

电动托盘车维修手册

ELECTRIC PALLET TRUCK
SERVICE MANUAL

HELI

目　　录 content

1　车辆维修安全注意事项 **Truck mantenance safty precautions** 3
2　电动托盘类叉车配置介绍 **Electric pallet truck models introduction** 5
2.1　托盘搬运车 Electric pallet truck 5
2.2　托盘堆垛车 Electric stacker 5
2.3　平衡重式托盘堆垛车 Counter balance stacker 5
3　主要部件介绍 **Main components introduction** 6
3.1　转向控制器 Turning controller 6
3.2　驱动控制器 Driving controller 9
3.3　仪表 Power meter 12
3.4　操纵手柄 Operation handle 14
4　电气原理图 **Electrical diagrams** 16
4.1　托盘堆垛车电气原理图 Diagram of electric pallet truck 16
4.2　托盘搬运车电气原理图 Diagram of electric stacker 17
4.3　托盘搬运车 DC 电机电气原理图 Diagram of DC electric stacker 18
5　车辆故障代码读取 **Read trouble shooting code** 19
5.1　转向系统故障代码读取 Trouble shooting code of turning system 19
5.2　驱动系统故障代码读取 Trouble shooting code of driving system 19
6　故障代码表 **Trouble shooting chart** 19
6.1　转向系统故障代码表 Trouble shooting chart of turning system 20
6.2　交流驱动系统故障代码 Trouble shooting of AC controller (Curtis1230) 21
6.3　直流驱动系统故障代码 Trouble shooting of DC controller (Curtis1243) 22
7　车辆故障排除 **Trouble shooting** 23
7.1　转向系统故障排除 Turning system trouble shooting 23
7.2　交流驱动系统故障排除 AC driving system trouble shooting 28
7.3　起重系统故障排除 Lifting system trouble shooting 33
8　**CURTIS** 手持单元 **Curtis programmer** 36
8.1　CURTIS 手持单元介绍 Introduction of Curtis programmer 36
8.2　CURTIS 手持单元操作 Operating instruction of Curtis programmer 37
9　充电器 **Charger** 38
9.1　充电器介绍 Introduction of charger 38
9.2　充电器操作 Operation of charger 38
9.3　充电器工作原理 How the charger works 39
9.4　充电器常见故障 Charger common faults 39
9.5　充电器电路图 Diagram of charger 40
9.6　充电器检修 Charger maintenance 41
10　车辆必要的定期维护 **Necessary regular maintenance of the truck** 44
10.1　车辆的日常清洁 Truck daily clean 44
10.2　重要电气部件维护 Important electric components maintenance 44

1　车辆维修安全注意事项

Truck maintenance safety precautions

- **车辆维修必须是专业人员**

车辆维修人员需要经过电动叉车专业知识培训，未经过培训的人员，请不要擅自维修车辆，防止造成人员伤害和车辆的损坏。

Service people should under professional training, those who without training are not allowed to maintain the trucks in case of an accident on people or trucks.

- **带电维修时，请将车辆驱动轮悬空**

带电检测电器故障时，请将车辆驱动轮垫起，使其离开地面，以避免造成人员意外损伤。

Hang up the driving wheel from the ground when testing electric components faults with power supply, to avoid any accidents of people.

- **使用正确电压等级的蓄电池**

电瓶额定电压和控制器上所标的电压值一定要相同。

注意：电瓶电压要和控制器的额定电压保持一致，过高的电瓶电压会烧掉功率单元，过低的电压会阻止逻辑单元操作。

Battery rated voltage should be as same as the voltage marked on the controller. Over rated battery voltage will burn out the power units, and too low voltage will stop logic units working.

- **断开蓄电池和车辆的连接**

  在需要对电气系统元器件进行维修和更换时，请先断开蓄电池与车辆的连接，避免短路时产生的大电流，对维修人员造成伤害。

  Please unplug the battery and truck when maintain or replace the electric components to avoid any accident causing by large current of shorted circuits.

- **不能随意拆卸部件**

  在没有弄懂原理的情况下，不得随意拆卸电器元件，以免人为损坏电器，造成人为电路故障或使故障范围扩大。

  Shall not be demolished at any electric components in the case of unknown reason, to avoid components defect or circuit fault or fault enlarges.

- **车辆禁止在雨天作业**

  不得在下雨时露天使用车辆，以免雨水渗入车辆内部，致使电路绝缘电阻下降，甚至短路而损坏电器。

  Shall not operate the truck in rainy day outside, to avoid rain water fall into the truck and causing decrease of the circuit resistance or even short circuit and making components defective.

- **禁止用水冲洗车辆**

  在日常维护、保养时，除蓄电池外，车辆及其它部件严禁用水或液体冲刷，以免损坏电器。

  When maintain the truck, except battery, shall not wash the truck or components by water or other liquid in case of defective.

2 电动托盘类叉车配置介绍

Electric pallet truck models introduction

2.1 托盘搬运车 Electric pallet truck

序号 item	车型 model	驱动控制器 Driving controller	转向控制器 Turning controller	驱动电机 Driving motor	转向电机 Turning motor	起升电机 Lifting motor
1	CBD15-170G	CURIS 1243 24V/200A	-	DC 0.63KW	-	DC 0.8KW
2	CBD20-150	CURIS 1230 24V/200A	LIFTSTAR 24V/ 25A	AC 1.5KW	DC 0.15KW	DC 1.2KW
3	CBD20-460	CURIS 1230 24V/200A	LIFTSTAR 24V/ 25A	AC 1.5KW	DC 0.15KW	DC 1.2KW

2.2 托盘堆垛车 Electric stacker

序号 item	车型 model	驱动控制器 Driving controller	转向控制器 Turning controller	驱动电机 Driving motor	转向电机 Turning motor	起升电机 Lifting motor
1	CDD12-030	CURIS 1243 24V/200A	LIFTSTAR 24V/ 25A	DC 0.63KW	DC 0.15KW	DC 3KW
2	CDD14-930	CURIS 1230 24V/200A	LIFTSTAR 24V/ 25A	AC 1.5KW	DC 0.15KW	DC 3KW
3	CDD14-920	CURIS 1230 24V/200A	LIFTSTAR 24V/ 25A	AC 1.5KW	DC 0.15KW	DC 3KW
4	CDD14-980	CURIS 1230 24V/200A	LIFTSTAR 24V/ 25A	AC 1.5KW	DC 0.15KW	DC 3KW
5	CDD16-D930	CURIS 1230 24V/200A	LIFTSTAR 24V/ 25A	AC 1.5KW	DC 0.15KW	DC 3KW
6	CDD16-950	CURIS 1230 24V/200A	LIFTSTAR 24V/ 25A	AC 1.5KW	DC 0.15KW	DC 3KW
7	CDD16-960	CURIS 1230 24V/200A	LIFTSTAR 24V/ 25A	AC 1.5KW	DC 0.15KW	DC 3KW

2.3 平衡重式托盘堆垛车 Electric counter balance stacker

序号 item	车型 model	驱动控制器 Driving controller	转向控制器 Turning controller	驱动电机 Driving motor	转向电机 Turning motor	起升电机 Lifting motor
1	CDD12-970	CURIS 1230 24V/200A	力达 24V/ 25A	AC 1.5KW	DC 0.15KW	DC 3KW

3 主要部件介绍

Main components introduction

3.1 转向控制器 Turning controller

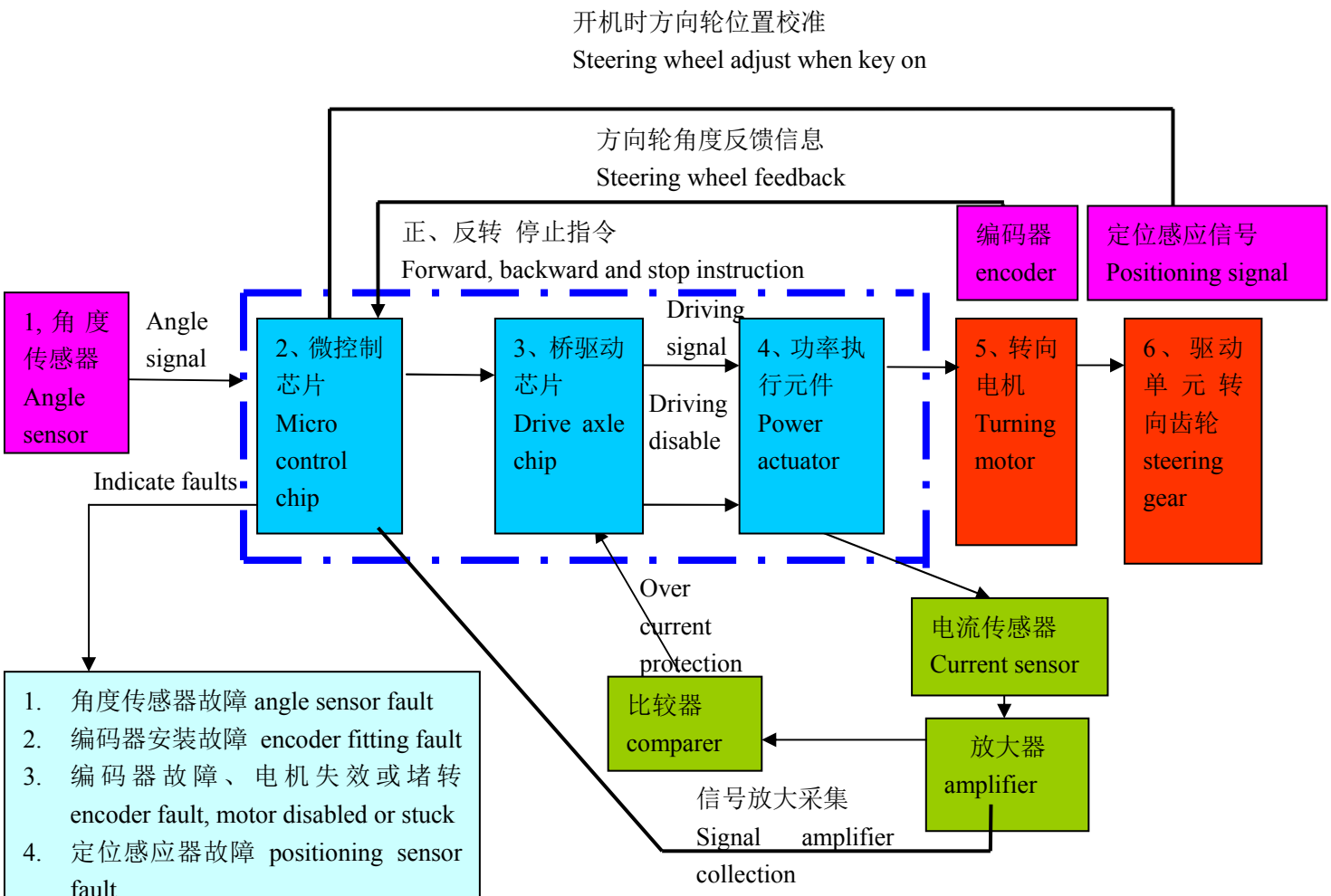
电子助力转向系统是本公司与国内名校多年产学研合作的成果，操纵力轻、能耗低、高效静音 ，具备关机自动记忆、开机自动复位功能。同时具有过压、过流、短路等多种自动保护功能，能够故障自动诊断，通过 LED 指示灯显示，方便保养和维修。

Electric power steering system is our pride achievement by years of research cooperation with famous university in China. It can make trucks easy operating, low energy consumption and low noise. This system has automatic memory when key off the truck, and back to reset when key on the truck later. Also it has self protection function against over voltage, over current or short circuit. It can showing the trouble shooting code by LED flashing, and makes easy maintenance and service.

3.1.1 技术规格 Technique specification

工作电压 working voltage---------- 24V
最大工作电流 maximal working current---------- 25A,可持续 1 分钟
环境温度 working environment temperature---------- －25℃ ~ 40℃
斩波器最高工作温度 chopper maximal working temperature-------- 80℃

3.1.2 工作原理　Working Theory



1. 角度传感器故障 angle sensor fault
2. 编码器安装故障 encoder fitting fault
3. 编码器故障、电机失效或堵转 encoder fault, motor disabled or stuck
4. 定位感应器故障 positioning sensor fault
5. 定位感应器安装故障 positioning sensor fitting fault
6. 电机长时间过流 motor long time over current
7. 控制器内部继电器损坏或电源线没接上 defective of relay of controller or disconnected with power supply
8. 供电电压超过极限范围 Over voltage supply than limited
9. 控制器损坏 defective controller

图 1　电子助力转向系统工作原理
Electric steering system working theory

3.1.3 转向控制器接线端子　Turning controller wires connection

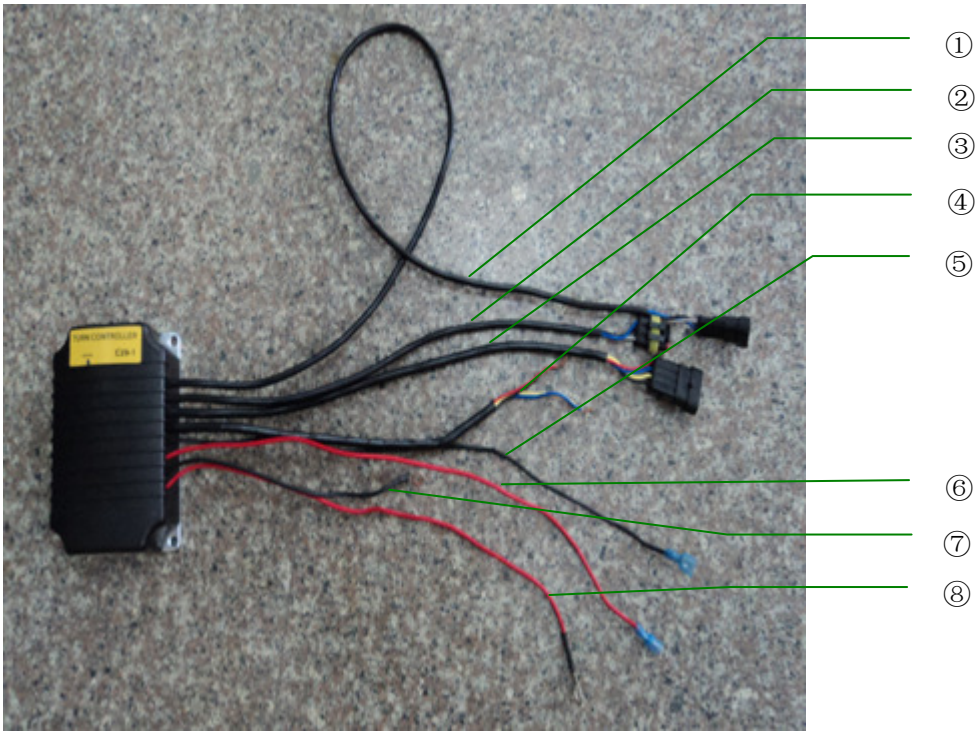


图 2　转向控制器接线端子 Turning controller wires connection

序号 item	线色 Wire color	功能 function	连接部件 Connect component
①	灰 gray	正极 anode：+24V	转向定位接近开关 Turning position approach switch
	黑 black	输出 output：0 / 12-14V	
	蓝 blue	负极 cathode：0V	
②	灰 gray	正极 anode：+5V	角度传感器 Angle sensor
	黑 black	输出 output：1.25-3.75V	
	蓝 blue	负极 cathode：0V	
③	红 red	电源正极 power supply anode：+5V	转向电机速度编码器 Turning motor speed encoder
	蓝 blue	A 相（方向信号） direction signal：0 / 5V	
	黄 yellow	B 相（脉冲信号） pulse signal：2.5V（转动时 turning）	
	黑 black	电源负极 power supply cathode：0V	
④	红黑 red black	控制电源输入 control power supply imput：+24V	24V 控制电源
	蓝黄 blue yellow	控制电源输出 control power supply output：+24V	
⑤	黑 black	电机负极 power supply cathode	转向电机 （工作电压：0-24V）
⑥	红 red	电机正极 power supply anod	
⑦	黑 black	电源负极 power supply cathode：0V	24V 驱动电源
⑧	红 red	电源正极 power supply anode：+24V	

3.2 驱动控制器 driving controller

3.2.1 交流控制器 AC Curtis controller——CURTIS 1230-2402

3.2.1.1 控制器规格 controller specification

工作电压 working voltage----------24V

最大工作电流-max working current----------200A,可持续 2 分钟 can last 2 mins

环境温度：-working environment temperature----------－40℃ ~ 50℃

斩波器最高工作温度：-Chopper max working temperature -- 85℃

3.2.1.2 控制器端口功能描述 controller port function description



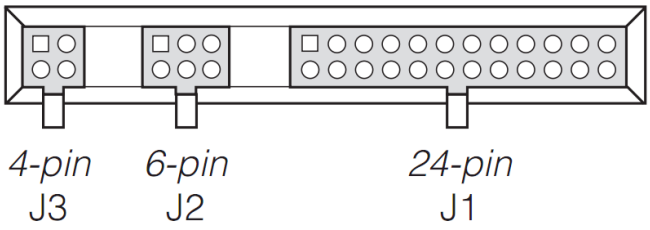
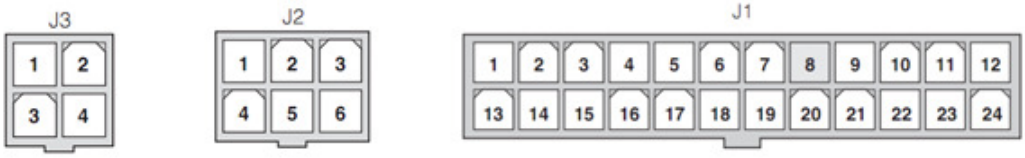


图 3 CURTIS 1230 交流驱动控制器及接线端口
CURTIS 1230 AC controller and wire connection ports



3.2.2 直流控制器 DC-controller CURTIS 1243-4220

3.2.2.1 控制器规格 controller specification

端口 port	功能 function
J2-1	速度编码器电源正极 Speed encoder power supply anode
J2-2	脉冲信号 pulse signal A
J2-3	电磁制动器驱动电源（正极） Magnetic brake power supply (anode)
J2-4	脉冲信号 pulse signal B
J2-5	速度编码器电源负极 Speed encoder power supply cathode
J2-6	电磁制动器驱动输出（负极） Magnetic brake output (cathode)
J3-1	信号接收 signal collection（+5V）
J3-2	手持单元电源负极 programmer power supply cathode
J3-3	信号发射 signal emission（+5V）
J3-4	手持单元电源正极 programmer power supply anode（+15V）

端口 port	功能 function
J1-1	24V 电源输入 power supply input
J1-2	24V 电源互锁信号 power interlock signal
J1-3	低速运行模式信号输入 low speed mode signal input
J1-6	加速信号 0-5V 输入 speed up signal 0-5V input
J1-13	前进开关信号输入 forward button signal input
J1-14	后退开关信号输入 backward button signal input
J1-15	紧急反向信号输入 emergent reverse button signal input
J1-16	紧急反向信号输出检查 emergent reverse button signal output check
J1-22	主接触器线包驱动信号输出 main controller coil signal output

工作电压 working voltage---------- 24V

最大工作电流 max working current---------- 200A, continuable 2 minutes

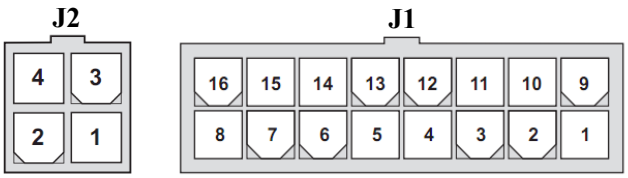
环境温度：working environment temperature-------- －40℃ ~50℃

斩波器最高工作温度：chopper max working temperature------85℃

3.2.2.2 控制器端口功能描述 controller port function description

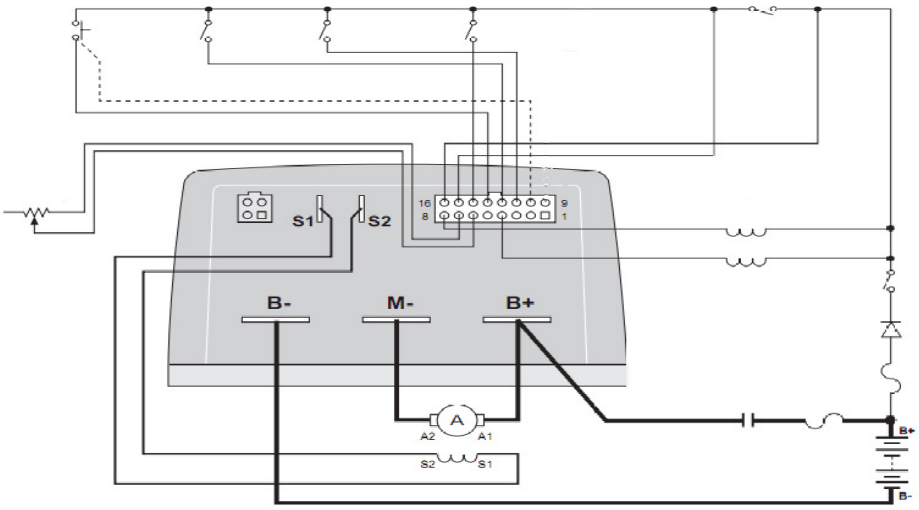


图 4　CURTIS 1243 直流驱动控制器及接线端口



端口 port	功能 function
J2-1	信号接收 signal collection（+5V）
J2-2	手持单元电源负极 programmer power supply cathode
J2-3	信号发射 signal emission（+5V）
J2-4	手持单元电源正极 programmer power supply anode（+15V）

端口 port	功能 function
J1-4	主接触器线包驱动信号输出 main controller coil signal output
J1-6	加速器滑动信号 0-5V 输入 accelerator signal 0-5V input
J1-7	加速器信号低端 accelerator signal lower end
J1-8	电磁制动器驱动信号输出 Magnetic brake signal output
J1-10	紧急反向信号输出检查 emergent reverse button signal output check
J1-11	后退开关信号输入 backward button signal input
J1-12	前进开关信号输入 forward button signal input
J1-13	紧急反向信号输入 emergent reverse button signal input
J1-15	24V 电源互锁信号 24V power supply interlock
J1-16	24V 电源输入 24V power supply input



3.3 仪表 POWER METER

3.3.1 仪表端口功能描述 Power meter ports function decription



图 5 仪表正视图
Front view



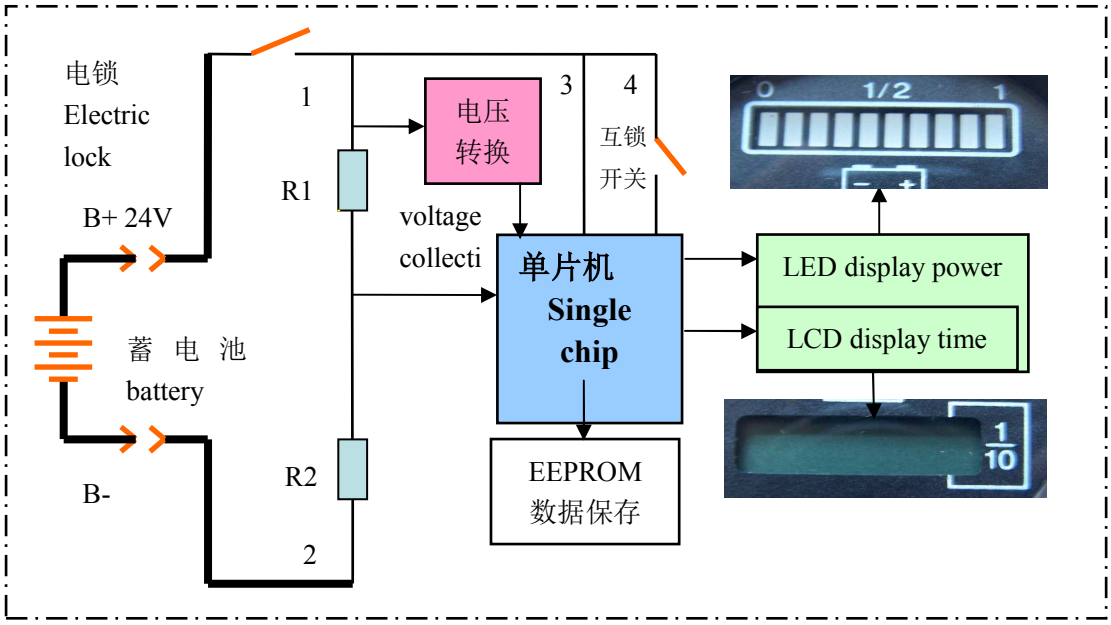
图 6 仪表后视图
Back view

- 电量表的底面有 4 个引脚，分别为+、-、S1、S2，其中+、-分别接电池的正极和负极，S1 和 S2 是两个信号输入端口，高电平（+24V）有效，S1 接高电平，则 LED 灯亮；在 S1 为高电平的前提下，S2 接高电平，则 LCD 开始计时。

There are 4 pins in the back side of the power meter, they are +、-、S1、S2, and +、- is for battery anode and cathode, S1、S2 for signal input, when the high level（+24V） is effected, S1 connects high level, LED on, when S1 connects high level, S2 connects high level, the LED starts to time.

引脚 pin	1	2	3	4
功能 function	电源正极 battery anode（+）	电源负极 battery cathode（-）	LED 电源（S1）	计时信号 time signal（S2）
待机电压 standby voltage（V）	24	0	24	0
工作电压 working voltage（V）	24	0	24	24

3.3.2 仪表工作原理简图 power meter working theory



3.3.3 仪表使用 power meter condition

- 使用环境温度 working environment temperature：-30℃～+50℃。
- 环境湿度 humidity：95%，非露状。
- 本电量表仅适用于蓄电池电压为直流 24V 的电动叉车。Only supply to DC 24V battery electric fork truck
- 电量显示为 5 盏绿灯，3 盏黄灯，2 盏红灯。
  Power meter display 5 green lights, 3 yellow lights, 3 red lights
- 电量表红灯闪烁时，电池已经欠压，应该及时充电；当电池电压高于 25V，重新复位到最右边的绿灯，表示电池为满电量。

When red light of power meter flashing, it means the battery is in low power, should charge. When the battery voltage is higher than 25V, the power meter back to green light, it means the power is full.

仪表电量显示格 power meter display grid	LED 灯色 color
第 1，2，3，4，5 格	绿色 green
第 6，7，8 格	黄色 yellow
第 9，10 格	红色 red

- 当电池电量高于 28V 时，最右盏绿灯闪烁，表示电池电量超满。
  When battery voltage is over 28V, the right green light flashes, it means the battery is too full.
- 电量表+、-极的最大供电电压不能超过 32V。
  The max voltage of power meter +,- pole is 32V.
- 电量表在计时时，LCD 的“H”标记闪烁，计时停止时，“H”标记不闪烁。时间显示单位为小时，显示小数点后 1 位，即计时分别率为 0.1 小时，如显示“8.3”，就是表示 8.3 小时，即 8 小时 18 分钟。
  When the power meter is timing, the “H” on the LCD flashes, when meter stop timing, “H” stops flashing as well. The power meter time by hours, leave one decimal, eg, if

the meter display 8.3, it means the truck is working 8.3 hours.

- 电量显示具有记忆功能，电池停止放电后回升的“虚电”，电量表不显示。
  Power meter has a memory function, when battery stops to output, the voltage will return back sometimes, but the meter will not display these part.
- 注意：电量表表面是玻璃覆盖，请避免冲击或撞击。
  Note: the power meter is covered by glass, shall avoid impack.

3.4 操纵手柄 handle

3.4.1 操纵手柄按键功能 handle button function

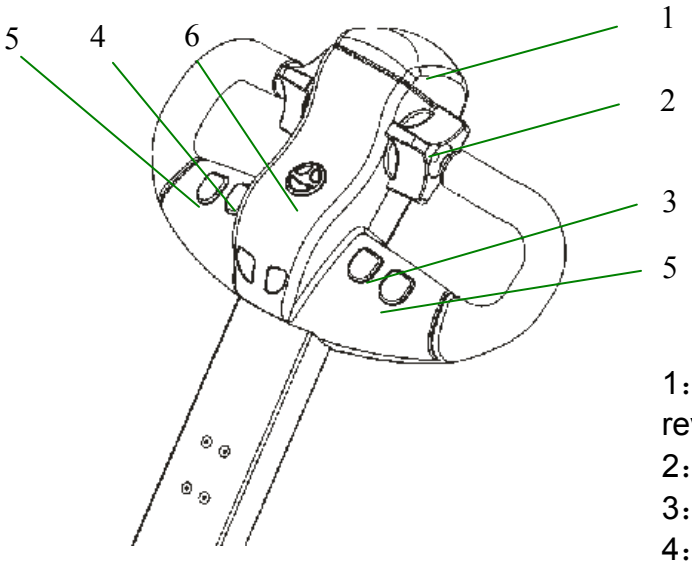


图 7 操纵手柄总成——跑车头
Handle assembly assy

1：紧急反向开关（肚皮开关）emergent reverse button
2：加速旋钮开关 speed up button
3：快速下降开关 quick lowering button
4：慢速下降开关 slow lowering button
5：起升开关 lifting button
6：喇叭开关 horn button

3.4.2 操作说明

- 紧急反向开关：车辆正向运行时，驾驶人员身体接触按键使其闭合后，车辆会沿货叉方向运行 3 秒钟，然后停止运行。

Emergent reverse button: when the truck is moving forward, operator touch this button, the truck will reverse for 3 seconds, and stop.
（注意：如果在打开钥匙开关前，此按键提前闭合，车辆将无法运行）
(note: if the emergent reverse button was closed, when key on the truck, it will not move)

- 加速旋钮开关：控制车辆的运行方向和运行速度。
- Speed up button: controlling direction and speed of the truck

（注意：操作时要慢慢旋转开关，避免急加速。车辆转弯时，需要适当松开旋钮，降速通过）
(**Note**: slowly turn the button for speed up, and when the truck is turning, slow down the speed)

- 快速下降开关：当需要快速下降货物时，按下此键。
- Quick lowering button: press this button for a quick lowering speed.

- 慢速下降开关：当需要低速下降货物时，按下此键。
- slow lowering button: press this button for slow lowering

（注意：同时按下快速和低速开关后，下降最快。托盘搬运车无快速下降功能）

(note: press quick lowering button and slow lowering button for the max lower speed. Electric stacker without quick lowering function)

- 起升开关：按下此键，货物上升。
- Lifting button: press this button, fork lifts

（注意：货物起升至限定位置后，起升按键失效，为正常保护，不是故障）

(note: lifting button will disabled when the forks are in max height)

- 喇叭开关：按下此键，喇叭工作。
- Horn button: press this button. Horn working

（注意：不要长时间按下此键，避免烧坏喇叭）

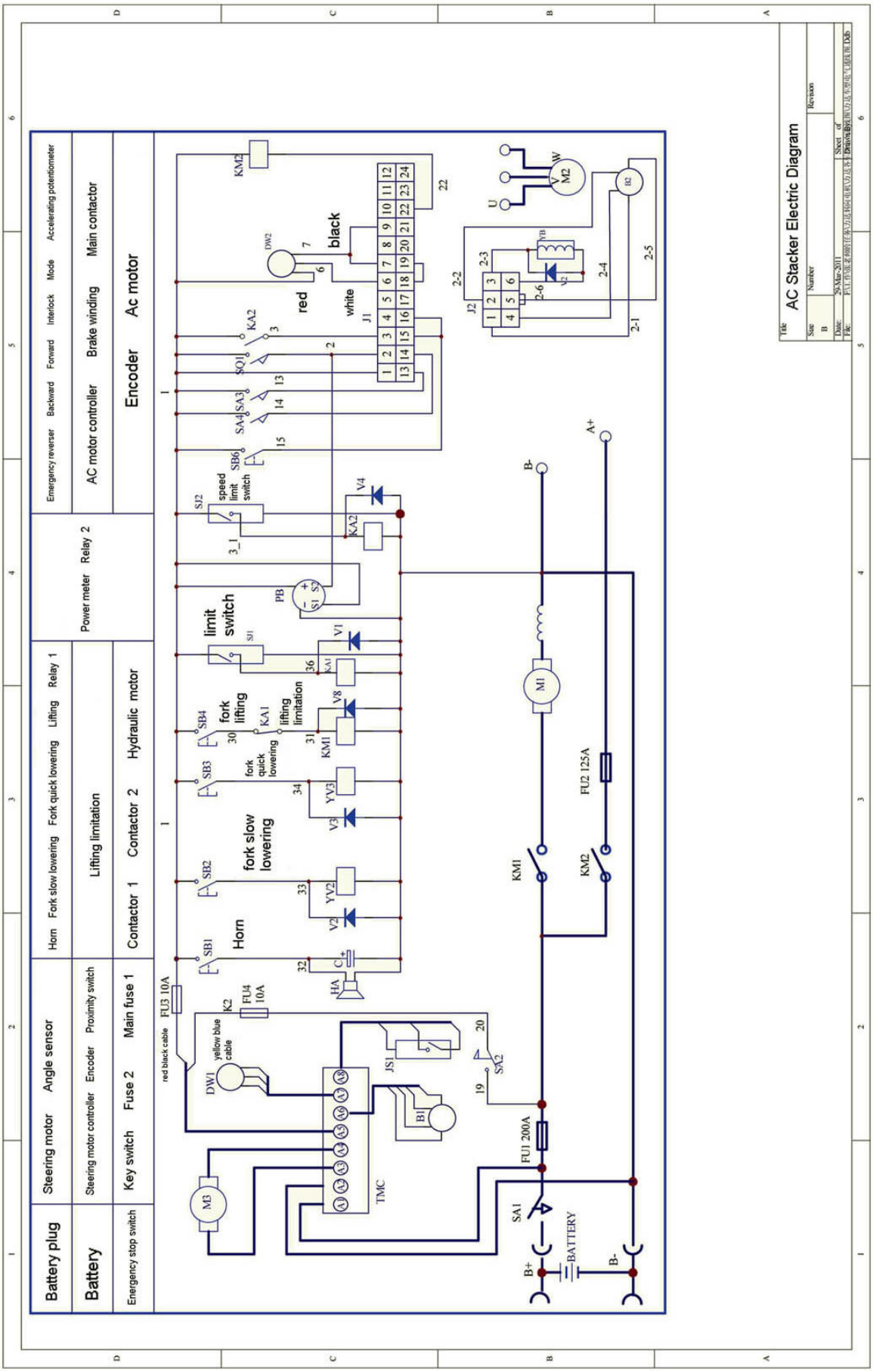
(note: not press horn button for long time to avoid burn out the horn)

3.4.3 操纵手柄控制信号 handle operation signal

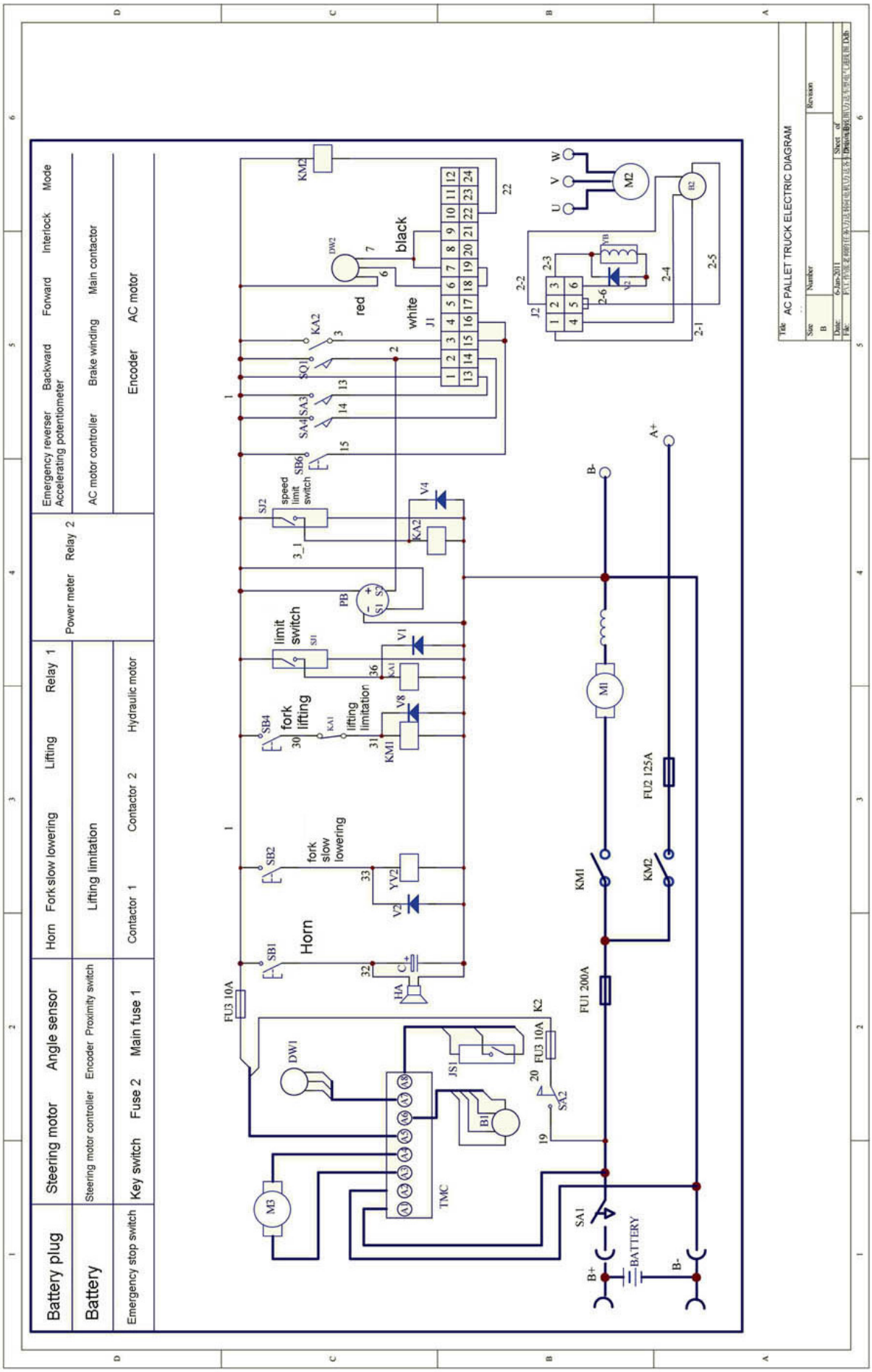
序号 item	功能键 function button	代号 code	输入端电压 Input voltage （V）	输出电压（待机） Output voltage (standby mode) （V）	输出电压（工作） Output voltage (working mode) （V）
1	紧急反向开关 Emergent reverse button	SB6	24	0	24
2	加速旋钮开关 Speed up button	SA3 （前进）	24	0	24
		SA4 （后退）	24	0	24
		DW2 （加速）	Higher end 高端：24 Lower end 低端：0V output 输出：0V	Higher end 高端：24 Lower end 低端：0V Output 输出：0V	Higher end 高端：24 Lower end 低端：0V output 输出：0-5V
3	快速下降开关 Quick lowering button	SB3	24	0	24
4	慢速下降开关 Slow lowering button	SB2	24	0	24
5	起升开关 Lifting button	SB4	24	0	24
6	喇叭开关 Horn button	SB1	24	0	24

4 电气原理图 Electrical diagrams

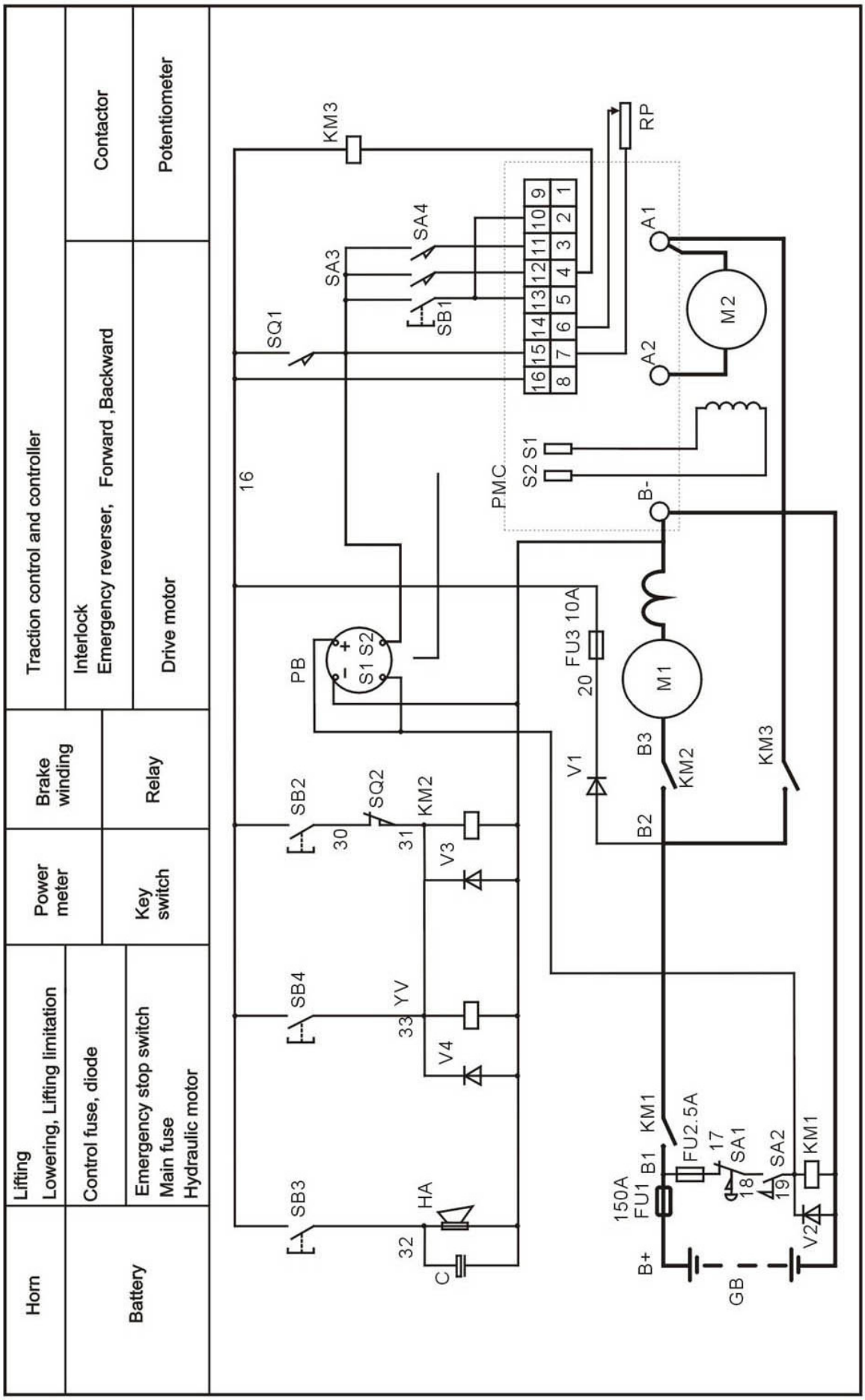
4.1 托盘堆垛车电气原理图 Diagram of electric stacker with AC motor



4.2 托盘搬运车电气原理图　Diagram of electric pallet truck with AC motor



4.3 直流托盘搬运车电气原理图 Diagram of electric pallet truck with DC motor



5 How to read trouble shooting code

5.1 How to read steering system troubleshooting code

Method：confirm the faulty by reading the flash times of the LED on turning controller



e.g.: LED flash ”4 times”。

- Check the trouble shooting chart of turning controller

Possible cause: approach switch connecting wire open or approach switch defective

Read LED flashing times

Photo1: turning controller

5.2 How to read driving system troubleshooting code

Method 1：confirm the fault by reading the flash times of the LED on driving controller （Note：There are two kinds of LED off pause：1.Pause between tens digit code and single digit, which is a short one. 2.Pause of trouble shooting code repeat, which is a little bit long）



e.g.: LED flash “** ***”, represent”2, 3”trouble shooting code.

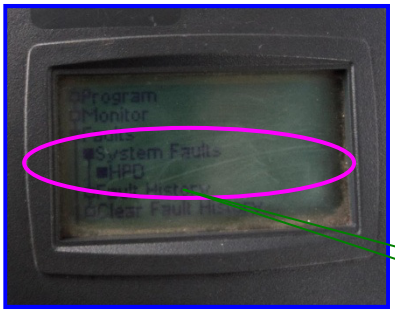
- Check the trouble shooting chart of driving controller

Possible cause：HPD SEQUENCING ERROR

Photo2: driving controller

Read LED flashing times

Method 2：confirm the fault by reading the Faults menu on the programmer



e.g.: Programmer display: HPD.

- Check the trouble shooting chart

Possible cause： HPD SEQUENCING ERROR

Read programmer faults

Photo3 Curtis programmer

6 故障代码表 TROUBLESHOOTING CHART

6.1 转向系统故障代码表 TURNING CONTROLLER TROUBLESHOOTING CHART

灯 代码 Led flash code	故障原因 Possible Causes
1 次 flash 1 time	转向电位器出现故障或连接线断开 potentiometer fault or wire open
2 次 flash 2 times	电机轴上安装的磁钢与后盖上编码器芯片距离过远 the magnetic steel on the motor axel is too far to the encoder
3 次 flash 3 times	编码器故障、连接线断开、电机内碳刷接触不良、电机堵转 encoder fault or wire open or carbon brush contact fault or motor turning stuck
4 次 flash 4 times	接近开关连接线断开或接近开关损坏 approach switch wire open or approach switch defective
5 次 flash 5 times	接近开关与大齿轮上的检测块距离过远或者其中一根地线断开，正常应在 0.8mm—1mm. distance between approach switch and main gear is too far (the normal should 0.8mm-1mm) or one of the earth wire open
6 次 flash 6 times	电机电流长时间过流或电机线短路 motor is overcurrent in a long time or wire shorted.
7 次 flash 7 times	控制器内部的继电器损坏或者电源线没接好 the relay inside the controller defective or power wire open
8 次 flash 8 times	控制器供电电压过高 the voltage is over the limitation
灯一直灭 Led keep off	控制器无电源或损坏（如果能正常工作，则是指示灯坏） the controller is power off or defective, in this case, if the controller is in good working condition, then it means the let is defective.
灯一直亮 Led keep on	控制器正常工作，没有显示故障 the controller is in good working condition.

6.2 交流驱动系统故障代码表 **CURTIS 1230 CONTROLLER TROUBLESHOOTING CHART**

灯 代码 **Led flash code**	手持单元显示 Programmer display	故障原因 **Possible Causes**
灯一直灭 **Led keep off**		没上电或者控制器损坏。 **NO POWER OR DEFECTIVECONTROLLER**
灯一直亮 **Led keep on**		控制器或者芯片故障 **CONTROLLER OR MICROPROCESSOR FAULT**
0，1	Currently no faults	控制器正常工作，没有显示故障 **CONTROLLER OPERATIONAL, NO KNOWN FAULT**
1，2	Motor speed encoder Motor Failsafe	电机速度编码器或安全失效故障 **MOTOR SPEED ENCOLDER OR FAILSAFE FAULT**
1，3	Motor Overcurrent Motor Output Fault	电机过流或相线接错故障 **MOTOR OVERCURRENT OR WIRING FAULT**
1，4	Static Return To Off	SRO（静态断开）顺序错误 **SRO SEQUENCING ERROR**
2，1	Throttle Wiper High	电位器滑动端一直为高故障 **THROTTLE WIPER HIGH**
2，2	EMR Wiring Open	紧急反向线故障。 **EMERGENCY REVERSE WIRING FAULT**
2，3	High Pedal Disable	HPD（脚踏板高位无效）顺序错 **HPD SEQUENCING ERROR**
2，4	Throttle Wiper Low	电位器滑动端一直为低故障 **THROTTLE WIPER LOW**
3，1	Multiplexer Fault	多路复用器接线故障（我们不用此功能） **TILLER MULTYPLEXER FAULT**
3，2	Main Contactor Precharge	主接触器或电池需要充电 **MAIN CONTACTOR OR PRECHARGE FAULT**
3，3	Brake Fault	刹车故障 **BRAKE FAULT**
4，1	Service Total Disable	限时服务时间到 **EXPIRED HOURMETER TIMER**
4，2	Battery Overvoltage Battery Undervoltage	电池电压过高或过低 **BATTERY OVER OR UNDER VOLTAGE**
4，3	Temperature Cutback	控制器温度过高或过低 **CONTROLLER OVER OR UNDER TEMPERATURE**
4，4	Anti Tiedown	模式开关与电池正极短路或永久与 M2 连接 **ANTI-TIEDOWN FAULT**
5，1	Hardware Failure	控制器损坏（硬件问题） **CONTROLLER FAILURE(HARDWARE)**
5，2	Software Failure	控制器损坏（程序问题） **CONTROLLER FAILURE(PROGRAM)**
5，3	Parameters Corrupt	控制器损坏（超出限制参数范围） **CONTROLLER FAILURE (OVER PARA LIMIT)**

6.3 直流驱动系统故障代码表（CURTIS 1243）

CONTRO TROUBLESHOOTING CHART

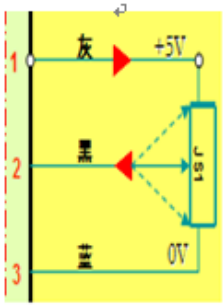
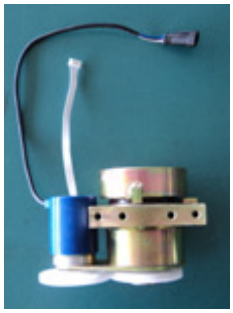
LED CODE	PROGRANNER LCD DISPLAY	FAULT CATEGORY	POSSIBLE CAUSE	FAULT CLEARANCE
0,1	NO KNOWN FAULTS	0	n/a	N/a
1,1	CURRENT SHUNT FAULT	1	1. Abnormal vehicle operation causing high current spikes. 2. Current sensor out of range. 3. Controller failure.	Cycle KSI. If problem persists, replace controller.
1,2	HW FAILSAFE	1	1. Noisy environment. 2. Self-test or watchdog fault. 3. Controller failure.	Cycle KSI. If problem persists, replace controller.
1,3	M- SHORTED	1	1. Internal or external short of M- to B-. 2. Incorrect motor wiring. 3. Controller failure.	Check wiring;cycle KSI. If problem persists, replace controller.
1,4	SRO	3	1. Improper sequence of KSI, interlock, and direction inputs. 2. Interlock or direction switch circuit open. 3. Sequencing delay too short. 4. Wrong SRO or throttle type selected. 5. Misadjusted throttle pot.	Follow proper sequence; adjust throttle if necessary; adjust programmable parameters if necessary.
2,1	THROTTLE WIPER HI	1	1. Throttle input wire open or shorted to B+. 2. Defective throttle pot. 3. Wrong throttle type selected.	When Throttle Wiper High input returns to valid range.
2,2	EMR REV WIRING	1	1. Emproper sequence wire or wire open.	Re-apply emergency reverse or cycle interlock.
2,3	HPD	3	1. Improper sequence of KSI, interlock, and throttle inputs. 2. Misadjusted throttle pot. 3. Sequencing delay too short. 4. Wrong HPD or throttle type selected. 5. Misadjusted throttle pot.	Follow proper sequence; adjust throttle if necessary; adjust programmable parameters if necessary.
	SRVC TOTAL	3	1. Total maintenance timer expired.	Reset with programmer.
	SRVC TRAC	3	1. Traction maintenance timer expired.	Reset with programmer.
	TOTAL DISABLED	3	1. Total disable timer expired.	Reset with programmer.
	TRAC DISABLED	3	1. Traction disable timer expired.	Reset with programmer.
2,4	THROTTLE WIPER LO	1	1. Throttle pot wire open or shorted to B+. 2. Wrong throttle type selected. 3. Defective throttle pot.	When Throttle Wiper Low input returns to valid range.
3,1	FIELD SHORT	1	1. Main contactor coil shorted. 2. Field winding shorted to B+ or B-. 3. Field resistance too low.	Check contactor coil and field winding; cycle KSI.
3,2	MAIN CONT WELDED	1	1. Main contactor stuck closed. 2. Main contactor driver shorted.	Check wiring and contactor; cycle KSI.
3,3	FIELD OPEN	1	1. Field winding connection open. 2. Field winding open.	Check wiring and cycle KSI.
3,4	MISSING CONTACTOR	1	1. Main contactor coil open. 2. Main contactor missing. 3. Wire to main contactor open.	Check wiring and cycle KSI.
4,1	LOW BATTERY VOLTAGE	1	1. Battery voltage lower than cutback limit 2. Battery plug corrosive 3. Battery plug or contactor loosen	
4,2	OVERVOLTAGE	1	1. Battery voltage over cutback limit 2. Operating truck with charging	
4,3	THERMAL CUTBACK	1	1. Temperature is over 85°C or lower than -25°C 2. Over load 3. Controller fitting incorrectly 4. Limit of working condition	
4,4	ANTI-TIE DOWN	1	1. Model switch short circuit with B+ 2. Model switch on stuck in model 4 or 2	

7　车辆故障排除 trouble shooting

7.1　转向系统故障排除 turning system trouble shooting

LED flash	1time	
故障检测 Trouble shooting	可能原因 possible causes	解决方案 solve method
1.检查角度传感器（黑色线）的电压输出值是否在规定范围内 Check if the output of angle sensor (black wire) is in the regular range.	1.角度传感器与控制器相连的三 根线任意一根断开或接触不良 One of the three wires of angle sensor contacting to controller open or contact fault.	重新连接导线 connect the wires
	2.角度传感器中位电压偏差过大（标准值：2.5V） The median voltage of angle sensor is out of range (standard:2.5V)	手动调整传感器电压值，使中位达到 2.5V Adjust the sensor coltage to 2.5V
	3.角度传感器损坏 angle sensor defective	更换角度传感器总成 Change the sensor
	1.转向控制器故障 turning controller faulty	更换新的转向控制器 Change new controller
注意事项	检查重点是角度传感器在三个位置的电压值变化，请参照附表 1 检修。 The key point is to test the voltage in three positions, follow below table:	

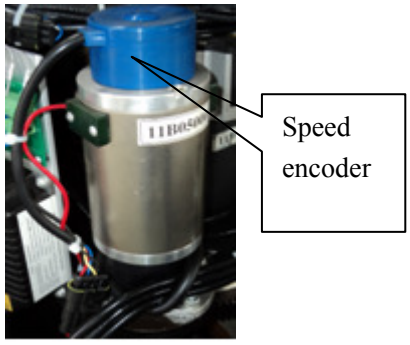
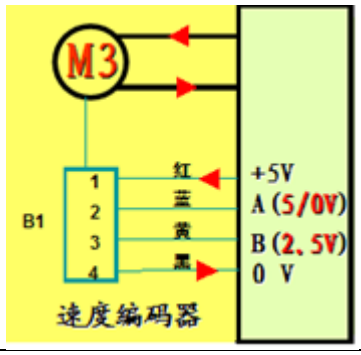
Attached list 1：角度传感器电压信号变化 angle sensor voltage signal test

状态/信号 State/signal	角度传感器电压 angle sensor voltage（V）				
	Battery anode 1（gray）	Output signal 2（black）	Battery cathode 3（blue）	接线图 Connection form	角度传感器 Angle sensor
Key on （standby）	5	median： 2.50	0		
Turning （working）	5	Turn left 90°：3.75 Turn right 90°：1.25	0		

LED flash	2 times	
故障检测 Trouble shooting	可能原因 possible causes	解决方案 solve method
1.检查速度编码器（蓝、黄色线）的电压输出值是否在规定范围内。 Check the voltage of speed encoder (blue, yellow cable) is in the regular range.	转向电机磁钢与编码器芯片距离过远 the magnetic steel on the motor axel is too far to the encoder	重新调整磁钢与芯片之间的安装距离。 Adjust the distance between magnetic steel and encoder
Note:	一般情况下不需要人为调整磁钢和编码器芯片间距。 Normally, no need to adjust the distance.	

LED flash	3 times	
故障检测 Trouble shooting	可能原因 possible causes	解决方案 solve method
1.转向电机不转 Turning motor stop running	1. 转向电机连接线松动或电机碳刷接触不良 wires connect to the motor fault or carbon brush contact fault	检修电机导线或碳刷 Check motor cable or carbon brash
2.转向电机微动 （拆检电机是否运转） Turning motor run slightly (dismantle motor check if running)	2.转向电机或齿轮箱受阻堵转 axel stuck in gear box or steering wheel or turning motor is stuck	检修电机或齿轮箱 Check motor or gearbox
3.转向电机明显转动 Turning motor running obviously	3.转向电机速度编码器故障 Turning motor speed encoder fault	更换新的速度编码器 Replace new speed encoder
	4.转向控制器故障 Controller defective	更换新的转向控制器 Replace new turning controller
Note	转向电机的运转情况是检测的重点，请参照附表 2 检修。 The running condition is key point, follow below table 2 to test:	

Attached list 2：转向电机速度编码器电压信号变化 turning motor speed encoder voltage signal test

状态/信号 **State/signal**	转向电机速度编码器电压 **turning motor speed encoder voltage（V）**			
	Battery anode 1（red）	Direction signal 2（blue）	Pulse signal 3（yellow）	Battery cathode 4（black）
Key on（standby）	5	0 / 5	5 / 0	0
Turning （working）	5	Turn left：5 Turn right：0	2.5	0
速度编码器及原理图 Speed encoder and its working theory				

LED flash	**4 times**	
故障检测 **Trouble shooting**	**可能原因 possible causes**	**解决方案 solve method**
1.转向电机运转 1 秒后停转 Turning motor stops after running 1 second.	1.接近开关连接线断开 approach switch connection wire open	重新连接开关连线 Re-connect the approach switch
	2. 接近开关损坏 approach switch defective	更换新的接近开关 Replace new approach switch
	3. 转向控制器故障 Turning controller defective	更换新的转向控制器 Replace new turning controller
Note	接近开关好坏的判断是重点，请参照附表 3 检修。 The key point is test the approach switch, follow below table 3:	

LED flash	5 times	
故障检测 **Trouble shooting**	可能原因 **possible causes**	解决方案 **solve method**
1.驱动轮转动一周后，突起的 3mm 的圆柱铁块（检测块）经过接近开关正下方时，如果接近开关指示灯不亮 during the first circle of steering wheel, check the 3mm bulgy point (cylindrical test unit) when it close to the underneath of approach switch, if the led of approach switch off	1.接近开关下方平面与检测块距离过远（正常距离：0.8 - 1mm） distance between approach switch and main gear test plate is too far (the normal should 0.8mm-1mm)	重新调整定位接近开关距离 Adjust the distance
2.用金属物体放在接近开关下方，指示灯微微亮 put one metal underneath to the approach switch, if the led of the switch on	2.接近开关地线（蓝色）断开 The earth wire of approach switch (blue) open	检修开关连接线路 Check the approach wire connection
3.用金属物体放在接近开关下方，指示灯不亮 put one metal underneath to the approach switch, if the led of the switch off	3.接近开关损坏 Approach switch defective	更换新的接近开关 Replace new approach switch
Note	接近开关好坏的判断是重点，请参照附表 3 检修。 The key point is test if the approach switch is good or defective, follow below table 3:	

Attached list 3：转向定位接近开关电压信号变化 approach switch voltage signal test

状态/信号 **State/signal**	转向定位接近开关电压 **approach switch voltage**（V）			
	Battery anode 1（gray）	Output signal 2（black）	Battery cathode 3（blue）	Approach switch
Key on (standby)	24	中位感应 median：0	0	
Turning (working)	24	不感应时左/右转 turn left/right： 12-14	0	

LED flash	6 times	
故障检测 Trouble shooting	可能原因 possible causes	解决方案 solving method
1.打开钥匙瞬间，控制器报“6 次”故障 When the moment of key on, the controller led flash 6 times	1. 转向电机连接线短路 turning motor short circuit	检修电机连接线 Check the motor wire connection
2.检测转向电机电流值是否超过 25A Check if over current (more than 25V) of the motor	2. 电机长时间过流或电机线短路 Motor long tine over current or motor wires short circuit.	检修电机和相关部件连接 Check wire connection of motor and related components.
Note	可以将转向电机拆下，通电观察其是否运转。 Test the turning motor if running when take off from the truck.	

LED flash	7 times	
故障检测 Trouble shooting	可能原因 Possible causes	解决方案 Solve method
1.检查控制器电源电压是否提供 Check controller power supply	1.蓄电池电压过低 battery voltage too low	检修蓄电池 maintain battery
	2.转向控制器电源线没接好 Turning controller power supply wire open or fault	检修电源线连接 check power supply wire connection
	3. 转向控制器内部的继电器损坏 Inside relay defective of the turning controller	维修或更换控制器 Maintain or replace controller
Note		

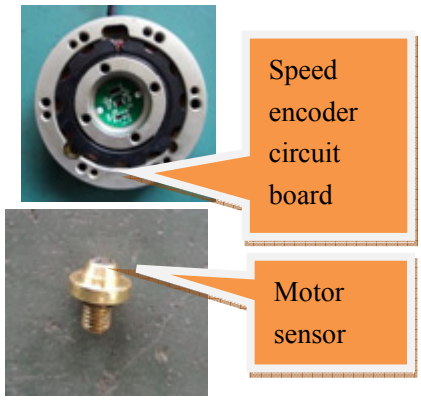
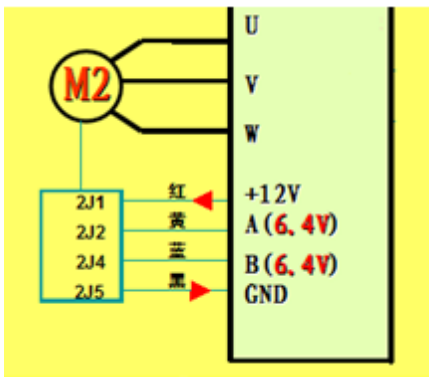
LED flash	8 times	
故障检测 Trouble shooting	可能原因 Possible causes	解决方案 Solve method
1.检查蓄电池电压等级及实际电压值 Check battery rated voltage and actual voltage	1. 供电电压超过正常工作电压极限 Voltage supply exceed limit working voltage	检修电源及其线路 Check power supply and it wire connection
	2. 电控故障，电压检测回路损坏 Controller fault, or voltage test loop fault	维修或更换控制器 Maintain or replace new controller
Note	托盘车辆使用的蓄电池电压等级为 24V。 The rated voltage of pallet truck battery is 24V	

LED flash	Off	
故障检测 Trouble shooting	可能原因 Possible causes	解决方案 Solve method
1.转向系统不能运行 Turning system disabled	1. 控制器无电源输入 controller no power supply	检查电源线连接 Check power supply wire connection
	2.控制器损坏 controller defective	更换转向控制器 Replace new turning controller
2.转向系统正常工作 Turning system work as normal	1. 控制器故障指示灯损坏 Controller LED defective	更换新的 LED 指示灯 Replace new LED
Note		

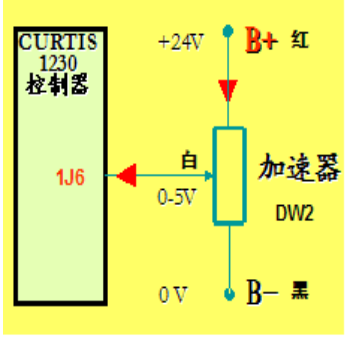
7.2 交流驱动系统故障排除 AC driving system trouble shooting

Trouble display	**LED display**	**Programmer display**
	1 ， 2	Motor speed encoder Or Motor Failsafe
故障检测 **Trouble shooting**	**可能原因 possible cause**	**解决方案 solve method**
1.检查电机速度编码器电源电压 Check motor speed encoder power supply voltage	1. 电控至速度编码器电源连接线松脱 Controller to speed encoder wire loosen or open	检修连接线路 Check wire connection
	2. 控制器损坏 controller defective	维修或更换控制器 Maintain or replace new controller
2.检查速度编码器 A、B 相脉冲信号 Check speed encoder A, B pulse signal	1.速度编码器损坏 Speed encoder defective	维修或更换速度编码器 Maintain or replace new speed encoder
Note	检测速度编码器信号变化请参考附表 4. Test speed encoder signal, follow below table 4	

Attached list 4：驱动电机速度编码器电压信号变化 driving speed encoder voltage signal test

状态/信号 **State/signal**	**驱动电机速度编码器电压（V）**			
	Battery anode 1（red）	Pulse signal 2（yellow）	Pulse signal 3（blue）	Battery cathode 4（black）
Key on（standby）	12.8	0 / 12.8	12.8 / 0	0
driving（working）	12.8	6.4	6.4	0
速度编码器及原理图 Speed encoder and its working theory				

故障显示 Fault display	LED display	Programmer display
	1, 3	Motor Over current Or Motor Output Fault
故障检测 Trouble shooting	可能原因 Possible cause	解决方案 Solve method
1.检查电机速度编码器电源电压 Check motor speed encoder power supply voltage	1.电机 U、V、W（力达标记：L1、L2、L3）接线错误 Motor position U,V, W (liftstar mark L1.L2,L3) wire connection fault	检查电机连接线安装位置 Check motor wire connection position
	2. 电机速度编码器 A、B 相错位 Motor speed encoder A,B malposition	检查编码器连接线安装位置 Check speed encoder wire connection position
2.检查速度编码器 A、B 相脉冲信号 Check speed encoder A, B pulse signal	1. 速度编码器损坏 Speed encoder defective	更换新的速度编码器 Replace new speed encoder
3.驱动电机电流过大 Driving motor over current	1.电机受阻，发生堵转（制动器抱闸、机械阻塞等） Motor stuck, or running stuck(brake or wheels block or other mechanical stuck)	1.确认客户工况是否超标 Confirm if long term over time used 2. 检修电机、减速箱等部件 Check motor, reducer box
note	注意观察电机运行状态（抖动或低速等现象）和检查电机电流。 Check the motor running state(shacking or lower speed), and check the current	

Fault display	LED display	Programmer display
	1, 4	Static Return To Off
故障检测 Trouble shooting	可能原因 Possible cause	解决方案 Solve method
检测手柄加速信号 Test handle speed up button signal	1.操纵顺序错误 （打开钥匙开关后，先加速后下压操纵手柄） Operation sequence fault(first speed up then pull down the handle, when key on)	松开加速手柄，手柄复位，重新运行 Loose speed up button, handle back to normal, and operate again
	2.打开钥匙开关后，操纵手柄加速信号 J6 输出电压大于 0.5V When key on, the speed up signal J6 voltage output larger than 0.5V	维修或更换加速电位器 Maintain or replace speed up potentiometer
手柄加速器及原理图 Handle accelerator and its working therory		
Note	加速器输出端（J6）电压范围 normal voltage range of accelerator output(J6)：0.2 - 5V。	

Fault display	LED display	programmer display
	2, 3	High Pedal Disable
故障检测 Trouble shooting	可能原因 Possible causes	解决方案 Solve method
检测手柄加速信号 Test handle speed up button signal	1.操纵顺序错误 （先加速后打开钥匙开关，下压操纵手柄） Operation sequence fault(first speed up then pull down the handle, when key on)	松开加速手柄，手柄复位，重新运行 Loose speed up button, handle back to normal, and operate again
	2.打开钥匙开关前，操纵手柄加速信号 J6 输出电压大于 0.5V When key on, the speed up signal J6 voltage output larger than 0.5V	维修或更换加速电位器 Maintain or replace speed up potentiometer
Note	加速器输出端（J6）电压范围 normal voltage range of accelerator output(J6)： 0.2 - 5V。	

Fault display	LED display	Programmer display
	3 , 2	Main Contactor Precharge
故障检测 Trouble shooting	可能原因 Possible cause	解决方案 Solve method
1.下压操纵手柄，主接触器线包瞬间有 24V 电压(先吸合后跳开) At the moment of pushing downward the handle, main contactor has 24V voltage (contactor close firstly then open)	1. 主接触器机械故障，触点不能有效闭合 Main contactor mechanical fault, contact point can not close enough.	维修或更换接触器 Maintain or replace new contactor
	2. 蓄电池电压过低（<20V） Battery voltage is too low(<20V)	维修或更换蓄电池 Maintain or replace battery
2.下压操纵手柄，主接触器线包无 24V 电压 When push downward the handle, the main contactor coil without 24 V voltage	1. 主接触器触点一直粘连 Main contactor keeps close	维修或更换接触器 Maintain or replace new contactor
	2. 主接触器线圈连接线松脱 Main contactor coil loosen	检修接触器连接线路 Check the circuit board of contactor
	3. 主接触器线圈断开 Main contactor coil open	检修接触器线圈 Check coil of contactor
	4. 主接触器驱动短路 Main contactor short circuit	检修接触器驱动回路 Check contactor driving loop
	5. 驱动控制器损坏 Driving controller defective	维修或更换新的控制器 Maintain or replace new contactor
Note	1.主接触器线包 24V 电压及触电工作状态的判断是维修的重要信息。 24V voltage of contactor coil and contact point condition is the key point. 2.主接触器（WPZ2-200/24）线包电阻值为：43 欧姆左右。 Main contactor(WPZ2—200/24) coil resistance is 43 Ω	

Fault display	LED display	Programmer display
	3 , 3	Brake Fault
故障检测 Trouble shooting	可能原因 Possible causes	解决方案 Solve method
1.按下手柄，加速运行车辆，检查电磁制动器线圈电压是否为 14V Push downward the handle, speed up the truck, check if the magnetic brake coil resistance is 14.	1. 制动器连接线松脱 brake connection wire loosen	检查电磁制动器连接线安装 Check the fitting of magnetic brake and wires
	3.制动器线圈断路 brake wire open	检修或更换电磁制动器 Maintain or replace magnetic brake
	4.制动器线圈短路 Brake coil short circuit	检修或更换电磁制动器 Maintain or replace magnetic brake
Note	电磁制动器工作保持电压不是 24V，而是 14V 左右。 magnetic brake voltage is 14 V, not 24V	

Fault display	LED display	Programmer display
	4 , 2	Main Contactor Precharge
故障检测 Trouble shooting	可能原因 Possible causes	解决方案 Solve method
1.蓄电池电压过高 Battery over voltage	1. 蓄电池电压等级不正确 Battery rated voltage incorrect	使用正确电压等级的电池 Replace suitable rated voltage battery
2.蓄电池电压过低 Battery lower voltage	1. 蓄电池单体存在断路 Battery cell open circuit	检修或更换蓄电池单体 Maintain or replace battery cell
	2. 蓄电池单体存在短路 Battery cell short circuit	检修或更换蓄电池单体 Maintain or replace battery cell
	3. 蓄电池单体间连接松动 battery cells connection loosen	重新连接蓄电池单体 Check the connection of battery
Note	蓄电池电解液比重和电压的检测应该同步进行，便于维修参考。 • Battery electrolyte specific gravity and voltage should both test （full charge：specific gravityρ=1.28-1.30g/cm^3；cell voltage≥2.1 V） （under voltage：specific gravityρ=1.16-1.17g/cm^3；cell voltage≤1.7 V）	

Fault display	LED display	Programmer display
	4 , 3	Main Contactor Precharge
故障检测 Trouble shooting	可能原因 Possible causes	解决方案 Solve method
1.手持单元或温度计读取控制器温度 Check the temperature of controller by programmer or thermometer	1. 车辆作业环境温度过高 too high temperature of working environment	间歇式工作，确保散热良好 Intermittent working, with good cooling of the truck
	2. 电控安装不佳，散热效果差 Bad fitting of the controller, cause bad cooling	重新安装，并涂装导热硅脂 Re-fitting of the controller, and put some thermal grease
	3. 驱动电机长时间大电流工作 Driving motor long term and large current working	检查工况，合理使用车辆 Check the working condition, choose suitable truck
	4. 车辆制动系统故障（如:制动器间隙调整过小等） Brake system fault (eg: brake distance too near)	检修制动、机械系统等 Check the brake
Note	手持读取 programmer menu：Monitor（检测）----Controller（控制器）----Temperature（电控温度）菜单，检测电控温度值。	

Fault display	LED display	Programmer display
	Solid on or off	
故障检测 Trouble shooting	可能原因 Possible causes	解决方案 Solve method
1.LED solid off	1.电控电源未连接上（接触器触点虚接、线路松动等） Power supply connection open(contactor wire loose)	检修接触器和电控线路连接 Check contactor and controller wire connection
2.LED solid on	1.控制器自身故障 Controller defective	维修或更换控制器 Maintain or replace new controller
	2. 车辆能正常运行，则是 LED 灯自身损坏 If truck can work as normal, the LED defective	维修或更换电控 LED 灯 Maintain or replace controller LED
Note		

7.3 起重系统排除 lifting system trouble shooting

7.3.1 车辆无起升 no lifting

Fault showing	车辆没有起升 truck can not lift
Solve method	**Possible cause**
1.起升接触器线包没有 24V 电压 Lifting contactor coil voltage is lower than 24V	1.蓄电池深度欠压或损坏 Battery deep under voltage or defective 2.转向系统故障 Turning system fault 3.起升开关故障，不能闭合 Lifting switch defective, can not close 4.起升限位开关损坏，一直闭合 Lifting limitation switch defective, keeps close 5.限位开关继电器损坏，触点常开 Limitation switch relay fault, open 6.接触器线包损坏（线圈短路或断路、线路连接松动等） Contactor coil fault(short circuit or open circuit, or loosen)
2.起升接触器线包有 24V 电压，触点不吸合或吸合不到位 Lifting contactor coil voltage is 24V, but contact point can not close or close enough	1.接触器机械故障 Contactor mechanical fault 2.接触器触点损坏 Contact point defective
3.起升接触器吸合，电机不运转 Lifting contactor close, motor does not run	1.起升电机损坏 Lifting motor defective 2.起升电机堵转（或机械卡死） Lifting motor block
4.起升接触器吸合，电机运转 Lifting contactor close, motor running	1.液压系统故障（油缸漏油、泵内漏等） Hydraulic system fault(oil leak) 2.液压油油位不够 Hydraulic pump oil not enough 3. 门架运动部件受阻，或调整不当 Mast can not move, block
note	1.此类故障，接触器和蓄电池作为检修的重点; key point is the contactor and battery 2.起升接触器工作状态是检修要点； Shall also check lifting contactor 3.起升接触器线包阻值为：43 欧姆。 Lifting contactor coil resistance is 43Ω

7.3.2 车辆起升缓慢 lifting too slow

Fault showing	车辆起升缓慢 truck lifting very slow
Trouble shooting	**Possible cause**
1.起升电机带载电压过低(<20V). Lifting motor voltage is too low(<20V)	1.蓄电池深度欠压或损坏 Battery deep under voltage or defective
2.起升电机带载电压正常 Lifting motor voltage is normal	1.液压管路内混有空气 Hydraulic tube with air 2.齿轮泵内漏 Gear pump oil leak 3.油缸漏油 Cylinder oil leak 4.起升电机自身故障 Lifting motor fault 5.电磁阀回油回路堵塞，不能完全密封 Electromagnetic valve oil back block, can not seal completely
3.起升电机带载电压正常，电流偏大 Lifting motor voltage is normal, but over current	1.环境温度过低，液压油粘稠 Too lower temperature, oil too thick 2.安全阀故障，起升货物超过额定载重量 Safe valve fault, over rated capacity 4.液压阀块油道有异物，出现堵塞 Hydraulic valve block
Note	油缸内漏和阀块堵塞发生几率较大。 Cylinder oil leak and block of valve are of large possibility

7.3.3 车辆起升后缓慢下降 lifting firstly, then lowering slowly

Fault showing	**车辆起升后缓慢下降 after lifting, will lowering slowly**
Trouble shooting	**Possible causes**
1.检查油缸漏油和单向阀密封情况 Check cylinder oil leak, and seal condition	1.单向阀可能被杂物卡住，导致单向阀关闭不严，油在泄漏 The check valve blocked, can not close enough, lead oil leak 2.下降电磁阀油道有异物堵塞，密封不严，存在渗漏 Lowering Electromagnetic valve blocked, can not seal enough, oil leak 4. 油缸密封圈破损，出现渗油现象 seal ring defective, oil leak
Note	重点检查液压系统密封和内漏情况。 The key point is to check hydraulic system seal condition and oil leak

7.3.4 车辆不能下降 Can't lower

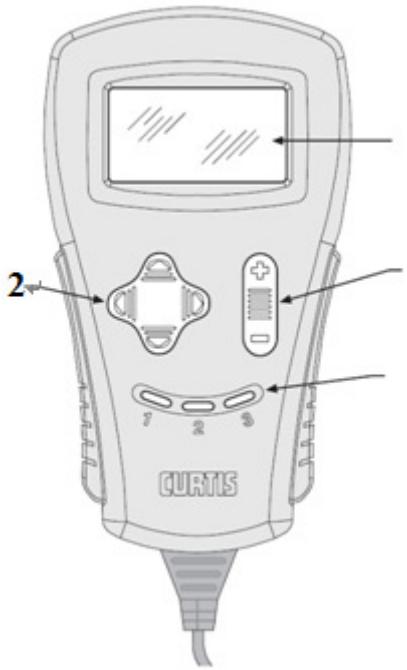
Fault showing	车辆不能下降 truck can not lower
Trouble shooting	**Possible causes**
1.下降电磁阀线包没有 24V 工作电压 Lowering electromagnetic valve coil voltage is lower 24V	1.蓄电池深度欠压或损坏 Battery deep under voltage or defective 2.转向系统故障 Turning system fault 3.下降开关故障，不能闭合 Lowering switch fault, can not close 4.电磁阀线圈损坏 Electromagnetic valve coil fault 5.电磁阀续流二极管击穿 Electromagnetic valve diode broken
2.下降电磁阀线包有 24V 工作电压 Lowering electromagnetic valve coil voltage is 24 V	1.电磁阀内部有异物堵塞，不能打开 Electromagnetic valve blocked, can not open 2.电磁阀自身故障 Electromagnetic valve defective 3.车辆起重系统机械卡死或调整不当 Lifting system block 5. 异物阻塞起重机构运行轨道 Mast block
note	1.key point：lowering Electromagnetic valve if working 下降电磁阀是否工作。 2.lowering Electromagnetic valve coil resistance is8 Ω 下降电磁阀线圈的电阻值为 8 欧姆。

7.3.5 车辆下降缓慢 lowering too slow

Fault showing	车辆下降缓慢 truck lowering very slow
Trouble shooting	**Possible causes**
1.电磁阀是否完全打开 Electromagnetic valve is open or not	1.电磁阀内部有异物堵塞油道 Electromagnetic valve block 2.电磁阀自身故障，吸合力不够 Electromagnetic valve defective, can not close enough
2.机械调整和运行阻力 Mechanical adjust and move resistance	1.车辆起重系统机械结构调整不当 Lifting system not in proper structure. 2.异物阻塞，增大下降运行阻力 Blocked, cause lowering resistance
Note	1.液压油清洁度低或者不及时更换，会造成阀块内部堵塞； Hydraulic oil too thick or not replace timely, will cause valve block 2.机械卡死和间隙调整不当，也会影响下降速度。 Mechanic stuck and incorrect distance will cause lowering speed slow down as well.

8 CURTIS 手持单元 programmer

8.1 CURTIS 手持单元介绍 programmer introduction



1: LED 显示屏 LED display screen
2: 导航键 directional button
3: 参数修改键 parameter adjust button
4: 快捷记忆按键 shortcut memory button
（在当前菜单目录下，长按 1、2、3 任何一个小按键 2 秒以上，手持单元会自动记忆，便于后期一键直接调用当前菜单。可记忆三个菜单位置。）
Long press each of 1,2,3 button for more than 2 seconds, the programmer will keep this setting into memory, and convenient for use this setting directly press by one button at the same menu. It can keep 3 setting into memory.

8.2 CURTIS 手持单元操作说明 operation instruction

- **操作注意事项 operating notes**
  - 手持单元主要功能是为了方便车辆检测和维修，在没有经过车辆制造商认可的情况下，不允许对控制器参数进行调整，以免发生车辆及人身安全事故。
    The programmer is for easy maintenance and service of the truck, shall not adjust controller parameter without the agreement of manufacturer, in case of truck or human accident.
  - 手持单元修改参数后，会自动保存，只需要关闭钥匙，重新启动即可。
    The programmer will automatically keep into memory after adjusting parameter, only need to key off and re-start it.
  - CURTIS 手持单元可以在控制器带电或断电的情况下连接。
    The programmer can be connected in the case of both controller power on or off.
- **车辆故障读取流程 faults read procedure**
  - 将手持单元与控制器连接后，打开钥匙开关；
    After programmer and controller connected, turn on the key switch.
  - 根据 CURTIS 手持单元菜单列表，找到：
    Faults（故障）——System Faults（系统故障）；
    Find below in the menu:
    Faults ——System Faults
  - 运行车辆，手持光标闪动行会出现英文故障内容，参照故障代码表解读。
    Key on the truck, and screen will display the faults, then find the faults by code.

- **车辆信号检测 signal inspection**
  - 将手持单元与控制器连接后，打开钥匙开关；
    After programmer and controller connected, turn on the key switch.
  - 根据 CURTIS 手持单元菜单列表，找到：
    Monitor（检测）—— Motor&Battery（电机和电池）/ Inputs（输入信号）
    / Controller（控制器）
    Find below in the menu: Monitor—— Motor&Battery/ Inputs / Controller
  - 根据需要，打开对应的检测菜单子项，运行车辆，观察手持数值变化。
    Check the related submenu, key on the truck, check the programmer value change.

- **CURTIS 手持单元菜单内容 programmer menu content**

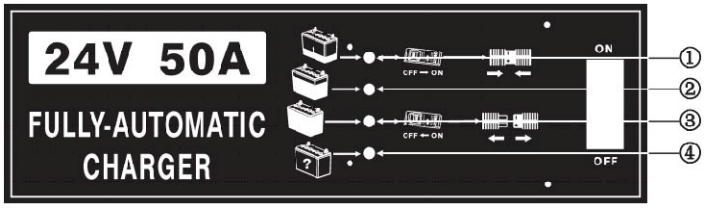
序 号 item	主菜单 main menu	一级子菜单 first level submenu	二级子菜单 second level submenu
1	Program 参数设置	Vehicle（车辆）	Rates 变化率 Speeds 速 度 Multi Mode 多种模式 Throttle 加速器 Sequencing 顺 序 Brake 制 动 Emergency Reverse 紧急反向
		Motor（电机）	Min Motor Voltage 最小电机电压 Nominal Motor Voltage 额定电机电压 Nominal Motor 额定电机频率 Max Motor Speed 最大电机转速
		Control（控制器）	……
		System（系统）	……
2	Monitor 检测	Motor & Battery （电机和电池）	Battery Voltage 电池电压 BSOC 电池电量 Motor Speed 电机转速 Motor Voltage 电机电压 Frequency 电机频率 Motor Current 电机电流 Slip 滑 差
		Inputs （输入信号）	Throttle Input 加速信号输入 Interlock Switch 互锁开关 Forward Switch 前进开关 Reverse Switch 后退开关 Mode Switch 模式开关 Emergency Reverse Switch 紧急反向开关 Inhibit Input 禁止开关 Speed Limit 限 速
		Controller （控制器）	Temperature 电控温度 Main Contactor 主接触器 Total Hour meter Hours 总时间 Drive Hour meter Hours 驱动计时 Fault Position 故障位置
3	Faults 故障	System Faults 当前故障 Fault History 历史故障 Clear Fault History (清除历史故障)	
4	Functions 功能	Settings 安装	Get Settings From Controller 复制电控参数 Write Settings To Controller 电控写入电参数 Reset all settings 所有设置复位
5	Information （信息）	------	
6	Programmer Setup （程序设置）	------	

9　充电器 Charger

9.1 充电器介绍 charger introduction



图 1　24V/50A charger



1，**Yellow lamp 1: Charge indication, Stage One**

2，**Yellow lamp 2: Charge indication, Stage Two**

3，**Green lamp: Charge completed**

4，**Red lamp: Charging time is too long**

产品特点：Features

1. 按照德国 DIN41774 标准设计的全自动智能型充电器；
DIN41774 Standard design auto charger
2. 自动化程度高，连接后自动充电，自动停机，故障自动报警；
Highly automatic, auto charging, auto stopping and auto faults alarm
3. 具有过压、低压、过流、极性反接等完善的保护功能；
Self protection of over voltage, over current, lower voltage and polarity reversed
4. 充电器内部温度监测，高温自动停机，确保核心部件不受损坏；
Auto stop when over temperature, avoid inside core components defect
5. 采用国际主流充电器 Wa 充电曲线，效率高、温升低，实现最优化充电；
International standard WA charging curve, with high efficiency, low temperature, and best charging mode.
6. 形小巧，结构简单，经久耐用，使用维护成本低。
Small design, easy structure, long life, and low maintenance cost

9.2 充电器操作 charger operation

1. 检查空气开关处于关断状态；
Check the air switch is off
2. 检查电源插头和充电器输出插头完好无损；
Check the power supply switch and charger output switch no defective
3. 将充电器输出插头与蓄电池插头连接；
Connect the battery plug with charger output switch.
4. 开机：将空气开关闭合，黄灯 1 亮，第一阶段充电开始，当蓄电池电量达到 90%后，充电进入第二阶段，同时黄灯 2 亮；
Start to charge: close the air switch, then yellow light 1 on. The first stage charging begin, when the battery is 90% capacity full, it come into second stage, the yellow light 2 on at the same time.
5. 当蓄电池完全充满电后，绿灯亮，充电停止；
When finish charging, green light on, it will stop charging.
6. 充电器进入补充充电状态，当蓄电池电压降低后，充电器对蓄电池进行间歇补充充电。
When the battery voltage is lower, charger will come into boost charge

9.3 充电器工作原理 Charger working theory

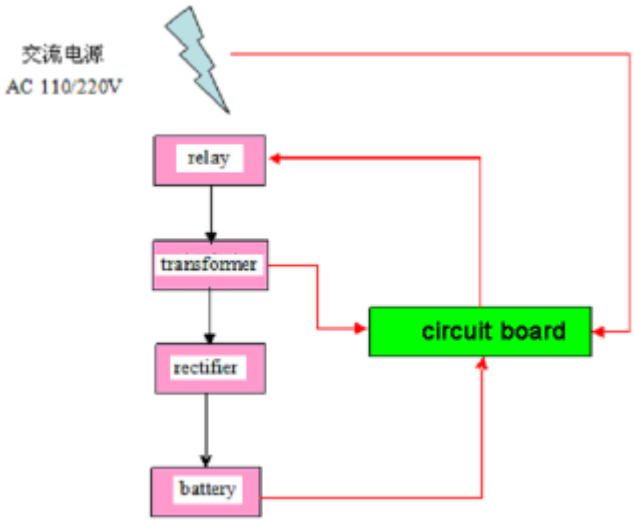


图 2　充电器工作流程示意图
Charger working procedure

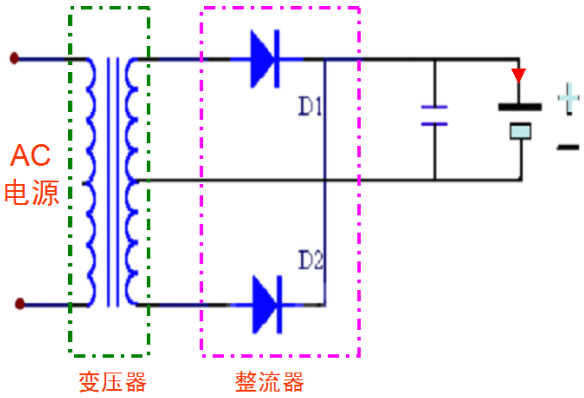


图 3　充电器工作原理简图
Charger working theory

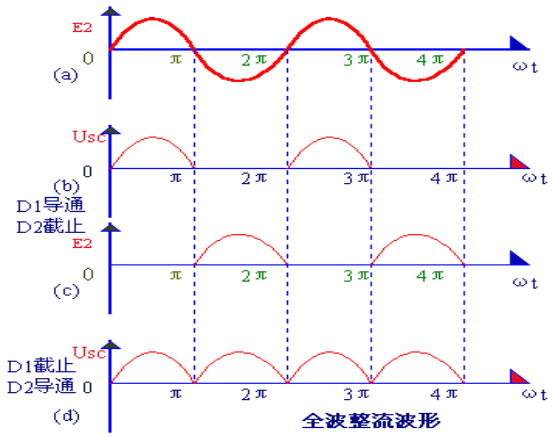
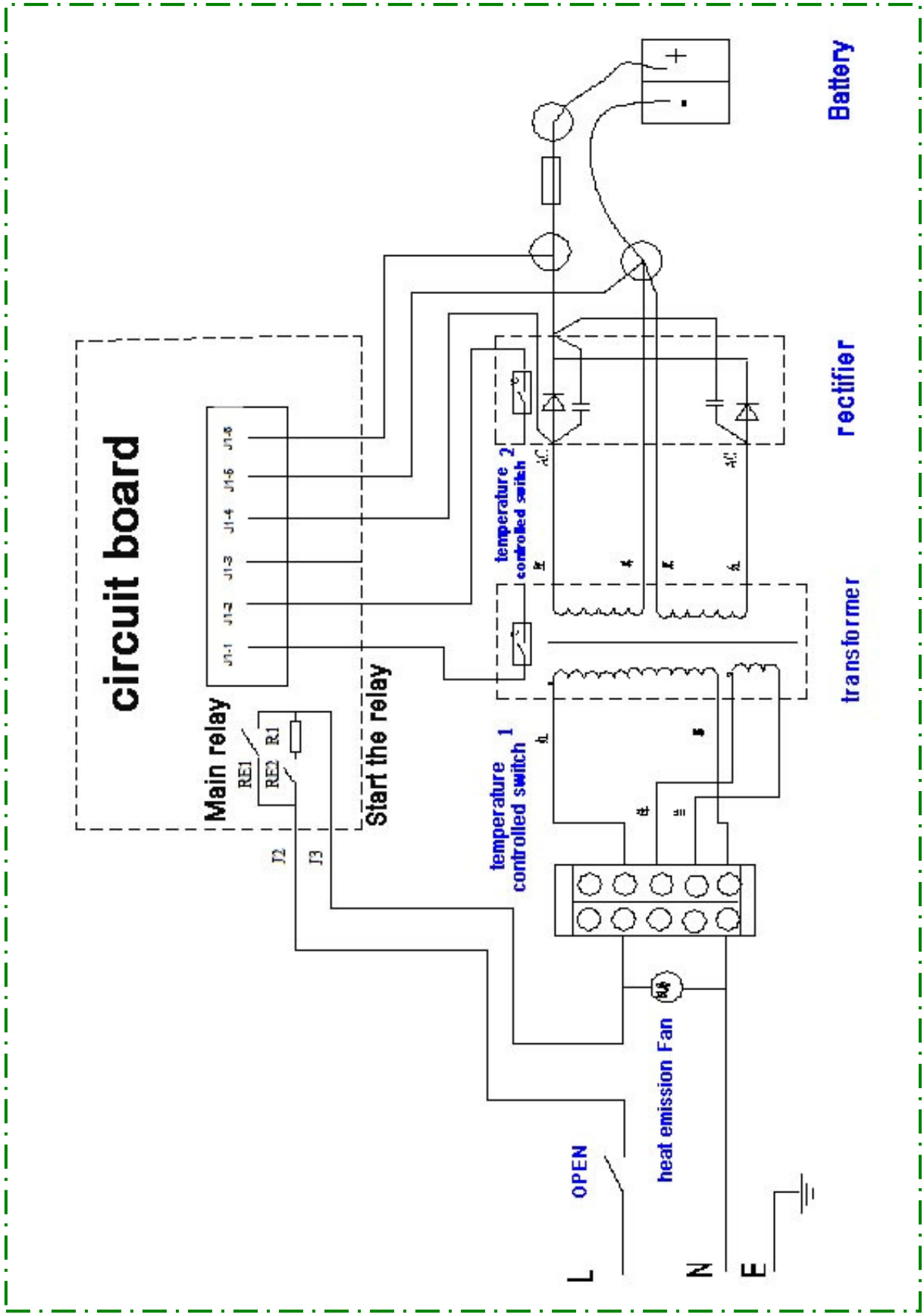


图 4　充电器整流波形图
Charger rectifying form

9.4 充电器常见故障 common faults of charger

1. 客户市电电源缺相故障（无电、电压过低）;
Caused by power supply (no power supply or lower voltage)
2. 充电器插件松动、虚接;
Plugs of the charger loosen or disconnected
3. 蓄电池深度放电（放电量大于 80%）;
Battery deep discharge (more than 80% capacity)
4. 蓄电池单体故障（短路、断路）;
Battery cell unit faults (short circuit, open circuit)
5. 蓄电池内部出现硫化、断格现象;
Battery inside vulcanized or broken.
6. 充电机电路板故障;
Charger circuit board faults
7. 充电机整流器故障;
Charger rectifier faults
8. 充电机变压器故障。
Charger transformer faults

9.5 充电器电路图 Charger circuit board



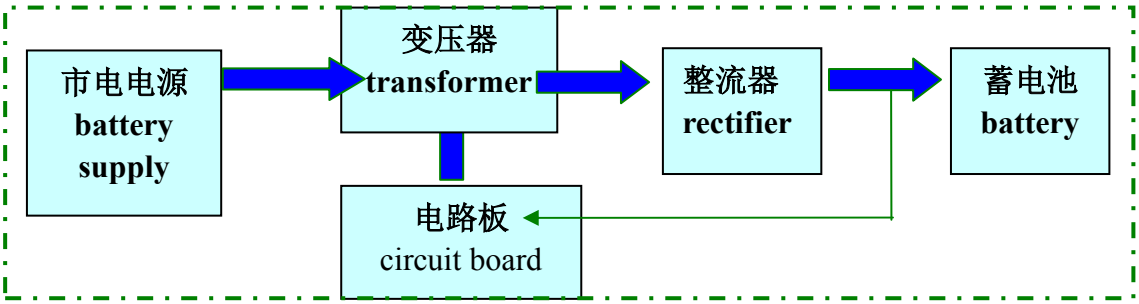
Picture 5 circuit diagram of Charger

9.6 Charger repairing

注意：本维修方法只适用于专业的充电器维修电气工程人员，未经电气专业知识培训的人员，不允许打开充电器外壳进行维修，以防发生安全事故。

Note: This method only apply to professional electrical engineers of charger service with special expertise. Those who without professional training are not allowed to open the charger cover, in case of an accident.

9.6.1 Repair procedure



步骤一：检查市电电源是否有电，电池是否欠压

Step 1: check if power supply normal and battery voltage is larger than 20V.

1. 确保 220V 交流市电电源有电，且连接可靠；蓄电池电压不低于 20V（低于 20 伏充电器会自动保护，停止工作）；

1. When the charger break down, firstly, confirm the battery DC and power supply AC are well connected to the charger. Then confirm if the voltage of the battery is larger than 20V, because if the voltage is lower than 20V, the charger will begin to self-protection, and stop charging.

2. 蓄电池电压低于 20V 时，可以短接充电器电路板上的 J2 和 J3 连接线，待电压上升至 20V 以上后，恢复 J2 和 J3 在电路板上的连接；

2. If the battery voltage is lower than 20V, shorted the J2 and J3 on the circuit board of the charger, waiting for the voltage larger than 20V, then re-connected the J2 and J3 on the circuit board.

3. 若电池不欠压，请在断电的情况下打开充电机外壳，观察保险丝、变压器、电路板等元器件是否有明显的烧坏或损坏。

2. If all above steps keep all right, then open the cover in the condition of power off. Then check the components like the fuse, transformer, and circuit board, test if these components were burned out or damaged.

步骤二：检查变压器是否有输出

Step 2: check the output of transformer

1. 断开直流端和交流端插头，检查充电器电路板无明显烧坏或损坏后，将电路板中 J2、J3 引脚的插头拔下（电路板完全脱离电路），使用一个金属薄片或一小段金属导线将 J2、J3 两个插头直接连接，如图 6 所示。

(1) Cut off both DC and AC power supply switch, after checking the charger circuit board no defective, then unplug the J1, J2, J3 switch of the circuit board (keep the

circuit board completely of the electric circuit). Use a thin metal plate or metal wire to connect J2 and J3, see photo 1 below:

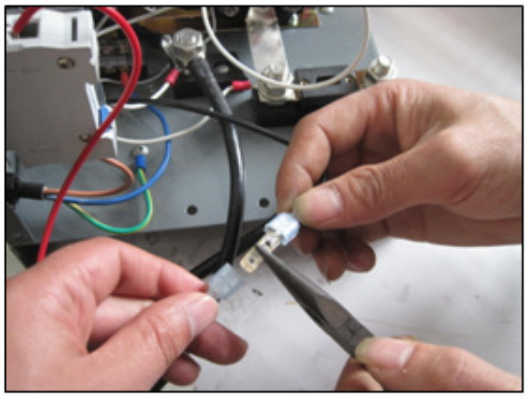


图 6　短接 J2 和 J3 插件
Shorted J2, J3 switch of the

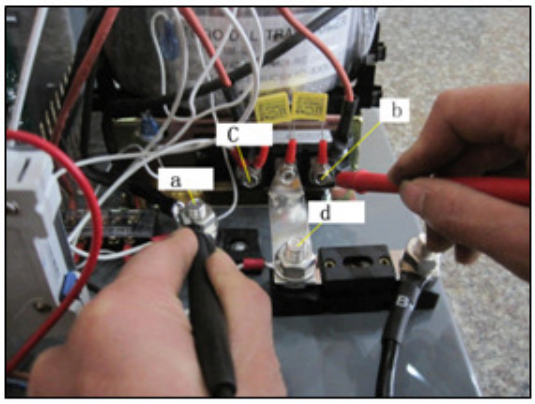


图 7　输出电压测量
test the voltage output

2. 只接通交流市电电源（不接蓄电池直流电），使用万用表的交流电压档，黑表笔接图 7 的 a 位置，红表笔接 b 位置，交流电压应为 28V 左右，接着将红表笔接到 c 位置（黑表笔位置不变），交流电压也应为 28V 左右。如果 b 或 c 任一位置的电压不正确，则可以判定变压器有故障。

2. Connect AC power supply only (keeping the battery DC off), use a multimeter with its AC voltage way, See photo 7, black pen connects point a, and red pen connects point b, the AC voltage should be about 28 V, the put the red pen to point c (keeping the black pen point a), the AC voltage should be about 28V too. If one of above voltages is not correct, then can confirm the transformer is defective.

Step 3: 检查整流模块是否有输出　check the output of rectifier module

1. 按上述步骤，如果 b、c 电压都正常，将万用表切换到直流电压档，黑表笔接 a 位置，红表笔接 d 位置，万用表应显示直流电 36V 左右，如电压很低或无电压输出，则可以判定是整流模块故障。使用万用表的二极管档也可以判断整流模块是否损坏。

If above voltages are correct (about 28V), the changer the multimeter to a DC way. Put the black pen to point a, and red pen to point d, the voltage should show about 36V. If the voltage showing is very low or no voltage, then can confirm the rectifier module is defective. You can also confirm if the rectifier module is defective or not by the diode way of the multimeter.

Step 4: 检查蓄电池充电电流　Test the battery current of charging

1. 如果整流模块输出直流电压值正常，接着做主回路充电检测，将蓄电池插头插上，充电开始，如图 8 所示，用钳形电流表测量电流，如有一定的充电电流（电流值随蓄电池电量多少而不同），表明整个整个主回路工作正常。则可推断充电器故障是由控制电路板引起。（注：主回路充电时，电路板被完全脱开，充电过程不受控制，只能短时间充电测试，不能作长时间充电）

If above 3 step is all right, then take a charging test of main circuit loop. Connect the battery switch on,

start to charge, see photo 8: Use clamp ampere meter to measure the current , if there is a certain current showing（the current will change according to a different battery capacity）, then can confirm the whole main circuit is all right. It can confirm the charger break down by a defective circuit board. (Note: when taking a charging test of main circuit loop, the circuit board is completely off, doesn't control charging procedure, so this test can only take for a short time, can not be test long)

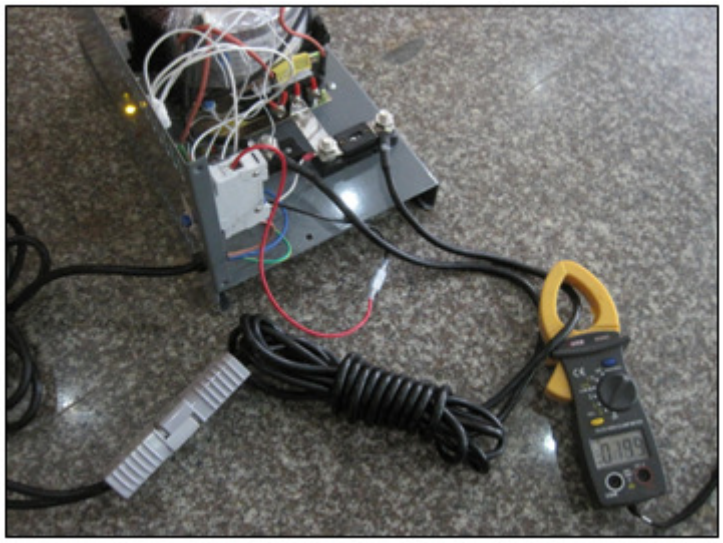


图 8　充电电流测量 test current of charging

特别说明：Special Note:

1. 如遇到步骤一中所述电池电压低于 20V，充电机自动保护的情况，可以短接充电器电路板上的 J2 和 J3 连接线，对蓄电池进行不带电路板控制的短时充电。但只能是短时充电，几分钟后，蓄电池电压上升后，立即恢复 J2 和 J3 原来的接线位置，在电路板的控制下进行自动充电。

1. If above step 1 mentioned voltage is lower than 20V, the charger start to self-protection, it can shorted the J2 and J3 on the circuit board of the charger, but only charging for a short time, several minutes later, when the voltage is larger than 20V, should re-connect the J2 and J3 as normal, the charger will auto charge by the circuit board.

2. 短接强行充电整个过程，操作人员必须在现场，防止发生电气部件短路着火等危险。

2. When the charger under shorted charging condition, service people should at site to avoid any accident like components on fire by a shorted circuit.

3. 充电机市电电源为 220V 交流强电，请维修人员在检修过程中注意安全，防止发生触电事故。

3. Service people should pay special attention during all the steps above to avoid any electric shock accident.

10 车辆必要的定期维护
Necessary regular maintenance of the truck

10.1 车辆的日常清洁 Truck daily clean

- 维护车辆前必须关闭钥匙开关并拔下蓄电池接插件；
  Plug off of the battery and key off the truck when doing the maintenance.
- 保持车辆的外观清洁，可以用湿布清洁车身，但不可以用水冲洗；
  Keep clean of the truck appearance; use a wet cloth to clean truck body instead of water wash.
- 定期用压缩空气吹净电气元器件上的灰尘，不允许用水清洗。环境恶劣、灰尘较大的，请增加维护次数；
  Regularly clean the dust of electric components by air compressor, water is not allowed. For a dusty environment, add more times of the maintenance.
- 每日检查所有轮胎上是否有异物，并及时清除。
  Check the wheels daily, and clean anything sticking on the wheels.

10.2 重要电气部件维护 Important electric components maintenance

图标定义 sign definition：○——检查 checked，修复 repaired，调整 adjusted； X——更换 replaced

10.2.1 蓄电池 Battery

- 蓄电池欠压后，应及时补充电，放置时间不得超过 24 小时；
  When the battery is under low voltage, it should be charged in time. Battery under low voltage shouldn't leave uncharged for more than 24 hours.
- 蓄电池补充蒸馏水应在充电末期或充完毕电后，且液面高度为极板上方 10-15mm，不能过高，防止电解液外溢；
  Supply distilled water to battery should after charging finished or about to finish, till the water surface level is 10-15mm up to the battery plate, but the water surface can not too high in case for a spill of electrolyte.
- 新的蓄电池正常使用 1-1.5 年内只需要补充蒸馏水，后期才需要补充酸液；
  New battery only need supply distilled water during first 1-1.5 years, acid is needed for later.
- 用湿布擦拭即可保持蓄电池表面清洁。污垢较多时，将蓄电池移出车体，闭合加液盖，用温水或碱水冲洗，清洗结束后进行风干；
  Keep the battery appearance clean by web cloth. If the battery is too dirty, then remove it out of the truck, water supply cap closed, wash by warm water or lye, and keep dry after cleaning.
- 蓄电池测量参考值：（三个重要因素——电压、比重、温度）
  Battery standard value (three important factors: voltage, specific gravity (SG), temperature)
  - ❖ 充满电时 full charged：比重(SG)ρ=1.28-1.30g/cm^3；单体电压(unit voltage)≥2.1 V
  - ❖ 欠压时 under low voltage ：比重(SG)ρ=1.16-1.17g/cm^3；单体电压(unit voltage)≤1.7 V

温度 temperature ℃	-15	0	15	30	45
比重 (SG) g/cm^3	1.31	1.30	1.29	1.28	1.27

- 蓄电池具体维护要求请参照下表：
  Standard requirement chart for battery maintenance

检查项目 item	维护要求 Maintenance requirements	工具 tools	每日(8 小时) Daily(8 hours)	每周 (50 小时) Weekly (50 hours)	每月 （200 小时） Monthly (250 hours)	每三个月 (600 小时) Seasonly (600 hours)	每半年 （1200 小时） Half a year (1200 hours)
蓄电池 battery	电解液液位 Electrolyte surface level	目测 visual		○	○	○	○
	电解液比重 Electrolyte SG	比重计 areometer		○	○	○	○
	电量 WH		○	○	○	○	○
	桩头是否松动 if battery pile loosen		○	○	○	○	○
	连接线是否松动 If connect wires loosen		○	○	○	○	○
	表面是否清洁 If appearance clean			○	○	○	○
	表面是否有异物 If other object on surface		○	○	○	○	○
	透气盖是否牢固 if breathable cover is firm			○	○	○	○
	远离明火 keep away from the fire		○	○	○	○	○

10.2.2 接触器及触点开关 Contactor and contact switch

- 检查触点上的磨损状况，当触点已磨损就要更换。接触器触点应 3 个月检查一次。
  Check the abrading condition of the contact point, if it's abraded, should re-new. Check it every 3 month.
- 检查接触器机械运动; 应当活动自如且不粘连, 接触器的机械动作应每 3 个月检查一次。
  Check the mechanical movement of the contactor, it should move freely and not adhered. Check it every 3 month.
- 检查手柄微动开关和前进后退开关，测量微动开关两端的电压降, 微动开闭合时应没有电阻，释放时应有清脆的声音。每隔 3 个月检查一次。
  Check the inching switch and move forward, move backward button of the handle, measure the voltage drop between input and output of the inching switch. When the inching switch close and open, it sounds crisp and clear, and there should be no electric resistance. Check it every 3 month.

10.2.3 驱动单元及控制器 Driving system and controller

- 检查驱动电机、速度编码器、电磁制动器连接线是否松动；
  Check the driving motor, speed encoder, and magnetic brake wire connected if loosen.
- 电机表面的清洁，对于环境恶劣的工况，请增加维护次数，防止灰尘累积过多，影响电机散热；
  Clean motor appearance regularly. For dusty or bad environment, add times of regular maintenance to avoid accumulated dust affecting poor motor cooling.
- 定期检查电机运行噪音，有明显异响的，要及时检查和维修；
  Check the noise of motor when working, if there's abnormal sound of the motor, check it in time.,
- 检查驱动控制器线束连接是否可靠，并观察导线连接处是否氧化或老化。
  Check the driving controller is on well wire connection, and check if the cables are oxidized or aged.

10.2.4 电转向系统 Electric steering system

- 检查整车转向是否灵活，转动角度是否到位，有无异响；
  Check if the truck turning freely, and the turning angle exactly, and no abnormal noise.
- 检查转向电机、速度编码器连接线是否松动；
  Check turning motor, speed encoder wire connection is loosening.
- 检查转向减速箱是否渗油和异响。
  Check turning gearbox any oil leak or abnormal noise.

检查项目 item	维护要求 Maintenance requirements	工具 tools	每日（8 小时） Daily (8 hours)	每周（50 小时） Weekly (50 hours)	每月（200 小时） Monthly (250 hours)	每三个月（600 小时） Seasonly (600 hours)	每半年（1200 小时） Half a year (1200 hours)
减速箱 gearbox	是否有异常噪声 Any abnormal noise		○	○	○	○	○
	检查是否渗漏 Oil leak		○	○	○	○	○
	更换传动油 Replace of transmission oil						X
转向总成 Turning system assembly	润滑转轴 Lubricate spindle			○	○	○	○
	检查转向是否灵活 Check if turning freely		○	○	○	○	○
	是否有异常噪声 Check if any abnormal noise			○	○	○	○
	转向手柄 Turning handle		○	○	○	○	○

■ <u>说明</u>： 本手册强调的是电气系统定期维护，其它部件和系统的维护，请参考车辆自带的维护说明书。

<u>Note</u>: This manual is for regular service of electrical system. But for the maintenance of other components and assembly, please follow the service instruction manual of each model.

Forklift

Техническая документация HELI / CHL

Контакты продавца

+7 (495) 159-44-32

zakaz@kupit-shtabeler.ru

kupit-shtabeler.ru

Москва, Дорожная улица, 3к6

Сервисное руководство HELI: электросистема складской техники

Сохранены исходные технические страницы. Документ относится к серии и не является паспортом отдельной машины. Комплектацию поставки смотрите в карточке товара.

Материал ограничен обслуживанием электросистемы. Типовую схему нельзя считать индивидуальной схемой заказанной АКБ 24 В/210 А·ч.