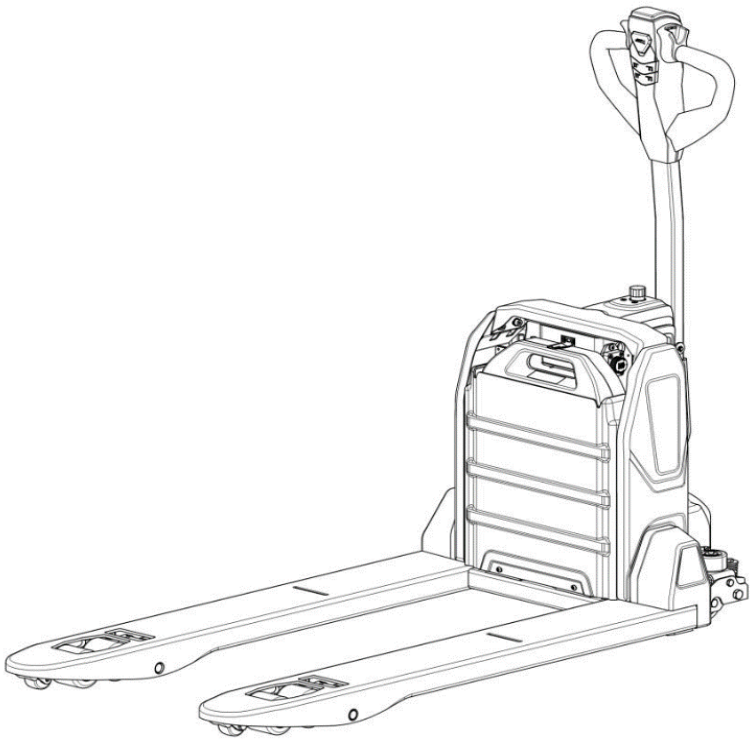
Service Manual

Pallet Truck

PTE15N2



WARNING

Do not use the pallet truck before reading and understanding these operating instructions.

NOTE:

- **Please check the designation of your present type at the last page of this document as well as on the ID-plate.**
- **Keep for future reference.**

Version 01/2024

PTE15N Pro-Service Manual-EN

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FOREWORD

Before operating the truck, read this ORIGINAL INSTRUCTION HANDBOOK carefully and understand the usage of the truck completely. Improper operation could create danger.

This handbook describes the usage of different electric pallet trucks. When operating and servicing the truck, make sure, that it applies to your type.

Keep this handbook for future reference. If this or the warning/ caution labels are damaged or get lost, please contact your local dealer for replacement.

ATTENTION:

- Environmentally hazardous waste, such as batteries, oil and electronics, will have a negative effect on the environment, or health, if handled incorrectly.

- The waste packages should be sorted and put into solid dustbins according to the materials and be collected disposal by local special environment protection bureau. To avoid pollution, it's forbidden to throw away the wastes randomly.

- To avoid leaking during the use of the products, the user should prepare some absorbable materials (scraps of wooden or dry duster cloth) to absorb the leaking oil in time. To avoid second pollution to the environment, the used absorbable materials should be handed in to special departments in terms of local authorities.

- Our products are subject to ongoing developments. Because this handbook is only for the purpose of operating /servicing the pallet truck, therefore please have understanding, that there is no guarantee out of particular features out of this handbook.

NOTE: On this manual, the left sign means warning and danger, which can lead to death or serious injury if not followed.

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目录

1. CORRECT APPLICATION

It is only allowed to use this electric pallet truck according to this instruction handbook.

The trucks described in this handbook are self-propelled electric power pallet trucks. The trucks are designed to lift, lower and transport palletized loads.

A wrong usage can cause human injuries or can damage equipment.

The operator/ the operating company has to ensure the correct usage and has to ensure, that this pallet truck is used only by staff, which is trained and authorized to use this truck.

The pallet truck has to be used on substantially firm, smooth, prepared, level and adequate surfaces. The truck is intended to be used for indoor applications with ambient temperatures between +5°C and + 40°C and for various transportation applications without crossing permanent obstacles or potholes. The work on ramps is allowed if ramp is not exceeding the allowed angle. While operating, the load must be placed approximately on the longitudinal center plane of the truck.

Lifting or transporting people is forbidden.

If used on tail lifts or loading ramps, please ensure that these are used correctly according to the operating instructions.

The capacity is marked on capacity sticker as well on the Identification plate. The operator has to consider the warnings and safety instructions.

Operating lighting must be minimum 50 Lux.

Any change or alteration that may affect the load rating, stability or safe operation of the vehicle shall be subject to the prior written approval of the vehicle's manufacturer of origin or its authorized manufacturer or its replacement. This includes the effects of changes such as increased braking, steering, visibility and movable accessories. When modifications or changes have been approved by the manufacturer or its replacement, load nameplates, labels, identification marks, operation and maintenance manuals will be changed accordingly.
Failure to follow these instructions to cause damage to the vehicle will result in loss of warranty.

2. DESCRIPTION OF THE PALLET TRUCK

a. Overview of the main components

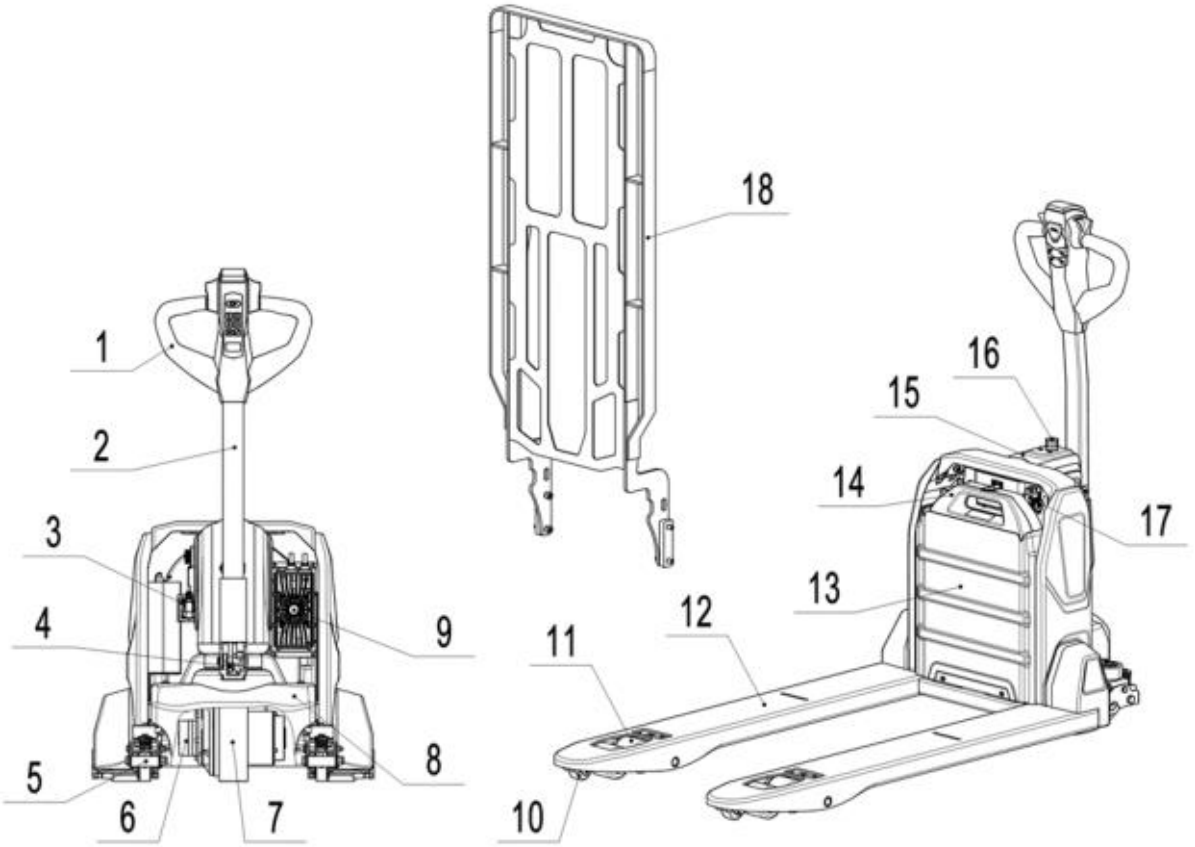


Fig. 1: Overview of the main components

Table 1: Main components

No.		Part	No.		Part
1	●	Control handle	10	●	Entry roller
2	●	Tiller bar	11	●	Load roller
3	○	Safety socket	12	●	Fork
4	●	Gas spring	13	●	Front panel
5	○	Side roller (PTE15N Pro)	14	●	Lithium battery
	●	Side roller (PTE20N Pro)	15	●	Cover
6	●	Electromagnetic brake	16	●	Emergency switch
7	●	Drive wheel	17	○	Battery lock
8	●	Apron	18	○	Load backrest
9	○	Integrated charger			
●: standard ○: optional					

Note: Optional load backrest (18) must be used with the side wheel (5).

b. Main technical data

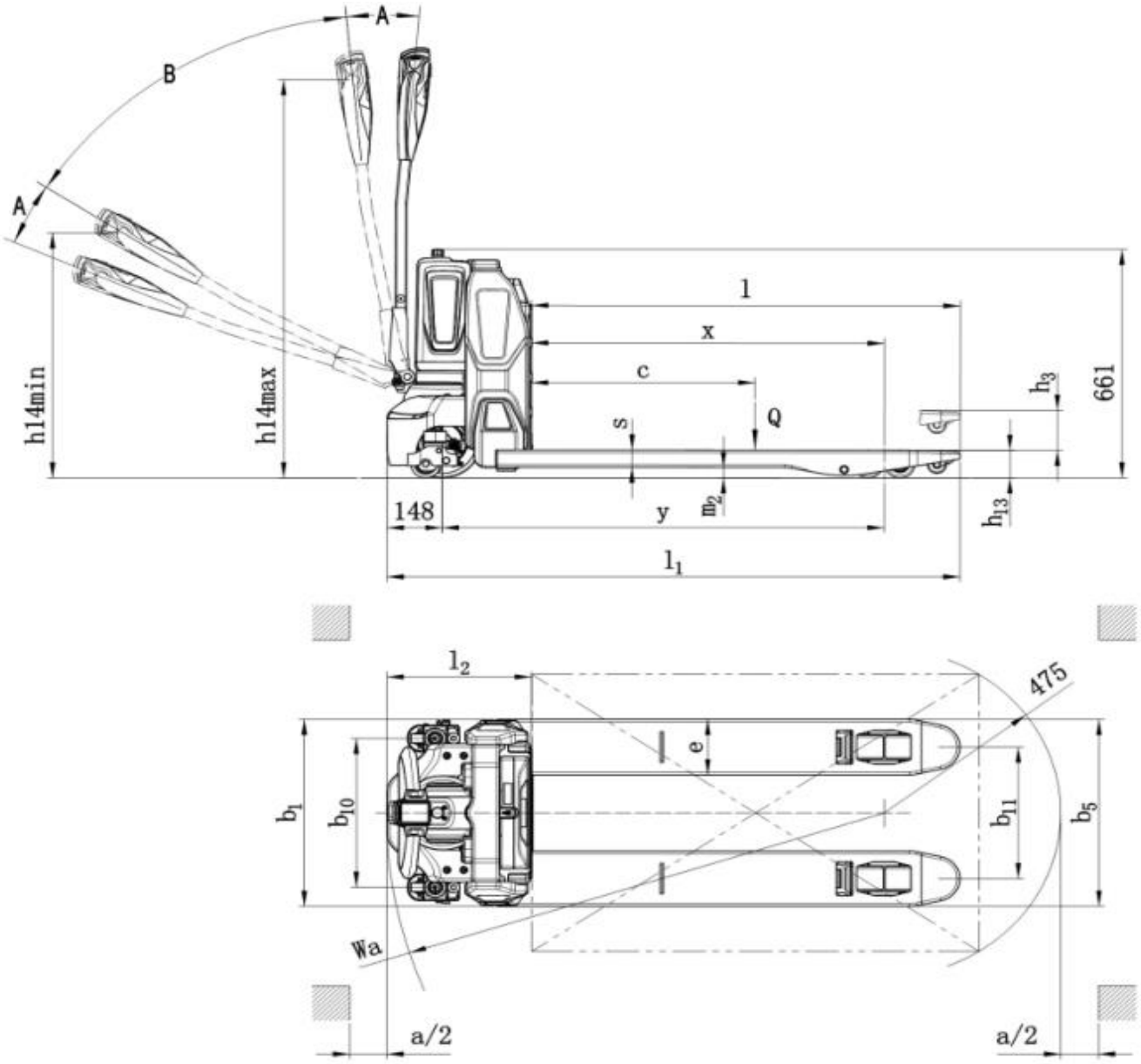


Fig. 2: Technical data

Table 2: Main technical data for standard version

Technical data （VDI2198）					2024.01.08
Identification	1.2	Model		PTE15N Pro	PTE20N Pro
	1.3	Power		Battery	Battery
	1.4	Operation		Pedestrian	Pedestrian
	1.5	Load capacity/rated load	Q （t）	1.5	2.0
	1.6	Load center distance	c （mm）	600	600
	1.8	Load distance	x （mm）	947	951
	1.9	Wheelbase	y （mm）	*1187*	*1189*

Wei-ghts	2.1	Net weight	kg	*125*	*127*	*149*	*153*
	2.2	Axle loading,laden front/rear	kg	*500/1225*	*626/1002*	*621/1528*	*625/1528*
	2.3	Axle loading,unladen front/rear	kg	*96/29*	*99/29*	*115/34*	*119/34*
Wheels/ frame	3.1	Tyres		PU		PU	
	3.2	Tyre size,front	x w (mm)	210×70		210×70	
	3.3	Tyre size,rear	x w (mm)	74×93[1)] / 80×70 (80×93)		74×93[1)] / 80×70 (80×93)	
	3.4	Additional wheels(dimensions)	x w (mm)	-/ 80×30		-/ 80×30	
	3.5	Wheels,number front/rear (x=driven wheels)		1x/ 2 (1x/ 4) Or 1x +2/ 2 (1x +2/ 4)		1x/ 2 (1x/ 4) Or 1x +2/ 2 (1x +2/ 4)	
	3.6	Tread,width,front	b_{10} (mm)	-/430		-/430	
	3.7	Tread,width,rear	b_{11} (mm)	380	525	380	525
Basic dimensions	4.4	Lift	h_3 (mm)	115		115	
	4.9	Height of tiller,min./max.	h_{14} (mm)	700 / 1160		700 / 1160	
	4.15	Height,lowered	h_{13} (mm)	75[2)] /80		75[2)] /80	
	4.19	Overall length	l_1 (mm)	1537		1543	
	4.20	Length to face of forks	l_2 (mm)	*388*		*394*	
	4.21	Overall width	b_1 (mm)	540	685	540	685
	4.22	Fork dimensions	s/e/l (mm)	50 / 160 / 1150		50 / 160 / 1150	
	4.25	Width across forks	b_5 (mm)	540	685	540	685
	4.32	Ground clearance(center of wheelbase)	m_2 (mm)	25[3)] /30		25[3)] /30	
	4.34	Aisle width for pallets 800× 1200 lengthways	Ast (mm)	*2013*		*2019*	
	4.35	Turning radius	Wa (mm)	*1336*		*1342*	
Performance data	5.1	Travel speed laden/unladen	km/h	*4.2/4.7*		*4.8/5.2*	
	5.2	Lift speed,laden/unladen	m/s	*0.020/0.025*		*0.017/0.022*	
	5.3	Lowering speed,laden/unladen	m/s	*0.05 / 0.04*		*0.05/0.03*	
	5.8	Max. gradeability,laden/unladen	%	6 / 16		8 / 16	
	5.10	Service brake		Electromagnetic		Electromagnetic	
Electrisc	6.1	Drive motor,output at S2 60min	kW	0.65		1.0	
	6.2	Lift motor,output at S3 10%	kW	0.5		0.8	
	6.3	Battery as per DIN 43531/35/36 A, B, C, no		No		No	
	6.4	Battery voltage/nominal capacity	V / Ah	24 / 20 (24 /40)		48 / 20	
	6.5	Battery weight	kg	5.5 (8.5)		8.5	

	6.6	Energy consumption acc. to VDI cycle	kWh/h	0.18	0.25
Misc.	8.1	Type of drive control		DC-speed control	DC-speed control

Note: 1) For truck equipped with this load roller, h_{13} is 75mm;

2) Here indicates that the truck is equipped with ∅74×93 single load roller;

3) When h_{13} is 75mm, m_2 is 25mm.

c. Description of the safety devices and warning labels

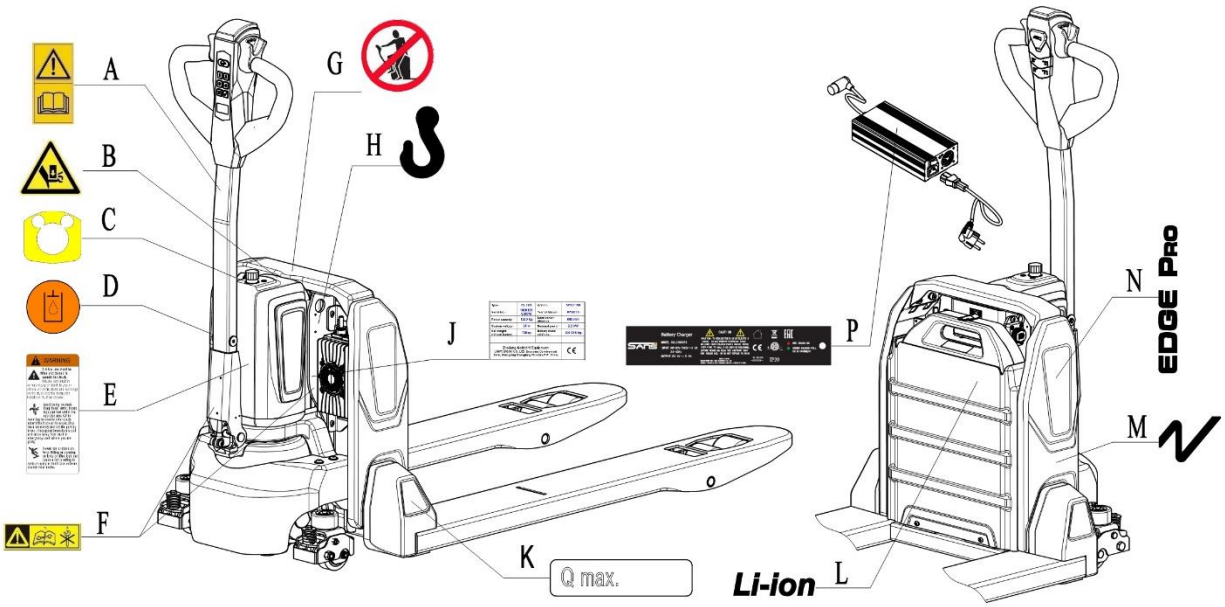


Fig. 3: Safety and warning labels

Table. 3: Description of safety devices and warning labels

A	Sticker (observe and follow the instructions)	H	Decal (crane hook)
B	Warning sticker (hands pinching)	J	Identification plate
C	Decal (emergency switch)	K	Label (capacity)
D	Sign oil filling point	L	Decal (Li-ion)
E	Warning sticker (safety information)	M	Decal (N)
F	Sticker (read and follow maintenance manual)	N	Decal (truck model)
G	Sticker (no passengers)	P	Charger ID plate

The truck has an emergency stop switch (16) that can stop all lifting, descending and driving functions. After confirming that the vehicle is located in the safe operation area, turn the switch clockwise to unlock the handle to operate the truck.

If you do not operate the truck, to prevent unauthorized use, press the emergency stop switch (16) or press the "X" button on the combination lock panel.

The handling vehicle handle (1) is equipped with an emergency reverse switch, when the vehicle is driving to the operator, as long as the emergency reverse switch is touched within the operating range of the handle, the vehicle can be driven away from the operator.
At the same time, follow the instructions shown on the label, and replace it in time if it is damaged or missing.

d. Identification plate (ID plate)

Pallet Truck			
Serial No.	xxx	Specification	xxx
Device code	xxx	Date of manufacture	xxx
Rated load weight	xxx kg	Load Center Distance	xxx mm
Rated voltage	xxx V	Rated power	xxx kW
Net Weight without Battery	xxx ±5%kg	battery weight （Min/Max）	XXX kg
Noblelift Intelligent Equipment Co., Ltd. XXXXXXXXXXXXXXXXXXXX			

Fig. 4: Identification plate

Nameplate format content is subject to equipment posting

3. WARNINGS, RESIDUAL RISK AND SAFETY INSTRUCTIONS

DO NOT

- Put foot or hand under or into the lifting mechanism.
- Allow other person than the operator to stand in front of or behind the truck when it is moving or lifting/lowering.
- Overload the truck.
- Put foot in front of the wheels, injury could result.
- Lift people. People could fall down and suffer severe injury.
- Push or pull loads
- Locate loads on sides or fork end. Load must be distributed evenly on the forks.
- Use the truck with unstable or unbalanced load.
- Use truck without manufacturer's written consent.
- Lifted loads could become unstable at wind forces. In the case of wind forces do not lift the load if there is any influence to the stability

Watch difference in floor levels when driving. Load could fall down or the truck could get uncontrollable.

Keep watching the condition of load. Stop operating the truck if load becomes unstable.

Brake the truck and activate the emergency switch (5) by pushing when sliding load on or off the truck. If the truck has any malfunctions, follow chapter 10.

Practice maintenance work according to regular inspection. This truck is not designed to be water resistant. Use the truck under dry condition. Prolonged continuous operation might cause damage of the power pack. Stop operation if temperature of hydraulic oil is too high.

- When operating the electric pallet truck, the operator has to wear safety shoes.
- The truck is intended to be used for indoor applications with ambient temperatures between +5°C and + 40°C.
- The operating lighting must be minimum 50 Lux.
- No operation of this vehicle on a slope
- To prevent unintended sudden movements when not operating the truck (i.e. from another person, etc.), press emergency switch (5) or press the X button of pin-code panel.

4. COMMISSIONING, TRANSPORTING, DECOMMISSIONING

a. Commissioning

Table 4: Commissioning data

Type	PTE15N Pro (540X1150)	PTE15N Pro (685X1150)
Commissioning weight [kg]	123kg	126kg
Dimensions [mm]	1530x540x1250	1530x685x1250

After receiving our new pallet truck or for re-commissioning you have to do the following before (firstly) operating the truck:

- Check if are all parts included and not damaged
- Make sure the tiller is assembled correctly (electrical socket is connected and fixed with two plastic clamps, circlip of the axle is installed)
- Check that battery is charged (follow chapter 8)
- Do the work according to the daily inspections as well as functional checks.

b. Lifting/ transportation

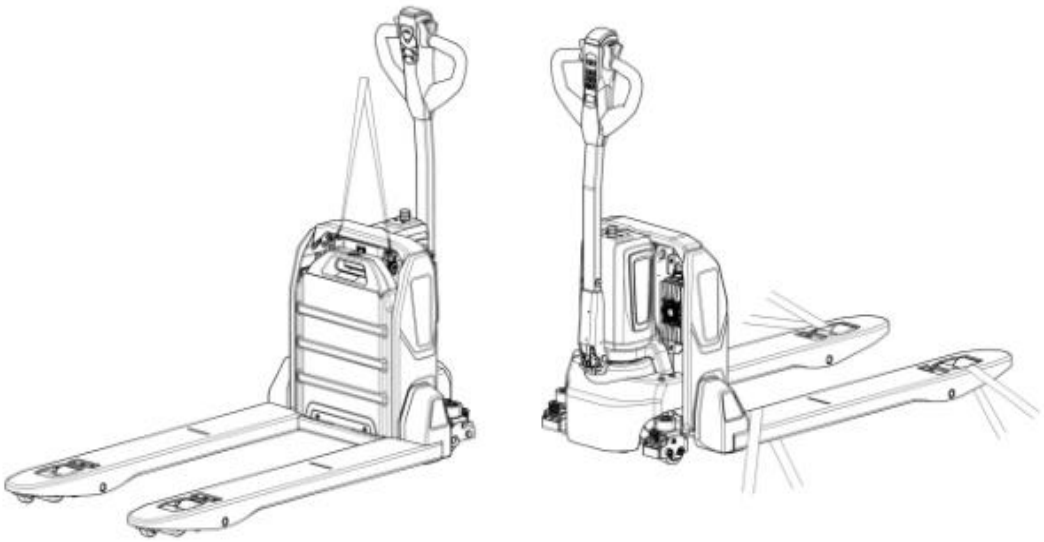
When transporting, remove the cargo, lower the fork to the lowest level, and secure the specialized lifting equipment according to the chart below.

Lifting

USE DEDICATED CRANE AND LIFTING EQUIPMENT

DO NOT STAND UNDER THE SWAYING LOAD

DO NOT WALK INTO THE HAZARDOUS AREA DURING LIFTING



Transportation

DURING TRANSPORTATION ON A LORRY OR TRUCK ALWAYS FASTEN THE TRUCK SECURELY

c. Decommissioning

When storing, remove the goods and lower the truck to the lowest position. Grease（ DIN 51825 标准油脂） all lubrication points mentioned in this manual (check regularly) to prevent vehicle rust and dust accumulation. Remove the battery and check the safety equipment to ensure that the vehicle is not squeezed after storage.

When the vehicle is finally taken out of service, the vehicle is handed over to the designated recycling company. According to regulations, oil, batteries and electronic components must be recycled.

5. DAILY INSPECTION

This chapter describes pre-shift checks before putting the truck into operation.

Daily inspection is effective to find the malfunction or fault on this truck. Check the truck on the following points before operation.

REMOVE LOAD FROM TRUCK AND LOWER THE FORKS.

DO NOT USE THE TRUCK IF ANY MALFUNCTION IS FOUND.

- Check for scratches, deformation or cracks.
- Check if there is any oil leakage from the cylinder.
- Check the smooth movement of the wheels.
- Check the function of driving with tiller in its vertical position.
- Check the function of the emergency brake by activating the emergency switch.
- Check handle proximity switch braking function
- Check the lifting and lowering functions by operating the buttons.
- Check if all bolts and nuts are tightened firmly.
- Visual check if there are any broken electric wires.
- If supplied with a backrest extension, check it for damages and correct assembling.

6. OPERATING INSTRUCTIONS

BEFORE OPERATING THIS TRUCK, PLEASE FOLLOW THE WARNINGS AND SAFETY INSTRUCTIONS (CHAPTER 3).

Make sure, that the load is palletized and stable and that the daily inspection is carried out.

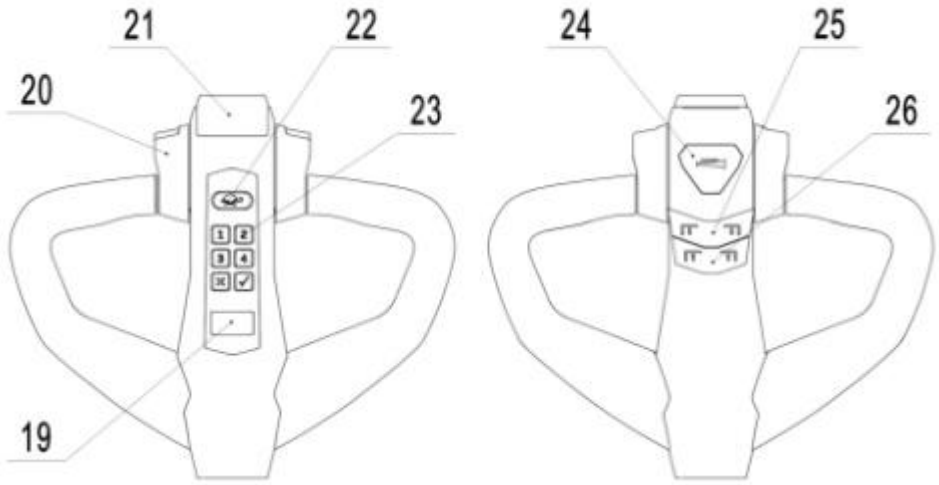


Table.5: Tiller controls

No.	Item	No.	Item
19	Display	23	Pin-code panel
20	Accelerator	24	Horn button
21	Emergency switch	25	Lifting button
22	Turtle button	26	Lowering button

There are two ways to start the truck: by manually entering the access code on the pin-code panel (23) and press " √ " button, or by RFID card (PTE20N Pro).

Press the horn button (23) to activate the audible alarm signal.

If the truck is equipped with an integrated charger (9), the charging plug of the integrated charger must be fully fixed to the safety socket (3), otherwise the truck may fail to start.

a. Parking

DO NOT PARK THE TRUCK ON INCLINED SURFACES.
The truck is equipped with an electromagnetic fail-safe stopping and parking brake.
Always lower the forks fully and activate the emergency switch (16) for parking.

b. Lifting

DO NOT OVERLOAD，MAXIMUM CAPACITY OF PTE15N 2 IS 1500KG

Before entering the pallet, fully lower the forks and move the truck to the appropriate position so that the center of gravity of the pallet (load) is approximately located in the center of the forks. And press the lifting button (25) to the appropriate lifting height.

c. Lowering

Press the lowering button (26).

Lower the load until the forks are clear of the pallet, then drive the truck carefully out of the load unit.

d. Travelling

TRAVEL ON INCLINES ONLY WITH THE LOAD FACING UPHILL.

DO NOT TRAVEL ON INCLINES EXCEEDING THE SPECIFIED TECHNICAL DATA.

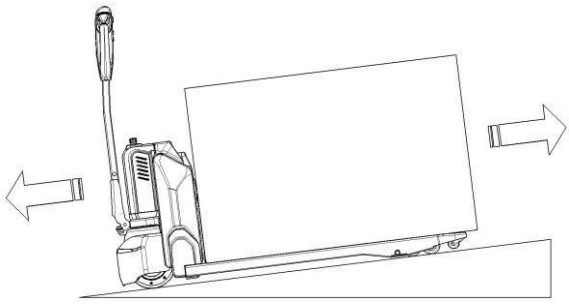


Fig. 9: Load facing uphill

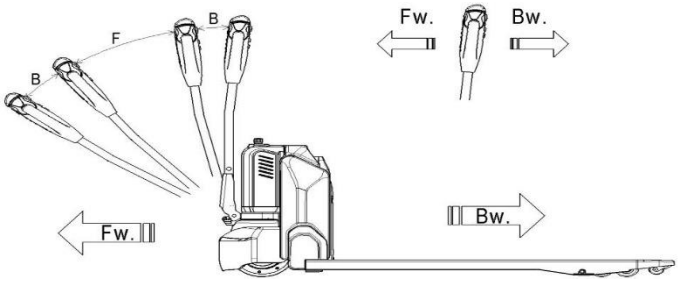


Fig. 10: Travel direction definition

After starting the truck by the access code, move the tiller to the working zone (‘F’).

Turn the accelerator (20) to the desired direction forward ‘Fw.’ or backwards Bw.’

Control travelling speed by operating the accelerator (20) carefully to the desired speed.

If the accelerator (20) is back to the neutral position, the controller decelerates the truck until the truck stops. If the truck stops, the parking brake will be engaged.

Carefully drive the truck to the destination. Watch the route conditions and adjust the travelling speed by operating the accelerator (20).

The truck supports turtle (slow) speed and travelling with tiller in vertical position.

Press turtle button (22) to slow speed mode and travel slowly by operating the accelerator, press the turtle button again to switch to regular speed mode.

Press the turtle button (22) and hold it for 2 seconds to activate the driving function with tiller in vertical position when operating in confined areas.

e. Steering

Steer the vehicle by moving the handle to the left or right. When the vehicle is moving forward (in the opposite direction of the fork), turning the handle to the right will turn the vehicle clockwise.

f. Braking

PLEASE CHECK THE BRAKING DISTANCE OF THE TRUCK BEFORE OPERATION.

THE BRAKING PERFORMANCE CAN BE INFLUENCED BY THE TRACK CONDITIONS AND THE LOAD CONDITIONS OF THE TRUCK.

The braking function can be activated in several ways:

- By moving the accelerator (20) to the neutral position or by releasing the accelerator, the regenerative braking is activated. The truck brakes until it stops.
- By moving the accelerator (20) from one driving direction directly to the opposite direction, the regenerative braking is activated until the truck starts traveling into the opposite direction.
- When the tiller is operated in the brake zone (' B ') or released, the tiller automatically moves up to the upper braking zone (' B '), the truck brakes until it stops.
- The emergency switch (21) prevents the operator from crash, once this button is activated, the truck slows down and/or begins to travel a certain distance to the rear (' Bw. ') and then stops.

g. Malfunctions

If there are any malfunctions or the truck is inoperative, please stop using the truck and activate the emergency switch (5) by pressing it. If possible, park the truck in a safe area and press “X” key on the pin-code panel. Immediately inform the manager or call your service. If necessary, move the truck out of the operating area by using dedicated towing/ lifting equipment.

h. Emergency

In emergencies or in the event of tipping over (or fall off a dock), keep a safe distance. If possible, press the emergency switch (16) and all electrical functions will be disengaged.

7. Pin-code panel

PTE15N 2 is equipped with the pin-code panel.

a. Introduction

Pin-code panel is an electronic system which is similar with an electronic alarm system. Truck will not be able to operate before entering a correct access code, the main function is to prevent unauthorized operation. In addition to the convenience of operation, it is also of great help to the anti-theft and security of the machine.

b. Main codes and functions

The PTE15N Pro is configured with a password lock and supports 1 set of manual password input operations. The password consists of four digits.

Pin-code access

The default password used by the combination lock is "1234", and the operator can directly use the password to start the vehicle

The default administrator password is 3232. You can change the password by following the steps below:

- Enter access code "3232", press "√" key.
- Enter the original user password, press "√" key.
- Enter new password, and press "√" key, the original password is updated.

In case you need to reset the password, please follow the procedures below:

- Enter *"123",* press "√" key.
- Enter *"123" again,* press "√" key. Password is reset to "1234".

8. BATTERY SAFETY, CHARGING AND REPLACEMENT

a. Description of the lithium-ion battery

- The lithium-ion battery is a battery with rechargeable cells
- the battery is designed for industrial trucks and can withstand related vibrations during operation.
- The battery is equipped with special connections for charging and discharging operations. Do not try to install or connect improper connectors to the battery.
- The battery has an intelligent battery management system, including voltage, temperature, current detection, under voltage, over voltage, low temperature, over temperature, over current, short circuit, communication and other protection safety functions.
- The internal resistance of lithium battery is generally low, which minimizes heat generation and maximizes the available power of the truck.
- The best battery life is achieved when the battery is operated at +5℃ to +40℃.
- Low temperatures reduce the effective battery capacity, high temperatures reduce the battery's life time.
- The temperature difference between the two sides of the battery shall not exceed 5°C.
- Only approved battery chargers must be used to charge the lithium battery.

b. Battery decals

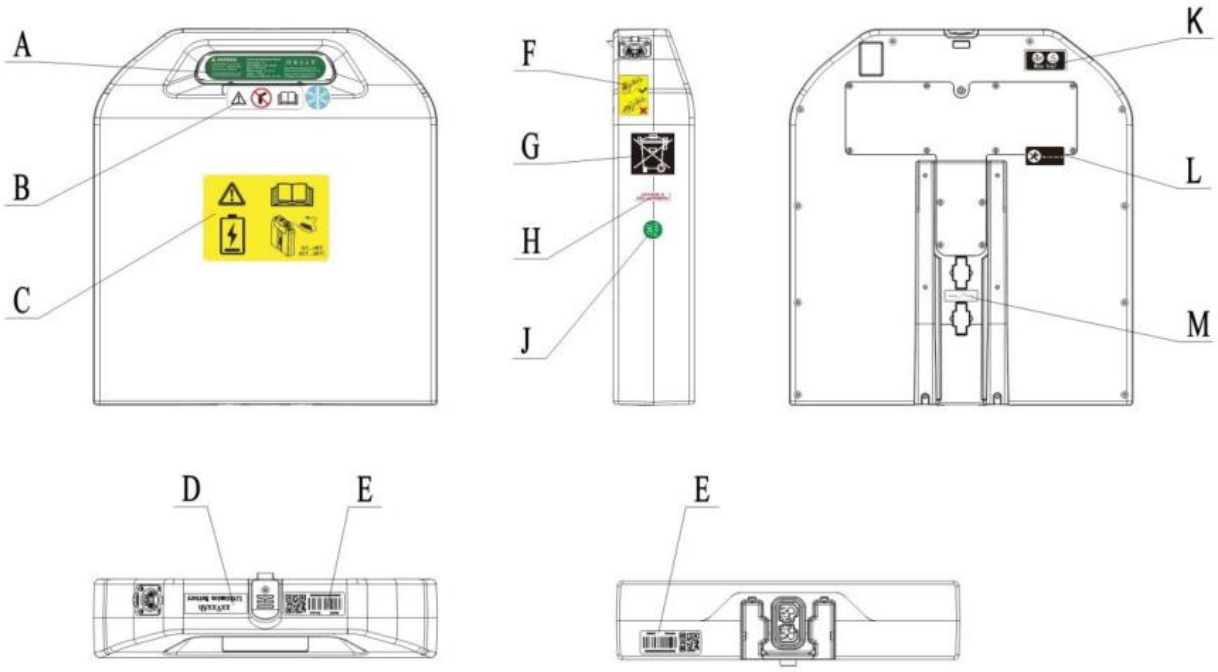


Fig. 8: Battery decals

Table 6: Description of battery decals

A	Identification plate (ID plate)	G	Sticker (do not discard the label)
B	Warning sticker (avoid collision)(with heating)	H	Sticker (removal of this sticker invalidates the warranty)
C	Warning sticker	J	Decal (QC)
D	Battery information	K	Sticker (waterproof and breathable)
E	Barcode and QR code	L	Sticker (inspection access)
F	Charging instructions	M	Decal (fuse)

The battery ID plate indicates the battery mass, and the center of gravity is approximately located in the center of the battery case. The batteries used are lithium batteries.

c. Battery charging and replacement

c.1 Charging:

- Batteries may only be charged, serviced or replaced by trained personnel.
- These operating instructions and the battery manufacturer's instructions must be observed when performing these operations.
- Before charging ensure that you are using an appropriate charger for charging the installed battery and that all safety measures are taken into consideration.
- The area for charging must be ventilated.
- The charge status of the battery is indicated by LEDs on the battery charger.

- The charging time depends on the battery charge status. The time it takes to charge an almost fully depleted battery depends both on the battery capacity and the charge current.
- The approximate duration can be calculated as follows: Charging time = capacity of battery / charge current of battery charger.
- Lithium-ion batteries can also be used when not fully charged. In this case, the remaining operating time is reduced.
- Charging continues automatically after a mains failure is restored. Charging can be interrupted by pulling out the mains connector and continued as a partial charge.
- If the battery has been hit and the battery case is damaged, do not attempt to charge it.

For trucks with built-in chargers, the charger plug (31) can be disconnected from the safety socket (3) and connected to the power socket for charging. When it is fully charged, the charger plug (31) needs to be connected to the safety socket (3).

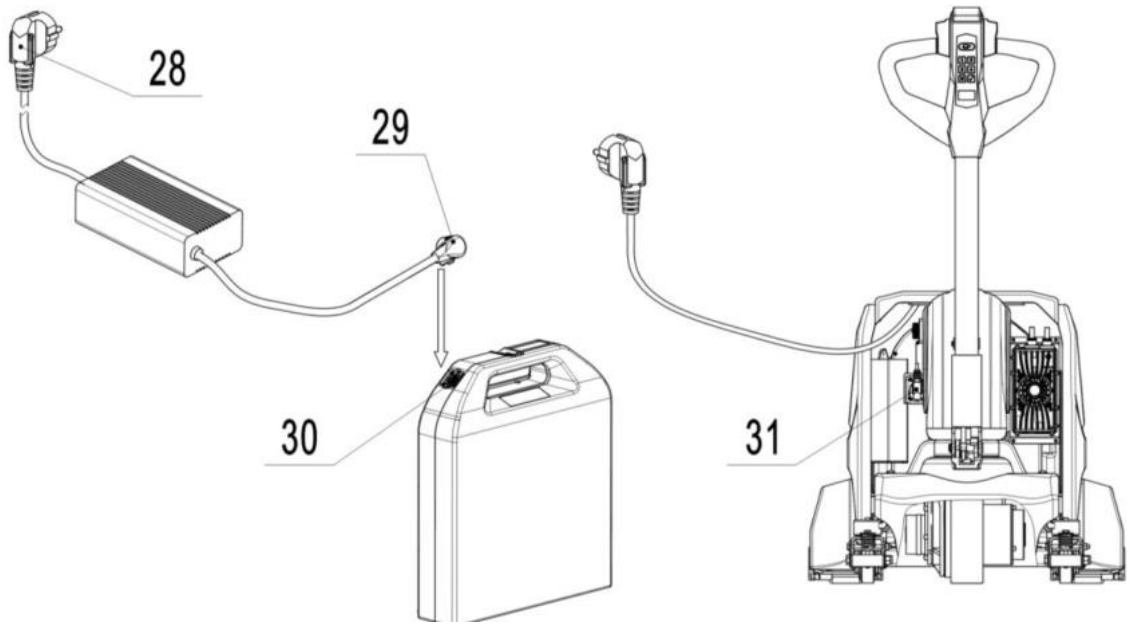
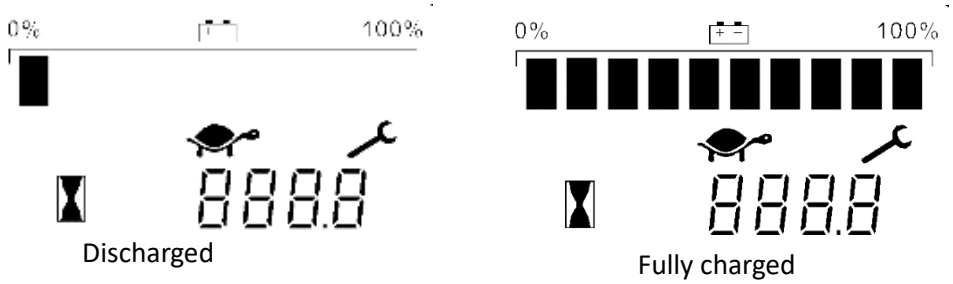


Fig.9: Battery charging

Table 7: LED-Status

LED- signal	Function
Red	Charging
Green	Fully charged

Display



Discharged

Fully charged

Fig. 10: Tiller panel

c. 2 Replacement

Park the truck securely, activate the emergency switch (16) by pressing it to turn off the truck.

Hold the battery grip and unfix the latch (27), then vertically take out the battery.

The installation is in the reverse order.

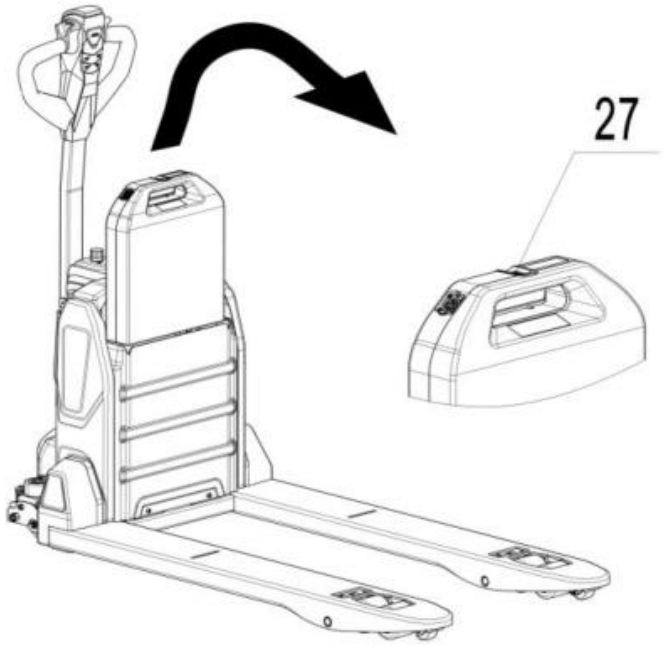


Fig. 11: Battery replacement

9: REGULAR MAINTENANCE

- Only qualified and trained personnel are allowed to do maintenance on this truck.
- Before maintaining, remove the load from the forks and lower the forks to the lowest position.
- If you need to lift the truck, follow chapter 4 by using designated lashing or jacking equipment. Before working, put safety devices (for instance designated lift jacks, wedges or wooden blocks) under the truck to protect against accidental lowering, movement or slipping.
- Please pay attention by maintain the tiller arm. The gas pressure spring is pre-loaded by compression, carelessness can cause injury.
- Use approved and from your dealer released original spare parts.
- Please consider that oil leakage of hydraulic fluid can cause failures and accidents.
- It is allowed to adjust the pressure valve only from trained service technicians.

If you need to replace the wheels, please follow the instructions above. The casters must be round and free of abnormal wear.

Check the items emphasized in maintenance checklist.

a. Maintenance checklist

Table 8: Maintenance checklist

		Interval (Monthly)			
		1	3	6	12
Hydraulic					
1	Check the hydraulic cylinder for damage noise and leakage				
2	Check the hydraulic joints for damage and leakage				
3	Inspect the hydraulic oil level, refill if necessary				
4	Replace the hydraulic oil (12 month or 1500 working hours)				
5	Check and adjust the pressure valve (1500kg(PTE15N Pro)+0/+10% or 2000kg(PTE20N Pro)+0/+10%)				
Mechanical system					
6	Inspect the forks for deformation and cracks				
7	Check the chassis for deformation and cracks				
8	Check if all screws are fixed				
9	Check the push rods for deformation and damages				
10	Check the gearbox for abnormal sound and noise				
11	Inspect the wheels for deformation and damages				
12	Inspect the steering bearing				
13	Inspect and lubricate the pivot points if necessary				
14	Lubricate the grease nipples				
Electrical system					
15	Inspect the electric wiring for damage				
16	Check the electric connections and terminals				
17	Test the Emergency switch function				
18	Check the electric drive motor for noise and damages				
19	Test the display				
20	Check, if correct fuses are used				
21	Test the warning signal				
22	Check the contactor				
23	Check the frame leakage (insulation test)				

24	Check function and mechanical wear of the accelerator				
25	Check the electrical system of the drive motor				
Braking system					
26	Check brake performance, if necessary, replace the brake disc				
Battery					
27	Check the battery voltage				
28	Clean the terminals for corrosion and damages				
29	Check the battery housing for damages				
Charger					
30	Check the main power cable for damages				
31	Check the start-up protection during charging				
Function					
32	Check the horn function				
33	Check the air gap of the electromagnetic brake				
34	Test the emergency braking				
35	Test the reverse and regenerative braking				
36	Test the safety (belly) button function				
37	Check the steering function				
38	Check the lifting and lowering function				
39	Check tiller proximity switch function				
General					
40	Check if all decals are legible and complete				
41	Inspect the castors, adjust the height or replace if worn out.				
42	Carry out a test run				

b. Lubricating points

Lubricate the marked points according to the maintenance checklist. The required grease specification is: DIN 51825, standard grease.

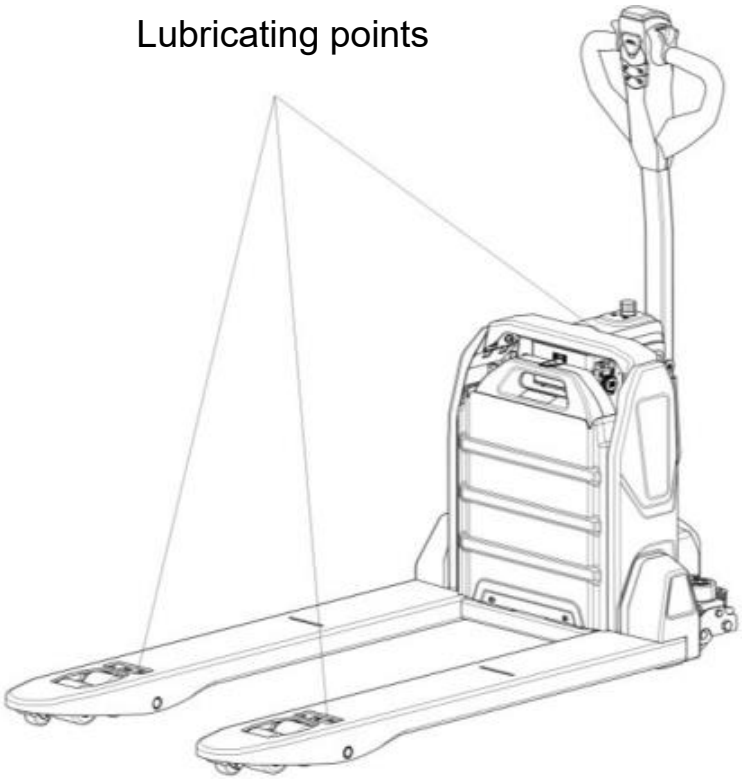


Fig. 12: Lubricating points

c. Check and refill hydraulic oil

According to the temperature recommended hydraulic oil models are:

Table 9: Hydraulic oil models

Environment temperature	–5℃~25℃	>25℃
Type	HVLP 32，DIN 51524	HLP 46，DIN 51524
Viscosity	28.8-35.2	41.4 - 47
Amount	0.4 L	

Waste materials such as waste oil, batteries or other materials must be treated and recycled in accordance with national regulations and, if necessary, handed over to a recycling company for recycling.

When the fork is lowered to the lowest level, the amount of oil should be between the min and max marks, and not exceed the max marks. When the fork is lifted to the highest level, the amount of oil should be between the min and max marks, and not lower than the min marks.

Add oil to refueling point if necessary.

d. Check electrical fuses

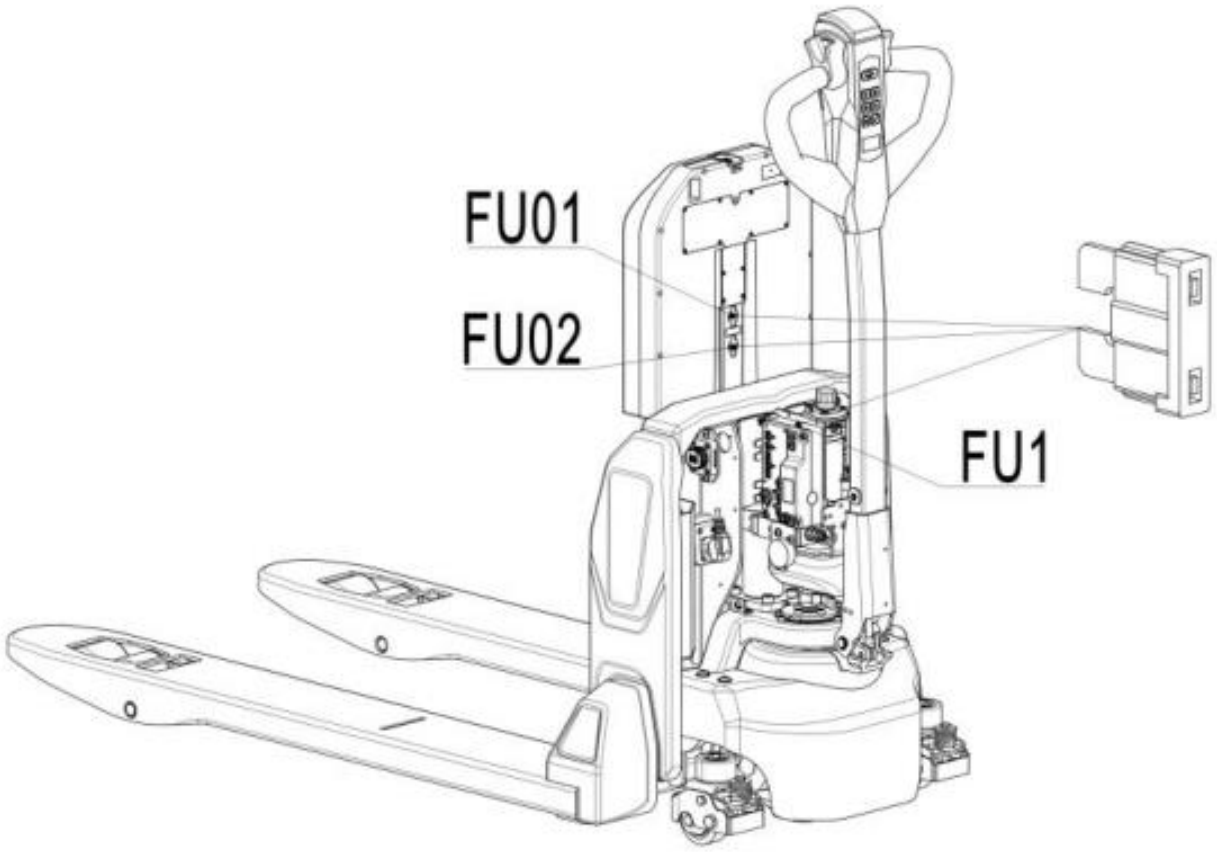


Fig. 13: Fuse location diagram

Table 10: Fuse specification

	PTE15N Pro
FU1	10A
FU01	30A
FU02	70A

10. **TROUBLESHOOTING**

- If the truck has malfunctions follow the instructions, mentioned in chapter 6.

Table 11: Trouble shooting

TROUBLE	CAUSE	REPAIR
Load can't be lifted	Load weight too high	Lift only the max. capacity, mentioned on the ID-plate
	Battery low power	Charge the battery
	Lifting contactor failure	Check and contact with service support for replacement if necessary
	Hydraulic oil level too low	Check and eventually refill hydraulic oil
	The relief valve pressure is small	Adjust the relief valve pressure
	Oil leakage	Repair the sealing of the cylinder
Oil leakage from air breathing	Excessive quantity of oil.	Reduce oil quantity.
Truck not starts operating	Battery is charging	Battery is charging
	Battery not connected	Battery not connected
	Fuse faulty	Fuse faulty
	Low battery	Low battery
	Emergency switch is activated	Emergency switch is activated
	The handle is not in the operating area	Move the tiller firstly to the braking zone.
	The built-in charger plug is not effectively plugged into the safe socket	Re-plug the internal charger into the safe socket

If the truck has malfunctions and can't be operated out of the working zone, jack the truck up and go with a load handler under the truck and safe the truck securely. Then move truck out of the aisle.

11. WIRING/ CIRCUIT DIAGRAM

a. Electrical circuit diagram

PTE15N Pro without speed reduction in steering

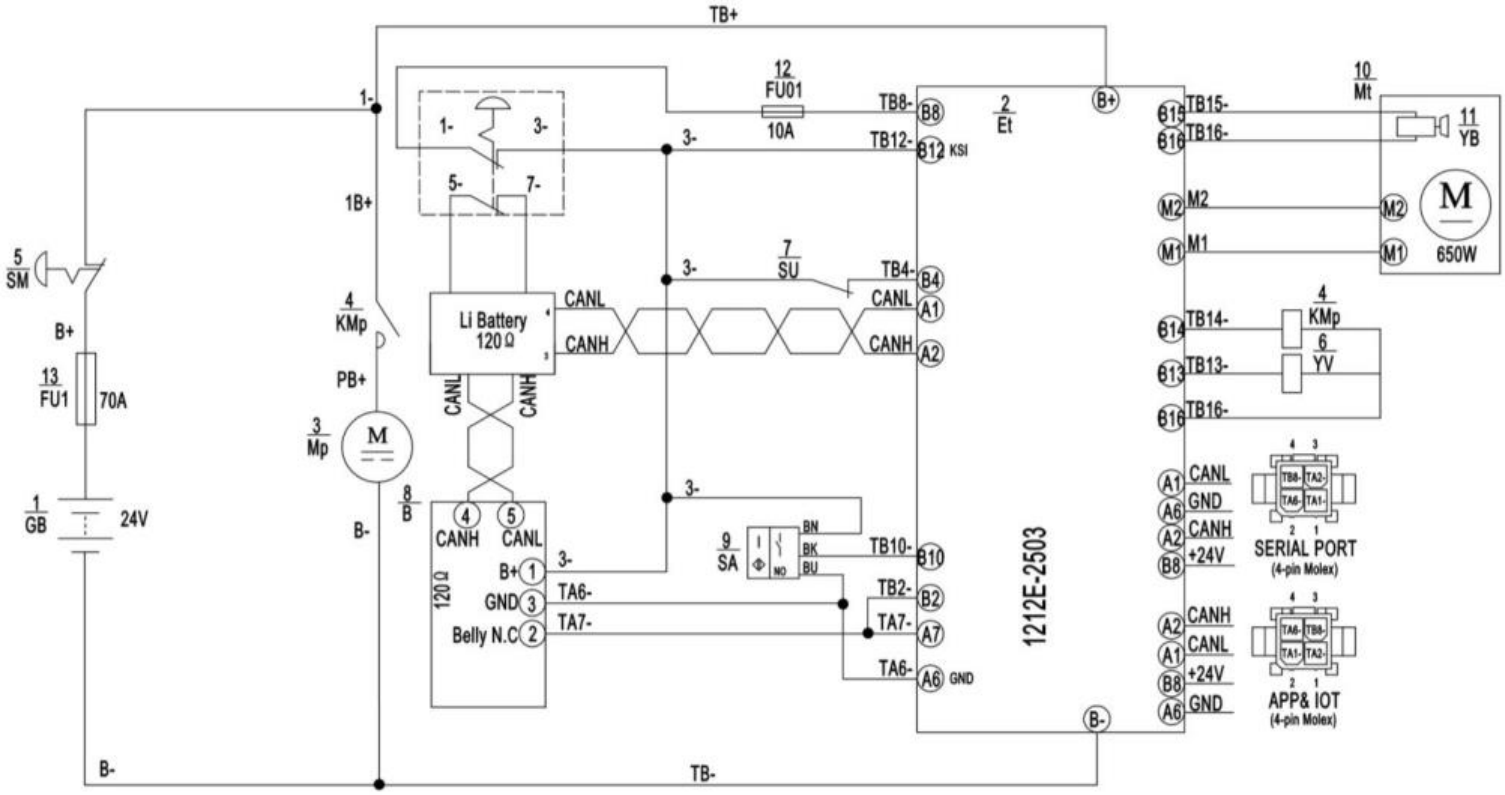


Fig. 14: Circuit diagram

table 12: Description of electrical diagram

Code	Item	Code	Item
GB	Battery	B	CAN tiller
Et	Controller	SA	Proximity switch
Mp	Pump motor	Mt	Traction motor
KMp	Pump contactor	YB	Electromagnetic brake
SM	Emergency switch	FU1	10A fuse
YV	Electromagnetic valve	FU01	70A fuse
SU	Micro switch		

PTE15N Pro with speed reduction in steering

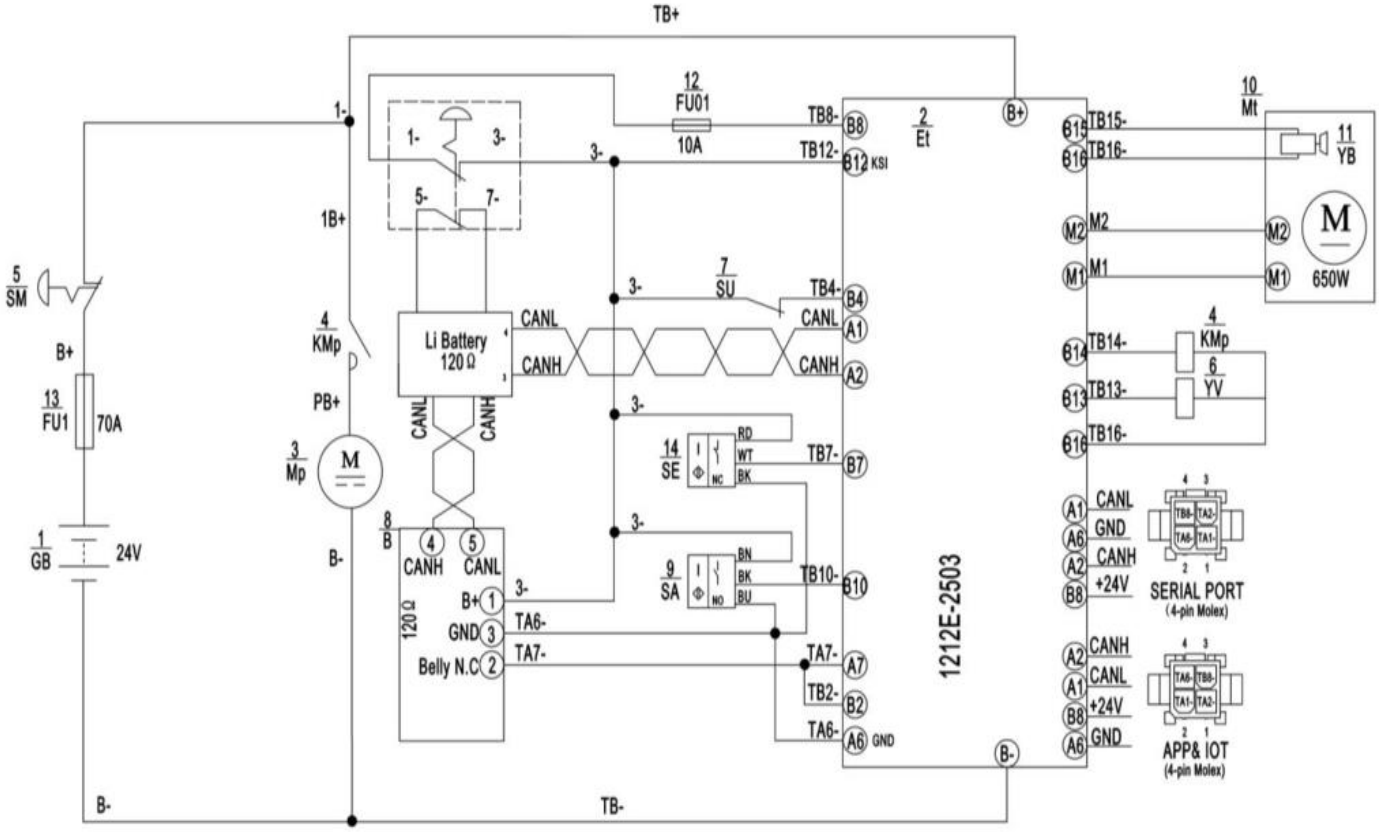


Fig 15: Circuit diagram

Table 13: Description of electrical diagram

Code	Item	Code	Item
GB	Battery	B	CAN tiller
Et	Controller	SA	Proximity switch
Mp	Pump motor	Mt	Traction motor
KMp	Pump contactor	YB	Electromagnetic brake
SM	Emergency switch	SE	Proximity switch
YV	Electromagnetic valve	FU1	10A fuse
SU	Micro switch	FU01	70A fuse

PTE15N Pro with integrated charger, without speed reduction in steering

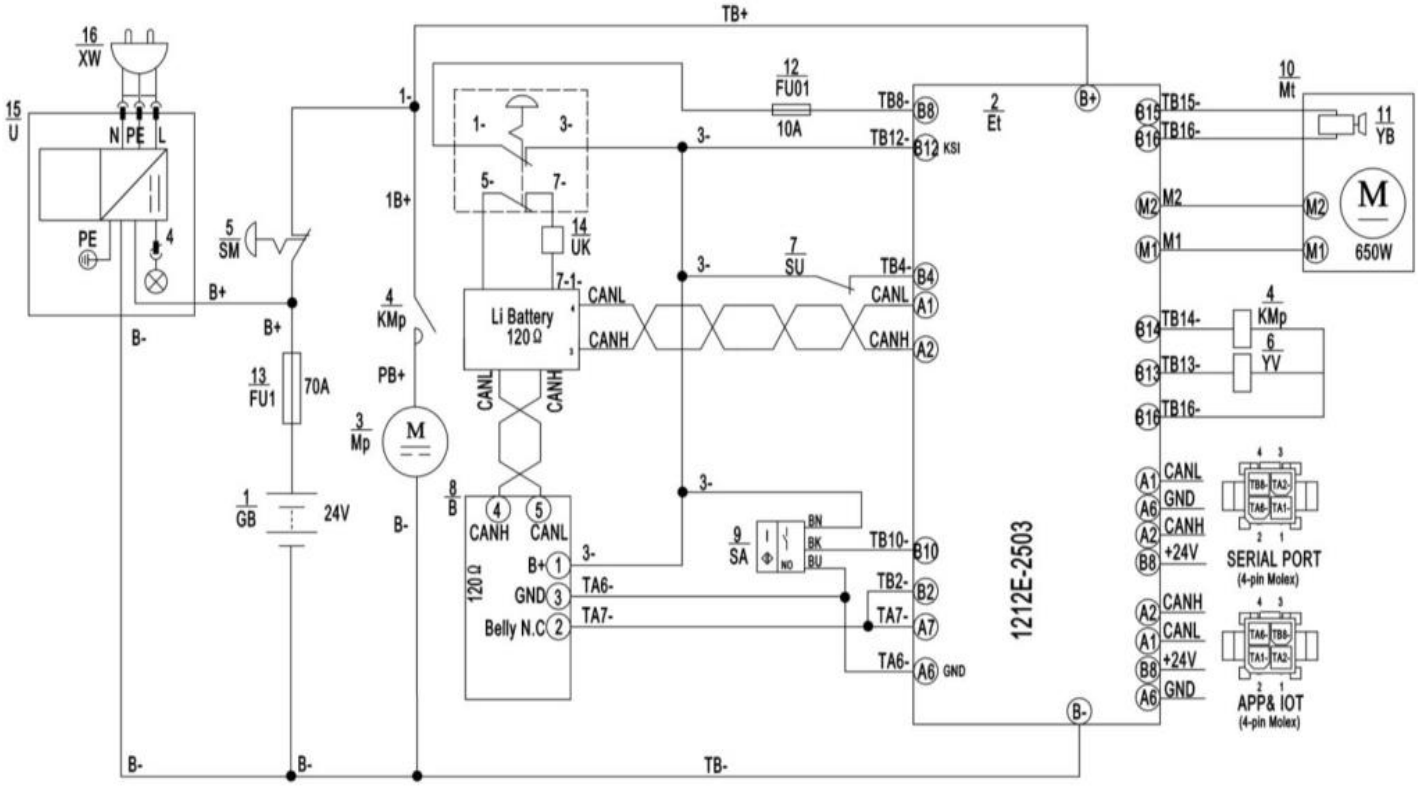


Fig. 16: Circuit diagram

Table 14: Description of electrical diagram

Code	Item	Code	Item
GB	Battery	B	CAN tiller
Et	Controller	SA	Proximity switch
Mp	Pump motor	Mt	Traction motor
KMp	Pump contactor	YB	Electromagnetic brake
SM	Emergency switch	FU1	10A fuse
YV	Electromagnetic valve	FU01	70A fuse
SU	Micro switch	UK	Safety socket
U	Charger	XW	Power input cable

PTE15N Pro with integrated charger and speed reduction in steering

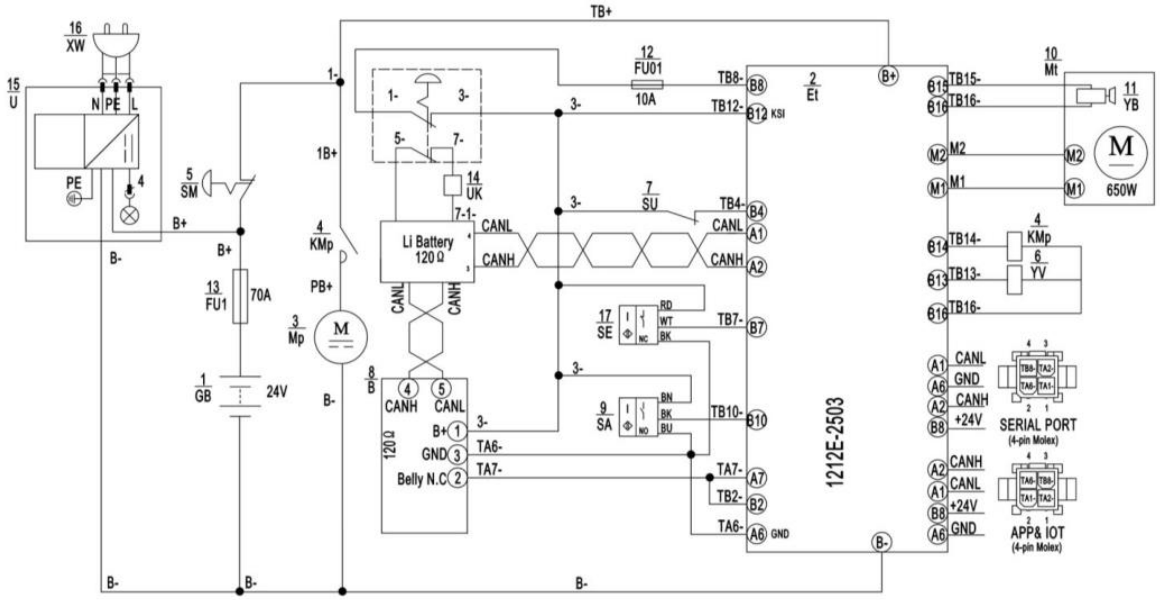


Fig. 17: Electrical diagram

Table 15: Description of electrical diagram

Code	Item	Code	Item
GB	Battery	B	CAN tiller
Et	Controller	SA	Proximity switch
Mp	Pump motor	Mt	Traction motor
KMp	Pump contactor	YB	Electromagnetic brake
SM	Emergency switch	SE	Proximity switch
YV	Electromagnetic valve	FU1	10A fuse
SU	Micro switch	FU01	70A fuse
UK	Safety socket	U	Charger
XW	Power input cable		

b. Hydraulic diagram

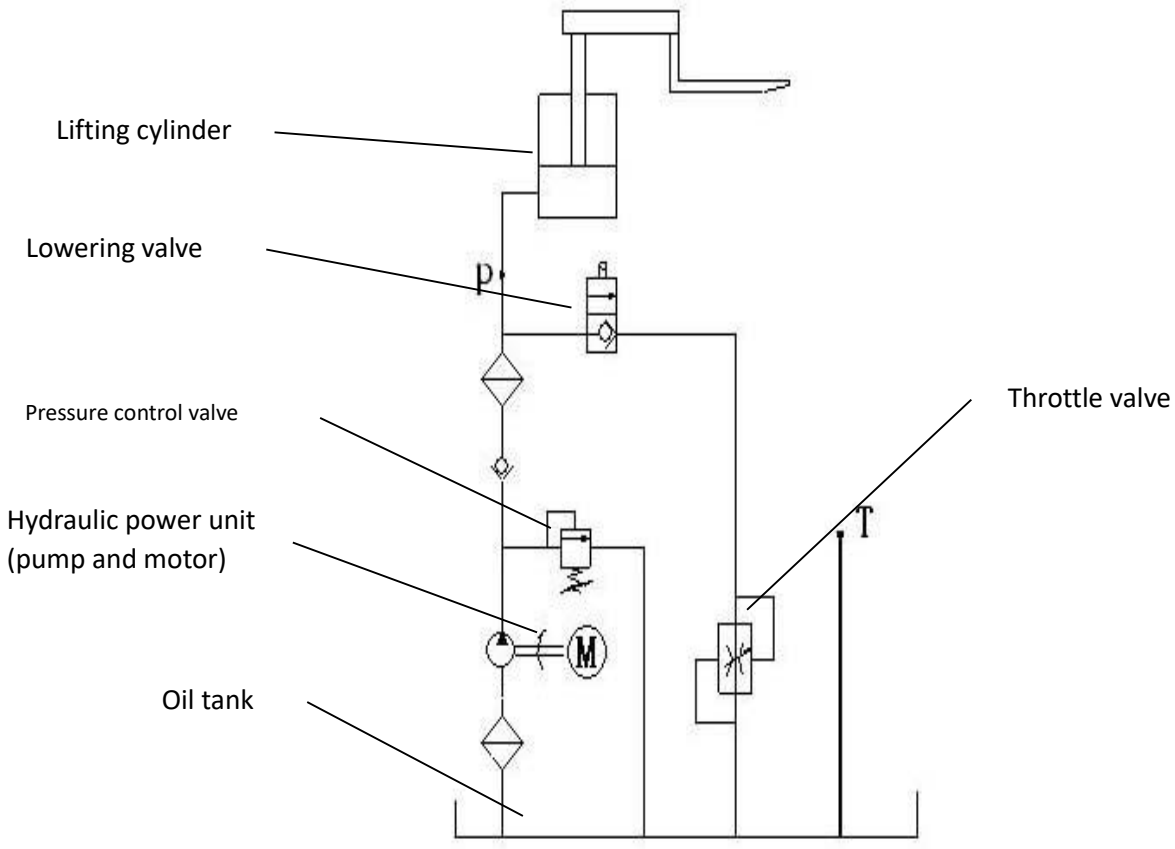


Fig. 18: Hydraulic circuit

Hydraulic oil inspection

Appearance	Scent	Situation	Results
Clear without discoloration	Good	Good	Can be used
Transparent color	Good	Mixing with other oils	Check viscosity, if it passes, it can continue to be used
Color changes like milk	Good	Mixing with air and water	Separate the water or replace the hydraulic oil
Color changes to dark brown	Not good	Oxidation	Replace the hydraulic fluid
Color is clear but with small black spots	Good	Mixing with other particles	Filter and use

12. Electronic Systems

a. Overview

The model is equipped with an electrical system consisting of the following components:

1. Batteries power the electrical system.

2. The power switch can be pressed in case of emergency to turn off all DC and AC circuits.

3. The motors, controllers and related equipment provide the necessary drive and pump power for the vehicle based on their interaction with sensors, switches, relays and actuators, as well as many parameter settings.

4. When the load is supplied with current higher than the limit, the fuse protects all DC loads from overcurrent by cutting off the power supply to the load.

5. Other DC loads activated by the operator's direct demand work independently of the controller. First, they are not controlled by the controller and are not the purpose for which they signal. However, they may interact with them in some configurations. These loads include light groups and speakers.

6. tiller displays gauges to monitor vehicles to inform users of their condition

b. Emergency switch

b-1 Appearance and specifications

b-2 Function

The emergency stop switch is used to cut off the current in the electrical system in case of emergency, thus stopping the operation of the vehicle. When pressed, all DC and AC circuits are open.

DC Circuit Open Circuit

Once the emergency stop switch is turned on, the battery is disconnected, so all DC loads are cut off.

b-3 Disassembly and installation

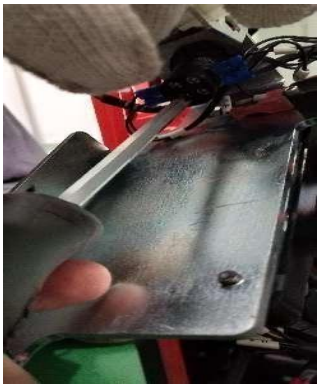
Preliminary Steps

1 Park the vehicle safely and remove the housing.

2 Cut off the power supply.

3 Disconnect the battery connector.

Emergency Stop switch disassembly and installation

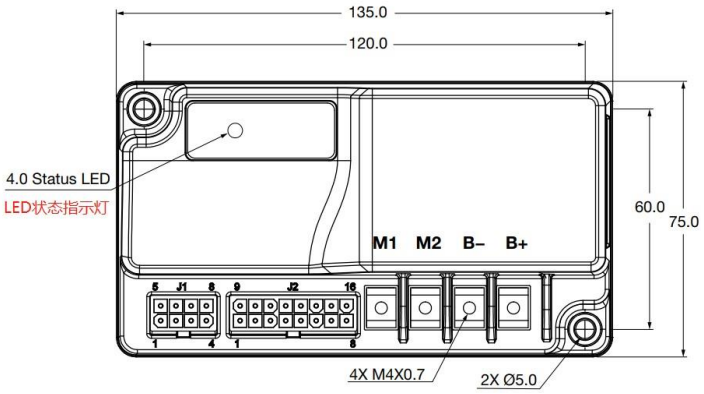
PTE15N Pro			
			
Remove the three bolts on the support using a 5mm hex socket		Use a Phillips screwdriver to remove the line under the emergency stop switch	Loosen the emergency stop switch fastening nut to remove the emergency stop switch

Conversely, installing an emergency stop switch is the reverse process of the above steps.

C. controller and related devices

C-1 Appearance

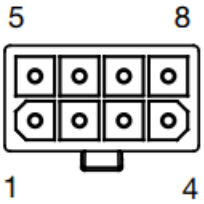
1). Controller Curtis 1212e (20 CE) (PTE15N Pro)



Docking connector： 8core Molex Mini-Fit Jr.

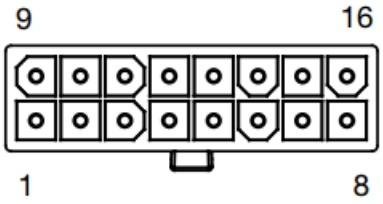
16pin Molex Mini-Fit Jr.

CONNECTOR PINOUT CHARTS



J1

Pin	Description
1	CAN L
2	CAN H
3	Switch 1
4	Charger Inhibit
5	Switch 5
6	I/O Ground
7	Switch 2
8	Horn Driver



J2

Pin	Description	Pin	Description
1	EMR NO	9	Reverse
2	Switch 3	10	Interlock
3	Pot-High / Inhibit	11	Forward
4	Lift Inhibit	12	KSI (keyswitch)
5	Mode Input	13	Lower Driver
6	Pot Wiper	14	Lift Driver
7	Switch 4	15	EM Brake–
8	B+	16	EM Brake+

C-2 Functions

The controller is connected via the following sensors, switches, relays and actuators.

These devices provide DC power and interact with the controller, which activates or receives data from them to control the machine based on a number of parameter settings.

By correctly setting the motor technical parameters and control technical parameters and function values of the controller, the safe and efficient operation performance and complete operation functions of the electric vehicle can be achieved.

1. The crawling speed of the electric vehicle can be adjusted. The crawling speed setting function of the controller enables the electric vehicle to run at low speed for a long time.

2. Acceleration rate can be set. Acceleration rate is the "soft and hard" feeling of throttle pedal when operating an electric vehicle. By setting the acceleration rate, the vehicle can meet the requirements of acceleration operation under different working conditions.

3. Maximum speed can be adjusted. Reasonable setting of maximum speed of electric vehicle can prevent traction motor from overloading due to excessive speed.

4. Safety protection function. If the power element of the controller is damaged during vehicle operation, the controller will disconnect the main contactor in the shortest time. When the controller temperature rises too high, the controller automatically limits the armature current of the motor. When the battery voltage is too low, the controller stops working for safety.

5. The motor controller has self-diagnostic function. In the process of working, once the controller fails, the fault code will be displayed on the tiller display instrument, and the controller will automatically stop working to ensure the security of the operating system.

6. The tiller display will show the battery power and the accumulated working hours.

C-3 Test Curtis 1212E Controller

Measure the diode voltage of the AC MOSFET circuit inside the controller to check whether it is burned or damaged.

Remove the cables and harnesses connected to the controller and completely discharge the internal capacitor (discharge the B+ and B- terminals with a resistor 30Ω/5W).

Use a multimeter to measure according to the table below and check whether it is normal. Each test item must be tested more than 3 times.

Item	Multimeter terminals		Normal value range	
	Red test lead	Black test lead	Measurement of polarity value	Measurement of resistance value
1	B+	B-		40KΩ+
2	B+	M2		80KΩ+
3	B+	M1		80KΩ+
4	M1	M2		60KΩ+
5	B-	M2	0.3-0.6V	
6	B-	M1	0.3-0.6V	

Multimeter pull to Ω file (resistance value determination) Multimeter pull to diode file (polarity value determination)

C-4 Disassembly and installation

1.Remove the housing to access the drive motor controller.

2.Turn off the emergency stop switch.

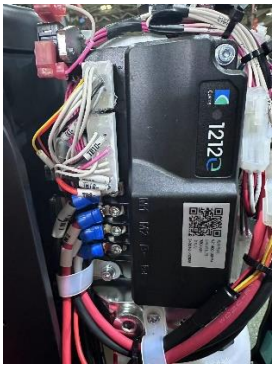
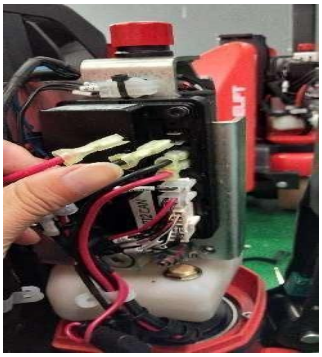
3.Disconnect the battery.

4.Keep the emergency stop switch on so that the power module can discharge. Twice for 30 seconds.

5. Turn off the emergency stop switch.

Note: Please remember that the controller contains ESD (Electrostatic Discharge) sensitive components. Proper precautions should be taken when connecting, disconnecting and handling.

Controller disassembly and installation

PTE15N Pro Controller Disassembly		
		

Before removing the controller, remember the wiring order, the cable from top to bottom is power positive, power negative, motor negative, motor positive	Unplug the wire	Remove the controller by removing two controllers anchor bolts with 5 mm inner hexagonal

Installing the controller is the reverse of the above steps.

d. **Tiller head**

d-1 Function

The tiller head controls some of the vehicle's movements through up and down buttons, belly switches, turtle buttons, throttle and combination locks and controller interplay.

A combination lock

B lift and lower

C belly switch

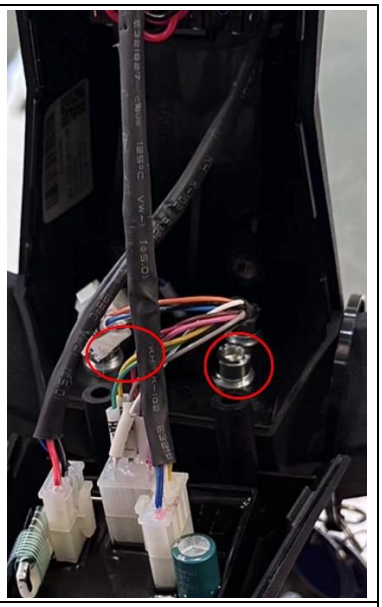
D throttle

E turtle switch

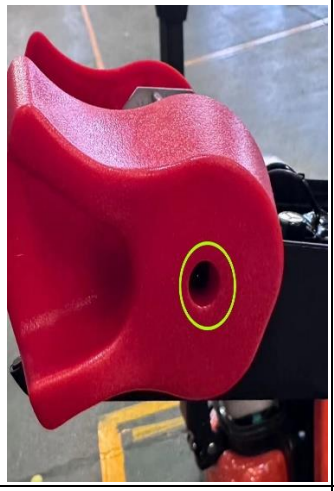
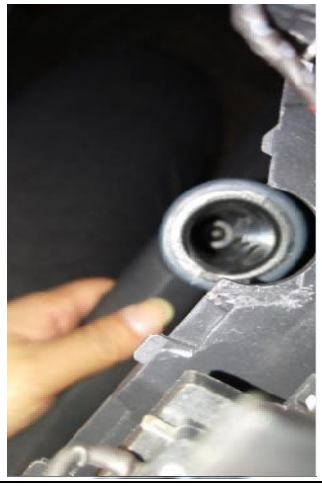
F horn switch

d-2 Tiller Head disassembly and Installation

1.Disassembly of tiller

		
Tiller rear cover fixing bolt removed with 5mm hexagon socket	Remove the tiller back cover by unplugging the connector	tiller front cover 4 fixed bolts can be removed with a 5mm hexagonal socket, you can remove the tiller

2. Tiller sub-part disassembly

			
Pinch both sides of the switch button snap, you can remove the switch button	After the removal of the two switch buttons, the original switch button position below the implementation of a Phillips screwdriver to unscrew the micro switch set can be removed	Remove the bolt here with a 3mm hexagon socket to remove the gas pedal handle	Remove the bolt inside the handle tube with a 4mm hexagonal socket to remove the handle glove

Installing the tiller and subassemblies is the reverse process of the above steps.

13. Drive/Brake System

a. Overview

The drive/brake system includes the following:

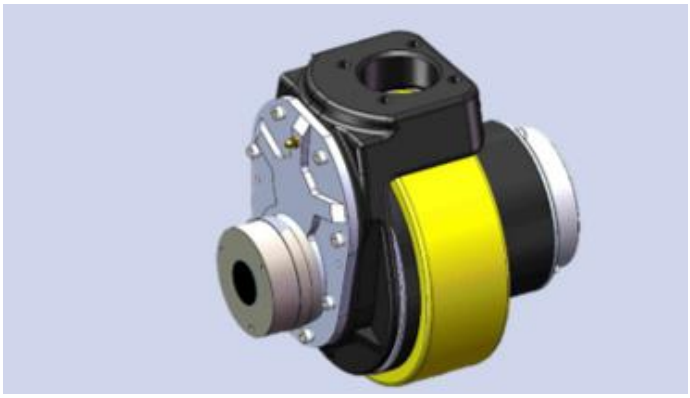
1) The drive motor controlled by the controller transmits the rotational force to the drive shaft (electric power mechanical power).

2) The drive shaft converts the rotational force transmitted from the drive motor into torque and speed suitable for driving through its gear set and sends them to the corresponding wheels (mechanical power). They also contain service brakes, which are electromagnetic brakes controlled by a controller to generate braking power (friction).

3) The accelerator sends the CAN number to the drive motor controller to accelerate the motor (CAN signal)

a-1 Driver Assembly

Appearance



The 15N2 is equipped with a 24V0.65kW Yongxuan Φ210 drive unit.

Operation

On the electric side, the drive motors turn their drive wheels so that the vehicle can move forward/backward

Controlled by controller

Each drive motor is connected to the controller via M1 and M2 wires. The controller operates the drive motor based on inputs from a number of switches and sensors, as well as internal parameter settings.

The drive motor operates when the following conditions are met:

1. Battery connection, emergency switch on to supply power to the controller,

2. Move the tiller to the operating area.

3. Determine the driving direction.

3. Twist the accelerator on the tiller

Drive Assembly disassembly and Installation

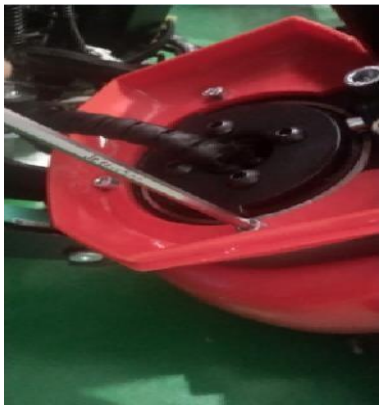
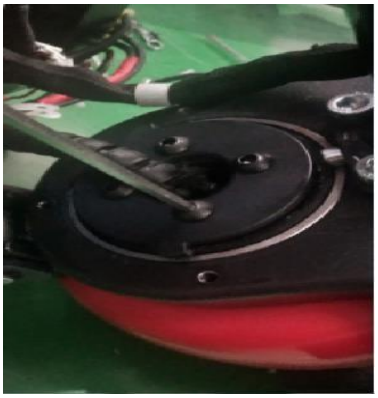
Preliminary steps

1. Park the vehicle safely and remove the drive wheel cover

2. Turn off the emergency stop switch.

3. Disconnect the battery connector

Procedure

		
1. Remove with 5mm hexagon	2. Use 6mm hexagon to remove 4 bolts on the bearing cover, here the bolts need to be installed with 1243 strength thread adhesive	3. The drive assembly is dropped so that the drive part is separated from the car body
		
4. Use iron or other hard objects to pad the middle hole and use a puller to disassemble the bearing	5. After the removal of the tapered bearing, the four bolts below the bearing can be removed with a 6mm hexagon to remove the connection flange, where the bolts need to be installed with 1243 strength thread adhesive	6. Round cover fixing bolts in the connection flange below, you need to turn over the connection flange, with 5mm hexagonal removal

Installing the drive assembly is the reverse of the above steps.

Note: Bearing GB276-6013-2RS (Step 3)

Tapered roller bearing type GB297-32913 on the connecting flange (Step 5)

b. Brake

Appearance

Brake Disassembly

PTE15N2 Brake Disassembly

Remove the brake by removing the three brake retaining bolts with a 5mm hexagon socket.

c. Troubleshooting

c-1 Drive motor

Problem	Possible Cause
Drive motor does not work	Switches not closing (battery connector, tiller proximity switch, accelerator): Turn off the switch. If it still doesn't work, use a voltmeter to test the power to the control panel and the current to each switch.
	Poor signal. Fuse blown: Check battery connection. Check the battery connector connection. Check fuses, drivers and logic. Replace fuse if blown. Check the drive motor and control panel for possible blown fuses. Some reasons are: Operating under excessive load, current limit is too high
	Low battery voltage: Check battery terminal voltage. If it's too low, recharge the battery.
Drive motor does not work	Excessive carbon brush wear（Spring pressure piece to the lowest position of the carbon brush groove）
Traction does not work during normal work, but hydraulic operation is normal	The brakes were defective, causing excessive drag. Heat builds up, causing the motor to stall. Check brake adjustment.
	Heavy traction loads: Reduce duty cycle loads.
Neither traction nor hydraulics will last the entire normal	The vehicle has a battery that is too small:
	The battery is not fully charged during battery charging: Check if the battery is charged Check if the battery charger is faulty.

operating period	The battery replacement interval is too long or the cooling time of the replacement battery is too short.
	The battery has one or more defective cells causing the battery's rated capacity and capabilities to be below normal:
	The drive system is consuming too much battery power due to a drive system failure. Check brake adjustment. Check wheel bearings, axles and other mechanical components so that corrections can be made to eliminate the fault. Change to tires with less friction
	Excessive battery drain from the hydraulic system due to lift failure, or incorrect hydraulic conditions for the duty cycle Check the mast for restrictions during operation.
	After a work shift, the vehicle works beyond its designed capacity without available power:
The positive (+) or negative (-) pole of the battery is in direct contact with the vehicle frame (body) or drive motor	Battery or control panel wire connections that make contact with the vehicle frame: Do a continuity test and move the wire contact. Remove wires sequentially until fault clears. The fault will break at the end of the wire
	Dirty Motor：Please clean up the toner in time
	Wet Motor：The motor is damp
The vehicle is not reaching its top speed	The battery is not fully charged or has a bad battery: Charge the battery.
	Faults in the drive motor, control panel, or drive train: Check vehicle speed in both directions and turn to speed limit proximity switch. If control panel adjustments are required, follow the appropriate section of Section 2 Electrical Systems. If the drive motor fails, test the motor assembly

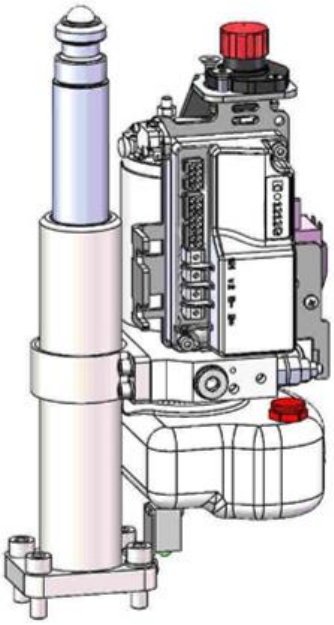
c-2 Dirver box

Problem	Possible Cause
Noise or vibration in the gearbox	Out of lube: Meet the correct amount of lubricant
	Using non-standard oils: Replace oil with standard oil.
	Gears are damaged or dented: Change the gear.
	Bearing damage: Replace bearings.
	Loose mounting bolts: Apply thread compound to the threads of the bolt and retorque to the specified torque.
Noise or vibration in the brake disc pack	Using non-standard friction material: Replace friction material with standard material.
	Friction lining wear: Replace the friction lining.
Installation part leaks	Loose mounting bolts: Apply thread compound to the threads of the bolt and retorque to the specified torque.

14. Hydraulic System

a. **Overview**

The hydraulic system is composed of working oil pump, lifting cylinder and piping and other components. The hydraulic oil is supplied by the oil pump directly connected to the motor. The oil pump pumps the hydraulic oil to the cylinder.



The hydraulic system is highly integrated with the electrical system, greatly reducing the length of the car body l2, which is easy to install and repair;

There is no tubing connection between the pump station and the cylinder, which greatly reduces the risk of oil leakage at the connection and improves the possibility of the hydraulic system.

The hydraulic system operates the lifting cylinders by means of pressurized hydraulic oil from the main hydraulic pump and pumps out the oil discharged from these cylinders.

1) The main hydraulic pump is driven by the pump motor controlled by the controller.

2) The main hydraulic pump pressurizes the oil in the hydraulic tank using the rotational force output from the motor and delivers the oil to the lifting cylinders.

3) The hydraulic oil tank stores the hydraulic oil returned from the lifting cylinder. The stored oil is sucked by the main hydraulic pump for reuse.

b. **Pump assembly**

b-1 Pump motor

The pump motor electrically transmits power to the main hydraulic pump to pump hydraulic fluid to operate the hydraulic system.

The pump motor is connected to the controller via a motor contactor. The controller operates the pump motor contactor based on inputs from multiple switches and sensors and internal parameter settings.

The pump motor operates when the following conditions are met:

The emergency stop switch is open.

Limit switch and rise button are closed.

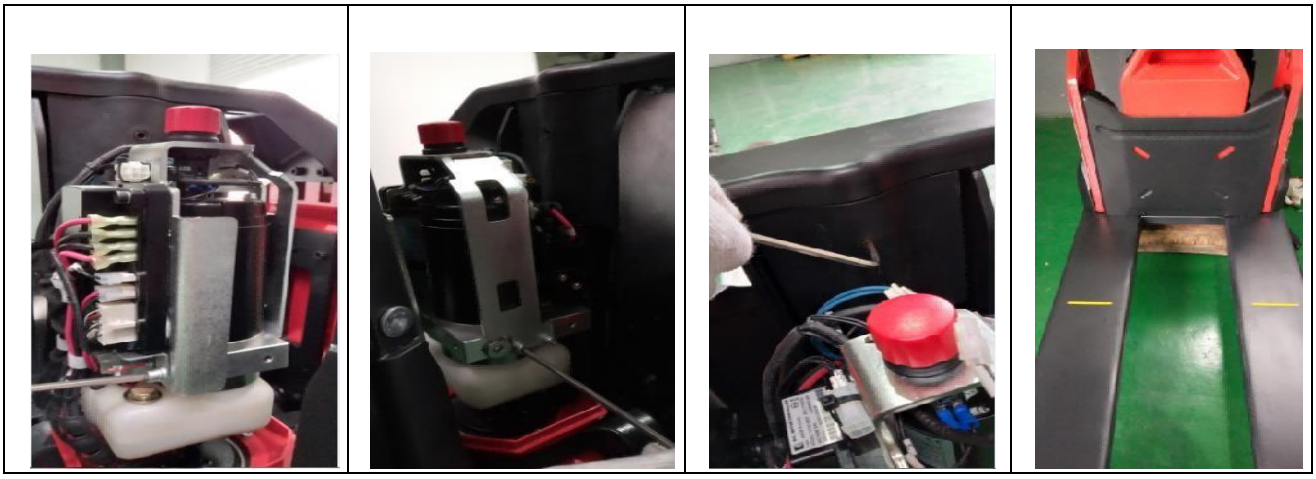
Pump motor contactor is engaged

Pump motor contactor Inspection:

For the pump motor contactor, as shown in Fig.

and check that it measures the specified value.

b-2 pump station disassembly (pump body and cylinder connection part of PTE15N2 reference cylinder disassembly) installation



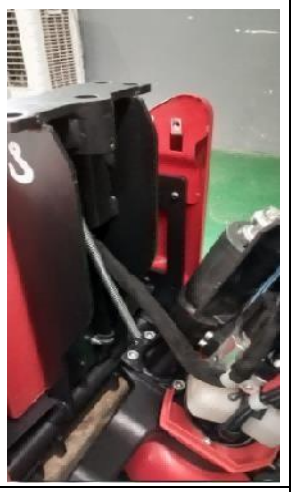
Remove the left fixing bolt of the bracket with a 5mm hexagon socket	Remove the right fixing bolt of the bracket with a 5mm hexagon socket	Remove the cylinder head locating bolt with a 5mm hexagon socket	Use wooden blocks to pad the front half of the vehicle
			
The vehicle is energized, press and hold the down button, and give the upper end of the cylinder a slight downward pressure to make the piston rod retract	When the piston rod leaves the upper seat, place the rear half backward	Remove the connection bolt between the cylinder and the pump station with a 5mm hexagon socket; use 1243 strength thread adhesive to tighten the bolt here.	O-ring specification is 13.5*1.8
			
Use a screwdriver to loosen the clamp	The tank and the pump station can be pulled apart. When installing the pump station, pay attention to whether the O-ring is installed in place and cannot be stuck by the tank opening and exposed outside and not in the groove.	Note: Pump station pressure adjustment First use a 10mm wrench to loosen the nut counterclockwise	Note: Pump station pressure adjustment Then use the 3mm hexagonal pressure adjustment, tighten is pressurized spin loose is to release pressure

Installing a pump station is the reverse of the above steps.

C. Lifting cylinder

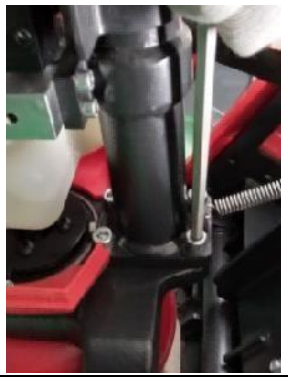
The cylinder is powered by a pump station.

Cylinder disassembly and installation

			
Remove the cylinder head locating bolt with a 5mm hexagon socket	Use wooden blocks to pad the front half of the vehicle	The vehicle is energized, press and hold the down button, and give the upper end of the cylinder a slight downward pressure to make the piston rod retract	When the piston rod leaves the upper seat, place the rear half backward
		The separation of the cylinder from the pump station and the disassembly of the cylinder, see next page, there are slight differences in the structure of PTE15N2 and PTE15N	
Remove the mounting sleeve from the top of the cylinder	Remove the connection bolt between the cylinder and the pump station with a 5mm hexagon socket; use 1243 strength thread adhesive to tighten the bolt here.		

Mounting the cylinder is the reverse process of the above steps.

	
PTE15N 2, O-ring specifications are 12.7 * 9.8 * 1.25, 9.5 * 1.8, in addition to the pump body O-ring specifications with PTE15N for 13.5 * 1.8	

		
Remove the cylinder base bolt with a **6mm** hexagon; use **1222** strength thread adhesive when installing the bolt here.	**PTE15N2** can be directly removed from the cylinder, **PTE20N2**'s cylinder has a nut here, after disassembly, the cylinder can be removed	The spring here is used to hang the front and rear drive part of the frame after the cylinder is disassembled to prevent it from falling apart. The size of the spring is **Φ10.4*Φ1.6*160**, and the two ends are hooked on the car body separately.

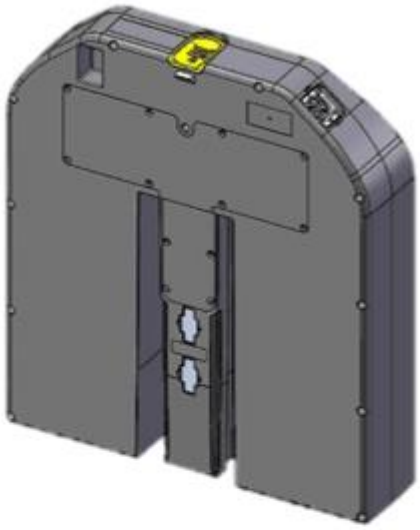
d. **Troubleshooting**

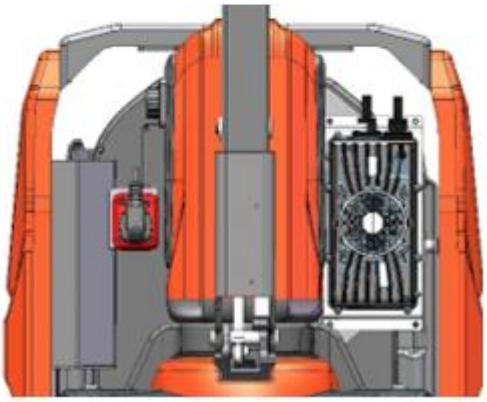
Pump motor

Problem Display	Possible Cause
Hydraulic pump motor does not work.	Poor connection or blown fuse. Check battery connection. Check key fuse. Check the hydraulic pump motor for possible blown fuses.
	power switch, upper limit switch, line contactor not closed. Turn off the power switch. Use a multimeter to check power flow through the power switch, line contactor coil, and line contactor. The power switch must be turned off.
	The voltage is not enough. Charge the battery or replace the battery. Check that the cable terminals are a tight fit with the battery terminals and control panel connectors. Check for broken wires inside the cable.
	Improper operation of lift and drive systems
	During battery charging operation, the battery is not fully charged.
	The hydraulic system is consuming too much battery power due to lift or hydraulic control not being correct for the duty cycle.
	The hydraulic pump motor is overheating. If the motor temperature reaches 155°C (311°F)

15. Main components, disassembly and installation and description requirements

a. Battery upgrade





15N Pro equipped with 2420, 2440(heating optional),

Battery back design maintenance window, replace BMS, secondary protection module, fuse more convenient;

The battery has added a lock slot and a breathing valve;

The battery connector has been upgraded from 6 to 10 cores to better adapt to the built-in charger configuration.

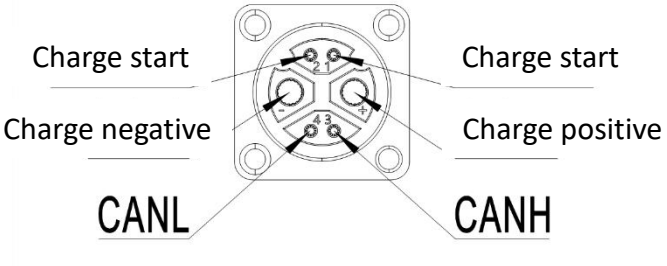
b. Charging port configuration

PTE15N Pro

Five contact points

Unlike the first generation, the first generation 24V20Ah battery charging port has no CANH and CANL

Charging port definition



PTE15 Pro

Three contact points

c. Discharge port configuration

PTE15N

Installation on both sides, discharge on the side

PTE15N Pro

Assemble directly according to the setting of the slot, and discharge in the middle

d. Frame Upgrade

PTE15N2 frame upgrade: the leg thickness is 4.5mm, the 75mm lower leg thickness is 5mm, the column is lengthened to the lower beam, and the double battery guide column, the frame welding strength is greatly improved;

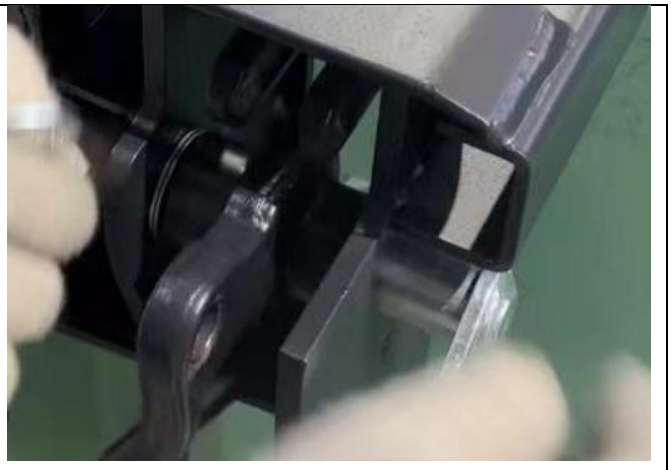
e. Installation of the ring rod

PTE15N ring rod

PTE15N Pro ring rod

The second generation of the ring rod is more lightweight (select ring rod according to the frame)

Trunnion Φ24.6x85

	
Tap the left and right sides separately	Install the ring rod with a trunnion threaded through the ring rod with an elastic washer to adjust the thickness. (same as left and right)
	
Tighten the screw with the M8x16 screw	

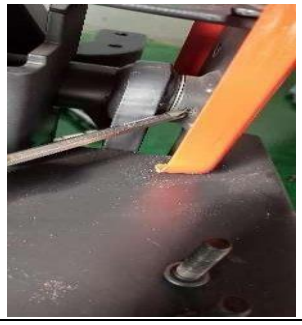
Disassembling the ring rod is the reverse process of the above steps

f. **Disassembly of coverings**

		
Remove the two bolts on the top of the motor cover using a 4mm hex socket to pull them out upwards	Remove two bolts on the left and right sides of the drive cover using a 6mm hexagonal socket	Remove the two bolts on the inside of both sides of the top cover with 6mm inner hexagonal

		
The front cover is fixed with one bolt on the left and right sides, and can be removed with a 6mm inner hexagon	Two bolts in front and bottom of the front cover. Remove the front cover with 6mm inner hexagonal	Three bolts in triangular area below the inside of both sides secured the side cover and can be removed with 6 mm inner hexagonal

g. Chassis disassembly

		
The ring bar and the front Chassis pin shafts can be pulled out by simply tapping one of the elastic pins out with a punch. Here the elastic pin specification is 6*40	The pin at the connection between the ring bar and the rear Chassis needs to be removed from the reed and then pulled out of the pin	Replacing the bearing wheel first knocks out the four elastic pins at the finger with a punch, where the specifications of the elastic pins are 5*30
		
The bearing wheel can be replaced by knocking out the bearing pin shaft	Replacing the arm block first requires that the elastic pin at the finger be knocked out with a punch to separate the arm block from hassis, where the elastic pin specification is 5*30	Then use the punch to knock out the elastic pin here, i.e. The pusher can be separated from the arm block, where the elastic pin size is 5*28

h. Drive Wheel Ring Replacement

PTE15N2 Drive Wheel	
	
When replacing the drive wheel, cut off the tie and unplug the motor cable connector	Remove 10 retaining bolts of driving wheel ring with 5 mm inner hexagonal angle, then remove the wheel ring, pay attention to the location of positioning holes and pins during installation Note: When the thickness of the PU ring is less than 1/3 of the thickness of the new ring, the new ring thickness is (13mm).

i. Disassembly and adjustment of auxiliary wheels

	
Two **17mm** wrenches remove one end nut and pull out the screw to remove the wheel ring	The pressure adjustment of the auxiliary wheel frame only needs a **13mm** wrench, and the screw rotates clockwise, counterclockwise or decompressed as shown in the figure.

j. Tiller Proximity Switch Disassembly and Installation

Preliminary steps

First park the vehicle safely, turn off the emergency stop switch and disconnect the power.

1). Press down on the tiller and disconnect the proximity switch harness.

2). Remove the proximity switch set screw and remove the proximity switch.

To install the tiller proximity switch, follow the above steps in reverse order.

k. Pump station contactor disassembly and installation

	
Use a 10mm open-end wrench to remove the contactor pile head cable, use a Phillips screwdriver to remove the contactor bracket fixing bolt, remove the contactor together with the bracket and then split	Remove the line at the contactor insert

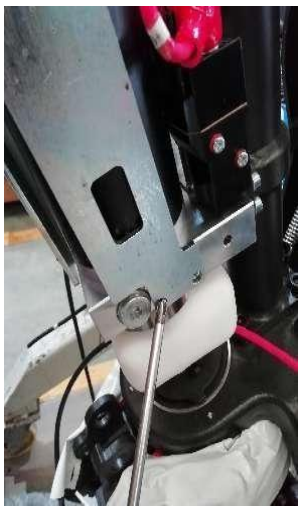
Installing the contactor is the reverse process of the above steps.

m. Pump station motor disassembly and installation

	
First, use a 10mm open-end wrench to remove the cable on the motor, then use a 10mm wrench to loosen the two bolts on top of the motor and pull them out to remove the pump station motor	The motor top cover will be pulled off, visible 4 carbon brushes, each two welded to the motor positive and negative pile head

Installing the motor is the reverse process of the above steps.

n. Limit micro switch disassembly and installation

PTE15N Pro		
		
Remove a total of three bracket fixing screws as shown in the figure	Lift fixing bracket	Remove the limit micromotion switch by removing the fixing screw with a hexagon in 3mm

Installing the limit microswitch is the reverse process of the above steps.

o. Torque requirement for main fixing screw

Picture example	position	Fastener Name	Tightening requirements
	Connection flange and drive wheel connection screw	Screw GB70.1-M10x25-8.8	Torque 50N.m Diagonal Tightening
	Bearing cover and connecting flange connection screw	Screw GB70.2-M8x16-10.9	Torque 30N.m diagonally tightened
	Lift cylinder and drive wheelset connect screw	screw GB70.1-M10x30-8.8	Torque 50N.m diagonal tightening;
	Pumping station valve block and lifting cylinder connection screw	screw GB70.1-M6x16-8.8 flat washer GB97.1-6-200HV	Torque 8 N.m Diagonal Tightening in Stages

	Universal Wheel Component Connects with Drive Wheel Seat	screw GB70.1-M10x25-8.8 flat washer GB97.1-10-200HV	Torque 50N.m；

16.CURTIS Handheld programmer

Operating Precautions:

The handheld unit note function is to facilitate vehicle inspection and maintenance. Adjustment of controller parameters is not allowed without the approval of the vehicle manufacturer to avoid vehicle and personal safety accidents.

After the handheld unit modifies the parameters, it will be saved automatically and only needs to be turned off the power switch and restarted.

The CURTIS handheld unit can be connected with the controller powered or unpowered

Note: The electronic control of PTE20N2 can not connect to the handheld unit before mid-2018. The connection wires are different from PTE15N and the software on PC side is different.

Process of Vehicle Fault Reading

Please turn on the power switch after connecting the handheld unit to the controller Check for the faults based on the CURTIS handheld unit menu list

When running the vehicle, the flashing line of the handheld cursor will prompt English fault content, which can be interpreted by referring to the fault code list

Vehicle Signal Inspection

Please turn on the power switch after connecting the handheld programmer to the controller

Check for the Monitor based on the CURTIS handheld menu list

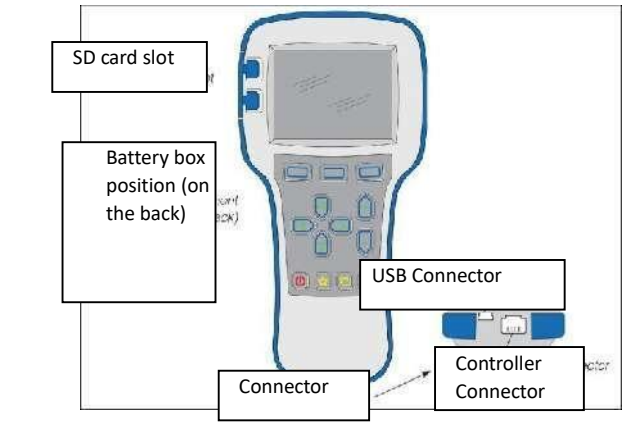
Please open the corresponding Inspection menu sub item according to the need, run the vehicle, and observe the change of handheld value.

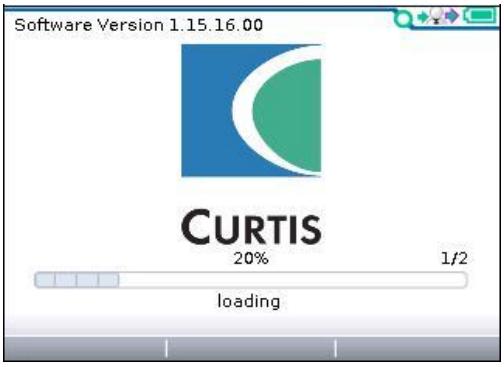
Contents of CURTIS Handheld Menu

The Curtis 1313 handheld programmer is used to configure the Curtis electronic control system. The set parameters, real-time monitoring controller data and fault diagnosis may be adjusted and saved through this programmer.

Warning：The control system will affect the performance of vehicle's acceleration, deceleration, hydraulic system and brakes. Hazardous conditions may occur if the vehicle control system is incorrectly programmed or beyond safety limit. Only the vehicle manufacturer or authorized service agent may program the control

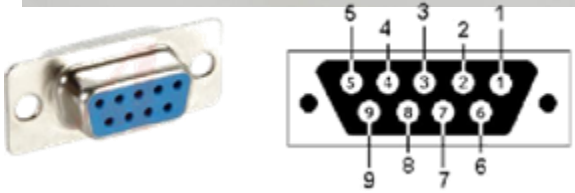
The programmer has two interfaces with a battery box and a memory card slot, of which one is used to communicate with electric control, and the other is used to communicate with PC.





Once the 1313 HHP has uploaded the information from the controller, it displays the Main Screen

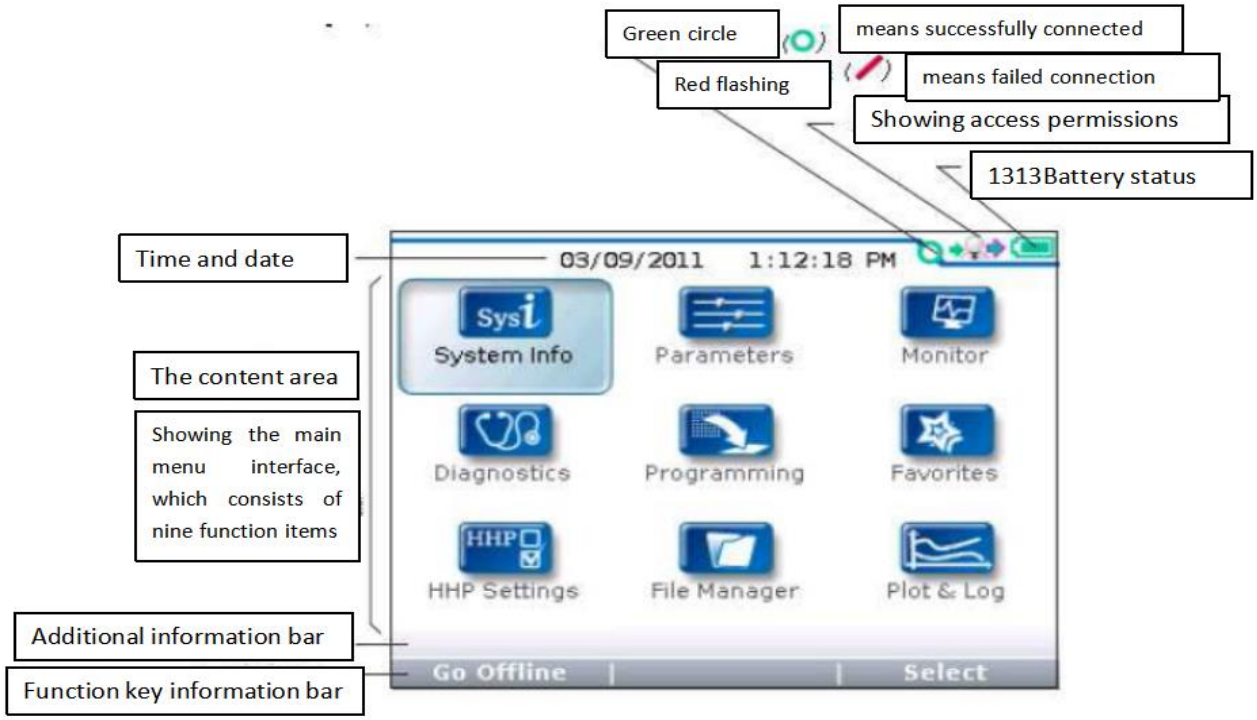
Programmer power on



1313-xx31 Wiring	
D-Sub Pin	Function
7	CAN_H
2	CAN_L
9	B+ (8–36 V)
6	B–

Vehicle wiring harness wiring for CAN connections 1313HHP

The handheld programmer is connected to the controller by plugging the cable of the handheld programmer into the programming port of the controller. After connecting to the controller, the handheld programmer will automatically power up and display the control information on the programmer.



Function keys

The three keys will be blank because the function of the three keys is based on the specified content. At any given time, the functions of the buttons are displayed on the LCD screen above. Directional arrow key

The information displayed can be selected by pressing up, down, or left or right through 4 directional keys.

+ / - Button

The parameters can be added or subtracted by the two keys. Meanwhile, "+" refers to "Yes" in the operation system, and "-" refers to "No", which may be used as a scrolling options in some cases

Power switch

When the programmer inserts an already powered controller, it is not necessary for the programmer to be initiated by pressing the power switches, and the programmer will start up automatically. When it is held down for a few seconds, the programmer will prompt turn off confirmation, which shall be answered by selecting "Yes" or "No" of the function keys. When the programmer is turned off, a few seconds of pressing will trigger the restarting of the

Menu structure

The main menu consists of nine submenus, each of which is displayed with a specific icon, and each item of the submenu is arranged in a hierarchy.

Some menus contain one item only, but most menus contain more than one item, and you can access the next level of submenus through each folder. It is possible for you to expand the table through grid options, enter a set of execution commands through dialog options, and return to the next level of menu whichever interface you are in.

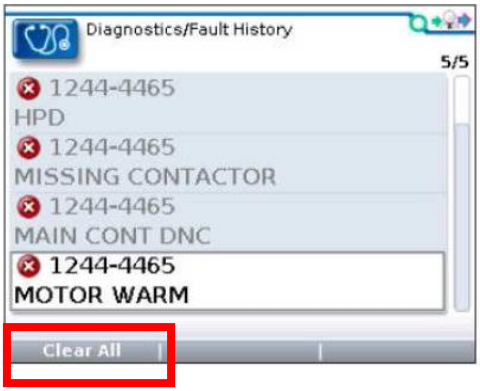
All nine submenu names are shown in bold on the main menu and below the icons. When you enter the stepped menu, the name of the submenu or the path you are in are displayed at the top of the screen.

Nine main menus

。Fault diagnosis menu

In the main menu, Select the "Diagnostics" Fault diagnosis icon and press the corresponding function key to enter the Fault diagnosis menu, which includes two folders: "Present Errors" and "Fault History"

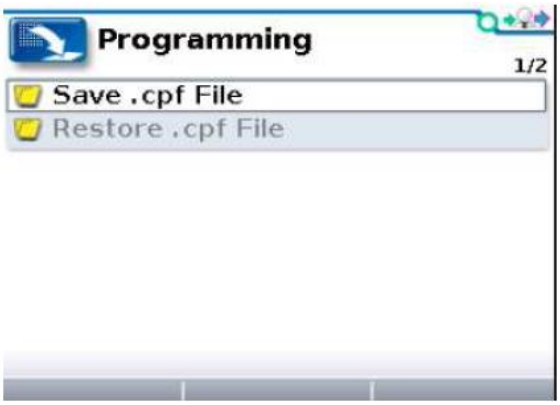
Note: the fault caused by a temporary event captured in the circuit is not a real system fault in some cases. and you can determine if the fault really exists by restarting the system and observing the automatic fault indication. In the history failure folder, the failures listed are all failures encountered after the last history failure was cleared, which can be restarted by clearing the fault content in the entire folder.



"Clear All" is used to Clear the history failure folders. A function key will be highlighted separately if there is a history failure in the history failure folder, and will be grayed out if there is no history failure.

Programming edit menu

In the main menu, Select the "Programming" programming icon and press the corresponding function key of "Select" to enter the menu. You can store and restore parameter setting files (.cpf files) through the programming menu.



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 need, and you need to name each. cpf file with a different name.Restore.cpf File

Restore.cpf File

You can select the. cpf file saved earlier to replace the. cpf file of the current controller. When the whole data recovery process is completed, a dialog box will pop up on the screen asking for the

17. Troubleshooting for Each Fault Code

a. PTE15N2 tiller error check list (Curtis 1212E)

PTE15N2 tiller error check list (CURTIS, 1212E)						
No.	**Tiller Fault Code**	**Fault Name**	**Possible Reason**	**Fault Source**	**CAN Address**	**Note**
1	**11-1**	Severe Undervoltage	Controller defective Battery defective	1212E Controller	ID:0X2AC	
2	**12-1**	Undervoltage Cutback	Incorrect battery voltage Main relay defective Controller AD defective	1212E Controller	ID:0X2AC	
3	**13-1**	Severe Overvoltage	Incorrect battery voltage Main relay defective Controller AD defective	1212E Controller	ID:0X2AC	
4	**13-2**					
5	**14-1**	Overvoltage Cutback	Incorrect battery voltage Main relay defective Controller AD defective	1212E Controller	ID:0X2AC	
6	**15-1**	Controller Severe Undertemp	Temperature sensor defective	1212E Controller	ID:0X2AC	

			Low ambient temperature			
7	**16-1**	Controller Overtemp Cutback	Temperature sensor defective High current for a long time	1212E Controller	ID:0X2AC	
8	**17-1**	Controller Severe Overtemp	Temperature sensor defective	1212E Controller	ID:0X2AC	
9	**21-1**	Throttle Fault	Throttle wiring fault Incorrect throttle type setting Incorrect throttle operation Steering Angle Pot wiring fault	1212E Controller	ID:0X2AC	
10	**21-2**					
11	**21-3**					
12	**21-4**					
13	**22-1**	HPD Sequencing	Incorrect throttle operation Throttle defective	1212E Controller	ID:0X2AC	
14	**23-1**	Main Relay Welded	Main relay defective	1212E Controller	ID:0X2AC	
15	**24-1**	Main Relay Did Not Close	Main relay defective Incorrect relay pull in voltage setting	1212E Controller	ID:0X2AC	
16	**24-2**					

17	**25-1**	Main Driver Fault	Main driver defective	1212E Controller	ID:0X2AC	
18	**25-2**					
19	**26-1**	Precharge Failed	Precharge PTC defective	1212E Controller	ID:0X2AC	
20	**26-2**					
21	**31-1**	Stall Detected	Precharge PTC defective	1212E Controller	ID:0X2AC	
22	**32-1**	Motor Short	Motor Short	1212E Controller	ID:0X2AC	
23	**32-2**					
24	**33-1**	Motor Open	Motor Open	1212E Controller	ID:0X2AC	
25	**33-2**					
26	**34-1**	EM brake failed To Set	EM brake defective	1212E Controller	ID:0X2AC	
27	**41-1**	Push SRO	Incorrect operation sequence Controller defective	1212E Controller	ID:0X2AC	
28	**42-1**	Interlock SRO Fault	Incorrect operation sequenc Controller defective	1212E Controller	ID:0X2AC	
29	**43-1**	Low BDI	Battery over discharged	1212E Controller	ID:0X2AC	
30	**44-1**	Speed Supervision	Speed is out of allowed range	1212E Controller	ID:0X2AC	
31	**44-2**					
32	**44-3**					
33	**44-4**					
34	**44-5**					

35	**51-1**	Over Current Fault	Controller defective Current sensor defective	1212E Controller	ID:0X2AC	
36	**52-1**	Current Sense Fault	Current sampling circuit defective	1212E Controller	ID:0X2AC	
37	**52-2**					
38	**53-1**	Driver Fault	Driver open or short Incorrect parameter settings	1212E Controller	ID:0X2AC	Motor, main contactor, electromagnetic brake, handle
39	**53-2**					interlock
40	**53-3**					Lifting contactor
41	**53-4**					Lowering solenoid valve
42	**54-1**	PUMP SRO Fault	Incorrect operation sequence Switch defective Incorrect parameter settings	1212E Controller	ID:0X2AC	
43	**54-2**					
44	**54-3**					
45	**54-4**					
46	**54-5**					
47	**55-1**	EMR SRO Fault	EMR switch defective EMR Incorrect operation sequence Incorrect parameter settings	1212E Controller	ID:0X2AC	
48	**55-2**					
49	**55-3**					

50	**56-1**	Creep SRO Fault	Incorrect operation sequence Cost	1212E Controller	ID:0X2AC	
51	**56-2**					
52	**56-3**					
53	**56-4**					
54	**61-1**	PDO Timeout PDO	CAN bus too heavy Incorrect parameter setting	1212E Controller	ID:0X2AC	
55	**61-2**					
56	**61-5**					
57	**62-SDO Abort ID**	PDO Mapping Error	Incorrect variable data length Incorrect access mode Incorrect CAN index	1212E Controller	ID:0X2AC	
58	**71-1**	Hardware Fault	MOSFET defective Micro defective	1212E Controller	ID:0X2AC	
59	**71-2**					
60	**71-3**					

61	**71-4**					
62	**71-5**					
63	**72-1**	Software Fault	Internal communication failed Incorrect firmware Change controller mode to work mode from test mode	1212E Controller	ID:0X2AC	
64	**72-2**					
65	**72-3**		Received CAN Node Reset command during running			
66	**81-Parameter index**	Parameter Out Of Range	Incorrect variable data	1212E Controller	ID:0X2AC	
67	**82-1**	Parameter Fault	Incorrect parameter settings FRAM defective	1212E Controller	ID:0X2AC	
68	**82-2**					
69	**82-3**					
70	**82-4**					
71	**82-6**					
72	**83-Block num**	NV Failure	FRAM operation failed	1212E Controller	ID:0X2AC	
73	**83-2**					
74	**83-3**					

75	**83-4**					
76	**83-5**					
77	**84-code**	Supervision	Cross check failed	1212E Controller	ID:0X2AC	
78	**84-2**	SUPERVISOR_FIFTEEN_V_SUPPLY_FAILURE				
79	**84-8**	SUPERVISOR_HARDWARE_FAULT				
80	**84-11**	PRIMARY_INIT_CAN_OBJ				
81	**84-12**	PRIMARY_INIT_ILLEGAL_CAN_SIZE				
82	**84-13**	PRIMARY_INIT_CAN_SIZE				
83	**84-14**	PRIMARY_INIT_TIMEOUT				
84	**84-15**	PRIMARY_WRITE_OJECT				
85	**84-16**	PRIMARY_WRITE_SIZE				
86	**84-17**	PRIMARY_WRITE_TIMEOUT				
87	**84-18**	PRIMARY_WRITE_CRC				
88	**84-19**	PRIMARY_WRITE_ACK				
89	**84-20**	PRIMARY_TASK_QUEUE_FAIL				
90	**84-21**	PRIMARY_FAULT_ACTIONS				
91	**84-22**	PRIMARY_ALU_FAIL				
92	**84-23**	PRIMARY_MESSAGE_WATCHDOG				
93	**84-24**	PRIMARY_FAULT_ACK				
94	**84-25**	SUPERVISOR_INIT_CAN_OBJ				
95	**84-26**	SUPERVISOR_INIT_ILLEGAL_CAN_SIZE				
96	**84-27**	SUPERVISOR_INIT_CAN_SIZE				

97	**84-28**	SUPERVISOR_INIT_TIMEOUT				
98	**84-29**	SUPERVISOR_WRITE_OJECT				
99	**84-30**	SUPERVISOR_WRITE_SIZE				
100	**84-31**	SUPERVISOR_TASK_QUEUE_FAIL				
101	**84-32**	SUPERVISOR_ALU_FAIL				
102	**84-33**	SUPERVISOR_MESSAGE_WATCHDOG				
103	**84-34**	SUPERVISOR_KSI				
104	**84-35**	SUPERVISOR_INPUT_1_SWITCH				
105	**84-36**	SUPERVISOR_INPUT_2_SWITCH				
106	**84-37**	SUPERVISOR_INPUT_3_SWITCH				
107	**84-38**	SUPERVISOR_INPUT_4_SWITCH				
108	**84-39**	SUPERVISOR_INPUT_5_SWITCH				
109	**84-43**	PRIMARY_INPUT_1_SWITCH				
110	**84-44**	PRIMARY_INPUT_2_SWITCH				
111	**84-45**	PRIMARY_INPUT_3_SWITCH				
112	**84-46**	PRIMARY_INPUT_4_SWITCH				
113	**84-47**	PRIMARY_INPUT_5_SWITCH				
114	**80**	Mode fault	Tiller Turtle speed button failure, Turtle speed button detected closed	Tiller		

			before power on.			
115	**81**	Lift fault	Rise button failure, the rise button is detected as being pressed before the power is turned on.	Tiller		
116	**82**	Lower fault	Faulty drop button, the drop button is detected as being pressed before the power is turned on.	Tiller		
117	**83**	BMS Communication Outage	Lithium battery communication timeout, 1. Lithium battery BMS damaged. 2. Lithium battery to Tiller communication line broken. 2. Tiller communication module damaged.	Tiller		
118	**84**	throttle_FAULT	The gas pedal is not in the neutral position before the code is entered, and the gas pedal needs to be reset to clear the fault.	Tiller		

119	**85**	Controller Communication Outage	Controller communication lost	Tiller		
120	**86**	Lift system failure	Pump station output continuous operation, lifting system failure, possibly rising micro switch failure	Tiller		
121	**90**	Over Voltage	Battery voltage is too high. 1, may be the charger overcharge. 2, battery BMS problems. 3, the vehicle for a long time downhill, caused by the feedback current charging.	Lithium Battery	0X2F0	
122	**91**	Over Discharge	Battery over-discharge. 1, lithium batteries are not used for a long time, resulting in low battery power. 2, overuse.	Lithium Battery		
123	**92**	Communication Outage	Battery communication timeout, communication timeout with controller	Lithium Battery		

124	**93**	Under Voltage	Battery voltage is too low, 1, long-term storage, not in time to charge. 2, the battery internal cell damage, resulting in the inability to charge into the power.	Lithium Battery		
125	**94**	Over Current	Battery overcurrent, 1, the use of equipment is not in accordance with the original program set by the controller to run. 2, after the replacement of the controller, the parameters do not match. 3, the lithium battery current Inspection problems.	Lithium Battery		
126	**95**	Over Temperature Protect	Severely high battery temperature, use or transport environment, causing severe internal high temperature of the battery.	Lithium Battery		

127	**96**	Temperature Protect	High battery temperature, use or transport environment, causing high temperature inside the battery.	Lithium Battery		

b. PTE15N2 Controller fault code table (Curtis 1212E)

PTE15N2 Controller fault code table（CURTIS，1212E）						
No.	**Controller fault Light**	**Fault Name**	**Possible Reason**	**Fault Source**	**CAN Address**	**Note**
1	**1，1**	Severe Undervoltage	Controller defective Battery defective	1212E Controller	ID:0X2AC	
2	**1，2**	Undervoltage Cutback	Incorrect battery voltage Main relay defective Controller AD defective	1212E Controller	ID:0X2AC	
3	**1，3**	Severe Overvoltage	Incorrect battery voltage Main relay defective Controller AD defective	1212E Controller	ID:0X2AC	

4	**1, 4**	Overvoltage Cutback	Incorrect battery voltage Main relay defective Controller AD defective	1212E Controller	ID:0X2AC	
5	**1, 5**	Controller Severe Undertemp	Temperature sensor defective Low ambient temperature	Controller Severe Undertemp	ID:0X2AC	
6	**1, 6**	Controller Overtemp Cutback	Temperature sensor defective High current for a long time	Controller Overtemp Cutback	ID:0X2AC	
7	**1, 7**	Controller Severe Overtemp	Temperature sensor defective	Controller Severe Overtemp	ID:0X2AC	
8	**2, 1**	Throttle Fault	Throttle wiring fault Incorrect throttle type setting Incorrect throttle operation Steering Angle Pot wiring fault	1212E Controller	ID:0X2AC	
9	**2, 2**	HPD Sequencing	Incorrect throttle operation Throttle defective	1212E Controller	ID:0X2AC	
10	**2, 3**	Main Relay Welded	Main relay defective	1212E Controller	ID:0X2AC	
11	**2, 4**	Main Relay Did Not Close	Main relay defective Incorrect relay pull in voltage setting	1212E Controller	ID:0X2AC	

12	**2, 5**	Main Driver Fault	Main driver defective	1212E Controller	ID:0X2AC	
13	**2, 6**	Precharge Failed	Precharge PTC defective	1212E Controller	ID:0X2AC	
14	**3, 1**	Stall Detected	Precharge PTC defective	1212E Controller	ID:0X2AC	
15	**3, 2**	Motor Short	Motor Short	1212E Controller	ID:0X2AC	
16	**3, 3**	Motor Open	Motor Open	1212E Controller	ID:0X2AC	
17	**3, 4**	EM brake failed To Set	EM brake defective	1212E Controller	ID:0X2AC	
18	**4, 1**	Push SRO	Incorrect operation sequence Controller defective	1212E Controller	ID:0X2AC	
19	**4, 2**	Interlock SRO Fault	Incorrect operation sequenc Controller defective	1212E Controller	ID:0X2AC	
20	**4, 3**	Low BDI	Battery over discharged	1212E Controller	ID:0X2AC	
21	**4, 4**	Speed Supervision	Speed is out of allowed range	1212E Controller	ID:0X2AC	
22	**5, 1**	Over Current Fault	Controller defective Current sensor defective	1212E Controller	ID:0X2AC	
23	**5, 2**	Current Sense Fault	Current sampling circuit defective	1212E Controller	ID:0X2AC	

24	**5, 3**	Driver Fault	Driver open or short Incorrect parameter settings	1212E Controller	ID:0X2AC	
25	**5, 4**	PUMP SRO Fault	Incorrect operation sequence Switch defective Incorrect parameter settings	1212E Controller	ID:0X2AC	
26	**5, 5**	EMR SRO Fault	EMR switch defective EMR Incorrect operation sequence Incorrect parameter settings	1212E Controller	ID:0X2AC	
27	**5, 6**	Creep SRO Fault	Incorrect operation sequence Cost	1212E Controller	ID:0X2AC	
28	**6, 1**	PDO Timeout PDO	CAN bus too heavy Incorrect parameter setting	1212E Controller	ID:0X2AC	
29	**6, 2**	PDO Mapping Error	Incorrect variable data length Incorrect access mode Incorrect CAN index	1212E Controller	ID:0X2AC	
30	**7, 1**	Hardware Fault	MOSFET defective Micro defective	1212E Controller	ID:0X2AC	

31	**7, 2**	Software Fault	Internal communication failed Incorrect firmware Change controller mode to work mode from test mode Received CAN Node Reset command during running	1212E Controller	ID:0X2AC	
32	**8, 1**	Parameter Out Of Range	Incorrect variable data	1212E Controller	ID:0X2AC	
33	**8, 2**	Parameter Fault	Incorrect parameter settings FRAM defective	1212E Controller	ID:0X2AC	
34	**8, 3**	NV Failure	FRAM operation failed	1212E Controller	ID:0X2AC	
35	**8, 4**	Supervision	Cross check failed	1212E Controller	ID:0X2AC	