MATERIAL HANDLING EQUIPMENT

MOVING AHEAD

Service Manual

Electric Forklift

EK20R/RL

Warning

You must understand the operation instructions in this manual before using it.

Note:

Please check the last page of this document and nameplate for all current product type identification.

Keep it for future use current product type identification.

Keep it for future use.

Manual

Maintenance List

Overview of main components

list 1:maintenance

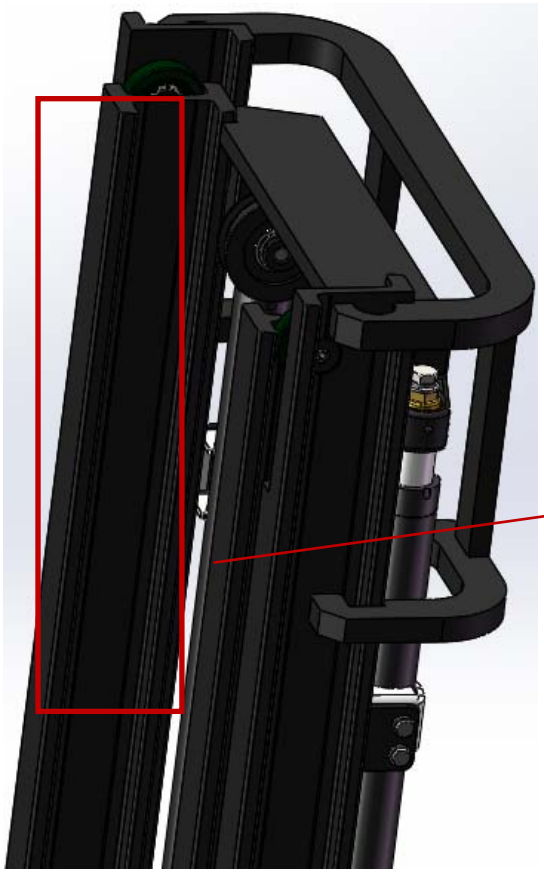
		Interval (month)			
		1	3	6	12
Braking					
1	Check the air gap of the electromagnetic brake			●	
Electric System					
2	Check operating switches to display the functions of devices and components	●			
3	Check alarm system and safety devices		●		
4	Check whether the cable is damaged and whether the wiring terminal is firm			●	
5	Check the function of microswitch Settings	●			
6	Check the controller and EPS controller			●	
7	Cable and motor fixation			●	
energy supply					
8	By looking at the battery		●		
9	Visually inspect the battery charging plug			●	
10	Check that battery cables are securely connected and grease the electrodes if necessary			●	
traveling system					
11	Check the gearbox for abnormal sound			●	
12	Check driving mechanism, grease and check the reset function of operating handle		●		
13	Check drive wheel and load wheel for wear and damage			●	
14	Check wheel bearing and fastening condition			●	
monolithic component					
15	Check the frame for damage			●	
16	Check signage for completeness			●	
29	Check the fixing condition of lifting door frame			●	
The hydraulic motor					
30	Check the function of hydraulic system		●		
31	Check hoses, piping and joints for tightness, sealing and damage		●		
32	Inspect cylinder block and piston for damage, sealing and fixation			●	
33	Check load chain Settings and re-tensioning if necessary			●	
34	Visually inspect the door stand roller and inspect the roller surface for wear			●	
35	Inspect forks and loading parts for wear and loss			●	
36	Check oil level in fuel tank			●	

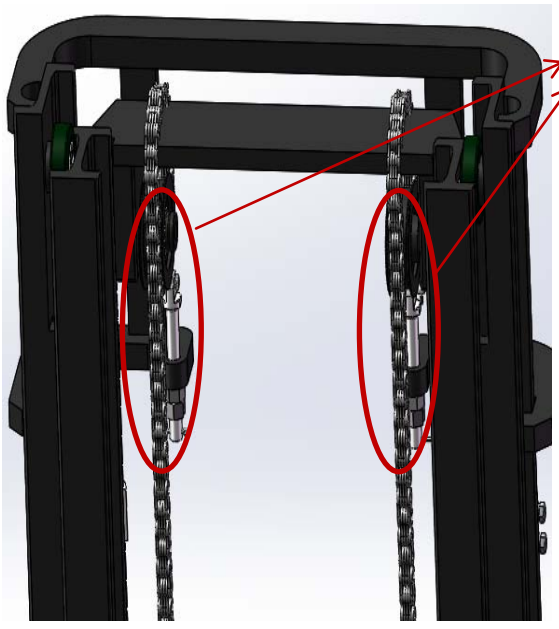
37	Replacement hydraulic fluid				•

1. Lubrication point.

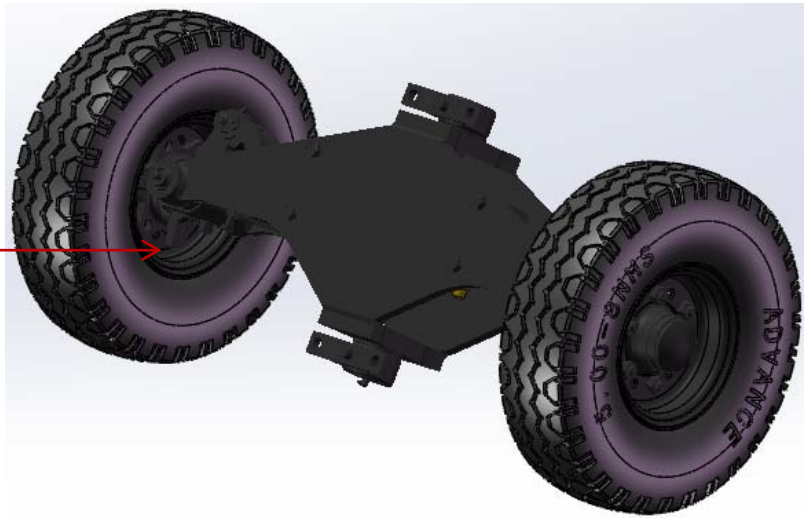
Lubricate marked points according to maintenance list. Required grease specification: DIN 51825 standard grease

Pic1：transmission chain





Wheel lubrication



A. Check and correct electrolytes

The electrolyte density is based on 25℃.Therefore, when measuring, if the temperature of the electrolyte is higher or lower than 25℃, every 1℃higher, should be measured from the actual density value plus 0.0007;On the contrary, lower than 25℃, every 1℃, should be minus 0.0007;If the temperature difference is large,

Can be corrected by pressing the following formula:

Standard temperature of electrolyte (25℃) Density is converted according to the following formula:

D25 = Dt + 0.0007(T-25)

D25 -- electrolyte density at 25℃

Dt -- T ℃ measured electrolyte density

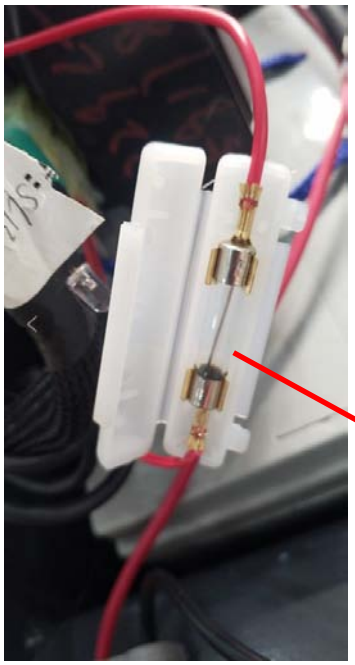
T -- Temperature of electrolyte when measuring density

Under the condition of normal working of charging function, the density of 1.26±0.005(25℃) temperature below 30℃ sulfuric acid electrolyte into the battery, liquid level requirements higher than the protection plate 0.6 ~ 1 in.

Leave the battery to rest for 3-4 hours, no more than 8 hours. Initial charging can be carried out only when the liquid temperature drops below 35℃.If the electrolyte level drops after standing, the electrolyte should be replenished.

The discarded batteries must be recovered and stored in the specified environmental protection area or the specified waste disposal area in accordance with the local laws and regulations, and the work must be carried out by qualified professional companies.

a. Check fuse



10A fuse

200A fuse

List 2: Fuse specification

	specification
Fuse 1	10A
Fuse 01	300A

2 Fault analyses

If the vehicle continues to malfunction, follow the instructions of the manual.

Hand and foot break common faults and troubleshooting methods

Failure	cause	maintenance
Poor braking	Improper position of brake pedal	Adjust the
	Leakage of brake system	Repair or replacement
	There is air mixed in the brake system	exhaust
	Brake shoe clearance is not properly adjusted	Adjust the
	Main pump sub pump bowl deformation, damage or excessive wear	Check the cause of damage and replace
	There is oil stain on the surface of brake	Clean up

	drum hole	
Brake uneven	The surface of the friction plate is greasy	Cleaning and replacement
	Brake drum hole deviation, large hole different center	Bright hole, ensure roundness, concentricity
	Brake shoe clearance is not properly adjusted	Adjust the
	Brake shoe return spring damaged	replace
	Points and pump failure	Repair or replacement
	Self-adjusting mechanism fails	Reset spring deformation, repair, replacement
Brake noise	Friction plate surface hardening or impurities	replace
	The bottom plate is deformed or the bolts are loose	repair
	Brake shoe is deformed or improperly installed	Replacement or repair
	Excessive wear of friction plate	replace
	Hub shaft is loose	replace
	The handle is not in the operating area	First move the handle to the braking area
Other poor braking	Brake overheating	Brake Check for a skid
	Impurities are mixed into the brake fluid	Confirm strains are mixed into the brake fluid
	Hand brake position cable deformation, joint off	Hand brake position cable deformation, joint off

(1) Common faults of steering system and troubleshooting methods

Failure	cause	maintenance
To problem	There is air in the steering system hydraulic line element	exhaust
	Working oil level is too low, inhale air	Gas exhaust
	The shunt valve hole is blocked and the spool is stuck	Cleaning and replacement
	Steering cylinder piston rod bent	Replace the piston rod
	Knuckle and knuckle pin bite to death	Lift the rear axle to see if you can

	Other steering when relative surface bite dead	swing from side to side Dismantle, repair
	The steel ball in the steering valve body fails and is blocked	Replacement spring
	Steering gear reset failure, spring breakage	Check piston seal ring and replace
	Leakage in steering cylinder is too large	Adjust pressure and flow
	There is air in the steering system hydraulic line element	Use specified oil
	Working oil level is too low, inhale air	replace
	The shunt valve hole is blocked and the spool is stuck	replace
	Steering cylinder piston rod bent	exhaust
The spill	The joint was not pried tight	Pry tight
	There are dirty joints between stator and rear cover of valve body of steering gear	cleaning
	Cylinder leakage	Check guide sleeve seal joint seal
Abnormal sound	Low oil level, hydraulic noise	Refueling and exhaust
	Suction tank or oil filter blocked	Cleaning and replacement

(1) Common faults of lifting system and troubleshooting methods

fault	cause	maintenance
Lifting, falling is not smooth, loud noise	The gap between the upper side roller of the outer frame and the channel steel of the inner frame is over 1mm	Reduce adjusting gasket
	The gap between the lower side roller of the outer frame and the channel steel of the inner frame is over 1mm	Add adjusting gasket
	The gap between the side roller of the fork frame and the channel steel of the inner door frame is over 1mm	Reduce adjusting gasket
	The side roller shaft fastening bolt is loose	fastening
	There are broken objects in the channel steel of sliding frame and inner door frame	Yeah, oil on the tracks regularly

The cargo fork frame is skewed	Pressure difference between left and right	Air replenishment and air pressure are consistent
	Inconsistent tightness of left and right chains	The tightness adjustment is consistent
	The oil channel in the speed limiting valve is blocked	Cleaning and replacement
	The oil inlet of the lifting cylinder is partially blocked	Maintenance and cleaning
The left and right elevations are not synchronized	Left and right lifting cylinder stroke is inconsistent	Use cylinder head 180 degree adjustment
	The height of the left and right cylinders is inconsistent	Adjusting bolts on the oil cylinder
	The left and right cylinder stroke is too inconsistent to exceed the cylinder head adjustment range	Add adjusting gasket on lifting cylinder piston rod
The over lift speed at full load cannot meet the requirements Or fail to lift	Insufficient working oil	Come on
	The throttle orifice of the speed limiting valve was blocked with stolen goods	Unpick and wash
	The safety valve is sliding and jammed	Cleaning and repairing
	Gas leakage of suction pipe weld at filter screen in oil tank	Repair welding, bottom leakage
	Loose pipe joint	Pry tight
	Oil pump gear and pump body excessive wear, clearance is too large	Check oil cleanliness, grade 9-11 required
	The sealing ring in the lifting cylinder is damaged or overwork and leaks too much	Replace seal ring
	Multi-way valve body and spool valve gap is too large, the main valve pressure is too low	Replacement and adjustment
	The shunt valve shunt improperly	Adjust the

(1) Common faults of electrical system and troubleshooting methods

fault	cause	maintenance
Open key switch no voltage Turn over the hoist	The key switch is not in contact	
	bolt	
	The connector is in poor contact	
	Loose battery connector	
Step on the accelerator pedal and the forklift will not walk	bolt	
	The connector is in poor contact	
	Bad contact of direction switch	
	The SCR speed regulating device is faulty	
The lifting motor does not work	Contactor coil is open or disconnected	
	The lifting switch does not work properly	
	bolt	
	Poor contact of connector	
	The contactor main contact is burned out	
The lifting motor work longtime	The lifting switch does not work properly	
The light is not working properly	Fuse is broken	
	Poor contact of connector	
	The bulbs	
Speakers don't ring	Poor contact of connector	
	Poor contact of horn switch	
	speaker	
Long horn ring	Horn switch contact long	
The reversing buzzer doesn't work	Buzzer bad	
	Bad contact of reversing switch	
	The line is not properly connected	

(1) Transmission failure causes and troubleshooting methods

fault	cause	maintenance
Decline in efficiency	1. 1. The friction plate is stuck or worn.	Check for gluing, uneven contact or warping of the friction plate.
	2. Bearing damage.	Replace the bearing
	3. Check whether the lubricating oil road is blocked.	dredge
The spill	1. The gasket is damaged.	Replace gasket
	2. Rubber parts are aged or damaged.	Replacement parts
	3. Parts are damaged and cracked.	replace

(1) Multi-way valve failure causes and troubleshooting methods

fault	cause	maintenance
External leakage	The sealing part of the lip is worn	Replace seal ring
	The valve stem seal is damaged	Replace stem or disc sub assembly
	The sealing part of the lip is embedded with foreign matter such as paint and dust	Clean the paint and other foreign matters embedded in the lip sealing part, pay attention to not damage the valve stem and sealing surface
	O-ring damaged (cut ring)	Replace the O-ring seal
	The sealing ring between valve discs is aged and deformed	Replace the new sealing ring
	There is scratch (new valve) or foreign matter in the sealing plane of valve disc	Remove foreign matter or replace valve disc
	Valve body hole and sealing ring slot hole different (new valve)	Replace the valve plates
	Back pressure exceeds allowable value	Check the loop and lower the return oil pressure to the specified value
	The bolts between plates are not evenly stressed or tightened	Tighten the stud bolts with specified torque
Stem cannot be reset	The control mechanism is not flexible	Check the control lever
	The stem was jammed with dirt	Clean valves, fuel tanks and pipelines
	The return spring is deformed or broken	Remove the back cover for inspection and replace the spring
	Stem deformation caused by external	Refit stem or replace valve sub

	force	assembly
	Uneven installation surface, deformation of valve body, resulting in stuck valve	Adjust the installation plane
Stem heavy drop in neutral position (leakage out of tolerance in neutral position)	Stem and valve hole wear, gap increase serious internal leakage	Reinstall stem
	Stem or orifice scratched and increased internal leakage	Refit stem or replace valve sub assembly
	Stem not returned to neutral position	Check reversing mechanism
	Overload valve or overload valve plug and valve body seal is not tight	Check whether the O-ring is cut. If damaged, replace it with a new O-ring
	There is serious leakage in the cylinder	Check the cylinder piston seal for damage
	The groove size of valve body decreases the length of out-of-tolerance sealing oil	Replace the valve plates
hard steering	The oil is not clean, and the shunt valve core or the shunt safety valve core is stuck by foreign matter	Clean shunt valve core or shunt relief valve core and fuel tank and pipeline
	The opening and closing characteristics of the shunt safety valve are not good or the pressure regulation of the shunt safety valve is low	Replace the shunt relief valve or readjust the shunt relief valve pressure
	Oil pump underflow	Check why the oil supply system of the oil pump is insufficient
	Steering gear failure	Replace the steering gear
No action of oil cylinder (low pressure or no pressure)	Foreign matter is stuck between main spool and seat of overflow valve or overload valve	Clean valves, fuel tanks, pipelines, etc
	Damping hole plugging	Hydraulic oil pollution is serious, clean the hydraulic system
	Abnormal wear of the cone spool	Inspect for wear and replace relief valve assembly
	Pressure regulating spring deformation	Check spring quality
	The adjusting screw of the relief valve is loose	After adjusting the pressure, tighten the nut according to the specified

		torque
	Oil pump failure	Replace the oil pump
Relief valve vibration Dynamic and noise	There is air in the hydraulic system	The system will be discharged after repeated operation for a while
	Pump suction air	Check oil absorption test of oil pump
	Suction pipeline resistance is too large; The suction side of the oil pump produces negative pressure	Check the cause of negative pressure
	The oil suction filter is blocked	Clean the oil filter and filter the oil
	The relief valve has a pressure point vibration and noise	Adjust relief valve, slightly raise or lower pressure gauge 1 ~ 2 scale grid
There is no self-lock in forward tilt or the self-lock in forward tilt exceeds the standard	The oil is not clean, so that the forward control small spool is stuck	Clean valves, fuel tanks, pipelines, etc
	Wrong oil mouth	Switch the wrong oil connection
	The oil is not clean, so that the forward control small spool is stuck	Clean valves, fuel tanks, pipelines, etc
	Wrong oil mouth	Switch the wrong oil connection

(1) Gear pump failure causes and troubleshooting methods

fault	cause	maintenance
The pump won't take in the oil Or oil absorption is not smooth	The oil suction filter has a small flow area or is blocked by foreign bodies	Replace the filter with a suitable flow area or clean the blocked filter
	The liquid level in the tank is low	The tank is filled with hydraulic fluid as required
	Oil pump installation position is too high; Suction range exceeds specified	According to the suction range of the oil pump, it is within 500mm
	Oil temperature is too low, oil viscosity is too high	Change oil or heat oil seasonally
	Suction tubing too thin or too long, too much resistance	Change the large diameter tubing, shorten the length of suction tubing
	The oil seal of the oil pump is damaged and air is inhaled	Replace the new oil seal
	Oil pump rotation is not correct or the speed is too high	Change the oil pump rotation, make the speed to the specified value

	Oil suction side leakage	Check the oil absorption part and its seal, and replace the failed seal
The discharge side of the pump does not produce oil	If not, the pump is damaged	Check and repair pumps or replace pumps
	The relief valve is damaged or jammed by stolen goods, and the oil flows back to the tank from the relief valve	Check and repair relief valve or replace relief valve, filter oil or replace oil
The oil outlet of the oil pump discharges oil but the pressure cannot rise	The side plate of oil pump is seriously worn and the volume efficiency is too low	Repair or replace the oil pump
	The spool of the relief valve is severely worn	Replace the new cone spool
	The overflow valve is jammed by stolen goods and loosely closed	Filter oil and remove dirt
	The pressure regulation of the relief valve is too low	Adjust the overflow valve to the specified value
	The oil suction takes in air	Check whether the sealing ring at the oil suction port is damaged
Low volume efficiency of oil pump	The seal inside the oil pump is damaged	Replace seal ring
	Lateral plate wear	Replace the side panel
	The oil pump contains stolen goods or too large clearance	Remove stolen goods and filter oil; Replacement of new oil pump
	The oil pump speed is too low or too high	Make the oil pump run within the specified speed range
	Negative pressure in the tank	Increase the capacity of air filters
Oil pump noise	1. Most cases are caused by insufficient oil absorption of oil pump, such as oil absorption filter blockage; Oil level is too low; Inhalation of air; Suction air at oil seal, etc	Keep oil level high and seal must be reliable to prevent oil contamination
	The return pipe is higher than the oil level, and there are a lot of bubbles in the oil	Immerse the return pipe below the oil level
	The oil viscosity is too high and the oil temperature is too low	Choose oil with proper viscosity according to the season, or heat it up

	The coaxial of the pump shaft and prime mover shaft is too large	Adjust the coaxiality of the two axes
	After maintenance, the driven gear is inverted and the meshing area becomes smaller	Disassemble the oil pump and turn the driven gear
Oil pump temperature rises too high	Pressure is too high, speed is too fast, side plate burns	Properly adjust the overflow valve; Reduce the speed to the specified value; Repair the pump
	Oil viscosity is too high or internal leakage is serious	Change the appropriate oil and check the seal
	The back pressure of oil return is too high	Eliminate the cause of high return back pressure
	The fuel tank is too small for heat dissipation	Increase the fuel tank

(1) Drive axle failure reasons and troubleshooting methods

fault	cause	maintenance
Very noise	Bolts connecting drive axle and frame are loose	fastening
	Frame nut loose	fastening
	Wear or damage inside hub	replace
	Half shaft spine wear	replace
	Bad lubrication	filling
Rough ride	Loose wheel nut	fastening
	The wheel deformation	replace
	Wear or damage inside hub	replace
	Bolts connecting drive axle and frame are loose	fastening
	The tire pressure is abnormal	fastening

(1) Other common faults and troubleshooting methods

fault	cause	maintenance
Abnormal sound during exercise	Hydraulic oil, gear oil and other oil does not meet the requirements	Fuel until required
	The front and rear hub bearings are loose and broken	After tightening the bearing and locking the nut, retract about 1/8 turn, and the hub should be free to

		turn. Fracture will renew the bearing.
	Gearbox, gear, friction plate damage	update
	Differential and cross shaft damaged	update
	Fastener loosening	Pry tight

If the vehicle is malfunctioning and cannot be operated outside the work area, lift the vehicle up, place a load handling device under the vehicle and secure the vehicle, then remove the vehicle out of the channel.

B、oil hydraulic circuit

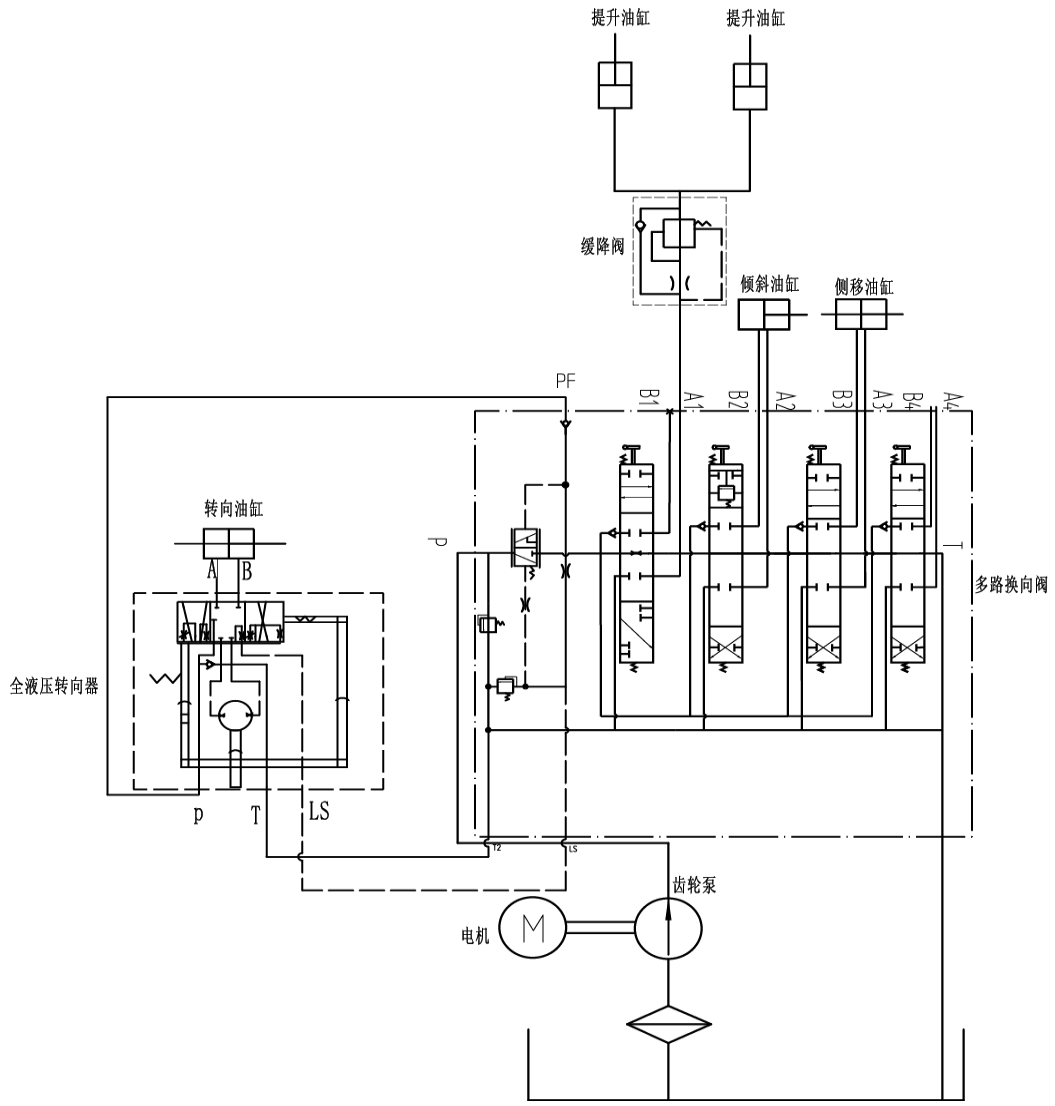


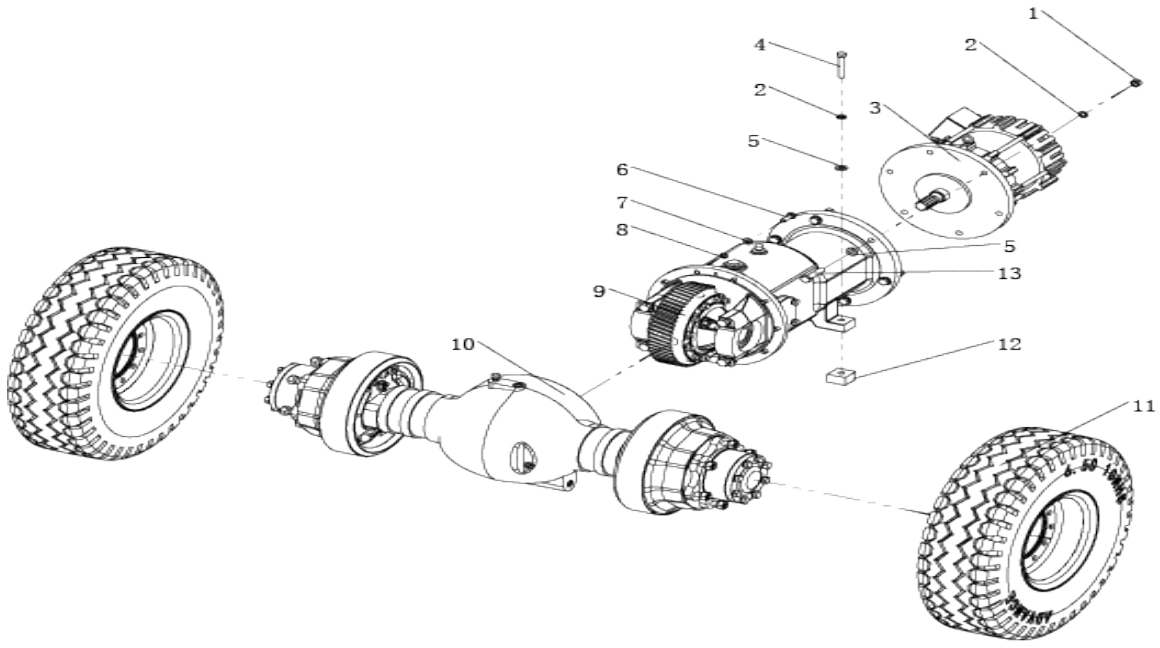
Figure 8: Hydraulic circuit

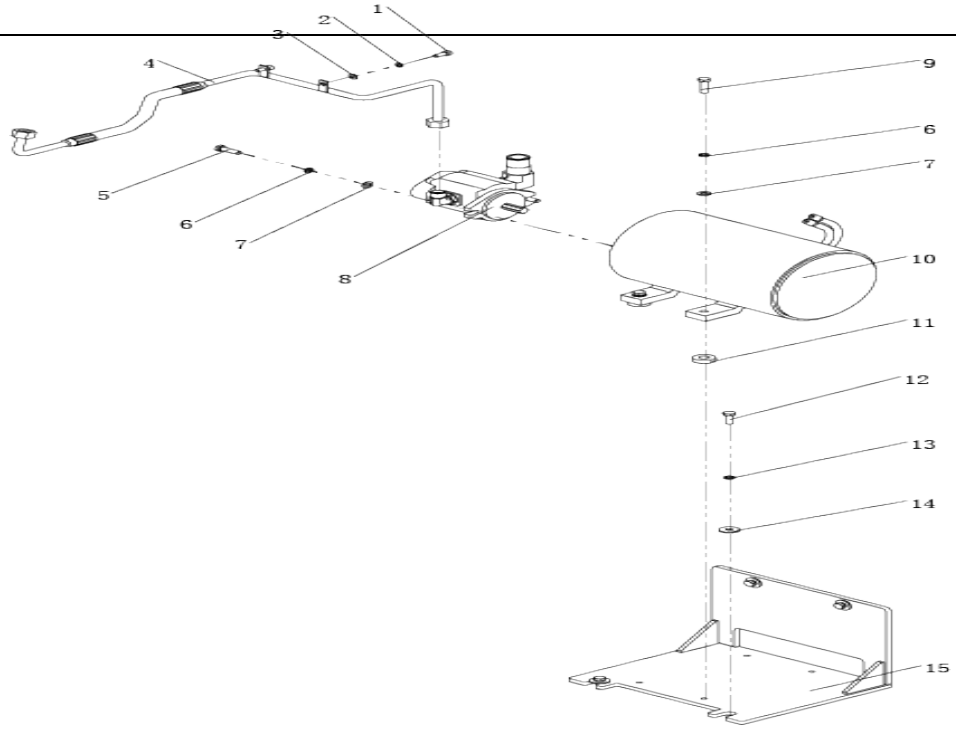
Hydraulic oil inspection

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	well	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 filtering

1. Main parts disassembly

A、Drive axle assembly removed



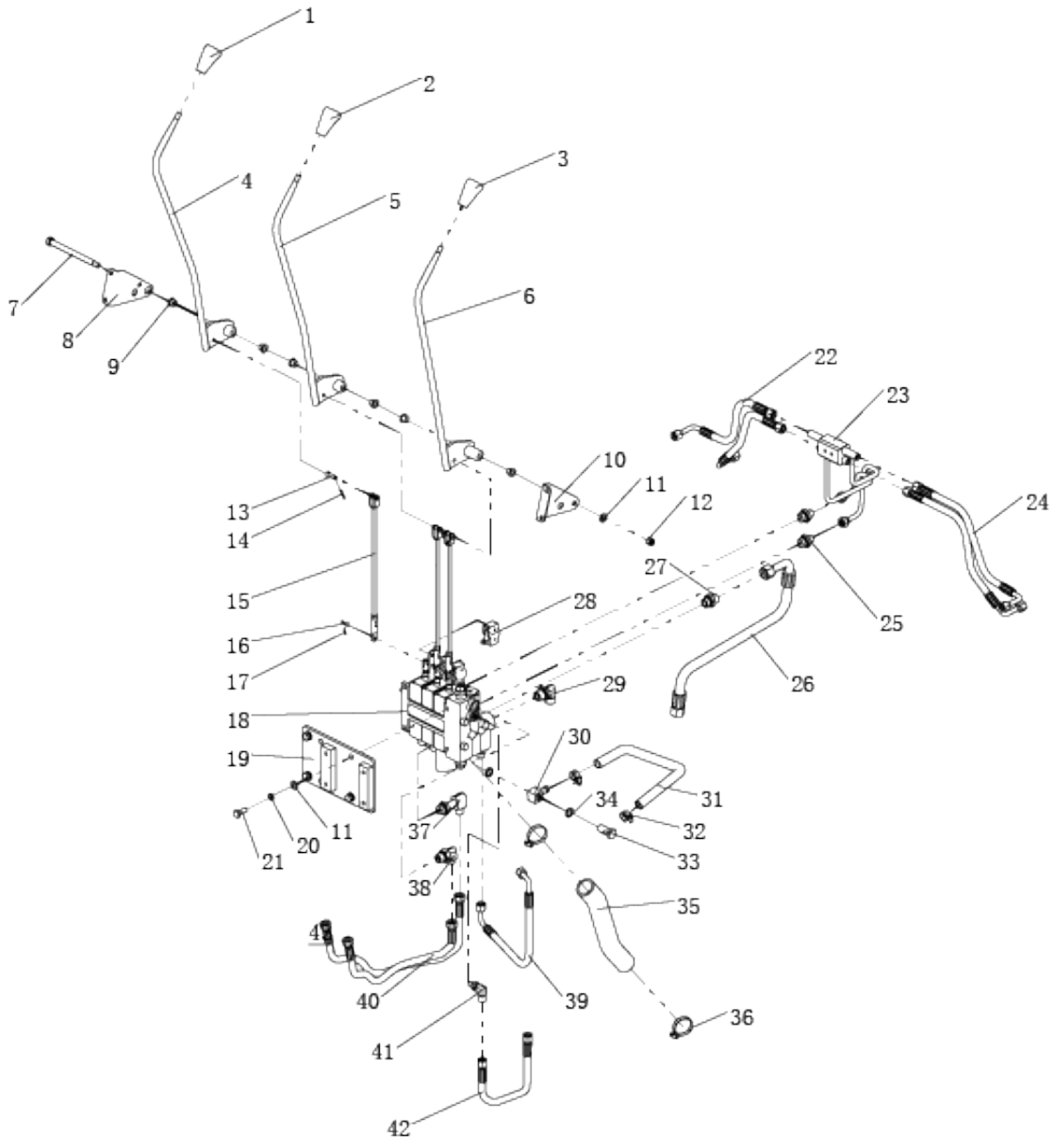


B、Pump station to remove

No.	Code	Name	Specifications	Quantity	Remarks
1	GB/T 70.1-2000	Hexagon socket head screws	M8×20	2	
2	GB/T 93-1987	Elastic washer	Φ8	2	
3	GB/T 97.1-2002	Flat washer	Φ8	2	
4	E15A-01.7.2	Multi - way valve oil inlet steel pipe		1	
5	GB/T 5781-2000	Hexagon head bolts full thread	M10×35	2	
6	GB/T 93-1987	Elastic washer	Φ10	6	
7	GB/T 95-2002	Flat washer	Φ10	6	
8	E15A-01.7.3	Gear pump fitting (14.5cc)		1	
9	GB/T 5781-2000	Hexagon head bolts full thread	M10×40	4	
10	1U141213-190	The oil pump motor	7.7kw	1	
11	E25A-01.31	The motor gasket		4	
12	GB/T 5783-2000	Hexagon head bolts full thread	M10×30	4	
13	GB/T 93-1987	Elastic washer	Φ10	4	
14	GB/T 96.1-2002	The big washer	Φ10	4	
15	E15A-01.7.1	Lifting motor mounting seat welded		1	

NO.	code	name	Specifications	quantity	Remarks
1	GB/T 6170-2000	Hexagonal nut	M12	6	
2	GB/T 93-1987	Elastic washer	Φ12	8	
3	1R342357	Traction motor		1	
4	GB/T 5782-2000	Hexagon head bolt	M12×70	2	
5	GB/T 97.1-2002	Flat washer	Φ12	8	
6	GB/T 5786-2000	Hexagon bolts, fine thread, full thread	M10×1.5×30	10	
7	GB/T 97.1-2002	Flat washer	Φ10	10	
8	GB/T 93-1987	Elastic washer	Φ10	10	
9	DCS15H6	Gear box		1	
10	REF10510-1	Internal combustion drive axle assembly		1	
11	6.5-10-10PR	The front wheel		2	
12	E15A-01.5.1	Gear box pad		2	
13	GB/T 5782-2000	Hexagon head bolt	M12×60	6	

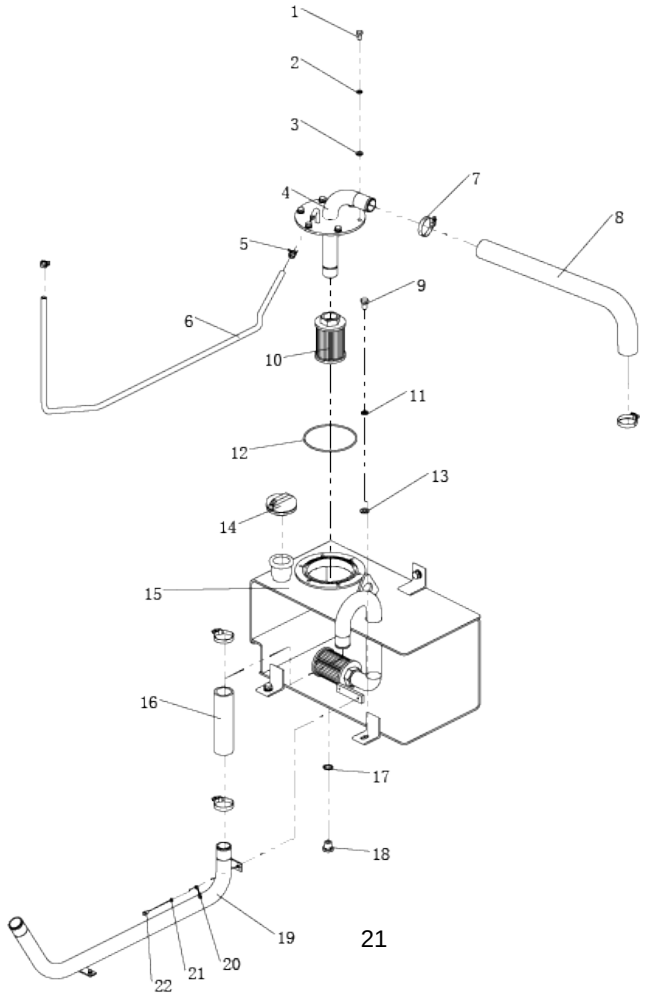
c. Multiway Valve Assembly Removal



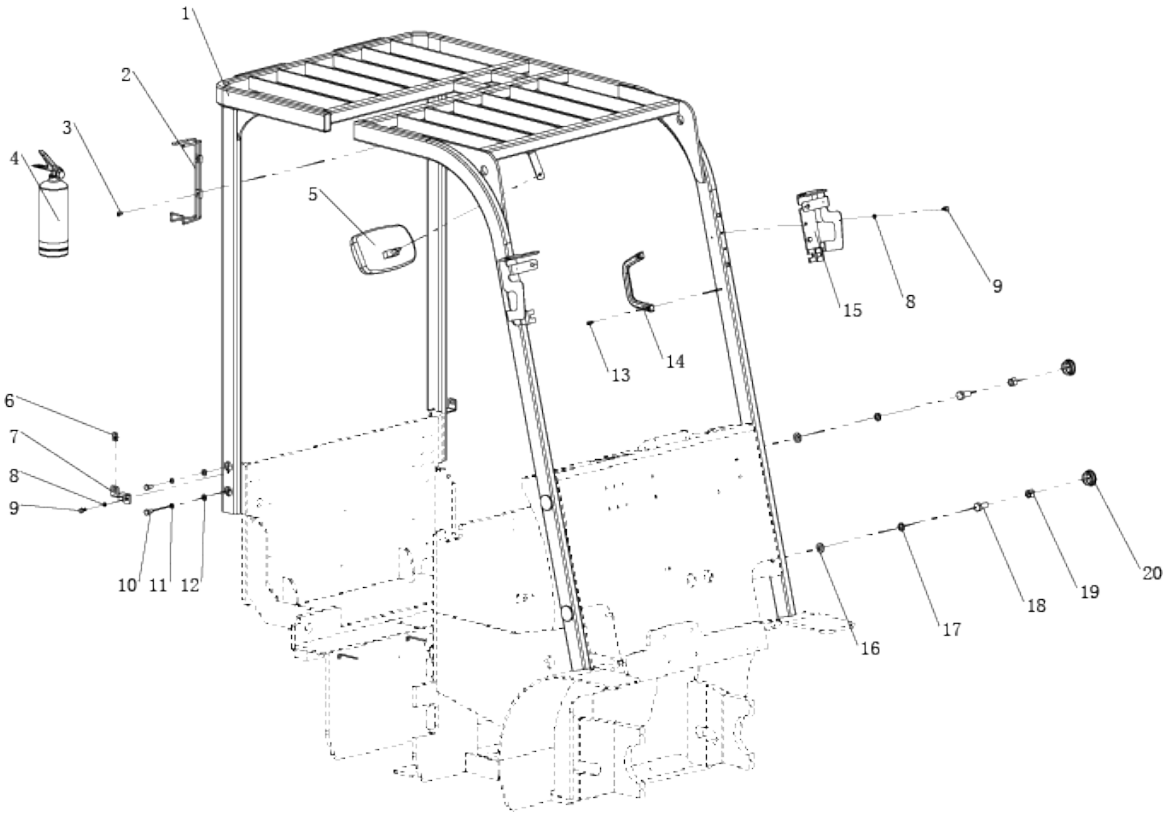
NO.	code	name	specification	quantity	remark
1	DF-CCSB-003	Move the handle sideways		1	outsourcing
2	DF-CCSB-003	Tilting handle		1	outsourcing
3	DF-CCSB-003	Lifting handle		1	outsourcing
4	E15A-01.9.1.3	Side shift lever welded		1	
5	E15A-01.9.1.2	Inclined handle bar welding		1	
6	E15A-01.9.1.1	Lifting handle bar is welded		1	
7	E15A-01.9.1.5	Support shaft		1	
8	E15A-01.9.1.3	Support block right		1	
9	CL10.5-1	Composite sleeve with shoulder	Φ14×Φ12×10	6	
10	E15A-01.9.1.4	Support piece left		1	
11	GB/T 95-2002	Flat washer	Φ10	5	
12	GB/T 889.1-2000	Hexagon lock nuts	M10	1	
13	GB 882-88	pin	Φ8×26	3	
14	GB/T 91-2000	Cotter pin	Φ3.2×20	3	
15	E15A-01.9.2	Connecting rod assembly		3	
16	Q25GB-01.4.14	pin	Φ4.8×18	3	
17	GB/T 91-2000	Cotter pin	Φ2×10	3	
18	MSV04-31233-10L-03	Multi-way valve		1	
19	E15A-01.9.5	Multiway valve mounting plate		1	
20	GB/T 93-1987	Elastic washer	Φ10	4	
21	GB/T 5781-2000	Hexagon head bolt	M10×25	4	
22	E15A-01.9.4.5	Inclined tubing B		2	
23	E15A-01.9.4.2	Inclined steel tube welding 1		1	
24	E15A-01.9.4.4	Inclined tubing A		2	
25	Q15GB-01.4.10	Directly to the head		2	
26	E25A-01.9.17	Lifting tubing		1	

27	Q25GB-01.4.8	Directly to the head		1	
28	Z-15GW22-B	Micro switch		3	
29	Q15GB-01.4.7	Right Angle adjustable joint		1	
30	E15A-01.9.4.3	Turn to oil return adapter		1	
31	E15A-01.9.4.6	Diverter outlet pipe		1	
32	EK20R.H	Hose hoops	Φ16-25	2	
33	E15A-01.9.4.7	Hollow bolt		1	
34	GB982-77	φ 16 combined gasket		2	
35	E15A-01.9.3	Return pipe		1	
36		Hose hoops	Φ32-50	2	
37	E25A-01.9.6	Right Angle connector		1	
38	E25A-01.9.8	Right Angle adjustable joint		1	
39	E15A-01.9.4.1	Steering tubing (oil inlet)		1	
40	E25A-01.9.18	Lateral tubing short (connected to multiple valve)		2	
41	E25A-01.9.7	Right Angle adjustable joint		1	
42	E25A-01.9.16	Steering tubing (preferred)		1	

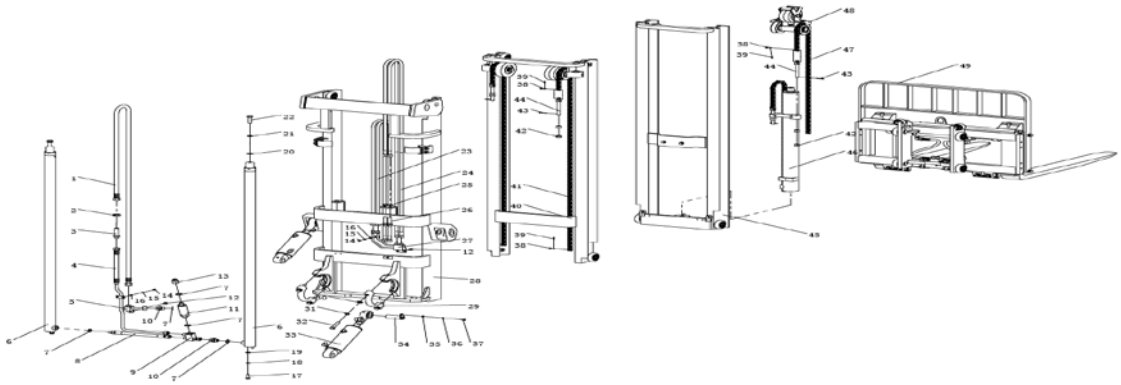
d、Tank assembly removal



e、Removal of roof guard frame



F、Door frame assembly removed



NO.	CODE	NAME	SPECIFICATION	QUANTITY	REMARK
1	E15A-04.1	Top guard frame welding		1	
2		1KG fire extinguisher holder		1	
3	GB/T 818-2000	Cross recessed pan head screws	M6×16	2	
4		1 kg of fire extinguisher		1	
5	HS200×110	Rear view mirror		1	
6		Spring snap nut	M6	2	
7	E15A-04.2	Side cover mounting support plate		2	
8	GB/T 93-1987	Elastic washer	Φ8	6	
9	GB/T 5781-2000	Hexagon head bolt	M8×16	6	
10	GB/T 5783-200	Hexagon head bolts full thread	M10×20	4	
11	GB/T 93-1987	Elastic washer	Φ10	4	
12	GB/T 97.1-2002	Flat washer	Φ10	4	
13	GB/T 70.1-2000	Hexagon socket head screws	M6×16	2	
14		Shake hands handle		1	
15	E10GS-05.2.1 E10GS-05.3.1	Protective cover welded		2	
16	GB/T 97.1-2002	Flat washer	Φ16	4	
17	GB/T 93-1987	Elastic washer	Φ16	4	
18	GB/T 5783-2000	Hexagon head bolts full thread	M16×35	4	

19	GB/T 41-2000	Hexagonal nut	M16		4	
20	NO. E25A-03.4 Code	Rubber plug Name	Φ41.3	Specification	6	Quantity Remark

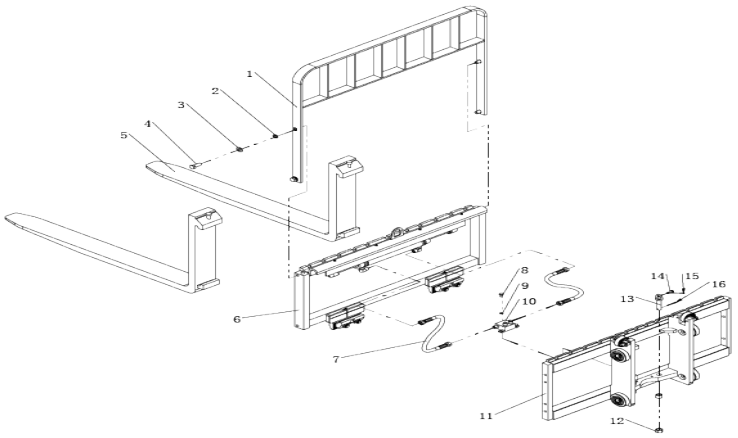
1	E15A-06.9.2	Lifting hose		1	
2	GB/T 6173-2000	Hexagon thin nuts with fine teeth	M22×1.5	1	
3	Q15GB-04.7.5	joint		1	
4	E15A-06.9.1	Steel pipe		1	
5	E15A-06.9.3	Steel pipe		1	
6	E15A-06.5	Lift cylinder assembly		2	
7	GB892-77	Combination gasket	Φ22	5	
8	E15A-05.6.2	High pressure hose		1	
9	E15A-06.9.7	Tee joint		1	
10	E10GS-01.11.8	Through joint		2	
11	XSF-F16L-60-1.5T	The speed limit valve		1	
12	GB/T 70.3-2000	Hexagon socket countersunk head screws	M8×20	3	
13	Q15GB-02.5.16	Joint (3)		1	
14	GB/T 5783-2000	Hexagon head bolts full thread	M6×12	3	
15	GB/T 93-1987	Elastic washer	Φ6	3	
16	GB/T 95-2002	Flat washer	Φ6	3	
17	GB/T 5783-2000	Hexagon head bolts full thread	M12×35	2	
18	GB/T 93-1987	Elastic washer	Φ12	2	
19	GB/T 95-2002	Flat washer	Φ12	2	
20	GB/T 95-2002	Flat washer	Φ16	2	
21	GB/T 93-1987	Elastic washer	Φ16	2	
22	GB/T 5786-2000	Hexagon bolts with fine teeth	M16×60	2	
23	E15A-06.9.5	hose		2	
24	E15A-06.9.4	hose		2	
25	GB/T 6173-2000	Hexagon thin nuts with fine teeth	M16×1.5	2	
26	E10GL-06.1.2	joint		2	
27	E15A-06.9.6	Steel pipe welded		1	
28	E15A-06.1	External door frame assembly		1	

29	E15A-01.19	Front axle clamp under	ZG310-570	2	
30	GB/T 97.1-2002	Flat washer	Φ14	4	
31	GB/T 93-1987	Elastic washer	Φ14	4	
32	GB/T 5783-2000	Hexagon head bolts full thread	M14×70	4	
33	E15A-0.7	Tilting cylinder assembly		2	
34	Q15GB-01.12	Inclined cylinder pin shaft welding		2	
35	GB/T 95-2002	Flat washer	Φ8	2	
36	GB/T 93-1987	Elastic washer	Φ8	2	
37	GB/T 5783-2000	Hexagon head bolts full thread	M8×16	2	
38	Q15GB-02.3.8	Tie pin		6	
39	GB/T 91-2000	Cotter pin		6	
40	E15A-06.2	Middle gantry assembly		1	
41	LH1223（BL623）	Plate chain	111	2	

G、Forks removal

NO	code	Name	Specification	Quantity	Remark
1	E15A-05.3.2	Retaining rack welding		1	
2	GB/T 93-1987	Elastic washer	Φ14	4	
3	GB/T 95-2002	Flat washer	Φ14	4	
4	GB/T 5783-2000	Hexagon head bolts full thread	M14×35	4	
5	Q1545.06.04-5	Pallet fork		2	
6	E10GS-10.3.3	Side shifter assembly		1	
7	E25A-05.7.7	Lateral oil pipe short (connecting tray)		2	
8	GB/T 5783-2000	Hexagon head bolts full thread	M8×16	2	
9	GB/T 93-1987	Elastic washer	Φ8	2	
10	E25A-06.5.9	Side moving tubing seat welded		1	
11	E15A-06.4.1	Wheel rack component		1	

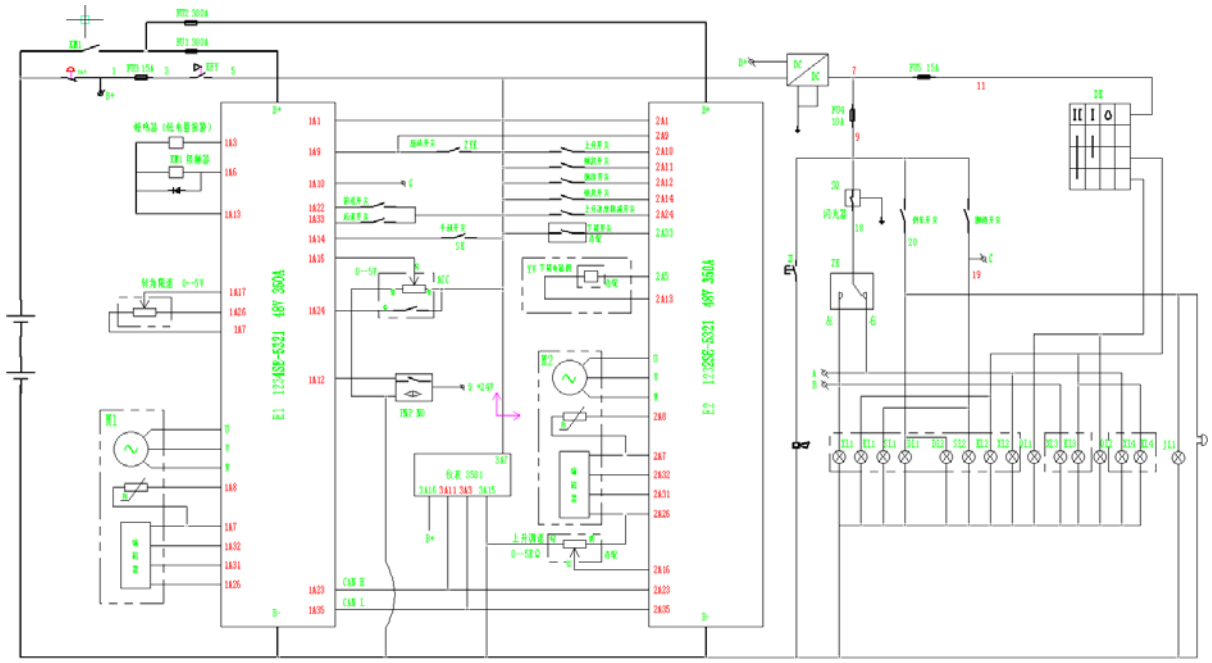
12	GB/T 41-2000	Hexagonal nut	M16	4	
13	E15A-05.7	The chain tension bar		2	
14	Q15GB-02.3.8	Tie pin		2	
15	GB/T 91-2000	Cotter pin	Φ3×20	2	
16	GB/T 91-2000	Cotter pin	Φ3×20	2	



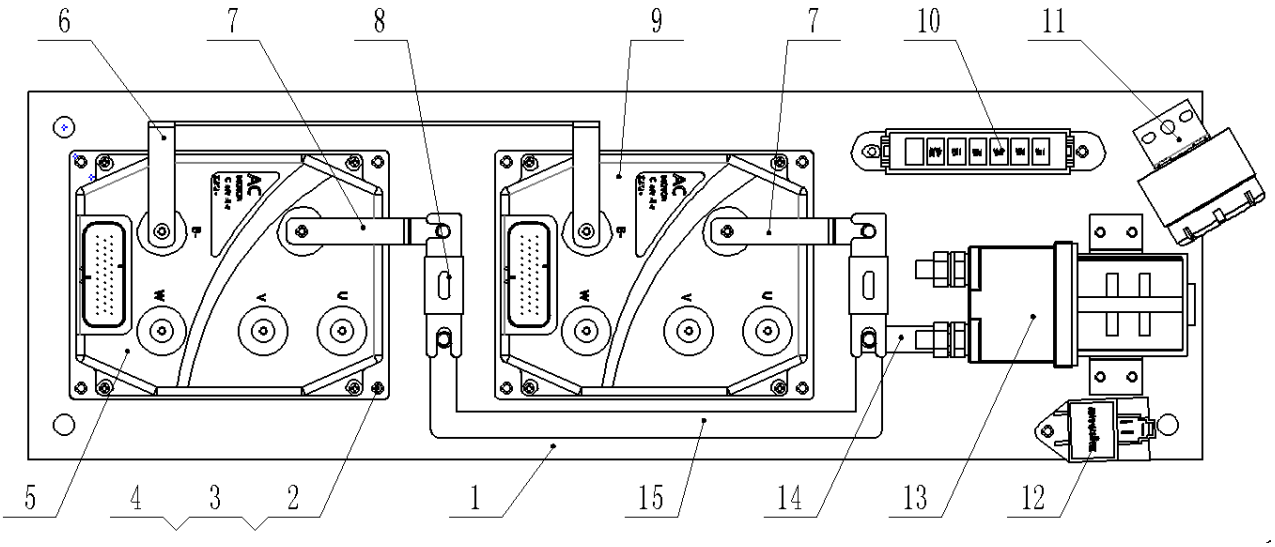
5. Electric System

The electrical system mainly includes battery, traction motor, pump motor, traction motor controller and pump motor controller, steering combination switch, multi-way valve block controller, display instrument, combination control switch, instrument and light

a. Electrical schematic diagram

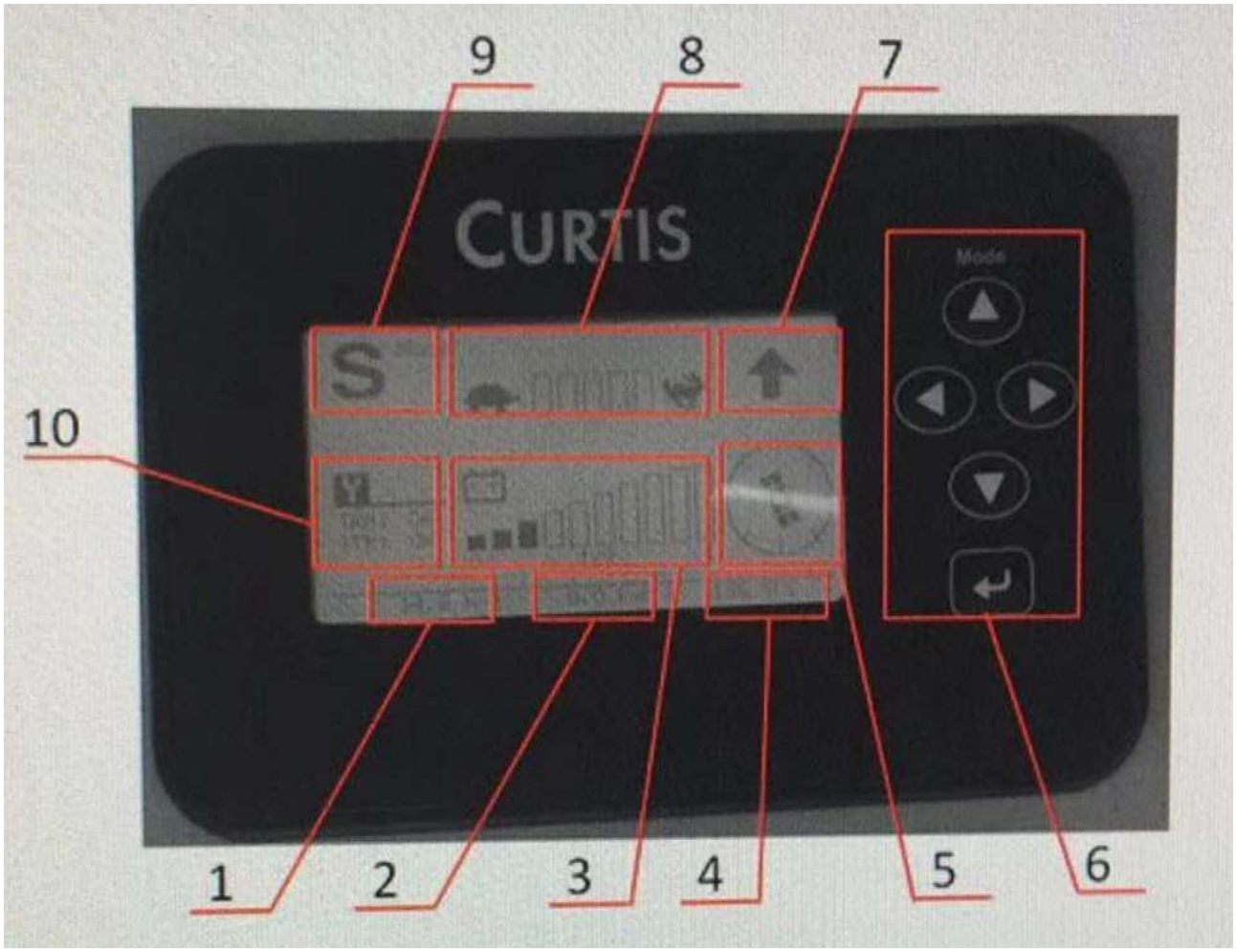


b. Electronic assembly



Intelligent instrument

NO	Code	Name	Specification	Quantity	Remark
1		Aluminum plate	δ/10	1	
2	GB/T 70.1-2000	Hexagon socket head screws	M6×16	8	
3	GB/T 93-1987	Elastic washer	Φ6	8	
4	GB/T 95-2002	Flat washer	Φ6	8	
5	1232SE-2421	Ac controller		1	
6		Article copper connection	B-	1	
7		Article copper connection	B+	2	
8		The fuse	300A	2	
9	1232SE-2421	Ac controller		1	
10		Fender bracket		1	
11		buzzer		1	
12		Electronic flasher		1	
13		Main contactor		1	
14		Article copper connection	B+	1	
15		Article copper connection	B+	4	
16		Aluminum plate			

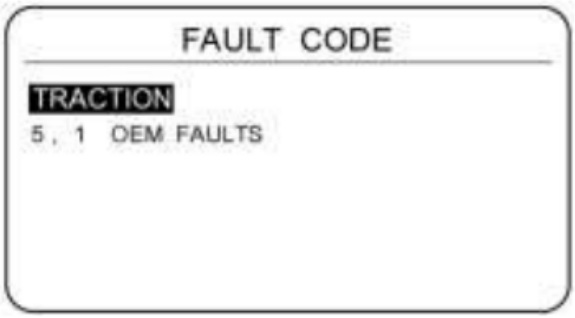


Function Description

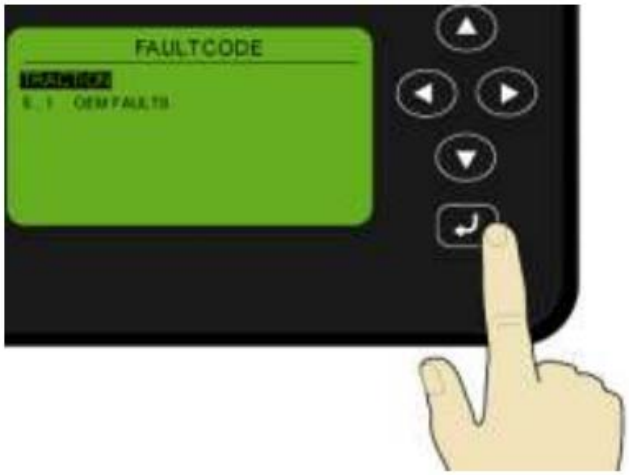
1. Vehicle running timing
2. Vehicle speed
3. Battery capacity
4. Maintenance countdown (no setting)
5. Turning Angle (EPS configuration)
6. Setting button
7. Vehicle speed range
8. Speed mode 1
9. Controller fault code

2. View the current fault information

1. Press confirm to enter the fault information screen



2. When the language of the meter is set to English, the English fault information is displayed. When the language of the meter is set to Chinese, fault information in Chinese is displayed.



1. Press the confirm button again, and the instrument exits the fault information interface.。

❖ **接口**

NO.	DEFINITION	NO.	DEFINITION
1	SCL Rx	9	SCL Tx
2	SCL GND	10	CAN_GND
3	CAN_L	11	CAN_H
4	CAN_L Termination	12	CAN_H Termination
5	Switch Input 1/Frequency Input 1	13	Switch Input 2/Frequency Input 2
6	Switch Input 3/HYD Fault Code Input	14	Switch Input 4 /TRA Fault Code Input
7	KSI	15	B-
8	MOSFET OUTPUT	16	B+

d. Fault Diagnosis menu

1232SEProgrammable fault diagnosis menu and status display LED fault diagnosis table

There are two luminous LED lights, red and yellow, on the controller shell. Different flashing conditions represent different fault conditions, as shown in the following table:

According to situation	On behalf of the meaning
Neither light is on	The controller has no power because the batteries are dead or the wiring is faulty
The yellow lights flickered	Controller works normally
The yellow and red lights are always on	The controller is updating its software
The yellow and red lights were flashing	Controller is faulty.

CODE	FAULT DISPALY	POSIBILITY
1，2	Controller Overcurren 控制器过流（主接触器、电磁制动器、电机不工作）	1. 1. The U, V, or W phases of the motor are short-circuited 2. 2. Motor parameters are incorrectly set 3. Controller failure
1，3	Current Sensor Fault 电流传感器故障（主接触器、电磁制动器、电机不工作）	1. Short circuit of U, V, W relative to car body (short circuit of motor stator) 2. The controller is faulty
1，4	Precharge Failed 预充电失败（主接触器、电磁制动器、电机不工作）	1. An external load connected to the capacitor bank (terminal B+) prevents the capacitor from charging. View the capacitor voltage under the Monitor menu.
1，5	Controller Severe Undertemp 控制器工作在低温保护温度之下（主接触器、电机、电磁制动器、	1. 1. The controller works in the limit environment (below -40℃). 2. View the controller temperature in the Monitoring menu.

	调速器不工作；满制动输入）	
1，6	Controller Severe Overtemp 控制器工作在超温保护温度之上（主接触器、电机、电磁制动器、调速器不工作；满制动输入）	1. The controller works under the limit temperature condition (higher than 95℃). 2. Vehicle overload. 3. The controller is improperly installed. 4. View the controller temperature in the Monitoring menu.
1，7	Severe Undervoltage 电池电压严重过低（驱动扭矩减小）	1. 1. Battery voltage parameters are incorrectly set. 2. 2. The battery runs out. 3. 3. The battery internal resistance is too high. 4. 4. The battery is not connected. 5. 5. View the capacitor voltage in the monitoring menu. 6. B+ fuse is blown or main contactor is not closed.
1，8	Severe Overvoltage 电池电压严重过高（主接触器、电机、电磁制动器、调速器不工作；满制动输入）	1. Battery voltage parameters are incorrectly set. 2. The battery resistance is too high when the regenerative braking current is generated. 3. The battery is not connected during regenerative braking. 4. View the capacitor voltage in the monitoring menu.
2，1	Controller Undertemp Cutback 控制器低温削减（驱动和制动扭矩减小）（当 VCL 语言执行失败时控制器不启动）	1. 1. The low-temperature reduction function of the controller takes effect. 2. 2. The controller works in the limit condition. 3. View the controller temperature in the Monitoring menu.
2，2	Controller Overtemp Cutback 控制器过热削减（驱动和制动扭矩减小）	1. 1. The controller overheats reduction function takes effect. 2. 2. The controller works under extreme temperature conditions. 3. 3. Vehicle overload. 4. 4. The controller is improperly installed. 5. View the controller temperature in the Monitoring menu.
2，3	Undervoltage Cutback 低压削减（驱动扭矩减小）	1. Under normal operation, the battery needs to be charged, and the low-voltage limit function of the controller takes effect. 2. Battery voltage parameters are incorrectly set. 3. The battery runs out. 4. The battery internal resistance is too high. 5. The battery cable is disconnected. 6. View the capacitor voltage under the programmer Monitor menu. B+ fuse is blown or main contactor is not closed. 1.
2，4	Overvoltage Cutback 过压削减（驱动扭矩减小）	1. The system runs properly. In the regenerative braking process, the regenerative braking current causes the battery voltage to be too high, and the controller overvoltage limit parameter takes effect

		2. Battery voltage parameters are incorrectly set. 3. The battery resistance is too high when the regenerative braking current is generated. 4. Open battery connection during regenerative braking. View the capacitor voltage under the programmer monitor menu. 1.
2，5	+5V Supply Failure 速度传感器+5V 信号中断（当 VCL 语言执行失败时控制器不启动）	1. 1. External load resistance connected to +5V supply (pin26) is too low. 2. View the 5V and Ext supply current under the Programmer monitor menu.
2，6	Digital Out 6 Overcurren 数字信号 6 输出过流（数字输出驱动端 6 不运行）	1. External load resistance connected to digital output driver 6 (pin19) is too low.
2，7	Digital Out 7 Overcurrent 数字信号 7 输出过流（数字输出驱动端 7 不运行）	1External load resistance connected to digital output driver 7 (pin20) is too low.
2，8	Motor Temp Hot Cutback 电机过热削减（驱动扭矩减小）	1. The motor temperature exceeds the parameter setting, so the requested current is reduced. 2. The motor temperature control parameters are not adjusted correctly. 3. View motor temperature and Analog2 input under programmer monitoring menu. If the thermostat is not used, the temperature compensation and temperature cut-off should be set to OFF
2，9	Motor Temp Sensor Fault 电机温度传感器故障（限制操作〈最大速度减小〉和电机过热削减功能失效）	1. The motor temperature sensor is improperly connected. 2. If the thermostat is not used, temperature compensation and temperature cut-off should be set to OFF 3. The motor temperature exceeds the maximum temperature setting value.
3，1	Coil1 Driver Open/Short 驱动 1 连接的负载开路/短路（驱动 1 无输出）	1. 1. The connected load is open or short. 2. 2. The connection terminal is contaminated. 3. The cable harness is damaged or incorrectly connected.
	Main Open/Short 主接触器线圈开路/短路（驱动 1、电机和电磁制动器不工作）	4. 1. The connected load is open or short. 5. 2. The connection terminal is contaminated. 1. The cable harness is damaged or incorrectly connected.
3，2	Coil2 Driver Open/Short 驱动 2 连接的负载开路/短路（驱动 2 无输出）	6. 1. The connected load is open or short. 7. 2. The connection terminal is contaminated. The cable harness is damaged or incorrectly connected.
	EM Brake Open/Short 电磁制动器线圈开路/短路（驱动 2 和调速器不工作，满制动）	8. 1. The connected load is open or short. 9. 2. The connection terminal is contaminated. 1. The cable harness is damaged or incorrectly connected.
3，3	Coil 3 Driver Open/Short	10. 1. The connected load is open or short.

	驱动 3 连接的线圈开路/短路 （驱动 3 无输出）	11. 2. The connection terminal is contaminated. The cable harness is damaged or incorrectly connected.
3，4	Coil 4 Driver Open/Short 驱动 4 连接的线圈开路/短路 （驱动 4 无输出）	12. 1. The connected load is open or short. 13. 2. The connection terminal is contaminated. The cable harness is damaged or incorrectly connected.
3，5	PD Open/Short 比例阀线圈开路或短路 （比例阀不工作）	14. 1. The connected load is open or short. 15. 2. The connection terminal is contaminated. The cable harness is damaged or incorrectly connected.
3，6	Encoder Fault 编码器故障 （限制操作功能生效）	1. Motor encoder is faulty. 2. The cable harness is damaged or improperly connected. 3. View motor monitoring menu: Motor RPM
3.7	Motor Open 电机开路（主接触器，电机和电磁制动器不工作）	1. Open motor U, V and W lines. 2. Cables are damaged or incorrectly connected.
3，8	Main Contactor Welded 主接触器粘连（主接触器，电机和电磁制动器不工作）	1. 1. Contact adhesion of main contactor. 2. 2. Motor U connection line is in bad contact or open circuit. 3. An alternate voltage path (such as an external precharged resistor) provides a current to the capacitor bank (B+ terminal).
3，9	Main Contactor Did Not Close 主接触器未闭合（主接触器，电机和电磁制动器不工作）	1. 1. The main contactor is not closed. 2. 2. The contact of the main contactor is burned or not in good contact. 3. 3. The external load in the capacitor bank (B+ end) prevents the capacitor bank from charging. 4. B+ fuse is blown.
4，1	Throttle Wiper High 加速器滑动端输入过高 （调速器不工作）	1. The sliding terminal voltage of the accelerator is too high. 2. View the monitoring menu accelerator input.
4，2	Throttle Wiper Low 加速器滑动端输入过低 （调速器不工作）	1. The voltage at the sliding end of the accelerator is too low. 2. View the monitoring menu accelerator input.
4，3	Brake Wiper High 制动电位器滑动端输入过高 （满制动输入）	1. 1. The sliding end voltage of brake potentiometer is too high. 2. View monitoring menu brake potentiometer input。
4，4	Brake Wiper Low 制动电位器输入过低 （满制动输入）	1. The sliding end voltage of brake potentiometer is too low. 2. Check the brake potentiometer input in the monitoring menu.
4，5	Pot Low Overcurrent 电位器低端过流 （调速器不工作，满制动输入）	1. 1. Potentiometer combination is connected to the low end of potentiometer to prevent it from being too low. 2. View monitoring menu potentiometer low end output.
4，6	EEPROM Failure 写入 EEPROM 存储器失败 （主接触器、电机、电磁制动器、调速器、互锁、驱动的 1-4 以及	1. Failed to write to the EEPROM memory. EEPROM memory is written by VCL, by CAN bus, by adjusting 1311 parameters, or by loading new software to the controller, which may be the cause of the failure.

	比例阀均不工作，满制动输入）	
4，7	HPD/Sequencing Fault HPD/操作顺序错误 （调速器不工作）	1. 1. Incorrect key switch, interlock, direction and accelerator input sequence. 2. 2. Key switch, interlock, direction and accelerator input connection is not good or switch failure. 3. View the programmer monitor menu input. 4.
	Emer Rev HPD 紧急反向操作后产生 HPD （调速器和电磁制动器不工作）	1. Emergency reverse operation aborted, but the accelerator, forward and backward inputs, interlock switch did not return to neutral.
4，9	Parameter Change Fault 参数改变错误（主接触器、电机、电磁制动器不工作）	1. This is a safety fault caused by a change in a parameter setting in 1311, which can be eliminated by opening the new switch. For example, if the user changes the accelerator type, this error can occur and the vehicle can be controlled only after the switch is turned back on.
5,1-6，7	OEM Faults OEM 级错误	1. These failures are OEM level failures that require a higher level programmer to see.
6，8	VCL Runtime Erro VCL 运行错误（主接触器、电机、电磁制动器、调速器、互锁、驱动的 1-4 以及比例阀均不工作，满制动输入）	1. VCL code runtime error. 2. See 1311 Controller Monitoring menu: VCL Error Module and VCL Error. This failure can be likened to the runtime VCL module ID and error code defined in detail in the OS system information file.
6，9	External Supply Out of Range 外部输入超出范围	1. Either external load connected to 5V or 12V generates too much or too little input current. 2. The external maximum and minimum parameters of the fault check menu are incorrectly adjusted. 3. See 1311 Input Test menu: External Input Current.
7，1	OS General （主接触器、电机、电磁制动器、调速器、互锁、驱动的 1-4 以及比例阀均不工作，满制动输入）	1. The internal controller is faulty.
7，2	PDO Timeout CAN PDO 接受超时	1. The receiving time of the CAN PDO exceeds the PDO timeout period. Procedure
7，3	Stall Detect 编码器停止探测 （控制运行在限制操作模式）	1. Motor stops. 2. The motor encoder is faulty. 3. The cable harness is damaged or improperly connected. 4. The power supply of the encoder is faulty. 5. See 1311 Motor Monitoring menu: Motor RPM.
8，7	Motor Characterization Fault 电机特性描述错误（主接触器、调速器、电磁制动器和电机不工作）	1. The description of motor characteristics in the motor description step is wrong.

8，8	Encoder Characterization Fault 编码器特征描述错误（主接触器、调速器、电磁制动器和电机不工作，）	1. The description of the encoder is incorrect. 2. Motor encoder pulse frequency is not a standard value (32,48,64,80 PPR)
8，9	Motor Type Fault 电机型号参数错误（主接触器、调速器、电磁制动器和电机不工作，）	1. The motor model parameter value exceeds the range.
9，2	EM Brake Failed to Set 电磁制动器制动失败（制动器处于）	1. The vehicle is still moving after the brake signal is issued. 2. The electromagnetic brake cannot hold the rotating motor tightly.
9，3	Limited Operating Strategy （LOS） 限制操作 （进入限制操作模式）	1.Either an encoder failure (code 36) or a stall detection failure (code 73) results in the restricted operation control mode being activated. 2. The motor encoder is faulty. 3. The cable harness is damaged or improperly connected. 4. Vehicle stall.
9，4	Emer Rev Timeout 紧急反向超时（调速器和电磁制动器不工作）	1. 1. The emergency reverse is activated, but the emergency reverse has stopped working because the emergency reverse time has timed out. 2. Emergency reverse signal adhesion

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:

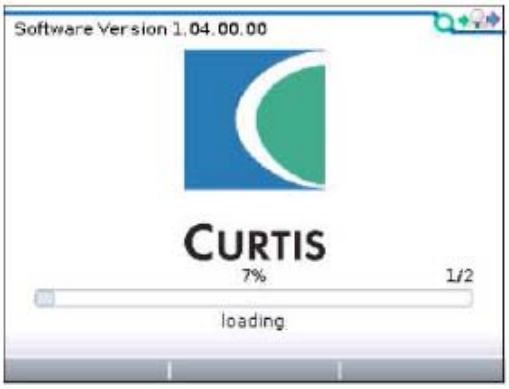
1. After connecting the hand held unit with the controller, open the key switch
2. According to the menu list of CURTIS hand held unit, find: Monitor.....
3. According to requirements, open the corresponding sub-item of the detection menu, run the vehicle, and observe the change of the hand-held value.

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.

Collect keys

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

The menu structure

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.

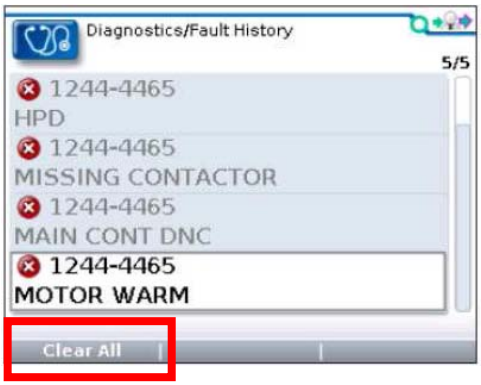
Nine Menu

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.

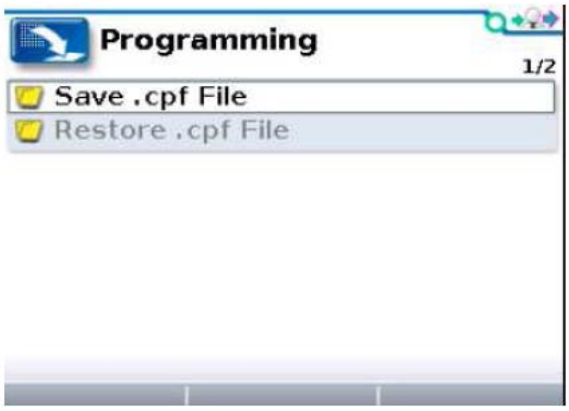
The historical faults folder lists all faults encountered after the last historical fault is cleared. By clearing the fault content in the entire folder, you can record the historical faults again.



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