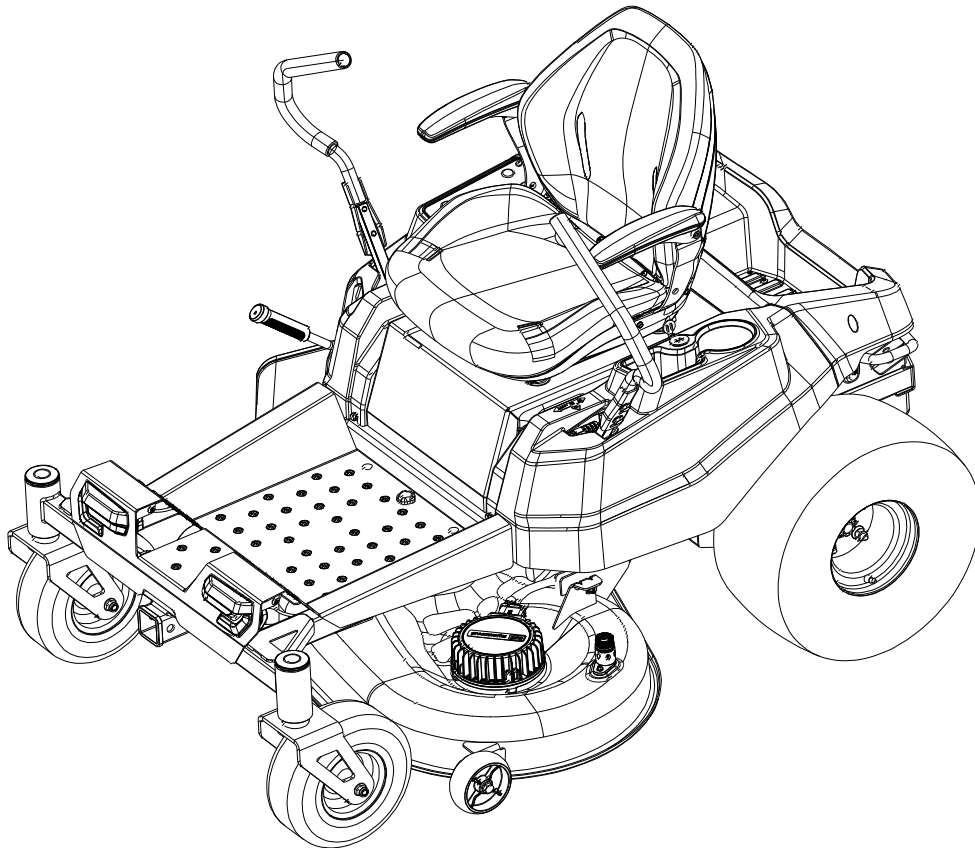


GREENWORKS

COMMERCIAL

7409302/7409402/7409502

Model No. CRZ426 CRZ428



WARNING:

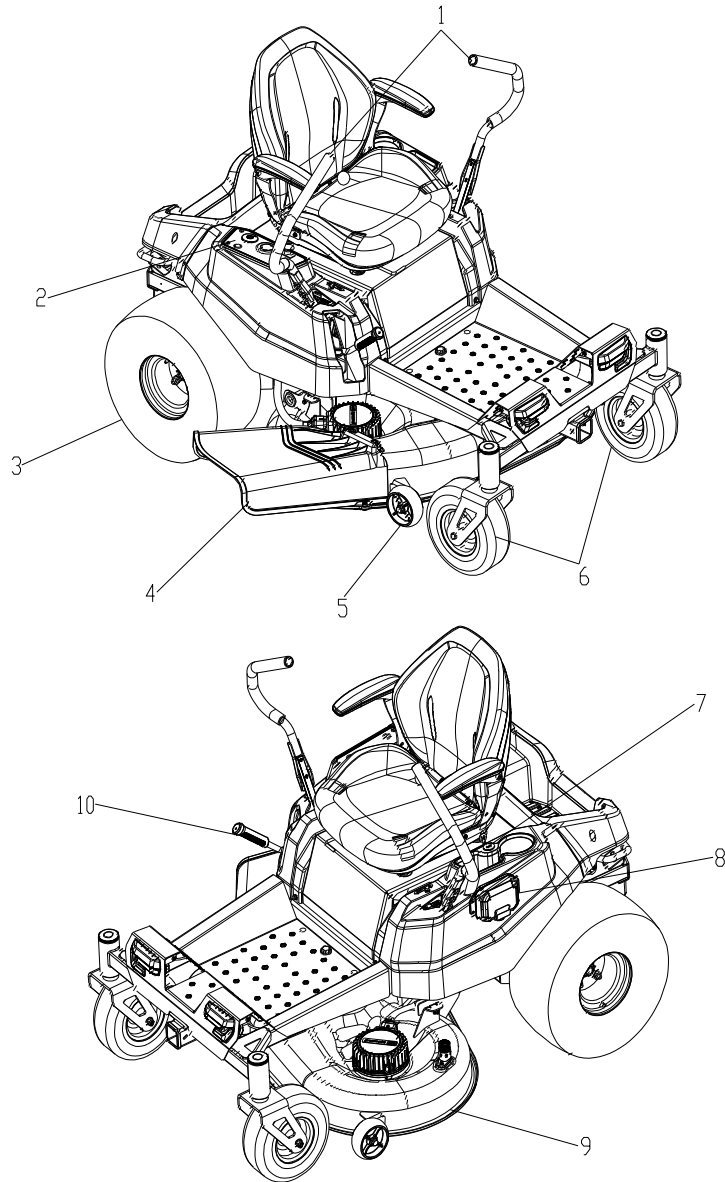
Undertaking repairs to gardening tools can be hazardous. Use correct tools and safety devices noted in the manual and obey all the instructions. Do not proceed until you are confident that you understand all steps and are capable of completing the repair work. Some repairs must only be performed by a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

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1 Component location



- | | |
|----------------------------|---------------------------------|
| 1. Steering control levers | 6. Front wheels |
| 2. Right control panel | 7. USB port |
| 3. Rear (drive) wheel | 8. GPRS |
| 4. Discharge chute | 9. Header |
| 5. Header roller | 10. Height adjustment component |

1.1 Terminology

Abbr.	Full term
CAN	Controller Area Network
HW	Hardware
PC	Personal Computer
PTO	Power Take Off
SW	Software
KSI	Key switch input

2 Warnings

- I. All disassembly, replacement, repair, and maintenance operations must be performed by professional operators who have read this manual.
- II. For the ease of quick disassembly and maintenance, you are advised to:
 - i. Before disassembly, put the machine in a suitable work area.
 - ii. Prepare the necessary disassembly tools beforehand.
 - iii. Remove the bolts in an appropriate order.
 - iv. Put the disassembled parts in a clean work area.
- III. In addition to obeying the conventional procedures for most repairing processes, there are some other special reminders:
 - i. Before any maintenance work, the start switch must be turned off, and if necessary, disconnect the main power supply of the vehicle.
 - ii. Do not put dangerous (flammable or explosive) items on the battery compartment.
 - iii. When replacing sharp and dangerous parts such as cutters, protective gloves or other protective measures must be used.
 - iv. No operations shall be carried out before all the moving parts have come to a standstill.
 - v. To avoid any personal injury or death, make sure that no one other than the maintenance operators is near the vehicle under repair or touches the mechanical parts by accident.

3 Electrical system

3.1 Faults

3.1.1 Fault 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 fault occurs and the fault code is shown on the digital display. Each electrical fault has a letter code followed by a number.

The first letter describes the system that caused the fault:

Letter	System
V	Vehicle
TR	Right traction controller (Master controller)
TL	Left traction controller (Slave controller)
PMU	Power management unit
MR	Right blade controller
ML	Left blade controller

Most faults 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 Fault code

System	Fault code	Type of fault	Solutions
Battery compartment	PMU 10	PMU loop fault	<ol style="list-style-type: none"> 1. Restart 2. Replace PMU 3. Replace battery pack
	PMU 11	Minor fault	Restart
	PMU 12	Major fault	<ol style="list-style-type: none"> 1. Restart 2. Check if the resistor connector is solidly engaged 3. Check the SoC of batteries in the compartment 4. Replace PMU 5. Replace left blade controller 6. Replace right blade controller

System	Fault code	Type of fault	Solutions
	PMU 13	No available battery	Replace battery pack
Vehicle	V 11	Abnormal CAN communication at left traction controller	<ol style="list-style-type: none"> 1. Restart 2. Check if the 10PIN connector of the left traction controller is properly engaged with the vehicle cable harness 3. Replace the left traction controller
	V 12	Abnormal CAN communication at left blade controller	<ol style="list-style-type: none"> 1. Restart 2. Check if the communication port of the left blade controller is properly engaged with the vehicle cable harness connector 3. Replace the left blade controller
	V 13	Abnormal CAN communication at right traction controller	<ol style="list-style-type: none"> 1. Reboot 2. Check if the communication port of the right blade controller is properly engaged with the vehicle cable harness connector 3. Replace the right blade controller
	V 14	Right traction controller	<ol style="list-style-type: none"> 1. Reboot 2. Check if the communication port of the right blade controller is properly engaged with the vehicle cable harness connector 3. Replace the right blade controller
	V 15	Vehicle power-on self-test error	<ol style="list-style-type: none"> 1. Check the left and the right control levers and make sure they are in the Park slot 2. Check the PTO switch, and make sure it's pressed (not started) 3. Reboot 4. Toggle both the left and the right levers to the Park slot. 5. Check the voltage values of both the left and the right accelerators with commissioning tools after powering on, and make sure they are within limits.
	V 16	Abnormal operation sequence	<ol style="list-style-type: none"> 1. Check the left and the right control levers and make sure they are in the Park slot 2. Check the PTO switch, and make sure it's pressed (not started) 3. Reboot 4. Toggle both the left and the right levers to the Park slot. 5. Check the voltage values of both the left and the right accelerators with commissioning tools after powering on, and make sure they are within limits.
	V 17	Left accelerator fault	<ol style="list-style-type: none"> 1. Check if the left potentiometer is solidly engaged 2. Replace the potentiometer

System	Fault code	Type of fault	Solutions
			3. Replace the left traction controller
	V 18	Right accelerator fault	<ol style="list-style-type: none"> 1. Check if the right potentiometer is solidly engaged 2. Replace the potentiometer 3. Replace the right traction controller
	V 21	PMU CAN communication anomaly	<ol style="list-style-type: none"> 1. Check if the right potentiometer is solidly engaged 2. Replace the potentiometer 3. Replace the right traction controller
	V 27	Seat switch anomaly	<ol style="list-style-type: none"> 1. Restart 2. Check if the connector under the seat switch is solidly engaged 3. Replace the seat switch 4. Replace the right drive controller 5. Replace the PMU
	V 31	Master-slave distinguishing fault	<ol style="list-style-type: none"> 1. Restart 2. Check the wiring harness 3. Replace the left traction controller 4. Replace the right traction controller
Right traction controller (Master controller)	TR 11	Overvoltage fault	Replace battery pack
	TR 12	Undervoltage fault	Replace battery pack
	TR 13	MOS overcurrent fault	<ol style="list-style-type: none"> 1. Restart 2. Replace the right traction controller
	TR 14	Locked rotor fault	<ol style="list-style-type: none"> 1. Restart 2. Replace the gearbox component of right traction motor 3. Replace the right traction controller
	TR 15	Hall sensor fault	<ol style="list-style-type: none"> 1. Reboot 2. Check if the 6PIN connectors of the right traction control and the driving motor are properly wired 3. Replace the gear box component of right traction motor 4. Replace the right traction controller
	TR 16	Right solenoid valve driving fault	<ol style="list-style-type: none"> 1. Check if the cable harness of the electromagnetic brake is properly connected 2. Replace the gear box component of right traction motor 3. Replace the right traction controller

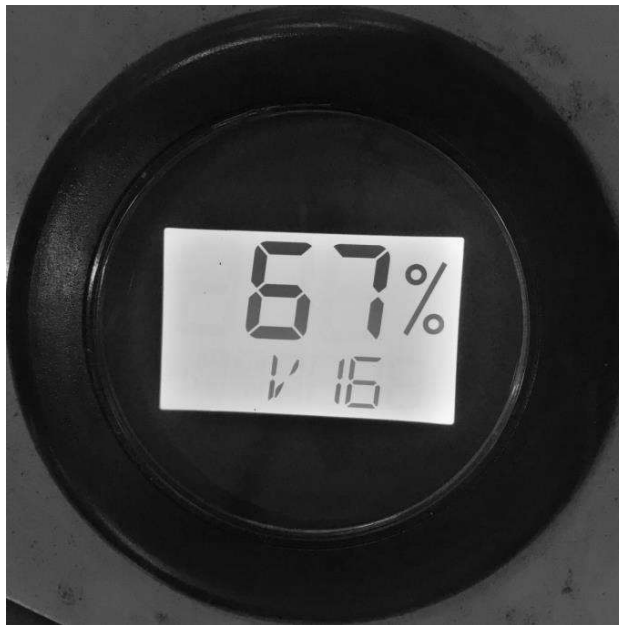
System	Fault code	Type of fault	Solutions
	TR 17	Controller overheating fault	Turn off the machine, and restart it after the controller cools down
	TR 18	Motor overheating fault	Turn off the machine, and restart it after the motor cools down
	TR 21	Motor temperature sensor anomaly	1. Check if the cable harness connector is properly engaged 2. Replace the gear box component of right motor 3. Replace the right traction controller
	TR 22	Controller power-on self-test anomaly	1. Reboot 2. Replace the right traction controller
	TR 23	Voltage platform selection fault	1. Restart 2. Check the wiring harness 3. Replace the right traction controller
	TR 24	Controller 5V fault	1. Restart 2. Replace the right traction controller
	TR 25	Controller 15V fault	1. Restart 2. Replace the right traction controller
	TR 32	Controller temperature sensor anomaly	1. Restart 2. Replace the right traction controller
Left traction controller (Slave controller)	TL 11	Overvoltage fault	Replace battery pack
	TL 12	Undervoltage fault	Replace battery pack
	TL 13	MOS overcurrent fault	1. Restart 2. Replace the left traction controller
	TL 14	Locked rotor fault	1. Reboot 2. Replace the gear box component of left driving motor 3. Replace the left traction controller
	TL 15	Hall sensor fault	1. Reboot 2. Check if the 6PIN connectors of the left traction controller and the driving motor are properly wired 3. Replace the gear box component of left traction motor 4. Replace the left traction controller
	TL 16	Left solenoid valve driving fault	1. Check if the cable harness of the electromagnetic brake is properly connected 2. Replace the left traction controller

System	Fault code	Type of fault	Solutions
			3. Replace the gear box component of left traction motor
	TL 17	Controller overheating fault	Turn off the machine, and restart it after the control cools down
	TL 18	Motor overheating fault	Turn off the machine, and restart it after the motor cools down
	TL 21	Motor temperature sensor anomaly	1. Check if the cable harness connector is properly engaged 2. Replace the gearbox component of left motor 3. Replace the left traction controller
	TL 22	Controller power-on self-test anomaly	1. Restart 2. Replace the left traction controller
	TL 23	Voltage platform selection fault	1. Reboot 2. Check the cable harnesses 3. Replace the left traction controller
	TL 24	Controller 5V fault	1. Reboot 2. Replace the left traction controller
	TL 25	Controller 15V fault	1. Reboot 2. Replace the left traction controller
	TL 32	Controller temperature sensor anomaly	1. Reboot 2. Replace the left traction controller
Left blade controller	ML 11	Overvoltage fault	Replace battery pack
	ML 12	Undervoltage fault	Replace battery pack
	ML 13	Motor overcurrent fault	1. Check if the phase wire of the left cutter motor is properly connected 2. Replace the left cutter motor or the cable harness of the motor 3. Check if the phase wire of the left cutter motor is short-circuited 4. Replace the left cutter control
	ML 14	Locked rotor fault	1. Power off the vehicle, and check if the grass clippings are excessive under the header 2. Lift the header, and reduce the height of cutting
	ML 15	Hall sensor fault	1. Check if the connector is properly engaged 2. Replace the left cutter motor 3. Replace the left blade controller
	ML 16	MOS tube fault	Replace the left blade controller

System	Fault code	Type of fault	Solutions
	ML 17	Motor open-phase fault	<ol style="list-style-type: none"> 1. Check if the connector of the left cutter motor is properly engaged 2. Replace the left cutter motor 3. Replace the left blade controller
	ML 18	Self-test error fault	Restart
	ML 21	Controller overheating fault	<ol style="list-style-type: none"> 1. Power off the vehicle, let the controller cool down for a while, and power it on again 2. Replace the left blade controller
	ML 22	Motor temperature sensor anomaly	<ol style="list-style-type: none"> 1. Check if the cable harness connector is properly engaged 2. Replace the left cutter motor
	ML 23	Motor overheating fault	Power off the vehicle, let the motor cool down for a while, and power it on again
	ML 25	Communication with left traction controller disconnected fault	Restart
Rightblade controller	MR 11	Overvoltage fault	Replace battery pack
	MR 12	Undervoltage fault	Replace battery pack
	MR 13	Motor overcurrent fault	<ol style="list-style-type: none"> 1. Check if the phase wire of the right cutter motor is properly connected 2. Replace the right cutter motor or the cable harness of the motor 3. Check if the phase wire of the right cutter motor is short-circuited 4. Replace the right blade controller
	MR 14	Locked rotor fault	<ol style="list-style-type: none"> 1. Power off the vehicle, and check if the grass clippings are excessive under the header 2. Lift the header, and reduce the height of cutting
	MR 15	Hall sensor fault	<ol style="list-style-type: none"> 1. Check if the connector is properly engaged 2. Replace the right cutter motor 3. Replace the right blade controller
	MR 16	MOS tube fault	Replace the right blade controller
	MR 17	Motor open-phase fault	<ol style="list-style-type: none"> 1. Check if the connector of the right cutter motor is properly engaged 2. Replace the right cutter motor 3. Replace the right blade controller
	MR 18	Self-test error fault	Restart

System	Fault code	Type of fault	Solutions
	MR 21	Controller overheating fault	1. Power off the vehicle, let the controller cool down for a while, and power it on again 2. Replace the right blade controller
	MR 22	Motor temperature sensor anomaly	1. Check if the cable harness connector is properly engaged 2. Replace the right cutter motor
	MR 23	Motor overheating fault	Power off the vehicle, let the motor cool down for a while, and power it on again
	MR 25	Communication with right traction controller disconnected fault	Restart

3.1.3 Reading the fault code (display screen)



The number in a bigger size refers to the SoC (state of charge) in percentage, and the one in a smaller size time. In case of a fault or multiple faults, the number in a smaller size will indicate it or loop them respectively. Electrical components

3.1.4 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).

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.

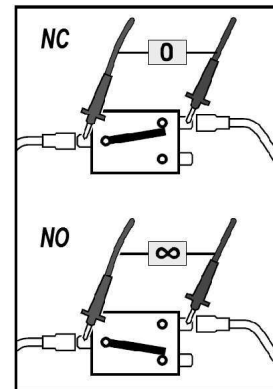
a) Normally Open Switch

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 indicates a defective switch.

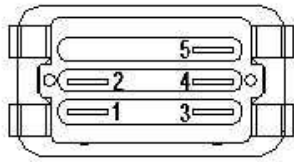
The diagrams show the connections of the electrical components in different situations.



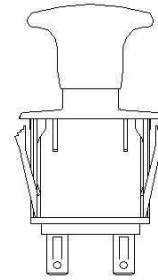
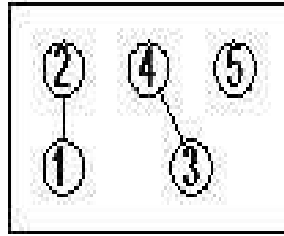
NOTE:

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

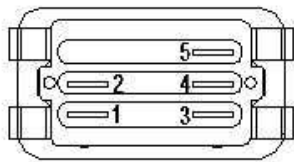
PTO SWITCH



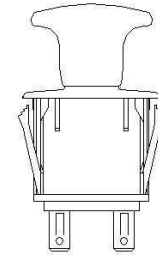
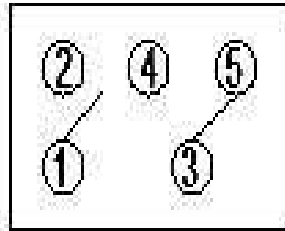
NC
NO
COM



CIRCUITS SHOWN WITH THE KNOB IN THE UP POSITION

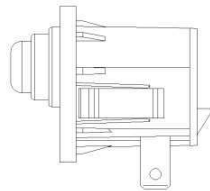
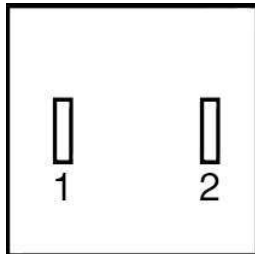


NC
NO
COM

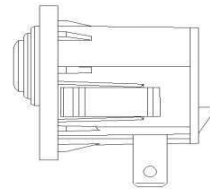
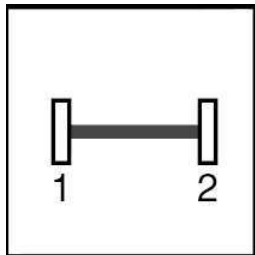


CIRCUITS SHOWN WITH THE KNOB IN THE DOWN POSITION

PARK SWITCH

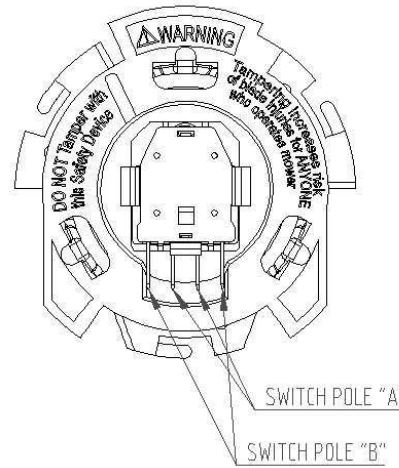


ELECTROMAGNETIC BRAKE ON



ELECTROMAGNETIC BRAKE OFF

SEAT SWITCH



SWITCH POLE 'A' TO PMU (ON)

SWITCH POLE 'B' TO RIGHT TRACTION CONTROLLER (NO)

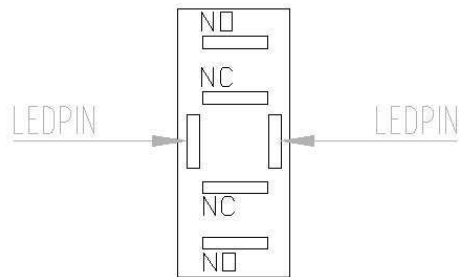
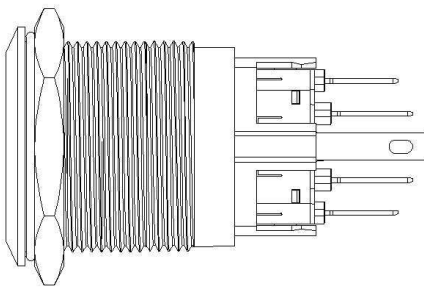
CUTTER/TRACTION SPEED SWITCH



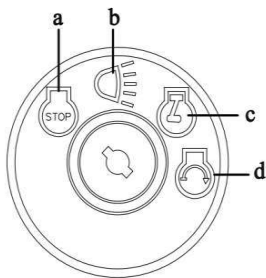
HIGH SPEED –
PUSHED DOWN & LIGHT ON



LOW SPEED –
POP UP & LIGHT OFF

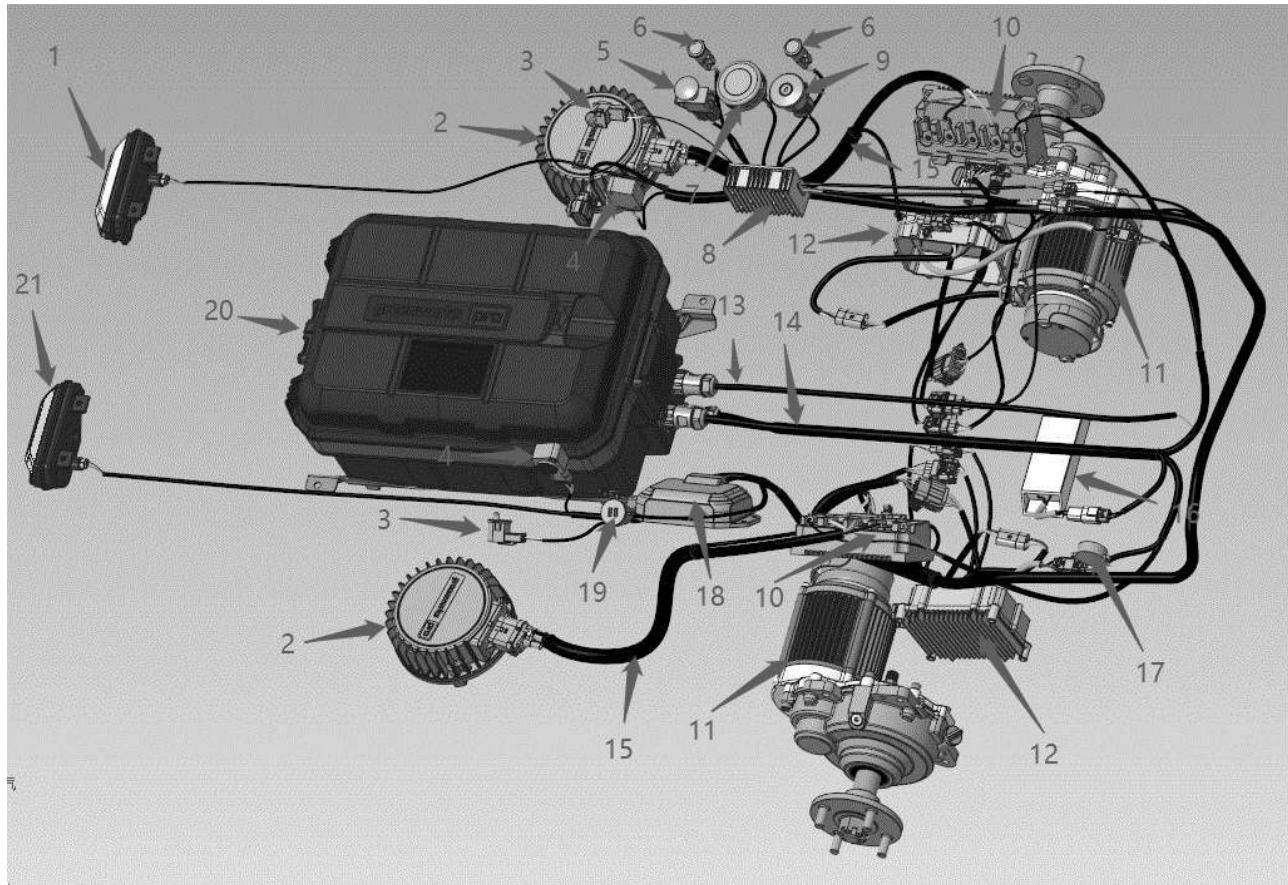


KEY SWITCH



a	Stop / Off
b	On (with lights)
c	Run
d	Start

3.2 Electrical wiring diagram



- | | |
|-------------------------------|-----------------------------------|
| 1. Right headlight | 12. Drive controller |
| 2. Cutter motor | 13. Vehicle control cable harness |
| 3. Park switch | 14. Vehicle power cord |
| 4. Potentiometer | 15. Motor cable harness |
| 5. PTO switch | 16. Cement resistor |
| 6. High/low(H/L) speed switch | 17. Buzzer |
| 7. Displayscreen | 18. GPRS |
| 8. DCDC | 19. USB |
| 9. Key switch | 20. Battery compartment |
| 10. Cutter controller | 21. Left headlight |
| 11. Drive gearbox component | |

4 Header

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

IMPORTANT:

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

4.1 Cutter

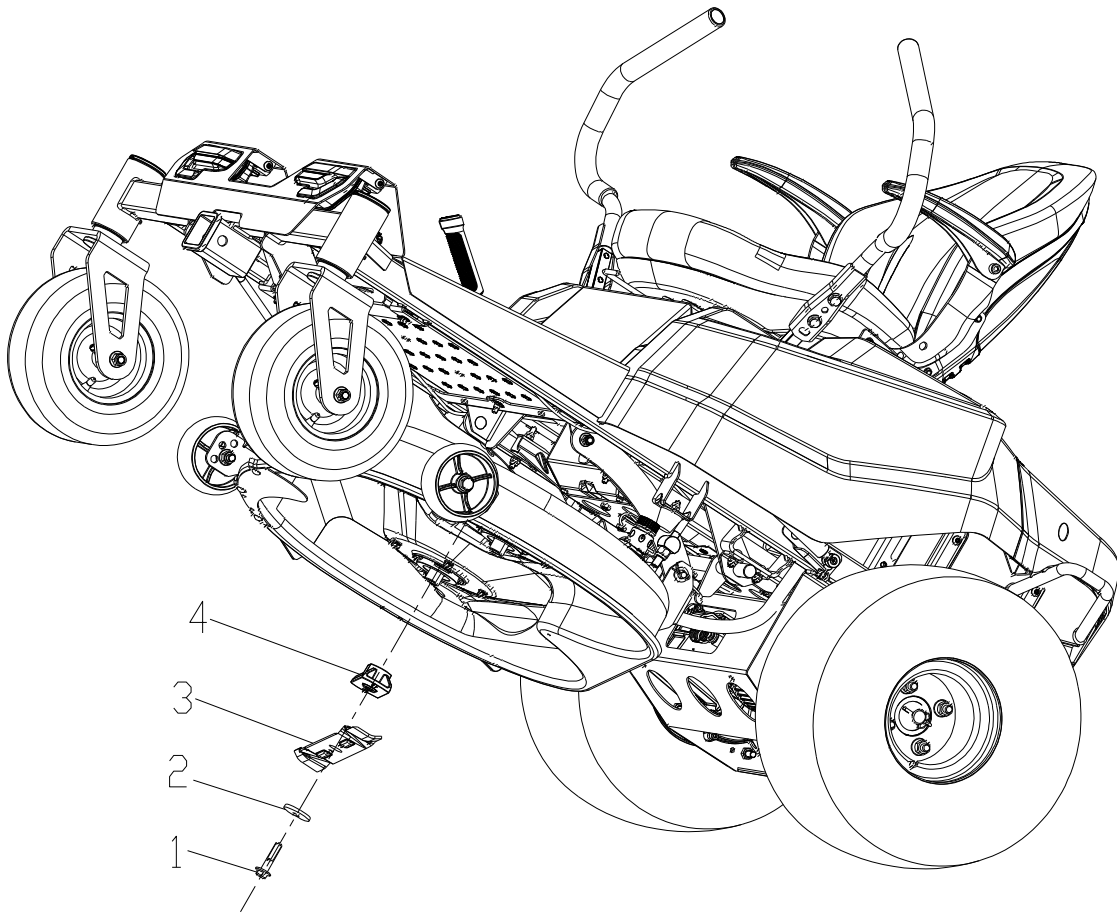


Fig. 1

- | | |
|--------------------|--|
| 1. Bolt 7/16-14UNC | 3. Grass discharge blade (grass chopper) |
| 2. Washer | 4. Blade holder |

Removal:

- Using a lifting tool, lift the front end of the header to a certain angle.

- With protective gloves on, hold the end of the blade (3) with one hand and loosen the bolt (1) with a 16mm socket by rotating counterclockwise.
- Remove the bolt (1), the washer (2), the blade (3), and the blade holder (4) in order.

Installation:

- Put the washer (2), the 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.
- With protective gloves on, hold the end of the blade (3) with one hand and tighten the bolt (1) with a 16mm socket by rotating clockwise, with a fastening torque of 90-100N·m.
- Gently rotate the blade by hand and make sure that no conflict between the two blades, no conflict between the blades and the header housing, such that the blades can rotate freely and smoothly.

NOTE:

- The removal and the installation steps for the two cutters are the same.
- Frequently inspect the wear of the cutters. Replace in time if a cutter is overworn, otherwise it will affect the dynamic balance of the working motor and lead to earlier damage of the cutter motor.

4.2 Cutter motor

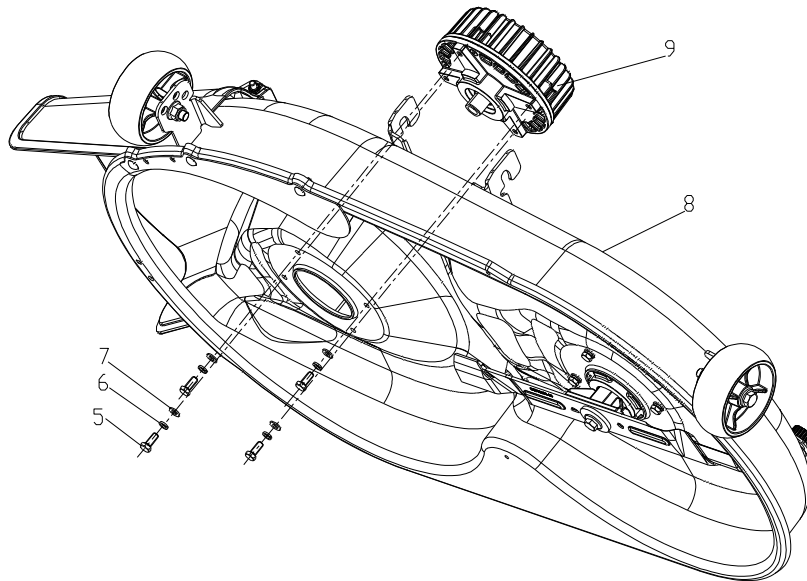


Fig. 2

- | | |
|---------------------------|-------------------|
| 5. Bolt 5/16-18UNC | 8. Header welding |
| 6. Spring washer $\phi 7$ | 9. Cutter motor |
| 7. Flat washer $\phi 8$ | |

Removal:

- Using a lifting tool, lift the front end of the header to a certain angle.

- Make sure that the start switch of the vehicle is in the OFF state. Cut off the main power of the vehicle, if necessary.
- Using an 8mm socket, remove the binding bolts (10) of the two cable harness clips on the header by rotating counterclockwise, and disassemble the motor connectors as circled in red in the Fig.3

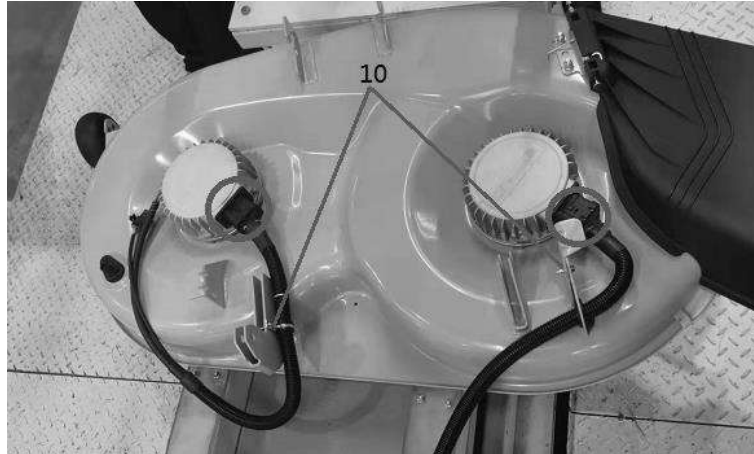


Fig. 3

10. Cable harness clip bolts

- Remove the cutter (see 4.1 for detailed steps).
- Use a 13mm socket to loosen the bolt (5) by rotating counterclockwise.
- Remove the bolt (5), the flat washer (7), and the spring washer (6) altogether. Each motor is fixed by 4 sets of bolts.
- Remove the cutter motor (9) from the header.

Installation:

- Put the cutter motor (9) into the mounting hole of the header housing. Rotate the motor until the motor mounting hole is aligned with the header mounting hole.
- 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 it clockwise into the threaded installation hole of the motor. Each motor is fixed by 4 sets of bolts.
- Tighten the bolt (5) with a 13mm socket with a tightening torque of 10-15N•m. Motor installation is complete.
- Refer to the reverse operation steps of motor removal, install the cutter, tighten the wiring harness fixing bolts, and install the three-phase wire and the Hall wiring harness of the cutter controller.

NOTE:

- The removal and installation steps for the two cutter motors are the same.
- The main power supply of the vehicle must be cut off when removing the wire harness of the cutter controller.

- When installing the wire harness of the cutter motor, the motor (left and right) in each position must correspond to the specific cutter controller (left and right), and must not be reversed.

4.3 Header roller

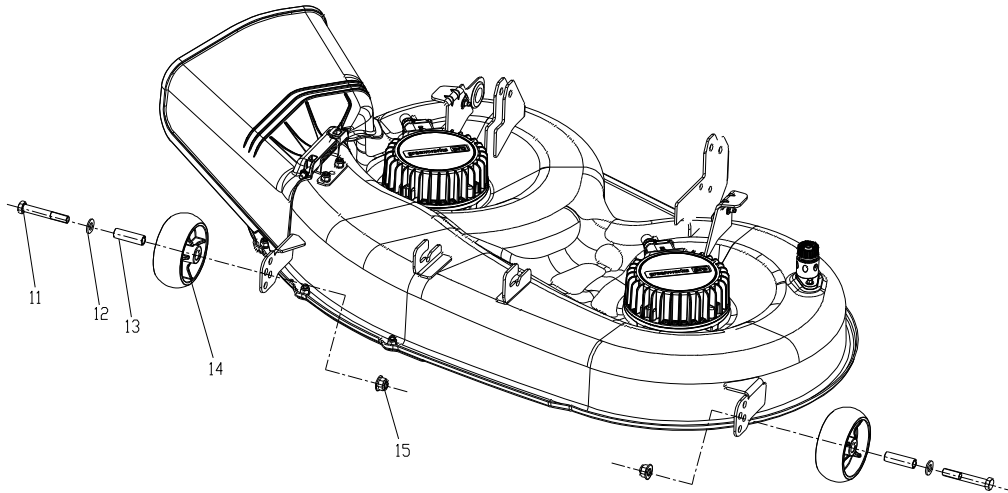


Fig. 4

- | | |
|---------------------|-------------------|
| 11. Bolt M12×80 | 14. Header roller |
| 12. Flat washer φ12 | 15. Nut M12 |
| 13. Sleeve | |

Removal:

- Use two 18mm sockets or 18mm wrenches to loosen the bolts (11) and nuts (15).
- Pull out the bolt (11).
- Remove the roller (14), the sleeve (13), and the flat washer (12) from the header welding.

Installation:

- Install the sleeve (13) into the inner hole of the roller (14).
- Pass the bolts (11), the flat washer (12) through the inner hole of the roller sleeve and the header welding (8) in order, then screw on the nut (15).
- Use two 18mm sockets or 18mm wrenches to tighten the bolts (11) and nuts (15), with a tightening torque of 45-50N•m. The roller (14) can now rotate freely, while the sleeve (13) cannot.
- The installation is complete.

NOTE:

- The removal and installation steps for the two header rollers are the same.
- The installation direction for the bolts of the two rollers is shown in the figure. The roller nuts (15) on both sides are located on the inside of the header.
- Inspect the header roller after installation. It should be spinning freely without a jam.

4.4 Cutter height adjustment

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

Rear wheels	Front wheels
8-10 PSI	40-42 PSI

4.4.1 Header levelling

- Drive the machine to a level ground, put the header height limit pin in the lowest position, which is 1.5 inch position hole (as shown in Fig.5 below).
- Use an 18mm open-end wrench to loosen the two adjusting nuts at the upper end of the height adjustment rod.
- Loosen the nut (17) and adjust the nut (16) and the nut (18): clockwise increases the cutter height and counterclockwise decreases the cutter height.
- Use a tape measure to measure the clearance above the ground at the four corners of the header (A, B, C, D in Fig.5)
- Use two 18mm 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.
- The rear two positions (C, D) are allowed to be slightly higher than the front two positions (A, B), but with a height difference not more than 5mm. The height difference between the left and right positions A, B and C, D shall be less than 2mm. The header can then be regarded as levelled within such standard.

NOTE:

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

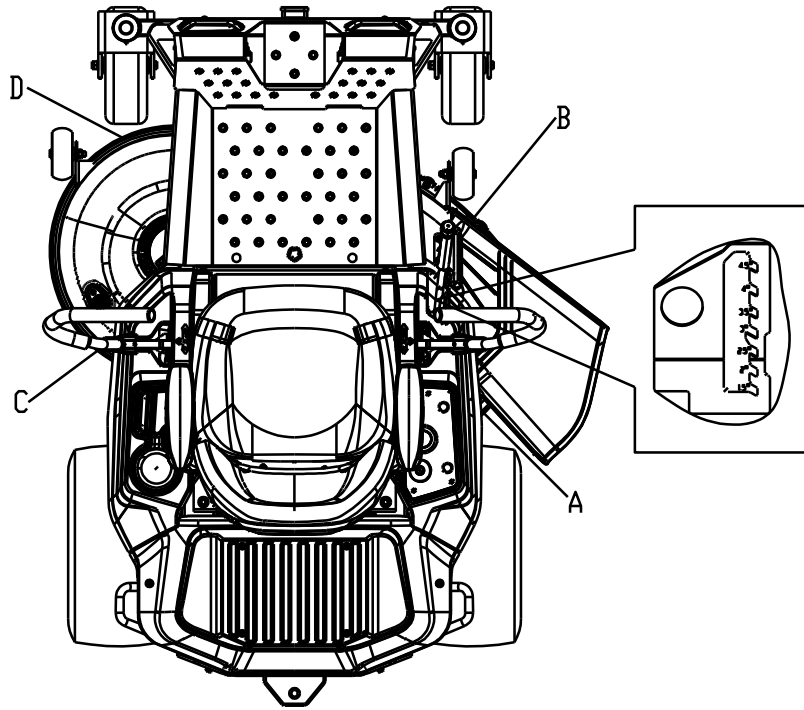


Fig. 5

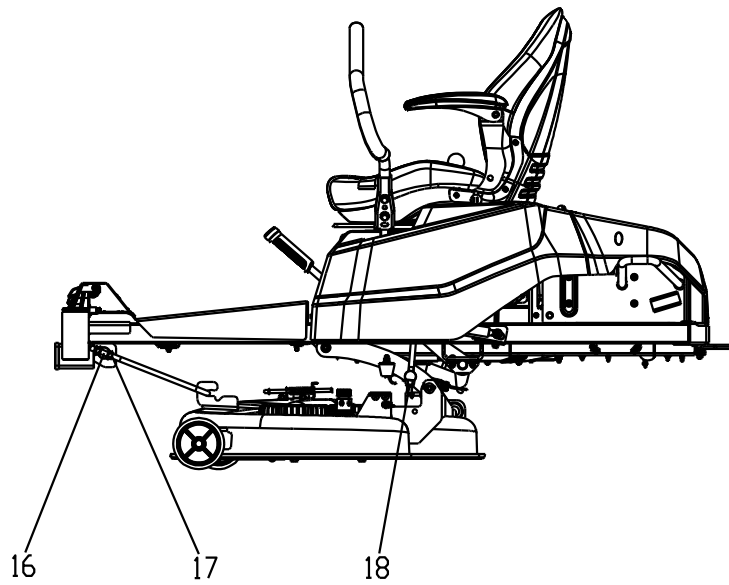


Fig. 6

16. Hex flange locking nut M12
 17. Hex flange locking nut M12

18. Hex flange locking nut M12

4.4.2 Header height adjustment

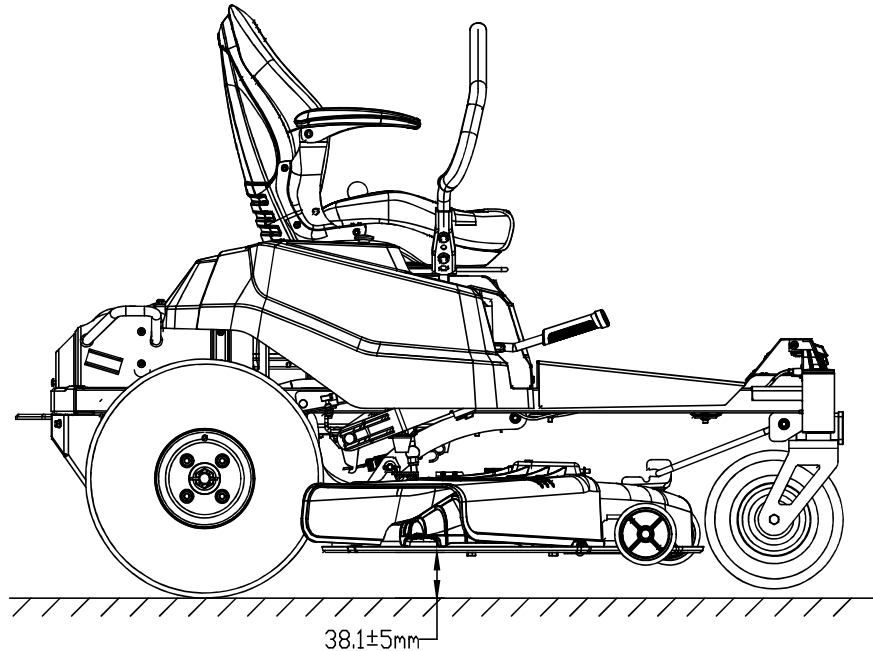


Fig.7

After the preliminary levelling of the header is completed, adjust the height of the cutter.

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

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

- Loosen the nut (17), then adjust the nuts (16) and (18): clockwise to increase the height of the cutter, and counterclockwise to decrease. For each adjustment, ensure the direction and rotation of nuts (16) and (18) on four height adjustment rods are exactly the same. The height of the cutter rises or falls by 1.75mm per rotation.
- Measure and adjust multiple times using the above method until the height of the cutter is within the range of 38.1±5 mm.
- Use two 18mm open-end wrenches to tighten the nut (17). When tightening the nut (17), the nut (16) must be kept in place.

NOTE:

- The header needs to be preliminarily levelled and then raised to ensure the header is level and the two cutters are basically at the same height.
- If the header is installed with a grass baffle, install the baffle at last. If the header has no grass baffle, skip this step.

4.4.3 Grass baffle

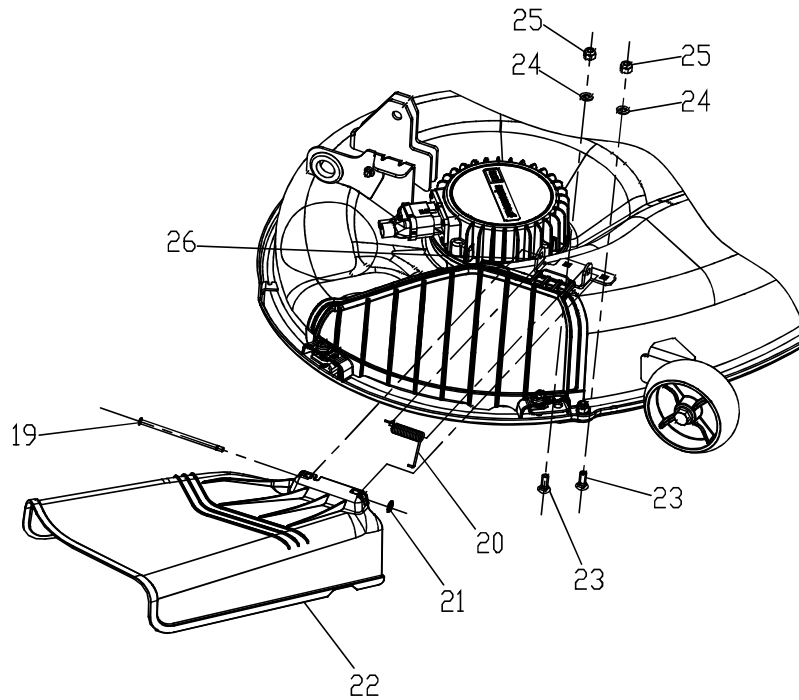


Fig.8

- | | |
|--------------------|-----------------------------|
| 19. Fixing pin | 23. Square neck bolt M8×20 |
| 20. Torsion spring | 24. Flat washer $\phi 8$ |
| 21. Bearing clip | 25. Nut M8 |
| 22. Grass baffle | 26. Discharge chute support |

Removal:

- Use a 13mm socket to loosen the nut (25) and remove the bolt (23) and the washer (24).
- Remove the grass baffle (22) and the discharge chute support (26) altogether.
- Remove the bearing clip (21) and pull out the fixing pin (19).
- Remove the torsion spring (20), the discharge chute support (26) and the grass baffle (22).

Installation:

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

NOTE:

-If no grass baffle is installed, skip this step.

4.4.4 Protective housing

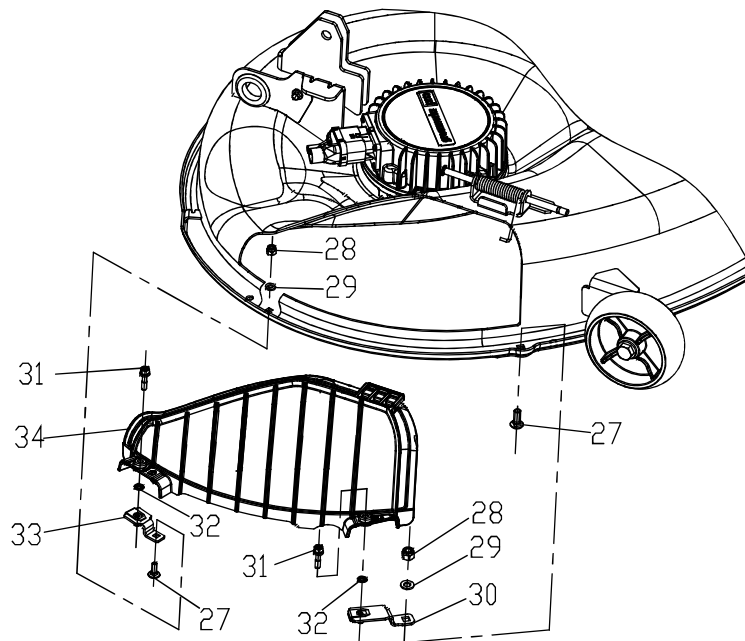


Fig.9

- | | |
|----------------------------|------------------------|
| 27. Square neck bolt M8×20 | 31. Custom bolt |
| 28. Nut M8 | 32. Bearing clip |
| 29. Flat washer ϕ 8 | 33. Holder B |
| 30. Holder A | 34. Protective housing |

Removal:

- Use a Phillips screwdriver to loosen the custom bolts (31) and remove the bearing clips (32).
- Use a 13mm socket or wrench to loosen the nuts (28).
- Remove the flat washers (29), the bolts (27), the holder A (30), the holder B (33), and the protective housing (34).

Installation:

- Use the bolts (27), the flat washers (29), and the nuts (28) to fasten the holder A (30) and the holder B (33).
- Use the custom bolts (31) and the bearing clips (32) to fasten the protective housing (34).

NOTE:

-If no protective housing is installed, skip this step.

5 Operation components

5.1 Steering control lever

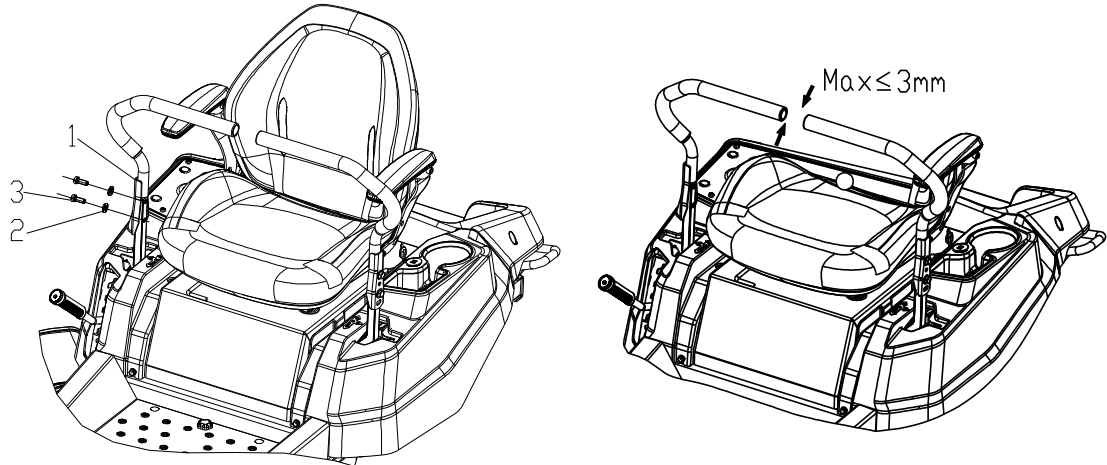


Fig. 1

- | | |
|---------------------------|----------------|
| 1. Steering control lever | 3. Bolt M10×25 |
| 2. Disc spring 22.5-2 | |

Removal:

- Use a 16mm socket or a 16mm wrench to loosen the bolt (3).
- Remove the bolt (3) and the disc spring (2).
- The control lever (1) is ready to be removed.

Installation:

- Put the control lever (1) on the control rod and align it with the two holes on the mounting plate. The control lever has two sets of mounting holes (upper and lower) to ensure the control lever has two positions (high and low) available. Installation shall be carried out according to the actual situation faced by the operator.
- Insert the bolt (3) through mounting holes on the disc spring (2) and the control lever (1). Tighten the control lever using the internal thread on the control rod, with a tightening torque of 20-30N•m.

NOTE:

- The removal and installation steps for the two control levers are the same.
- After installation, the levers on two sides should be aligned with one another at both the head and the tail, with no obvious misalignment. The maximum longitudinal distance between the centers of the two control levers should not exceed 3mm (as shown in Fig.1 above).

5.2 Operation enclosure, switches and display screen

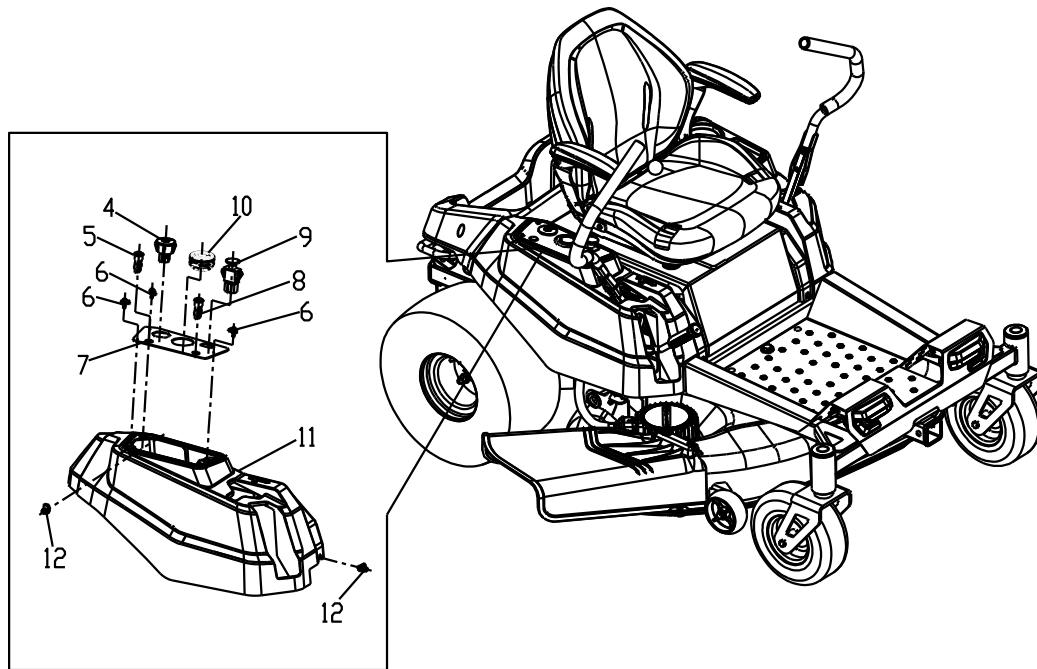


Fig. 2

- | | |
|------------------------------|-------------------------|
| 4. Key switch | 9. Cutter switch |
| 5. Cutter H/L speed switch | 10. Displayscreen |
| 6. Screw M6×20 | 11. Operation enclosure |
| 7. Switch panel | 12. Assembly M8×20 |
| 8. Traction H/L speed switch | |

Removal: panel & wires

The removal steps for the left and right enclosures are the same. The displayscreen and other parts are installed on the left enclosure, while the USB connector is on the right enclosure.

- Use a 5mm Allen wrench to loosen the screw (6) on the switch panel (7).
- Open the switch panel (7). You can see the connectors of the key switch (4), the cutter H/L speed switch (5), the traction H/L speed switch (8), the cutter switch (9), and the displayscreen at the back (as shown in figure below).
- Disconnect the connectors of the key switch (4), cutter H/L speed switch (5), traction H/L speed switch (8), cutter switch (9), and the displayscreen (10) from the back.
- Use two hands to push the snaps at the back of the switch panel (7), and pull out the key switch (4), cutter H/L speed switch (5), traction H/L speed switch (8), cutter switch (9), and the displayscreen (10).

CAUTION:

- To prevent damage to the switch and the panel, do not drag the wire harness.

- Use a 13mm socket to loosen and remove the four assemblies (12) on the corners of the operation enclosure.
- Open the operation enclosure (11).
- Disassemble the right enclosure.
- Disassemble the USB connector.



Connectors of the right operation enclosure



Connectors of the left operation enclosure

Fig.3

Installation:

- Align the key switch (4), the cutter switch (9), and the displayscreen (10) to the three holes on the switch panel (7) respectively.
- Push them to the switch panel (7) with a slightly stronger force until the snaps clip with the back of the panel to complete the installation.
- Connect the component connectors at the back, as shown in the figures above.
- Use four cross-recessed hexagon head washer assemblies $M8 \times 20$ (12) to install the operation enclosure (11) to the vehicle, with a fastening torque of $5-8N \cdot m$.

NOTE:

- The removal and installation steps for the operation enclosures on two sides are the same.
- Connection of the switch connectors is shown as Fig.3 above (connectors inside the left operation enclosure).

5.3 Potentiometer

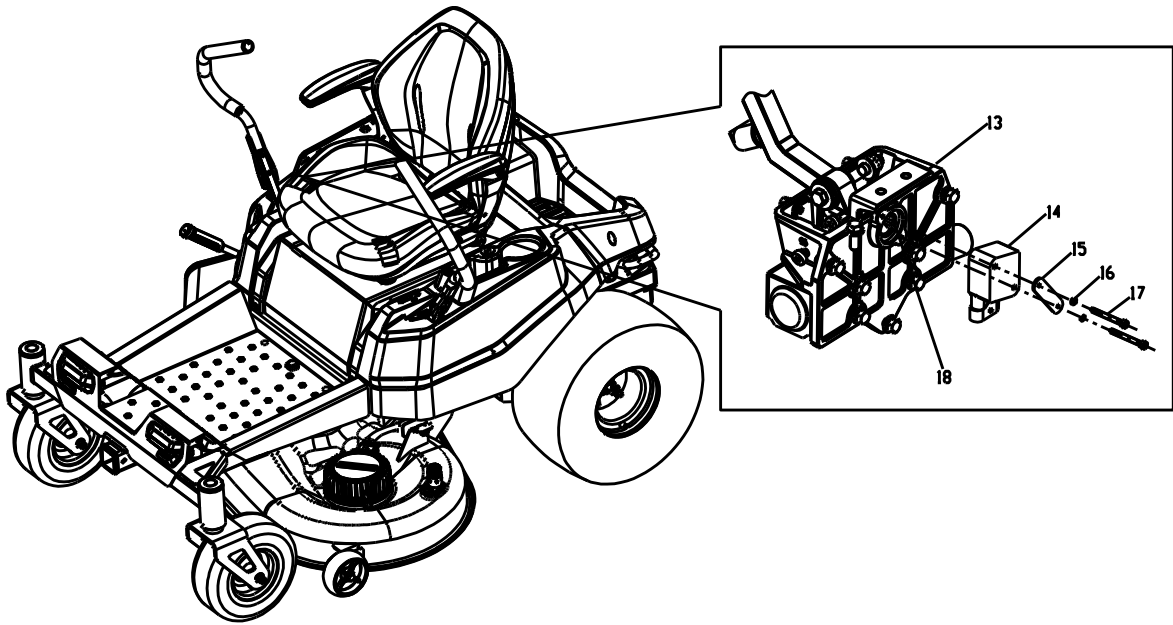


Fig. 4

- 13. Potentiometer mount
- 14. Potentiometer
- 15. Potentiometer pad

- 16. Spring washer $\phi 4$
- 17. Screw M4 \times 35
- 18. Shaft

Removal:

- Use a 3mm Allen wrench to remove the screw (17), the spring washer (16), and the potentiometer pad (15) by rotating counterclockwise (the screw comes with thread locker when released. If you have difficulty in removal, heat the screw with an electric heat gun first).
- Disconnect the potentiometer wire harness connector (see Fig. 5 and 6 below).
- Remove the potentiometer (14) from the mount (13) and the shaft (18).