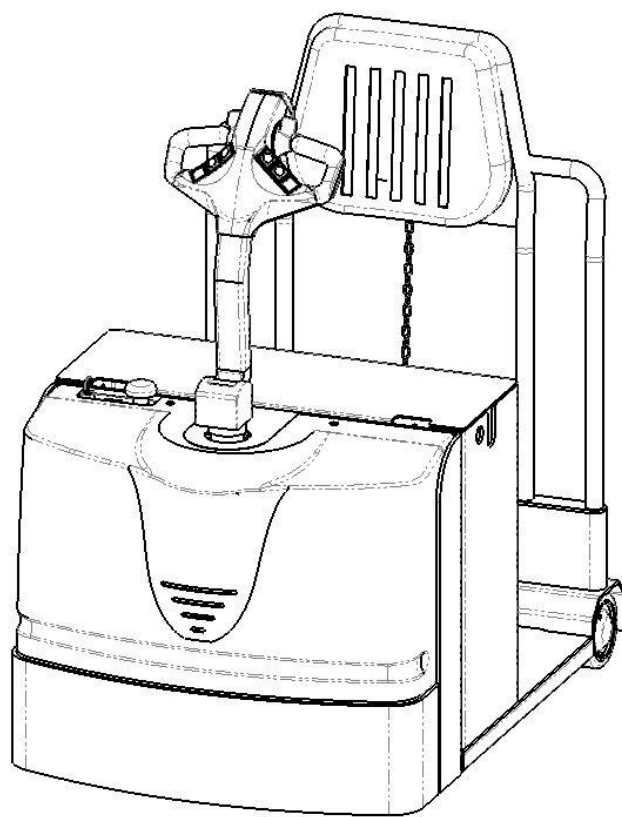




Operation And Maintenance Manual

MG20/30 Series Towing Tractor



Banyitong Science & Technology Developing Co., Ltd.
www.mimachina.com

PREFACE

MG20/30 series towing tractor, equipped with comfortable soft cushion, low center of gravity, smooth driving, often used in airports, stations, postal, industrial enterprises and other industries, it can be used as luggage traction, regional logistics, and workshop circulation important means of transport.

The manual of MG20/30 series towing tractor are introduced the major parts of the structure, working principle and maintenance, maintenance knowledge, it can help operators and reasonable use towing tractor, through carefully reading the original maintenance manuals, user can master the safety operation of towing tractor the necessary technical knowledge.

The operators of this product should have skilled operation skills. It is the operator's responsibility to understand vehicle performance and safety rules in detail. If you have any questions, please contact us.

This operation and maintenance manual is written for different types of forklifts. In the process of operation for use and maintenance, please pay attention to the specific provisions of the corresponding forklift models.

Our company will continue to develop and optimize the forklift equipment, so please understand that the company must reserve the right to modify the appearance, equipment and technology of the equipment. For this reason, the forklift user shall not extend any claim for specific performance of the forklift equipment from the contents of this operation and maintenance manual.

If you have any questions or suggestions regarding the contents of this article, please feel free to contact the local after-sales service department.

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Chapter 1 Safety Regulation

1 Safety

- 1.1 Please check all the safety switches, equipment in advance everyday before using the tow tractor according to the requirement so as to ensure safety devices normal.
- 1.2 Check that all the cautions and design parameter on the tow tractor are not destroyed.
- 1.3 The batteries must be fixed safely in the battery case.
- 1.4 It's forbidden to use the tow tractor when it's damaged or out of order and cause unsafe use.
- 1.5 When maintaining or adjusting the tow tractor, only professionals can do that.

2 Operating the tow tractor

- 2.1 It should be used on a flat surface and not on slopes.
- 2.2 The weight of the cargo and the weight of the operator should not exceed the rated traction load of the battery tractor. Overload is strictly prohibited.
- 2.3 When the tow tractor is used in the place of cold storage, it must be made specially. When the tow tractor is in design and manufacture, it has certain restriction for using occasions.
※ Air with inflammable and explosive dust or gas.

3 Responsibility of operators

- 3.1 People who have been trained and approved can operate the tow tractor.
- 3.2 Obey this instruction and local relevant security rules, regulations and traffic rules.
- 3.3 It's forbidden to operate the tow tractor when there's oil on your hands and feet.

4 Workplace

- 4.1 The tow tractor can only run on hard and flat roads such as concrete or pitch roads. Don't work in greasy and dirt area so as to skid.
- 4.2 Make sure the ground can bear the total weight of the tow tractor, that is the tow tractor weight, load weight and the operator's weight.

5 Driving and guiding during transportation

- 5.1 Don't brake and turn suddenly under the condition of driving at high speed.
- 5.2 Slow down the speed on the slope and keep goods at the lowest position. Running should be straight up and down on the slope. It's forbidden to turn back on it.
- 5.3 If the road surface skids, the operator should slow down the speed in order to prevent the tow tractor from spinning or overturning.

5.4 If your sight is obstructed, you can put goods behind you and drive. If necessary, ask others to guide in order to ensure security.

5.5 Keep a safe distance with front of the vehicle, persons, objects.

5.6 Ring the horn while you overtake.

5.7 Before entering the elevator, the battery tractor should ensure that the elevator can withstand all the weight.

6 Transporting goods

6.1 Transport of goods in the carriage left and right position remain equal, unstable or unsafe not allowed to transport.

6.2 Special care should be taken when carrying excessive or heavy cargo. The tractor should be equipped with shelving for the goods of higher transportation height.

7 Precaution of parking

7.1 It's forbidden to park the tow tractor on the slope.

7.2 Park the tow tractor at the appointed place.

7.3 It's forbidden to park the tow tractor at the urgent exit.

7.4 Don't park it at the place to hinder work.

8 Battery loading and unloading

8.1 Be careful while fixing and removing the batteries and the plug, Read the instruction carefully firstly, see the chapter of the batteries in detail.

8.2 Please wear the protective glasses while changing or charging the batteries.

9 Maintenance and repair

Maintenance can prevent mistakes and accidents. Please see the chapter of maintenance in detail.

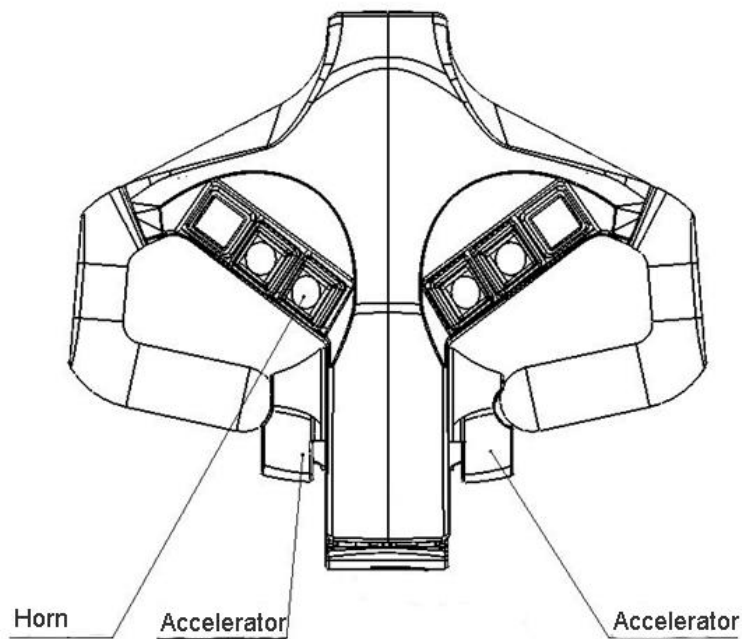
All replacement parts and spare parts should be approved by our company. It's forbidden strictly to maintain or reequip the tow tractor, which can influence security or use function.

Chapter 2 Warning, Trade Mark And Sign

The tow tractor has the following signs:

(Please read the signs on the tow tractor about relevant content)

1. Controlling switch of driving direction and speed
2. Horn sign
3. Nameplate



Handle

Chapter 3 Introduction To The Tow Tractor

The tow tractor drives with electric energy. Walking is controlled by the switch on the operating handle. The operating arm controls steering.

The tow tractor use 24V electronic system, and adjust its speed steplessly by a set of integrated circuit controller to ensure steady speed and acceleration while driving.

1 Applicable occasion of the tow tractor.

The tow tractor is suitable for handling goods on a truck.

2 Forbidden occasion of the tow tractor.

It can't be used in the following situations:

2.1 Places which can cause fire or explosion such as oil district.

2.2 It's used for transporting people.

2.3 It works on the meadow or the sand.

3 Tow tractor parameter

Model	MG20	MG30
Rated capacity kg	2000	3000
Rated towing power N	400	600
Speed without loading km/h	5.5	5.5
Speed with loading km/hmm	4.7	4.6
Weight (with battery	520	520
Turning radius mm	1200	1200
Overall width mm	850	850
Driving wheel	Rubber	Rubber

The relevant parameters of the tow tractor are marked on the plate of the tow tractor.

4 Main components

4.1 Operating arm

In the course of driving, walking and steering is controlled by the operating arm. The operating arm can steer maximum 180°. When the operating arm is on the top, it will shut off the power and brakes automatically.

4.2 Plate of the tow tractor

The plate encloses the model, rated lifting weight, maximum lifting height, weight and the serial

number when it's out of our company.

4.3 Case lid

It can be taken down and has a good visibility.

4.4 Instrument

The voltmeter shows voltage value at the time of working normally and reflects whether the batteries are sufficient.

4.5 Battery socket assembly

When charging the batteries, pull out the socket and insert the plug of the charger into it.

4.6 Driving equipment with the brake

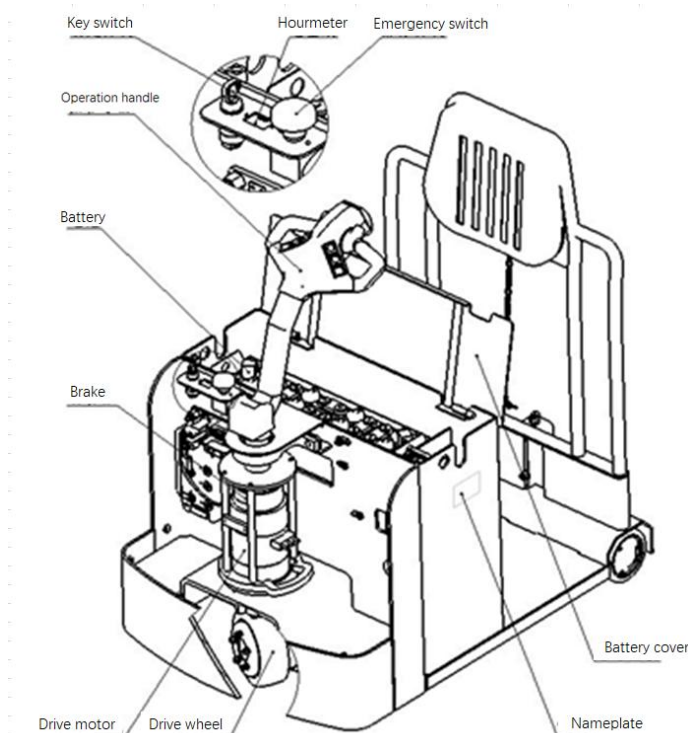
Enclose electromagnetic brake, walking motor, gearbox and driving wheels. Steering bearing is equipped between the driving motor and the gearbox.

4.7 Speed-adjusting equipment

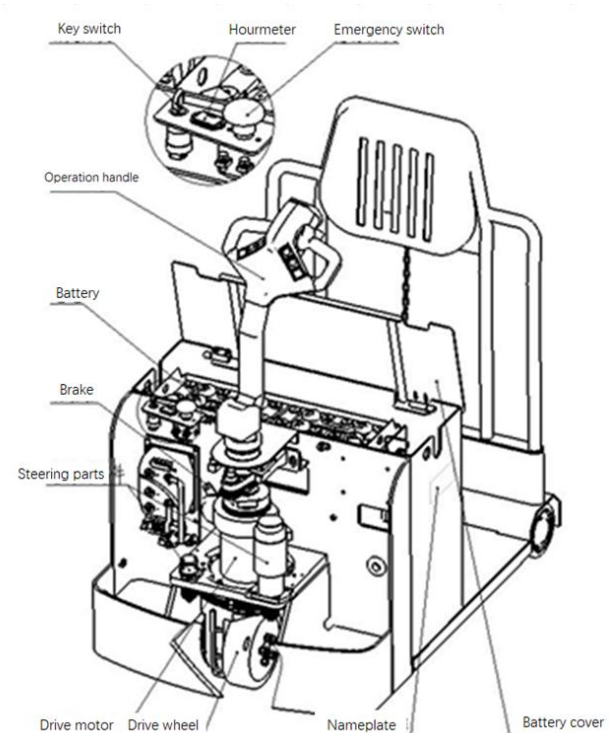
Normal running under 24V. Regulate speed by electric control.

4.8 Batteries

Batteries are fixed in the case, the voltage is 24V, the capacitance is 210Ah.



Vehicle assembly (mechanical steering type)



Vehicle assembly (EPS steering)

Chapter 4 Controlling Device

1. Driving direction and speed control

Rotate the switch on the handle head to control driving direction, regulate speed and acceleration with it.

2. Horn

Press it and it can ring.

3. Socket assembly

Pull out the socket and turn off the power in the following situations.

3.1 Accident

3.2 Under the urgent and dangerous situation.

3.3 Welding

Note:

When you are welding around the tractor, the batteries are easy to be damaged. If the weld current scurries into the batteries, they will be destroyed. It's necessary to pull out the socket at this moment.

When charging, pull out the socket, and connect the plug of the charger with the movable socket. After finishing charging, resume the socket to where it is.

4. Key switch

This switch is used to control the circuit on or off.

5. Hour meter

When the key switch is turned on, the meter shows the battery allowance .During normal operation (except for climbing), when the battery level is low, it indicates that the battery is low. Please charge the battery as soon as possible or replace another set of fully charged batteries to continue using. There are ten grids indicated enough battery power left, when the LED indicator light of leftmost two grids glitters, it means the battery amount is insufficient, charge them as soon as possible .

Chapter 5 Driving

1. Startup

Please do in proper order as following, otherwise the forklift doesn't run.

1.1 Make sure that the outlet is inserted firmly.

1.2 Turn the key switch to the on position

1.3 Make sure that the battery group has enough electricity.

Note:

Operating the tractor at a low electricity for a long time will diminish the life-span of the batteries. You mustn't startup the tractor before finishing charging.

1.4 Leave the supreme position when the operating handle is downwards.

1.5 Choose the driving direction correctly, control the speed in an ideal state. Accelerate it to the ideal speed slowly.

Warning!

Don't operate the tractor with serious function defect and danger. The operator should check the following safe functions at first before working every day.

※ The horn function is normal.

※ The operation function is normal.

※ The brake function is normal.

2. Braking

2.1 When the operating arm moves upwards to the supreme or bottom position, the tractor will turn off the power and brake.

2.2 When the direction switch is in normal running and turns to the opposite direction, it can carry out the function of electric brake. Controlling the running speed can control the magnitude of the power of the walking electric mechanism.

2.3 Parking the tractor

Make the tractor stop by loosening the driving direction switch and resuming it to the empty position.

3. Steering

3.1 Steering is controlled by the operating arm. Steering angle can be at the left and right direction in the range of 90°.

3.2 If the tractor meets barriers, it's forbidden to pass by force. You can detour the barriers by rotating

the operating arm to move ahead or go backwards.

Warning!

The wheels are not allowed skid.

If there's grease and dirt on hands or shoes, it's easy to fail operation and make the tractor out of control. So you should wipe your hands or the shoes before driving it.

4. Parking

4.1 Loosen the direction switch.

4.2 Loosen the operating arm, it will return to the braking position automatically.

4.3 Rotate the key switch to the off position.

Be careful!

Do not allow to drive without authorization.

If the operator leaves, please take the key away with you.

Chapter 6 Transporting Goods

1. The weight of goods should be in the range of the tractor allowed.
2. Reduce speed when turning around.
3. If your obverse sight is obstructed, you can ask others to guide the direction.
4. You should slow down the speed when going up and down the slope. It's forbidden to turn back on the slope.

Warning!

The tractor has danger of overturning if you turn round on the slope.

5. When the tractor goes down the slope, the distance of brake of the forklift is lengthened, and braking time is increased. So you should lower down the speed to reduce braking time. Don't go up and down the slope by force.
6. Before the tractor enters the lift, you should make sure the lift can the whole weight (the forklift weight, goods weight, the operator weight).

Chapter 7 Battery and Charger

Check the battery voltage of the battery tractor is 24V.

1. Changing the batteries

You can only change the batteries which weight is equal to the weight of the original batteries. The weight of the batteries influences stability and function of the forklift.

Warning!

Don't change the weight and the size of the batteries at random, otherwise it will influence the center of gravity of the forklift. The battery weight is too heavy or too light, it will influence stability and brake ability of the forklift. The weight must keep the same with the rated value on the forklift sign.

1.1 Order to remove the batteries with insufficient electric power.

1.1.1 Open the case lid of the batteries.

1.1.2 Cut off the connection between the plug and the cable line.

1.1.3 Take out the battery group from the forklift with a proper hook of the battery case.

1.1.4 Close the lid of the batteries.

1.2 Order to install the batteries.

1.2.1 open the case lid of the batteries;

1.2.2 Use the hanging device to hang the battery group with sufficient power and put it into the battery case in the forklift.

1.2.3 Connect the plug with the cable line.

1.2.4 Close the case lid of the batteries.

2. Charging

2.1 Forbid smoking and using flame while charging.

You can use the automatic charger. Pay attention to not charging insufficiently or overcharging so as not to damage the batteries.

The most electric current of the charger

Batteries (Ah)	Charger (A)
210	30

Danger!

The attenuant vitriol in the electrolyte of the batteries has corrosion. If it spatters to skin, you should wash it with water and soap as soon as possible. If it enters your eyes, please go see the doctor and wash your eyes with clean water. While checking the batteries, you should wear protective glasses and gloves.

2.2 Preparation for charging

The batteries must be charged as soon as possible after the forklift is used. They can't exceed 24 hours.

2.2.1 Make the key switch to the off position after parking, and pull out the key.

2.2.2 Open the case lid, make sure it ventilates above the batteries.

2.2.3 Pull out the plug, connect the plug of the charger with the battery plug .

2.2.4 Open the lid of battery electrolyte holes for breath.

2.2.5 Turn on the charger to charge

Warning!

While charging, especially in a closed area, you should keep a ventilated environment. Oxygen and hydrogen emerge in the course of charging, if it meets flame or electric spark, it can cause explosion. So you should shut off the charge power before pulling out the plug.

2.3 In the term of charging

You should consult the instruction of the batteries about charging method and using maintenance. Usually you can judge whether electricity is sufficient with the following methods.

2.3.1 The proportion of the battery electrolyte keeps basic stable for over 2-3 hours continuously.

2.3.2 The surface of the electrolyte in the batteries produces strong bubble, the electrolyte turns from milky to limpid.

The above mentioned situations show that electricity of the batteries is sufficient.

2.4 After charging sufficiently

2.4.1 Shut off the charging power and the charger.

2.4.2 Pull out the charger plug from the battery plug.

2.4.3 Insert the battery outlet into the battery plug.

2.4.4 Close the battery electrolyte lid.

The comparison table of sufficient battery temperature and electrolyte proportion is as follows:

Temperature ° C	Proportion g/cm3
-15	1.31
0	1.30
+15	1.29
+30	1.28

+45	1.27
-----	------

If it dis-accords with the proportion of the form, you should adjust it by feeding acid or distilled water.

3. Battery maintenance

3.1 In order to ensure the battery life, the battery should be fully charged before use, charging insufficient battery can not be used.

3.2 Avoid over charge and over discharge, it will seriously affect battery performance and life.

3.3 Keep the feeding hole and vent covers clean. Take them off or open when charging, after charge finished, install them or close them. Keep the battery surface, connecting wire and screws clean and dry . If there is sulfuric acid, clean them by cotton yarn dipped into lye wipe . Be careful do not let the lye into the battery.

3.4 After charging, check the battery acid level, timely add distilled water to maintain the liquid level. Under normal conditions, add the dilute sulfuric acid it strictly prohibited.

3.5 Charge battery in time after used ,generally not more than 24 hours.

3.6 Keep good ventilation when charging , no fireworks.

3.7 In the following cases, the battery needs to be balanced charging .

3.71 Normal battery .(balanced charge every 3 months)

3.72 Lay aside an unused battery for a long time.

3.73 There is a "lagging battery" in the battery pack (lagging battery refers to the voltage value of the charging and discharging process is lower than battery that has been repaired for a fault).

3.8 Balanced charging method.

3.8.1 General charge first.

3.8.2 When the battery is fully charged, stop charging for 1 hour, and then use 0.25I5 to charge for 1 hour.

Press 3.8.2 to repeat several times until the charger closes, there will be fierce bubbles in the battery.

3.9 When the battery is not in use, it shall be replenished by ordinary charging method one month after the storage period.

3.10 The battery should avoid direct sunlight and be no less than 2M away from the heat source.

3.11 Avoid contact with any liquid or harmful substances . No mental impurities should fall into the

4. Maintenance of electromagnetic brake

4.1 Long time using under the condition of heavy humidity, need to prevent it getting rusty. The rust on the contact face will affect it using, please kindly remove it.

4.2 Keep the hands off the fabrication surface, and make it clean without grease, otherwise can't

reach the Max. torsion ,please clean the contact surface.

4.3 Under the using condition of high temperature please install it at vent place, generally suitable for the temperature between -10℃-40℃。

4.4 In the beginning of using, the torsion at low point, will keep stable after certain time using.

4.5 Please check regularly, including switch work or not? noise causing? abnormal heating? Fabrication and reversing parts with foreign object, grease? Fabrication clearance and voltage normal or abnormal ?

Chapter 8 Fault Diagnosis

1. Fault diagnosis of controller

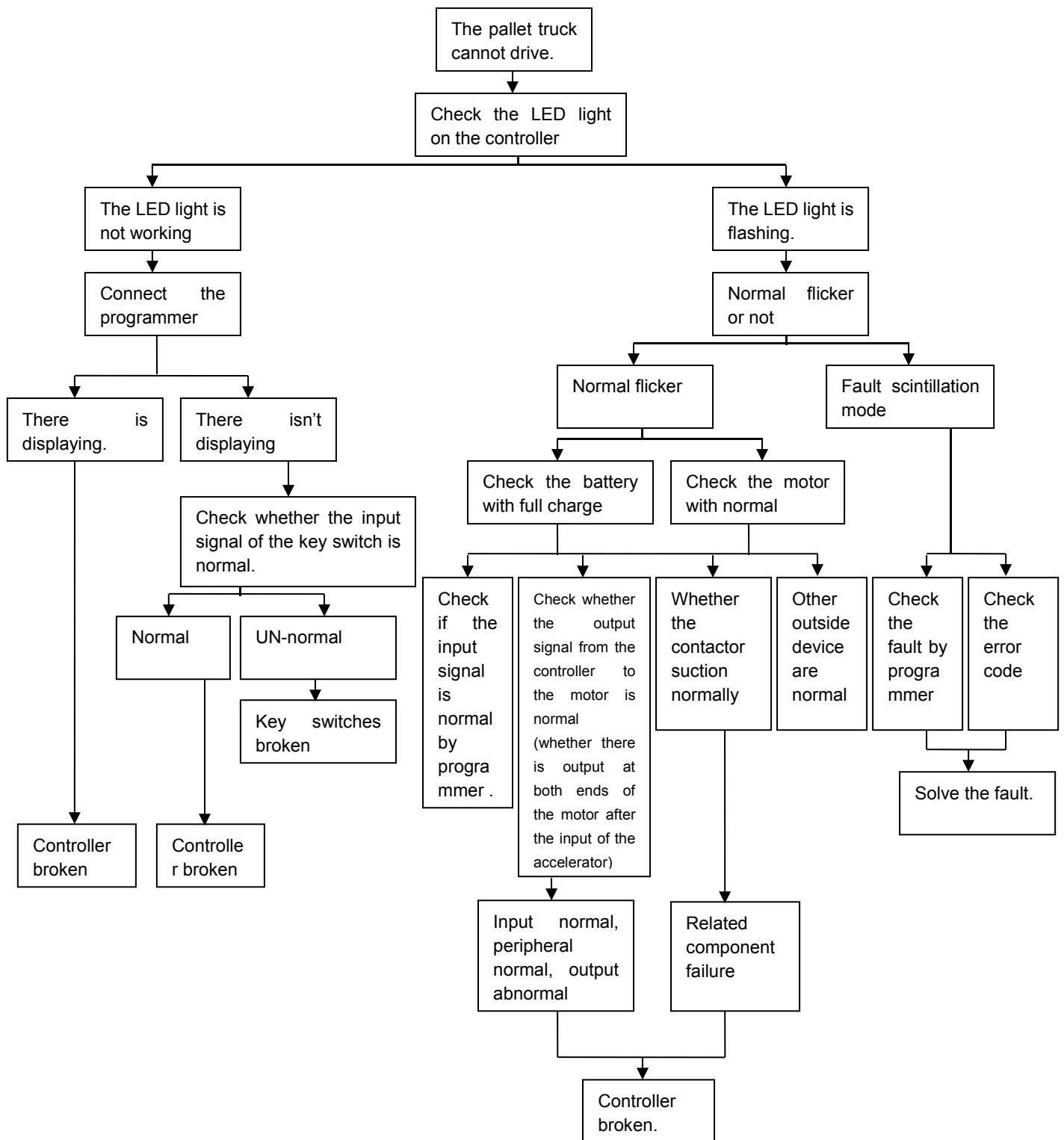
The machine installed with LED lights, display different information through the different light colors combination.

When faults occurred, can try re-starting the equipment after making sure not the wiring error and machinery malfunction. If the fault still not removed, please turn off and check the 35needleconnector

LED Display Information Explanation	
Display	Information
LED off	Controller power off; Or battery capacity used out; Or other serious malfunction.
Yellow LED light flash	Working normal
Yellow& red LED lights keep on	Under the condition of program loading
Red LED light keep on	Software un-installation Restart. Re-install software if need
Red &yellow LED lights flash alternately	Controller malfunction, code consist of 2 numbers. Red light flash times display the code sequence is first or second number, yellow light flash times display the corresponding specific number.

assemble correct or has dirty and damaged, re-start the machine after repairing and cleaning.

When the whole electric system get fault, the marks flash on the electric controller for reference and diagnose, below is the form of malfunction diagnosis.



Customers can solve the malfunction through above methods and contact our after-sales departments to inform the malfunction code of LED lights.

2. Fault diagnosis of EPS

Full electric steering system is a type of high accuracy, sensitive & energy-saved, environmental and high performance steering system, only correct operation and maintenance can ensure the whole performance work properly, enhance the lifespan. After the malfunction occurs, find the malfunction code which display on the controller, and then check the components fastener, wiring harness good or not, terminal drop out of become less crowded cause poor contact, components damaged or not.

The product controller is equipped with LED display lamp, through LED light change to display different information.

LED Display Information Explanation	
Display	Information
LED off	Controller powered off; Or battery capacity used out; Or other serious malfunction.
Red LED light flash	Working normal
Red LED light keep on	Under the condition of program loading
Different Red LED lights flash alternately	Controller malfunction,code consist of 2 numbers.

Customers can solve the malfunction through above methods and contact our after-sales services to inform the malfunction code of LED lights.

Chapter 9 Maintenance

Please carry on a routine maintenance after the towing tractor works for 500 hours. Efficiency, life-span and security of the towing tractor depends on daily maintenance.

When you maintain the towing tractor, the replacement parts should be offered by our company to ensure quality. We suggest you get in touch with the agent or the after sale service department of our company to make your towing tractor work safely and economically.

1 Safety regulation of maintenance

People who study systematically can maintain the towing tractor.

1.1 Keep maintaining place clean.

1.2 Don't bring loose or valuable object with you while maintaining.

Attention!

When you maintain the electric system of the towing tractor, metal touch electrified electronic elements, which is easy to cause short circuit or burning. So please take off your watch, earrings or other ornaments.

1.3 Pullout the plug and disconnect battery power before maintaining the towing tractor.

1.4 Turn off the key switch of the towing tractor before opening the left and right case covers or electric system.

1.5 Please disconnect the battery power before welding, because welding current may enter the battery, in order to avoid this situation, please shut off the battery power.

1.6 When working under the towing tractor, it should be supported by a bracket.

Warning!

If it is improper to support the towing tractor, it will overturn and hurt people. If the towing tractor has no protection of hoisting equipment or supporting shelf, it's forbidden to work under it.

2 Maintenance which users can finish

2.1 Routine maintenance and safety inspection

2.1.1 carrying on routine maintenance and inspection is the responsibility of operators.

2.1.2 If you don't carry on routine maintenance to the towing tractor, which will affect safety and reliability of the towing tractor, it's easy to cause serious accidents.

2.1.3 While checking and finding out trouble, you should repair it at once and stop using it.

2.2 You can finish daily, weekly and monthly maintenance mentioned in below chart.

Serial No.	Check point	Check content
------------	-------------	---------------

1	Operation control	Check whether its function is normal
2	Horn	Check whether its function is normal
3	Steering	Check whether its function is normal
4	Hour meter	Check whether its function is normal
5	Driving device	Check whether it has unusual noise and oil leakage
6	Electromagnetic clutch	Check if it works normally and if it keeps in touch or not
7	Transmission	Check whether its function is normal
8	Wheels	Check if they're damaged, get rid of greasy dirt and metal scrap
9	Frame	Check if it's damaged, get rid of dirt
10	Battery	Check whether it's leaking

The other maintaining parts in the maintenance chart can only be finished by the maintenance men of our company or our authorized maintaining department.

3 Clean the towing tractor

3.1 Regular cleaning is carried out weekly to ensure its reliability, please remove the power outlet before cleaning to avoid short circuit and damage the electrical system.

3.2 External cleaning

3.2.1 Remove the adherent objects from the wheel every day to keep it flexible.

3.2.2 After finished cleaning, you should add lubricating oil to the necessary lubricating positions of the towing tractor according to the lubricating position chart.

3.3 Clean electrical components

Use compressed air to blow clean motor dust and line dust.

Attention!

Electrical components should not be flushed with high pressure flushing devices, do not wipe with a wet cloth.

Do not damage electrical components on the circuit board .To keep electrical components in position and avoid short circuit .

4 Maintenance List

Part No.	Running interval	1day	1week	1month	3months	6months	12months	36months
1	Body system							

1.1	Check cover plate(Left. Right)				★			
1.2	Check battery box fixture				★			
1.3	Check the frame for cracks				★			
1.4	Check that the body is securely				★			
2	Electrical motor							
2.1	Check for loose joints			★				
2.2	Clean the motor			★				
2.3	Check installation bolts for firmness			★				
2.4	Check for abnormal bearing noise			★				
3	Drive system							
3.1	Check for leak					★		
3.2	Check for oil level				★			
3.3	Check for noise					★		
3.4	Oil change							★
4	The part of wheel							
4.1	Remove cords and debris from wheels	★						
4.2	Check whether drive wheel is wear and bolts				★			
4.3	Remove and lubricate wheel body bearings					★		
5	Brake parts							
5.1	Clean brake				★			
5.2	Check the wear condition of brake friction disc				★			
5.3	Check brake condition under loose brake condition			★				
6	Electric controller board							
6.1	Cleaning and				★			

	Installation inspection							
6.2	Secure tight cable connector				★			
6.3	Check the contactor contacts					★		
6.4	Check the action of contactor					★		
7	Storage batteries							
7.1	Check the level of electrolyte (the level should be 10-15mm above the plate)		★					
7.2	Check whether the connection between the towing tractor and battery is tight		★					
7.3	Check each battery and its insulation sheath		★					
7.4	Check electrolyte specific gravity and temperature			★				
7.5	Clean batteries	★						
8	Control handle							
8.1	Check the installation of fastening					★		
8.2	Check the brake switch				★			
8.3	Check whether the fastening screw falls					★		
8.4	Check the function of the safety switch					★		
8.5	Check and adjust damping spring					★		

5 List of lubrication positions

Part No.	Lubrication	Interval time (h)			Types of lubricating oil and grease
		500	1000	3000	
1	Wheel bearing (including		L		A

	steering)				
2	Driving gear box	H		O	B

L= lubricating H= inspect O= oil change

6 Lubrication oil and fat

Grease Category		Specification		Applicable parts
		-20℃～0℃	0℃～40℃	
A	Lubricating grease	3#Drop point of lithium base grease170		Bearings and bushing
B	Transmission oil	70W/75 (abroad SAE75W)	85W/90 (abroad SAE80W/90)	Gear box
C	Lubricating oil	CC15W (Low temp.SAE10W)	CC30 (Normal temp. SAE20W)	Chains and pipeline

Chapter 10 Transportation and Storage of Towing Tractor

1. Tow and transport faulty towing tractor

1.1 When towing or towing the tractor with a rope, the towed tractor must be steered by a driver to release the brakes.

1.2 When the brake function of the towing tractor is intact, pull the tractor by pulling the control handle to the operating position and ask others to help push the tractor(the pushing part is at the frame) to send the tractor to the destination or the maintenance point of our company for repair.

1.3 If the driving wheels of the towing tractor broken, you can pull the towing tractor with a trailer or a tow tractor.

Attention

The driving wheel of towing tractor must be lifted off the ground, otherwise the wheels and motor will be badly damaged.

1.4 If the electromagnetic brake of the towing tractor is out of order and can't brake, then the towing tractor will move with topography. At this moment you must underlay the wheels with wedge blocks in a proper way to prevent it from moving.

2. Preservation of the towing tractor

If the towing tractor needs to be stored for a long time, please take the following measures:

2.1 Storage battery

2.1.1 Recharge the battery ,and then maintain it according to the daily maintenance method.

2.1.2 Charge maintenance and check electrolyte level every 3 month.

2.2 Driving system

When the storage time exceed one week, the drive wheel should be fixed firmly and can be supported to prevent it from moving ,also, unload the cargo.

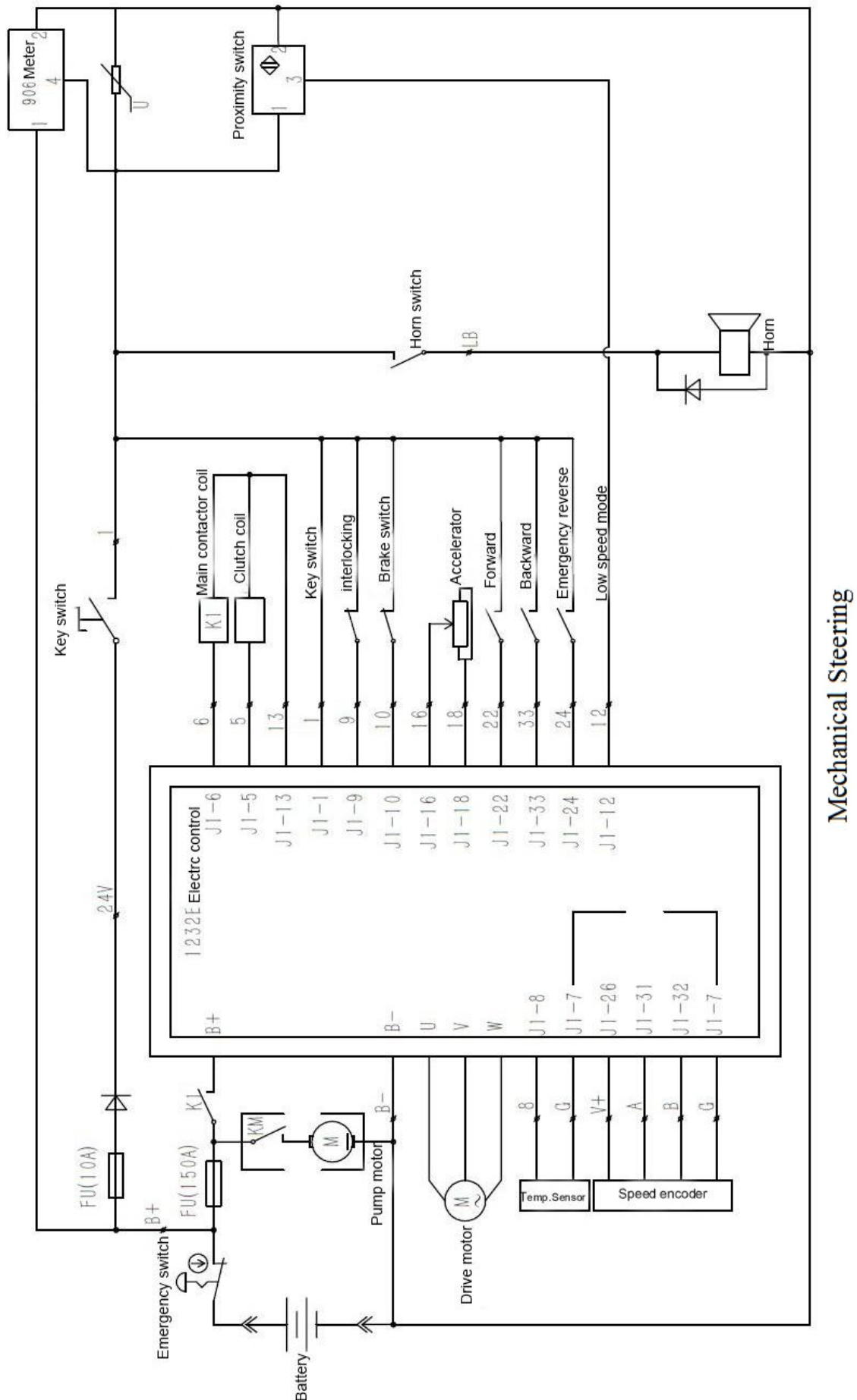
2.3 Caution of reusing the towing tractor after preservation

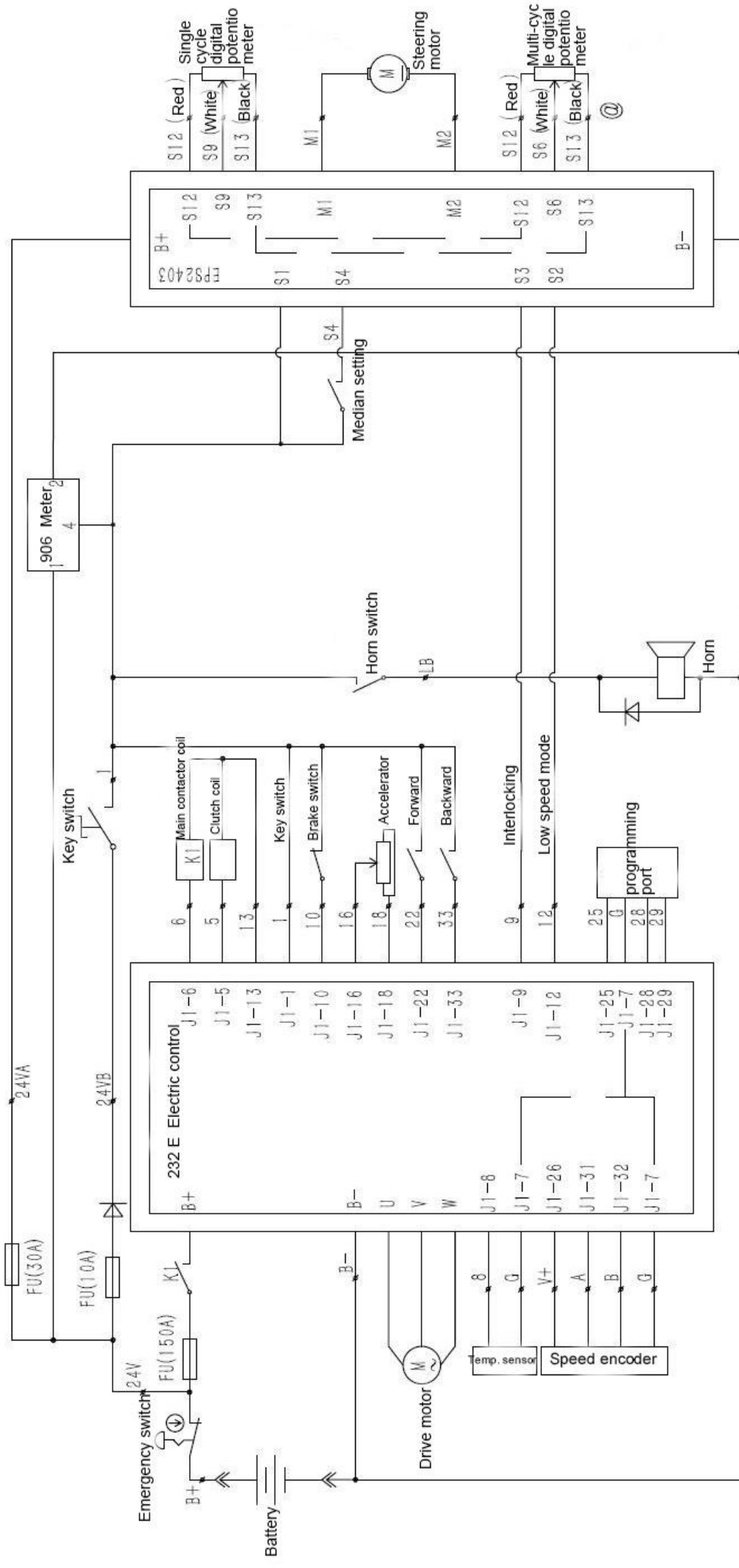
2.3.1 When storage for a period of time,please check the use function and safety of the forklift like routine maintenance and safety inspection before re-use.

2.3.2 When the storage time exceed 3 months , prevent maintenance can be carried out according to the requirements of this manual (at intervals) of 500 hours.

Chapter 11 Schematic Diagram

1. Electrical schematic diagram





Electric Power Steering