KODIAK AMERICA
CR580S
USER MANUAL

Warning:

Read and follow the safety instructions in this manual and on the machine's safety warning tags. Failure to do so could result in serious injury, death or property damage.

Please save this manual for reference.

NOTICE:

A SNOW BLOWER is a highly technical and custom piece of equipment meant to operate in adverse weather conditions especially extremely cold temperatures.

Kodiak shall not be liable for any adverse consequences arising from the following circumstances：

- Operation of equipment not in accordance with the information in this manual.
- Lack of maintenance or proper lubrication
- Consequences resulting from unauthorized modification or alteration of the equipment.
- Equipment damage or accident caused by not using OEM parts or using untested or unauthorized parts or tools.
- Kodiak will not be responsible for any failure or damage to the machine due to force majeure such as natural disasters (earthquakes, typhoons, etc.) or political upheaval.

Different regions and local government departments may also have stricter operating regulations for snow blowers. In case of conflict with these safety operating regulations, the more stringent safety operating regulations should be followed.

Responsibilities of the Kodiak manufacturer

- To providing quality equipment
- Timely after-sales service
- Provide access to training to equipment operators and maintenance personnel.

Responsibilities of customer or other authorized personnel and management.

- Personnel involved in the operation and maintenance of the snow blower may only operate and maintain the snow blower if they have been systematically

trained and fully understand the instructions including operation and maintenance in this manual.

- Ensure that the operator is trained, fully understands Kodiak's operation and maintenance manual, has any applicable license as is required locally and is in good health.
- Periodically check the safety awareness of all relevant personnel.
- If there is any fault affecting the safety, stop operation immediately.
- Ensure timely maintenance and repair of the equipment.
- Plan the use of the equipment carefully and consciously.

Responsibilities of all operating personnel

- If there is any phenomenon that may cause abnormal operation of the equipment or if there is potential danger, operation should stop until the situation can be analyzed for safety.
- All personnel working on or around the equipment must obey all warning signals, signs and be vigilant for the safety of themselves and others.
- Pay attention to observe if there is any danger, and report the danger warning to the operator and any pertinent personnel in time.
    - Such as high voltage lines in the operating area, non-personnel, poor ground conditions, etc.

Table of Contents

1. Main technical parameters of the equipment

1.1 Fuel and Hydraulic Oil

- In order to maintain this vehicle, prolong the service, reduce the fuel consumption rate, and protect the atmospheric environment, please use the cleanest grades of diesel and hydraulic oil available in your area:
- Hydraulic oil: 32 high-pressure wear-resistant hydraulic oil. Used in areas with ambient temperatures above -45 degrees Celsius.

1.2 Major Technical Parameters

1. Vehicle Weight in kg
    a. Total 14350
    b. Front Axle 7900
    c. Rear Axle 6450
2. Vehicle Dimensions in mm
    a. Length 8425
    b. Width 2760

    c. Height 3650
3. Wheelbase 2553mm
    a. Turning Radius 5.6 Meters
4. Speed
    a. Maximum 53kph
    b. Minimum stable speed .15kph
5. Maximum grade 20%
6. Engine
    a. Maximum 2050 RPM
7. Occupants
    a. Maximum 2
8. Brakes
    a. Working pressure (Mpa .86) (124 psi)

1.3 Electrical System

Wire-connecting	Single-wire, negative-pole grounding
Voltage	DC24V
Charger	28V/80A
The cylinder liner heater	220V 1500W
The start system	No auxiliary cold start minimum ambient temperature -18 ℃
Battery	Delphi 6-QW-180

1.4 Fluid Specifications

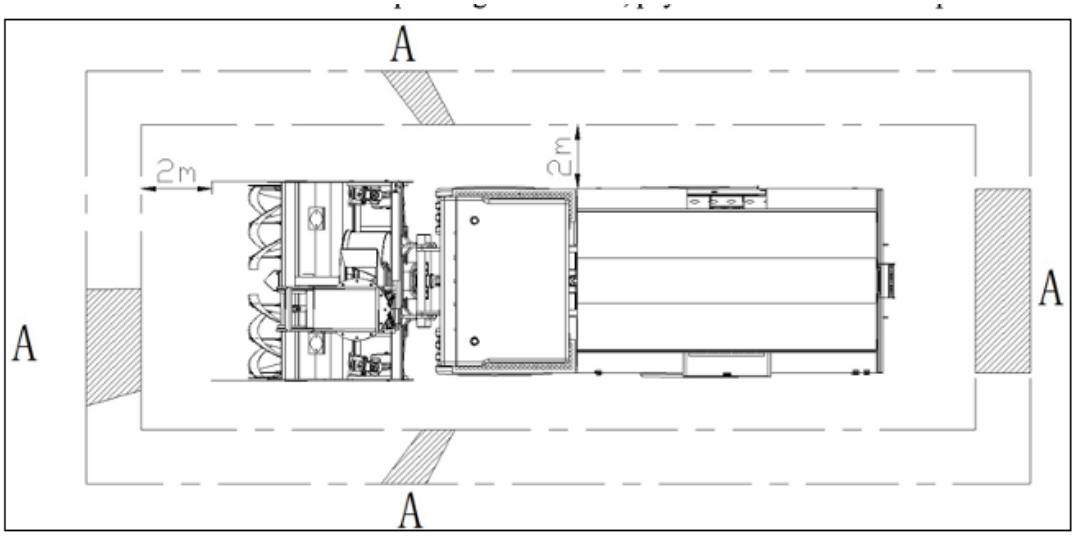
Item	Model	Volume in Liters
Engine oil	5W-40 CI-4	43
Engine coolant	-45℃	50
blower gearbox	80-W90 GL-5	13
Hydraulic oil	Mobil DTE Excel 32	250

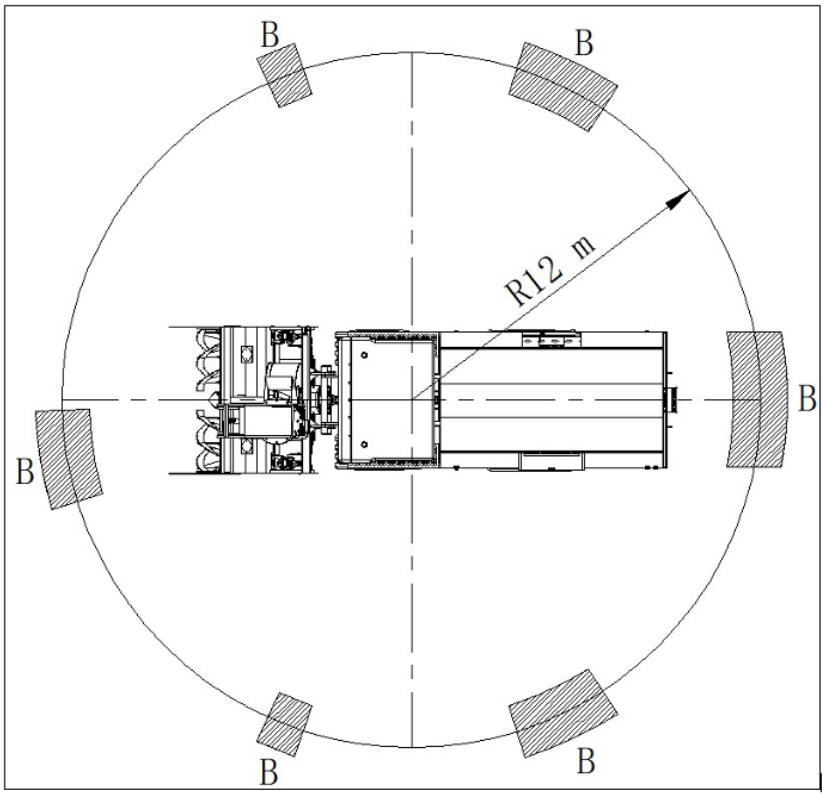
1.5 Break in Period

- Note: This Kodiak snow blower has been calibrated and thoroughly tested before delivery. Kodiak prohibits full-load operation of equipment in extreme weather conditions, which can seriously affect engine performance, shorten engine life and possibly lead to danger for the operator.
- To ensure that operators are fully aware of the contents of this manual, and pay attention to the following points:
    - After the engine is started, idle the heater for 3 to 5 minutes. During this warm-up, do not operate the accelerator pedal, adjust the throttle knob or increase the engine speed to 1000 rpm, until the coolant temperature reaches 50 degrees C.
    - Avoids heavy loads until the engine has reached working temperature.
    - Avoid sudden acceleration or an emergency stop under load.
- When the engine is running at an empty or light load (less than 15% load) for a long time, it may cause oil accumulation at the engine exhaust manifold or booster, and oil accumulation at engine empty or low load operation is normal. You can remove this oil from the exhaust manifold by loading the engine >30% for ten minutes. To minimize oil accumulation, the engine reduces long-term empty or light-duty operation.

1.6 Driver's field of view

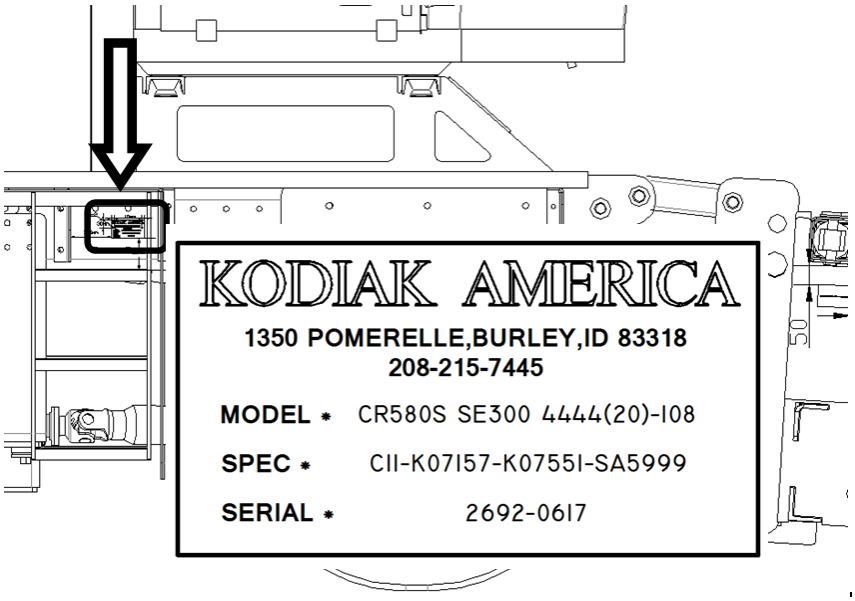
- There is a 2 meter boundary “A” and a 12 meter boundary “B” that is not visible to the operator due to the height of the cab. See below. Note that the obstruction in the front of the vehicle is a moving obstruction due to the position of the volute





1.7 Vehicle series number plate

- When the equipment needs to be maintained or replaced, please have the serial number ready when you contact Kodiak or your local Kodiak dealer.



2. General Safety

2.1 General Considerations

- Signage
    - Be sure to fully understand each safety sign
    - Do not use any cleaning product that might damage the signage
    - If any warning sign is damaged or faded, it must be replaced before the machine can be operated
- Operation
    - Only trained or designated personnel can operate and maintain the machine.
    - All safety rules, precautions and instructions for use must be followed when operating or maintaining the machine.

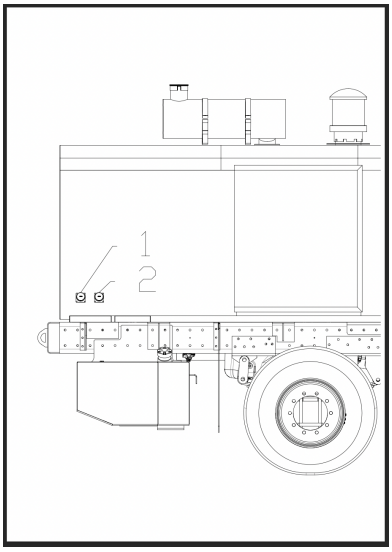
    - Drinking alcohol or taking medication can seriously reduce or impair the ability to safely operate or repair machines and by doing so will put yourself and others at risk.
- Check before starting the engine
    - Coolant check: Look at the window at the top of the radiator, note that the coolant level must be 1/2 higher than the window position, when filling the coolant, must be stopped or wait for the coolant temperature to drop below 45 degrees C in order to open the water tank cover for filling, in order to ensure the safety of personnel.
    - Fuel check: Check the fuel level before starting
    - Signaling device check: First turn on the main switch, then put the ignition key in the "ON" position (engine shutdown state) to see if the engine alarm indicator point is working properly (when the key is on, the engine alarm indicator lights up for five seconds and then automatically goes out).

2.2 Starting Engine

- **During daily work, the following checks are carried out BEFORE starting the engine:**
- Before starting, check for any oil leakage from the equipment.
- Check to make sure grease points are lubricated
- Make sure the parking brake is engaged
- Check whether the display screen is working normally;
- Wipe any dirt or dust from work lights, warning lights, and fault lights and check whether the lights are working properly.
- Check the coolant level, fuel level, engine oil level and hydraulic oil level.
- Check if the air filter is blocked;
- Check that there are no people or obstructions on, under or around the machine, and if necessary, issue a warning to ensure that they evacuate to a safe area.
- It is forbidden to start the engine by short-circuiting the starter motor circuit. This not only poses a safety hazard, but also causes damage to the equipment.
- Make sure the stroker is in neutral before starting

2.2.1 Cold Weather Start

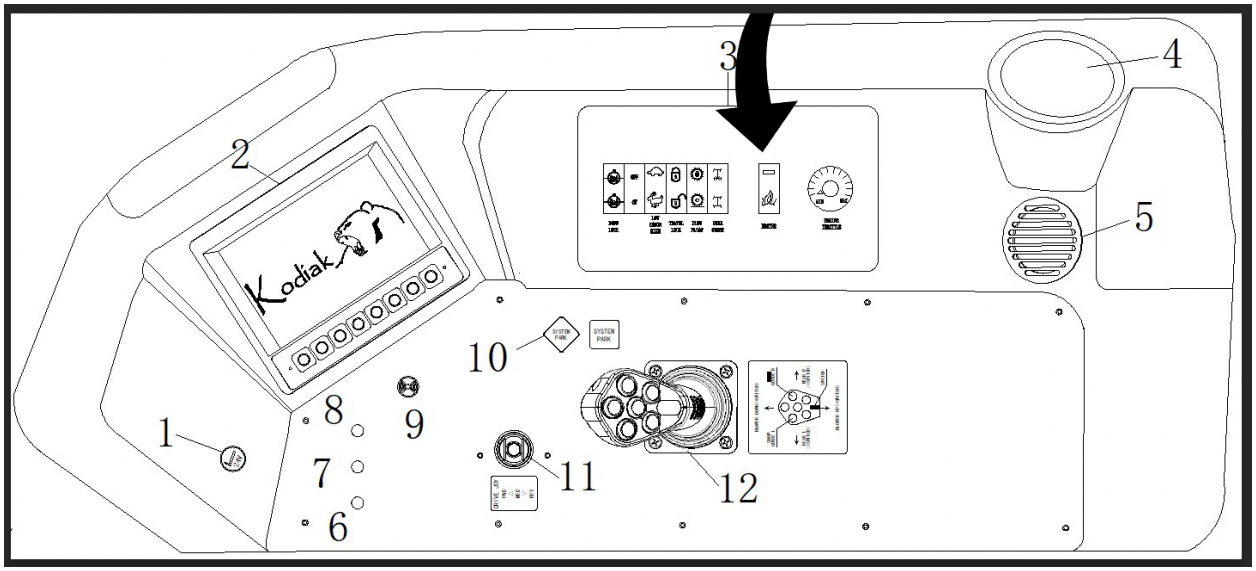
- When the ambient temperature is less than -18°C, the engine must be preheated. There are 2 systems for preheating. 1) is the built-in heating system and 2) Is a , 220V AC power; as shown in the figure below:



1. AC220V engine coolant heater interface.
2. AC220V battery charger interface.

- **Note: The electronic control module (ECM) will control the engine speed when starting. It is forbidden to manually force a higher engine speed.**
- Make sure the machine is in neutral and the blower head gear shifter is in neutral.
- Turn the key switch to the START position; keep the key switch in the starting position for 15 seconds. Wait 120 seconds in between trials.
- Let the engine idle for 3-5 minutes, or let the engine idle until the water temperature indicator starts to rise. The engine runs smoothly at idle speed until the speed gradually rises to a high idle speed. Allow the white smoke to dissipate before performing normal operations.
- Run the engine at low idle until all systems reach operating temperature. During the warm-up period, check all meters and indicators.
- COLD WEATHER START WITH ON BOARD SYSTEM.

- **NOTE, THIS CAN ONLY BE USED IN A VENTILATED AREA. THIS SYSTEM USES FUEL FROM THE FUEL TANK.**
- Turn on the main power, press the “Heater” button on the console. Let it run for 10-20 minutes depending on ambient temperature.
- Start the engine and turn the heater off.



2.2.2 Jump Start

WARNING: INCORRECT CABLE CONNECTIONS CAN CAUSE THE BATTERY TO EXPLODE. SPARKS CAN ALSO CAUSE FIRE. USE CAUTION WHEN JUMP STARTING THE VEHICLE.

- Use a battery power supply with the same voltage as the starting motor, jump start only allows the same voltage, using a higher voltage will damage the electrical system.
- Connecting the battery cables in the reverse direction, will cause the alternator and battery damage.
- The negative cable should be connected last and disconnected first.

2.3 Engine Running

2.3.1 Engine Idle

- Proper operation and maintenance are key to obtaining the maximum service life and economy of the engine. If you follow the instructions in the operation and maintenance manual, the use-cost can be minimized and the service life can be maximized. Always allow the engine to reach operating temperature at idle.
- When the engine is operated for a long time under no-load or light load (less than 15% load), it may cause oil accumulation at the engine exhaust manifold or turbo. It is normal for the engine to produce oil accumulation at no-load or low-load operation. You can remove this oil from the exhaust manifold by loading the engine >30% for ten minutes. To minimize oil accumulation, the engine reduces long-term empty or light-duty operation.

2.3.2 Engaging Drive

- When the engine is running, check the engine gauges. The engine should be within the normal operating range before “drive” is engaged.
- Engage the driven equipment at low RPM and check whether the equipment is working properly. If the load changes or the cycle changes, the governor will adjust the engine speed as needed. Running the engine for too long at low idle speed or reduced load may cause increased oil consumption and carbon deposits in the cylinder. Carbon deposits cause power loss and/or performance degradation. When operating under reduced load, the engine should be operated at full load every 4 hours in order to burn off excessive carbon deposits.

2.3.3 Fuel Consumption Guidelines

- The efficiency of the engine affects fuel economy. Cummins design and manufacturing technology provides maximum fuel efficiency for all applications. Follow the recommended steps to get the best performance during the life of the engine.

- Avoid fuel spills. The fuel will expand when heated. Fuel may overflow from the fuel tank. Check for leaks in the fuel line. Carry out the required repairs to the fuel line.
- Know the characteristics of different fuels. Use only recommended fuel.
- Avoid unnecessary no-load operation. Stop the engine instead of running the engine without load for a long time.
- Always observe the maintenance indicator of the air filter. Keep the air filter clean.
- Unless the air filter maintenance indicator indicates that the filter needs to be cleaned, do not remove the air filter cover.
- Keep the electrical system in good condition. A bad battery unit will overwork the alternator. This will consume additional power and fuel.
- Make sure the belts are adjusted properly. The belts should be in good condition.
- Make sure all hose connections are tight with no leakage.
- Ensure that the driven equipment is in good condition. A cold engine consumes more fuel. Keep the cooling system components clean and well maintained. Never run an engine without a water temperature regulator.
- The engine information nameplate is engraved with the fuel system setting value and the operating altitude limit. If the engine is moved to a higher altitude, the set value must be modified by the Cummins agent. Modifying the set value will help the engine provide maximum efficiency. The engine can operate safely at high altitude, but the output horsepower of the engine will be reduced. The fuel setting value should be modified by the Cummins agent in order to obtain the rated horsepower.

2.4 Engine Off

ATTENTION: STOPPING THE ENGINE IMMEDIATELY AFTER LOAD CAN CAUSE OVERHEATING AND CAUSE DAMAGE OR SPEED UP ENGINE WEAR. LET THE ENGINE IDLE FOR 3 MINUTES OR UNTIL THE TEMPERATURE DROPS BEFORE SHUTTING OFF THE ENGINE.

- Set the parking brake to the "park" position.

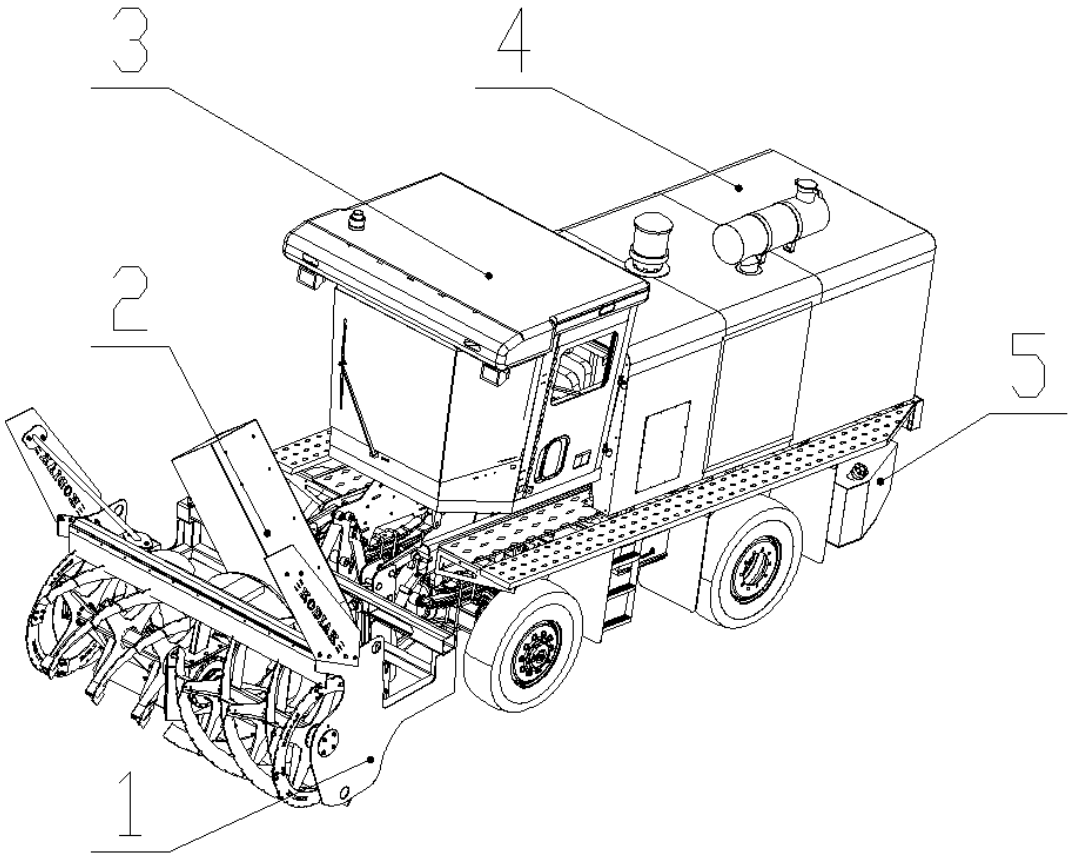
- After the engine has been idling for 3~5 minutes, turn the key switch to LOCK and the engine will stop
- Turn off the main power switch

2.5 Check After Stopping Engine

- Check whether the auger and drive shaft bolts are loose.
- Check if the equipment is leaking oil or water.
- Check fuel level.
- Check for paper and debris near the engine. Remove paper and debris to avoid the risk of fire.
- Check the engine oil level after stopping the engine for ten minutes.
- Record working hours. Perform maintenance as described in the maintenance manual.

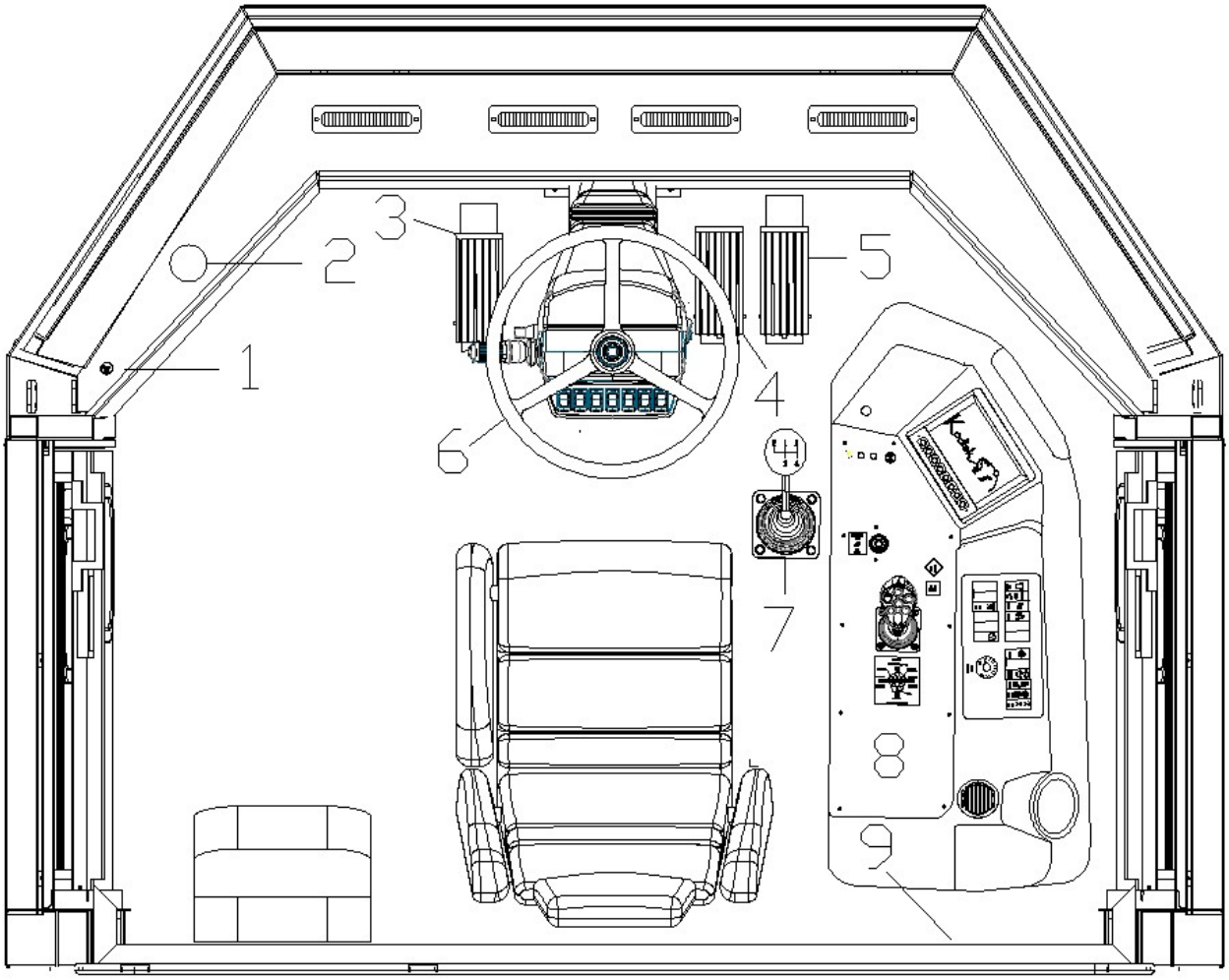
3. System Functions

3.1 General Layout



1.Blower Head 2.Volute 3.Cab
4.Doghouse 5.Fuel Tank

3.2 Cab Interior



1. 24V 240W Chargepoint	2. Washer fluid fill
3. Deceleration pedal	4. Brake pedal
5. Acceleration pedal	6. Steering Wheel assembly
7. Gear shift to blower head	8. Console
9. Electrical box	

3.2.1 24 V Chargepoint

- This cab is equipped with a 24V 240 W chargepoint. DO NOT SMOKE IN THE CAB.

3.2.2 Washer Fluid Tank

- The washer fluid tank is located in the front left of the cab, and the filling port of the tank is located under the left front windshield. Unscrew the decorative cover to fill the antifreeze wiper fluid.
- **Note: Since the equipment is used in a cold area, to prevent the wiper spray pipe from being frozen, please use an antifreeze wiper fluid that is compatible with the ambient temperature.**

3.2.3 Deceleration Pedal

- The deceleration pedal is located on the left side of the steering wheel column. When the vehicle is running, after stepping on the pedal, the travel transfer case is disconnected from the engine power. The greater the stroke, the greater the deceleration of the vehicle. When the deceleration pedal is pressed, the vehicle speed will also slowly stop. After the pedal is released, the engine will continue to provide power to the transfer case.

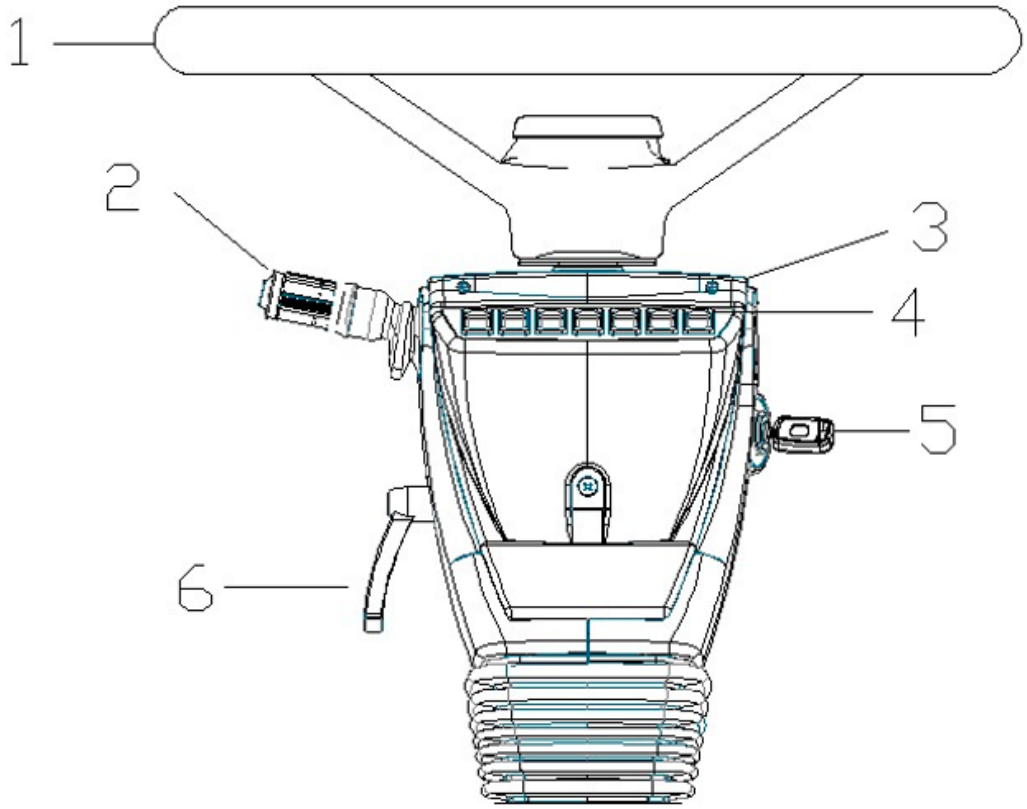
3.2.4 Brake Pedal

- The brake pedal is located on the right side of the steering column, and when pressed the vehicle is forced to decelerate through conventional braking. When driving at high speed, you should step on the deceleration pedal in advance and then step on the brake pedal to prevent mechanical friction between the snow blower and the ground when the vehicle is forced to brake.

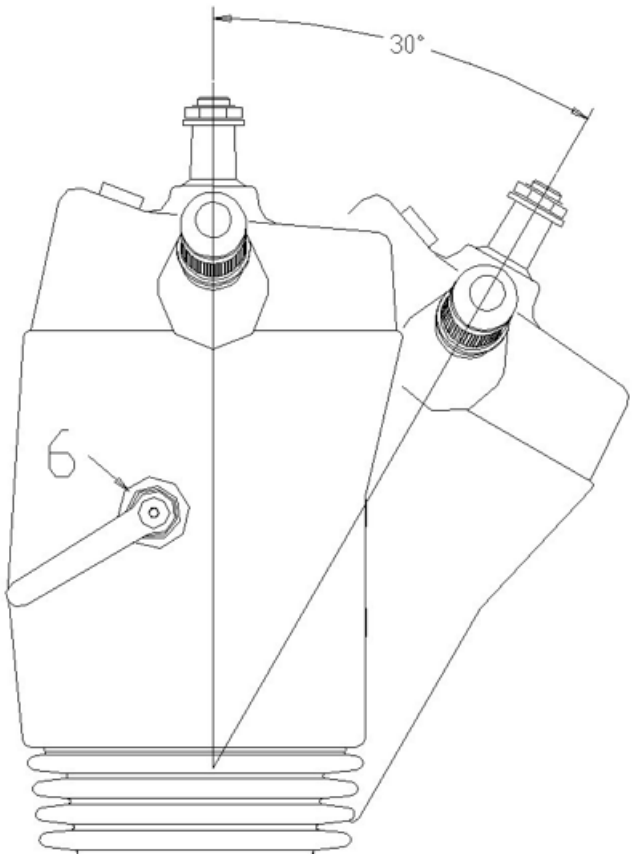
3.2.5 Acceleration Pedal

- The accelerator pedal is located on the right side of the steering wheel column to the right of the brake. This pedal is used in conjunction with the hydrostatic stroker located on the console.
- The pedal is safer and easier to use when traveling to the work site.
- The stroker is safer more useful when blowing snow because consistent slow speeds are necessary to be held during operation.

3.2.6 Steering Wheel



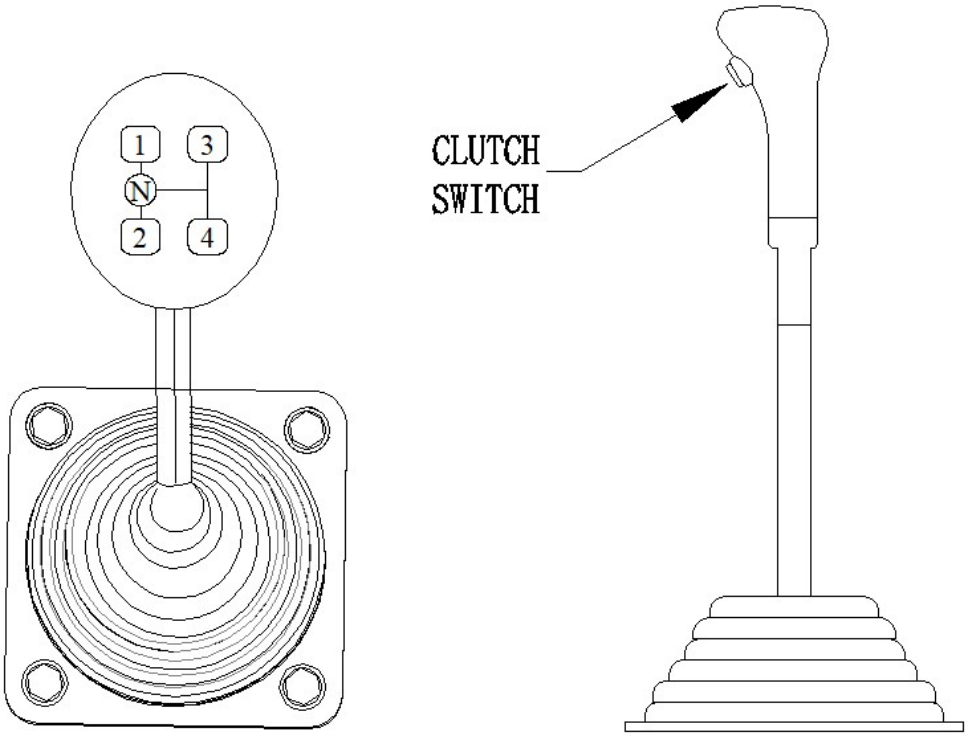
1. Steering wheel
2. Turning signal lever
3. LED indicators
4. Miscellaneous rocker switches
5. Ignition Switch
6. Steering column tilt lever



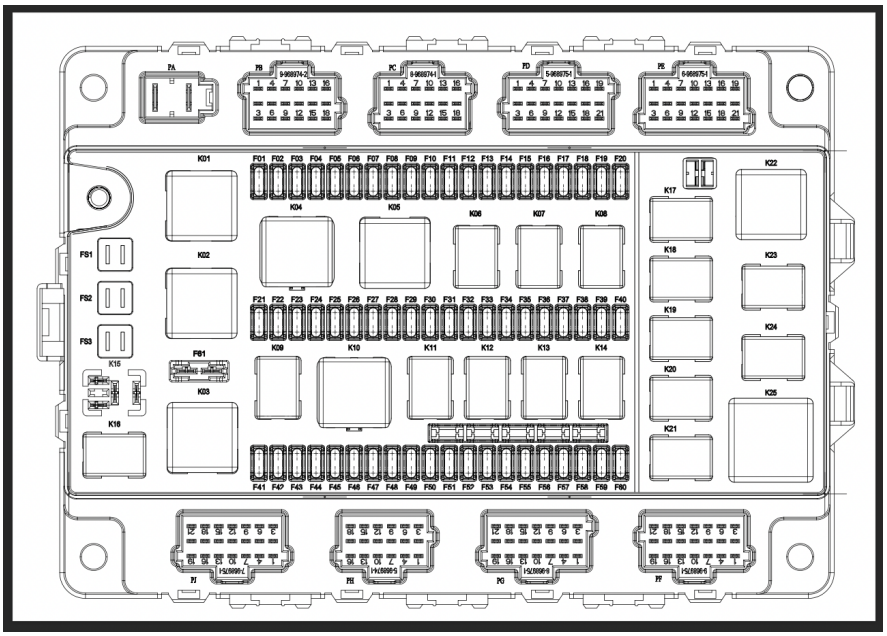
Loosen the tilt lever counterclockwise to loosen the column. Set to the desired tilt angle and tighten the lever by rotating it clockwise.

3.2.7 Shifter

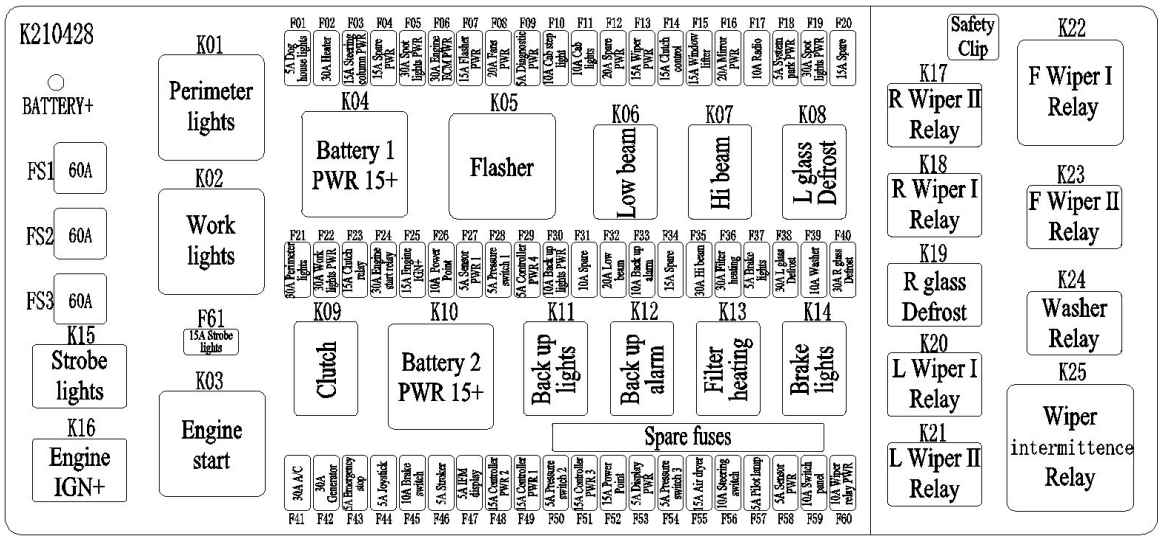
- The driver manually shifts gears to control the engagement and disengagement of the transmission to the blower head. Different gears are selected as well to adapt to the snow conditions.
    - Higher gears will throw the snow farther but with less torque. Higher gears are not suitable for deep snow
    - Lower gears will have more torque and are better suited for deep snow but will not throw the snow as far.



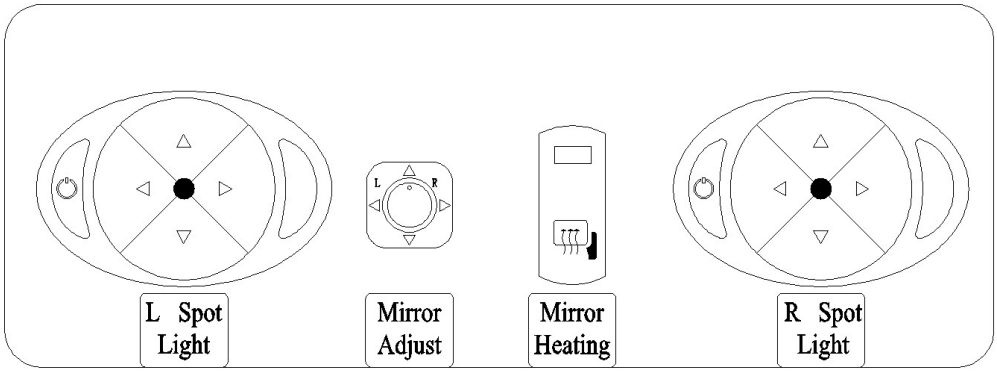
3.2.8 Electrical Mounting Plate



- The main function of the electrical wiring box is to protect the electrical equipment and prevent the wires from burning, and if a fuse is corroded or the fuse shell is black, it must be replaced with the same type of fuse. For greater detail of the electrical system, please refer to the maintenance manual

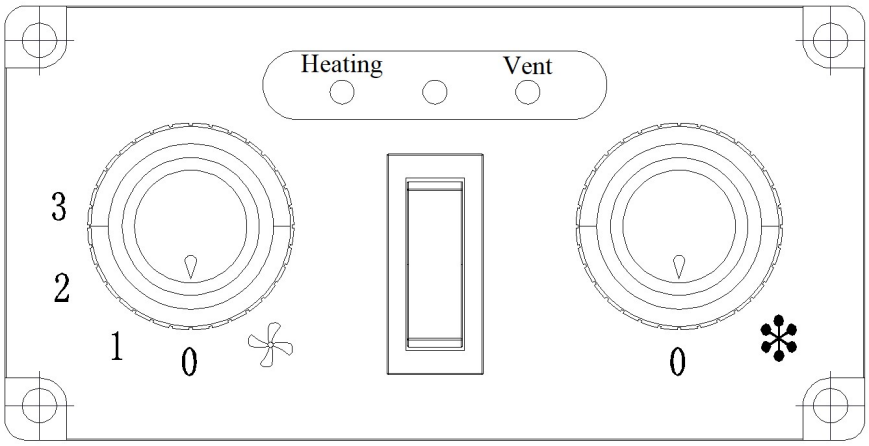


3.2.9 Work Lights



1. Left work light control switch
2. The mirror adjustment switch
3. The mirror heating switch
4. Right work light control switch

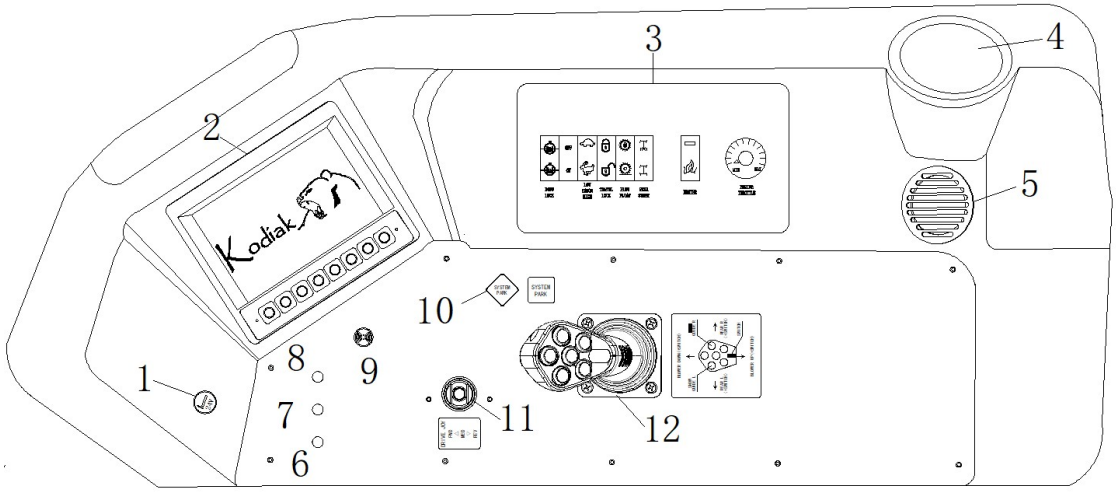
3.2.10 Heater



- Heating control panel, control panel can control the fan speed and adjust the air intake heat.

3.2.11 Console

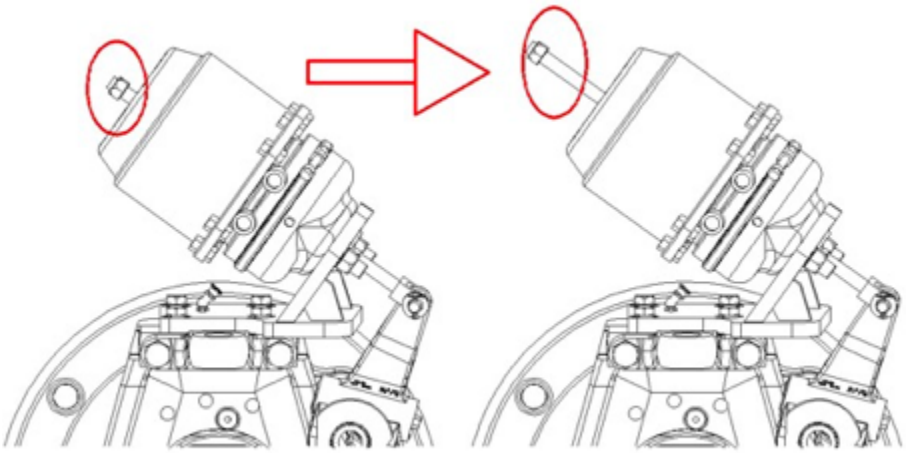
- The cab is equipped with a professional integrated independent console.
- All snow blowing operations can be carried out on the console, and all operation methods are completed by the driver alone.



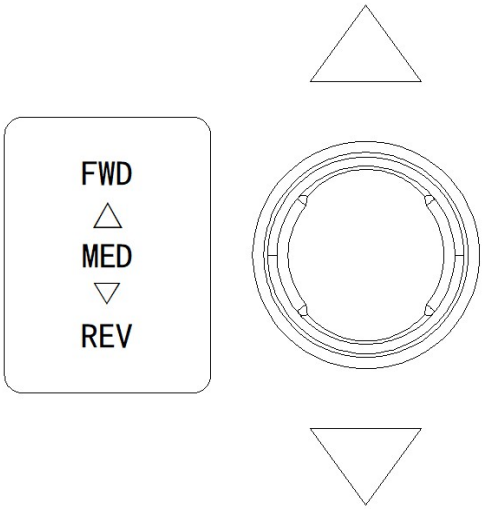
1. 24V Chargepoint
    a. DC24V 300W power chargepoint, not to be used for smoking

2. Display Monitor
    a. The display is a 7-inch TFT color display with a resolution of 800×480 pixels, that displays the engine status and the running status of the monitoring system; the main interface is the default when it is turned on, and the main interface of the display shows the following information in real time: speedometer, engine speed, engine water temperature, engine oil pressure, odometer, working hours, fuel tank oil level and fault alarm indication.
3. Switch Panel
    a. This switch panel contains switches for the transfer case, travel lock, diff lock, rear steer, plow float and engine RPM and engine pre-heater.
4. Cup holder
5. Air vent
6. Engine Fault/Shutdown lights
7. Check engine light
8. Engine wait light
9. System fault alarm
10. Parking brake
    a. When the vehicle is stopped, the parking brake must be applied to prevent the vehicle from moving without operation and causing a collision. Push the parking brake switch to realize the parking brake.
    b. Manually release the parking brake: If the vehicle fails, the engine cannot be started, or the brake system fails, the parking brake cannot be released pneumatically, and the parking brake must be manually released when the tow truck is required. Manually release the parking brake method: Use the M14 wrench to turn the outside of the brake screw on the brake chamber of all wheels to the limit position to release the parking brake.。
    c. **Note: After the parking brake is manually released, the vehicle will lose its braking force. Therefore, before manually releasing the parking brake, wheel wedges must be installed on the wheels of the**

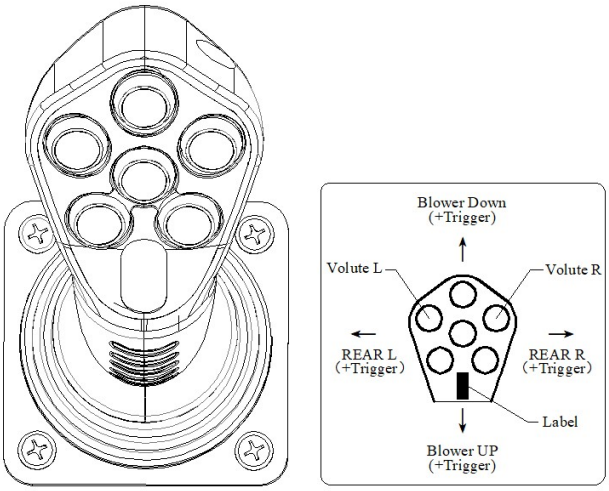
front and rear axles to prevent the vehicle from slipping due to lack of braking force and causing safety accidents.



11. Hydrostatic drive stroker
    a. The vehicle cannot move when the stroker is in the neutral position. When the stroker is pushed forward or backward, the greater the stroke, the faster the vehicle speed. The stroker must be placed in the middle position before starting or parking; if the stroker is not in the middle position, the vehicle will not start.

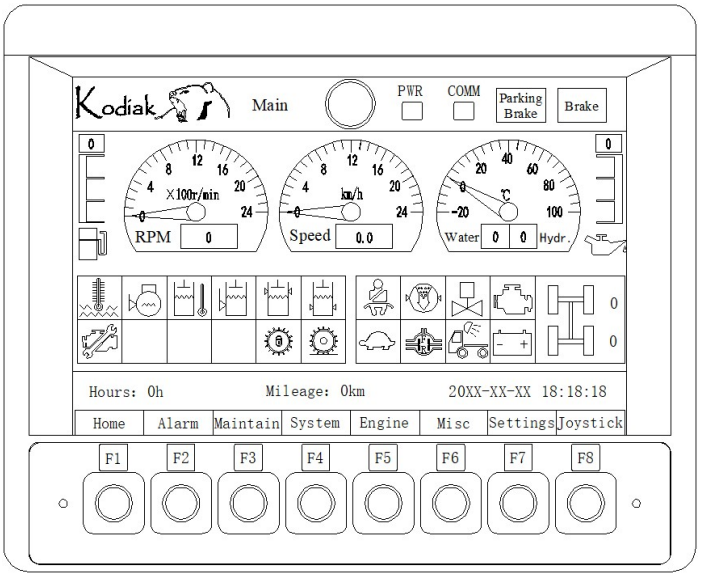


12. Blower head joystick
    a. This joystick controls the movement of the snow blowing head attachment and the rear wheel steering function. Through the display interface, you can view the joystick movement in real time. When the joystick is moving, the corresponding position on the display screen will light up (green).

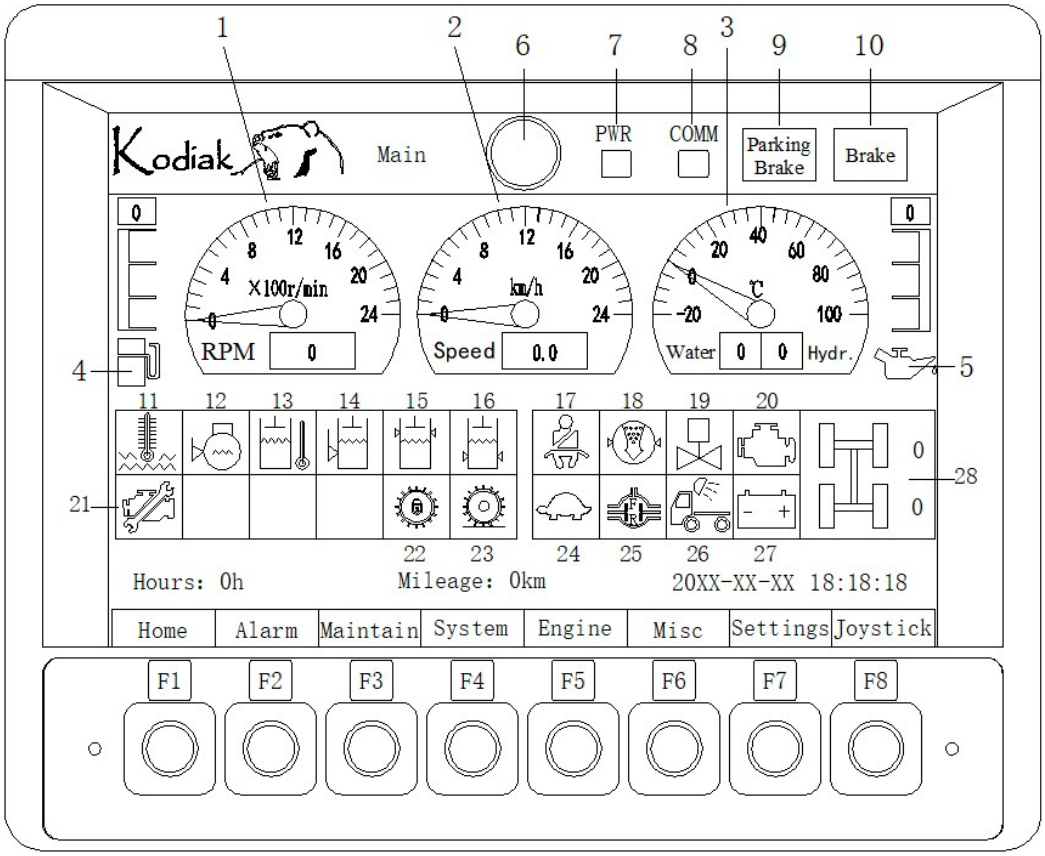


3.3 Display monitor use and programming

3.3.1 Main Interface



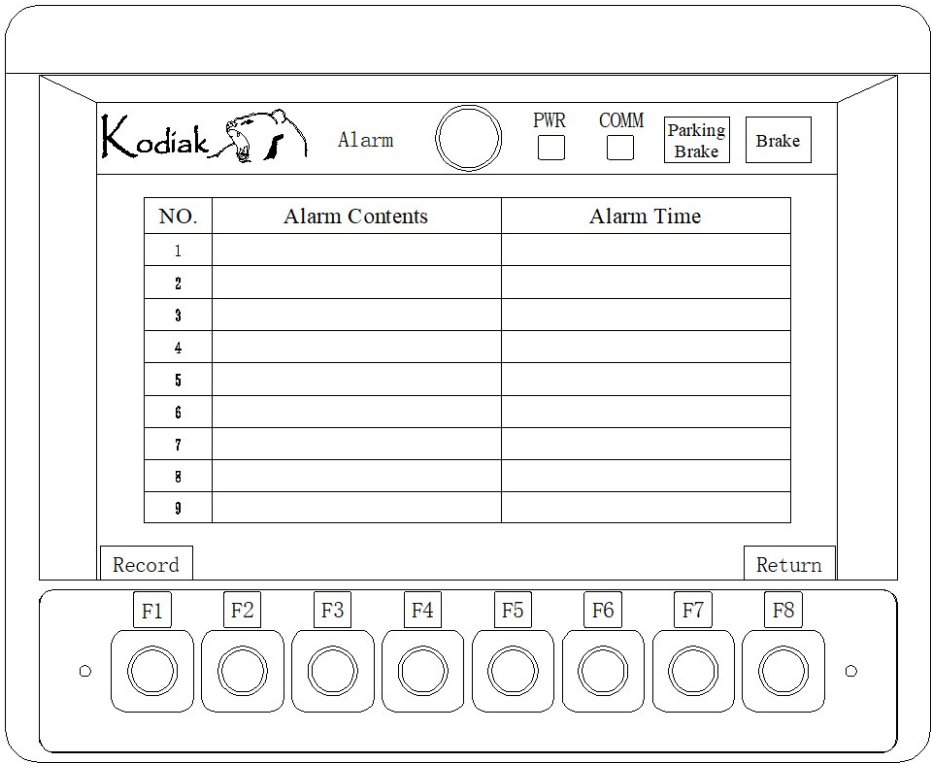
- The display screen is divided into eight interfaces: main interface, alarm interface, maintenance interface, controller interface, engine interface, other interfaces, system setting interface, and joystick interface.
- In the main interface state, you can enter the corresponding function interface through the eight buttons at the bottom of the display screen.



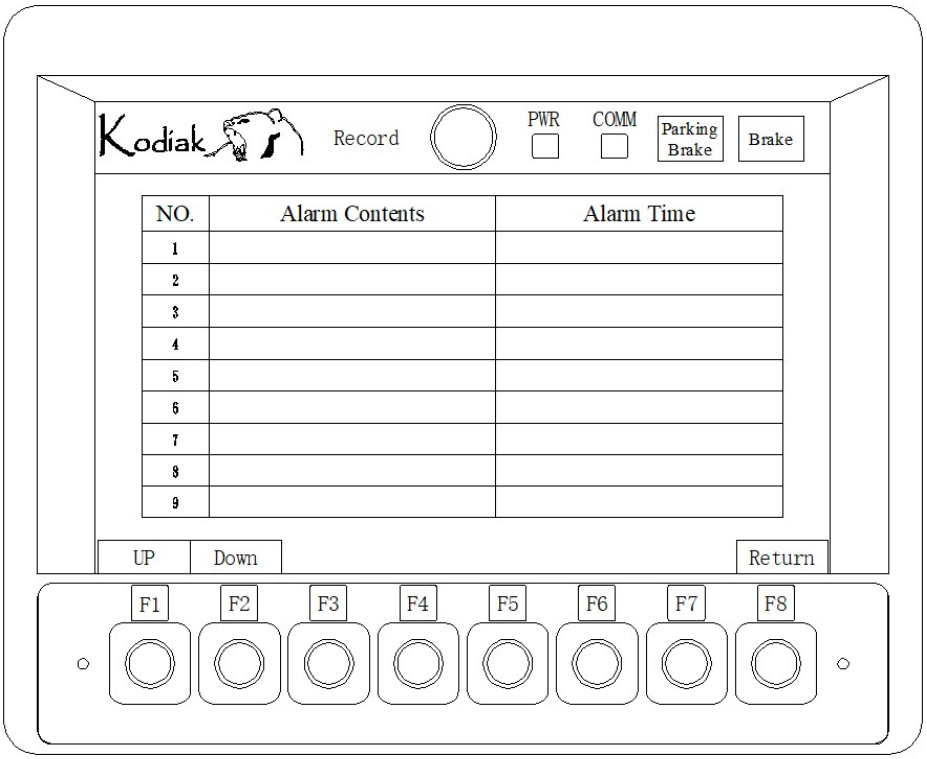
1. Engine Tachometer	2. Speedometer
3. Coolant and Hydraulic oil temp	4. Fuel Gauge
5. Oil Pressure	6. Emergency Stop
7. CanBus Power indicator	8. CanBus Communication indicator
9. Hand Brake	10. Foot Brake
11. High Coolant temp Alarm	12. Coolant level Low
13. Hydraulic oil temp High	14. Low Hydraulic level

15. Hydraulic oil pressure High	16. Low Hydraulic pressure
17. Safety Belt indicator	18. Low air alarm
19. Valve coil fault	20. Engine protection
21. Service Engine	22. Travel lock
23. Plow Float	24. Gearbox low/high
25. Differential lock (Diff lock)	26. Reverse light
27. Battery charging indication	28. Wheel alignment indicator

3.3.2 Alarm Interface



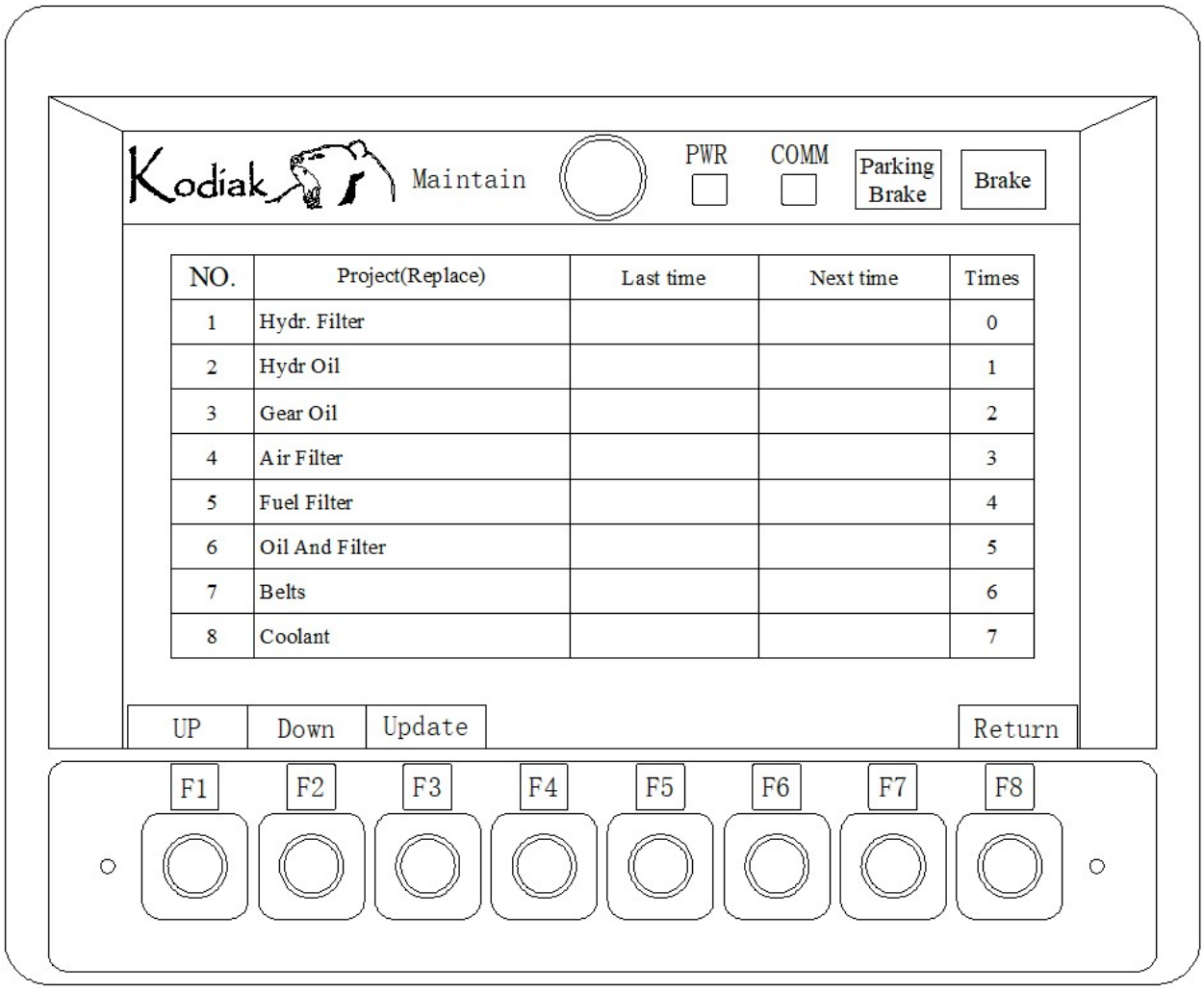
- Press F2 on the main interface to enter the alarm record interface, you can view the system alarm content in real time, and continue to press the F1 button to view the device's fault record.



- The fault point of the equipment can be quickly and accurately determined through the alarm record interface. When the above red fault indicator appears during the operation of the equipment, please immediately move the equipment to a safe location for inspection and confirm that the equipment can continue to operate after troubleshooting

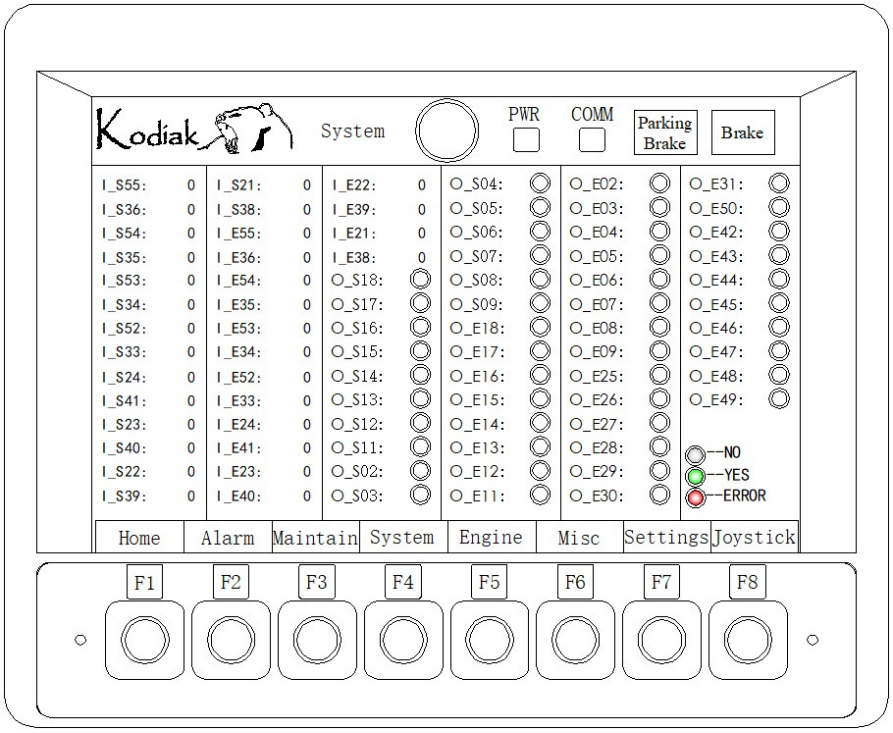
3.3.3. Maintenance Interface

- Press F3 on the main interface to enter the equipment maintenance interface. After each maintenance of the equipment, use "F2" and "F3" to toggle up and down to the maintenance item, and press "F5" to update, the system will save the maintenance information, and automatically generate the next maintenance time. There will later be an automatically prompt maintenance on the main interface of the display for the next maintenance interval.

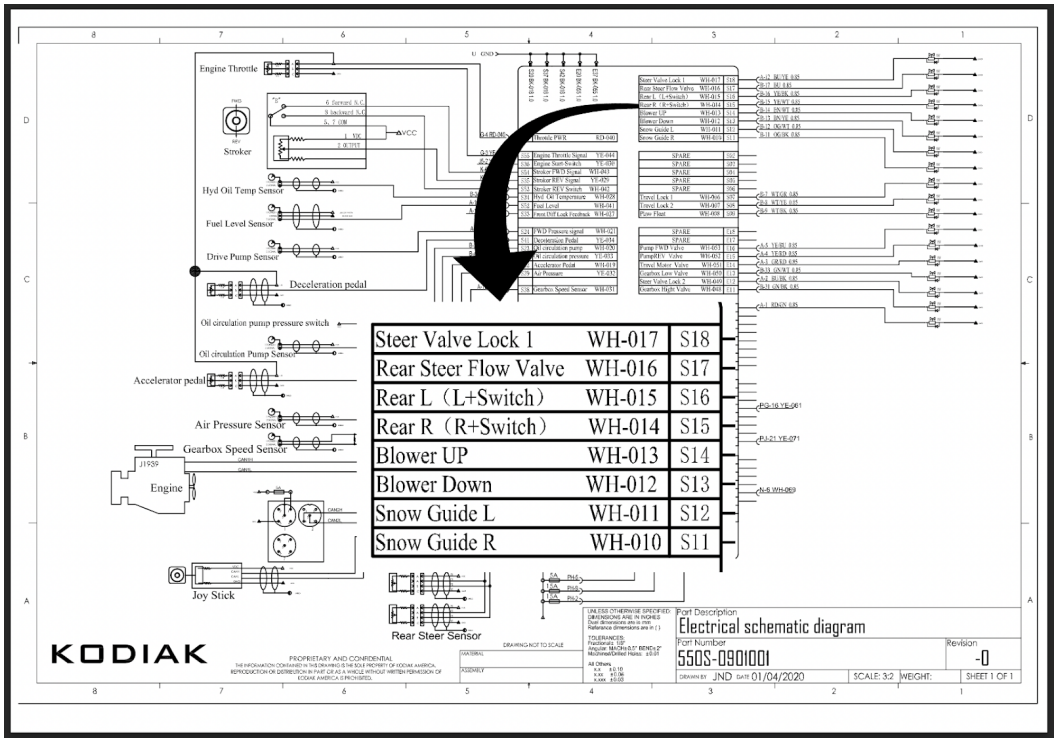

Kodiak
Maintain
PWR
COMM
Parking Brake
Brake
NO.
Project(Replace)
Last time
Next time
Times
1
Hydr. Filter
0
2
Hydr Oil
1
3
Gear Oil
2
4
Air Filter
3
5
Fuel Filter
4
6
Oil And Filter
5
7
Belts
6
8
Coolant
7
UP
Down
Update
Return
F1
F2
F3
F4
F5
F6
F7
F8

3.3.4 Controller Interface

- Press F4 in the main interface to switch to the controller interface, and you can change the input and output signal status of the controller according to this page.
- The controller output page can accurately determine whether the controller has a signal output; when the electrical components are working normally and the wiring harness is connected properly, the output point of the controller will display green; when the electrical component fails, the wiring harness is short-circuited or the wiring harness is open, the output point will be displayed in red; please contact the after-sales service in time when there is a fault in the line to eliminate the fault in time.

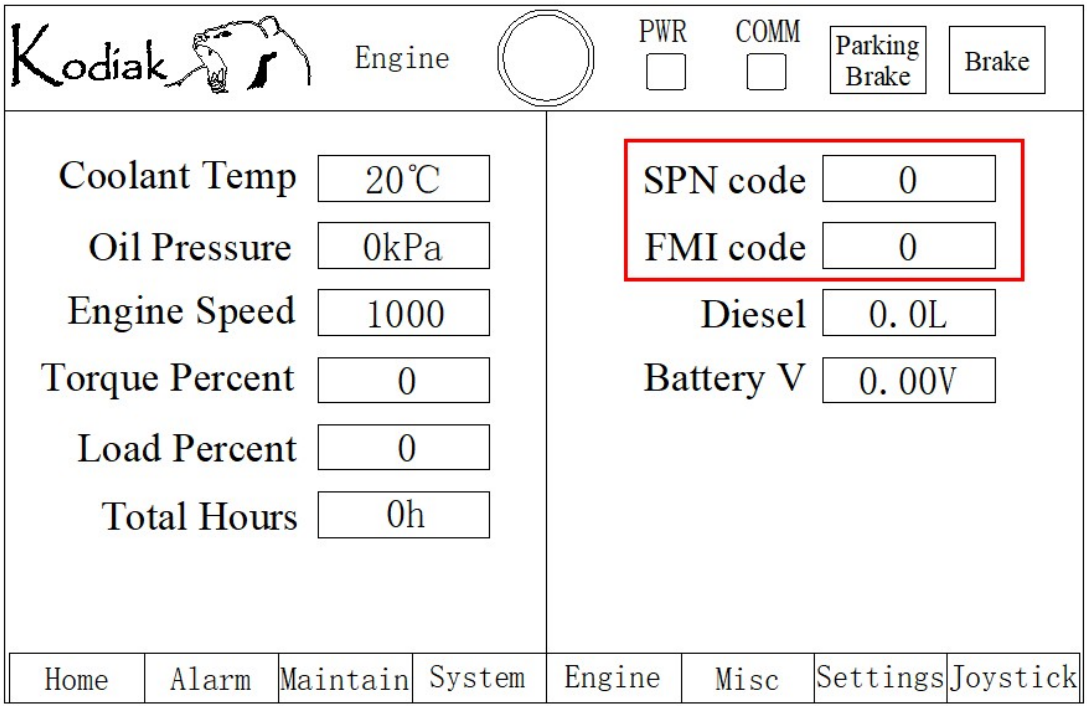


The numbers shown above on this screen correlate directly with the electrical schematic diagram in the maintenance manual. For example, if _S17 is red, you will know there is a fault in the “Rear Steer flow Valve”.


Engine Throttle
Stroker
Hyd Oil Temp Sensor
Fuel Level Sensor
Drive Pump Sensor
Deceleration pedal
Oil circulation pump pressure switch
Oil circulation Pump Sensor
Accelerator pedal
Air Pressure Sensor
Gearbox Speed Sensor
Engine
Joy Stick
Rear Steer Sensor
Steer Valve Lock 1 WH-017 S18
Rear Steer Flow Valve WH-016 S17
Rear L（L+Switch） WH-015 S16
Rear R（R+Switch） WH-014 S15
Blower UP WH-013 S14
Blower Down WH-012 S13
Snow Guide L WH-011 S12
Snow Guide R WH-010 S11
KODIAK
PROPRIETARY AND CONFIDENTIAL
Part Description
Electrical schematic diagram
Part Number
550S-0901001
Revision
-0
DRAWN BY JND DATE 01/04/2020
SCALE: 3:2
WEIGHT:
SHEET 1 OF 1

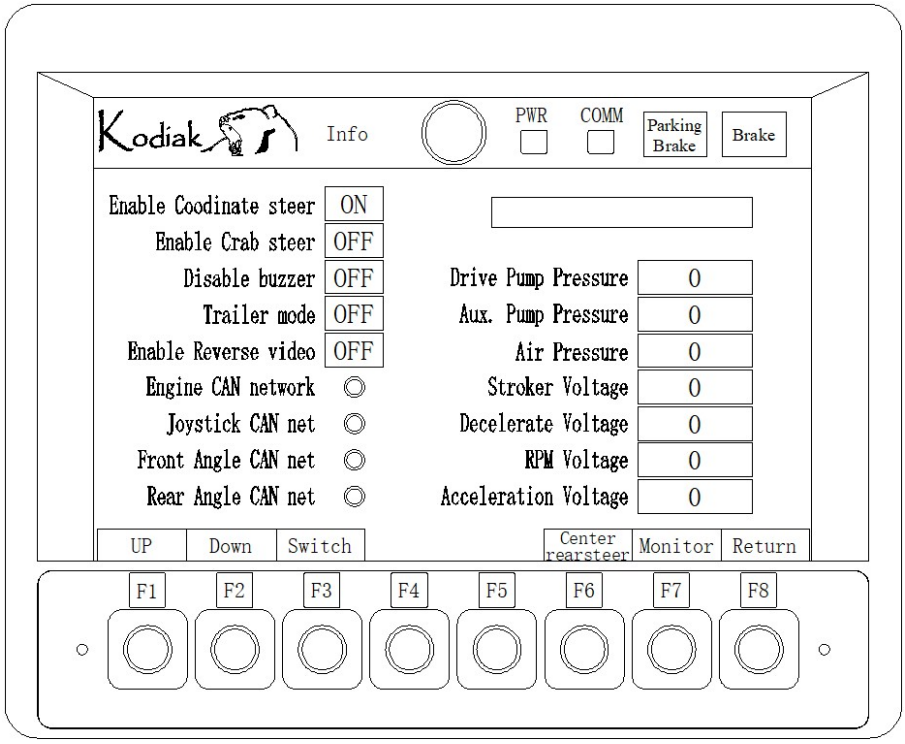
3.3.5 Engine Interface

- Press F5 on the main interface to directly enter the engine interface, you can monitor the real-time status of the engine. If the engine fails, the SPN (Suspect Parameter Number) code and FMI (Failure Mode Identifier) code will appear as numerical values. You can check the fault code through the local engine after-sales service network or the engine operation manual to determine the malfunction of the engine.



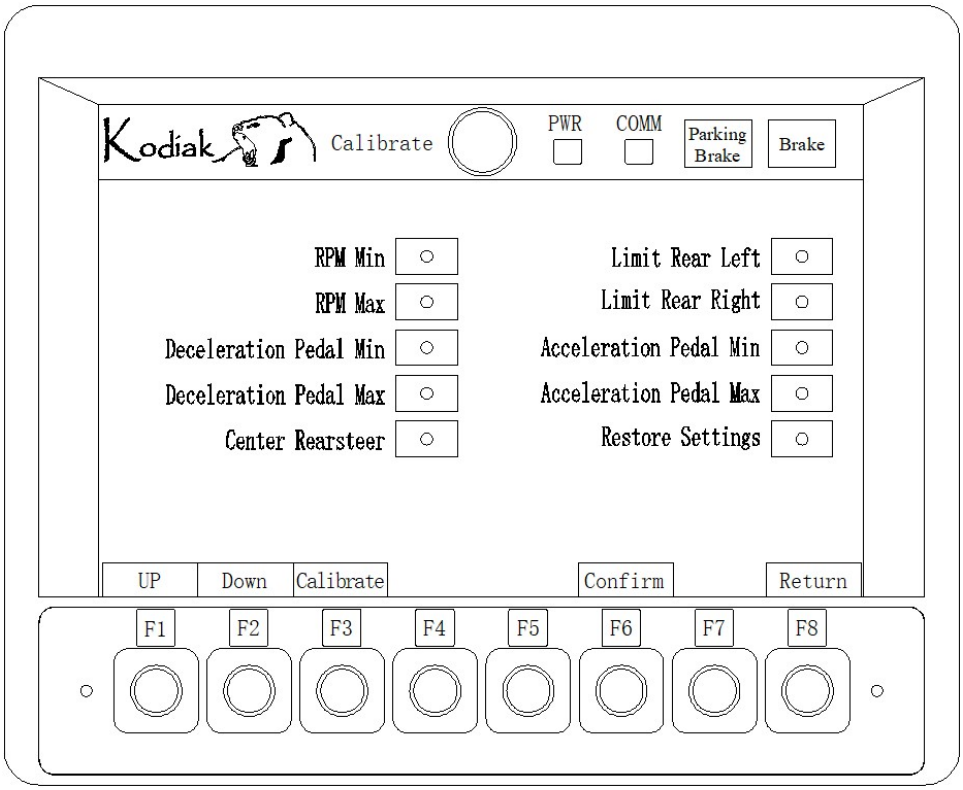
3.3.6 Information (Info) Interface

- In the main interface, press F6 to directly enter the information interface. Under the information interface, you can set the switching function of coordinate steering and crab steering.
- The rear-wheel steering function is limited to the use of the transfer case in low gear.
- When the rear-wheel steering function is turned on, the crab steering is disengaged. After the rear-wheel steering switch is turned on, the rear-wheel steering logo at the bottom right of the main interface of the display screen will light up, and the default steering mode of the rear wheels is coordinated steering;
- When switching to the crab mode, turn off the coordinate steering first before turning on the crab steering enable. After the crab steering is enabled, the steering angle of the rear wheels at the bottom right of the main interface of the display screen will follow the rotation in the same direction with reference to the angle of the front wheels;



3.3.7 Settings Interface

- Press F7 in the main interface to enter the setting interface, you can set the accelerator knob, deceleration pedal, accelerator pedal, the initial angle of the front and rear wheels or restore the factory settings. The calibration interface can set the engine speed according to the actual operating load;
- Engine speed range: 700 rpm-2100 rpm (Factory setting)
- If the front and rear wheels are not in the middle position, they need to be manually adjusted to the middle position and reset;
- When calibrating the rear wheels to the left position, turn on the rear wheel steering manual mode, use the joystick to turn the rear wheel to the leftmost side and perform calibration;
- When calibrating the rear wheels to the right position, turn on the rear wheel steering manual mode, use the joystick to turn the rear wheel to the rightmost side and perform calibration
- All parameters of the equipment are set in the factory before delivery. If the factory settings are restored during use, THEY MUST be set again in the following order, otherwise the rear wheel steering will not be available:
    - (1) the rear wheels in the middle;
    - (2) The left-turn limit of the rear wheel is calibrated
    - (3) the right-turn limit of the rear wheel is calibrated
- If you have any questions during the calibration process, please contact the manufacturer.

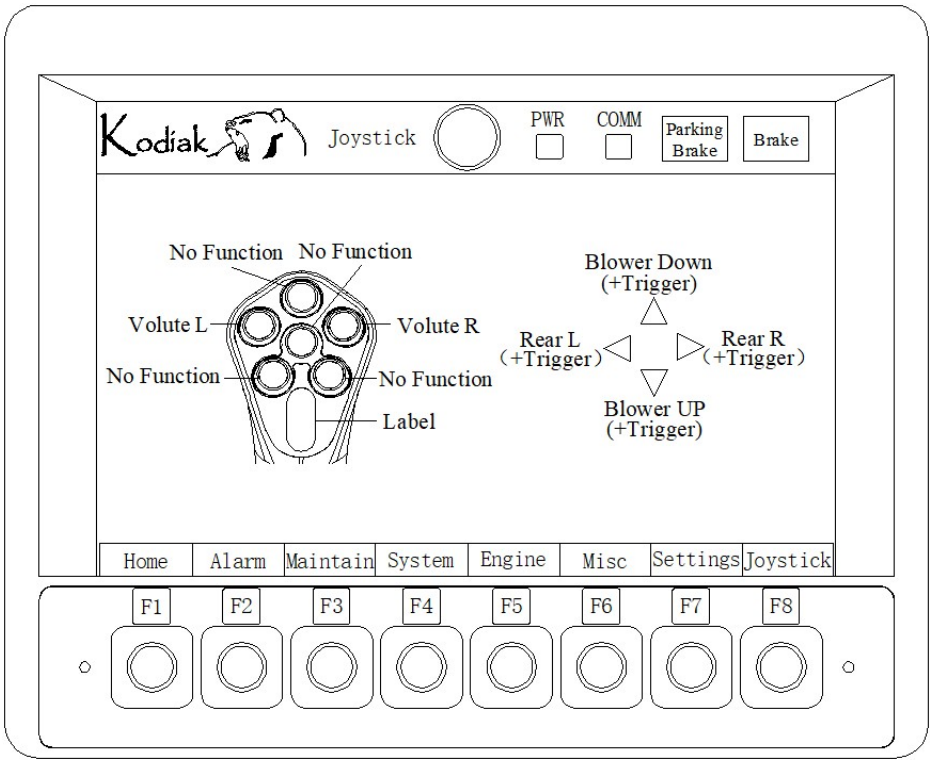



```
    G_WD_EngineSpeed_Potentiometer_Min_Factory : WORD:=  1540;
    G_WD_EngineSpeed_Potentiometer_Max_Factory : WORD:= 3188;
    G_WD_Decelerate_Padel_Min_Factory : WORD:= 1229;
    G_WD_Decelerate_Padel_Max_Factory : WORD:= 4434;
    G_WD_EngineSpeed_Padel_Min_Factory : WORD:= 1229;
    G_WD_EngineSpeed_Padel_Max_Factory : WORD:= 4434;
    G_WD_FrontWheelAngle_Middle_Factory : WORD:= 1841;
    G_WD_RearWheelAngle_Middle_Factory : WORD:= 1774;
    G_WD_RearWheelAngle_TurnLeftMax_Factory : WORD:= 1572;
    G_WD_RearWheelAngle_TurnRightMax_Factory : WORD:= 1970;
END_VAR

VAR_GLOBAL RETAIN PERSISTENT
    G_WD_EngineSpeed_Potentiometer_Min : WORD:=  1540;
    G_WD_EngineSpeed_Potentiometer_Max : WORD:= 3188;
    G_WD_Decelerate_Padel_Min : WORD:= 1229;
    G_WD_Decelerate_Padel_Max : WORD:= 4434;
    G_WD_EngineSpeed_Padel_Min : WORD:= 1229;
    G_WD_EngineSpeed_Padel_Max : WORD:= 4434;
    G_WD_FrontWheelAngle_Middle : WORD:= 1841;
    G_WD_RearWheelAngle_Middle : WORD:= 1774;
    R_WD_RearWheelAngle_TurnLeftMax : WORD:= 1572;
    R_WD_RearWheelAngle_TurnRightMax : WORD:= 1970;
END_VAR
```

3.3.8 Joystick Information

- In the main interface press F8 to enter the joystick interface, in this interface, when the work Joystick moves, the corresponding keys of the Joystick interface light up at the same time. If the display does not show the corresponding working status, there is an equipment electrical system failure that should be corrected in a timely manner.



4. Operation

4.1 Low temperature precautions

- **Note: Keeping the viscosity of the working fluid at 15-30cSt is conducive to extending the life of the hydraulic system, while working with low viscosity (less than 10cSt) can easily result in poor lubrication of the system components and increased leakage of the system, thus accelerating the damage to the system components. Cold hydraulic fluid may cause cavitation, and cavitation destroys pumps and motors.**

- The equipment has been filled with the following fluids:
    - Hydraulic oil: 32# high-pressure wear-resistant hydraulic oil; used in areas where the ambient temperature is above -45°C.
    - Coolant: Mobil Antifreeze -45°C, use in areas where the ambient temperature is above -45°C;
    - Engine oil: 5W-40 CI-4;
    - Transfer case: 80W-90 GL-5.
- Recommended range of hydraulic oil viscosity

Hydraulic oil uses temperature range	°C	-20 to +70
Use the viscosity range	cSt	10 to 80
Best use of viscosity	cSt	15 to 30
Maximum viscosity (short cold start)	cSt	1000

- Recommended grade of viscosity of the hydraulic oil

Operating temperature （°C）	The recommended viscosity level
circa 30-40	VG22
circa 40-60	VG32
circa 60-80	VG46, VG68

4.2 Battery

- Precautions
    - Keep all sparks away from the battery.
    - The battery electrolyte is very dangerous. If it gets into the eyes or splashes on the skin, immediately wash it with water and ask a doctor for treatment.
    - The electrolyte of the battery can dissolve the paint, if it splashes on the equipment, it should be rinsed with water immediately
    - If the battery electrolyte freezes, do not charge the battery or start the engine with a different power source. This could lead to battery failure and even fire.
    - Do not leave the battery in a low temperature environment for a long time to avoid difficulty in starting the device. The capacity of the battery will decrease in a low temperature environment, cover the battery or remove the battery from the vehicle and store it in a warmer place until you are ready to use the equipment.

4.3 Operation Pre-check

- Before operation, visually check each system while the engine is at idle speed. Check the engine water temperature, oil pressure, and equipment communication on the display screen.
- **The pressure, flow and flow rate of each circuit of the hydraulic system have been adjusted to appropriate values for the whole machine before leaving the factory. Without permission, the user cannot adjust the total pressure and flow control valves of the system.**

4.4 During Operation

- When the equipment is in operation, please clean the snow around the air pre-filter in time to ensure that the air pre-filter has sufficient air intake, otherwise the engine power will be affected.

- During snow removal operations, if the equipment swings sharply back and forth or tilts for an extended period of time, it may cause the engine oil pressure to be too low, and the internal parts of the engine could be severely worn, affecting the life of the engine.
- If an engine fault light alarm or system alarm occurs, stop the engine and evaluate the situation. Please contact Kodiak after-sales service in time.
- If the equipment operates continuously for a long time, the following points need to be paid attention to in order to ensure efficient operation:
    - When the fuel volume is lower than 20%, the controller will give an alarm, please fill in fuel in time to avoid unnecessary complications of a drained fuel system. It may adversely affect filter and pumps
    - Always pay attention to the engine oil pressure and coolant temperature to ensure the normal and efficient operation of the engine.
    - Always pay attention to whether there is an alarm message or warning prompt on the display screen.
    - Prepare enough shear bolts in advance to prevent fatigue and fracture of bolts from affecting snow removal operations.

4.5 Post Check

- After the operation is completed, in order to prevent freezing of mud, water, etc., so as not to affect the next use of the equipment, the following precautions should always be followed:
    - Mud or snow must be completely removed from the body. This prevents damage to seals due to mud or dirt entering the sealing surface with icy water droplets
    - Park the equipment on hard, dry ground
    - Drain the water collected in the oil-water separator to prevent it from freezing and causing the engine to start difficult or unable to start.
- Visually inspect the vehicle for damage

4.6 Long Term Storage

- When storing the equipment for a long periods of time (more than one month), the equipment should be handled as follows:
    - Start idling and check for oil leakage.
    - Fill up with fuel to prevent moisture accumulation.
    - Replace and fill up with lubricating oil
    - Fill all the grease points
    - Apply a thin layer of grease on the surface of the piston rod of the hydraulic cylinder
    - Remove the negative terminal of the battery and lock the engine compartment door.
        - If stored in a cold area, remove batteries to a warm location
    - Clean the equipment and store it in a dry building. If the equipment is placed outdoors, park the equipment on a level ground and cover it with a cover cloth or tarpaulin.

4.7 During Storage

- Reapply any grease to all points
- Start the engine once a month, and let the auger run for five minutes to cover a new oil film on the surface of the moving parts, and to charge the battery.

4.8 After Storage

- Note: If heavy rust is found on the vehicle, please contact Kodiak or an authorized agent before operation
- To use the equipment after long-term storage, proceed as follows before use:
    - Wipe off the grease on the piston rod of the hydraulic cylinder
    - Add grease to each movable mechanism
    - When the equipment is stored for a long time, the moisture in the air may be mixed into the oil. Check the quality of the lubricating oil and hydraulic

oil before and after starting the engine. If there is water in the oil, please replace the same type of lubricating oil or hydraulic oil immediately

5. General Precautions

- OFF: This is the position to turn off the main power supply of the vehicle equipment during normal parking,
- ON: in this position, all circuits of the whole vehicle are connected.
- START: When the key is turned to this position, the starter works and the engine starts to run. When the engine is started, the key should be released immediately, the key will automatically bounce back to the "ON" position, and the starter power supply will be cut off.
- **The vehicle must meet the following three conditions to be allowed to start:**
    - **the stroker is in the neutral position,**
    - **the emergency stop switch is in the open state,**
    - **the auger gearbox is in the neutral state.**
- Note: When the vehicle is running, do not turn or remove the key at will. The vehicle will be powered off, the engine will be stalled, the steering gear will not have hydraulic assistance, and the driver will lose the ability to control the vehicle's direction.
- Do not try to start the engine for more than 15 seconds. If the start fails, it should be restarted after 120 seconds.
- The key has its own anti-secondary start function to prevent the engine from restarting again when it is running. If you need to restart, you must turn the key off to the "OFF" position and then power on again.
- When the engine is stopped, the start key should be in the "OFF" position. (If the key is in the "ON" gear for a long time, it will cause the battery to continue to discharge. When the battery loses power, it will affect the normal start of the engine.)
- Before operation, check whether the vehicle has oil or liquid leakage in a circle around the vehicle. If there is any oil or liquid leakage, the problem must be solved before the equipment can be started.

- Before operation, check the fastening of the front and rear axle saddle bolts, the traveling transfer case drive shaft bolts, the auger drive shaft bolts, the pump drive shaft bolts, and the radiator fan drive shaft bolts.
- If the ambient temperature is lower than -18°C, you need to warm up the engine 5 minutes in advance, use 220V (alternating current) to heat the engine cylinder liner, or use the parking heater to heat the vehicle coolant to ensure that the engine is at low temperature It can start up normally and quickly.
- If the battery is found to be in a state of lack of power, such as when the battery voltage is less than 24V, use 220V (AC) to charge the battery in time.
- After starting the equipment every day, check the charging status of the engine generator. After the engine is running at >1000rpm for 3 minutes, check whether the battery voltage of the display is ≥27V.
- The best engine speed during snow throwing operation is usually at full RPM
- If the vehicle is not used frequently (not used within 7 days), 220V should be used to charge the battery regularly, 16h≥charging time≥8h.
- When the vehicle is working normally, the differential lock must be turned off. If the differential lock is not turned off in time, the coaxial drive tires will be severely worn when the vehicle is turning, or the final drive and differential of the drive axle may be damaged. The diff lock should only be used for short periods of time
- After the rear-wheel steering rocker switch is turned on, the speed of the vehicle will be limited to less than 16km/h. Before you stop using the rear-wheel steering function, be sure to turn the rear wheels back to the neutral position.
- When switching between the high and low gears of the traveling transfer case, the vehicle must be stopped and then switched. If the switching is performed during the traveling of the vehicle, the transfer case may be knocked out of gears, resulting in damage to the transfer case.
- When transporting, when the blower head is raised to the highest point, be sure to turn on the travel lock; so that the blower head does not lower during travel
- If you find that the wiper is frozen, do not force the wiper to work. You must clean off the ice and snow before it can work. If the wiper is forced to work, it will cause the wiper motor to burn out or the wiper arm to slip.

- If the vehicle fails, the engine cannot be started, or the brake system fails, the parking brake cannot be lifted pneumatically, and a tow truck must be used, the brakes will have to be manually released. (For the release method, refer to item 3.2.11.(10) of the operation manual.)
- Do not step on the brake pedal deeply when the vehicle is driving at a high speed during the transition to avoid road or vehicle damage

As technology and products are constantly updated, materials and technical specifications are subject to change without notice.