Service manual
Full-electric stacker
EB16EA

Warning
You must read the operation instruction before using the manual:

- **Please check the last page of this document and all the current product type identification on the nameplate.**
- **Keep it for future use.**

Manual

1. Maintain List

a. Main part overview

Table 1: Maintain List

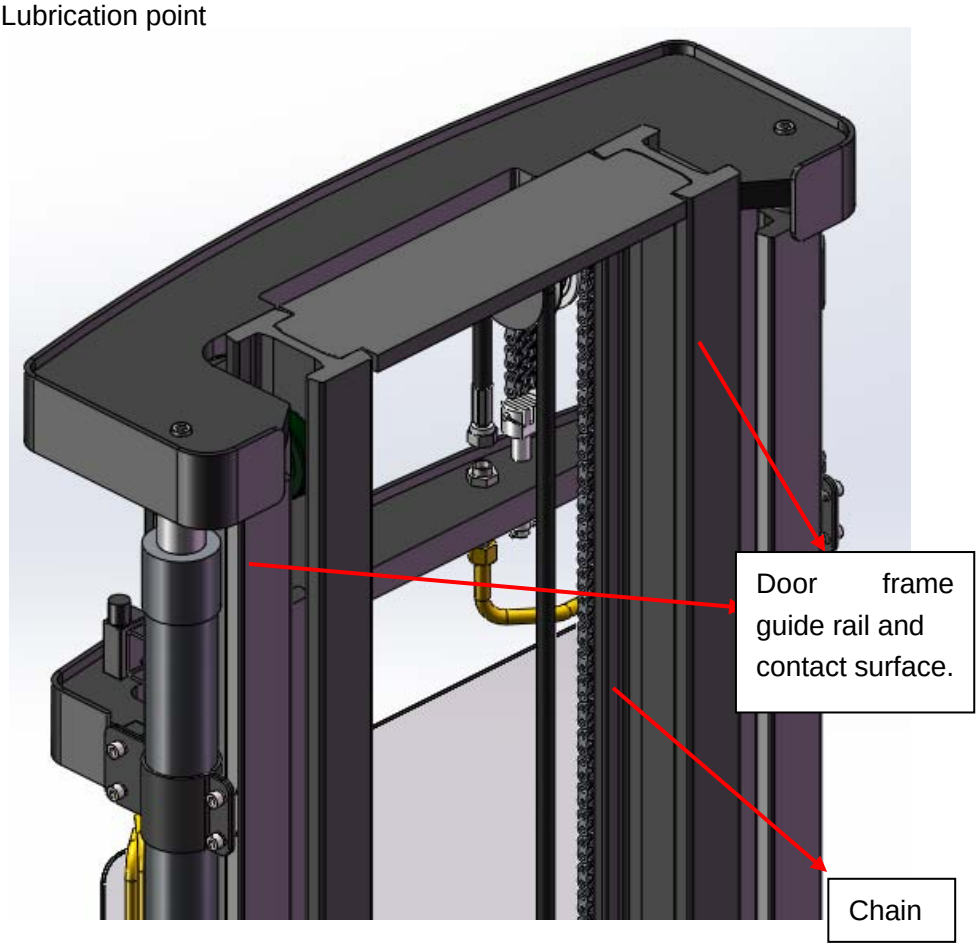
		Time Interval（Month）			
		1	3	6	12
Hydraulic System					
1	Check hydraulic cylinder and piston for damage, noise and leakage.		●		
2	Check hydraulic connector for damage and leakage.		●		
3	Check hydraulic oil level and refill it if necessary.		●		
4	Refill hydraulic oil after 12 months or 1500 hours.				●
5	Check and adjust the function of the hydraulic value. (1500kg/2000kg +0/+10%)				●
Mechanical System					
6	Check whether the fork is deformed or broken.		●		
7	Check whether the chassis is deformed or broken.		●		
8	Check whether all screws are fastened.		●		
9	Check whether the push rod is deformed or damaged.		●		
10	Check the gearbox for noise and leakage.		●		
11	Check whether the wheel rod is deformed or damaged.		●		
12	Lubricate steering bearings				●
13	Check and lubricate the pivot point.		●		
14	Grease nipple	●			
Electrical system					
15	Check whether the power wiring is damaged.		●		
16	Check the electrical connection		●		
17	Check the emergency switch function.		●		
18	Check electric rive system for noise damage.		●		
19	Check electricity meter.		●		
20	Check whether the correct fuse is used.		●		
21	Detection warning signals.		●		
22	Check the contactor		●		
23	Check the leak in the frame(insulation test)		●		
24	Check the function and wear of the drive controller		●		
25	Check the electric system of the drive motor.		●		
Brake system					
26	Check the brake ferformance. Replace the brake disc or adjust the air gap if necessary.		●		
Battery					
27	Check the battery voltage.		●		
28	Check the terminal for corrosion and damage and lubricate the terminal.		●		
29	Check whether the battery cover is damaged.		●		
Charger					
30	Check whether the main cable is damaged.			●	
31	Check startup protection program in the process of charging.			●	

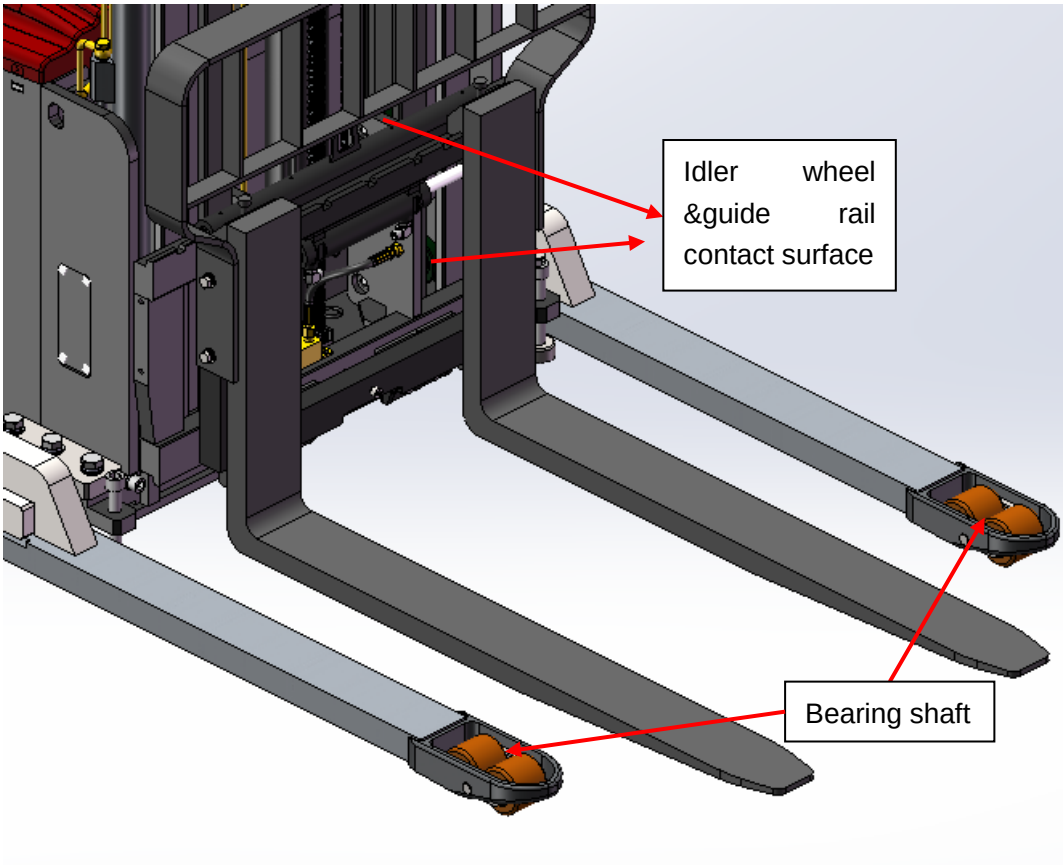
Function					
32	Check the horn function.	●			
33	Check air gap of solenoid value.	●			
34	Detect emergency braking.	●			
35	Detect the reverse braking and regenerative braking.	●			
36	Check the emergency reverse switch function.	●			
37	Check steering function.	●			
38	Check lifting and lowering function.	●			
39	Check the handle proximate switch function.	●			
Comprehensive					
40	Check whether all labels are clear and complete.	●			
41	Check the bearing wheels and adjust the height, replace if it is worn.		●		
42	Perform a test run.	●			

b. Lubrication point

Lubricate the marked point according to the maintain list. The required grease specification is the DIN 51825 standard grease.

Picture.1: Lubrication point





c. Check and refill hydraulic oil

According to the temperature, we recommend the type of hydraulic oil as following:

Temperature	–5℃~25℃	>25℃
Model	HVLP 32， DIN 51524	HLP 46， DIN 51524
Viscosity	28.8-35.2	41.4 - 47
Oil volume	14~15L	

Wasted material such as waste oil, waste battery or other material must be processed and recycled in accordance with the national regulation. And if necessary, they need to be handed over to recycle companies to recycle.
The oil level should not be lower than the minimum amount of oil required when the vehicle start out.
If necessary, please add the oil to the filling points.

d. Check electric fuses

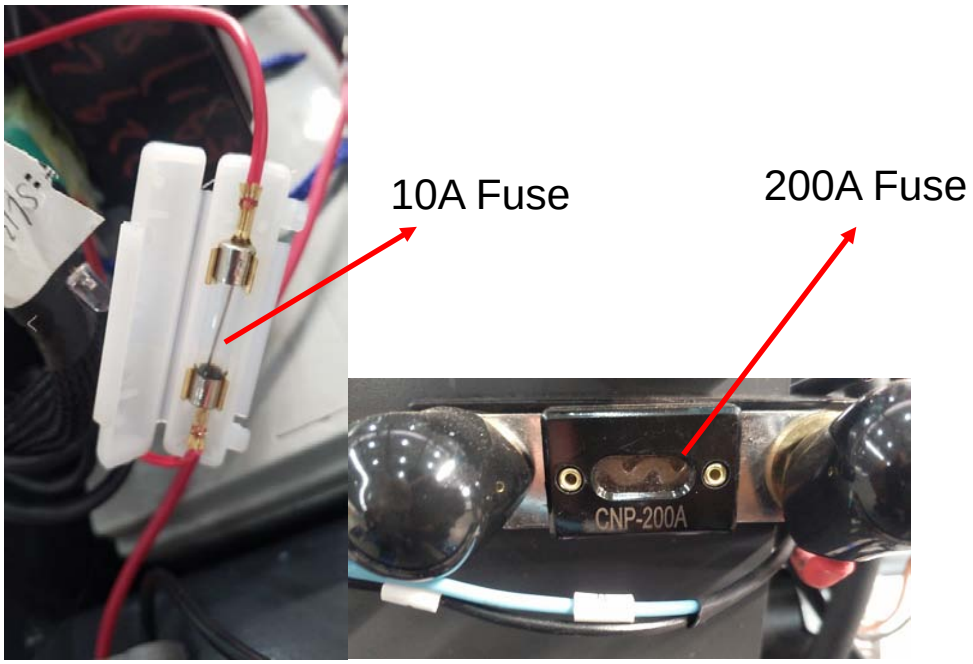


Table 2: fuse specification

	specification
Fuse 1	10A
Fuse 01	200A

2. Malfunction Analysis

a. Common malfunction analysis

If the vehicle still in problems, please follow the chapter 6 in this manual.

Table 3: Malfunction analysis

Malfunction	Cause	Solution
Goods can't be lifted up	Over load	Only lift the maximum capacity show on nameplate.
	Battery discharge	Charge the battery
	Lift fuse damaged	Check and replace the fuse
	Low hydraulic oil level	Check and refill hydraulic oil
	Oil leakage	Detect the sealing condition of oil cylinder.
Suction leak	High oiliness	Reducing oiliness

The vehicle can't be operated	Battery is charging	Full charge the battery, then unplug the main power plug from the outlet.
	Battery disconnected	Connect battery correctly.
	Fuse malfunction	Check and replace the fuse.
	Low battery	Charge the battery
	Emergency switch is activate	Unplug the emergency switch
	The handle is not in operating area	Move the handle to the braking area.
The vehicle drive to one direction	Accelerator and connector are damaged	Check the accelerator and connector
The vehicle move slowly	Battery discharging	Check the battery condition on the discharge monitor
	The electromagnetic brake has been activated.	Check the electromagnetic brake
	The handle wiring harness isn't connected or damaged	Check the handle wiring harness and connector
	At the 400mm altitude, the speed decreases and the sensor fails	Check the sensor
	Electric system overheated	Stop using and cool the vehicle
	The thermal sensor fails	Check, replace the thermal sensor if necessary
The vehicle suddenly start	Controller damage	Change the controller
	The accelerator has not moved back to the middle place.	maintain or replace accelerator

If the vehicle malfunction and can't operate outside work area, please hold up the vehicle, and place a load handing device under the vehicle and make sure it is secure , then move the vehicle from channel.

b. Fault code display

1、Steering fault code

code	malfunction name	Possible cause
12	Controller Overcurrent 控制器过流	1.steering motor wiring short 2.controller fail
13	Current Sense Fault 电流传感器故障	1.controller fail
14	Precharge Fault 预充电故障	1.controller fail
15	Controller Severe Undertemp 控制器严重低温	1.the controller runs in ultra-low temperate environment 2.temperature sensor damage
16	Controller Severe Overtemp 控制器严重过温	1.vehicle overload 2.the controller runs in ultra-high temperate environment 3.the controller is improperly fixed
17	Severe Undervoltage 严重欠压	1.battery or battery cable connection is faulty 2.there are other large loads attached to the battery 3.battery no power and wrong model
18	Severe Overvoltage 严重过压	1.in regen, the battery and battery cable resistance is too high 2.battery cable disconnected during the regen procedure.
21	Motor Temp Hot Cutback 电机温度过高削减	1.vehicle overload 2.the controller runs in ultra-high temperate environment
22	Controller Overtemp 控制器过温	1.vehicle overload 2.the controller runs in ultra-high temperate environment 3.the controller is improperly fixed
23	Motor Polarity Fault 电机极性故障	1.the motor polarity is reversed 2.position feedback device has reversed polarity
24	5V Output Failure 5V 输出故障	1.5V output overload 2.controller failure
31	Main Driver Fault 主接触器故障	1.the internal relay coil is damaged 2.the internal relay drive open or short
32	Relay Welded 继电器粘连	1.the internal relay adhesion 2.controller failure
33	Relay Did Not Close 继电器未吸合	1.the internal relay receives close command but fails to close 2.internal relay patch oxidation
34	Hardware Fault 硬件故障	1.a hardware fault was detected 2.motor voltage is out of range 3.IIC communication is lost 4.power tube short circuit
35	Fault Output Failed 故障输出失效	1.the fault output cable is incorrect connected 2.controller failure
36	Motor Stalled 电机堵转	1.Motor stalled 2.the encode of the steering motor fails or the cable is disconnected 3.the steering motor is disconnected. 4.parameter do not match the motor
37	Motor Open 电机开路	1. steering motor wiring open 2.the wrong motor connection 3.controller failure

38	Motor Short	1.steering motor wiring short
41	Command Analog1 Out of Range 模拟量 1 指令超出范围	1.command analog input 1(J1-6) is out of range 2.low command (J1-14)out of range(for resistive type) 3.parameter settings are incorrect.
42	Command Analog2 Out of Range 模拟量 2 指令超出范围	1.command analog input 2 (J1-13)out of range 2.analog1 and analog 2 fail to be cross- checked 3.parameter settings are incorrect.
43	Feedback Analog1 Out of Range 模拟量 1 反馈超出范围	1.feedback analog input 1(J1-11) is out of range 2.parameter settings are incorrect
44	Feedback Analog2 Out of Range 模拟量 2 反馈超出范围	1.feedback analog input 2(J1-3) is out of range 2.analogJ1-11 and analog J1-3 fail to be cross-check 3.parameter settings are incorrect
45	Parameter Change Fault 参数更改故障	1.parameter change,need to restart. 2.parameter are restored to default
46	EEPROM Failure 存储器故障	1.memory parameter verification calculation error 2.controller failure
47	Encoder Fault 编码器故障	1.the encode date exceeds the allowable range. 2.orthogonal encoder A phase or B phase open 3.polarity encoder B phase open
53	Home Position Not Found 没找到 Home 位置	1.Home switch failure 2.installation or cable connection error
62	Communication Fault 通讯故障	1.communication lost during walking
63	Communication Lost 通讯丢失	1.Rx(J1-8) cable connection error 2.there is a handheld programmer being used on the walk controller.
71	Software Fault 软件故障	1.app failure 2.controller failure
73	Following Error 跟随故障	1.parameter setting is incorrect 2.position feedback device failure 3.steering motor failure
75	Parameter Conflict 参数冲突	1.parameter setting and other parameters conflict

2、Fault code of walking controller

code	Malfunction name	Possible cause
1	Controller Overcurrent	1， motor external U,V or W connection short circuit 2， motor parameter isn't match 3， controller malfunction
2	Current Sensor Fault	1，motor U,V,W through the stator on the car body short circuit,resulting in leakage. 2，controller malfunction
3	Precharge Failed	1，the positive end of the capacitor is connected with negative load,so that the capacity can not be charged normally
4	Controller Severe Undertemp	1，the operating environment of the controller is too harsh
5	Controller Severe Overtemp	1，the operating environment of the controller is too harsh 2，vehicle overload 3，controller installation incorrect
6	Severe Undervoltage	1， battery parameter setting mistake 2， power consumption for non-controller system 3， excessive battery impedance 4， the battery is disconnected 5， the fuse is not connected ,or the main contactor is not connected.
7	Severe Overvoltage	1， battery parameter setting is incorrect. 2， excessive battery impedance 3，battery connection disconnected during regenerative brake
8	Controller Undertemp Cutback	1、 the controller operate under the restricted conditions 2、 the operating environment of the controller is too harsh
9	Controller Overtemp Cutback	1, the operating environment of the controller is too harsh 2，vehicle overload 3，controller installation incorrect
10	Undervoltage Cutback	1，low battery 2，battery parameter setting incorrect 3，non-controller system runs out of power 4, excessive battery impedance 5, the battery disconnected 6， the fuse is not connected ,or the main contactor is not connected.
11	Overvoltage Cutback	1， the regenerative braking current increase the battery voltage during the regenerative braking 2，battery parameter setting incorrect 3，excessive battery impedance 4，battery connection disconnected during regenerative brake
12	+5V Supply Failure	1， the impedance of external load is too low
13	Digital Out 6 Failure	1， the impedance of external load is too low
14	Digital Out 7 Overcurrent	1， the impedance of external load is too low
15	Motor Temp Hot Cutback	1， the motor temp reaches or exceeds the alarm temp set by program, resulting in reduced current output 2，motor temp parameter setting incorrect

		3， If the motor does not use a temperature sensor, the programming parameters “Temp Compensation and Temp Cutback” must be set to OFF.

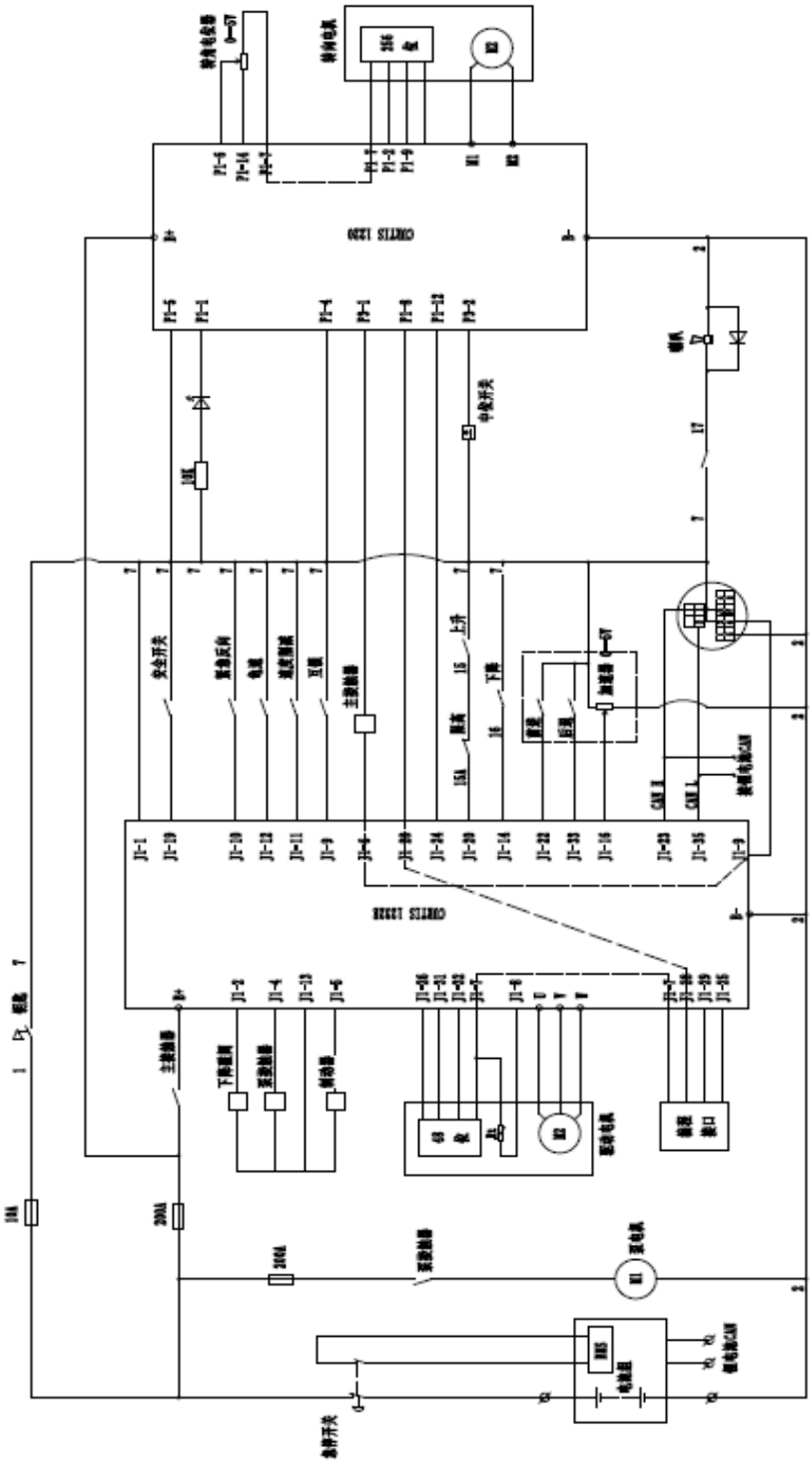
16	Motor Temp Sensor Fault	1，motor temp sensor connects incorrectly 2， If the motor does not use a temperature sensor, the programming parameters “Temp Compensation and Temp Cutback” must be set to OFF.
17	Coil 1 Driver Open/Short	1， load connection to be open or short 2，the connection pin is dirty 3， wrong connection
18	Main Open/Short	1， load connection to be open or short 2， the connection pin is dirty 3， wrong connection
19	Coil2 Driver Open/Short	1. load connection to be open or short 2. the connection pin is dirty 3. wrong connection
20	EMBrake Open/Short	1，load connection to be open or short 2， the connection pin is dirty 3， wrong connection
21	Coil3 Driver Open/Short	1，load connection to be open or short 2， the connection pin is dirty 3， wrong connection
22	Coil4 Driver Open/Short	1，load connection to be open or short 2， the connection pin is dirty 3， wrong connection
23	PD Open/Short	1，load connection to be open or short 2， the connection pin is dirty 3， wrong connection
24	Encoder Fault	1， Motor encoder failure 2， wrong connection
25	Motor Open	1，Motor Open phase 2，wrong connection
26	Main Contactor Welded	1， main contactor contact fusion 2， motor U or V disconnected or missing phase. 3，the circuit capacitor connected to the B+ terminal is charged
27	Main Contactor Did Not Close	1， main contactor is not closed 2， primary contactor junction oxidation, melting, or unstable connection 3， the capacitor is charged by external device. 4， the fuse is disconnected
28	Throttle Wiper High	1，the output voltage of accelerator potentiometer is too high.
29	Throttle Wiper Low	1，the output voltage of accelerator potentiometer is too low.
30	Pot2 Wiper High	1，pot 2 output voltage is too high
31	Pot2 Wiper Low	1，pot 2 output voltage is too low
32	Pot Low Overcurrent	1，pot impedance is too low
33	EEPROM Failure EEPROM	1，fail to write the EEPROM storage. This may caused by VCL writing to EEPROM storage, or by CAN BUS,or by a parameter error programmed into the controller after the programmer parameters are adjusted.

34	HPD/Sequencing Fault	1， key start,interlock, orientation and accelerator input sequence are incorrectly set. 2，wiring,switch key,interlock, orientation or accelerator input failure.
35	Emer Rev HPD	1，the emergency reverse operation is over,but the accelerator, forward and reverse input and interlock have not been reset.
36	Parameter Change Fault	1，In order to ensure the safety of the vehicle, certain parameter changes must be reactivated after the key switch.
38	VCL RunTime Error	1，the VCL code timed out
39	External Supply Out of Range	1，the 5Vnad 12vV source currents are too large or too small 2， parameter error in Checking Menu，such as“ExtSupply Max”,“Ext Supply Min”
40	OS General	1，internal controller failure
41	PDO Timeout	1，CAN PDO message receiving time exceeded the PDO time limited.
42	Stall Detected	motor stalling 2，motor encode failure 3，wrong wiring connection 4，Power supply of the input motor encoder is faulty
43	Motor Characterization Fault	1, in the motor matching process of modern code comparison: 0 = normal 1= The controller receives the encoder number, But the impulse quantity is undefined.Please hand set Buy pulse value 2= Motor temperature sensor failure 3= High temperature reaction failure of motor 4= motor overheating reaction failure 5= Low temperature reaction failure of motor 6= low voltage response failure 7= high pressure reaction failure 8= The controller cannot detect the encoder message Alpha, channel signal is down 9= Motor parameter setting exceeds the range
44	Motor Type Fault	1. The motor type parameter value is out of range
45	VCl/OS Mismatch	1. The VCL program in the controller does not match the OS program
46	EM Brake Failed to Set	1. The vehicle is still moving after the electromagnetic brake command is set. 2, electromagnetic brake braking force is too small
47	Encoder LOS (Limited Operating Strategy)	1. Due to motor blocking or encoder The failure causes the restricted operating state to be The activation 2. Wrong wiring 3. Traffic jams
48	Emer Rev Timeout	1. The emergency reverse timeout is activated because the EMR Timer expires 2. The emergency reverse switch is always in the On position
49	Illegal Model Number	1. The controller model cannot be identified 2. Hardware and software do not match each other

		3. The controller is damaged
50	Dualmotor Parameter	The Enable parameter of dual motors is set to ON, and the control Mode selection parameter is not set to (Speed Mode Express) or 1 (Speed Mode).

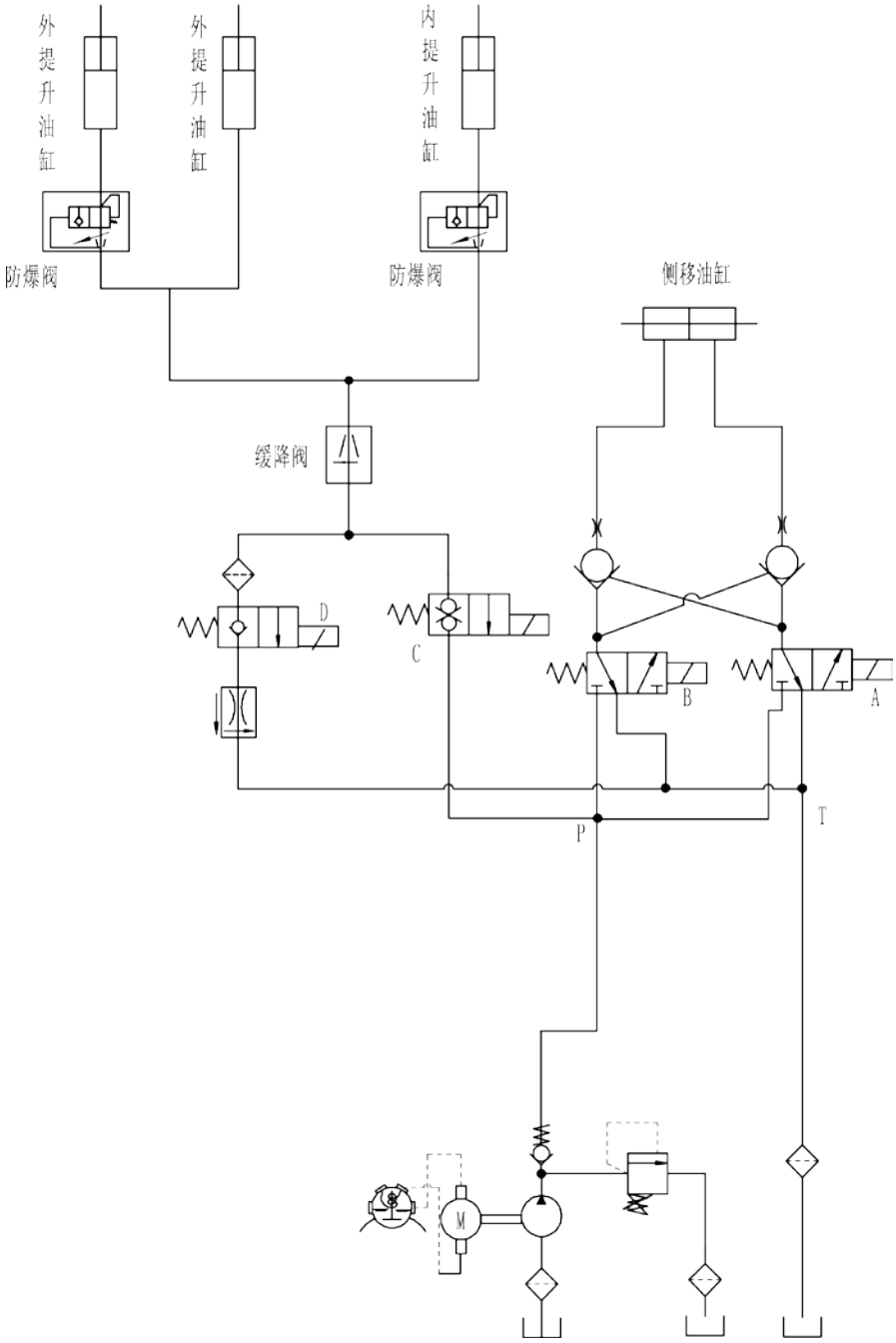
3. Circuit/circuit diagram

a. Circuit



b. Hydraulic circuit

Hydraulic circuit diagram（with lateral）

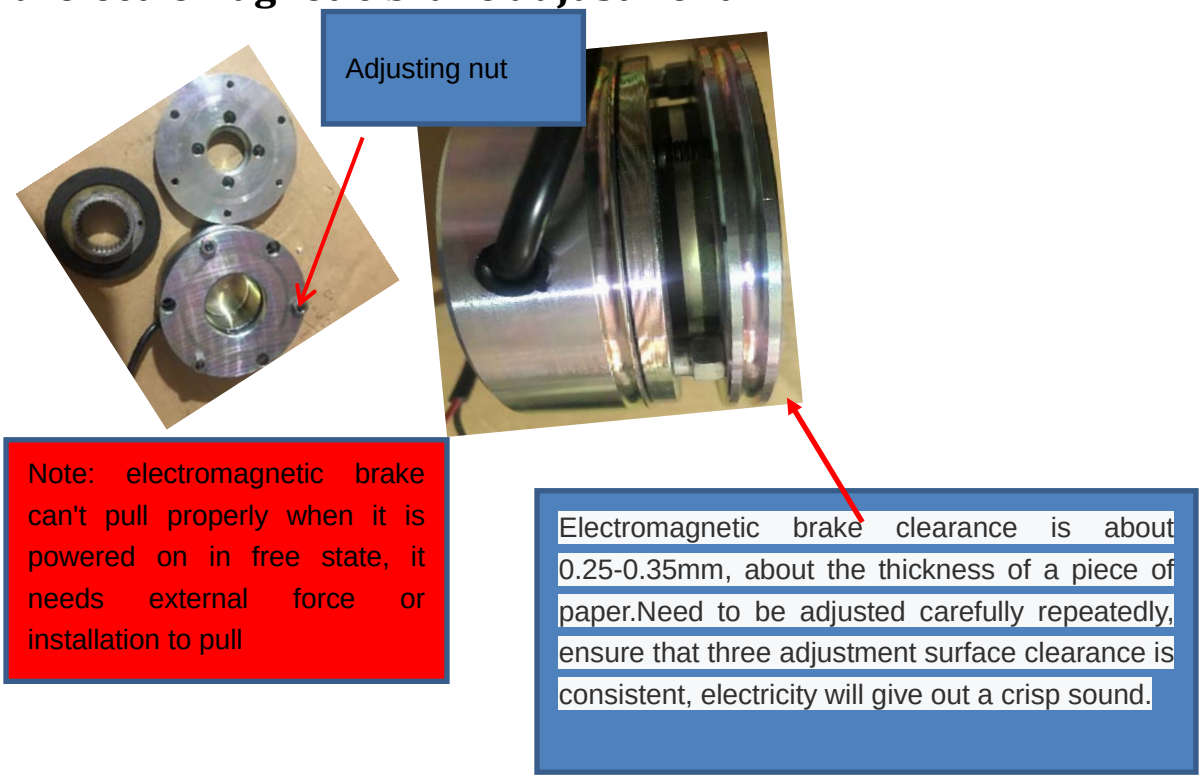


Hydraulic oil inspection

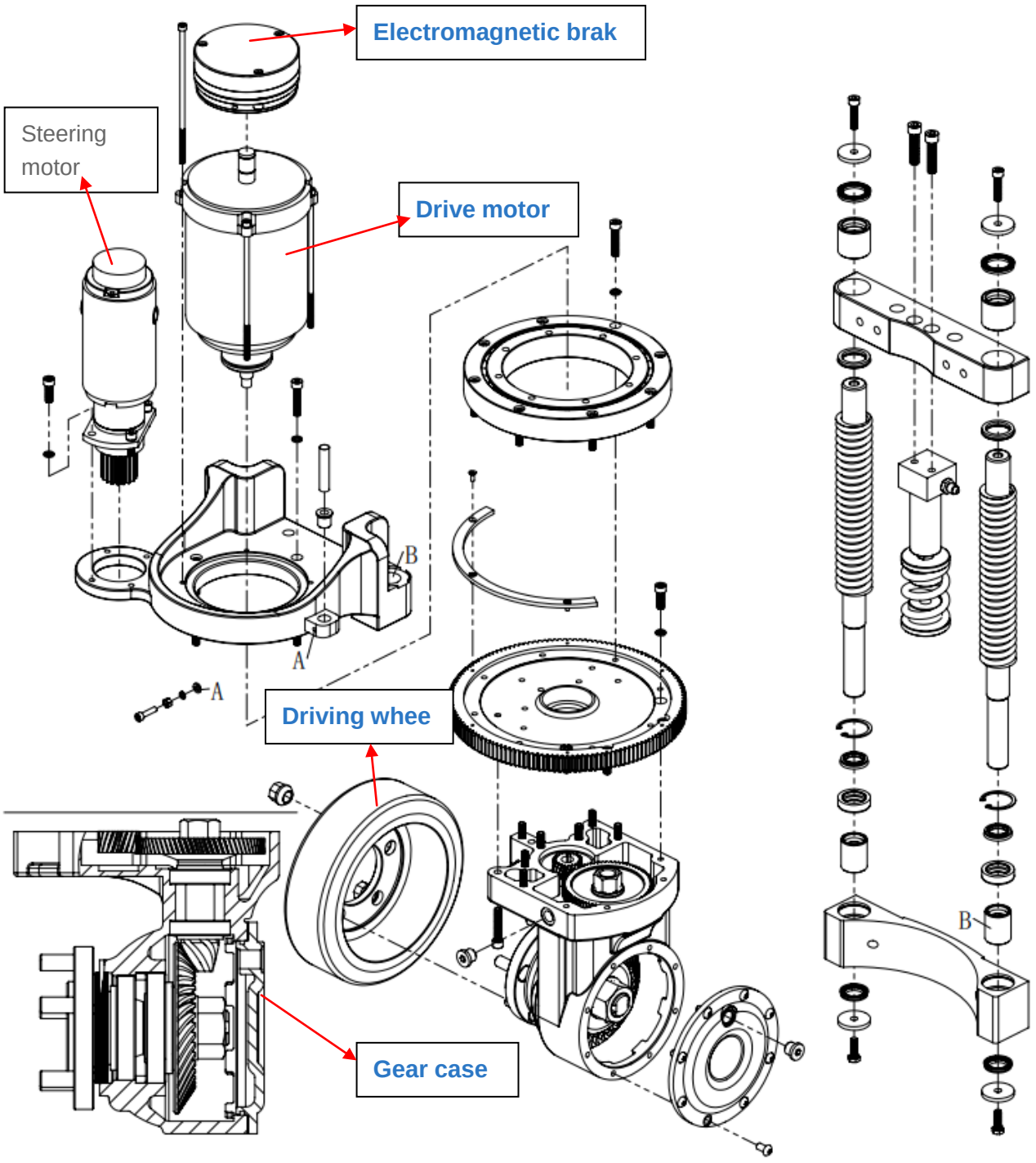
Appearance	odor	condition	results
Clear not discoloration	good	good	can be used
color transparency	good	with other oil mix	check viscosity, if qualified can continue to use
Color changes like milk	good	mixed with air and water	to separate moisture or replace hydraulic fluid
The color becomes dark brown	Not good	for oxidation	replacement of hydraulic oil
Clear color but small black spots	good	mix with other particles	can be used after

4. Disassembly of main parts

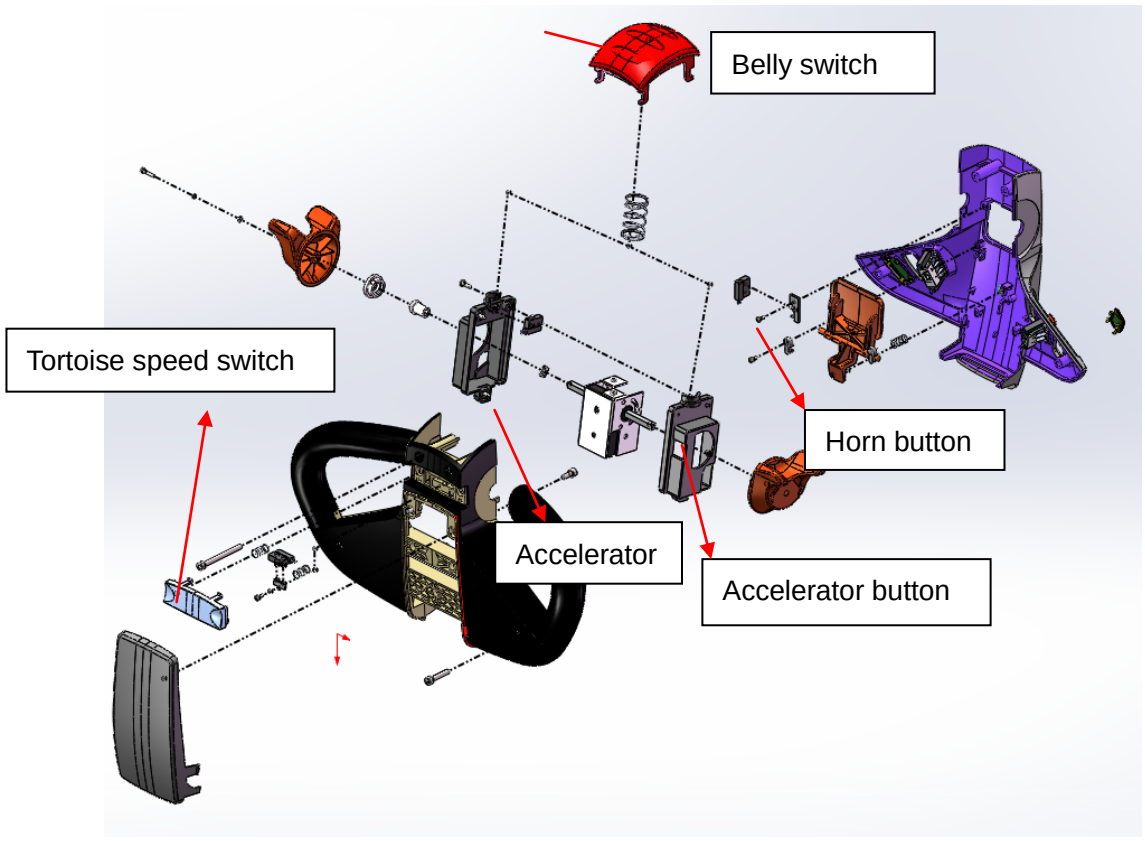
a. electromagnetic brake adjustment



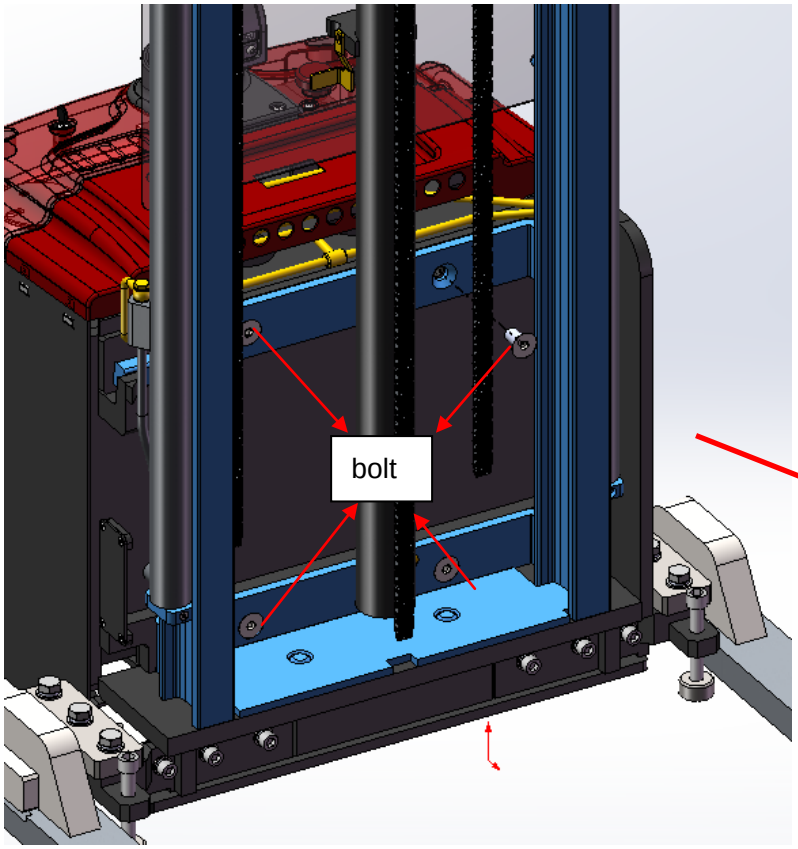
c. Drive the disassembly diagram



d. Handle assembly

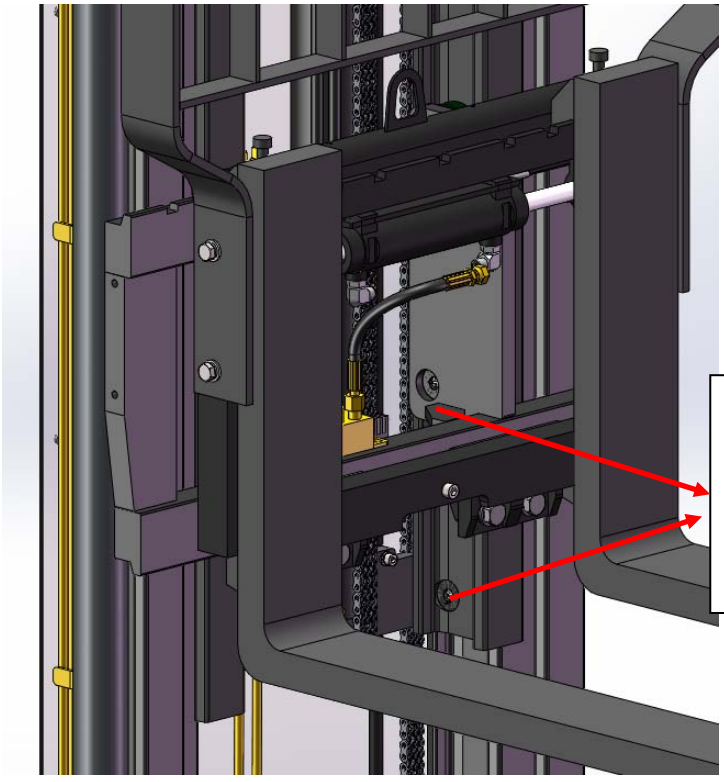


e. Dismantling of frame and door frame

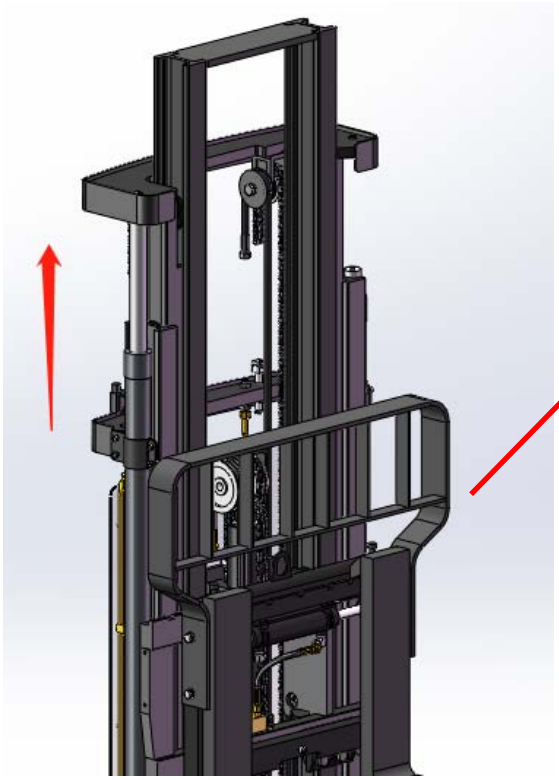


After removing the axle seat cover and bolt, the door frame can be separated from the frame. Note: the body and door frame shall be fixed with external objects during disassembly to avoid safety accidents in the process of disassembly.

f. Mechanical part of door frame

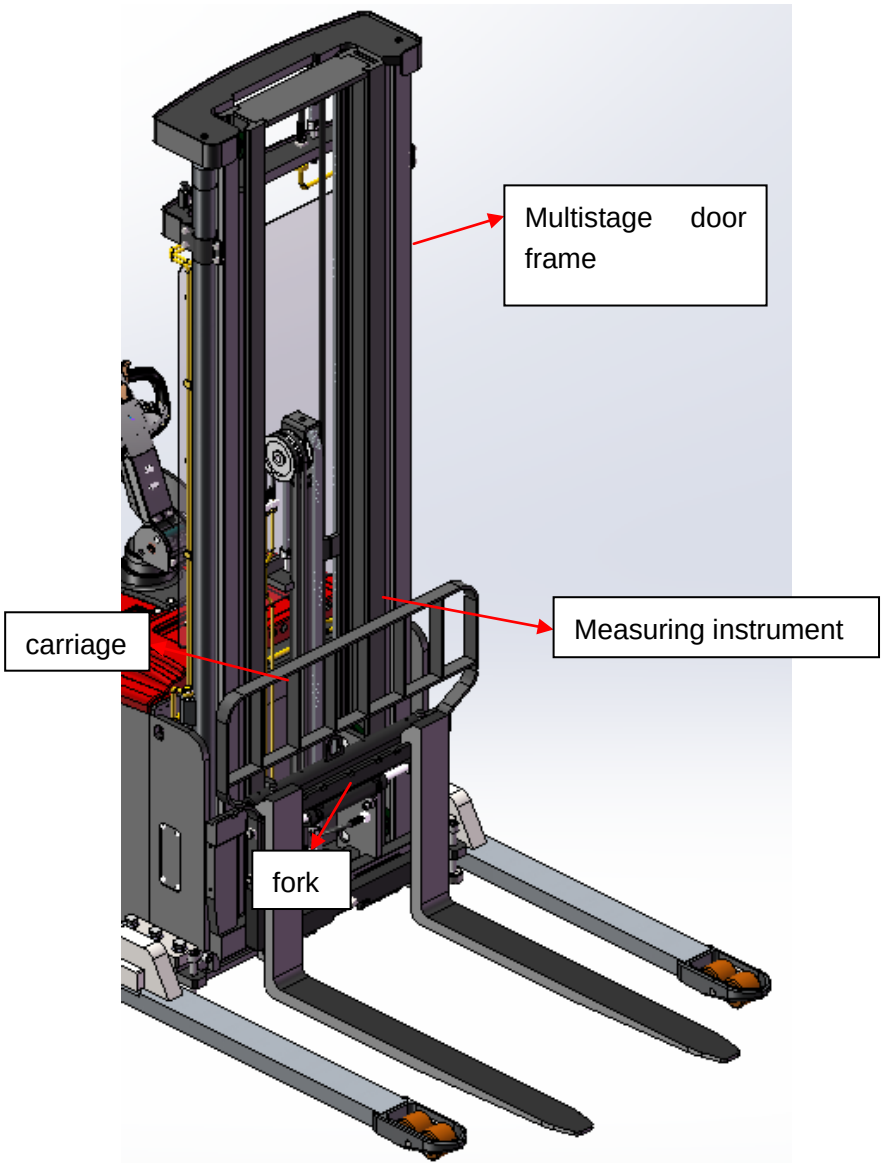


The clearance between the door frames is adjusted by adjusting the tightness of the adjusting screws



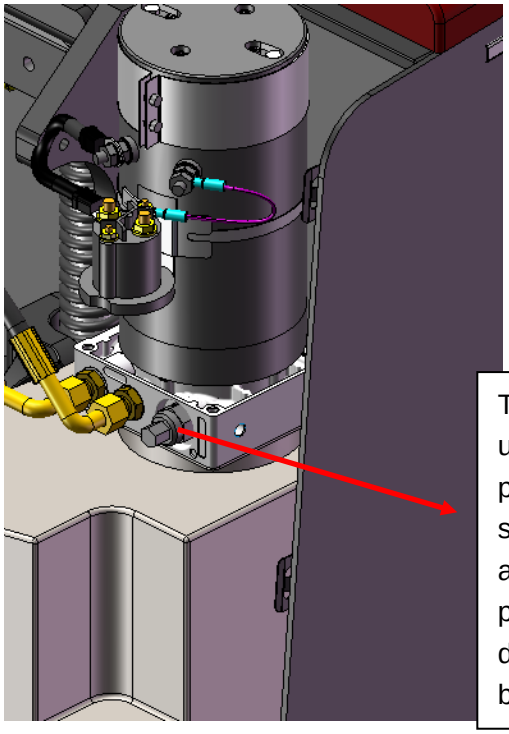
The door frame can be raised by loosening the adjusting screw

Door frame with side sliding



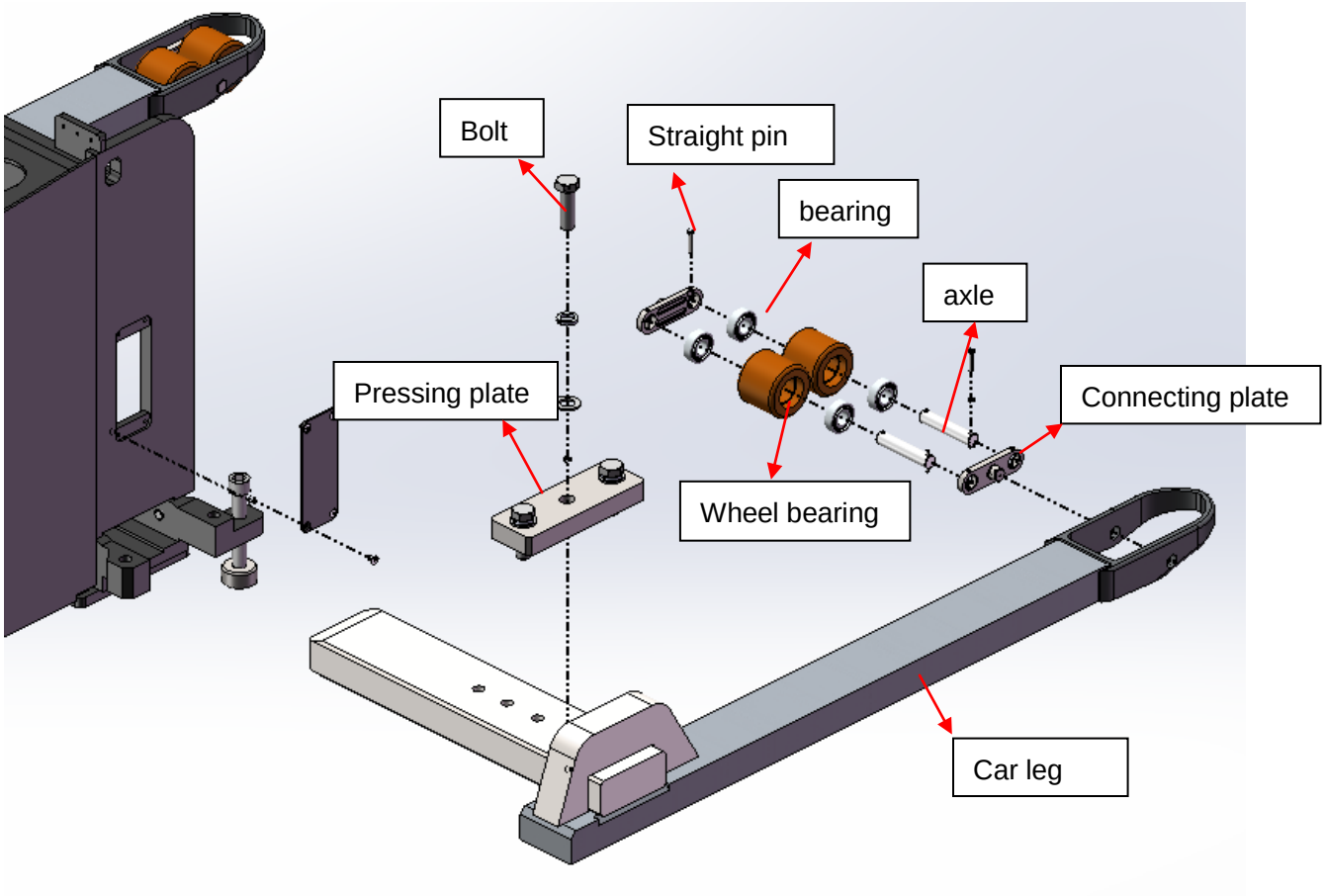
f. Frame mechanical part

Pressure regulation diagram



The relief value is used to adjust the oil pressure, which should be adjusted to avoid excessive pressure causing damage to the car body

Disassembly drawing of adjustable leg bearing wheel（Model with slide shift）



5. CURTIS Hand held unit

Precautions for operation:

The attention function of the hand-held unit is to facilitate vehicle inspection and maintenance. It is not allowed to adjust the controller parameters without the approval of the vehicle manufacturer, so as to avoid vehicle and personal safety accidents.

The hand-held unit will automatically save the modification parameters, just need to close the key switch, restart.

The CURTIS hand held unit can be connected in the event of a controller power or power failure

Vehicle fault reading process:

1. After connecting the hand held unit with the controller, open the key switch

2. From the menu list of CURTIS hand held units, find: Faults...

3. When the vehicle is running and the hand-held cursor flashes, there will be English fault content, which can be interpreted by referring to the fault code table

Vehicle signal detection:

1. After connecting the hand held unit with the controller, open the key switch

2, According to the menu list of CURTIS hand held unit, find: Monitor.....

3. According to requirements, open the corresponding sub-item of the detection menu, run the vehicle, and observe the change of the hand-held value.

CURTIS Contents of hand held unit menu:

The Curtis 1313 hand held programmer is used to configure the Curtis electric control system.Through this programmer, you can adjust and save the set parameters, real-time monitoring of controller data and fault diagnosis

Warning: The control system can affect the vehicle's acceleration rate, deceleration rate, hydraulic system and braking. A dangerous situation can occur if the vehicle control system is not programmed correctly or exceeds safety. Only the vehicle manufacturer or an authorized service agent can program the control system

The programmer has two interfaces, one is used to communicate with the electric control, the other is used to communicate with the PC, the programmer has a battery box and a memory card slot

当编程器加载完控制器的信息后，编程器上会显示主菜单。

The programmer is powered on

The connection line of the hand held programmer can be connected to the controller by inserting the programming port of the controller. After connecting the controller, the hand held programmer will be powered on automatically and the control information will be displayed on the programmer.

The function keys

Since the function of the three keys is determined by the specified content, the three keys are blank. At any given time, the function of the button is displayed on the LCD screen above.

Direction arrow key

The displayed information can be selected up, down, or left by four directional buttons.

+ / - buttons

You can add and subtract parameters by using these two keys. In addition, "+" can mean "Yes" and "-" can mean "No". In some cases, it can also be used as a scrolling option.

Power key

When the programmer inserts a controller that has been powered on, the programmer does not have to press the power button to use it. The programmer will start up automatically. When you hold it down for a few seconds, the programmer will prompt you whether to turn it off. You can decide whether to turn it off by selecting the "Yes" and "No" represented by the function key. After closing the programmer, press for a few seconds and the programmer will restart.

Collect keys

There are two ways to enter the Favorites menu. You can enter Favorites from the main menu or press this key

The main menu consists of nine sub-menus, and each sub-menu is displayed with a specific icon. Each item in the sub-menu is arranged by hierarchy.

Some menus contain only one item of information, but most menus contain more than one item of information, and open each item folder to access the next level of sub menus. Expand the table through the grid option, enter a group of execution commands through the dialog box option, and return to the upper menu regardless of the interface by pressing the left direction button.

The names of all nine sub menus are shown in bold on the main menu and below the icon.When entering the stepped menu, the name of the sub menu or the path you are in is displayed at the top of the screen.

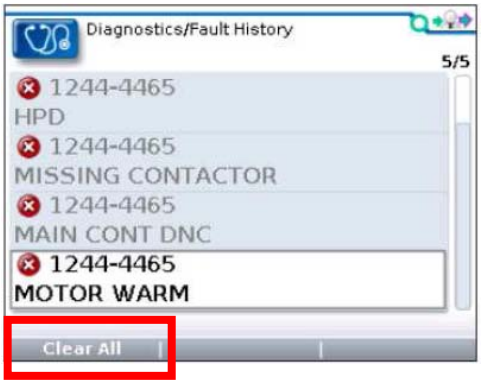
nine menu

Fault Diagnosis menu

On the main menu, Select Diagnostics and press Select to access the Fault diagnosis menu. The Fault diagnosis menu contains Present Errors current faults and Fault History historical faults

Note: Sometimes a fault caused by a temporary event captured in the circuit is not a system fault. You can determine whether the fault exists by restarting the system and observing whether the fault disappears automatically.

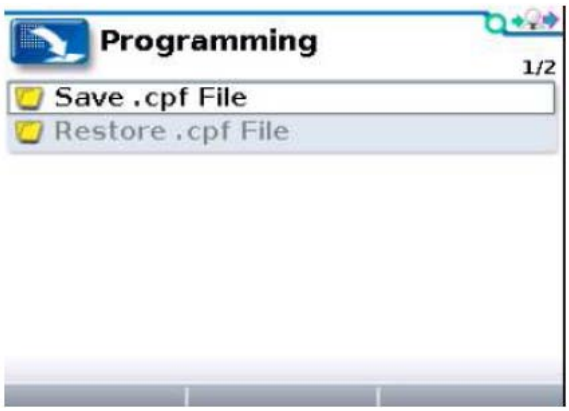
The historical faults folder lists all faults encountered after the last historical fault is cleared. By clearing the fault content in the entire folder, you can record the historical faults again.



Clear All is used to Clear historical fault folders.A function key is highlighted only when there are historical failures in the historical failures folder and grayed out when there are no historical failures.

Programming menu

On the main menu, Select The Programming icon and press Select to access the menu.Save and restore parameter Settings files (.cpf files) through programming menus



Save.cpf File (Save.cpf File)

Use the save. CPF file function in the programming menu to back up the currently set parameters. You can save as many.cpf files as you want, and you need to name each.cpf file differently

Restore. CPF File (Restore.cpf File)

Restore. CPF File The. CPF File saved earlier can be used to replace the. CPF File of the current controller. When the data recovery is complete, a dialog box is displayed asking you to restart the system.