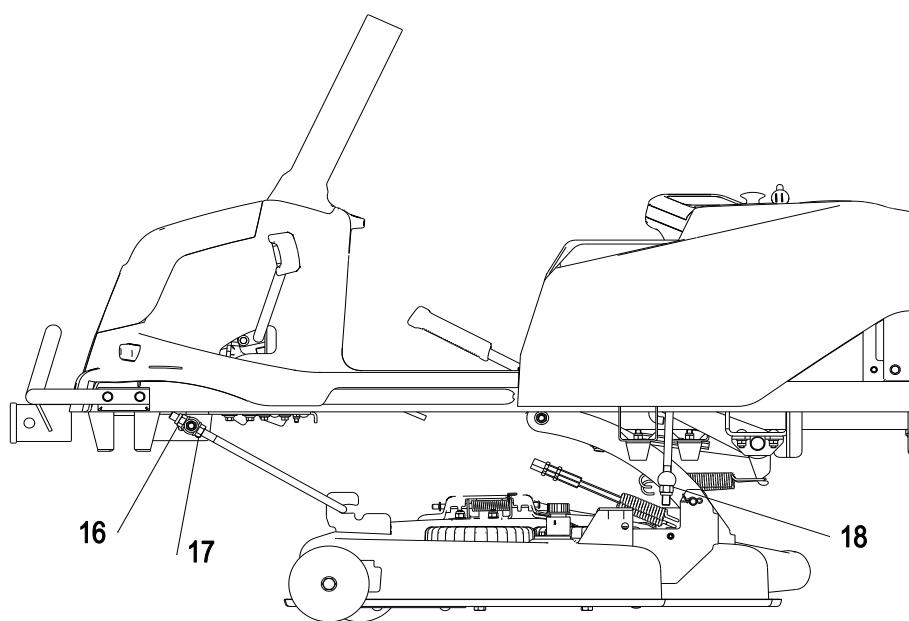


Fig. 6

- | | |
|-------------------------------|------------------------|
| 1. Hex flange locking nut M12 | 3. Hex locking nut M12 |
| 2. Hex flange nut M12 | |

4.4.2 Deck Height Adjustment

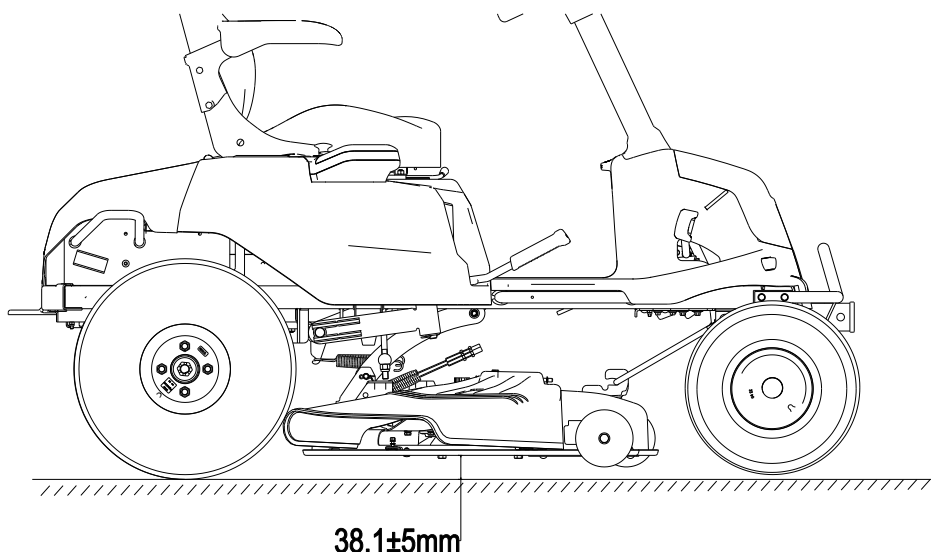


Fig.7

After the preliminary levelling of the deck is completed, adjust the height of the blade.

At this point, the blade needs to have a theoretical clearance of 1.5 inches (38.1±5 mm) above the ground (as shown in Fig.7).

Use a tape measure to measure the clearance of the right blade tip above the ground on the right side around the grass discharge chute. A clearance within the range of 38.1±5 mm is appropriate. If not, use the steps below to adjust the height of the blade.

Adjust the Blade Height:

1. Loosen the nut (17), then adjust the nuts (16) and (18): clockwise to lift or counterclockwise to lower the blade.
2. For each adjustment, ensure the direction and rotation of nuts (16) and (18) on four height adjustment rods are same. The height of the blade rises or falls by 1.75 mm per rotation of the nut (16) and (18).
3. Measure and adjust multiple times using the above method until the height of the blade is within the range of 38.1±5 mm.
4. Use two 18 mm open-ended wrenches to tighten the nut (17). When tightening the nut (17), the nut (16) must be kept in place.
5. If the deck is installed with a grass baffle, install the baffle at last. If the deck has no grass baffle, skip this step.

NOTE:

The deck needs to be preliminarily levelled and then raised to ensure the deck is level and the three blades are basically at the same height.

4.5 Mulching

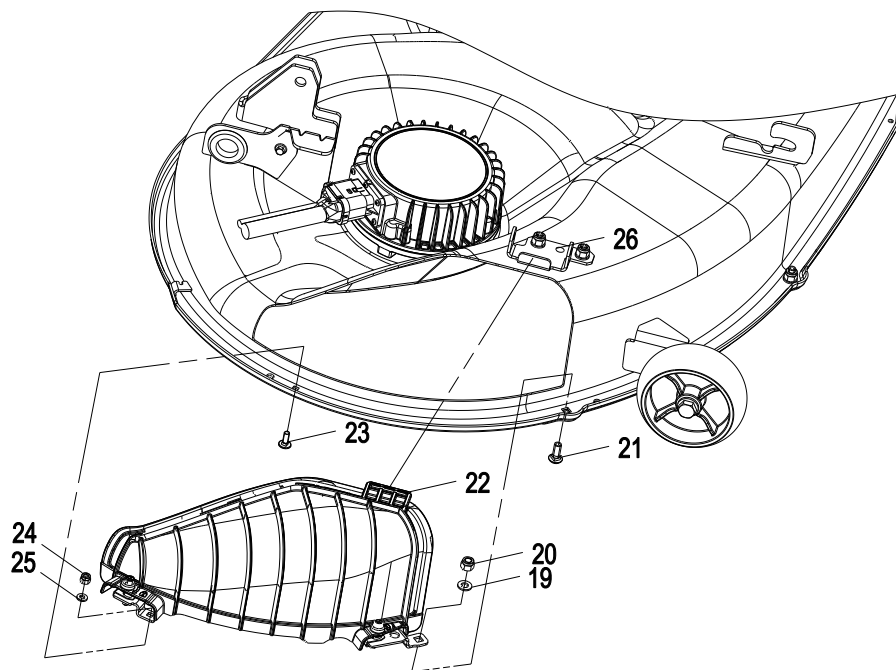


Fig.8

- | | |
|---------------------------|---------------------------|
| 19. Flat washer, $\Phi 8$ | 23. Square neck bolt M6 |
| 20. Locking nut M8 | 24. Locking nut M6 |
| 21. Square neck bolt M8 | 25. Flat washer, $\Phi 6$ |
| 22. Mulching cover | 26. Grass catcher support |

Removal: if the deck is with a mulching

1. Use a 13 mm open-end wrench to remove the locking nut (20) counterclockwise and the washer (19) and the bolt (21) altogether.
2. Use a 10 mm open-end wrench to remove the locking nut (24) counterclockwise and the washer (25) and the bolt (23) altogether.
3. Remove the mulching (22) from the grass catcher support (26).

NOTE:

If no mulching is installed, skip this step.

4.6 Discharge Chute

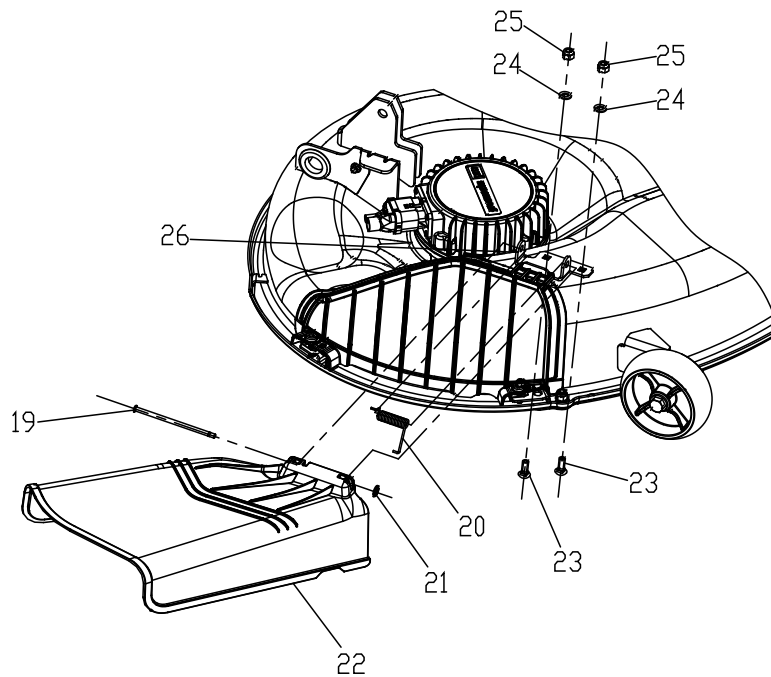


Fig.9

19.	Fixing pin	23.	Square neck bolt M8×20
20.	Torsion spring	24.	Flat washer Φ8
21.	Bearing clip	25.	Nut M8
22.	Discharge chute	26.	Discharge chute support

Removal:

1. Hold bolt (23) with hand, use a 13 mm socket to loosen the nut (25), then remove bolt (23) and washer (24).
2. Remove the discharge chute (22) and the discharge chute support (26) altogether.
3. Remove the bearing clip (21) and pull out the fixing pin (19).
4. Remove the torsion spring (20), the discharge chute support (26) and the discharge chute (22).

Installation:

1. Put the torsion spring (20) in the middle of the discharge chute support (26).
2. Put the discharge chute (22) on the support (26) and align the holes.
3. Pass the fixing pin (19) through the aligned holes and insert the bearing clip (21).
4. Use the bot (23)), the flat washer (24), and the nut (25) to fasten the support (26), with a fastening torque of 15-20 N•m (11~15 Ft-lbs).

NOTE:

If no discharge chute is installed, skip this step.

5. Operation Components

5.1 Switch Panel and USB

Installation:

1. Install the switches and display screen onto the panel correspondingly as shown in Fig.1.
2. PTO switch (1) corresponds to the connector (8) as shown in Fig.2.
3. The display screen (2) corresponds to the connector (9).
4. Key switch (3) corresponds to the connector (11).
5. Reverse mowing button (4) corresponds to the connector (12).
6. The D/R switch (5) corresponds to the connector (7), as shown in Fig.2.

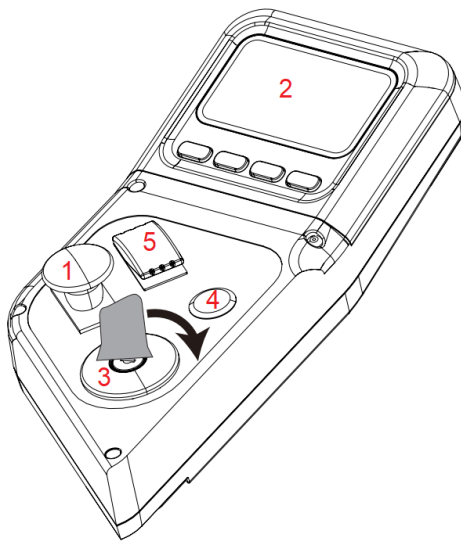


Fig.1

- | | |
|-------------------|--------------------------|
| 1. PTO switch | 4. Reverse mowing button |
| 2. Display screen | 5. D/R switch |
| 3. Key switch | |



Fig.2

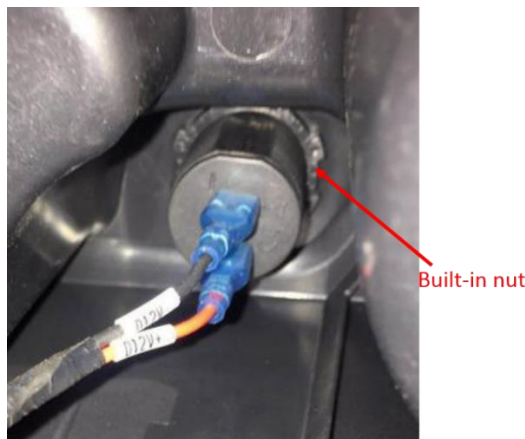


Fig.3

Removal:

1. As shown in Fig. 4, use a T15 screwdriver to remove the bolt (16) counterclockwise and pull out all connectors as shown in Fig. 2. The entire switch panel is now separated from the right enclosure (15).
2. As shown in Fig. 3, connect the black wire with USB (14) negative terminal and the red wire with positive terminal.
3. Pull all plugs in sequence and remove USB (14) built-in nut counterclockwise.
4. Remove the USB from the left enclosure (13).

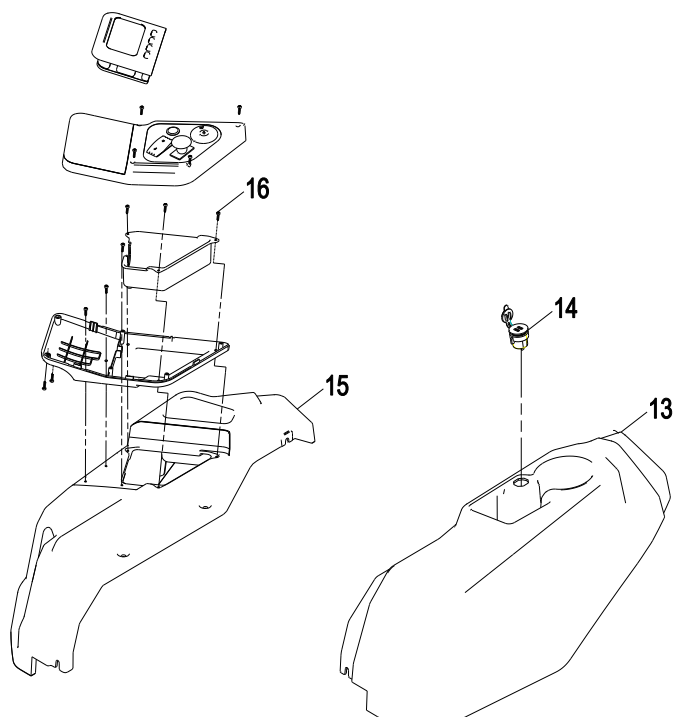


Fig. 4

- | | |
|--------------------|---------------------|
| 13. Left enclosure | 15. Right enclosure |
| 14. USB | 16. Screw, Hex M6 |

5.2 Control Components

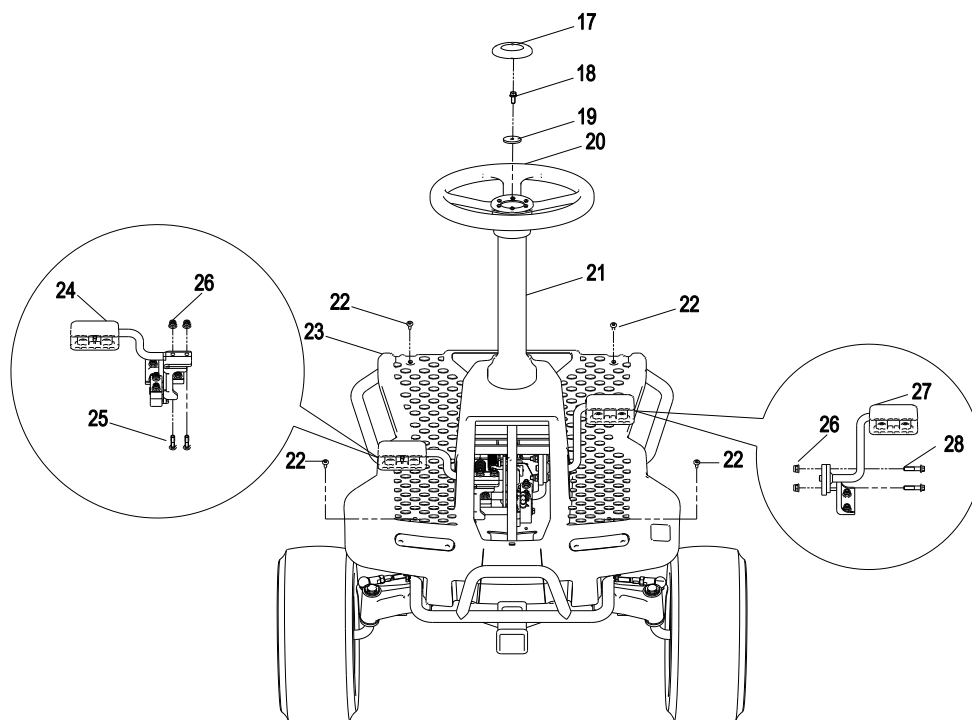


Fig. 5

- | | |
|--|----------------------------|
| 17. Middle cover | 23. Pedal |
| 18. Sems bolt M8 | 24. Throttle pedal |
| 19. Large washer, Grade A | 25. Bolt M8 |
| 20. Steering wheel | 26. Spring washer Φ 8 |
| 21. Steering column cover | 27. Brake pedal |
| 22. Hexalobular socket wrench pan head screw | 28. Bolt M8 |

Removal:

1. Open the middle cover (17).
2. Use a 13 mm socket wrench to loosen the sems bolt (18) counterclockwise and remove the bolt (18).
3. Remove washer (19).
4. Pull out the steering wheel (20) upward.
5. Remove the steering column cover (21).
6. Use a 13 mm socket wrench to loosen the bolt (26) counterclockwise and remove throttle pedal (24).
7. Use a 13 mm socket wrench to loosen the bolt (28) counterclockwise and meanwhile, use a 13 mm open-end wrench to tighten the nut (26).
8. Remove the brake pedal (27).
9. Use a T30 screwdriver to loosen four bolts (22) counterclockwise and remove the pedal (23). Now you can see the operating components as shown in Fig. 6.

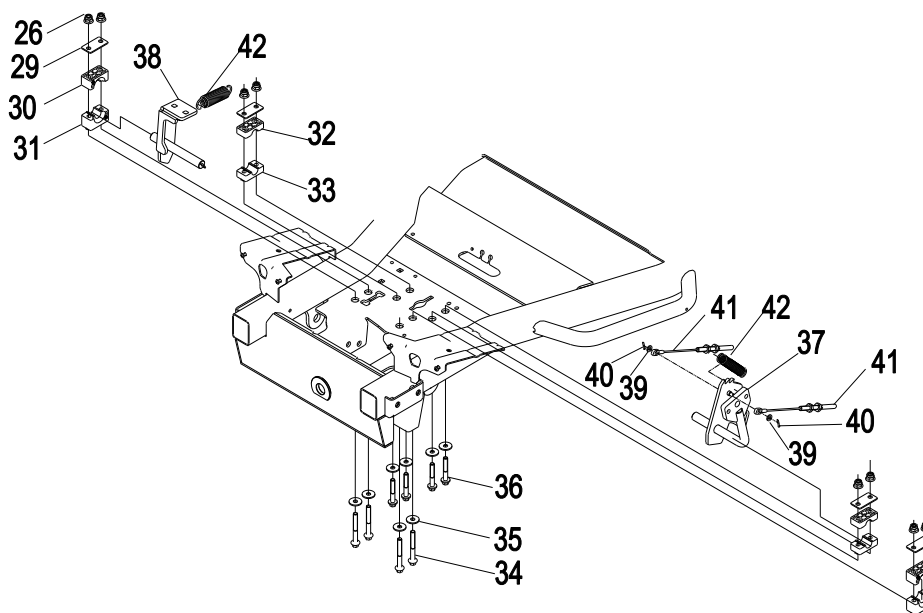
Installation:

Fig. 6

29. Holddown plate	36. Bolt M8
30. Upper plate	37. Rear shaft weldment
31. Bottom holder	38. Pedal weldment
32. Upper support	39. Flat gasket $\Phi 6$
33. Lower support	40. Cotter pin
34. Bolt M8	41. Brake cable
35. Washer $\Phi 8$	42. Brake retracting spring

1. Apply lubrication inside the arcs of both the bottom holder (31) and the upper plate (30).
2. While holding the nut (26) and the holddown plate (29) in place using a 13 mm open-end wrench, use a 13 mm socket to fasten the bolts (34, 35) by rotating clockwise.
3. Secure the side supports of the pedal (38) on the vehicle chassis and connect the brake retracting spring (42).
4. Apply lubrication inside the arcs of both supports (32, 33).
5. While holding the nut (26) and the holddown plate (29) in place using a 13 mm open-end wrench, use a 13 mm socket to fasten the sems bolt (36, 35) by rotating clockwise.
6. Secure the side supports of the rear shaft weldment (37).
7. Manually rotate the pedal welding (37) and make sure it rotates smoothly.
8. Connect the brake retracting spring (42) and the brake cable (41).
9. Use the flat gasket (39) and the cotter pin (40) to secure the brake cable.

5.3 Steering Adjustment

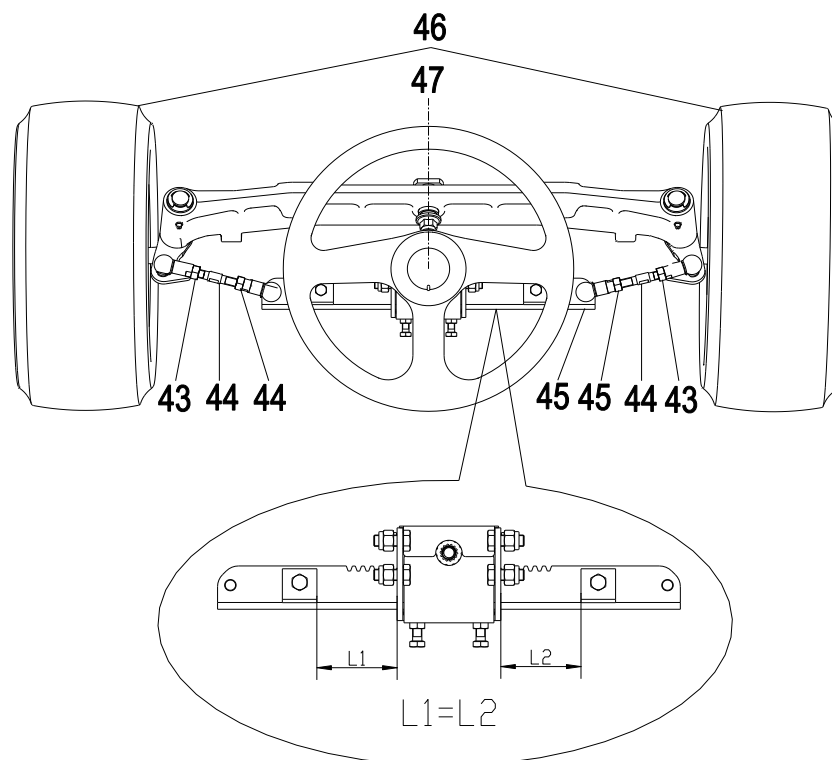


Fig. 7

43. Nut M10	46. Front wheel
44. Steering adjustment lever	47. Steering wheel
45. Nut M10	48. Gear rack

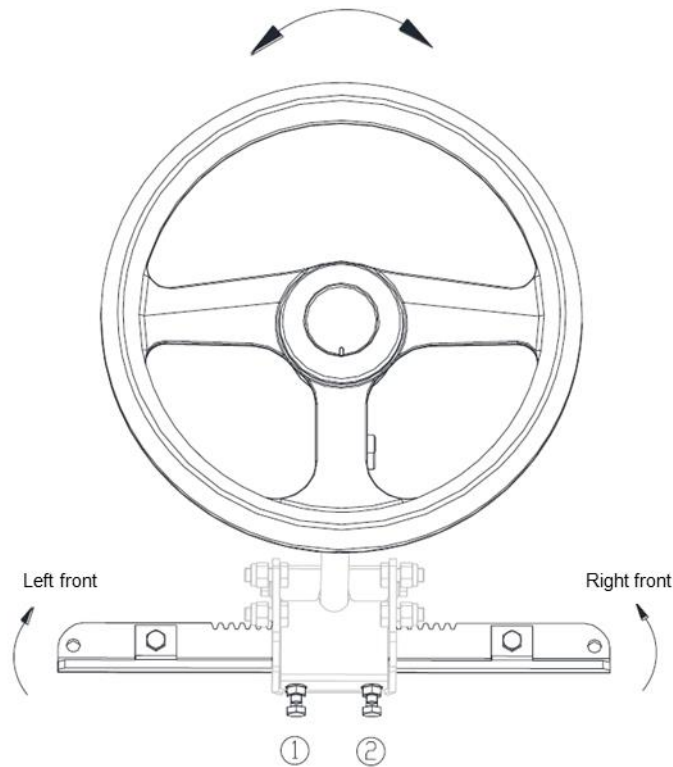
Adjustment:

1. Adjust the gear rack (48) to a middle position to make sure that the length of the left and right are equal ($L1=L2$ in Fig. 7)
2. Before installation, turn the steering wheel (47) to the position shown in Fig. 7.
3. If left and right front wheels (46) are not in the straight-ahead position, keep the steering wheel (47) in a fixed position and regulate the steering adjustment lever (44) to correct the direction of tires.
4. Taking the left front wheel for example, under the conditions that the gear rack is in the middle position and $L1=L2$, if it shows a leftward deviation when the steering wheel (47) turns to the position shown in Fig. 7, you need to use a 10 mm open-end wrench to secure the steering adjustment lever (44) while loosening the nuts (43) and (45) with a 16 mm open-end wrench.
5. Keep the steering wheel (47) in a fixed direction and rotate the steering adjustment lever (44) to regulate the left front wheel back to the straight-ahead direction.
6. Use a 10 mm open-end wrench to keep the steering adjustment lever (44) in fixed position (now, the lever cannot be rotated), use a 16 mm open-end wrench to loosen the nuts (43) and (45).

NOTE:

Repeat above steps to adjust the direction of the right front wheel.

5.4 Gear Rack Clearance Adjustment



Adjustment:

1. Rotate the steering wheel clockwise, if the gear rack tilts in left front direction, you need to adjust the bolt and nut in position ①.
2. Use a 13 mm open-end wrench to tighten the bolt in position ① while using a 13 mm open-end wrench to loosen the nut in position ① at the same time.
3. Rotate the bolt in position ① forward to eliminate the clearance of the gear rack.
4. Rotate the steering wheel counterclockwise, if the gear rack tilts in right front direction, tighten the bolt in position ② to adjust the clearance (same as left side adjustment).
5. After the adjustment is complete, make sure the steering wheel rotates smoothly and the clearance is appropriate.
6. Tighten the nut in position ①/② (use a 13 mm open-end wrench to keep the bolt of position ①/② in fixed position while using a 13 mm open-end wrench to tighten the nut in position ①/② at the same time).

5.5 Parking and Braking Adjustment

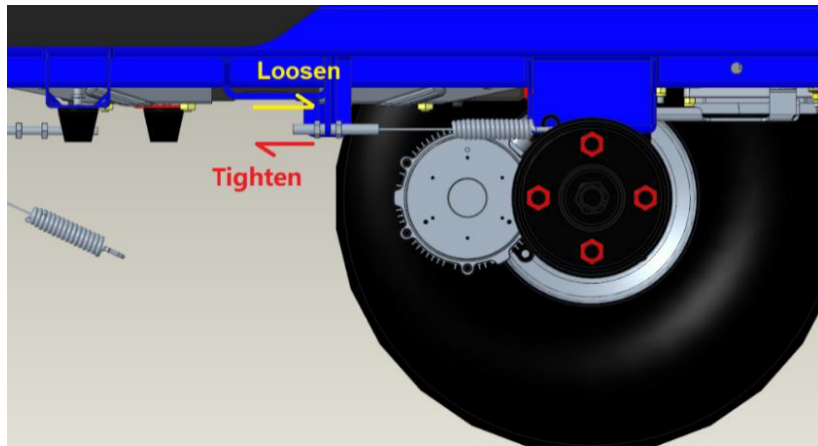


Fig. 8

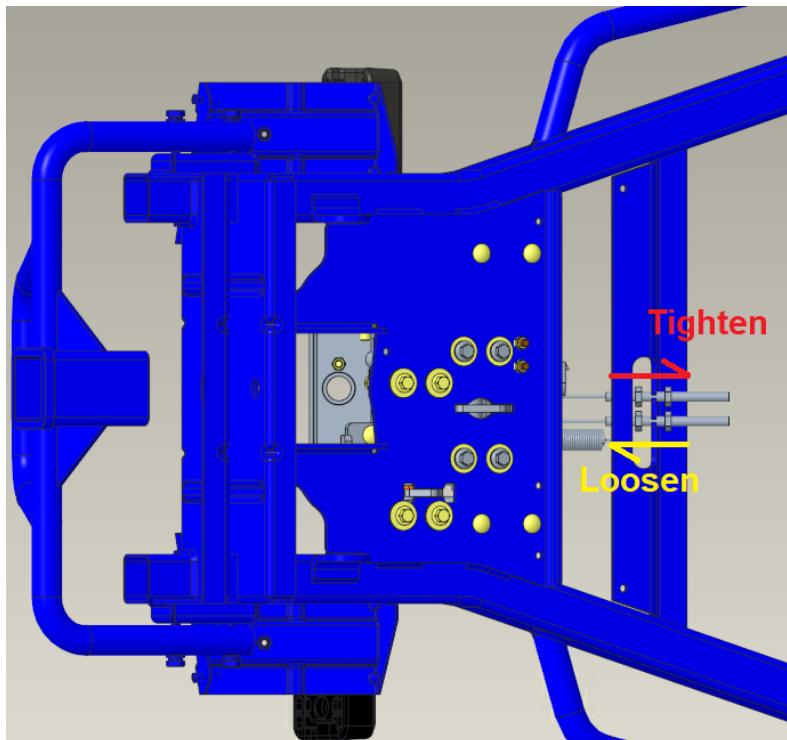


Fig. 9

1. As shown in Fig. 10, step on the brake pedal (49) and push down the parking lever (50). If the vehicle still moves down along the ramp, you need to move the vehicle to a level ground.
2. As direction shown in Fig. 8, use a 14 mm open-end wrench to rotate the nut behind the brake cable backwards for a distance of 2 mm and pull the cable forwards for a distance of 2 mm.
3. Tighten the nuts at both ends.
4. If there is no adjusting stroke available for the cable thread as shown in Fig. 8, alternatively adjust as direction shown in Fig. 9.

5. Rotate the nut in the front of the vehicle forwards for a distance of 2 mm and pull the cable backwards for a distance of 2 mm.
6. Tighten the nuts at both ends.
7. After adjusting the cable on a level ground, move the vehicle to a 16.7° ramp, for parking operation.
8. If the parking fails again, repeat the adjustment above, until you can successfully park on the ramp.

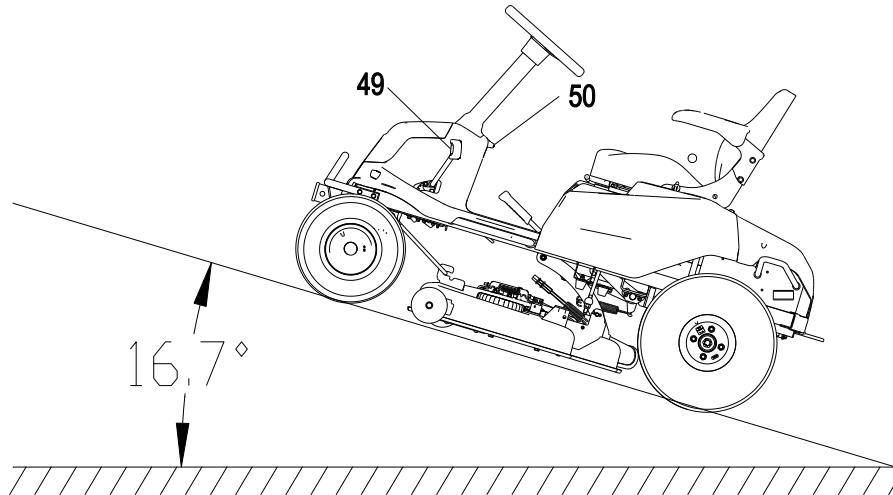


Fig. 10

49. Brake pedal

50. Parking lever

9. Move the vehicle onto a 16.7° ramp.
 10. Step on the brake pedal (49), and push the parking lever (50) down.
 11. Keep the parking lever (50) pushed down and release the braking pedal (49).
- If the vehicle does not move down along the ramp, it means that the parking is effective.

5.6 Potentiometer Voltage Adjustment



Fig. 11

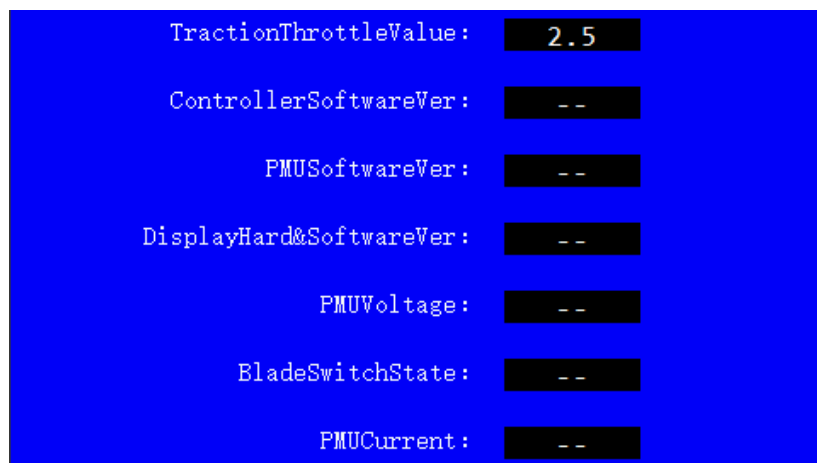


Fig. 12

1. Turn on the vehicle main power and make sure that the control levers are in the middle position and open status.



2. Press and hold the buttons ( and ) for more than 3 seconds, as shown in Fig.11. Then will enter the system management interface.
3. The voltage value displayed in the screen, as shown in Fig.12. The values in the first row represent the voltage of potentiometers. Please refer to the data in the following table for adjustment.

Accelerator Position	Initial	Rearmost
Standard range of the voltage	0.7-1.0 V	4.6-4.9 V

6. Seat and Battery Compartment

6.1 Seat

Removal:

1. Turn the seat with the seat pan forwards until the seat fall onto the steering wheel.
2. Pull out the protective cover (3).
3. Use a 13 mm socket wrench to loosen the nut (2) counterclockwise and remove the flat washer (1). All four groups shall be dismantled.
4. Pull out the seat switch connector as shown in Fig. 2.
5. Remove the seat from the retaining plate.

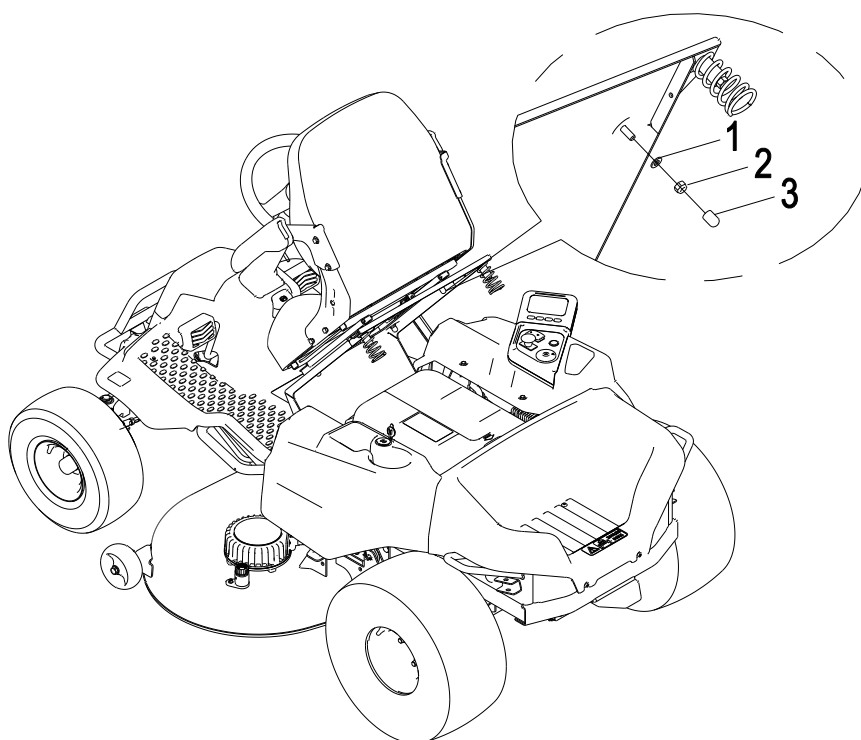


Fig.1

- | | |
|-----------------------------|---------------------|
| 1. Flat washer Φ 8 | 3. Protective cover |
| 2. 5/16-18 self-locking nut | |



Fig.2

NOTE:

Before the seat removal, disconnect the connector shown in Fig. 2 to prevent harness or switch damage.

Installation:

1. Align four bolts at the bottom of seat with four mounting holes for the seat mounting plate. Put the seat on the seat pan and roll it forward together with the seat pan.
2. Install the plain washer (1) and use a 13 mm socket wrench to tighten the nut (2) diagonally. Tighten the nut on the other diagonal line.
3. Wrap the nut (2), the plain washer (1) and the exposed part of the seat bolts with the protective cover (3).
4. Properly install the seat switch connector to complete the seat installation.

6.2 Battery Compartment

Before removing the battery compartment, you must remove the cargo bed first.

Removal: cargo bed & battery compartment & battery pack

1. Turn off the vehicle main power.
2. Use a T30 screwdriver to remove the eight binding bolts (Fig.3).
3. Remove the cargo bed of the vehicle.

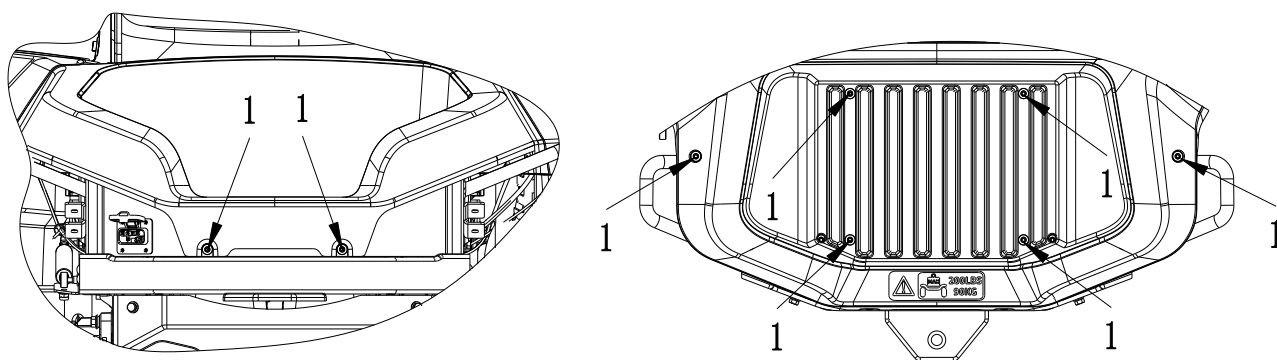
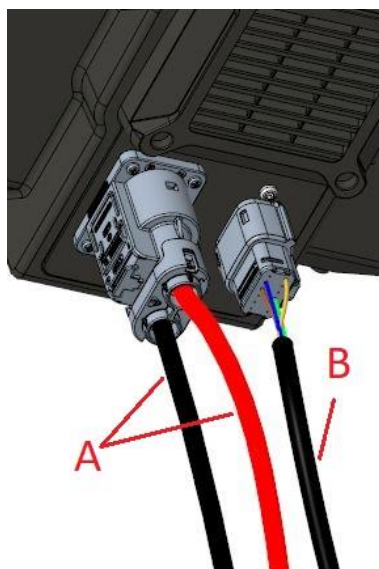


Fig. 3



The battery compartment.

Fig.4

A. Harness - Power

B. Harness - Control & Signal

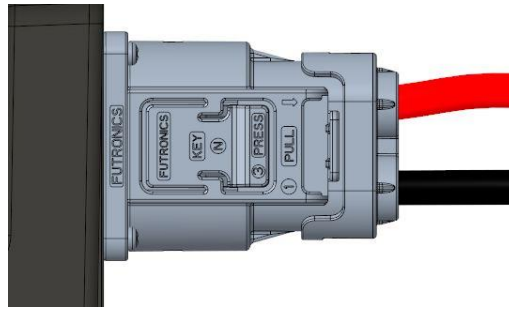


Fig.5-1

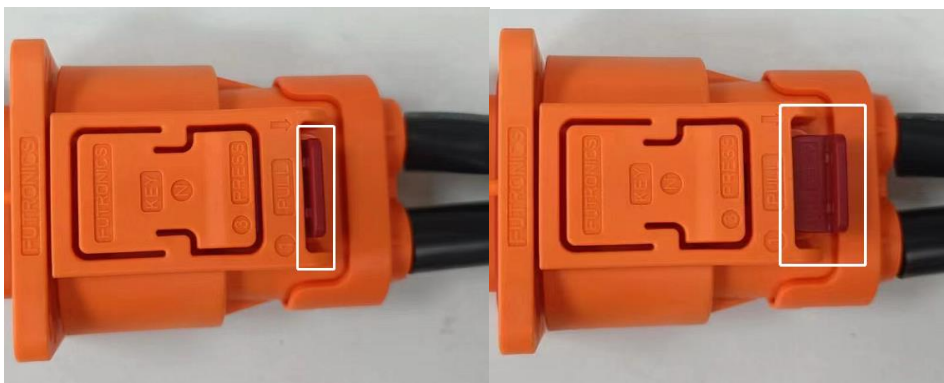


Fig.5-2

Pull back the plug CPA

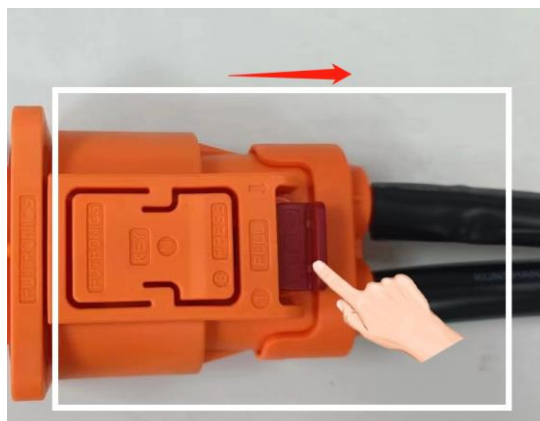


Fig.5-3

Push the CPA down and pull the plug back

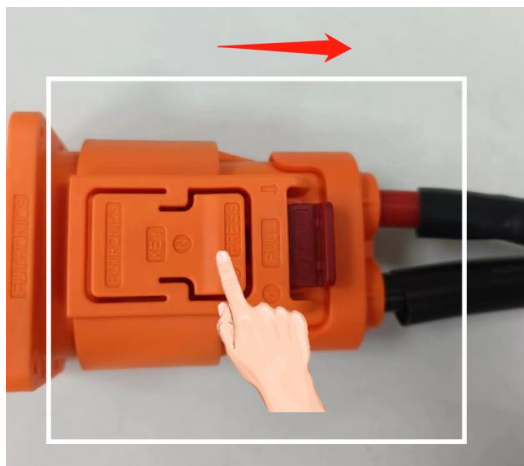


Fig.5-4

Press down the key position and pull out the plug backwards. The plug socket is separated.

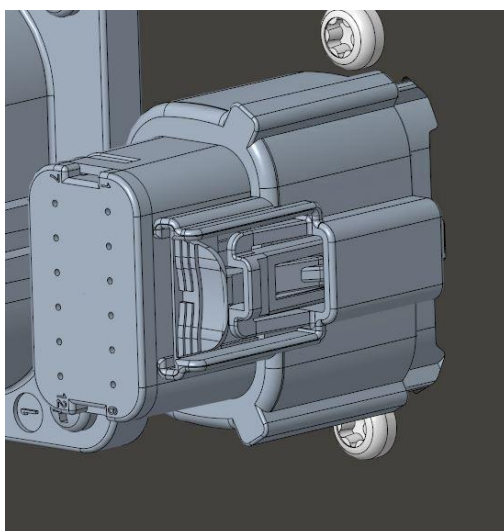


Fig.6-1

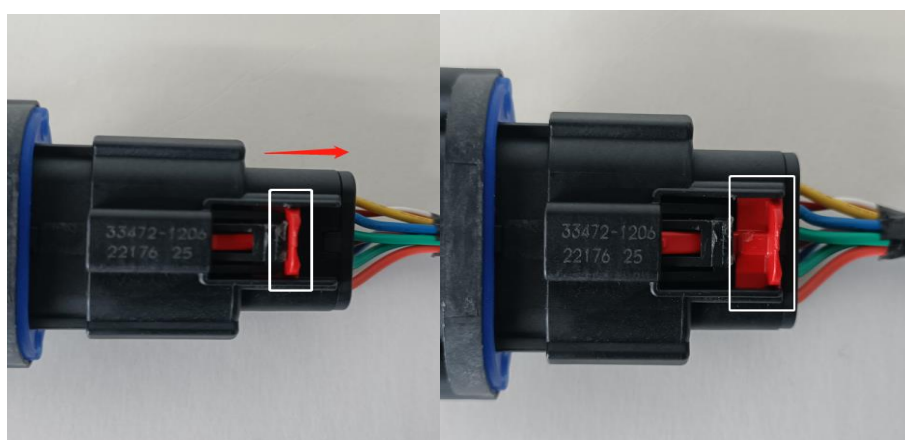


Fig.6-2

Pull back the plug CPA

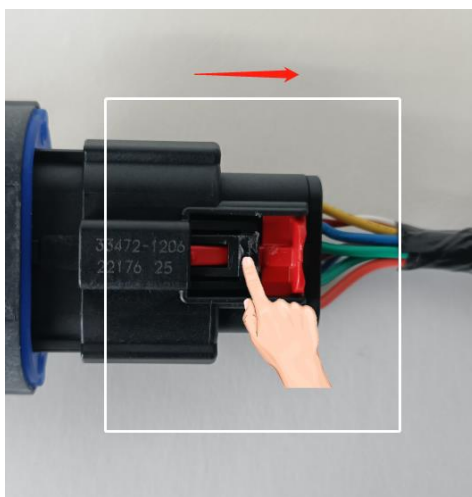


Fig.6-3

Press down the key position and pull out the plug backwards. The plug socket is separate.

4. Remove all the battery packs (3) from the battery compartment (2).
5. Loosen the connector of the harness (A) as shown in Fig.4 and Fig.5).
6. Loosen the connector of the harness (B) as shown in Fig.4 and Fig.6).
7. Use a 13 mm socket to loosen the four nuts (1) in Fig.7 by rotating counterclockwise and remove them.
8. Remove the battery compartment from the vehicle.

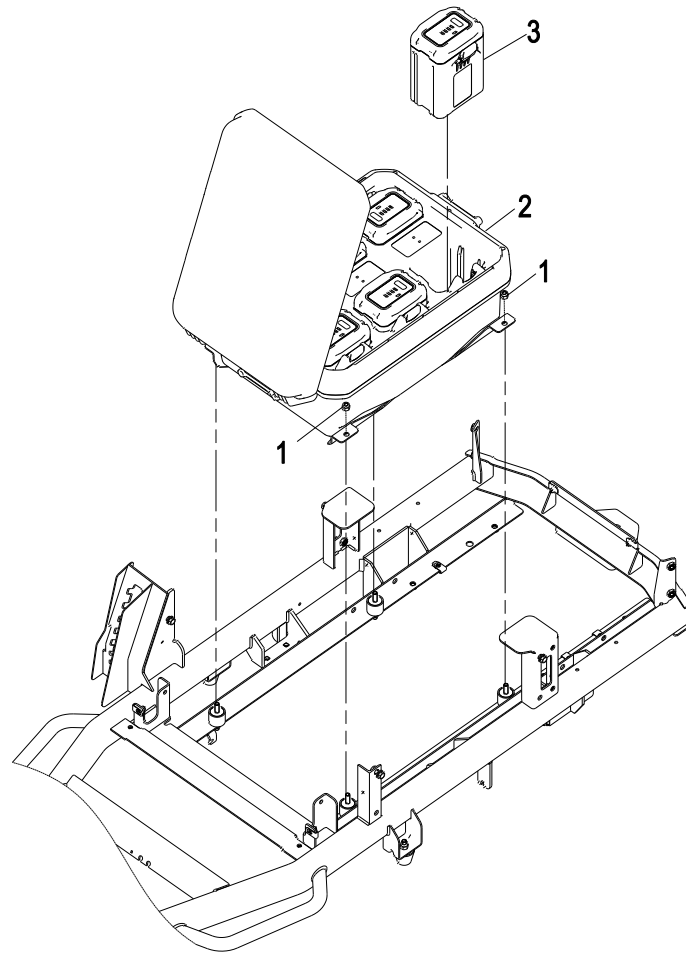


Fig. 7

- | | |
|------------------------|-----------------|
| 1. Nut M8 | 3. Battery pack |
| 2. Battery compartment | |

Installation:

1. Align the four mounting holes of the support beneath the battery compartment (2) with the four studs on the vehicle rubber pad.
2. Using a 13 mm socket wrench, tighten the nuts (1) to the rubber pad by rotating clockwise.
3. Install A, B connectors in Fig.4 to the battery compartment (2).
4. Put the battery pack (3) into the battery compartment (2).
5. Close the cover of the battery compartment (2) and turn the seat over to its original position.
6. Mount the cargo bed onto the frame with a T30 screwdriver and eight M6 hexagon socket fancy pan head screws at eight positions as marked in red circles in Fig.3.

7. Controllers and Other Components

7.1 Controller

Removal:

1. Remove the cargo bed first as described in **6.2**.
2. Power off the vehicle.
3. Use a T30 screwdriver to loosen and remove all four hexalobular socket pan head screws (3) counterclockwise.
4. Dismantle the mounting plate (4).
5. Use an Allen wrench (tip size 6 mm) to loosen and remove all four hexagon socket head cap screws (2) counterclockwise, and loosen all terminals on the controller.
6. Remove the controller (1).

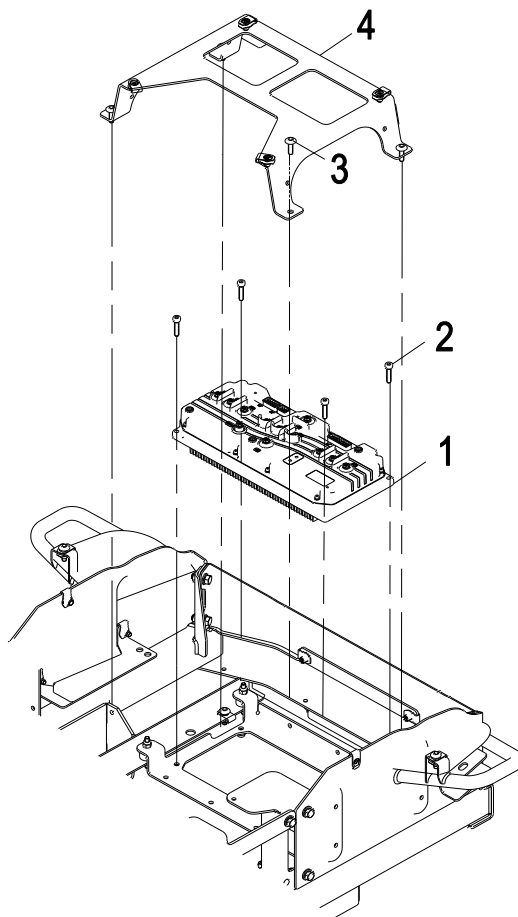


Fig. 1

- | | |
|----------------------|---------------------------|
| 1. 3-in-1 controller | 3. Hex pan head screw, M6 |
| 2. Hex screw | 4. Mounting plate |

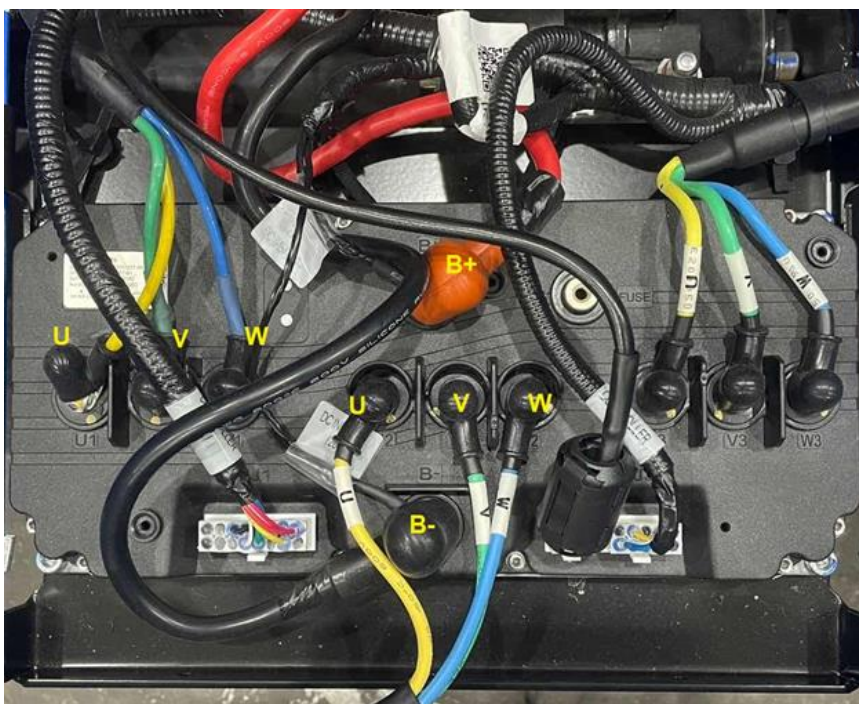
Installation:

Fig. 2

1. As shown in Fig. 2, connect the yellow wire to point U of the drive controller, connect the green wire to point V, the blue wire to point W, the red wire to point B+ and the black wire to point B-.
2. As shown in the steps for drive controller removal above, install in reverse order.
3. Switch on the power source and start the machine to see if the vehicle works properly.

7.2 DC-DC and Antenna

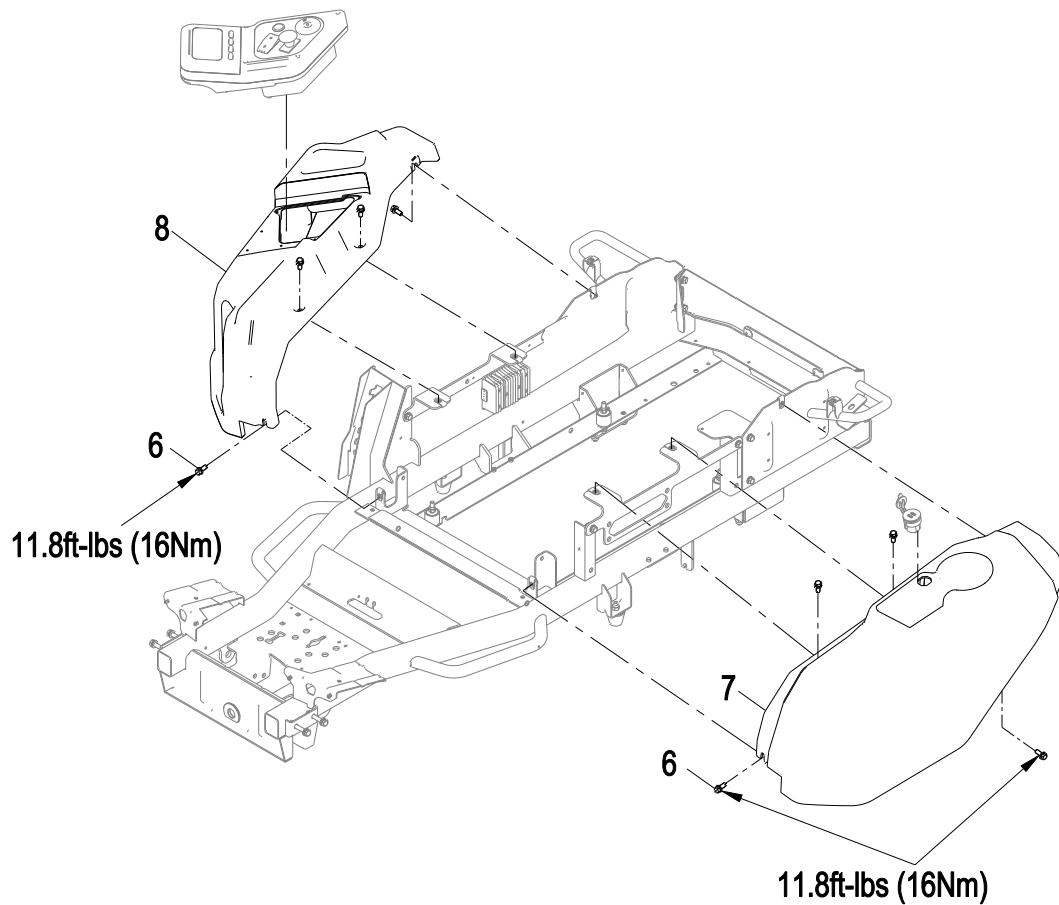


Fig.4

- | | |
|-------------------|--------------------|
| 5. Bolt M8 | 8. Right enclosure |
| 6. Left enclosure | |

Removal:

1. Loosen the assembling bolts (6) (totally 8 bolts for left and right enclosures) counterclockwise with a 13 mm socket wrench.
2. Pull out all harness connectors by referring to the removal steps for the switch panel and USB shown in **5.1** above.
3. Make sure that the harness is not attached to the enclosure components.
4. Remove the left and right enclosures from the frame.
5. DC-DC and antenna is under the right enclosure (8).

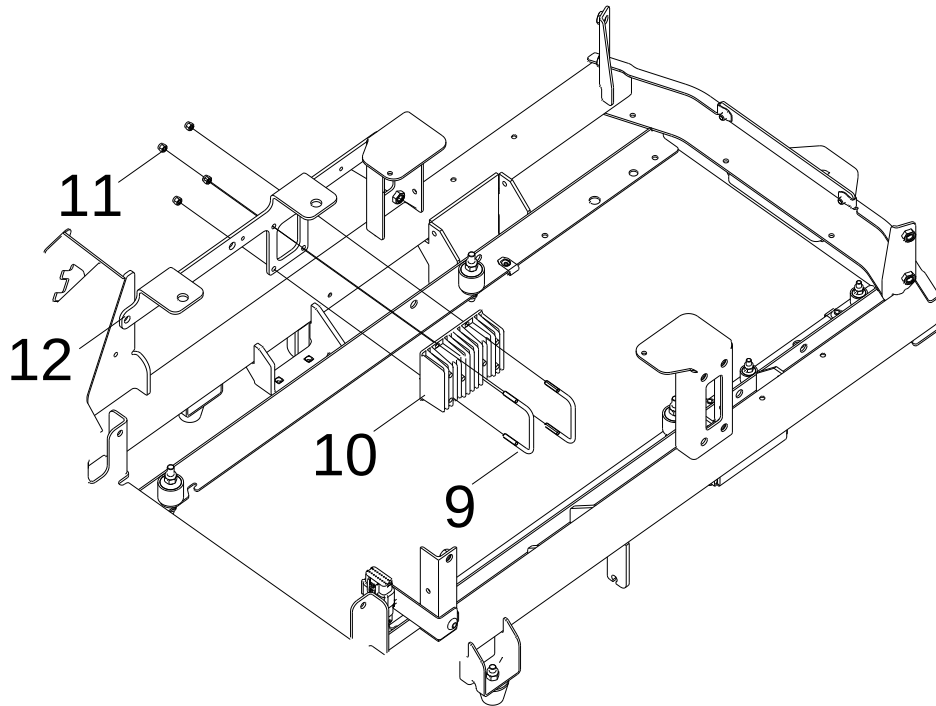


Fig.5

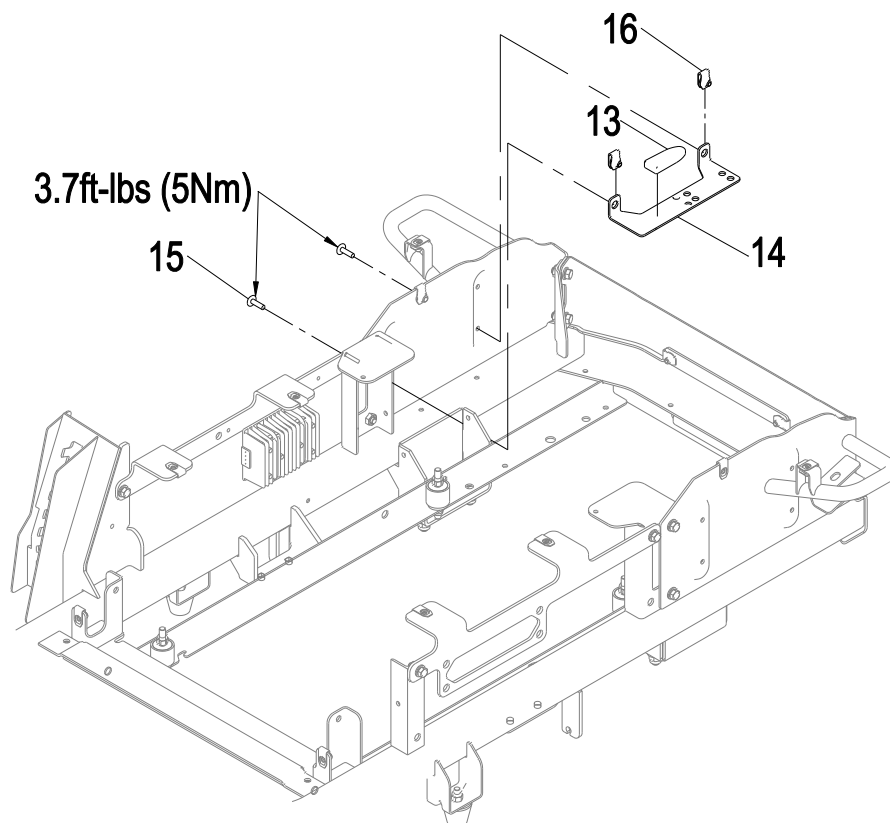
- | | |
|----------------|--------------------|
| 9. Locking rod | 11. Locking nut M5 |
| 10. DC-DC | 12. Mounting plate |

Removal:

1. Disassemble the right enclosure (see 7.2 for detailed steps).
2. Turn off the vehicle main power.
3. Disconnect the connector in the DC power (10).
4. Use an 8 mm socket to loosen the nut (11) by rotating counterclockwise and remove the locking rod (9).
5. Remove the DC power source (10).

Installation:

1. Use the locking rod (9) to install the DC-DC (10) on the mounting plate (12) and align the holes on them.
2. Use an 8 mm socket to fasten the nut (11) to the locking rod (9) with a tightening torque of 5~6 N•m (3.7~4.4 Ft-lbs).
3. Connect all the connectors properly.
4. Install the right enclosure in place (8).



13. Antenna

14. Mounting plate

15. Screw, Torx T30 M6×20

16. Nut, Clip-On M6

Removal:

1. Turn off the vehicle power supply.
2. Remove the switch panel. (**See 5.1 for detailed steps**)
3. Rotate and remove the antenna connector.
4. Peel off the antenna (13) from the mounting plate(14).

Installation:

1. Install the mounting plate (14) and fix with screws (15) and nuts (16).
2. Stick the antenna (13) onto the mounting plate (14).

NOTE: The adhesive is on the back of the antenna.

8. Wheels and Drive Axle

8.1 Front Wheel

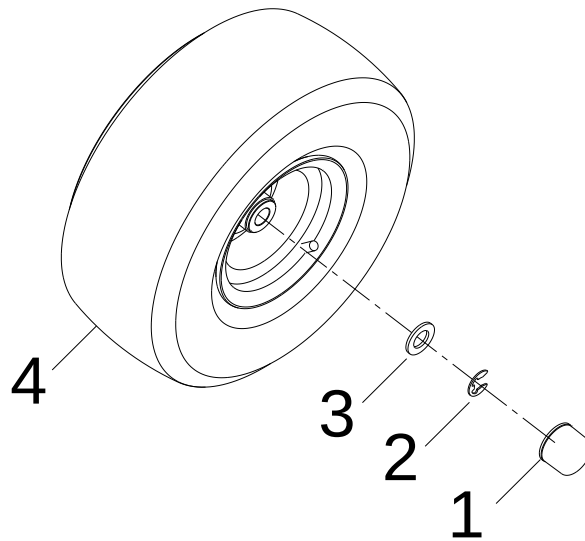


Fig. 1

- | | |
|----------------------|----------------|
| 1. Front wheel cover | 3. Washer |
| 2. E-ring | 4. Front wheel |

Removal:

1. Using a hoisting tool, lift the front end of the vehicle and lift the front wheels off the ground.
2. With protective gloves properly on, pull out the front wheel cover (1).
3. Use a medium-sized slotted screwdriver to insert into the gap of the E-ring (2) and rotate.
4. Remove the E-ring (2).
5. Remove the washer (3).
6. Remove the front wheel assembly (4).
7. Dismantle the other front wheel by repeating the same steps above.

Installation:

1. Make the gas nozzle of the front wheel face outwards and align the central bearing hole with front wheel axle.
2. Install the washer and fix the E-ring.
3. Grease the front wheel with a grease gun until there is grease in the mating hole.
4. Install the front wheel cover.
5. Adjust the pressure of the front wheel installed to 24~26 PSI.

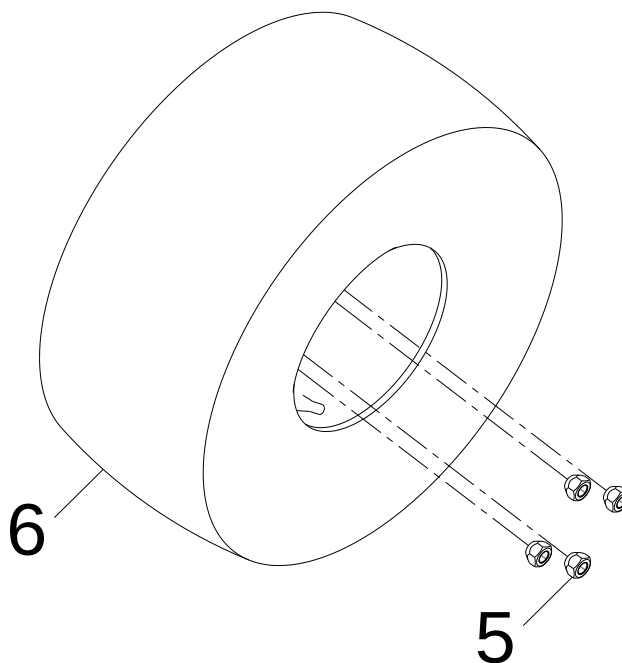
8.2 Rear Wheel

Fig. 2

5. Clamp nut 1/2-2UNF

6. Rear wheel

Removal:

1. Park the vehicle as the steps shown in **5.2 above** (purpose: rear wheel will not run when its clamp nut is loosened).
2. According to Fig. 2, lift the rear end of the vehicle up to a certain height, until the rear wheels are lifted off the ground.
3. Loosen and remove the nut (5) (eight nuts in total for left and right rear wheels) counterclockwise with a 21 mm socket wrench.
4. Upon removal of all nuts, dismantle the rear wheel (6) from the drive axle.

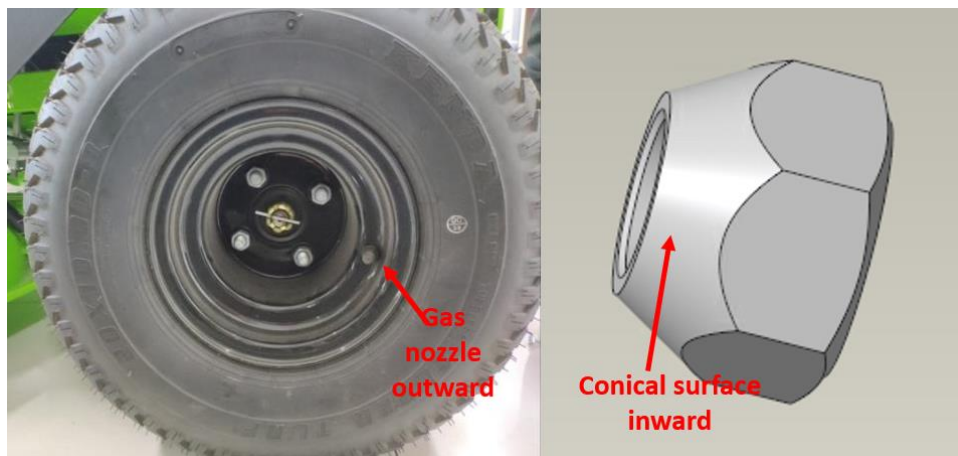


Fig. 3

Installation:

1. Park the vehicle as the steps shown in **5.4 above** (purpose: rear wheel will not run when its clamp nut is tightened).
2. According to Fig. 2, lift the rear end of the vehicle up to a certain height.
3. As shown in Fig. 3, make the gas nozzle of the rear wheel facing outwards and make the conical surface of the clamp nut facing inwards. Tighten the clamp nuts (eight nuts in total for left & right rear wheels) clockwise with a 21 mm socket wrench to the torque of 95 N.m (70 Ft-lbs).
4. Adjust the pressure of the rear wheels installed to 8~10 PSI.

NOTE:

After completing the installation of front and rear wheels by following steps mentioned above, refer to **4.4.3** to adjust the deck again.

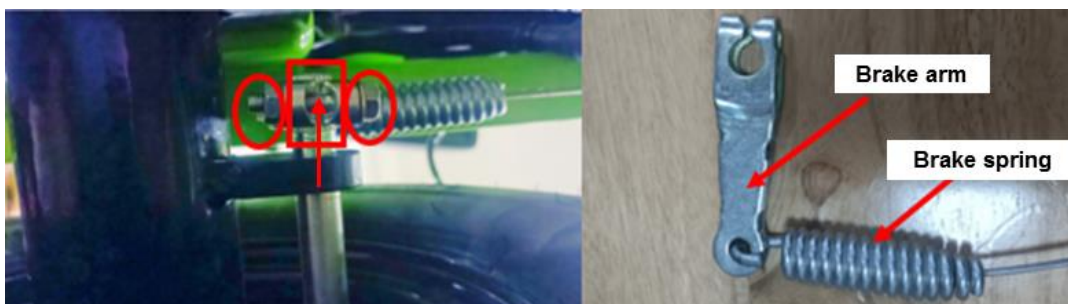
8.3 Drive Axle

Fig.4

Removal:

1. Make a color mark between the brake arm gap and the spline shaft (in red box: make an alignment mark for the arm and the spline shaft, as indicated by the arrow in Fig. 4).
2. Use a 10 mm open-end wrench to fix the bolt in red circles in Fig. 4 while using a 10 mm open-end wrench to loosen the nuts in red circles.
3. Remove the brake spring from the brake arm circle hole.
4. Install and fix the brake arm to the position marked in red box. (**see Fig. 4**)
5. Refer to **7.1** to remove drive controller.
6. Use a 15 mm open-end wrench to tighten the nut (7) in Fig.6. Use a 16 mm socket wrench to remove the bolt (8) by rotating counterclockwise in Fig. 6 (four sets of bolts and nuts in total for front & rear wheels).
7. Lift the frame tail up and rotate the rear wheel.
8. Remove the drive axle from the frame together with the rear wheels.
9. Loosen and remove the nut (5) in Fig.2 (eight nuts in total for left and right rear wheels) counterclockwise with a 21 mm socket wrench.
10. Remove the rear wheels at both sides of the drive axle.

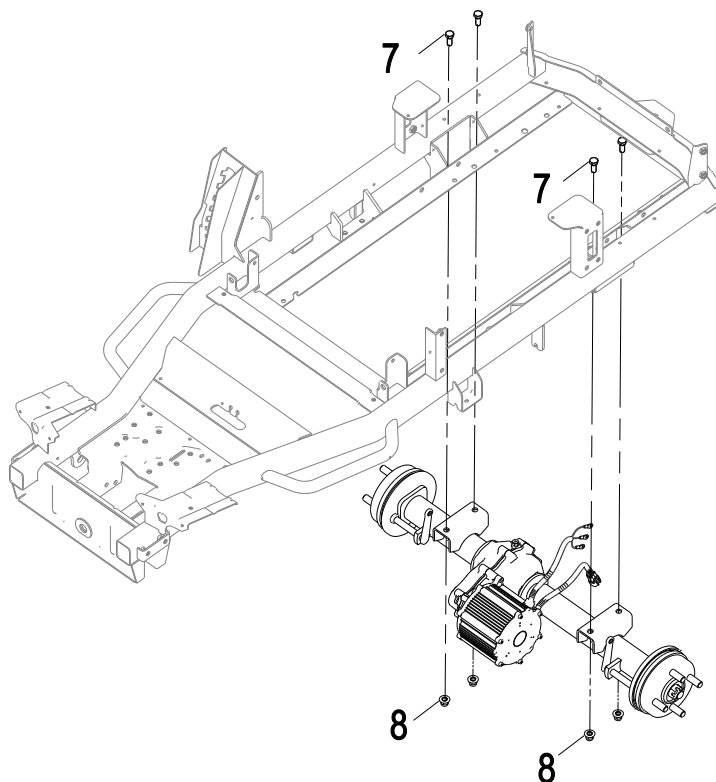


Fig. 6

7. Bolt M10

8. Nut M10

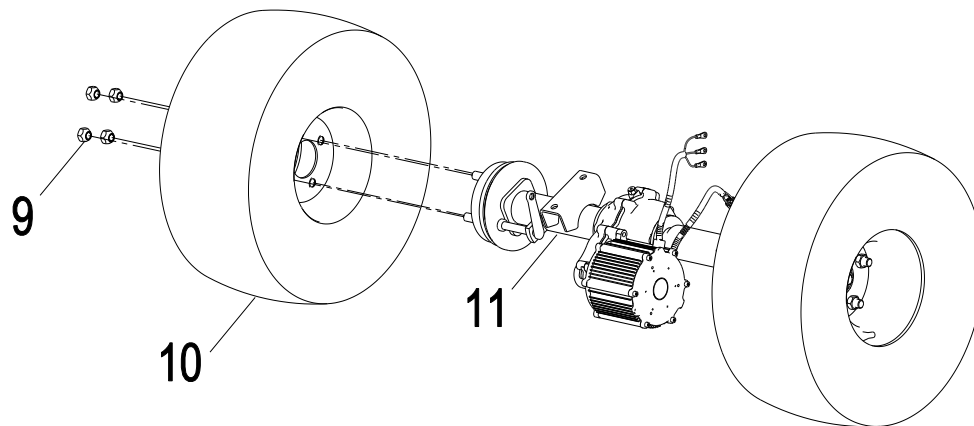
**Installation:**

Fig. 7

- | | |
|--------------------------|----------------|
| 9. Clamp nut 1 / 2-2 UNF | 11. Drive axle |
| 10. Rear wheel | |

1. As shown in Fig. 7, pre-install the rear wheels and drive axle.
2. Fix the rear wheel (10) onto the drive axle (11) with a 21 mm socket wrench and nut (9) to a torque of 95 N.m (70 Ft-lbs).
3. Lift the frame tail up, push the drive axle and rear wheels pre-installed under the frame and make sure that the motor faces forwards.
4. Fix brake spring into mounting hole for brake arm of the drive axle.
5. Fasten four sets of bolts and nuts as shown in Fig. 6 above to a torque of 45 N.m (33 Ft-lbs).
6. Refer to the wiring method shown in Fig. 5 above, install the three-phase terminals and hall sensor connectors.
7. Mount the cargo bed.

8.4 Gearbox Oil Change

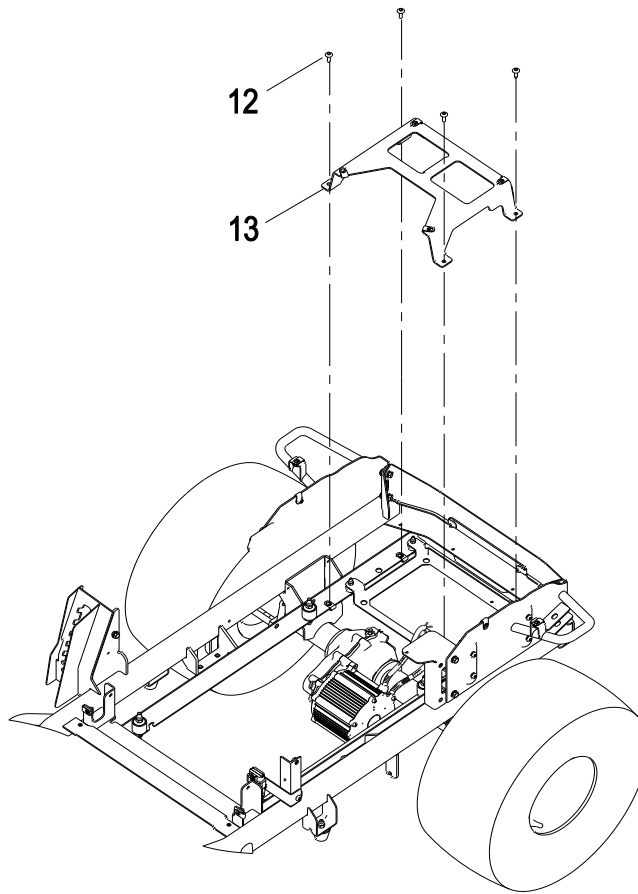


Fig. 8

12. Hexalobular socket pan
head screw

13. Mounting plate

14. Fixing support

1. Remove the cargo by repeating steps in **6.2** for cargo removal.
2. As shown in Fig. 8, use a T30 screwdriver to remove the screw (12).
3. Remove the mounting plate.
4. Pull out the connectors connected to the six connecting ports of the fixing support.
5. Remove the fixing support (14).
6. Now you can see the oil inlet for drive axle.

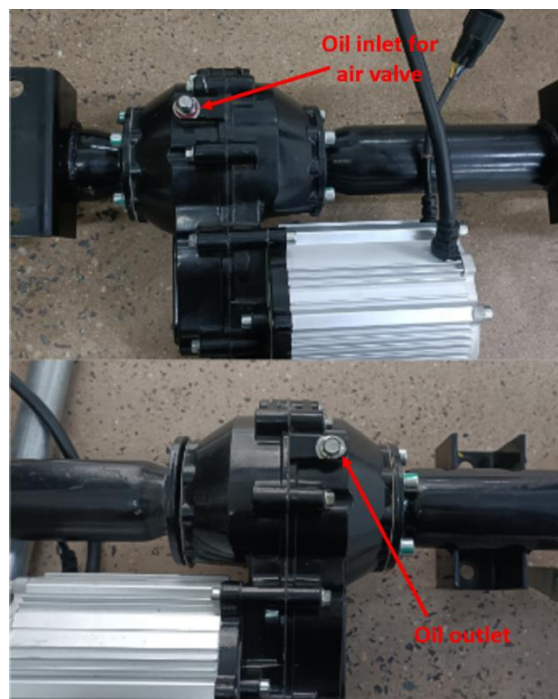


Fig. 9

The gear oil needs to be renewed after a period of time.

First oil change interval for a new vehicle	50 h
Subsequent oil change interval	200 h
Oil specification	SAE85W-140
Oil consumption per gearbox	130 ml (0.14 quarts)

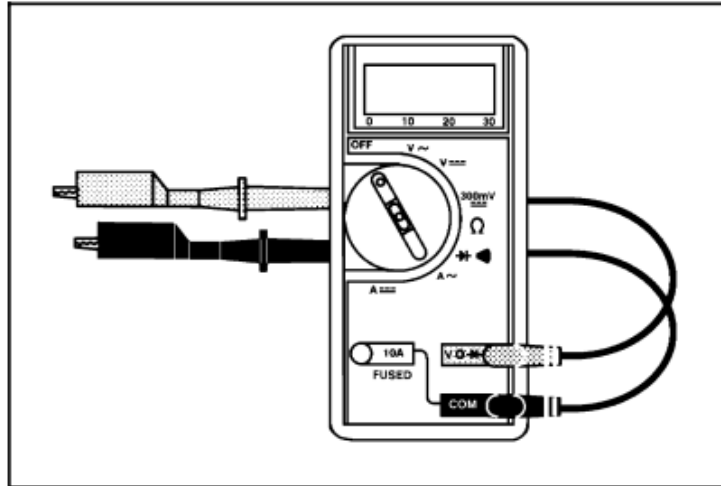
Oil change steps:

1. Remove the bolt of the oil outlet with a 10 mm socket wrench.
2. Remove the bolt of the oil inlet with a 12 mm socket wrench.
3. Discharge all gear oil used in the gearbox.
4. Install the bolt of the oil outlet to a torque of 9 N.m (6.6 Ft-lbs).
5. Add 130 ml (0.14 quarts) gear oil (SAE85W-140) into the oil inlet.

9. Special Tools

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

9.1 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.

9.2 Special Tools

Tools	Cable to Flash Program	Host Computer Program	Remarks
CAN Interface		According to the purpose of each model	ERP: R0203845-00
16-Pin adapter			ERP: R0203075-00

10. Specifications

10.1 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	
		N•m	Ft-lbs	N•m	Ft-lbs	N•m	Ft-lbs
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	
		N•m	Ft-lbs	N•m	Ft-lbs	N•m	Ft-lbs
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	
		N•m	Ft-lbs	N•m	Ft-lbs	N•m	Ft-lbs
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	
		N•m	Ft-lbs	N•m	Ft-lbs	N•m	Ft-lbs
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