Excavator electrical maintenance manual

Precautions for electrical system maintenance

When performing maintenance on the electrical system of the machine, please strictly observe the following precautions. Otherwise, if you don't pay attention to it a little, it will turn a small problem into a big problem, causing greater economic losses. When maintaining, in order to disconnect the wires and connectors, the power of the whole machine should be cut off first. Failure to do so will result in damage to the wire harness, blown fuse, and sometimes even a fire due to a short circuit of the wires. Correctly identify the color and function of the wires: on the wire harness, each wire corresponds to a color and the wire gauge corresponds to the three-digit number (four-digit number in extremely small cases) on the drawing, please pay attention to distinguishing the colors And wire gauge, so as not to misread and bring unnecessary trouble to your maintenance. Connect the connectors correctly: When connecting the connectors (especially when the connectors are concentrated), please carefully observe the letter (one or two capital letters) logo of the connector and the wires at both ends of the connector Whether the color corresponds to avoid wrong insertion. Wrong insertion of connectors will cause many unpredictable failures, and may even cause a vehicle fire. When unplugging the connector, please grasp the connector itself and press the lock of the

connector to separate in two directions, and it is not allowed to grab the wire and pull it out hard.
3 When connecting the connectors, be sure to observe whether the lock is fastened, otherwise, please reconnect until the lock is fastened. When repairing the waterproof connector, special attention must be paid not to allow water to enter the inside of the connector, otherwise, it must be dried before reconnecting. Correct use of circuit testing instruments: 1. When using various circuit testing instruments, one should first understand their working principles and conditions of use, and unreasonable use is strictly prohibited. 2. When measuring voltage and current, select an appropriate measurement range to avoid damage to the instrument. 3. It is strictly forbidden to measure voltage at the current and resistance levels. Understand the schematic diagram of the circuit: The schematic diagram is the relationship diagram of the components and devices of the electrical system when they are in normal operation. , Quickly make a correct judgment on the fault phenomenon, avoid blind dismantling, and save maintenance time. Correctly understand the meaning of "ground": the negative pole of the battery is the "ground", and construction machinery generally uses the negative pole to ground, that is, the negative pole of the battery is connected to the whole machine body (including metal conductors connected together such as the frame and cab) Therefore, when the negative pole of the battery is firmly connected to the body of the whole machine, the body of the whole machine is also "ground". When measuring the ground voltage or resistance of a certain detection point, one test lead (red test lead) of the multimeter should be connected to the detection point, and the other test lead (black test lead) should be connected to any position of 4 the whole machine body (note: there should be no paint, oil or dust on this position wait). Bind the wiring harness and wires correctly: 1. Avoid hard bending and hard bending of the wiring harness. 2. Keep away from moving parts to prevent breakage and wear. 3. Avoid friction with sharp metal edges and corners. 4. Keep away from oil and water as much as possible. 5. Keep away from high temperature parts (such as engine block) as much as possible. When the wire or wire harness is found to be frayed, it should be wrapped or replaced immediately, and the wire harness should be fixed in a place where it will not be frayed. Use the fuse correctly: When replacing the fuse (also known as the fuse), be sure to use the same specification fuse, and it is not allowed to use copper wire for emergency treatment. The chip fuse and plate fuse (60A) used in this product shall comply with the relevant regulations of QC/T 420 "Fuses for Automobiles". Therefore, if you need to replace the fuse during maintenance, please use the parts provided by Parts Sea, and it is forbidden to purchase randomly in the market.

How to use a digital multimeter?

1. Measuring method of DC voltage:

2. Set the range switch to the required voltage range (since the system voltage of the machine is DC 24V, generally DC 200V is used),

3. Connect the black test lead to the "COM" jack, and the red test lead to the "V Ω" 5 jack

1. Connect the red test lead to the measured point, and the black test lead to ground, and the displayed value is the voltage value of the measured point.

2. the resistance measurement method: Connect the black test lead to the "COM" jack, and the red test lead to the "V Ω" jack. Set the range switch to the required resistance range, Connect the test leads across the two ends of the measured resistance, and the displayed value is the resistance value of the measured resistance.

3. Diode measurement method: Put the range in the " " position, Connect the black test lead to the "COM" jack, and the red test lead to the "V Ω" jack. Connect the red test lead to the positive pole of the diode, and the black test lead to the negative pole of the diode, and the reading "510" (for the diode components used in this machine) should be displayed. If the connection is reversed, the reading "1" will be displayed. For more detailed usage, safety requirements and precautions, please refer to the instruction manual of the digital multimeter. Basic circuit knowledge of construction machinery

1. The concept of circuit Connecting the positive and negative poles of the power supply and electrical equipment with wires to form a current path is called a circuit or loop. 6

2. Ohm's Law In a circuit, the magnitude of the current is proportional to the voltage and inversely proportional to the resistance. This is Ohm's law, expressed as: Current (I) = Voltage (U) / Resistance (R)

3. Single-wire system and negative ground In the industrial power supply system, the metal casing of the electrical equipment is connected to the neutral line of the power system, which is called protective zero connection. Its purpose is to quickly cut off the power supply when the live wire of the electrical equipment is grounded, so as to prevent high voltage from being applied to the electrical equipment and endangering personal safety. Connecting the metal shell of electrical equipment with the grounding body is called protective grounding. When the insulator of the electrical equipment is

damaged or the shell is charged, the current is introduced into the earth through the protective grounding wire to protect personal safety. The above-mentioned grounding and zero connection are a kind of protective measures.

4. However, the power consumption of automobiles or construction machinery is completely different from the zero connection or protective grounding mentioned above. We often connect the positive terminal of the battery to the electrical equipment, and the negative terminal to the frame, that is, to use the metal body of the frame to replace a wire in the circuit. The circuit formed by this method is called a single-wire system. At present, the low-voltage circuits formed by automobiles and construction machinery all over the world are stipulated as negative ground.

5. the voltage of the electrical system of construction machinery 7 The nominal voltage of automobiles or construction machinery is mostly 12V or 24V, which can usually be distinguished in this way: gasoline vehicles use 12V electric system, while diesel vehicles use 24V electric system, and construction machinery all use diesel engines, so they are 24V electric system, but there are also poles. A small number of diesel vehicles use 12V electric system. For the human body, after a lot of experiments, it is proved that whether it is AC or DC, as long as it is above 36V, it will cause harm to the human body, and below 36V, the human body will not feel anything even if it directly touches the charged body, so 36V The following voltage is called safety voltage.

6. the basic connection method of the circuit Series: The so-called series means that all the loads are connected before and after to form a path. Its characteristic is that the same current passes through each load, and the total resistance of the series circuit is equal to the sum of each resistance. Parallel connection: The same end of all loads is connected to the power supply, and the other end is connected to the negative pole, which is called parallel connection. Most of the circuits on automobiles or construction machinery are connected in parallel.

7. Voltage drop caused by wire resistance All wires have resistance, so when current flows through a wire, a certain voltage drop occurs. There are two factors that affect the voltage drop: one is the wire itself (cross-sectional area), and the other is the contact resistance between the wire and the frame and the connector. For example: when the electric lock is turned on, the headlights are turned on, and then the diesel engine is started, the headlights will suddenly dim during the starting period,

which is because the 8 voltage of the battery drops due to the large current passing through the circuit.

8. Three effects of current When a current passes through a circuit, three effects generally occur: thermal effect, magnetic effect and chemical effect. For example: when the current flows through the light bulb, the filament will heat up and emit light, which is the thermal effect of the current; when the battery supplies power to the electrical equipment, there will be current passing through the electrolyte inside the battery, and bubbles will be generated on the surface of the plate, which This phenomenon is called the chemical effect of current; when the coil of the instrument is passed with current, the pointer will swing, because the magnetic field lines generated around the coil exert a force on the pointer, which is called the magnetic effect of current. Nine, electric power

9. When all kinds of electric effects are realized, the current does work. The electric power supplied or consumed in 1 second is called electric power, and its symbol is P, which is proportional to the product of voltage and current, namely: P=U×I

10. Resistors A resistor is an element that takes electrical energy and converts it all into heat. For example: the components used to adjust the wind speed in the air conditioning system are resistors and lights.

11. Capacitor The unit of capacitance is F (Farad). The function of the capacitor is: it can store DC energy, which is proportional to the capacitance and the square of the charging voltage. Its characteristics: direct current cannot pass through the capacitor, but 9 alternating current can pass through the capacitor, and the higher the frequency, the easier it is to pass through.

12. Coil (self-inductance) The unit of self-inductance is H (Henries). A coil is made by winding the wire continuously in the same direction. It is very difficult for direct current to pass through the coil, but it is difficult for alternating current to pass through, and the higher the frequency of alternating current, the more difficult it is to pass through. For example: various relays, electromagnets, electromagnetic instruments, etc. used in construction machinery are examples of coil applications.

13. Diodes A diode is a semiconductor device that can only pass current in one direction. The applications in construction machinery are mainly silicon rectifier diodes and Zener diodes on

generators and freewheeling diodes in relay coils.

14. Integrated circuits An integrated circuit is a circuit block with resistors, capacitors, diodes, and transistors assembled on a semiconductor substrate to form a certain function. Power Systems 1. After the power switch (controlling the positive pole of the power supply) is closed, the voltage of the battery (two batteries connected in series, the nominal voltage is 24V) will reach the main power relay through wires 202, 203, 206, connectors AH and AG At a contact point of the AF electric lock, the power terminal (30) of the AF electric lock is reached through the No. 242 wire, the 7.5A electric lock insurance, and the No. 219 wire. 2. 10 2. Turn on the electric lock (turn the electric lock to ON), then the terminal 30 is connected to the terminal

15. The wire 219 is connected to the wire 204, and the current passes through the safety wire 7.5A301 of the oil cut-off valve to the oil cut-off valve to keep the coil energized , No. 304 power relay coil to the ground (note: our company's excavators and backhoe loaders both stipulate that the ground wire is 8XX line, which will not be repeated below), after the power relay coil is energized, the contact switch is closed, and through the fifteenth road Each circuit in the fuse box is sub-insured, all 15 LED lights are on, and the electrical load of the vehicle is energized.

3. Turn the electric lock to START position: Terminal 30, terminal 15 and terminal 50 are connected to each other, wire 219, wire 204 and wire 306 are connected. The starting relay coil is connected to the ground, so that the starting relay contact is closed, and the flow flows into the electromagnetic switch coil of the starter motor, and the starter motor starts to work. Current flows through the push-pull coil from the coil manager to the flameout electromagnet to the ground at the same time; the fuel oil circuit is opened and the power is cut off within 0.5 seconds, and the flameout electromagnet starts to work. The starter motor drives the engine flywheel to rotate, and the engine starts. After the engine is started, the generator starts to generate electricity (nominal voltage 28V) driven by the transmission belt, and the generator charges the battery for the load power supply of the vehicle through 50A insurance to 11 sub-insurance.

4. After the engine starts, the driver releases the electric lock key, the electric lock automatically resets to the "ON" position, the No. 306 wire is de-energized, the contact of the starter relay is disconnected, the No. 128 wire is de-energized, and the starter motor stops working; at the same time, the engine

is turned off The relay contacts are disconnected, the No. 302 wire is de-energized, and the flame-out electromagnet push-pull coil is de-energized, but the coil is still working, so that the fuel oil circuit continues to be opened, and the engine continues to run.

5. Turn off the electric lock (turn the electric lock to the "OFF" position), the No. 301 wire is powered off, the flameout electromagnet keeps the coil off, the fuel oil circuit is closed, the engine is turned off, and the generator no longer generates power; at the same time, the main power relay The coil is de-energized, the contact is disconnected, the No. 240 wire is de-energized, and the electrical load of the whole vehicle is de-energized.

6. Turn off the power switch, and the vehicle will be powered off. Introduction of main components: 1) Ignition switch: The engine start switch must be in the "ON" position and the engine must be running to ensure electrical and hydraulic system functionality. This step must be performed to prevent serious damage to the machine. Disconnection (1) Engine ignition switch The key can only be pulled out when the ignition switch is in the "off" position, and the key must be turned to the "off" position before starting the engine again. Turn the key to the "OFF" position to stop the engine. 12 ON (2) - When the key is released from the "START" position, the engine start switch will automatically return to the "ON" position. Start (3) - Turn the ignition key to the "Start" position to crank the engine. Release the key immediately after starting. Note: If the engine cannot be started, turn the key to the "OFF" position first, and the key must be turned to the "OFF" position before starting the engine again. NOTE: If the engine does not start after 30 seconds, turn the key back to the "OFF" position and wait 2 minutes before turning the ignition switch to the "START" position again. Before starting the engine, the hydraulic start lever must be in the neutral position to avoid personal injury. Electronic monitoring system

1. The method of judging whether the electric lock is damaged or not: Disconnect the connection between wire 219/204/306 and the electric lock, remove the electric lock from the vehicle, and check the resistance of the digital multimeter with the 200 ohm range as shown in the table below. Warning: If the driver releases the electric lock key after the car starts successfully, but the electric lock does not reset to the "ON" position, please turn off the electric lock immediately to stop the engine; if the generator still does not stop, please disconnect the negative switch immediately! Otherwise, the starter motor, flameout electromagnet and battery will be seriously damaged. 2. Fuse (also known as

insurance): The fuse plays a very important role in safety protection in the circuit. See Figure 4-Figure 7 for the physical object and installation location. Warning: The chip fuse and flat fuse (60A) used in this product should comply with the relevant regulations of QC/T 420 "Fuses for Automobiles". Therefore, if you 13 need to replace the fuse during maintenance, please use the parts provided by Parts Sea, and it is forbidden to purchase randomly in the market! Whether the fuse is blown can be judged visually; it can also be measured with a multimeter with a resistance of 200 ohms. The measured value between the two pins of the unblown insurance is 0-1 ohm. See Figure 9 for the installation position of the insurance. 3): Diode assembly (DIODE ARREY): It is composed of four diodes, as shown in Figure 7, with two copper sheets on each top and bottom Between them is a diode unit. The basic characteristic of a diode is unidirectional conductivity, that is, forward conduction and reverse cut-off. The diode assembly mainly plays the role of "freewheeling" for the relay coil in the circuit of this machine. Judging method of whether the diode component is damaged or not: use the red test lead of the multimeter (diode file) to connect the positive pole of the diode (the upper row of copper sheets in Figure 7 is the positive electrode), and the black test lead to connect to the negative electrode (the lower row of copper sheets in Figure 7 is the negative electrode), and the display The value is 510. Otherwise, 1 is displayed. Note: When wiring the diode assembly, the 200 line is connected to the positive pole, and the reverse connection is not allowed! The installation position of the diode assembly on the machine is shown in Figure

9. If the diode is broken down and short-circuited, it will cause the 10A electric 14 lock fuse to blow. 4) Relay: This machine uses 4 relays, the largest relay R1 is the main power supply, two of the same size are used as the start R3 and the push-pull oil cut-off valve R4, and the smallest relay R2 is used as the travel speed changer. The method of judging whether the relay is damaged or not: use the resistance range of the multimeter to measure: the resistance between 85 and 86 is about 300Ω; the resistance between 30 and 87 is infinite. Connect 85 to the positive pole of the DC 24V power supply, 86 to the negative pole of the DC 24V power supply, and 30 and 87 should be turned on. 5): Relay R3 and R4 (MZJ50A/006): This machine uses two relays of MZJ50A/006 type, one is used as a start relay, and the other is used as a flameout relay. See Figure 9 for the installation location. The relay has four terminals. Between the two small bolts is a coil with a resistance of about 70 ohms. Between the two large bolts is the contact point. The working principle of the relay is shown in Figure

12. When a certain current flows in the coil, the two contacts are turned on, and when the coil is

powered off, the two contacts are disconnected. The method of judging whether the relay is damaged or not: Measure with the resistance gear of the multimeter: the resistance between two small bolts is about 70Ω; the resistance between two large bolts is infinite. Connect the positive pole of the DC 24V power supply to a small bolt, and the negative pole to another small bolt, and the two large bolts should be connected. 6): Relay (MZJ100A/006): The MZJ100A/006 relay in this machine is used as the main power relay, and the installation position is shown in Figure 9. The relay has four terminals. Between the two small bolts is a coil with a resistance of about 15 6.5 ohms. Between the two large bolts is the contact point. The working principle of the relay is basically the same as that of the MZJ50A/006 relay. The difference is that the coil of this relay is composed of two coils connected in parallel, the push-pull and the holding coils. Click the switch. At the moment when the armature pushes the contact switch to close, at the same time, it opens the small switch inside the relay connected in series with the push-pull coil, so that the push-pull coil is de-energized, and the contact switch is kept in the closed state under the action of the electromagnetic force of the coil; the coil is kept off. After power on, the contact switch is disconnected. The method of judging whether the relay is damaged or not: Use the resistance gear of the multimeter to measure: the resistance between two small bolts is about 6.5Ω; the resistance between two large bolts is infinite. Connect the positive pole of the DC 24V power supply to a small bolt, and the negative pole to another small bolt, and the two large bolts should be connected. 7) Flame-off electromagnet: The flame-off electromagnet of this machine is a product of Synchro-Start Company, which belongs to the "power off and oil off" type, that is, the oil circuit is opened when the power is turned on, and the oil circuit is closed when the power is turned off. See Figure 13 for the installation location. The flameout electromagnet is externally connected with red, white and black wires. The coil (maintaining coil) between the red wire and the black wire has a resistance of about 40 ohms, and the coil (push-pull coil) between the white wire and the black wire is about 1 ohm. When wiring, please pay attention, red-to the red wire of the wiring harness, white-to the white wire of the wiring harness, black-to the black wire of the wiring harness, do not reverse the connection! Otherwise, it will cause the flameout electromagnet to burn out or the whole vehicle circuit to catch fire. 16 The flameout electromagnet controls the opening and closing of the engine's fuel oil circuit. Therefore, if the flameout electromagnet does not work normally, the engine will not start, or it will automatically shut down after starting. The method of judging whether the flameout electromagnet is working normally; when the electric lock is turned on, the lever of the flameout electromagnet will not move. When the electric lock is turned to the "START" position, the lever should move forward quickly to open the fuel oil circuit and release the electric lock.

After the key and the electric lock are automatically reset to the "ON" position, the pull rod should not move (that is, keep the oil circuit open). Otherwise, it can be concluded that the flameout electromagnet cannot work normally, and the specific failure judgment is shown in Figure 14. In addition, the installation of the flameout electromagnet needs to ensure the coaxiality and stroke of the pull rod. When replacing the flameout electromagnet, please install it in strict accordance with the requirements of New Costa. 8): Generator: The generator of this machine generally adopts BOSOCH generator, which is a supporting component of diesel engine, with a working voltage of 28V, a current of 40A, and a built-in voltage regulator. This generator has 3 outlets, they are: B+: Generator power output terminal. D+: Charging indicator signal W: Speed signal (not used in this machine) The generator and battery are connected in parallel to supply power to the electrical equipment of the vehicle. Before the machine is started, it is powered by the battery; after the machine is started, it is powered by the generator, and at the same time, the generator also charges the battery. Warning: It is strictly forbidden for the generator to supply power to the 17 electrical equipment independently without the battery. Warning: It is forbidden to check whether the generator is generating electricity by instantaneously short-circuiting the positive and negative poles of the generator to generate sparks. so as not to burn out the silicon diode and affect the regulator Note: The terminal - B+ is connected to the yellow wire, remember not to connect it wrong! Otherwise, the silicon rectifier diode will burn out, which will lead to more serious failures. The schematic diagram of the generator principle is shown in Figure 16. The generator is composed of rotor, stator, transmission pulley, fan, front and rear end covers, brushes and other components; the excitation winding is generally wound on the rotor and the stator is connected in a "Y" shape; the rectifier is generally a six-tube bridge full-wave rectifier. 1. When the DC voltage acts on both ends of the excitation winding, the current will generate a magnetic field. Driven by the motor, the magnetic field will rotate with the rotor. The three-phase symmetrical winding of the stator will generate three-phase frequency with the same frequency under the action of the rotating magnetic field. , Equal amplitude, 120° difference in sinusoidal electromotive force. 2. Using the unidirectional conductivity of silicon diodes for rectification, at any moment, only the positive diode connected to the winding phase with the highest potential conducts; similarly, only the negative diode connected to the winding phase with the lowest potential conducts ; Such a repeated cycle, the six diodes are turned on in turn, and a relatively stable pulsating DC voltage is obtained at both ends of the load. 3. The terminal voltage of the generator is directly proportional to the rotational speed of the generator; since the rotational speed of the engine varies in a large 18 range, the terminal voltage of the generator will also vary in a wide range, which cannot satisfy the

constant use of electrical equipment on the loader. voltage requirements. Therefore, a voltage regulator must be provided. 4. The voltage regulator uses the on-off of the switch tube to change the magnitude of the excitation current, thereby changing the strength of the magnetic field to stabilize the voltage of the generator. 5. The filter capacitor is mainly used to filter out the peak pulse and high-frequency interference from the generator. The method and treatment measures for judging whether the generator is generating electricity normally: 1. Turn on the electric lock, carefully observe the readings of the voltmeter, start the car, and then observe the readings of the voltmeter, the latter reading should be higher than the previous one. 2. You can also use the 200V DC voltage of the multimeter to check, open the electric lock, measure the generator terminal voltage (the red test lead is connected to the generator D+, and the black test lead is connected to the ground) and record the reading of the multimeter (this reading is actually the terminal voltage of the battery, Generally below 26V); start the car, measure the terminal voltage of the generator again, and record the reading of the multimeter (if the generator is generating power normally, this reading is about 28V), and comparing the two, the latter reading should be higher than the previous reading. 3. If the generator does not generate electricity: 19 First check whether the generator drive belt is too loose. Turn off the electric lock, and use a wrench to check whether the wiring of the terminal of the generator is correct, tight and reliable. Check whether the generator grounding is secure. If the problem still cannot be solved, contact Parts Sea or the maintenance service point of the diesel engine manufacturer. 9): starter motor: the starter motor is a supporting component of the diesel engine. It is mainly composed of electromagnetic switch, DC motor, shift fork and transmission gear. The starter motor converts the electrical energy of the battery into mechanical energy through a DC motor, and the transmission gear drives the engine flywheel to start the engine. Warning: After the engine is started, the starter motor should stop working immediately, otherwise the transmission gear will be damaged, the DC motor will be burned, the flameout electromagnet will be damaged, and the capacity and life of the battery will be seriously affected. See Figure 18 for the wiring. Contact 1 is connected to the positive output cable of the battery (not shown in this figure), and the S terminal is connected to the red wire. Remember! Can not be wrong. Warning: Do not allow any metal conductors to approach contact 1, contact 2 and S terminals at will! It is especially necessary to ensure that the fuel pipe and other metal objects passing near the starter motor will not contact or rub against contact 1, contact 2 and S terminal after the vehicle has been running with severe vibration for a long time. Otherwise, the whole vehicle may catch fire! Note: Please check frequently whether the connection between contact 1, contact 2 and S terminal is tight and reliable. Before checking, be sure to turn off the power switch!

Otherwise, short-circuit sparks may be generated, which may 20 damage the wrench and the terminal. The principle description is shown in Figure 19. Turn on the negative switch, and the 24V terminal voltage of the battery reaches contact 1. The moment the electric lock is turned to the "START" position, the red wire is energized (24V), and the current passes through the holding coil and the push-pull coil at the same time. When point 1 is connected to contact 2, the current will flow from the battery-contact 1-contact 2-DC motor coil to make the DC motor rotate; the iron core moves to the right and at the same time drives the shift fork to drive the transmission gear to the left to mesh with the engine flywheel; The motor drives the flywheel to rotate, and the engine starts. During the starting process (the electric lock is in the "START" position for a few seconds), the red wire is always powered (24V), the contact 1 and the contact 2 are always connected, and the voltage of the contact 2 is also 24V, it can be seen that the push-pull The voltage across the coil is equal and no current flows. At this time, the iron core is kept in the starting state under the action of the electromagnetic force of the holding coil. After the start is successful, the driver releases the key of the electric lock, and the electric lock automatically resets to the "ON" gear, and the red wire immediately cuts off the power. In a short period of time, the current flows as contact 1-contact 2-push-pull coil-S Terminal-Holding Coil-Ground, it can be seen that the current flow direction of the holding coil and the push-pull coil is opposite, and the direction of the magnetic field generated by the two is opposite, the electromagnetic force acting on the core cancels each other, and the core returns to the initial position under the action of the spring force. At this time, the contact 1 and the contact 2 are disconnected, the current no longer flows through the push-pull coil and the holding coil, and the transmission gear is also reset to the initial position. The starter motor stops working. 21 Judgment of common faults of the starter motor: 1. Fault phenomenon: the power switch, the starter motor runs by itself. Judgment: This situation is generally caused by contact sintering (moving contact plate and contact 1, contact 2 cannot be separated after sticking firmly). Treatment method: re-grind the contact and moving contact plate or replace the electromagnetic switch or replace the starter motor. Fault phenomenon: When starting, the starter motor does not respond. Fault judgment and treatment method: While turning the electric lock to the "START" position, check the voltage of the red wire at the S terminal of the starter motor. If there is no voltage, check the electric lock, starter relay, battery, etc. If the voltage is normal, turn on the electric lock again, and measure whether there is electricity at contact 1. If there is no electricity, check the battery, battery line, and negative switch. If the voltage of contact 1 is normal, it can generally be concluded that the starter motor itself is faulty and cannot be started. The further detection is as follows: while turning the electric lock to the "START" position, check the voltage of the

contact 2 of the starter motor. If there is no power, it can be judged that the electromagnetic switch is faulty, and the electromagnetic switch can be replaced; if the voltage is normal, it can be judged as The DC motor is faulty, replace the starter motor assembly. 10): Battery (37B0077, also called battery): This machine uses 2 DELPHI batteries connected in series. The negative pole of the first battery is grounded through the power switch, the positive pole is connected to the negative pole of the second battery, and the positive pole of the second battery is connected to the starter motor and the power relay. See Figure 20. The storage battery is a reversible DC power supply, which is connected in parallel with the generator to supply power to the electrical equipment. The storage battery can supply the starting current of 200-600A to the starter 22 motor in a short time (5-10s). The battery is also equivalent to a large capacitor, which can absorb the overvoltage that appears in the circuit at any time, so as to protect the electrical components from being broken down. Warning: When connecting more than two batteries, do not mix batteries of different models, especially different brands. Warning: Do not approach the battery with naked flames to avoid explosion. Warning: When performing routine maintenance and repair of the battery, please carefully read the safety information on the nameplate of the battery, otherwise, it may cause great harm to your body. Note: The installation of the battery must be fastened and reliable to avoid bumps and damage when the machine is running. Note: When the ambient temperature is below minus 15 degrees Celsius, a cold start assist device must be used to assist the start! The state of battery power can be understood through the color change of the electric eye (also known as the state of charge display density meter, see Figure 21). Green—Normal, Black—Needs to be charged, Bright—Battery is dead. If the car does not start, it is very likely that the battery is insufficient or the battery cable is not connected reliably. Note: Please always check whether the battery cable connection and the grounding point (Figure 22) are reliable. Before checking, please disconnect the negative switch! Before the assembly and disassembly of the battery cable, please disconnect the negative switch! When assembling, first install the positive pole head, and then install the negative pole head; when disassembling, first remove the negative pole head, and then remove the positive pole head; so as not to damage the battery 23 pile head and wrench due to short-circuit sparks. The detection method of the battery terminal voltage: use the DC 200V of the multimeter to detect, the red test lead is connected to the battery positive output cable stud, the black test lead is connected to the battery negative stud (the stud connected to the negative switch), and the reading of the multimeter is the battery terminal voltage (generally between 24.8V and 26V). For more detailed information, see the user manual of the battery. Common causes of battery failure type faults reasons solutions Insufficie nt charge 1.The voltage is below 12

volts 1.The setting value of the vehicle voltage regulator is too low 2.The electrical load of the vehicle is greater than the charging capacity 3.Driving at idling speed, driving at night, and overloading of electricity load. 4.Many times of starting and short driving distance, idling driving 5.The engine drive belt is loose or the circuit is faulty 6.Use corroded terminals or wiring harnesses for battery 1.Adjust electrical configuration 2.Adjust the charging voltage 3.Battery supplementary charge 24 poles overchar ge 2.It is difficult to start and the light is weak. 1. The set voltage of the vehicle voltage regulator is high. 2. The charging time is too long. 3. When supplementing electricity, the charging voltage is too high, exceeding 16.2 volts 1.Adjust the charging voltage 2.Battery replacement Overdisc harge 3.Start the tester to measure in the yellow or red area 1. Vehicle charging circuit failure 2. Vehicle circuit short circuit 3. When the vehicle is not in use, the electrical load is not turned off 4. The vehicle has been stopped for a long time without dismantling the negative connection 1.The supplementary charge of the battery is serious, replace it 2.Repair vehicles 3.Remove the negative connection after the vehicle stops for a long time short circuit 1.The shell is deformed and bulging Manufacturing defects inside the battery battery replacement open circuit 2.When charging, the pores spray Manufacturing defects inside the battery battery replacement 25 acid Reverse charging 3.Lead powder on the plate is easy to fall off Positive and negative connections are wrong when charging battery replacement battery burst 1.The voltage is below 12.0 volts. The flammable hydrogen-oxygen mixture gas inside the battery is ignited due to sparks or high heat 1. Poor welding inside the battery or short circuit produces sparks 2. External terminal short circuit 3. The battery is overcharged 4. The exhaust hole is blocked battery replacement Fault reasons solutions When the electric lock is turned on, the sound of the power relay pulling in and closing cannot be heard, and the electric load of the whole vehicle has no power (for example, when the switch of the lamp is Negative switch not closed Close the negative switch Negative switch damaged Replace negative switch The battery is severely depleted Recharge or replace battery 60A fuse fuse Replace 60A insurance The 10A electric lock fuse in the 15-way fuse box is blown Replace 10A insurance Damaged electric lock Replace electric lock MZJ100A/006 type power relay damaged Replace the Power Relay 26 operated, the light does not turn on, and when the switch of the wiper is operated, the wiper does not move, etc.). The battery line connector is loose Check the contact 1 of the starter motor, the four terminals of the battery terminals, the battery line contacts, and the battery line connector at the negative switch, and retighten them. Wire harness connector loose Reconnect the connector other reasons deal with it accordingly Instrument system 1. The instrumentation system includes instruments, alarm units, sensors and alarm pressure switches. The schematic diagram is shown in Figure 37. 2. Description of main

components: 1): Instruments: The instrument panel assembly includes 6 instruments including engine water temperature gauge, engine oil pressure gauge, fuel oil level gauge, voltmeter, tachometer and working hour meter, all of which are pointer type except the working hour meter And with backlight. The alarm unit monitors the running status of the whole machine at any time, and drives the alarm unit to perform a secondary light alarm to remind the driver according to the input signals of the instrument, sensor, and pressure switch when necessary. Please refer to the operation section for specific usage information. 2): Temperature sensor: This machine is equipped with 2 temperature sensors to monitor the water temperature and hydraulic oil temperature. The installation positions of the 2 temperature sensors are shown in the figure. The temperature sensor is equivalent to a temperature-sensitive resistor, and the resistance 27 decreases as the temperature rises. 3): Pressure sensor: This machine is equipped with a pressure sensor to monitor the oil pressure. See Figure 41 and Figure 42 for the installation position of the pressure sensor. Pressure sensors are similar to piezoresistors that increase in resistance as pressure increases. 4): Fuel oil level sensor: The fuel oil level sensor is actually a sliding wire resistance, the oil level rises, and its resistance value decreases. Installed on the fuel tank (resistance value is about 1~80Ω). 5) Speed sensor: We use an electromagnetic induction sensor, and the flywheel of the diesel engine is used to cut the magnetic force line to generate an electromotive force. The resistance is about 1000Ω. Three: System common troubleshooting: 1): The indication of the thermometer is abnormal: remove the sensing line () at the temperature sensor. If the sensing line is grounded, the meter will display the full scale. If the sensing line is suspended, the meter will display the minimum reading, indicating that the meter and the circuit Good, the sensor is damaged, replace the sensor. Otherwise, check the circuit, if the circuit is good, then it is the fault of the instrument. 2): The indication of the pressure gauge is abnormal: remove the sensing line (oil pressure) at the pressure sensor. If the sensing line is grounded, the meter will display the minimum reading. If the sensing line is suspended, the meter will display the full range, indicating that the meter The line is good, the sensor is damaged, replace the sensor. Otherwise, check the circuit, if the circuit is good, then it is the fault of the instrument. B principle description: 28 1. The principle of the washer: open the electric lock, the wiper is guaranteed to be energized (24V), turn on the water washer switch (it is an automatic reset rocker switch, see the attachment - rocker switch information for details), water washer motor (installed on the kettle, See Figure 10) When it is powered on, pump the water in the kettle to the nozzle (installed under the front window glass of the cab) and spray it on the window glass. 2. Wiper principle: The front and rear wiper motors configured on this machine are permanent magnet motors, and both adopt the method of controlling the

positive pole. As shown in Figure 9, the wiper motor is connected to five external wires, among which the red is the power wire (the common brush lead wire of the high-speed gear armature and the low-speed gear armature), the black is the negative wire (connected to the ground through the motor shell), and the blue is the The other brush lead of the high-speed gear armature, the green is the other brush lead of the low-speed gear armature, and the white is the reset wire. After the electric lock is opened, wire No. 161 is energized (24V). If the wiper switch (see the attachment - rocker switch information for details) is at gear I, pin 3 and pin 5 are connected, and the motor runs at low speed; if the wiper switch is at gear II, pin 3 and pin 1 When it is turned on, the motor runs in high-speed gear; if the wiper switch is turned off (that is, from I gear to O gear), pin 5 and pin 7 are connected, because the wiper does not stop at the initial position at the moment of turning off the switch, The current passes through No. 161 wire—low gear armature—wiper switch pin 5—wiper switch pin 7—white reset wire—ground (Note: There is an automatic stop device inside the motor to ensure that the wiper can always stop at the initial position position, when the wiper is in the initial position, the reset line is connected to the power line, otherwise, the reset line is connected to the negative line), the motor continues to run, and when the wiper rotates to the initial position, the reset line is connected to the power line Pass, 29 the armature of the low-speed gear of the wiper motor is short-circuited, and the motor continues to run under the action of inertia to generate electricity, generating electromagnetic braking torque and immediately stops rotating. Common troubleshooting—the wiper motor does not work:

1. Check whether the 10A wiper fuse is blown.

2. Check whether the wiper switch is damaged.

3. Check whether the connector is loose and whether the wiring harness is worn.

4. Check whether the wiper motor armature is short-circuited or open-circuited. Troubleshooting of common faults—the nozzle does not spray water. 1. Observe whether the motor is running and whether it can pump water. 2. Check whether the water circuit is disconnected (the water pipe is disconnected or tied too tightly). 3. Check whether the nozzle is blocked. Electric horn circuit Principle description: open the electric lock, the 10A electric horn insurance is powered (24V), press the electric horn switch, the current will be from 10A electric horn insurance-electric horn-electric horn switch-

ground, electric horn (see Figure 12) intermittently beep. Troubleshooting of common faults—when the electric lock is turned on, the electric horn does not sound when the switch of the electric horn is pressed:

1. Check whether the 10A electric horn fuse is blown.

2. Check whether the electric horn switch (pilot handle button switch) works normally. Under normal circumstances, press the electric horn button switch 30 and the wire will be energized.

3. Check for loose connectors and worn harness.

4. Whether the relay on the horn assembly is damaged.

5. Check whether the electric horn is damaged (connect one of the two terminals of the electric horn to the 24V power supply and the other to ground, if the electric horn does not sound, it can be determined that the electric horn is damaged). Air conditioner circuit Principle description: 1. Turn on the electric lock, the 20A air conditioner insurance is powered (24V), and the air volume switch pin B is powered through the wire. If the air volume switch is in the off position (O position), the five pins of the air speed switch (B, C, L, M, H) are not connected to each other, no matter how you operate the transfer switch and temperature control switch, the follow-up circuit will not work, and the system can neither cool nor heat. 2. Turn the air volume switch to any one of the low, medium and high gears, the corresponding pins L, M, H and pin B are connected, and the evaporator fan motor works at low, medium and high speeds; at the same time, Pin C is always connected to pin B. 3. The principle of the heating circuit: Turn the switch to the warm wind position, the wire No. 112 is energized, the electromagnetic water valve is energized to work, the hot water channel is opened, the hot water of the engine enters the inside of the evaporator, and the heat is transferred from the air outlet by the fan. At the same time, the red indicator light (corresponding to LED2 in the schematic 31 diagram) is on, indicating that the system is working in the heating state. Note that through the diode CP2, the cooling part circuit is also energized, turn the temperature control switch clockwise to the appropriate position, the cooling part works at the same time, and the temperature and humidity of the warm air can be adjusted. 4. Refrigeration circuit principle: Turn the transfer switch to the cold wind position, and the No. 405 wire is energized. If the pressure of the refrigeration pipeline is normal, the contacts of the high and low pressure protection switches are closed, and the No. 406 wire is energized, and

the temperature control switch is turned clockwise. To a certain position, the thermostat ST starts to work (Note: the temperature control switch is actually a sliding wire resistor, and its resistance value corresponds to the temperature at which the thermostat cuts off the circuit one by one), the circuit is connected, and the coil of the relay K There is current flowing, the contact is closed, the compressor clutch is energized and closed (otherwise, the compressor pulley is idling, and the system does not cool), the plunger pump inside the compressor works under the drive of the pulley, and the system starts to cool. At the same time, The green indicator light (corresponding to LED1 in the schematic diagram) is on, indicating that the system is working in the cooling state. 5. In the schematic diagram, the resistors R1 and R2 are the current-limiting resistors of the light-emitting diodes LED1 and LED2 respectively, and the diode CP1 is the freewheeling diode of the electromagnetic water valve coil.