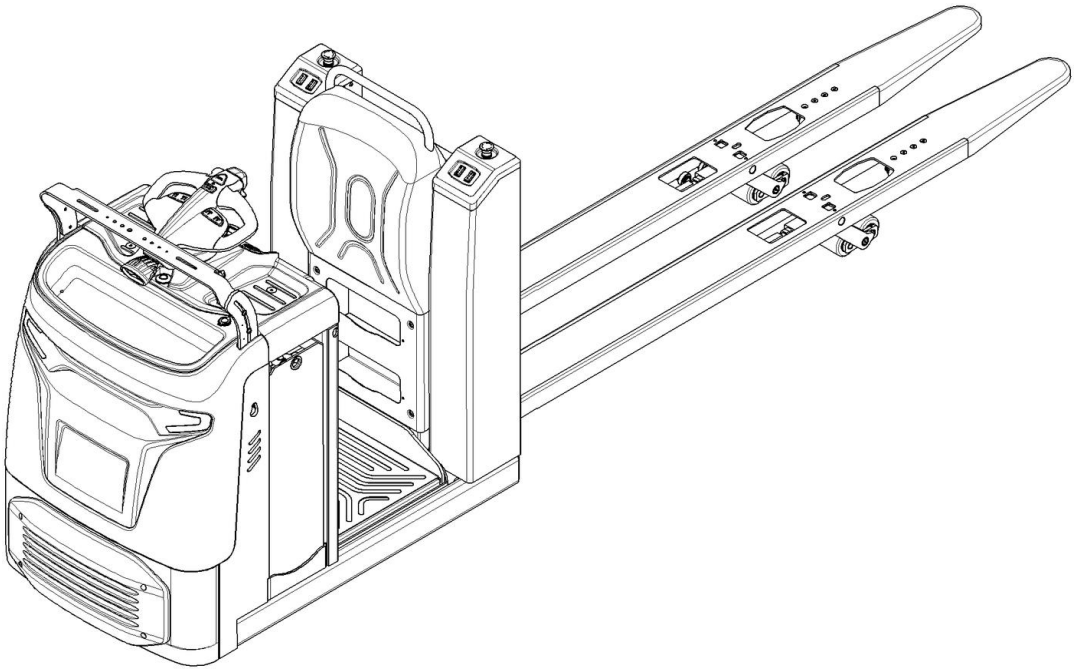
25EO-X

LOW-LIFT ORDER PICKER

SERVICE MANUAL



WARNING

Do not operate the tow order picker before reading and understanding the operating instructions.

NOTE:

Please check product type and parameters of your truck in this manual as well as on the ID-plate.

Keep this instruction manual for future reference.

FOREWORD

Before operating the order picker, please read this instruction manual carefully and understand the usage of the truck completely. All instructions in this manual should be seriously followed, otherwise warranty will be invalid by default, and our company shall not be liable for any losses arising therefrom.
If the customer or a third party modifies the order picker without manufacturer's permission, the warranty will be invalid by default, and our company shall not be liable for any loss arising therefrom.

This manual describes the usage of different stand-on order pickers. When operating and servicing the order picker, make sure that it applies to your truck type.
Our products are subject to ongoing developments, so the company reserves the right to modify the appearance, configuration and function of the products, therefore please have understanding, that any claims on performance shall not be derived from this manual.
Keep this manual for future reference. If this manual and the warning/ caution stickers are damaged or got lost, please contact your local dealer for replacement.
This order picker complies with the requirements according to EN 3691-1 (Industrial trucks- safety requirements and verification, part 1), EN 12895 (Industrial trucks- electromagnetic compatibility), EN 12053 (Safety of industrial trucks- test methods for measuring noise emissions), EN 1175 (Industrial truck safety–electrical requirements), ensured the truck is used according to the described purpose.
The noise level for this machine is less than 70 dB(A) according to EN 12053.
The vibration is 0.96 m/s2 according to EN 13059.

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: In this manual, the symbol on the left indicates warning and danger, which may lead to death or serious injury if not followed.

Copyright

Contents

1. CORRECT APPLICATION

The order picker described in this manual is standing low-lift order picker , which possess functions such as: electrically powered low lift of forks, electrically powered lift of man-up platform (optional), electrically powered walking and steering, and electromagnetic braking.

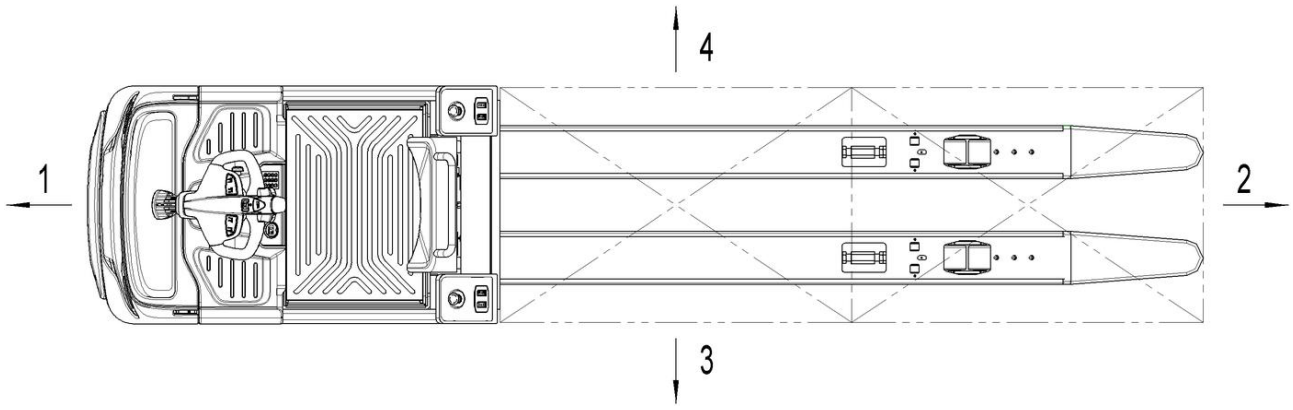
It is only allowed to use the order picker following the instructions of this manual. Improper usage will cause human injuries or damage to the equipment. Meanwhile, the operator/ the operating company has to ensure the correct usage and has to ensure, that this order picker is used only by staff, who is trained and authorized to use this order picker.
The operator must pay attention to the information on the warning stickers, safety instructions and ID plate on the truck to ensure the proper usage.

The order picker has to be used on substantially firm, smooth, prepared, level and adequate surfaces.
The order picker should be operated with ambient temperatures between +5℃ to + 40℃.
The order picker is intended to be used indoors with 50Lux operating lighting at least.
Pushing or pulling the loads by forks or the truck body is not allowed.
Operating sideways or diagonally on ramps is not allowed. Keep the forks upwards when going up or down the ramps.
Lifting or transporting people is not allowed.
The order picker is not allowed to be used in an area with explosion hazard.
The order picker is not allowed to be used outdoors in bad weather.
The order picker is not allowed to be used in a dusty or corrosive environment, unless it equips with special protective assembly approved by manufacturer.

No modifications or changes to this order picker which may affect rated traction capacity, stability or safety requirements of the order picker shall be made without the prior written approval of the original order picker manufacturer, its authorized representative, or a successor thereof. This includes changes affecting, for example, braking, steering, truck weight and the increase/ decrease of removable accessories. When the manufacturer or its successor approve a modification or change, they shall also make and approve appropriate changes to ID plate, operation and maintenance manuals.
Obeying these instructions will make the warranty invalid.

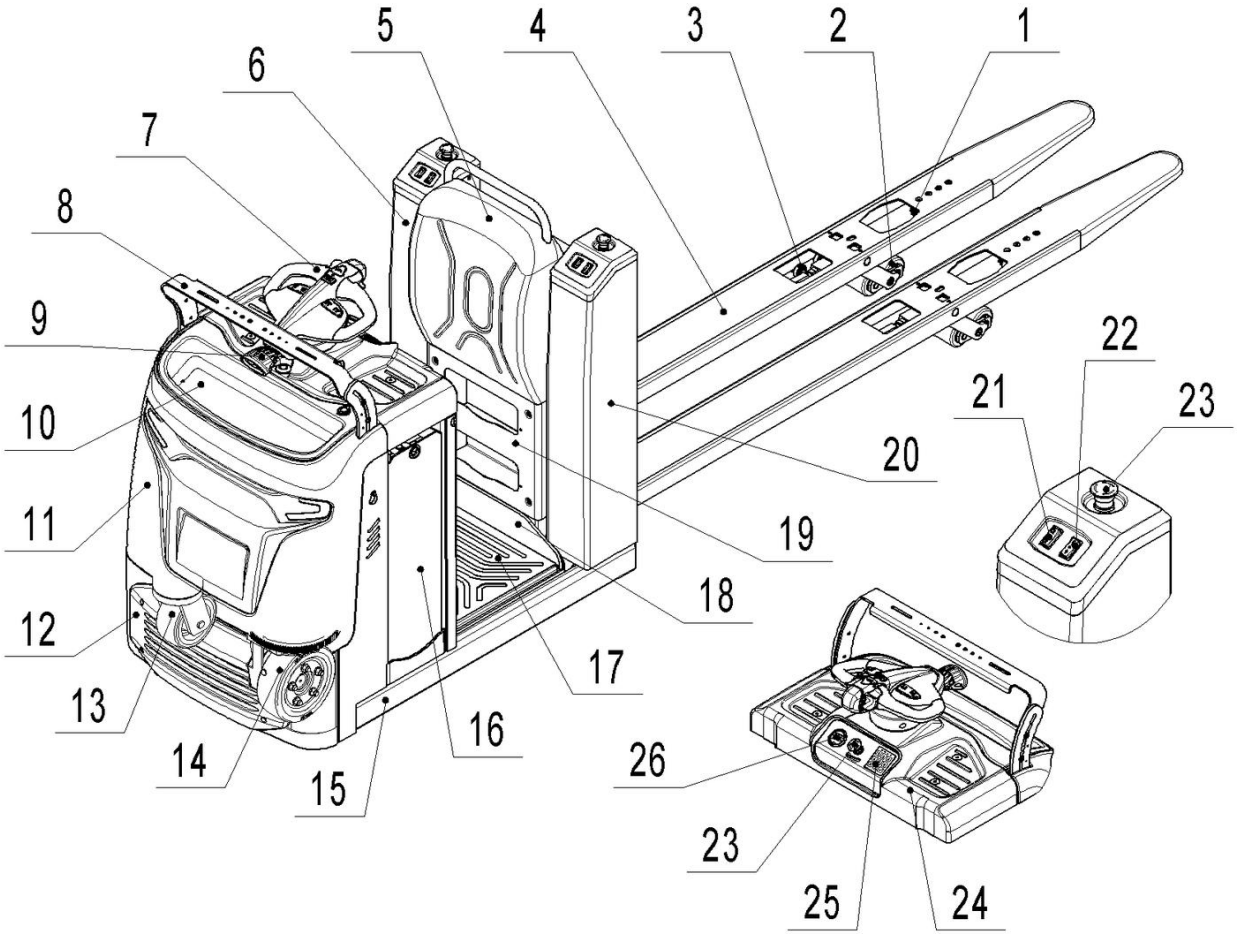
2. DESCRIPTION OF THE ORDER PICKER

a. Definition of directions



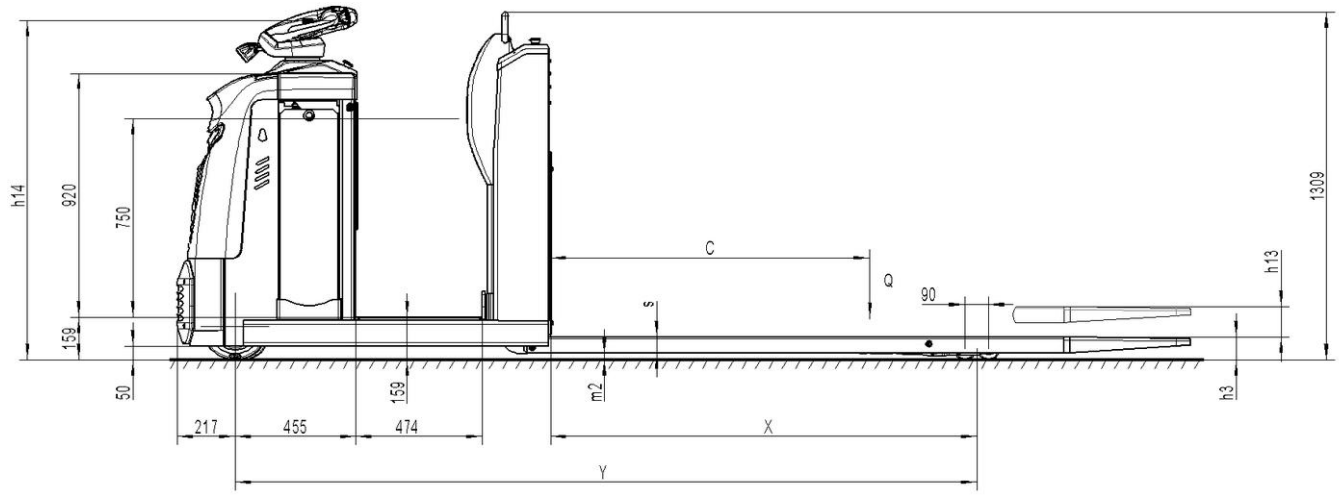
No.	Definition of directions	Note
1	Front	Driving side
2	Rear	Loading side
3	Left	
4	Right	

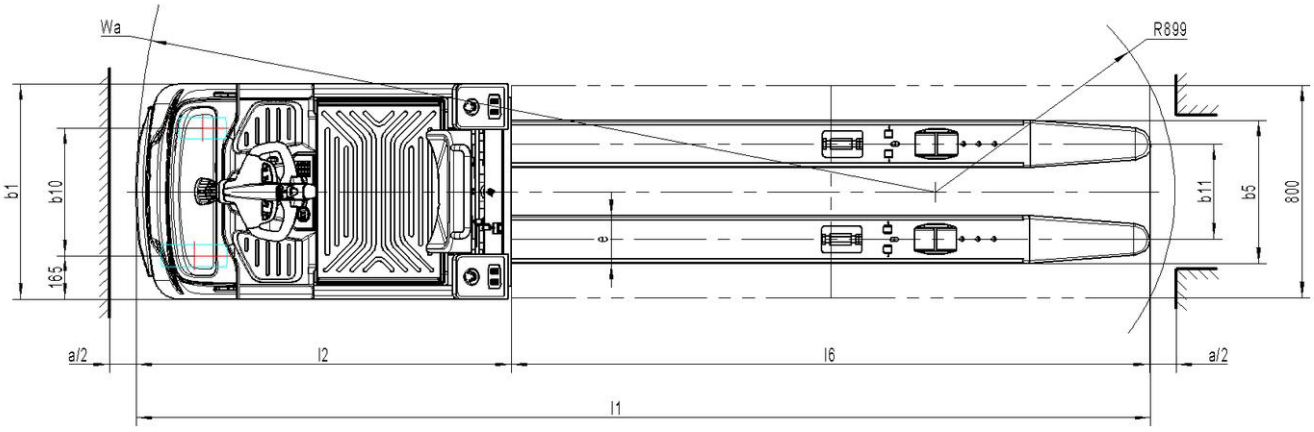
b. Overview of the main parts



No.		Description	No.		Description
1	○	Entry-roller	15	●	Chassis
2	●	Tandem load wheels	16	●	Lead-acid battery
	○	Single load wheel		○	Lithium battery
3	○	Exit-roller	17	●	Rubber mat
4	●	Fork	18	●	Platform
5	●	Backrest		○	Platform (man-up)
6	●	Right cover	19	●	Storage compartment
7	●	Tiller		○	Fender
8	●	Accessory bar	20	●	Left cover
9	●	Blue-ray light	21	●	Sideways control (FW./ BW.)
10	●	Storage compartment	22	●	Sideways control (lift/ lower)
11	●	Front cover	23	●	Emergency button
12	●	Bumper	24	●	Upper panel
13	●	Side roller	25	●	Pin-code lock
14	●	Drive wheel	26	●	Indicator
●：Standard ○：Optional					

c. Main technical data





Type sheet for industrial order picker according to VDI 2198				
Identification	1.2	Model		25EO-X
	1.3	Drive		Electric
	1.4	Manual,pedestrian,stand-on,seated,order picker operation		Order pickers
	1.5	Load capacity/rated load	Q(kg)	2500
	1.6	Load center distance	C(mm)	1200
	1.8	Load distance	X(mm)	1535[1)]
	1.9	Wheelbase	Y(mm)	2723[1)]
Weight	2.1	Net weight without battery	kg	968
	2.2	Axle loading, laden front/rear	kg	1290/2530
	2.3	Axle loading, unladen front/rear	kg	980/340
Wheels/ frame	3.1	Tires		PU
	3.2	Tire size, front	∅ x w (mm)	∅250×80
	3.3	Tire size, rear	∅ x w (mm)	∅82×82
	3.4	Additional wheels(dimensions)	∅ x w (mm)	∅180×80
	3.5	Wheels, number front/rear(x=driven wheels)		1+1x/4
	3.6	Tread width, front	b_{10} (mm)	480
	3.7	Tread, width, rear	b_{11} (mm)	360
Basic dimensions	4.4	Lift	h_3 (mm)	115
	4.9	Height of tiller	h_{14} (mm)	1280
	4.15	Height, lowered	h_{13} (mm)	85
	4.19	Overall length	l_1 (mm)	3770[2)]
	4.20	Length to face of forks	l_2 (mm)	1370[2)]
	4.21	Overall width	b_1 (mm)	810
	4.22	Fork dimensions	s/e/l	60/180/2400
	4.25	Width across forks	b_5 (mm)	540
	4.32	Ground clearance(center of wheelbase)	m_2 (mm)	25
	4.34	Aisle width for pallets 800×1200 lengthways	Ast(mm)	3970[3)4)]
	4.35	Turning radius	Wa (mm)	2965[3)]
Performance data	5.1	Travel speed laden/unladen	km/h	9/12
	5.2	Lift speed, laden/unladen	mm/s	40/64
	5.3	Lowering speed, laden/unladen	mm/s	60/40
	5.8	Max. gradeability, laden/unladen	%	6/12
	5.10	Service brake		regenerative
Electrics	6.1	Drive motor, output at S2 60min	kW	2.6
	6.2	Lift motor, output at S3 10%	kW	2.2
	6.3	Battery as per DIN 43531/35/36 A，B，C，no		no
	6.4	Battery voltage/nominal capacity K5	V/Ah	24/465
	6.5	Battery weight	kg	352
	6.6	Energy consumption as per EN 16796	kWh/h	0.7
Misc.	8.1	Type of drive control		AC-speed control
	8.4	Sound pressure level at operator's ear as per EN12053	dB(A)	<70

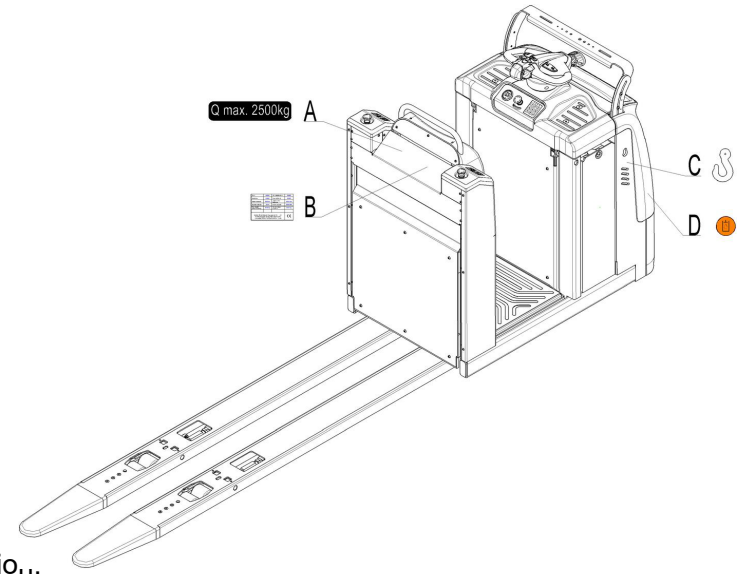
1) Forks lowered X=1600mm，Y=2788mm；　　2) With bumper l1=3810mm，l2=1409；

2) With bumper Wa=3005mm，Ast=4010mm　　4) Diagonal calculation acc. to VDI2198: Ast=initial value+94mm

d. Description of the safety devices and warning stickers

For the USA market, the description of the safety and warning labels is mentioned in chapter 11.

A Capacity sticker
B Identification plate (ID plate)
C Crane hook sticker
D Hydraulic oil adding sticker



The order picker is equipped with 3 emergency buttons (23), pressing any one of the three buttons can turn off all the functions of the order picker .

The tiller of this order picker is equipped with a safety (belly) button (27), which switches the driving function away from the operator, if the order picker travels towards the operator and the tiller is activated in the tiller's operating positio...

Follow also the instructions given on the stickers.
Replace the stickers if they are damaged or missing.

e. Identification plate (ID plate)

3. WARNINGS, RESIDUAL RISK AND SAFETY INSTRUCTIONS

DO NOT

- Operate the order picker without safety shoes.
- Place your feet or hands under the order picker.
- Allow other person than the operator to stand in front of or behind the order picker when it is moving.
- Overload the order picker.
- Lift people. People could fall down and suffer severe injury.
- Push or pull loads.
- Drive laterally or diagonally on ramps.
- Load the loads unevenly, loads must be evenly distributed on two forks.
- Load the order picker with unstable and unbalanced loads.
- Refit the order picker without manufacturer's written consent.
- Lift the heavy loads or big loads in the case of wind influence.

If the working ground is not smooth or firm, the loads may slip off or the order picker may lose control when driving. Therefore, please check the working conditions before driving. When driving on the undesired working ground, please always keep an eye on the loads. Stop operating the order picker if the loads become unstable.
This order picker is not designed to be water-resistant, do not operate it outdoors in rainy days.
If the order picker has malfunctions, check chapter 6 for details.

4. COMMISSIONING, TRANSPORTING, DECOMMISSIONING

a. Commissioning

Type	25EO-X
Commissioning weight [kg]	Around 1400
Dimension [mm]	3800X840X1500

After receiving the new order picker or for re-commissioning, you have to do followings before (firstly) operating the order picker:

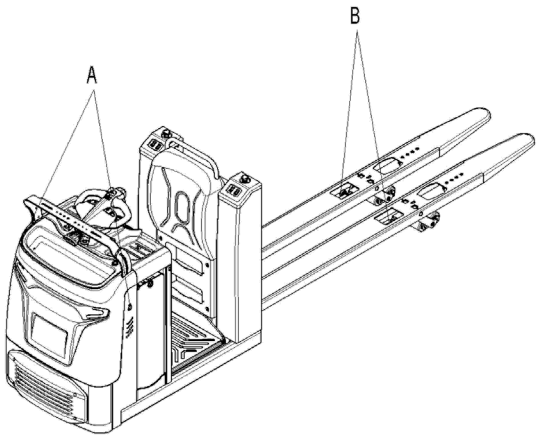
- Check if all parts are included and not damaged.
- Check if all functions of the tiller work normally.
- Check if proper batteries and chargers are used.
- Check the hydraulic system for oil leakage.
- Do the work according to the daily inspections as well as functional checks.

b. Lift/ transportation

For transportation, remove the loads and lower the forks to the lowest position, use proper crane equipment or forklift to place the order picker on the vehicle or other equipment for transportation, and fix the order picker as required.

Lift

The operation of loading and unloading to the order picker shall be carried out only by personnel that has been trained in operation of fixing and lifting tools.
Use specific cranes and lifting equipment.
Equip yourself with protective equipment when the crane is working.
Do not stand under rickety loads.
Do not walk into a dangerous zone while lifting.
Ensure that lifting tools will not damage the order picker during lifting.

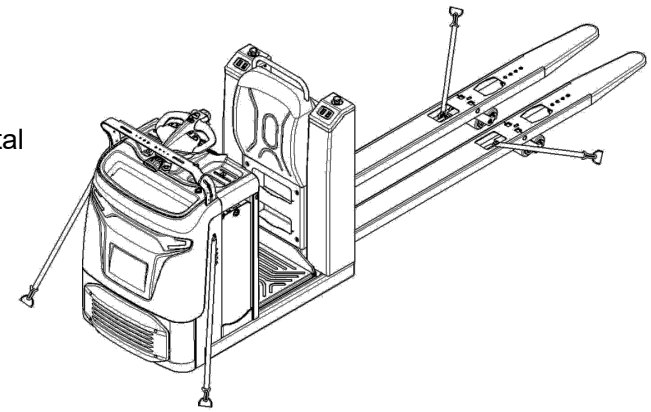


Safely park the order picker and remove the front cover. Fix the lifting tools to A and B of the truck.

Lift the order picker to the destination, place the order picker safely before moving the lifting equipment.

Transportation

During transportation on a lorry or truck always fasten the order picker securely.
Fix the order picker with a wedge in case of accidental movement.
The lashing band used should be strong enough.
Fix the loading and unloading AIDS (pallets, wedges) with anti-slide materials.



Lower the forks and park the truck securely.
Fasten the order picker with lashing band according to the picture on the right, find the proper location for the lashing band.
Or fasten the order picker via the man-up platform with lashing band.

C. Decommissioning

For storage, remove the loads, lower the forks to the lowest position, grease all parts listed in this manual (regular inspection), eventual protect the order picker against corrosion and dust. Remove the battery from the order picker and check the safety devices and ensure Remove the battery and check the safety equipment to make sure there is no crush on the order picker.
For final decommissioning, hand the order picker to a designated recycling company. Oil, batteries and electric components must be recycled due to legal regulations.

5. DAILY INSPECTION

This chapter describes pre-checks before operating the order picker. Remove loads from order picker and lower the forks to the lowest position.
Daily inspection is effective to find the malfunctions or faults on this order picker. Check the following

items before operation.

DO NOT USE THE order picker IF ANY MALFUNCTION IS FOUND.

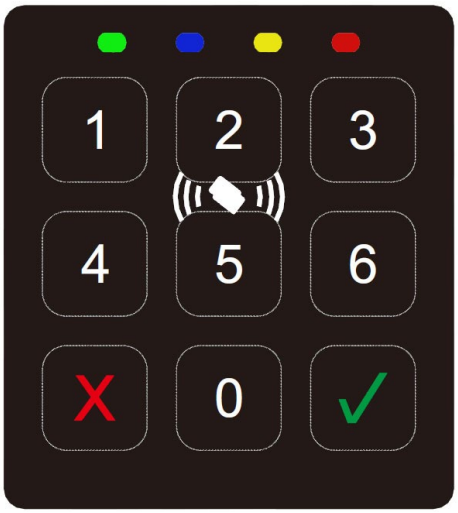
- Check for scratches, deformation or cracks.
- Check if there is any oil leakage from the cylinder.
- Check the vertical creep of the order picker.
- Check the smooth movement of the wheels.
- Check the emergency braking function by activating the emergency button.
- Check the function of the proximity switch of the tiller.
- 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 hoses or broken electric wires.

6. OPERATING INSTRUCTIONS

ONLY PEOPLE TRAINED CAN OPERATE THE ORDER PICKER. BEFORE OPERATING THIS ORDER PICKER, PLEASE FOLLOW THE WARNINGS AND SAFETY INSTRUCTIONS (CHAPTER 3).

Operate the order picker with safety shoes.
Non-trained personnel are not allowed to operate and drive the order picker.
Lifting people is not allowed.
Stop operating immediately if any damages or defects are found, and report to the superior.
Modification or repair for the order picker without manufacturer's authorization is not allowed.

a. Pin-code lock Settings



The initial password of the pin-code lock is "1234", which should be changed after starting the order picker for the first time. New password should not be the same as the administrator password. Please consult your local dealer or call service hotline for the administrator password.

Pin-code lock supports additional ID cards, password entry, password modification and password reset.

Register additional ID cards: in standby mode, correctly enter the administrator password, press "√" button, the yellow indicator will flash, then enter "3" and press "√" button, the yellow indicator will continue flashing to enter the mode of registering additional ID card. At this time, put the additional ID card close to the pin-code lock and take it away. Press "×" button, the yellow indicator will be off and exit the mode of registering additional ID card, or wait for 5 seconds after the card is successfully registered, then the system will exit the current mode automatically.

Password entry: in standby mode, correctly enter the administrator password, press "√" button, the yellow light will flash, and then press "1" and "√" button, the yellow indicator will continue flashing to

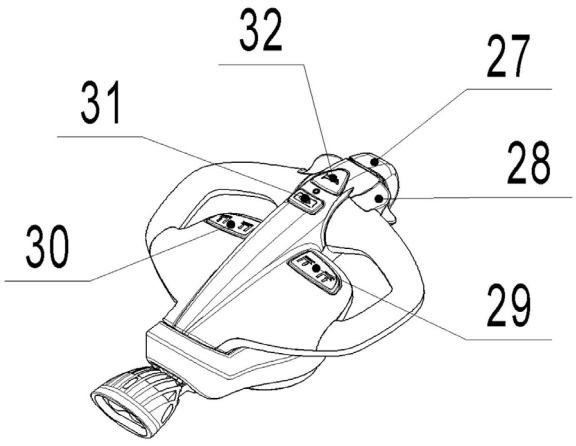
enter the mode of password entry. At this time, enter a 4-digit-code in turn and press "√" button, the password entry is successfully done if the buzzer rings once. Pin-code lock can support up to 10 sets of passwords. After recording 10 sets of passwords, the newly entered passwords will be overwritten one by one from the first set, please save the passwords that have been set.

Password modification: in standby mode, correctly enter the administrator password and press "√" button, the yellow indicator starts flashing. Then press "2" button and "√" button, the yellow indicator continues flashing and entering the password modification mode. Enter the initial password and press "√" button, the buzzer will ring once. Then enter new password and press "√" button, after the one-time ring of the buzzer, the yellow indicator will be off and the password is successfully modified.

Password reset: in standby mode, correctly enter the administrator password and press "√" button, the yellow indicator starts flashing, and then press "0" button. The buzzer will ring once, which indicates that the passwords set by users are cleared and reset as initial password “1234”.

As shown in the figure above, the four indicators on the pin-code lock are green indicator (power), blue indicator (working), yellow indicator (waiting) and red indicator (error).

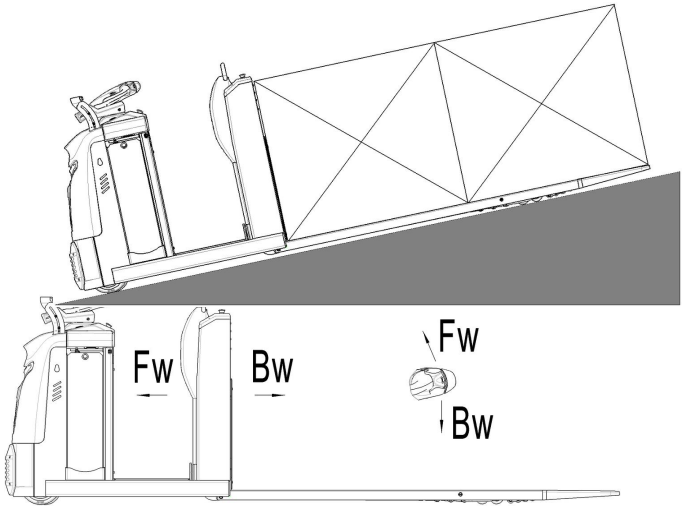
b. Starting



After completing daily inspection, turn on emergency button (23) to make the order picker connected to the power and standby. Enter the correct password and press "√" button and the buzzer rings once, the green indicator turns on and the order picker is successfully started. Or put ID card close to the pin-code lock, after buzzer rings once, the green indicator is on and the order picker is successfully started. Before starting the order picker, check if there is safety hazard around the order picker, and then press the horn button (32) to send out the warning signal of the working order picker.

c. Driving

TRAVEL ON INCLINES ONLY WITH THE LOAD FACING UPHILL.
DO NOT TRAVEL ON INCLINES MORE THAN SPECIFIED WITH THE TECHNICAL DATA.

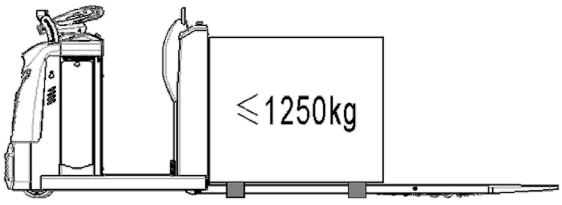


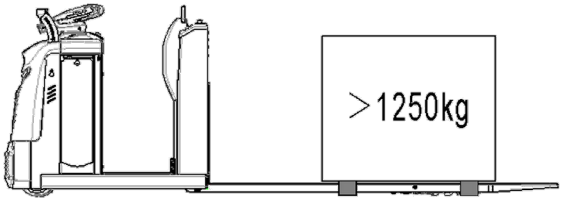
Turn the accelerator button to the desired direction forward ‘Fw.’ or backwards Bw.’. Carefully operate the accelerator knob (28) to control the driving speed to the desired speed. If the accelerator knob is back to the neutral position, the controller will slow the order picker until it stops. If the order picker stops, the parking brake will work.

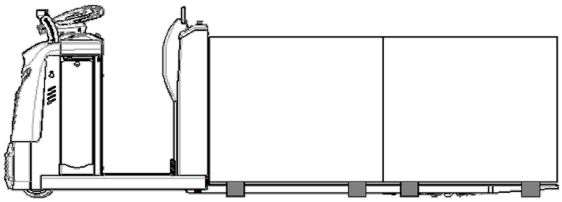
Please carefully drive the order picker to your destination, watch the route conditions and adjust the driving speed via the accelerator knob operation.

Press "turtle speed" button (31) to activate the turtle speed function. The indicator turns red and the maximum speed of the order picker decreases; When press turtle button (31) again, the turtle speed function is closed, the indicator turns green and the maximum speed of the order picker will be decreased to the initial speed.

d. Lifting







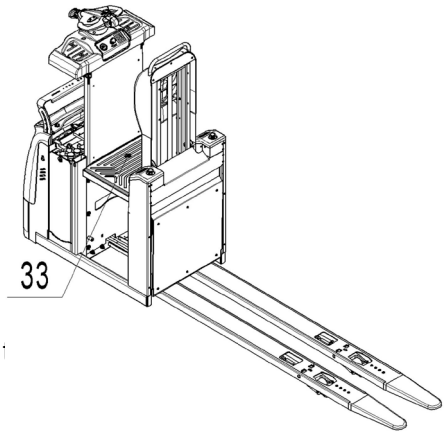
A single pallet with a load of up to 1250kg can be placed behind the forks.
A single pallet with a load of more than 1250kg shall have its center of gravity coincident with the load center of the order picker in vertical direction. The loads shall not exceed the tip of the forks by more than 50mm.
Do not overload, the rated capacity of this order picker is 2500kg, and the rated capacity of the load generally is not equal to the allowable loads. Damage to the order picker or deformation of the fork caused by not handling the loads as required will make the warranty invalid.

Lower the forks to the lowest position and move the forks to proper position under the loads. Press lift button (29)/(30) until proper height is reached.

In picking mode, forks can be lifted by operating sideways control (22).

If the platform can be lifted, the lift button (30) on the tiller can control the lifting of the platform, and the lift button (29) on the tiller can control the lifting of the forks.

e. Lowering



Operator should be in correct position before lowering the forks.
Do not place your hands and feet under the forks or order picker.

Press lowering button (29) or (30) and the forks will be lowered.

If the platform can be lifted, the lift button (30) on the tiller can control the lowering of the platform, and the lift button (29) on the t the forks.

In picking mode, forks can be lowered by operating sideways control (22).

Stomp the pedal switch (33) twice quickly and hold on, the platform can be lowered by this way. The platform stops lowering if the pedal switch (33) is released.

f. Steering

Steer the order picker by moving the tiller (7) to left/ right side. Left/ right rotation limit of the tiller is 60°, corresponds to the 90° left/ right rotation limit of the drive wheel.

If you steer the tiller when driving the order picker, the speed of the order picker will be gradually decreased with the increase of steering angle.

g. Braking

Braking performance depends on the conditions of the road, loads and speed of the order picker. The braking function can be activated by several ways below:

- Operate the accelerator knob (28) back to the neutral position or release the accelerator knob, the regenerative braking is activated. The order picker brakes until it stops.
- Operate the accelerator knob (28) from one driving direction directly to the opposite direction, the regenerative braking is activated and the order picker starts driving into the opposite direction.

Activate safety (belly) button (27), the order picker decelerates the truck in opposite direction until the order picker stops.

h. Parking

Do not park the order picker when on ramps.

Operators are not allowed to leave the order picker for a long time without power supply

Park the order picker on firm and level ground.

Press emergency switch (23) if the operator is to leave the order picker for a long time.

i. Malfunctions

If there are any malfunctions or the order picker is inoperative, please stop using the order picker and press the emergency button (23). If possible, park the order picker on a safe area.

Inform immediately the manager and, or call for after-sales service. If necessary, tow the truck out of the operating area by using specific towing/ crane equipment.

j. Emergency

If emergency button (23) is pressed during driving operation, the order picker will be stopped with maximum braking power, so the loads may drop off from the order picker or trailer, so emergency button (23) cannot be used as the brake during driving.

Emergency button (23) can only be used under dangerous conditions during driving.

If emergency switch is damaged or out of reach, there will be risk of accidents.


80%
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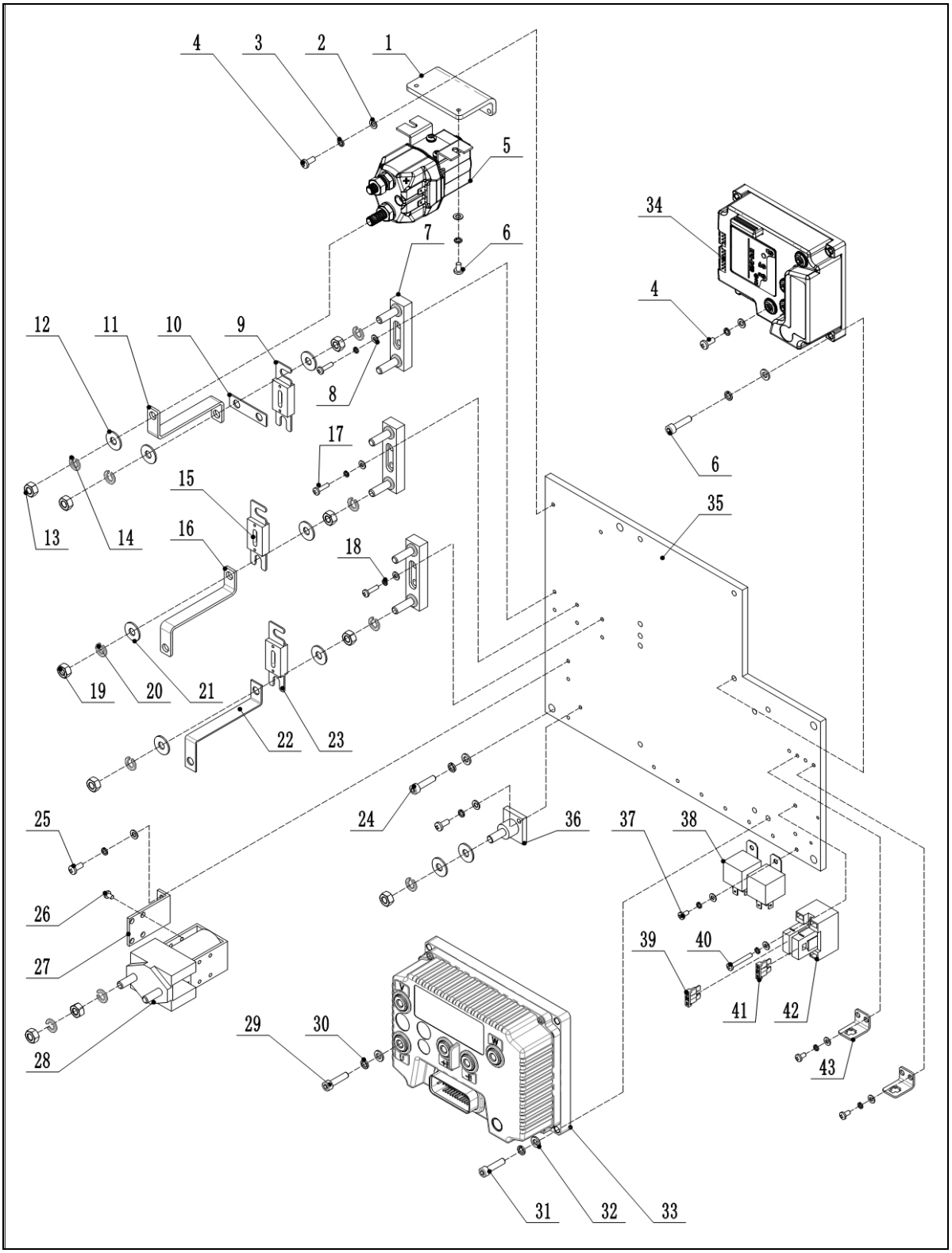
7. Controllers and related devices

a. Controller appearance

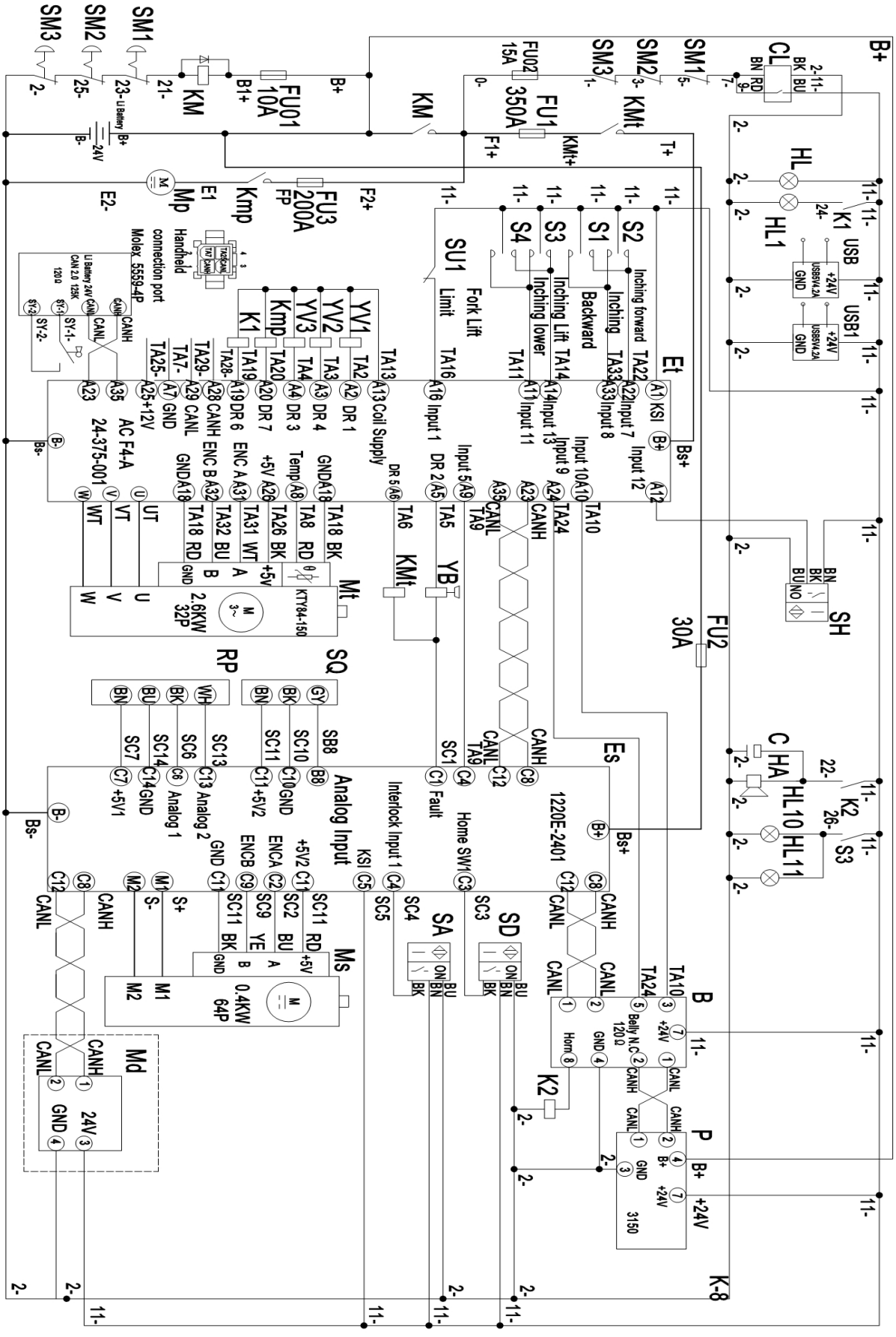
This section uses ACE0 as an example. For details about other controllers, see the parts manual



No.	Item Description	No.	Item Description
1	Holder	23	Fuse 30A
2	Flat Washer Φ5	24	Screw M8x16
3	Spring Washer Φ5	25	Screw M4x12
4	Screw M5x12	26	Screw M4x6
5	Contactor	27	Holder
6	Screw M5x8	28	Contactor
7	Fuse Holder	29	Screw M6x30
8	Flat WasherΦ4	30	Spring Washer Φ6
9	Fuse 200A	31	Screw M6x25
10	Copper Busbar	32	Flat WasherΦ6
11	Copper Busbar	33	Controller
12	Flat WasherΦ10	34	Controller
13	Nut M10	35	Plate
14	Spring Washer Φ10	36	Fuse Holder
15	Fuse 350A	37	Screw M4x8
16	Copper Busbar	38	Relay
17	Screw M4x16	39	Fuse 15A
18	Spring Washer Φ4	40	Screw M4x30
19	Nut M8	41	Fuse10A
20	Spring Washer Φ8	42	Fuse Holder
21	Flat WasherΦ8	43	Holder
22	Copper Busbar		

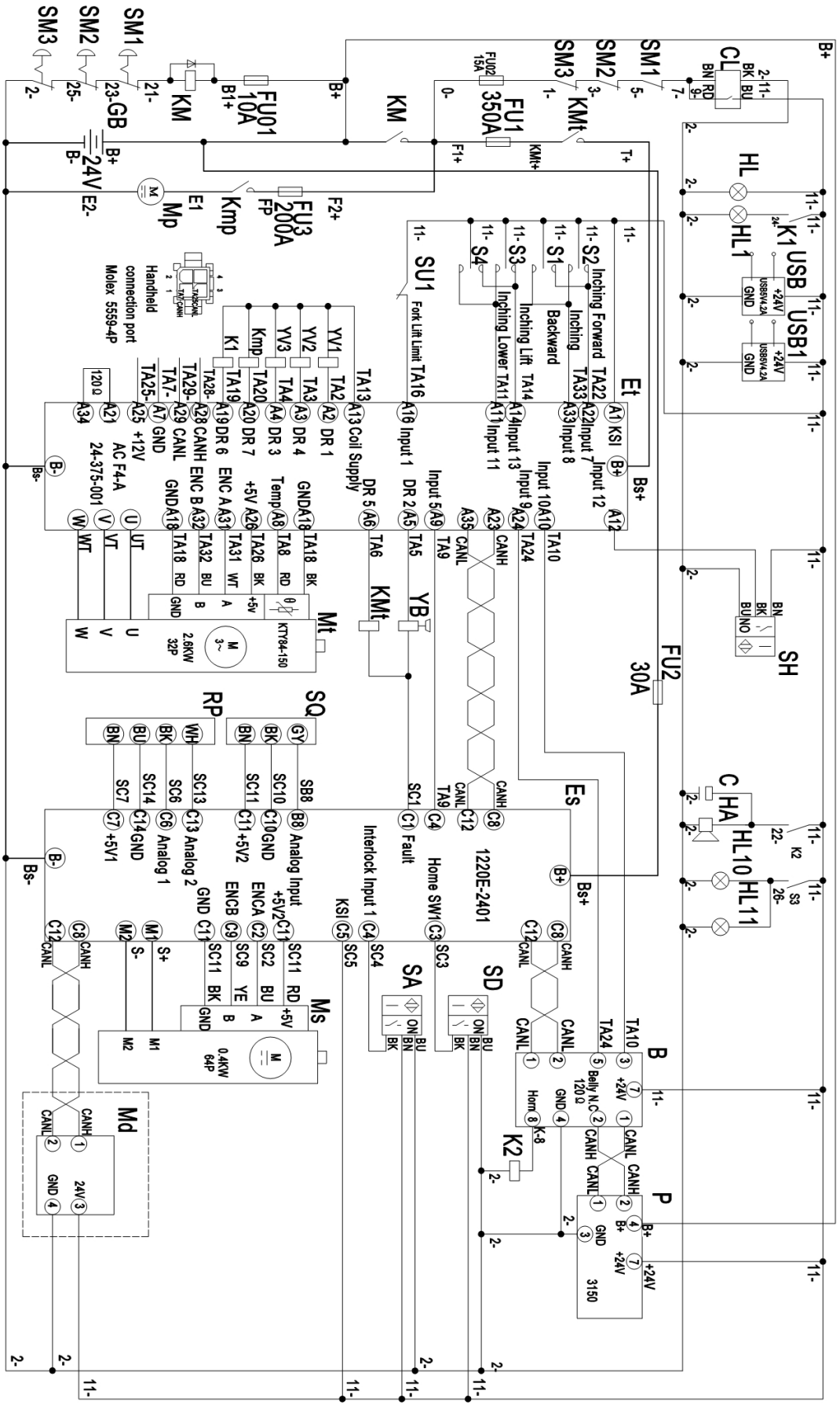
b. Wiring/circuit diagram

b-1 **Standard 20 CE(Lithium battery)circuit diagram**



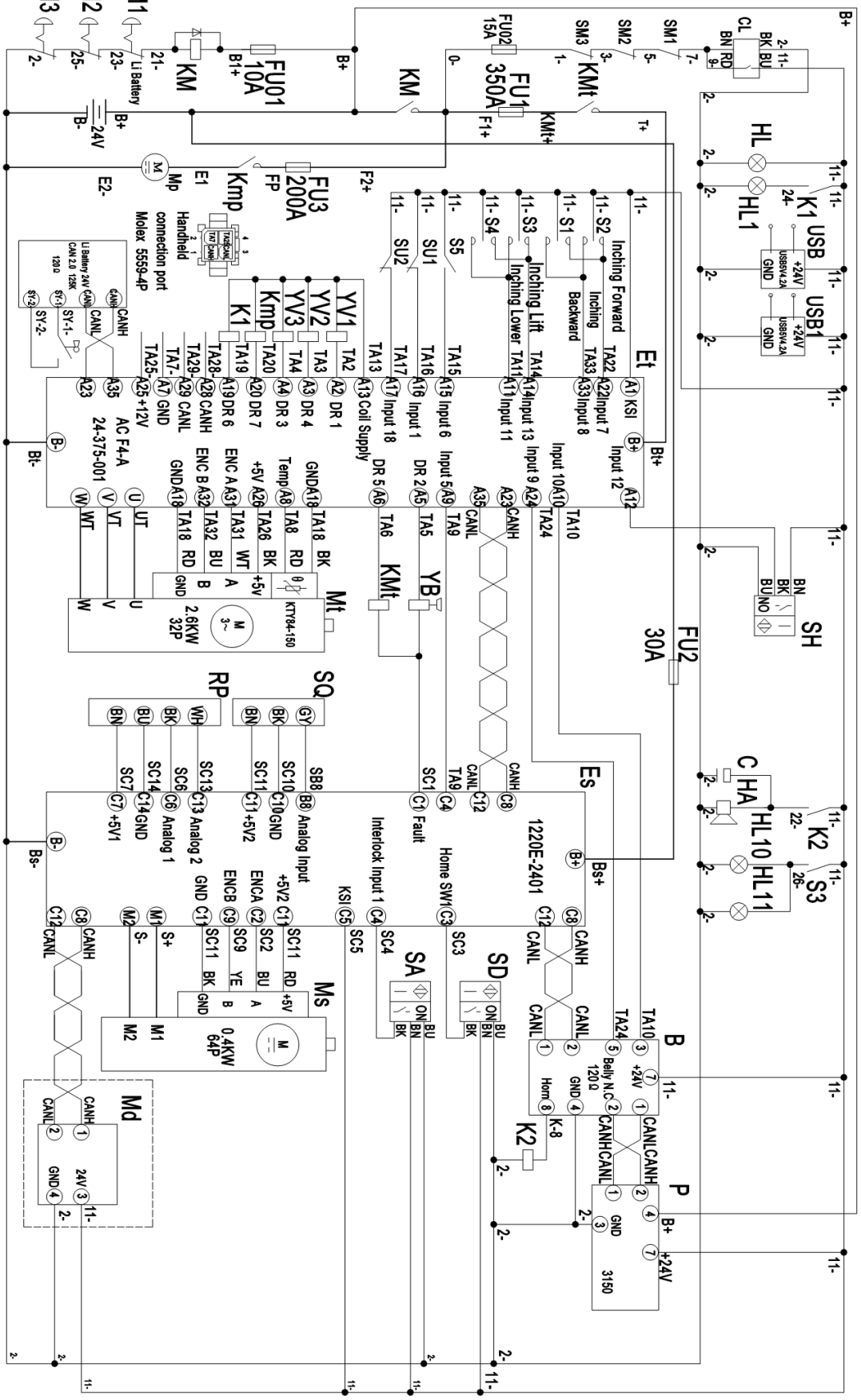
No.	Code	Name	No.	Code	Name
1	CL	Password lock	21	Et	Traction controller
2	SM1、SM2、SM3	Stop switch	22	SH	Limit switch
3	FUO2	Fuse15A	23	FU2	Fuse30A
4	KMt	Main contactor	24	YB	Elec. brake
5	FU1	Fuse350A	25	Mt	Traction motor
6	KM	Main contactor	26	SQ	Position sensor
7	FUO1	Fuse10A	27	RP	Potentiometer
8	Li Battery	Li Battery	28	C	Capacitance
9	HL	Warning lamp	29	HA	Horn
10	HL1	Blue lamp	30	Es	Steering controller
11	S1、S2、S3、S4	Dot switch	31	HL10、HL11	Headlamp
12	SU1	Limit switch	32	B	Tiller
13	Md	Lot terminal	33	SD	Mid-position switch
14	FU3	Fuse200A	34	SA	Pedal switch
15	YV1	Elec. valve	35	Ms	Steering motor
16	YV2	Elec. valve	36	P	Indicator
17	YV3	Elec. valve	37	K2	Horn Relay
18	Kmp	Bump contactor			
19	K1	Blue lamp Relay			
20	USB、USB1	USB			

b-2 Standard 20 CE(Lead-acid battery)circuit diagram



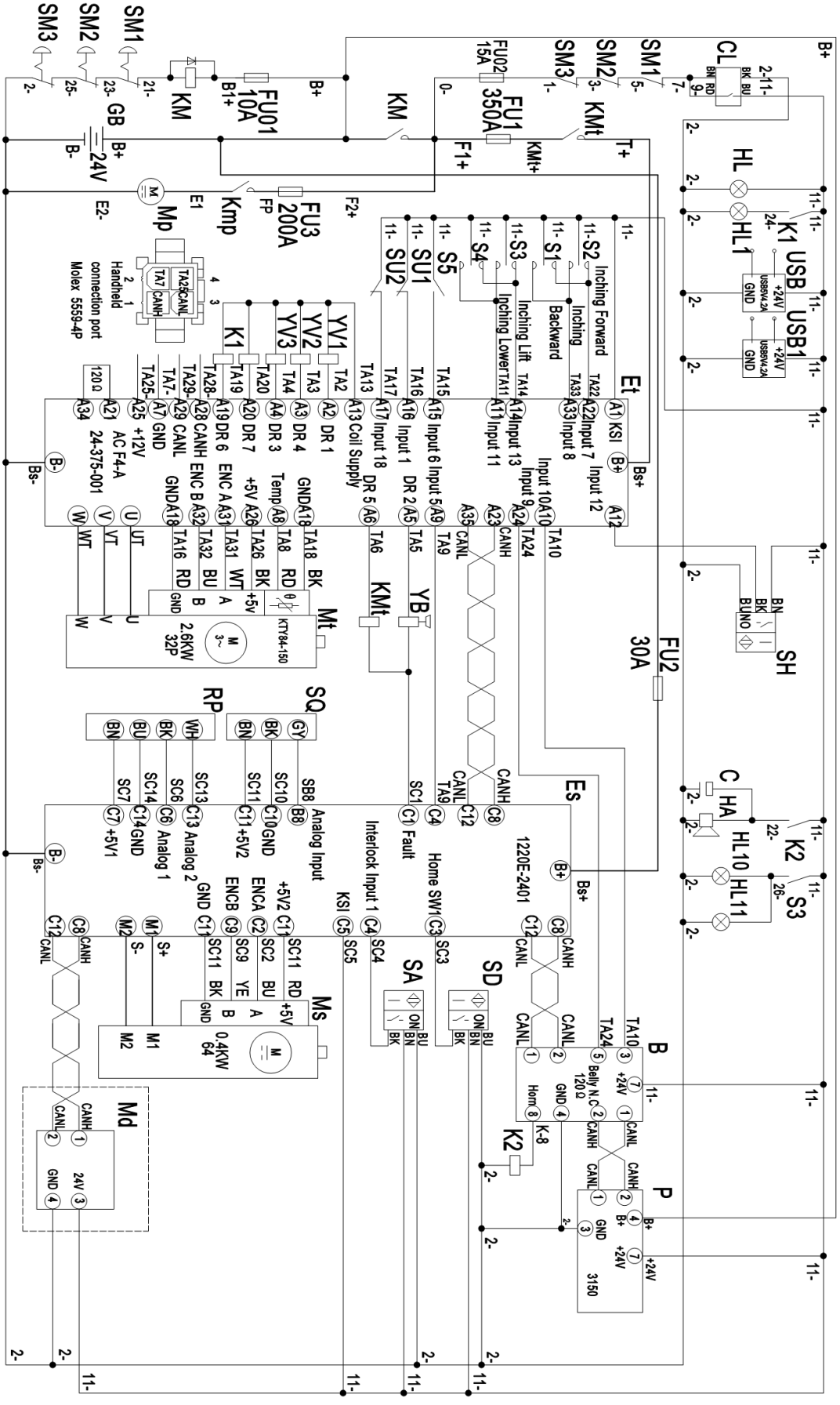
No.	Code	Name	No.	Code	Name
1	CL	Password lock	21	Et	Traction controller
2	SM1、SM2、SM3	Stop switch	22	SH	Limit switch
3	FUO2	Fuse15A	23	FU2	Fuse30A
4	KMt	Main contactor	24	YB	Elec. brake
5	FU1	Fuse350A	25	Mt	Traction motor
6	KM	Main contactor	26	SQ	Position sensor
7	FUO1	Fuse10A	27	RP	Potentiometer
8	GB	Battery	28	C	Capacitance
9	HL	Warning lamp	29	HA	Horn
10	HL1	Blue lamp	30	Es	Steering controller
11	S1、S2、S3、S4	Dot switch	31	HL10、HL11	Headlamp
12	SU1	Limit switch	32	B	Tiller
13	Md	Lot terminal	33	SD	Mid-position switch
14	FU3	Fuse200A	34	SA	Pedal switch
15	YV1	Elec. valve	35	Ms	Steering motor
16	YV2	Elec. valve	36	P	Indicator
17	YV3	Elec. valve	37	K2	Horn Relay
18	Kmp	Bump contactor			
19	K1	Blue lamp Relay			
20	USB、USB1	USB			

b-3 Platform lifting 20 CE(Lithium battery)circuit diagram



No.	Code	Name	No.	Code	Name
1	CL	Password lock	21	Et	Traction controller
2	SM1、SM2、SM3	Stop switch	22	SH	Limit switch
3	FUO2	Fuse15A	23	FU2	Fuse30A
4	KMt	Main contactor	24	YB	Elec. brake
5	FU1	Fuse350A	25	Mt	Traction motor
6	KM	Main contactor	26	SQ	Position sensor
7	FUO1	Fuse10A	27	RP	Potentiometer
8	Li Battery	Li Battery	28	C	Capacitance
9	HL	Warning lamp	29	HA	Horn
10	HL1	Blue lamp	30	Es	Steering controller
11	S1、S2、S3、S4、S5	Dot switch	31	HL10、HL11	Headlamp
12	SU1	Limit switch	32	B	Tiller
13	Md	Lot terminal	33	SD	Mid-position switch
14	FU3	Fuse200A	34	SA	Pedal switch
15	YV1	Elec. valve	35	Ms	Steering motor
16	YV2	Elec. valve	36	P	Indicator
17	YV3	Elec. valve	37	K2	Horn Relay
18	Kmp	Bump contactor	38	S5	Foot drop switch
19	K1	Blue lamp Relay	39	SU2	Limit switch
20	USB、USB1	USB			

b-4 Platform lifting 20 CE(Lead-acid battery)circuit diagram



No.	Code	Name	No.	Code	Name
1	CL	Password lock	21	Et	Traction controller
2	SM1、SM2、SM3	Stop switch	22	SH	Limit switch
3	FUO2	Fuse15A	23	FU2	Fuse30A
4	KMt	Main contactor	24	YB	Elec. brake
5	FU1	Fuse350A	25	Mt	Traction motor
6	KM	Main contactor	26	SQ	Position sensor
7	FUO1	Fuse10A	27	RP	Potentiometer
8	GB	Battery	28	C	Capacitance
9	HL	Warning lamp	29	HA	Horn
10	HL1	Blue lamp	30	Es	Steering controller
11	S1、S2、S3、S4	Dot switch	31	HL10、HL11	Headlamp
12	SU1	Limit switch	32	B	Tiller
13	Md	Lot terminal	33	SD	Mid-position switch
14	FU3	Fuse200A	34	SA	Pedal switch
15	YV1	Elec. valve	35	Ms	Steering motor
16	YV2	Elec. valve	36	P	Indicator
17	YV3	Elec. valve	37	K2	Horn Relay
18	Kmp	Bump contactor	38	S5	Foot drop switch
19	K1	Blue lamp Relay	39	SU2	Limit switch
20	USB、USB1	USB			

c. Test and troubleshoot

Fault codes can be viewed directly in the dashboard, or the current fault information can be viewed with a handheld programmer.

Test

A. Controller

Measure the diode voltage of the AC MOSFET (ZAPI for example) circuit in the controller, and check whether it is burnt or damaged.

Each test item must be tested repeatedly for more than 3 times.

item	Multi meter terminals		Normal range	
	Red pen	Black pen	Determination of polarity value	Resistance measurement
1	B+	U/V/W/B-		Over 1MΩ
2	B-	U/V/W		Over 1MΩ
3	U/V/W	B+	0.3-0.6V	
4	B-	U/V/W	0.3-0.6V	

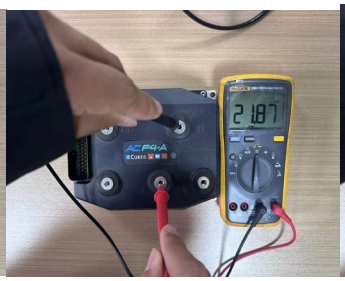
1） Pull the multi meter to Ω Turn the multi meter to diode (polarity measurement)

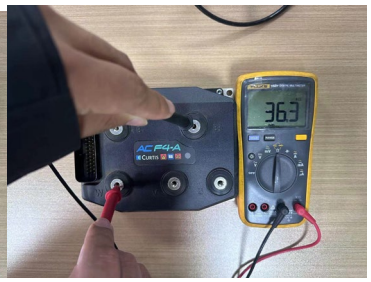
2） Remove the cables and wiring harness connected to the controller, and fully discharge the internal capacitor (with resistance 30) Ω/ 5W to discharge B + and b-terminals).

3） Use a multi meter to measure the voltage of the diode (0.3-0.6 V) and check whether it is normal.

Test 1: measure the diode voltage, red wire is B -, black wire is u, V and W.

Test 2: measure the diode voltage to u, V and W with red lead, and B + with black lead.





Note: The multi-meter pointer cannot be reversed

rrm

B. line contactor and fuse measurement



For line contactors and line fuses, connect an ohmmeter (multi meter set to Ohm) at the point shown in the figure and check that it measures the specified value.

8. BATTERY MAINTENANCE, CHARGING AND REPLACEMENT

- Only trained technicians are allowed to maintain, charge or replace the battery.
- Recycling of batteries undergoes national regulations. Please follow these regulations.
- Protect batteries away from open fire for battery disposal, otherwise it will cause explosion.
- Smoking and open fire is not allowed around the battery. Keep the inflammable materials or equipment that is easily catching sparkles 2m away from the charging place. And the charging place must be ventilated and equips with fire extinguishers.
- Before finishing the maintenance work, make sure, that all cables are connected correctly and that there are no disturbing towards other components of the order picker.

The weight of the battery has great influence on safety, stability and load capacity of order picker. Please consider the maximum operating temperature of the battery and check the battery manufacturer's manual for details.

If the order picker equips with lithium battery, please follow the lithium battery manual to maintain, charge and replace the battery.

a. Maintenance

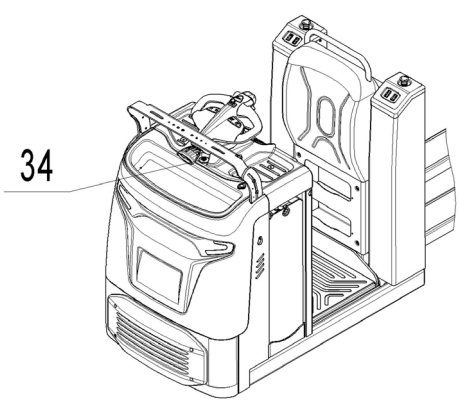
Lead-acid battery terminals, cable terminals and battery caps must be fasten and clean, and properly grease these parts.

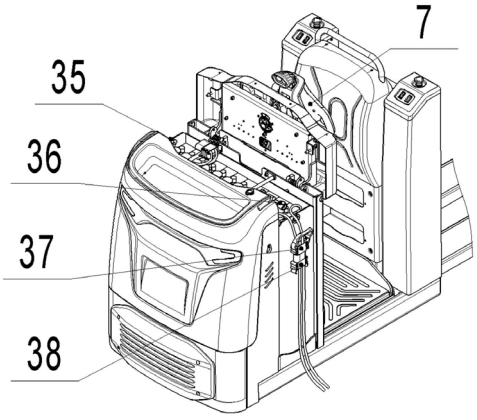
- For normal operation, add water once every 2 weeks; under high temperature or high intensity working conditions, add water once a week.
- Water should not exceed the maximum level.
- Better to add water in the last period of charging.
- Add deionized water (distilled water), do not add purified drinking water or acid liquid.
- Check details in the battery manual for other maintenance requirements.

b. Charging

- It is only allowed to use the supplied charger for charging the battery.
- The room where you are charging must be ventilated.
- Keep the inflammable materials or explosive articles 2m away from the charging place.

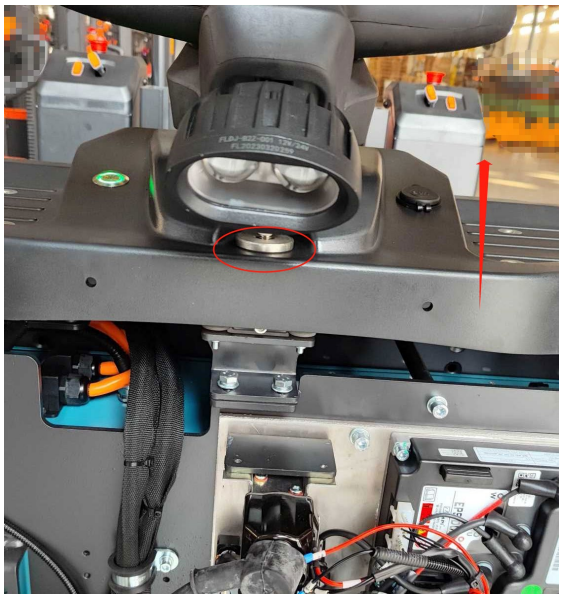
Park the order picker securely and switch off the order picker with pressing the emergency button (23). Press lock catch (34) and lift the tiller (7) to open the console. Unplug the battery connector (37) and connect it to the charger for charging. Battery assembling is in the opposite order.

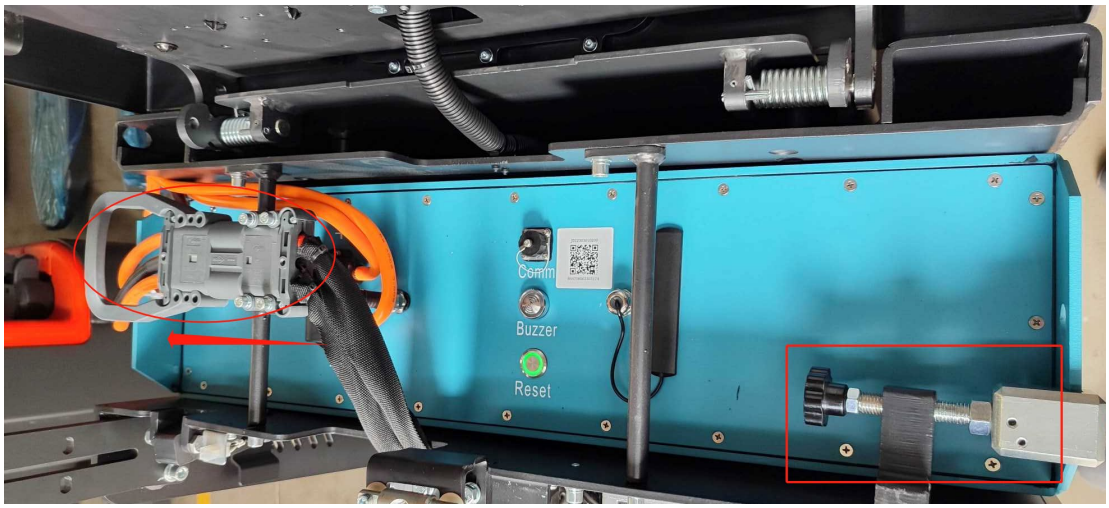




c. Replacement

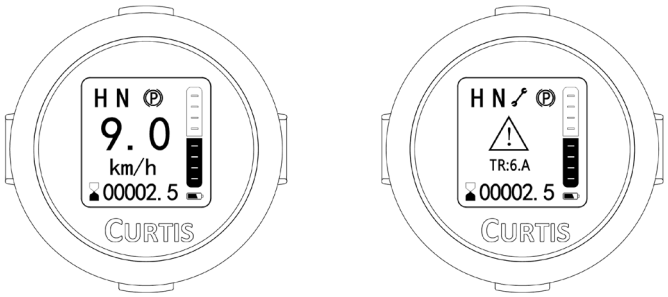
Take out the battery and place it on the equipment for battery replacement safely, and ensures that the battery replacement device does not move during the battery replacement.
Incorrect use of the device may cause the battery being tipped over!
To remove the battery, press lock catch (34) and lift the tiller (7) to open the console. Flip the pad (35), loosen the battery lock lever (36) and turn it over, then remove battery from the side of the order picker.
Battery assembling is in the opposite order.





Replace the lithium battery in the same way as the preceding method. Lift the cover, power off, remove the battery discharge port connector, loosen the battery fixing block, and move the battery in the direction of the arrow to remove the battery.
Installation is the reverse process of removal.

d. Battery indicator



The left side of the figure above is the main interface of the Indicator, which contains the battery power display, cumulative working hours and driving speed.
The right side of the above figure is the fault interface, which contains the fault code.

When the remaining battery power is 10%-19%, the battery column changes from green to yellow.
When the remaining battery power is 0-9%, the battery column changes from yellow to red, and the driving speed decreases.

When the remaining battery power is more than 70%, the indicator shows the same value of battery power as the value before charging if the battery is charged.
Only when the remaining battery power is less than 70%, the indicator shows the correct value of battery power if the battery is charged.

e. Description of lithium-ion batteries

- A lithium-ion battery is a type of battery with a rechargeable high-performance energy cell.
- The battery is designed for industrial vehicles and can withstand severe shocks and knocks.
- Batteries have special interfaces for charging and discharging to prevent the use of incorrect batteries and chargers.
- The battery has an intelligent battery management system, including voltage, temperature detection, under voltage, overvoltage, over temperature, overcurrent, short circuit and other safety functions.
- The internal resistance of the battery is very low, which minimizes heat generation and maximizes the available power of the car.

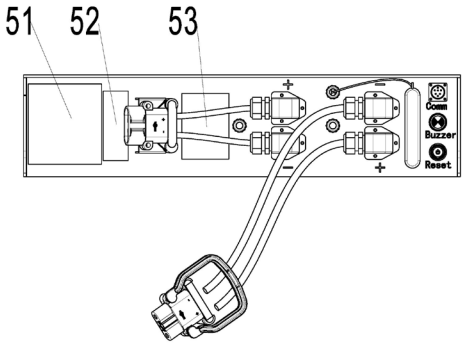
Battery operating temperature range

- The best battery life is achieved when the battery is operated at +5℃ to +40℃.
- Low temperatures will reduce the available capacity of the battery, and high temperatures will reduce the service life of the battery.
- The temperature difference between the two ends of the battery must not exceed 5 ° C.

Battery charger

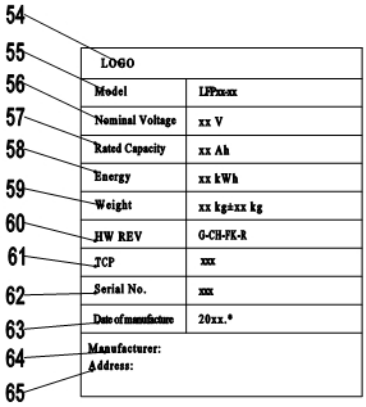
- Use only approved battery chargers to charge lithium-ion batteries.

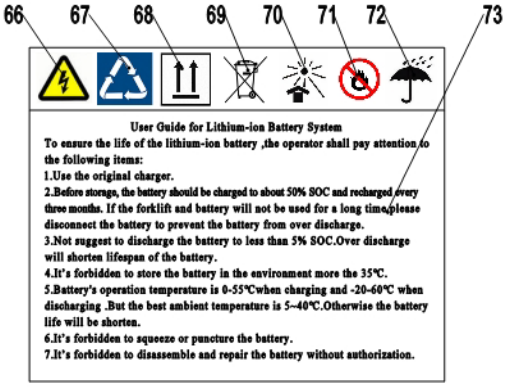
f. Battery Label

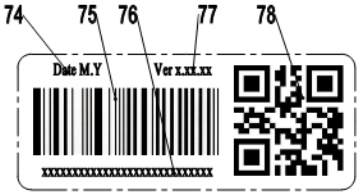


Item	Description
51	Identification plate
52	Bar code and two-dimensional code
53	Warning Label

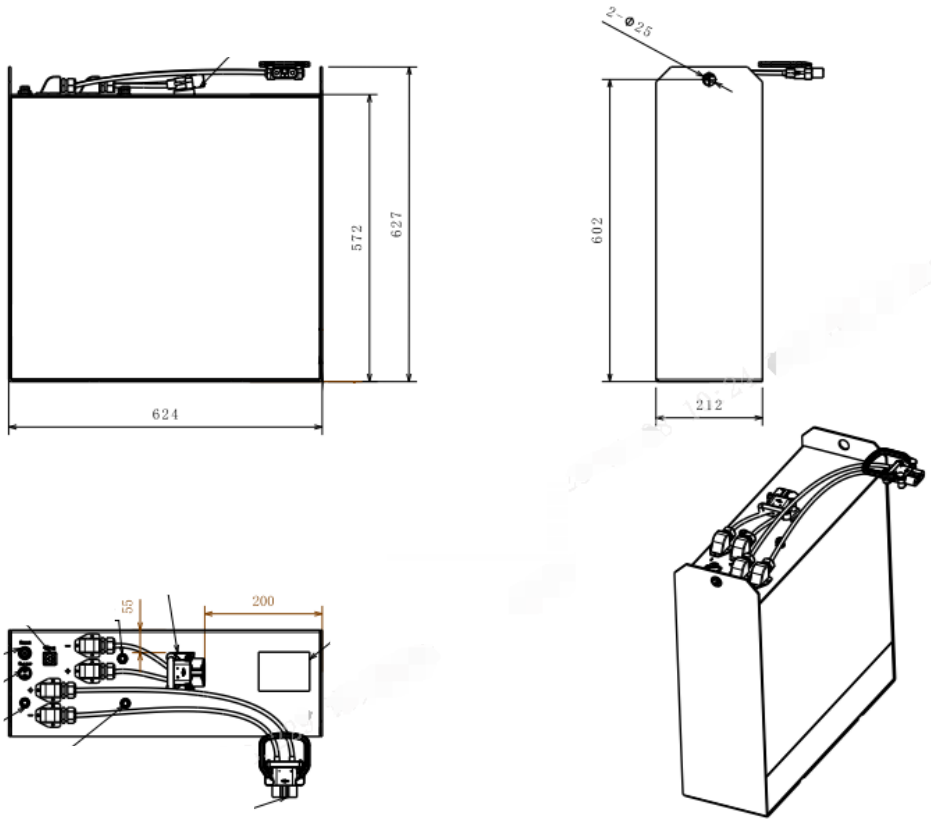
Identification plate and Warning label







No.	Description	Item	Description
54	Manufacturer logo	67	Rechargeable logo
55	Battery model	68	Vertical upward packing, transportation
56	Nominal voltage of battery	69	No putting into ordinary garbage bins
57	Rated capacity of battery	70	No long-term exposure to sunshine
58	Battery energy of battery	71	Stay away from fire
59	Weight of battery	72	Keep out of the rain
60	Configuration of battery	73	Guide to use
61	Protocol version of battery	74	Production date
62	Production serial No.	75	Battery information bar code
63	Production date	76	Bar code interpretation
64	Name of manufacturer	77	Software version of battery
65	Manufacturer's address	78	Battery information 2D code
66	Electrical hazard marker		



Outline diagram (24V 200Ah as an example)

g. Safety Instructions, Warning Indications and other Notes

Safety regulations for handling lithium-ion batteries

Do not try to make any repairs or servicing of lithium batteries

Risk of electric shock and burning

The battery's charging and discharging connectors have open terminals, avoid any body contacts, contamination or direct contacts with objects which can cause short circuit connection of terminals. Use necessary pre-cautions and protective caps to secure the open terminals. The connectors should be maintained in clean and dry conditions.

Use only batteries designed and approved by the manufacturer for the truck.
Do not try to modify or alter the battery.

Any damage or defects to the charger can result in accidents. Use only charger approved by the manufacturer of the truck, which is suitable for used battery

In case charger has any damages or defects, exclude the charger from operation and contact your service provider. Do not modify or try to repair the charger.

Proper use of charger or use of wrong charger can cause damages to a battery or charger. Follow the required charger specifications; If the operation voltage of the charger is out of the applicable voltage range, the charger or battery may be damaged causing serious safety risks. The charger in use must be approved by the battery (truck) manufacturer.

Reversed connection of charging plug is prohibited. Follow the instruction for correct connection. For disconnection of charging plug use dedicated grip and never pull out the plug by means of cable.

Stop charging immediately if any abnormalities are detected, e.g. severe temperature increase, deformation of battery case, smoke, noise etc.

Intermediate charging

Lithium batteries support so called opportunity charging. The lithium battery, which is not fully discharged can be charged in any time. However, frequent opportunity charging not to the full charging state and stop of charging process before the appearance of corresponding indication of charger may result in dis-balance voltage of cells which increases the battery BMS calculation error. In order to effectively deal with this phenomenon, charge the battery in full allowing the automotive balancing process to be completed at least once a week.

Do not charge a fully charged battery

Note that in order to prevent the battery from continuing restart of charging under fully charged condition causing reduction of battery lifetime, the BMS has a protection function that prohibits recharging of fully charged battery. The charger will not work while battery is fully charged.

Potential hazards

If equipment is used according to its design purpose, following the correct operations procedures, there are no hazards anticipated.

The following hazards can arise in the event of improper use:

- Physical damage to the battery in case a battery falls or is deformed through impacts. Mechanical damages can cause leakages of harmful materials, fire or battery explosion.
- Short circuits may be caused by connecting the two battery terminals, for instance caused by water or intentional/unintentional connections.
- Temperature damages caused by location of batteries in overheated locations or being exposed to impact of fire, open sunlight etc. can cause leakages of harmful materials, fire or battery explosion.

In order to avoid fire, explosion and leakage of harmful materials, a safe place for storing batteries until the service arrives on site must satisfy the following criteria:

- Do not store in places where personnel is located.

- Do not store in places with valuable objects and close to valuable objects.
- A Class D fire extinguisher must be available on demand.
- There should not be any fire or smoke detectors in the storage area in order to ensure that an automatic fire detection system is only activated in the event of actual danger (e.g. naked flames).
- No ventilation intake pipes should be in the facility to exclude spreading of discharged content within a building.

Examples of where to store a non-functional battery:

- Roofed outdoor position.
- Ventilated container.
- Covered fire resistant box with pressure and smoke discharge option.

Symbols - Safety and Warnings

	Caution! Battery short-circuit is prohibited.
	The battery can be recharged cyclically
	Vertical upward packing, transportation and use
	Used lithium-ion batteries must be treated as hazardous waste. Lithium-ion batteries marked with the recycling symbol and the sign showing a crossed-out waste bin must not be disposed of with ordinary household waste.
	Avoid fire and short circuits causing overheating. Do not ignite or locate batteries close to open flame, heat sources or sparks. Keep lithium-ion batteries away from heat sources.
	Protect the lithium-ion battery from solar radiation or other forms of heat radiation. Do not expose the lithium-ion battery to heat sources.
	Keep out of the rain.

Explosion and fire hazard

Physical damage, thermal effects or incorrect storage in the event of a defect can result in explosions or fire. The battery materials can be flammable.

Particular hazard from combustion products

The lithium batteries may be damaged by a fire. When extinguishing a lithium battery fire, the following information must be taken into consideration.

Contact with combustion products can be hazardous

Fire produces combustion products, which can occur in the form of smoke, through leaking fluids,

escaping gases, debris as well decomposition products of certain chemicals. These combustion products are substances that enter the body through the respiratory tract and/or the skin can produce and adverse effects such as choking.

Avoid contact with combustion products.
Use protective equipment.

Special firefighting protective equipment

Use self-contained breathing apparatus.
Wear protective equipment.

Additional firefighting instructions

To prevent secondary fires, the lithium-ion battery must be cooled from the outside. Fluids or solids must never be directed into the lithium battery.
Suitable extinguishing agents

- Carbon dioxide extinguisher (CO2)
- Water (not on mechanically opened or damaged batteries)

Unsuitable extinguishing agents

- Foam
- Grease fire extinguishing agents
- Powder extinguishers
- Metal fire extinguishers (PM 12i extinguishers)
- Metal fire powder PL-9/78 (DIN EN 3SP-44/95)
- Dry sand

Instructions for cooling an overheated, non-physically damaged battery

This type of damage may be caused by a short circuit inside the battery, which may result in leakage of harmful materials, fire or battery explosion.

Material discharge

Battery electrolyte fluid can be hazardous

Electrolyte fluid can be discharged if the battery is physically damaged. Avoid its contact with skin or eyes. If the contact happened:

- Rinse the affected parts with big amount of water and request for medical assistance immediately.
- In case of skin irritation or if any substances are breathed in request the medical assistance immediately.

Precautionary measures for personnel

- Keep personnel away, avoid any contact with smoke or discharged materials.
- Block off the affected area and ensure its reasonable ventilation.

- Wear personal protective equipment. If vapors, dust or aerosols are presented use self-contained breathing apparatus.

Precautionary measures for the environment

Do not allow spilled fluids to enter the water system, drainage system or the underground water.

Cleaning measures

The leaked fluid must be removed professionally following the related protocols.

Battery lifetime and maintenance

The lithium-ion batteries are maintenance-free.

Full discharge can damage the battery

Self-discharge can cause the battery to fully discharged state. Full discharge shortens the service life of the battery and can cause deep discharge and activation of related safety protocols when battery will not be able to be charged anymore.

Before a long period of inactivity, the battery must be charged to at least 70%.
Re-charge the battery at least every 12 weeks.

If the battery is deeply discharged or if the battery temperature is below the permissible level, the battery will not charge. Deep discharged batteries can never be charged. Due to the risk of condensate formation, batteries that have been stored at 0°C or below must only be charged after natural warming up to at least +5°C, forced heating is forbidden.

Storage and safe handling

Storage of batteries

Deep Discharge can damage the battery

If the battery is not used for a long period of time, it can become damaged through discharge.

- Before a long period of inactivity, the battery must be charged to the level of at least 70%.
- Recommended to check and charge, if necessary, the battery every 4 weeks when not in use.
- The storage of fully charged battery reduces its lifetime. Recommended level of charge is in the range of 30% to 70%
- The temperature range for storing the battery is 0°C to 30°C.

Instructions for safe handling

New lithium-ion batteries are transported and stored with a charge status of at least <70 %.

- Do not modify the battery.

- Do not open, damage, drop, penetrate or deform the battery.
- Do not throw the battery into a fire.
- Protect the battery from overheating.
- Protect the battery from direct sun light.
- Follow storage and charging procedures

Failure to comply with these safety instructions can result in fire and explosion or the leakage of harmful materials.

Faults

If any damage is found to the battery or battery charger contact the service provider immediately.

Do not open the battery.

Disposal and transport of a lithium-ion battery

Instructions for disposal

Lithium-ion batteries must be disposed of in accordance with the relevant national environmental protection regulations. Batteries must be treated as hazardous waste. Batteries must not be disposed with ordinary waste.

Shipping information

The lithium-ion battery is a hazardous material. The applicable regulations must be fulfilled during transportation.

Shipping functional batteries

Functioning batteries can be shipped in accordance with the related regulations

Shipping faulty batteries

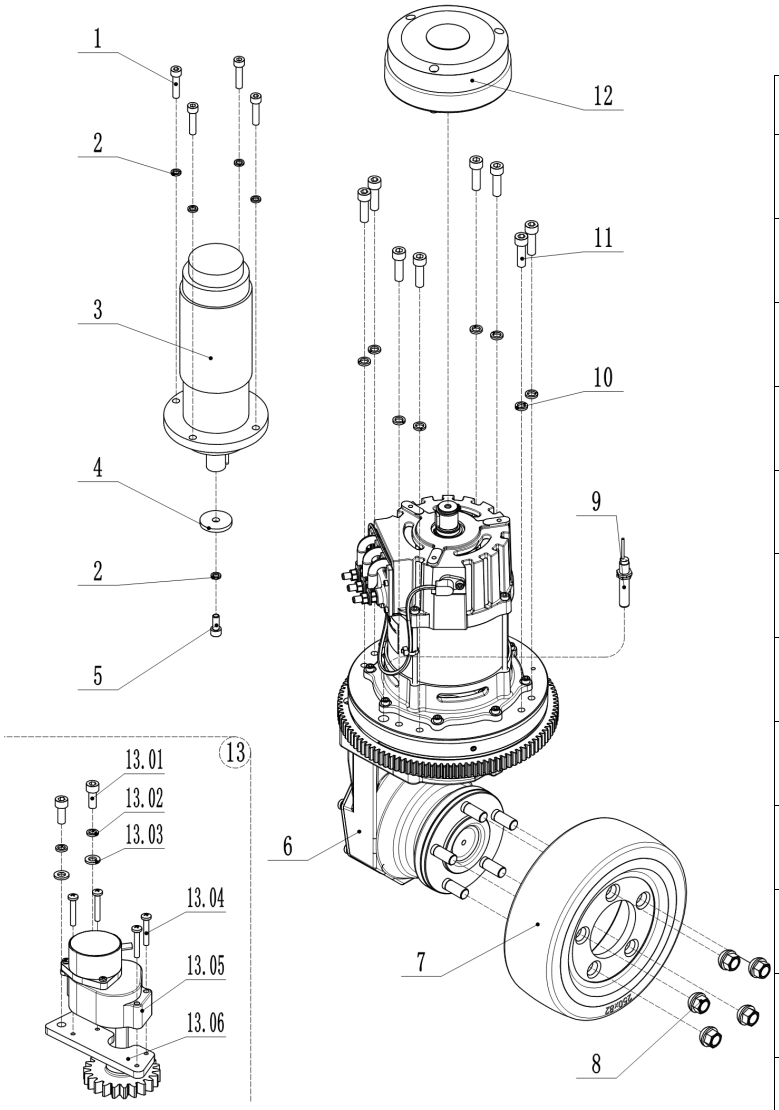
To transport faulty lithium-ion batteries, contact the service provider. Faulty lithium batteries require following of special transporting procedures.

9. Drive/brake system

a. Overview

The drive/brake system includes the following:
1) The drive motor controlled by the controller transmits the rotating power to the drive shaft (electric-mechanical power)
2) The drive shaft converts the rotational power transmitted from the drive motor through its gear set into the torque and speed suitable for the drive, and sends it 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 Drive Unit



No.	Item Description	Qty.	Note
1	Screw M8x30	4	
2	Spring Washer 8	5	
3	Motor	1	
4	Baffle	1	
5	Screw M8x20	1	
6	Steering Unit	1	
7	WheelΦ250x82	1	
8	Nut	5	
9	Proximity Switch	1	
10	Spring Washer 10	8	
11	Screw M10x30	8	
12	Brake	1	
13	Potentiometer kit	1	20CE Optional
13.01	Screw M6x16	2	
13.02	Spring Washer 6	2	
13.03	Flat Washer6	2	
13.04	Screw M4x25	4	
13.05	Potentiometer	1	
13.06	Mounting plate	1	

Operation

The drive motor runs when the following conditions are met:

1 Open the emergency stop switch, start the power supply, unlock the code lock, and power the vehicle

2 people stand on the operation area,

3 Determine the direction of travel,

4 Press the accelerator switch on the handle

Remove and install the drive assembly

Preliminary steps

1 Park the vehicle safely and remove the drive wheel cover

2 Turn off the emergency stop switch and key switch

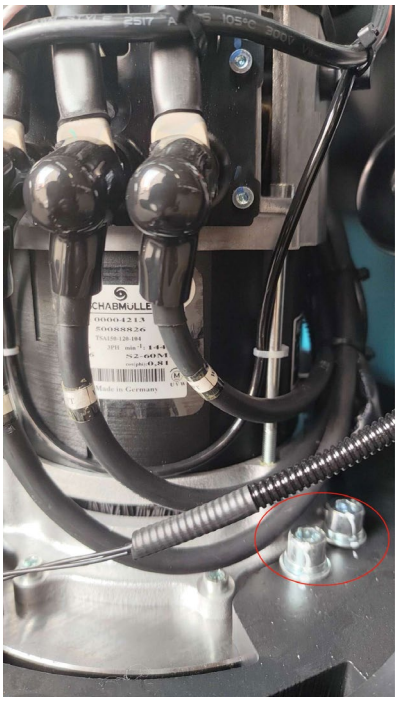
3 Disconnect the battery connector

Disassembly procedure

1) Unplug the harness connector of the motor and remove the power cord


3) Then remove the screws connecting the motor with the car body

4)

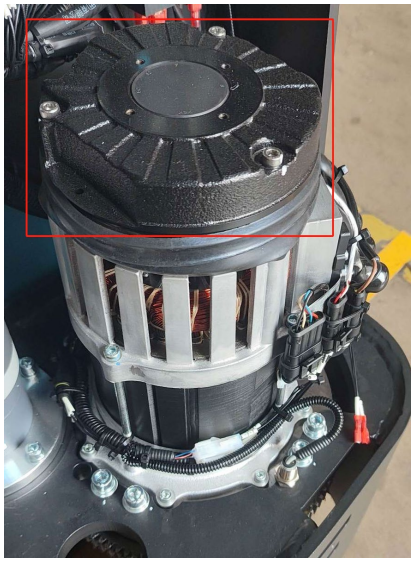
3) Remove the screw and take off the motor power cord connector

4) Remove and replace the 5 screws fixing the PU ring with a 17mm wrench

5) The reverse process of installation and disassembly

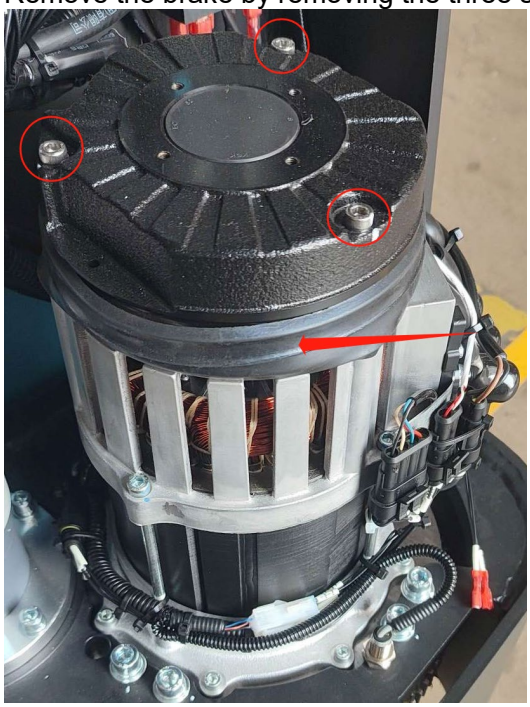
b. Brakes

Appearance



Brake removal and installation

Remove the brake by removing the three screws that are fixed to the drive wheel with a 5mm hex wrench.



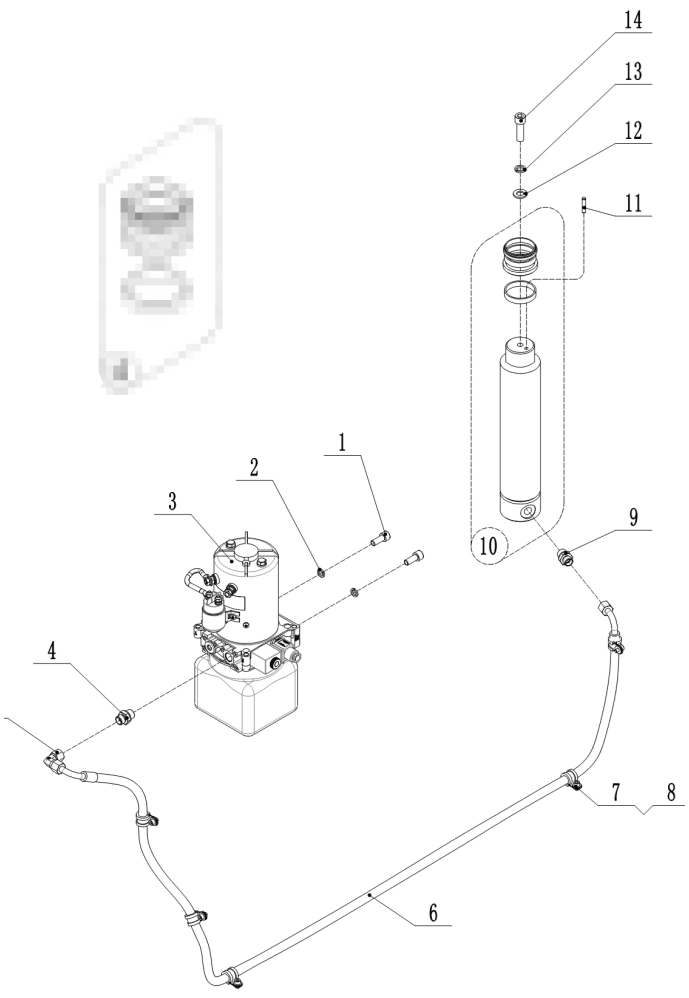
The reverse process of installation and disassembly

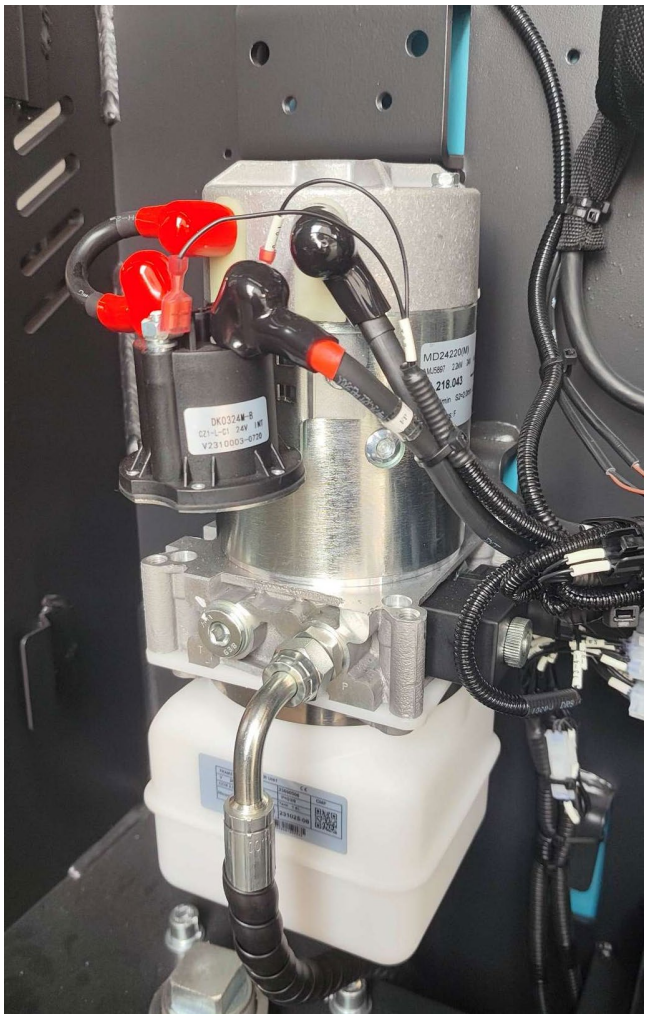
10. Hydraulic system

a. Overview

The hydraulic system is composed of working oil pump, lifting oil cylinder, pipeline and other parts. The hydraulic oil is supplied by the oil pump directly connected with the motor. The oil pump sends the hydraulic oil to the cylinder.

1) Component





The hydraulic system operates other hydraulic parts through hydraulic force from pump.

1. The main hydraulic pump is driven by the pump motor controlled by the controller.
2. The main hydraulic pump uses the rotating force output from the motor to pressure the oil in the hydraulic tank and conveys the oil to the lifting cylinder.
3. The hydraulic tank stores the hydraulic oil returned from the cylinder. The stored oil is sucked by the main hydraulic pump for reuse.

Hydraulic oil circulation

The hydraulic oil tank stores hydraulic oil, which is supplied to the main hydraulic pump through a filter. The main hydraulic pump pressurizes the supplied oil and sends it to the lifting cylinder. When hydraulic oil is received, these systems perform their functions and then drain the waste oil to the tank through the return filter.

2) Detection

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

The pump motor is connected to the controller through the motor contactor. The controller operates the pump motor contactor according to the input from multiple switches and sensors and the internal parameter settings

The pump motor operates when the following conditions are met:

The key emergency stop switch is closed

The limit switch and the up button are closed

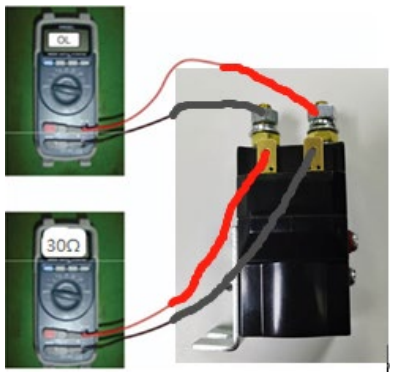
Pump motor contactor is closed

Detection of pump motor contactor:

For the pump motor contactor, as shown in the figure,

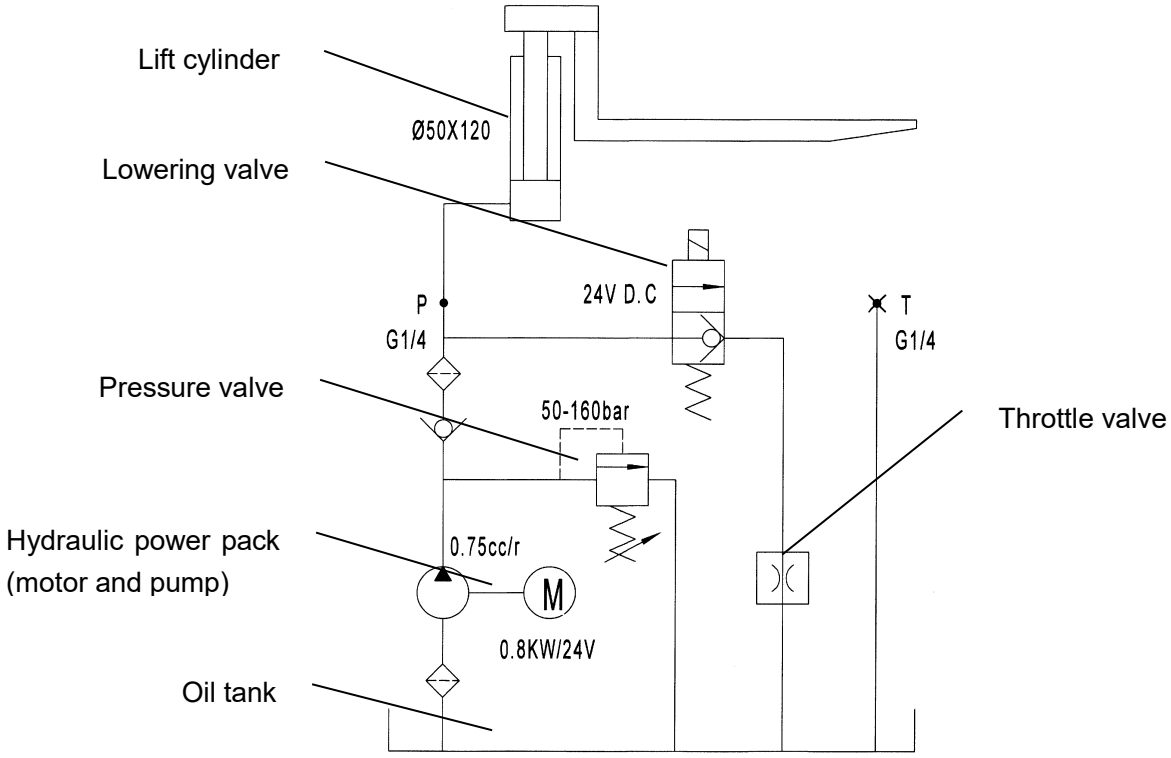
And check whether it measures the specified value.

!DANGER:
Pressurizing the hydraulic oil can cause severe burns and even amputation infection. Before performing the following steps, make sure that the pressure has been



The pressure of the safety valve has been adjusted before delivery, and the user is not allowed to adjust and disassemble it at will

b. Hydraulic circuit



c. TROUBLESHOOTING

Pump Motor

Trouble	Possible cause
The hydraulic pump motor does not work	Poor connection or blown fuse. Check the battery connection. Check the key fuse. Check whether the fuse of the hydraulic pump motor may be blown.
	Key switch, upper limit switch and line contactor are not closed. Turn off the key switch. Use a multi meter to check the power flow through the key switch, line contactor coil and line contactor. The key switch must be turned off.
	Insufficient voltage. Charge or replace the battery. Check whether the cable terminal fits closely with the battery terminal and the control panel connector. Check whether the wires inside the cable are broken.
	The lifting and drive system is not operating correctly.
	During the battery charging operation, the battery is not fully charged.
	The hydraulic system uses too much battery power because the lift or hydraulic control is not correct for the duty cycle.
	The hydraulic pump motor is overheating. If the motor temperature reaches 155 ° C (311 ° F)

Hydraulic Pump

Trouble	Possible cause
Noise in the pump.	The oil level is low.
	Oil is very thick (viscosity is too high)
	The pump inlet pipeline is restricted.
	Worn parts in the pump.
	The oil is dirty.

	Air leaks into the inlet line.
The oil temperature is too high.	The oil level is low.
	The oil passage is restricted.
	The oil is too thin.
	Air leakage exists in the system.
	The pump is too worn.
	The system operates under too high pressure.
Leakage at pump shaft seal.	The shaft seal is worn out.
	The pump body is worn internally.
	Operation with low oil level in the tank will cause the seal to be sucked.
	During installation, the seal is cut at the shoulder of the pump or keyway.
	The sealing lip is dry and hardened by heat.
The pump cannot deliver fluid.	The oil content in the tank is low.
	The pump inlet pipeline is restricted.
	There is air leakage in the pump inlet pipeline. Loose bolts. Defects in the suction line of the bay.
	The viscosity of the oil is wrong.
	The pump is too worn.
	Pump shaft failure
	The bolts for the pump do not have the correct torque.

11. 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 order picker, please use the specific binding equipment or lifting equipment mentioned in Chapter 4. Before lifting the order picker, please put the safety device (for instance designated jack, wedge, or wooden blocks) under the order picker to avoid accidental fall, movement or sliding.
- 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 wheel, please follow the instructions above. Casters must be round and free from abnormal wear.
Check the key items emphasized in the maintenance checklist.

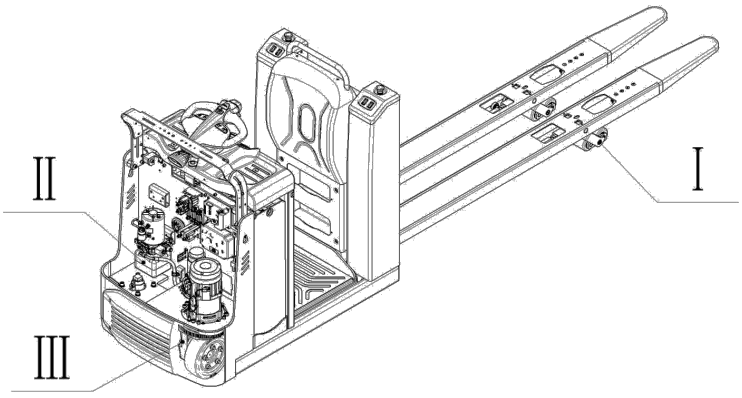
a. Maintenance checklist

		Interval (Month)			
		1	3	6	12
Hydraulic system					
1	Check the hydraulic cylinder(s), piston for damage noise and leakage		•		
2	Check the hydraulic joints and hose for damage and leakage		•		
3	Inspect the hydraulic oil level, refill if necessary		•		
4	Refill the hydraulic oil (12 month or 1500 working hours)				•
5	Check and adjust function of the hydraulic valve (2000kg +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 noise and leakage		•		
11	Inspect the wheels for deformation and damages		•		
12	Inspect and lubricate the steering bearing				•
13	Inspect and lubricate the pivot points		•		
14	Lubricate the grease nipples	•			
Electrical system					
15	Inspect the electric wiring for damage		•		
16	Check the electric connections and terminals		•		
17	Test the function of emergency button		•		
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(s)		•		
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 or adjust the air gap		•		
Battery					
27	Check the battery voltage		•		
28	Clean and grease the terminals and check for corrosion and damage		•		
29	Check the battery housing for damages		•		
30	Check and if necessary refill the battery with distillated water	•			
Charger					
31	Check the main power cable for damages			•	
32	Check the start-up protection during charging			•	
Function					
33	Check the horn function	•			
34	Check the air gap of the electromagnetic brake	•			
35	Test the emergency braking	•			
36	Test the reverse and regenerative braking	•			
37	Test the safety (belly) button function	•			
38	Check the steering function	•			
39	Check the lifting and lowering function	•			
40	Check the stop button function	•			
General					
41	Check if all decals are legible and complete	•			
42	Inspect the castors, adjust the height or replace these if worn out.		•		
43	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.



Ⅰ. Load wheels

Ⅱ. Hydraulic system

Ⅲ. Gearbox

Waste material like used oil, waste batteries or others must be properly disposed and recycled according to the national regulations and if necessary brought to a recycling company.

The oil level in the oil tank should not be under the min marks for starting the order picker.

c. Check and refill hydraulic oil

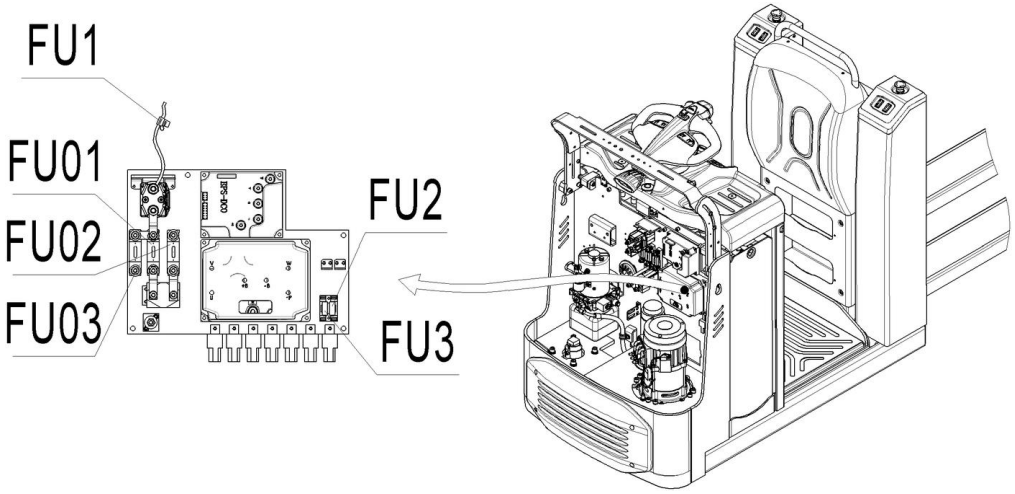
The required hydraulic l type is:

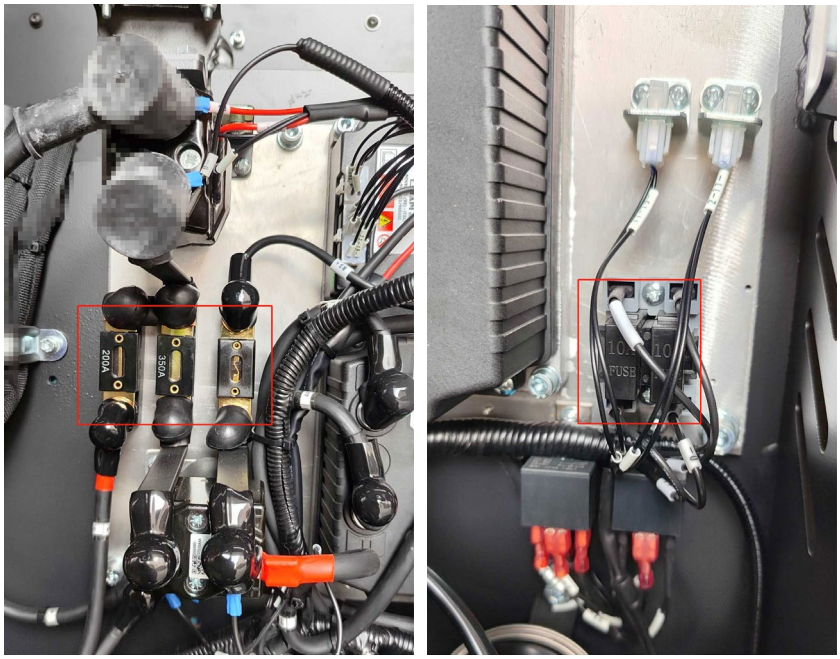
- H-LP 46, DIN 51524
- Viscosity is 41.4 – 47
- Oil filling level: 1.5L for standard order picker, 3.0L for optional order picker with man-up platform

d. Checking electrical components and fuses

Remove the front panel, the fuses are located as shown in the following figure.

1)

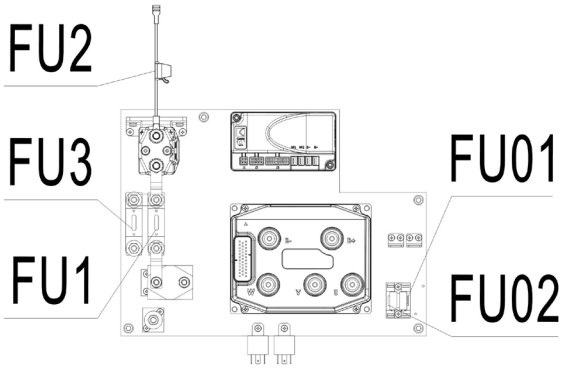




The location of the fuse

Fuse	Specification
FU1	10 A
FU2	10 A
FU3	15 A
FU01	350 A
FU02	30 A
FU03	200 A

2）20CE



Fuse	Specification
FU1	350 A
FU2	30 A
FU3	200 A
FU01	10 A
FU02	15 A

12. TROUBLE SHOOTING

Fault	Possible cause	Solution
The truck cannot move	Battery connector is not connected well	Check and well-connected the connector
	The emergency switch is pressed	Release emergency switch
	The pin-code lock is not activated	Activate the pin-code lock
	Low battery	Check SOC and must charge the battery
	Protection device is damaged	Check the protection device
Low driving speed	SOC is under 10%	Charge the battery
	Turtle speed button is pressed	Release turtle speed button
	Man-up platform is lifted over 300mm	Lower Man-up platform until it is within 300mm
Loads cannot be lifted	Overload	Load the truck within rated capacity
	SOC is below 10%	Charge the battery
	Lifting fuse fault	Check and replace the lifting fuse
	Hydraulic oil level too low	Check and eventually refill hydraulic oil
	Oil leakage	Repair the hoses and/or sealing of the cylinder
	Proximity switch under the platform is damaged or not activated	Adjust or replace the proximity switch
Drive wheel slippage	Floor is not clean	Clean the floor
	Pits on the floor	Remove the trailer and drive out of the pit

If you are unable to troubleshoot the order picker after trying all the solutions listed above, contact your local dealer or our after-sales department, who will be responsible for further troubleshooting.

In order to find out the cause of the fault more accurately and quickly, please provide the following important information when you are to contact the local dealer or the after-sales department::

- Serial number of the truck (on the ID plate);
- Fault code on the indicator display;
- Description of the fault;
- The specific part of the order picker with fault;
- Contact details

13. The CURTIS control system

a. The Curtis handheld programmer

INTRODUCTION

The Curtis 1313 Handheld Programmer (1313 HHP) performs programming and troubleshooting tasks for Curtis programmable motor controllers, gauges, and control systems. The 1313 HHP connects to Curtis devices in one of two ways—specific to the device: Either directly via the device's RS232 serial port, or through a Controller Area Network (CAN) connection which can have multiple devices on the CAN bus. Cables specific to the connection type are supplied with the 1313 HHP.

This manual covers the operation for the CAN open network connected devices.

For an additional overview of the 1313 HHP, consult the datasheet, Curtis document number 50194, available on the Curtis website: www.curtisinstruments.com

a. **See:** *Home/Products/Motor Controllers/Programming/1313 Handheld Programmer/Datasheet*
Direct Link: 1313 Handheld Programmer: datasheet

Available on the Curtis website is the 1313 Handheld Programmer Operation video tutorial.

See: *Home/Videos/1313 Handheld Programmer Tutorial*
Direct link: Tutorial:1313 Handheld Programmer Operation

NOTICE

This document refers to generic Curtis products. The images used are principally of the F2-A motor controller which may not match other devices or applications compatible with this 1313 HHP. This manual does, however, describe the usage of the applications (app) that can be used for all compatible devices. Custom OEM products and applications may not have some features described in this manual.
For technical support or applications not covered in this manual, contact the vehicle manufacturer. OEMs should contact the Curtis distributor where the 1313 HHP and devices were obtained, or the regional Curtis sales-support office.

WARNING

WARNING! The control system can affect speed, acceleration, deceleration, dynamic stability, and braking. If the control system is programmed incorrectly or outside the safe limits as determined by the vehicle manufacturer, a dangerous situation can result. Only the vehicle manufacturer or an authorized service agent or dealer should program the devices that form a control system.

This manual, RevC July 2022, is updated for the following 1313 HHP software.

Consult the Application Note: 1313 HHP Software Update, RevG (pdf) for the software matching the revisions shown. Update to both the Serial and CAN (this manual) software versions as illustrated below.

Software Version	1.24.03.00
HHP Resource Version	0.91
DME Resource Version	0.98
MH Resource Version	0.59
FWM Version	2.09.00.00

HW3 = **Blue-band** handsets
Serial (G1) communication protocol

Software Version	1.09.08.00
HHP Resource Version	0.19
FWM Version	2.09.00.00

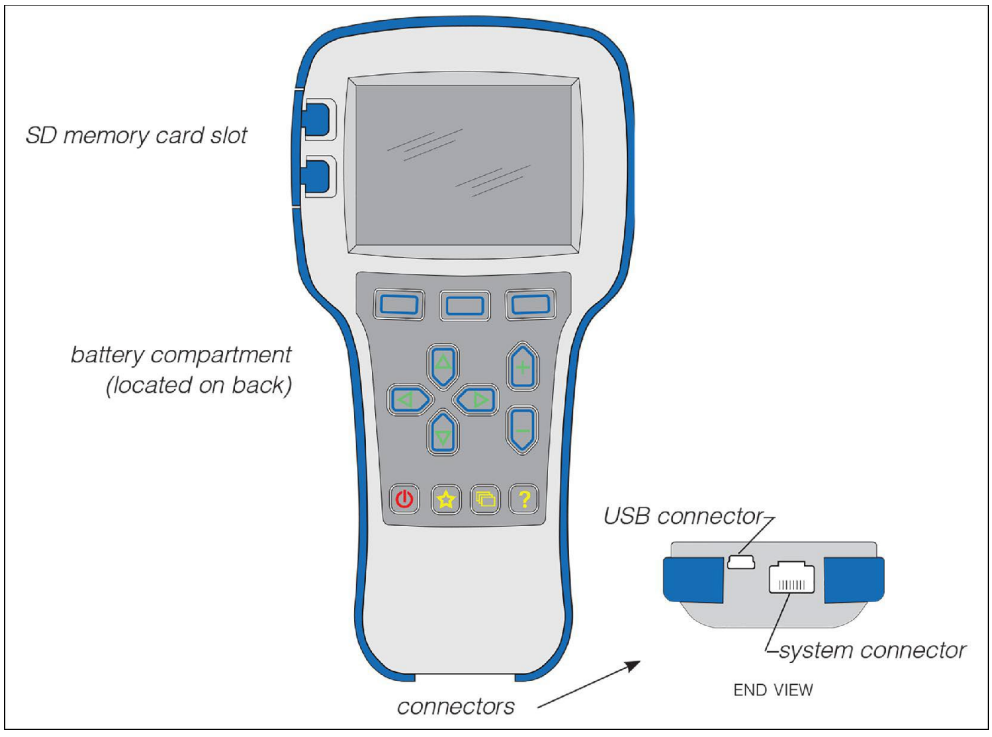
HW3 = **Blue-band** handsets
CANopen (G2) communication protocol

b. 1313 HHP OPERATION

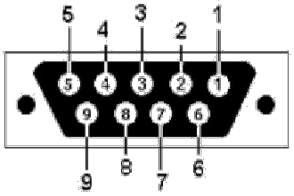
This Chapter describes how to use the 1313 HHP for CAN-based communication devices. Although there are similarities between the CAN-based devices and the serial devices, there are differences in the connection and the apps.

CONNECTIONS

The 1313 HHP has two connectors, one for communicating with the devices and one for interfacing with a PC. The 1313 HHP also has a battery compartment and a memory card slot.



Controller (Vehicle System) Connector



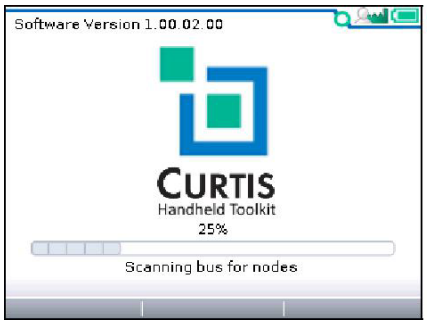
1313-xx31 Wiring	
D-Sub Pin	Function
7	CAN_H
2	CAN_L
9	B+ (8–36 V)
6	B–

Vehicle Harness Wiring for CAN Connected 1313 HHP

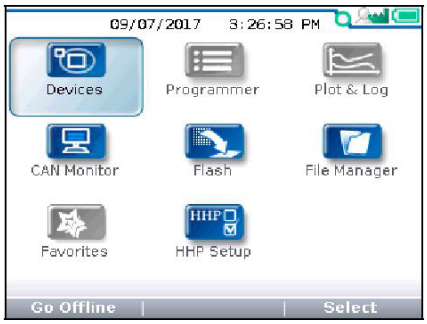
POWER-ON THE 1313 HHP

Connect the 1313 HHP to the system by plugging it into the system's CANbus using the supplied DB9 CAN-port cable. If the CAN connection point provides power, the 1313 HHP will automatically power up. If not, press the power key (⏻) and it will power up and run off its internal batteries (if batteries are installed). Once running, the 1313 HHP will then listen to the CAN bus and automatically create a list of detected devices.

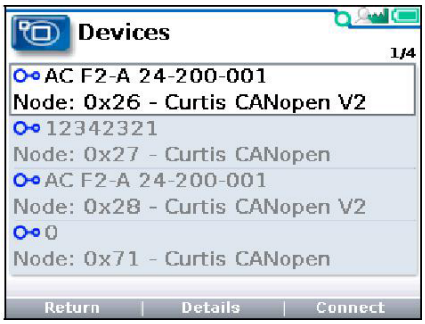
The first screen (see left image) indicates the scanning progress. Systems can have multiple devices on the CANbus, so once the scanning process is complete, press the "Select" softkey on the main screen (middle image) to open the Devices app, then scroll to the desired device and press the "connect" softkey (right image). The device-specific apps are disabled (grayed out) until a device is connected.



Scanning for Nodes

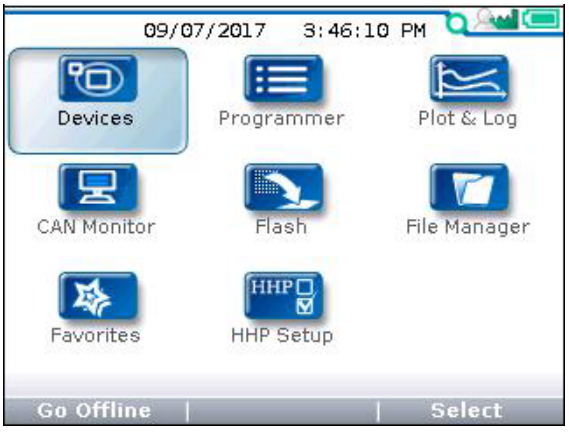


Devices option



Select the device to connect

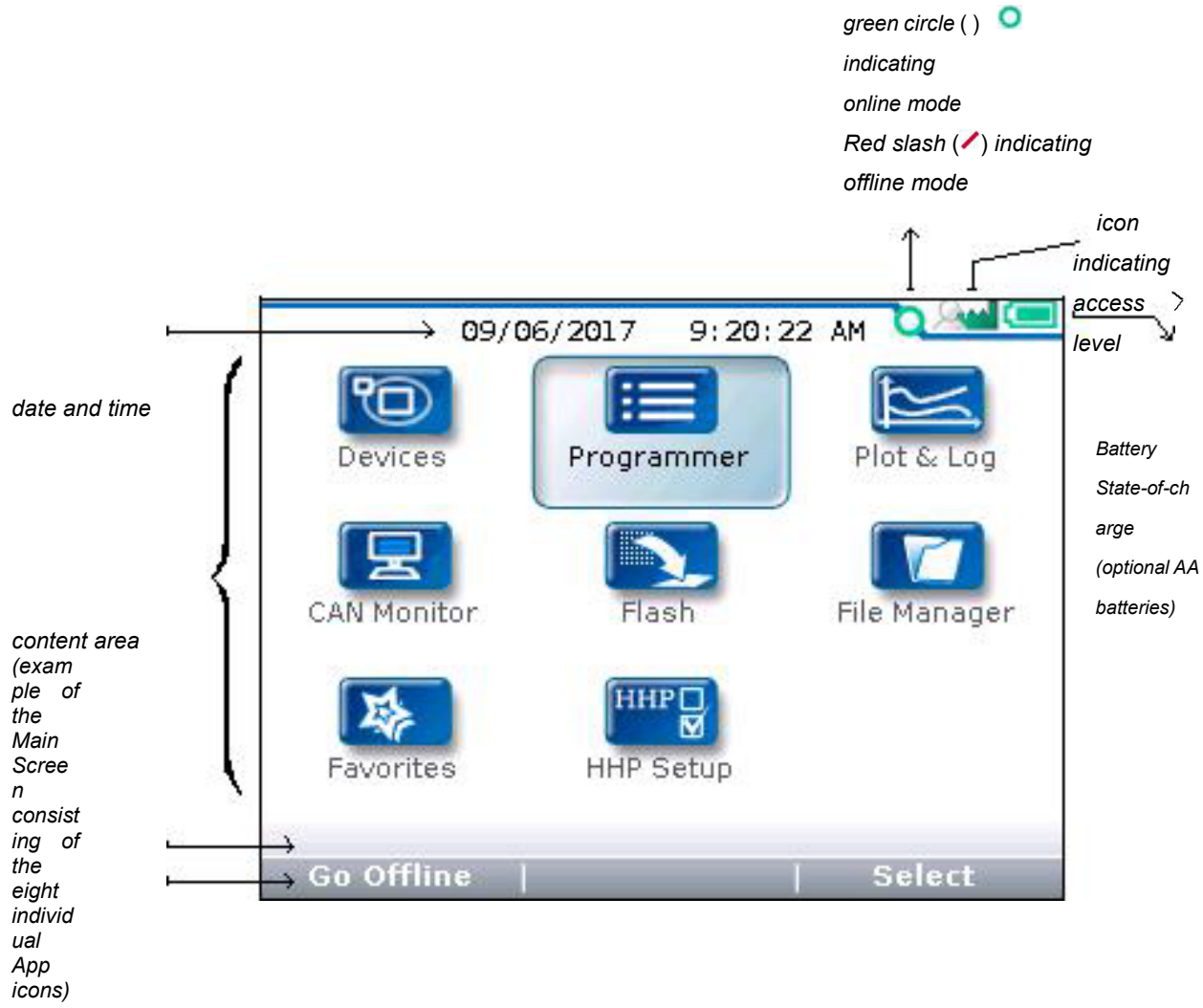
If the 1313 HHP hasn't previously connected to a selected device, it will sequence through four steps uploading information. The 1313 HHP will automatically remember this device. All subsequent connections to this device, even on a different system, will be much faster, only requiring the final current-data upload step. After the 1313 HHP has uploaded this data from the device, the Main Screen is displayed.



Main Screen: when connected to a device.

DISPLAY FORMAT

The high-resolution clarity of the LCD screen allows a wealth of information to be displayed at once. The example below shows the information available in the Main Screen.



In this above example, pressing the “Select” softkey will open the highlighted Programmer app. The “Select” softkey opens whichever app is highlighted. Pressing the "Offline" softkey switches the 1313 HHP to Offline mode. In Offline Mode, the 1313 HHP cannot communicate with the device. The 1313 HHP can perform operations that do not require communication with the device.

ACCESS LEVEL

The 1313 HHP is available in five access levels: OEM Factory, OEM Dealer, Field Advanced, Field Intermediate, and Field Basic, based upon the model number. Each 1313 HHP model has access to levels below it, but not above it. Using the HHP Setup app, the access levels can be lowered, which is useful to view apps and menus as they would appear to the lower-access 1313 HHP models.

For technical support regarding access levels, contact the vehicle manufacturer. OEMs should contact the Curtis distributor from which the 1313 HHP and device were obtained, or contact the regional Curtis sales-support office.

Access levels:

OEM Factory:

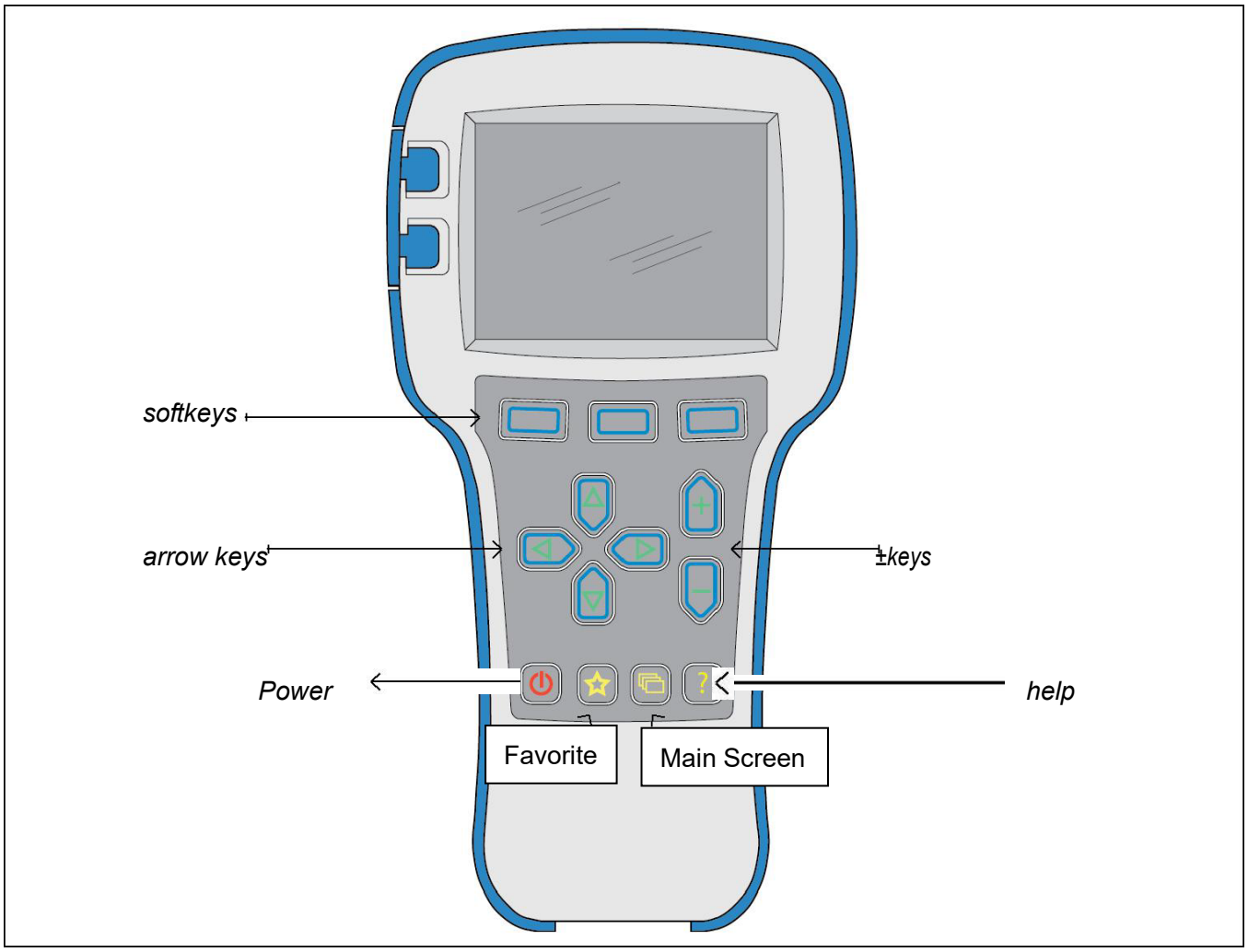
OEM Dealer:

Field Advanced:

Field Intermediate: **Field Basic:**

KEY FUNCTIONS

The pushbutton keys on the 1313 HHP’s keypad allow rapid navigation through the apps.



Soft keys

These three keys are blank because their function is context-specific. At any given time, their function is shown directly above them on the LCD screen. The symbol "»" indicates more options. Pressing the softkey under the "»" will scroll to another set of softkey options.

Arrow Keys

Use these four keys to scroll up-and-down and right-and-left within the display screen. In the main screen, use the arrow keys to highlight one of the apps; then open the highlighted app using the "Select" softkey.

Within apps, the left-arrow key (◁) is used to navigate back to the previous screen, up to the apps opening screen. If the "Exit menus with left arrow" is set to "Yes" in the HHP Setup options, press this key will exit the app, displaying the main screen.

Within apps, the right-arrow key (▷) is used to navigate forwards—that is, to go to the next screen, the next function, or to open a parameter's detail screen.

± Keys

Use these keys to increase or decrease the value of parameters. These keys are also used as "+ = Yes" and "– = No" keys. The keys are also used to scroll through optional settings such as access levels or languages.

Power

The Power key turns the 1313 HHP on or off.

If the CANbus is powered, the 1313 HHP will turn on automatically when connected.

Turn off the 1313 HHP by pressing and holding the Power key for 2 seconds. A pop-up message will ask you to confirm. The softkey text will offer the choices "Yes" and "No." Unplugging the 1313 HHP will turn it off even if the batteries are installed.

If the 1313 HHP has been turned off, or if it has timed out and shut off, pressing the Power key will turn it on again.

Note: when the 1313 HHP is connected to a PC using the USB cable, the 1313 is powered by the PC. Pressing the power key will have no effect. The 1313 HHP displays "USB Mode Active" and appears as a removable drive to the PC.

Favorites

This key is an alternate way to bring up the Favorites app. Access Favorites by either selecting the Favorites icon on the Main Screen, or by using this Favorites key, Favorites, for more information about using the Favorites app.

Screenshots

Momentarily press the Power Key and then momentarily press the Favorites key to save the present image of the LCD display. These are called screenshots.

Main Screen

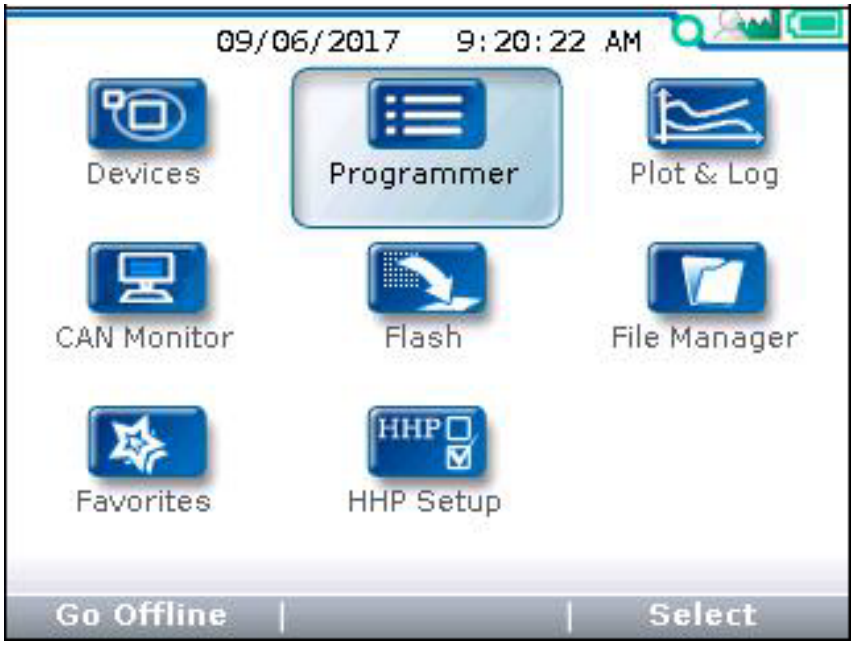
Pressing this key will return the 1313 HHP to the Main Screen from any location. When the main screen is displayed, use this key to cycle through the individual apps. Use either this key or the arrow keys to navigate within the main screen.

Help

This key is used to display context-specific Help texts.

MAIN SCREEN AND APPS ORGANIZATION

The Main Screen contains 8 apps that are each identified by a specific icon.



To select an app, scroll using the arrow keys () until the app is highlighted. Apps can also be selected by successive presses of the main screen key (). Each press will highlight the next app.

When navigating within an app, the left-arrow key () can be used to navigate back to the previous screen. (It is possible to limit this left-arrow key function using the "`Exit menus with left arrow`" item in the HHP Settings menu.

c. DEVICE

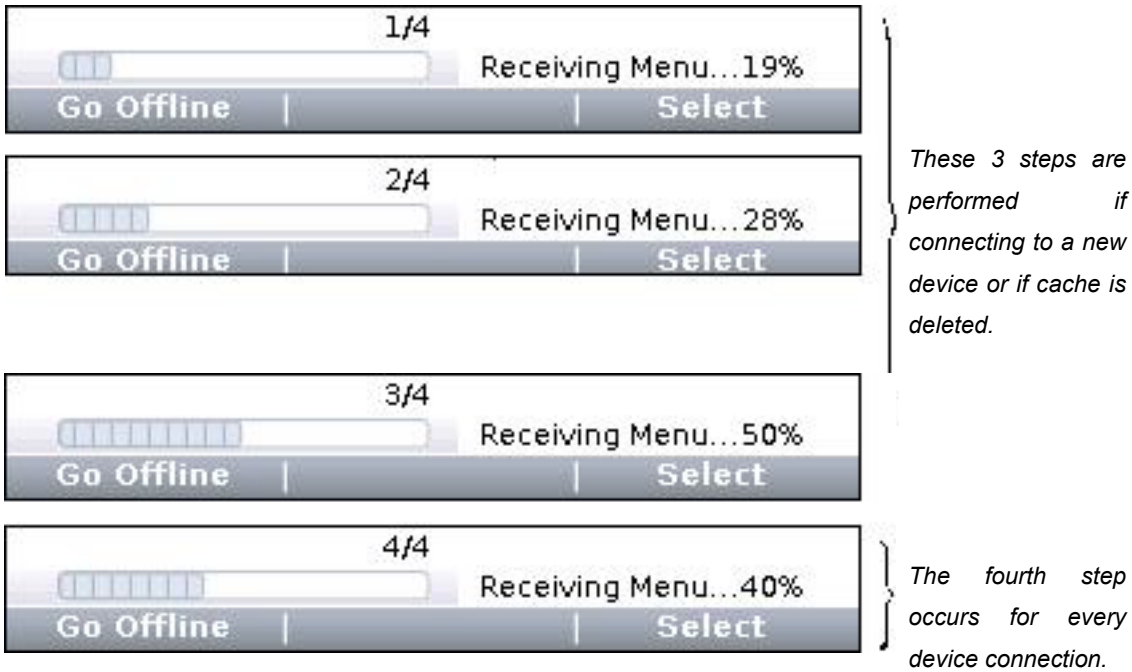
Device Details and Connection

To use the 1313 HHP, a device must be compatible and then a CAN connection established. The Device app is where devices (CAN nodes) discovered during the startup CANbus-scan are listed*.

After the 1313 powers up and completes the start -up scan, the Main Screen is displayed with the Devices app highlighted. Press the "Select" softkey to open the Devices app. The app lists the active devices found on the CANbus. When a compatible device (e.g., `Curtis CANopen V2`) is highlighted, the "Connect" softkey will be enabled (selectable). If not, the softkey will be disabled (grayed out).

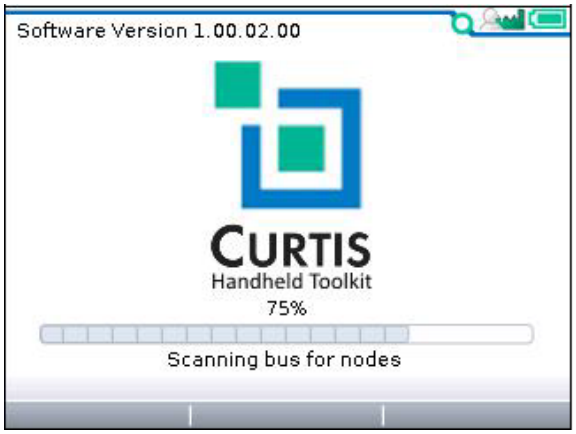
The Device app is also where device-specific information can be viewed before connecting—useful when many devices are listed. Press the "Details" softkey to view information such as the device Family, Model number, Serial number, Manufacture date, and its software/firmware/hardware versions. The "Details" softkey remains available once connected.

If a selected device hasn't connected to the 1313 HHP before, the connection-screen displays a series of 4 successive progress bars (`Receiving Menu…x%`) that are identified as ¼, 2/4, ¾, 4/4. The 1313 HHP saves the information from the first 3 progress bars in a cache file. If this cache file is deleted (see "`Delete Cache File`" in the HHP Setup app), the 4 steps will repeat the next time a connection is made to the same device. If the device's cache file is available, the next connection to the device will skip the first 3 progress bars and will display progress bar 4/4 as the latest parameter settings are acquired from the device. Connection times are greatly improved when a cache file is available.

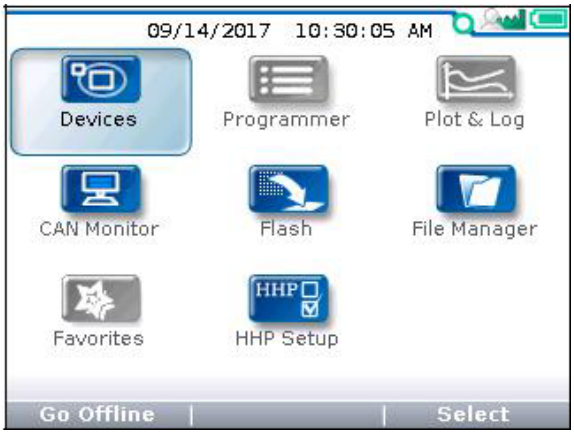


The following screenshots illustrate the Devices app usage. Notice that in the second and fifth images, the Devices app and 4 other apps are available before connecting to a device. (See the CAN Monitor, Flash, File Manager, HHP Setup, and Offline Mode chapters.) Once a device is connected, the remaining 3 device-specific apps (Programmer, Plot & Log, and Favorites) become available.

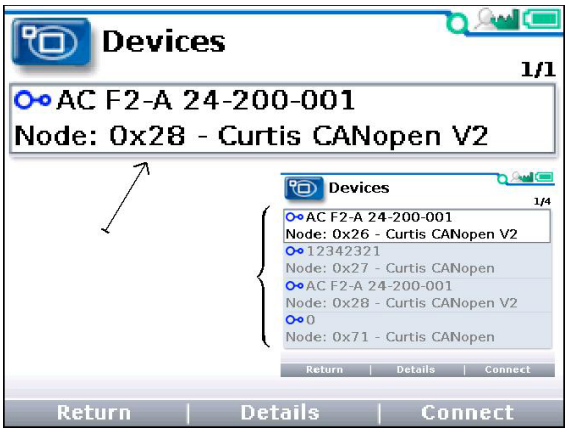
** Note: If known devices on the CANbus do not appear on the app's listed devices, check their node ID. Devices on the CANbus cannot have the same node ID and be discovered/shown on the 1313 HHP.*



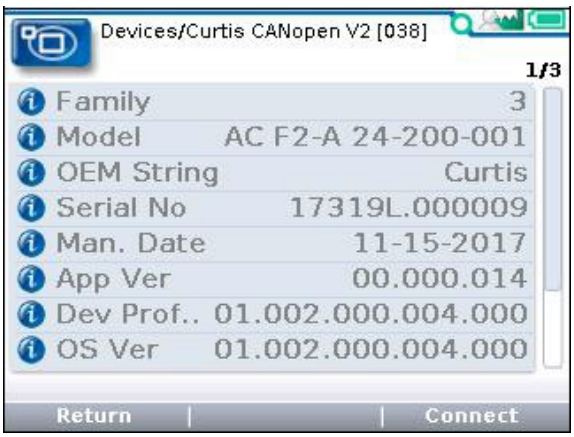
(1) 1313 HHP startup-scan of CANbus for devices



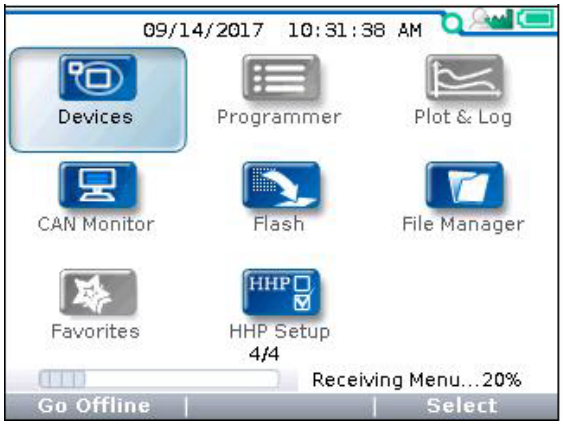
(2) Main Screen following the CANbus scan Just the "Offline" capable apps are available.



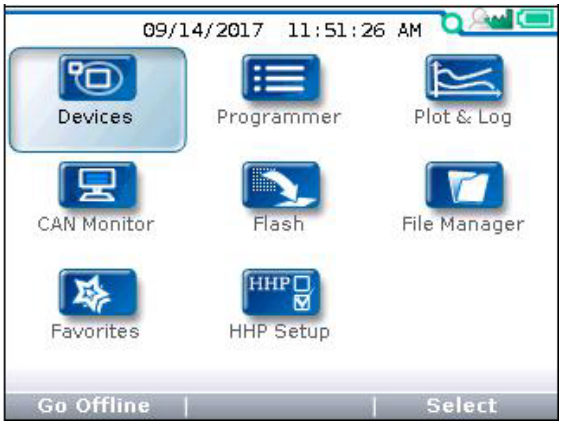
(3) "Select" softkey—opens app and lists devices



(4) "Details" softkey—returns device information

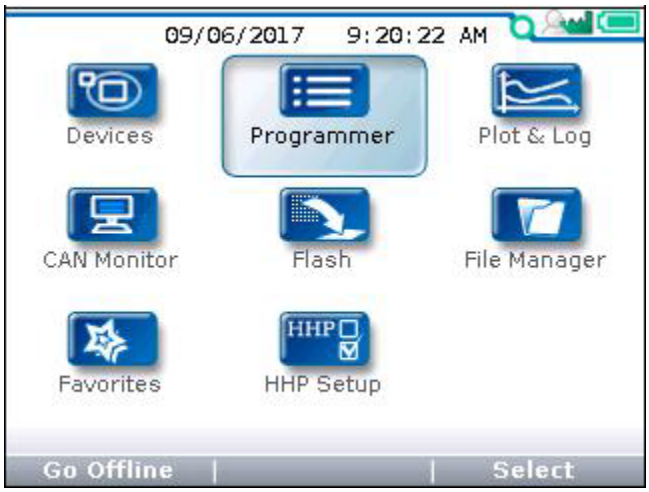


(5) "Connect" softkey—receiving data progress



(6) Device connected—all apps are available

d. PROGRAMMER



The Programmer* app is where parameters, monitor variables, active-faults, and the fault -history are accessed. There are no separate monitor and diagnostics apps on the main screen. This chapter covers all of the items that can be accessed with the Programmer. It is recommended that the Device manual be consulted for explanations of the read/write and read only variables viewable within Programmer.

Not all devices will have the same Programmer menus pictured here, and some devices may not operate as describe in this chapter. Available faults and diagnostic procedures can vary with the deviceThe the 1313 HP does not support the umlaut characters ÄÖÜ and äöü. Their usage (i.e., custom parameters or menus) will result in a corrupted/shifted text display.

In the main screen, highlight the Programmer icon and press the “Select” softkey to open the app. Use the arrow keys and the softkeys to navigate within Programmer. Use the +/- keys to adjust parameter values. Each item in Programmer is assigned an icon indicating its type. These are:

( ) The *pencil* read/write icon indicates an adjustable parameter.

( ) The *open-book* read-only icon corresponds to monitor variables.

( ) The menu icon, indicating there are additional items, or sub-menus, within.

( ) An active fault, or a fault within the Fault History menu.

( ) The parameter is out of range (warning)

Note that related monitor variables often reside within particular parameter menus—offering immediate feedback for a parameter change**.

PROGRAMMER STRUCTURE

When any of the app's top-level menus are selected (Select) the name of the app is displayed adjacent to the Programmer icon. When navigating through a hierarchical menu, the text at the top of the screen expands to show the path taken. Likewise, the item's relative position on the screen or in a menu is shown in the window. The top, or first item will indicate "`1 of X`" while the bottom, or last item will indicate "`X of X`" on the screen. This is helpful when the quantity of items in the menu/sub-menu exceeds the display's 8 lines. Illustrated below are two examples showing the path and position of highlighted items in the Speed Mode menu of an F2-A motor controller.

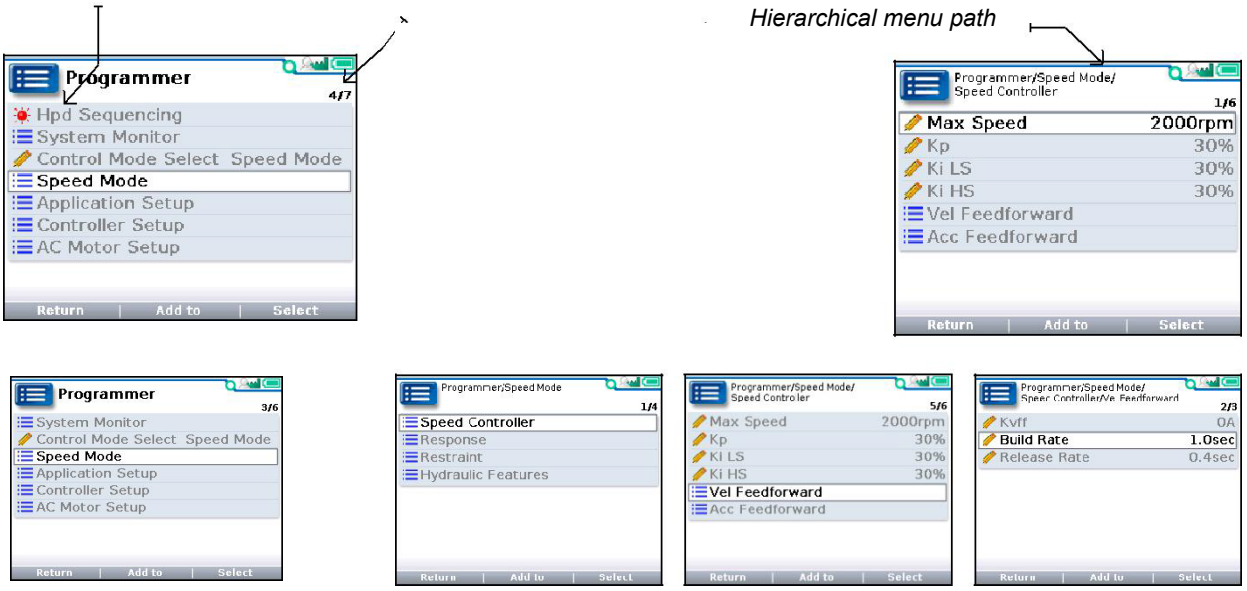
(1) parameter *Max Speed*

(2) parameter *Build Rate*

Displayed faults are device specific

Highlighted parameter is the 4th of 7 items(4/7)

Hierarchical menu path

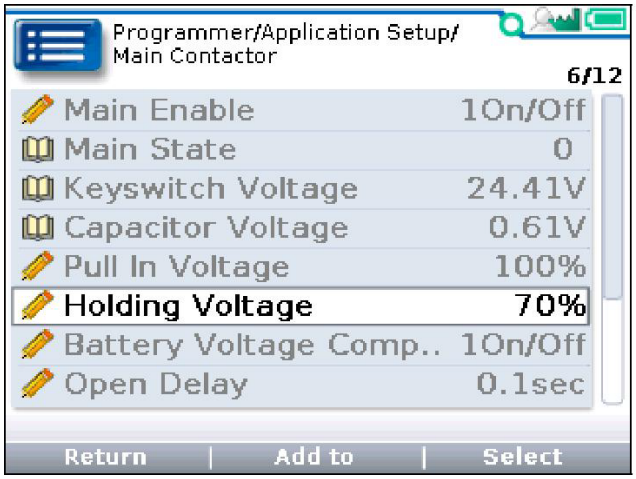


If exiting an app using the main screen key ( ) and later returning to the same app, the app will open to a location that depends on the "`Remember Last View`" setting in the HHP Setup app. If the setting is "Off", the app opens at the top-level. If the setting is "On", the app opens to the most recently used location.

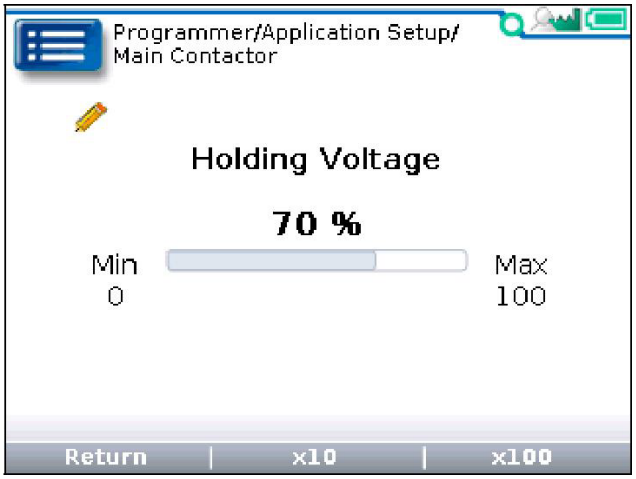
Note: If the 1313 HHP is turned off (e.g., the device or CANbus is key-cycled) the "`last-place-memory`" is lost. Each power-on session begins the Remember Last View anew, even if the setting is "On".

ADJUSTING/EDITING PARAMETERS

Within Programmer, use the down (▽) or up (△) arrows to navigate between parameters, monitor-items, or sub-menus. If the menu contains more than the 8 items shown on the screen, a scrollbar appears at the right edge of the screen. When a scrollbar is present, the lines wrap around so that navigating up from the top line/item navigates the screen to the last line/item on the list and vice versa.



Holding Voltage highlighted



Holding Voltage _ expanded (detail screen example)

When a parameter is highlighted, pressing the "Select" soft-key or right-arrow key (▷) will open to a detail screen, where the present setting is shown in relation to the available range. The preceding comments regarding parameter adjustments also apply to the detail screen.

e. Trouble shooting for Curtis system (Curtis-F4-A)

No.	The meter/controller displays the fault code	Fault Name	Description	Cause or solution
1	1-2	Controller Overcurrent Fault Type: 1 = U-phase overcurrent 2 = W phase overcurrent 3 = V-phase overcurrent 4 = Controller current > 135% current limit	Turn off motor, main contactor, electromagnetic brake, accelerator, full power brake	1, the motor U, V, W phase external connection short circuit 2. The motor encoder signal is disturbed 3. Motor parameters are misadjusted 4, controller failure
2	1-3	Current Sensor Fault Fault Type: 1	Turn off motor, main contactor, electromagnetic brake, accelerator, full power brake	1, U, V or W phase leakage to the car body (short circuit in stator) 2. Controller failure 3. Replace the controller
3	1-4	Precharge Failed Fault Type: 1. Interruption 2. Energy limitation 3, time limit	Turn off motor, main contactor, electromagnetic brake, accelerator, full power brake	1, The load connected to th+G4:I6e controller B+ terminal post inhibits the capacitor charging inside the controller 2. Check the voltage displayed by Programmer System Monitor Menu Controller Capacitor Voltage 3. Replace the controller
4	1-5	Controller Severe Undertemp	Turn off motor, main contactor, electromagnetic brake, accelerator, full power brake	1, the controller works in extreme environments 2. Check the temperature displayed by Programmer System Monitor Menu Controller Controller Temperature By raising the temperature above -40 degrees Celsius, restart the key switch or interlock switch, and replace the controller if not;

5	1-6	Controller Severe Overtemp	Turn off motor, main contactor, electromagnetic brake, accelerator, full power electric brake	1, the controller works in extreme environments 2. The load is too heavy 3. The controller installation is unreasonable 4. Check the temperature displayed by Programmer System Monitor Menu Controller Controller Temperature By lowering the temperature to below 95 degrees Celsius. Restart the key switch or interlock switch, or replace the controller if it does not work;
6	1-7	Severe B+ Undervoltage	No drive torque output	1, non-controller systems consume photocells 2. The internal resistance of the battery is too high 3. The battery is not connected when driving the motor 4. The fuse connected to B+ is blown or the main contactor is not closed 5. The controller battery parameters are set incorrectly 6. Check the voltage displayed by Programmer System Monitor Menu Controller Capacitor Voltage
7		Severe KSI Undervoltage	None, unless specific measures are in the VCL software	1, non-controller systems consume photocells 2. The resistance of KSI input line is too high 3. The KSI line is disconnected when driving the motor 4, the fuse blown 5. Check the voltage displayed by Programmer System Monitor Menu Controller Keyswitch Voltage
8	1-8	Severe B+ Overvoltage	Turn off motor, main contactor, electromagnetic brake, accelerator, full power brake	1, the controller battery parameters are set incorrectly 2, regenerative braking, when there is current back charge battery, the internal resistance of the battery is too high 3. The battery is not connected during regenerative braking 4. Check the voltage displayed by Programmer System Monitor Menu Controller Capacitor Voltage

9		Severe KSI Overvoltage	Turn off motor, main contactor, electromagnetic brake, accelerator, full power brake	1, the battery voltage to the KSI (pin1) terminal of the controller exceeds the severe high voltage set point 2, Check the voltage displayed by Programmer System Monitor Menu Controller Keyswitch Voltage
10	1-9	Speed Limit Supervision	Turn off the interlock, electromagnetic brake	1, motor speed has been detected exceeding the Max Speed Supervision setting 2. Max Speed Supervision is set incorrectly 3. Check the Programmer Application Setup Max Speed Supervision setting value
11	1-10	Motor Not Stopped 1 = The motor moved more revolutions than then parameter, Motor Not Stopped Position Error setting Motor Not Stopped Position Error 2 = The motor moved faster than the parameter, Motor Not Stopped Speed Error (RPM) for 160 ms Motor Not Stopped Speed Error 3 = The three-phase drive has applied an electrical frequency greater than the Motor Not Stopped Max Frequency parameter, and Motor Not Stopped Max Frequency applied an RMS current greater than the Motor Not Stopped Max Current parameter for 64 ms Motor Not Stopped Max Current Parameters set	Turn off the motor, main contactor, electromagnetic brake, accelerator, oil pump, and brake at full power	1. Motor Not Stopped. 2. Check out: Programmer » Application Setup » Motor Not Stopped menu. 3. Internal controller failure or conflict causes the motor to rotate when stopped
12	1-11	Critical OS General (<100) Internal Fault. Contact Curtis support.	Turn off the motor, main contactor,	1. (<100) Internal failure. 2. (>100) The CIT version is too old to fully support the FOS version.

		(>100) An ill-formed or corrupted application package was loaded into controller.	electromagnetic brake, accelerator, interlock, drive 1, drive 2, drive 3, drive 4, drive 5, drive 6, drive 7, proportional drive, oil pump, coil power supply, full power braking	
13	1-12	OS General 2 (<100) Internal Fault. Contact Curtis support. (>100) An ill-formed or corrupted application package was loaded into controller.	The controller is not operational	1. (<100) Internal failure. 2. (>100) The CIT version is too old to fully support the FOS version.
14	1-13	Reset Rejected	Turn off interlocks, accelerators	Restart the key switch
15	1-14	Motor Short	The controller is not operational	Reset the controller
16	2-2	Controller Overtemp Cutback	Reduced drive and braking torque	1. The controller works in extreme environments 2. The load is too heavy 3. The controller installation is unreasonable 4. The performance of the controller is limited at this temperature 5. Check the temperature displayed in Programmer System Monitor Menu Controller Controller Temperature By lowering the temperature to below 85 degrees Celsius. Restart the key switch or interlock switch, or replace the controller if it doesn't work;

17	2-3	Undervoltage Cutback	Reduced drive torque	1. The battery needs to be charged, and the performance of the controller is limited at this voltage 2. The controller battery parameter setting is wrong 3. Non-controller systems consume photocells 4. The internal resistance of the battery is too high 5. The battery is not connected when driving the motor 6. The fuse connected to B+ is burned out or the main contactor is not engaged 7. Check Programmer System Monitor Menu Controller Currents Under-voltage Cutback 8. Check the voltage displayed in Programmer System Monitor Menu Controller Capacitor Voltage
18	2-4	Overvoltage Cutback	Brake torque Note: This fault can only be detected during regenerative braking	1. During normal operation, the current generated by regenerative braking is recharged to the battery, and the battery voltage is too high, resulting in failure, and the performance of the controller is limited under this voltage 2. The controller battery parameter setting is wrong 3. Regenerative braking, when there is a current to recharge the battery, the internal resistance of the battery is too high 4. The battery is not connected during regenerative braking 5. Check Programmer System Monitor Menu Controller Currents Overvoltage Cutback 6. Check the voltage displayed in Programmer System Monitor Menu Controller Capacitor Voltage
19	2-5	"Ext 5V Supply Failure" Fault type: 1. The output 5V voltage is out of range 2. Current out of range at 5V voltage"	Turn off the 5V output	1, The external 5V load is too small (pin16) 2. Check the voltage and current of the 5V output displayed in Programmer / System Monitor Menu / Outputs

20	2-6	"Ext 12V Supply Failure" Fault type: 1. The output 12V voltage is out of range 2. Current out of range at 12V voltage"	Turn off the 12V output	1, the external 12V load is too small (pin23) 2. Check the voltage and current of the 12V output displayed by Programmer / System Monitor Menu / Outputs
21	2-8	Motor Temp Hot Cutback	1, reduce the drive torque 2. If Motor Braking Thermal CutBack Enable = On, reduce braking torque	1. The temperature of the motor is greater than or equal to the Temperature Hot setting value, which causes the controller to output current limiting 2. The motor temperature and sensor parameters are set incorrectly 3. Check Programmer / AC Motor Setup / Temperature Sensor
22	2-9	Motor Temp Sensor	Enter LOS mode, reduce the motor speed, and turn off the motor high position reduction function	1. The motor temperature sensor is not connected properly; 2. The sensor polarity connection is incorrect (pin9 and pin12) 3. The motor temperature and sensor parameters are set incorrectly 4. Check Programmer System / Monitor Menu / AC Motor Temperature
23	3-1	Main Contactor Drive Failure Fault Type: 1. Drive short circuit 2. Drive overcurrent 3. Open/short circuit (high detected, should be low) 4, open/short circuit (low detected, should be high) 5. Broken wire	Turn off the motor, main contactor, electromagnetic brake, accelerator, and brake at full power	1, The driver load is open or short 2. The connector pin or contactor coil is dirty 3. Connector crimping error or wiring error
24	3-2	EM Brake Driver Fault Type: 1. Drive short circuit 2. Drive overcurrent 3. Open/short circuit (high detected, should be low) 4, open/short circuit (low detected, should be high) 5. Broken wire	Turn off the electromagnetic brake, accelerator, and brake at full power	1, The driver load is open or short 2. The connector pin or contactor coil is dirty 3. Connector crimping error or wiring error
25	3-4	Load Hold Diver Fault	Closes the currently assigned driver	Equivalent to Driver 1 Fault

26	3-5	Lower Fault	Closes the currently assigned driver	Equivalent to Driver 1 Fault
27	3-6	Encoder Fault Fault Type: 1. Verify the loss 2. Overcurrent leads to pulse loss 3. Speed pulse signal loss 4, motor matching 5. Encoder power supply part failure	Turn off the electromagnetic brake, accelerator, and brake at full power	1. The motor encoder fails 2. Crimping or wiring error 3. Check Programmer / System Monitor Menu / AC Motor / Motor RPM 4. Check Programmer / AC Motor Setup / Quadrature Encoder / Encoder Fault Setup 5, Check Programmer System / Monitor menu / Hardware Inputs: Analog 3 and 4.
28	3-7	Motor Open	Turn off the motor, main contactor, electromagnetic brake, accelerator, and brake at full power	1, the motor phase is open 2. Crimp or wiring error
29	3-8	Main Contactor Welded	Turn off the motor, main contactor, electromagnetic brake, accelerator, and brake at full power	1. The main contactor contact is always adhesive 2. The motor is open in V phase or U phase 3. There is an external voltage directly connected to the controller B+ binding post
30	3-9	Main Contactor Did Not Close Fault Type: 1. The main contactor does not close after there is a control command 2. The main contactor is disconnected when working 3. The steering failure causes the main contactor to be disconnected	Turn off the motor, main contactor, electromagnetic brake, accelerator, and brake at full power	Type 1: 1. The main contactor does not suction 2. The main contactor contact is defective 3. The B+ binding post of the controller is connected to a large load, which causes the capacitor to not be charged effectively 4. The high-current fuse is blown out 5. The parameters of the main contactor are set incorrectly Type 2: 1. The main contactor is disconnected when working 2. The contactor coil connection is disconnected 3. Contactor failure

31	4-2	Throttle Input Failure. Fault Type: 1. The outside is too low or too high	Turn off the accelerator	1, the accelerator input voltage is out of the range of Analog Low and Analog High settings, and the corresponding analog input is defined as the accelerator input 2. Check Programmer / Controller Setup / Analog Inputs / Analog 1 Type 3. Check Programmer / Controller Setup / Analog Inputs / Configure
32	4-4	Brake Input	Full power braking	Corresponding faults triggered by the brake input source (assigned analog inputs) Note: Input fault diagnosis can also be the input voltage out of range
33	4-6	NV Memory Failure Fault Type: 1. Invalid verification 2. Data writing error 3. Data reading error 4. Data writing is not completed due to power failure	Turn off the motor, main contactor, electromagnetic brake, accelerator, interlock, drive 1, drive 2, drive 3, drive 4, drive 5, proportional drive, full power braking	1. The memory data read and write fails 2. Internal fault of the controller
34	4-7	HPD Sequencing	Turn off the accelerator	1. The key switch, interlock, direction switch, and accelerator input are operated in an incorrect sequence 2. Wiring or crimping errors in key switches, interlocks, direction switches and accelerator inputs are broken 3. Key switches, interlocks, directional switches and accelerator inputs are damp 4. Check Programmer System / Monitor Menu / Inputs Switch Status 5. Check Programmer System / Monitor Menu / Inputs Throttle Command
35		EMR Rev HPD	Turn off the accelerator and electromagnetic brakes	The emergency reverse operation has ended, but the accelerator input, direction switch, and interlock have not returned

36		Oil Pump High Pedal Protection (Pump HPD) Fault Type: 1, just lifting 2, just go down 3. Lifting and descending	Turn off the oil pump	Wrong lift/descent accelerator input condition (>25%) Setting Parameter Error: 1. Hydraulic suppression type 2. HPD/SRO judgment time Hardware failure of oil pump accelerator
37	4-9	Parameter Change Failure Fault Type: CAN ID of the recorded parameter	Turn off the motor, main contactor, electromagnetic brake, accelerator, and brake at full power	After the interlock is closed, the safety-related parameters are modified, i.e. those marked with PCF
38	4-10	EMR Switch Redundancy	Turn off interlocks, electromagnetic brakes	1, 1 or 2 of the two emergency reverse switches do not work, resulting in an invalid state 2. The switch is damp or enters the dirt
39	5-1	Arm PDO Timeout Fault	Turn off the motor, main contactor, electromagnetic brake, accelerator, and brake at full power	1. If the controller communication data is not sent to the controller within 500ms, check the CAN communication
40	5-2	VCL HPD SRO Fault	Turn off the motor, main contactor, electromagnetic brake, accelerator, and brake at full power	1. Click the switch signal before starting, and the accelerator signal is connected first 2. Accelerator signal is connected before interlock signal
41	5-3	Display PDO Timeout Fault	No steering, turn off motor, main contactor, electromagnetic brake, accelerator, full power brake	1. If the instrument communication data exceeds 400ms and is not sent to the controller, check the CAN communication
42	5-4	BDI Low Liftlock	Walking speed down, lifting lock	1. The current power is lower than Par BDI Lockout Level, and the traveling motor Speed is reduced to Par BDI Lockout speed

43	5-5	PDO Fault 1220	Turn off the motor, main contactor, electromagnetic brake, accelerator, and brake at full power	1.1220E Steering controller communication data is not sent to the controller for more than 500ms, check the CAN communication
44	5-6	1220 shutdown Fault	No steering, turn off the motor, main contactor, electromagnetic brake, accelerator, full power braking	1. The 1220E controller sends a critical fault message and notifies the running stop
45	5-7	1220 Limit Fault	Power reduction	1. The 1220E controller transmits a common fault message and notifies the running device of power reduction
46	5-8	Handshake Fault	Turn off motor, main contactor, electromagnetic brake, accelerator, full power brake	1. If the walking and turning handshakes fail, check the CAN bus
47	5-9	Interlock SRO	Current vehicle None	Reservation fault
48	6-1	Rema EMR SRO	Turn off motor, main contactor, electromagnetic brake, accelerator, full power brake	1. When starting the device, the handle has transmitted an emergency reverse signal
49	6-2	Throttle Supervisor Fault	Turn off motor, main contactor, electromagnetic brake, accelerator, full power brake	1. Check the dual-channel accelerator signal, and the continuous difference between the two signals is more than 10% for more than 1S
50	6-3	Unmatched Display Fault	Warning	1. Select the correct instrument type 2. The CAN communication between the controller and the instrument is abnormal
51	6-4	BMS Fault Grade Non Zero	Warning	Check the battery

52	6-5	PDO Timeout BMS	Turn off the motor, main contactor, electromagnetic brake, accelerator, and brake at full power	1. If the communication data of the lithium battery is not sent to the controller for 1S, check the CAN communication
53	6-6	BMS Temp High fault	Limited operation Drive Current Li fault state	1 Lithium battery over temperature alarm
54	6-7	BMS LOW AH	Limited operation Drive Current Li fault state	Need to be charged
55	5-A	BMS voltage difference	Limited operation Drive Current Li fault state	Check the battery
56	5-B	BMS Severe Overvoltage	Warning	Check the battery
57	5-C	BMS Undervoltage	Warning	Check the battery
58	5-D	BMS Temp LOW fault	Warning	Check the battery
59	5-E	Battery type mismatch	Warning	Reservation fault
60	5-F	Remote pdo timeout	Turn off the motor, main contactor, electromagnetic brake, accelerator, and brake at full power	1. The remote module Underdog 5S does not send any message to the controller. Check CAN communication
61	6A	Inch Foot Pedal Fault	Turn off the motor, main contactor, electromagnetic brake, accelerator, and brake at full power	1. When the pedal is pressed down, it triggers a little movement

62	6-8	Inch Foot Pedal Fault	Turn off the motor, main contactor, electromagnetic brake, accelerator, interlock, drive 1, drive 2, drive 3, drive 4, drive 5, proportional drive, full power braking	1. Run time fault is defined by VCL, refer to system information 2, when using VCL to control the drive, the drive command does not match the drive letter
63	7-1	OS General	Close all	Reset the controller
64	7-2	PDO Timeout	Trigger: Two adjacent PDOs have been receiving messages for more than the set PDO timeout Clear: Receives CAN NMT information, or resets the controller	1, The time for the two adjacent PDOs to receive information exceeds the set PDO timeout time 2. Adjust PDO settings, check Programmer/Application Setup/CAN Interface/PDO Setups
65	7-3	Stall Detected	Turn off the motor, electromagnetic brake, and accelerator, change the control mode to LOS, and the motor output is limited	1, motor stalled 2. The motor encoder fails 3. Wrong crimping or wiring 4. The power supply part of the motor encoder is abnormal 5. Check Programmer System / Monitor Menu / AC Motor / Motor RPM
66	7-7	Monitoring Faults (Supervision) Fault Type: Curtis monitoring code	Turn off the motor, main contactor, electromagnetic brake, accelerator, interlock, drive 1, drive 2, drive 3, drive 4, drive 5, proportional	Faulty internal controller

			drive, full power braking	
67	7-9	Supervision Input Check	Turn off the motor, main contactor, electromagnetic brake, accelerator, interlock, drive 1, drive 2, drive 3, drive 4, drive 5, proportional drive, full power braking	Faulty internal controller
68	8-2	PDO Mapping Error	Turn off the PDO	1, too many data bits are allocated during PDO mapping, or the target is incompatible 2. Adjust PDO settings, check Programmer/Application Setup/CAN Interface/PDO Setups
69	8-3	Internal Hardware Failure Fault Type: Curtis Hardware Code	Turn off the motor, main contactor, electromagnetic brake, accelerator, and brake at full power	An internal controller fault has been detected
70	8-4	Motor Braking Impaired	Turn off the motor, main contactor, electromagnetic brake, accelerator, and brake at full power	The battery is overcharged, the motor or controller is overheating, or the parameters are not suitable. Reset the interlock pedals
71	8-7	Motor Characterization Error Fault Type: 71 Write memory RAM fails 72 temperature sensor failure 73 The motor overheats 74 controller temperature reduction	Turn off the motor, main contactor, electromagnetic brake, accelerator, and brake at full	The motor fails to match during the motor matching

		76 low pressure reduction 77 High pressure reduction 78 without encoder signal 79 current check out of range 80 current check out of range 81 can detect encoder signals, but cannot automatically detect the number of pulses per revolution (encoder steps) 82 Automatic matching failed The 90/98 does not detect the permanent magnet synchronous motor feedback sine/cosine signal The 91 permanent magnet synchronous motor does not rotate 92 permanent magnet synchronous motors do not accelerate or have low acceleration 94-97 permanent magnet synchronous motor delay compensation out of range The 99 permanent magnet synchronous motor rotates when it starts matching 102 permanent magnet synchronous motor temperature sensor failure 103 permanent magnet synchronous motor high temperature reduction 104 permanent magnet synchronous motor controller temperature reduction 106 permanent magnet synchronous motor controller low voltage reduction 107 permanent magnet synchronous motor controller high voltage reduction	power	

72	8-8	Encoder Pulse Error	Turn off the motor, main contactor, electromagnetic brake, accelerator, and brake at full power	1, the encoder step count setting does not match the reality 2. Check the verification parameter settings Programmer AC Motor Setup Quadrature Encoder/ Encoder Steps 3. The motor loses IFO control, and the motor accelerates and rotates without accelerator signal input.
73	8-9	Parameter Out of Range Fault Type: Record target CAN ID	Turn off the motor, main contactor, electromagnetic brake, accelerator, and brake at full power	1, The parameter value is detected to be out of range 2. Check and rewrite parameters with CIT tool"
74	9-1	Bad Firmware	The controller does not fully boot	The controller firmware is incorrect 1. CRC or OS mismatch 2. Incompatible OS was used
75	9-2	EM Brake Failed to Set	Turn off the electromagnetic brakes, accelerators Trigger slope standing function after interlock activation	1, the vehicle is detected running, after the electromagnetic brake is set to brake 2. The electromagnetic brake cannot prevent the motor from rotating after braking
76	9-3	Encoder LOS	LOS mode	1, Encoder 3-6 fault or 7-3 fault, enter LOS mode 2. The motor encoder fails 3. Wrong crimping or wiring 4. Vehicle stall
77	9-4	Emer. Rev Timeout	Turn off the accelerator and electromagnetic brakes	1, Emergency Reverse triggers and ends, because the emergency reverse time expires 2. Emergency reverse input is stuck
78	9-6	Pump BDI	Turn off the oil pump	1, the power is lower than the set value of the low battery lock parameter 2. The BDI parameter setting is incorrect

79	9-9	Parameter mismatch Fault Type: 1. The dual-wheel drive function is turned on in torque mode 2, SPMSM motor feedback selected encoder 3. AC induction motor feedback selected sine-cosine	Turn off the motor, main contactor, electromagnetic brake, accelerator, and brake at full power	1. Incorrect motor feedback selection for different motor technology applications 2. The dual-wheel drive function is turned on in torque mode 3. The dual-drive function is turned on when the single controller is applied
80	9-10	Monitoring for Interlock Braking Supervision. Fault Type: 1. The motor speed exceeds the speed limit of interlock brake monitoring 2. The interlock is disconnected, and the electromagnetic brake is not set braking within the set time 3. The interlock is disconnected, the electromagnetic brake is not set to brake, and the rotor position exceeds the RPM position limit	Turn off the motor, electromagnetic brake, main contactor	1. During interlock braking, the motor speed exceeds the parameters set under Interlock Braking Supervision 2. Check Programmer / Application Setup / Interlock Braking / Supervision Enable. 3. Check out Programmer/Application Setup/Interlock Braking/Interlock Braking Supervision
81	9-11	EMR Supervision	Turn off the motor, electromagnetic brake, main contactor	1. During the emergency reverse process, the motor speed exceeds the parameters set under Emergency Reverse Supervision 2. Check Programmer / Application Setup / Emergency Reverse / Emergency Reverse Supervision.
82	10-1	Driver 1 Fault Fault Type: 1. Drive short circuit 2. Drive overcurrent 3, open/short circuit (detected high, should be low) 4, open/short circuit (detected low, should be high) 5. Broken wire 6. The output limit is no current Fault type 3-5 requires drive fault detection to be turned on	Turn off driver 1	1, The driver load is open or short 2. The connector pin or contactor coil is dirty 3. Wrong crimping or wiring of the connector 4. The drive is overcurrent, and the value of the Driver 1 Overcurrent parameter is exceeded 5. Check Programmer / Controller Setup / Outputs / Driver 1 / Driver 1 Overcurrent.

83	10-2	Driver 2 Fault Fault Type: 1. Drive short circuit 2. Drive overcurrent 3, open/short circuit (detected high, should be low) 4, open/short circuit (detected low, should be high) 5. Broken wire 6. The output limit is no current Fault type 3-5 requires drive fault detection to be turned on	Turn off driver 2	1, The driver load is open or short 2. The connector pin or contactor coil is dirty 3. Wrong crimping or wiring of the connector 4. The driver is overcurrent, and the value of the Driver 2 Overcurrent parameter is exceeded 5. View Programmer / Controller Setup / Outputs / Driver 2 / Driver 2 Overcurrent.
84	10-3	Driver 3 Fault Fault Type: 1. Drive short circuit 2. Drive overcurrent 3, open/short circuit (detected high, should be low) 4, open/short circuit (detected low, should be high) 5. Broken wire 6. The output limit is no current Fault type 3-5 requires drive fault detection to be turned on	Turn off driver 3	1, The driver load is open or short 2. The connector pin or contactor coil is dirty 3. Wrong crimping or wiring of the connector 4. The driver is overcurrent, and the value of the Driver 3 Overcurrent parameter is exceeded 5. Check Programmer / Controller Setup / Outputs / Driver 3 / Driver 3 Overcurrent.
85	10-4	Driver 4 Fault Fault Type: 1. Drive short circuit 2. Drive overcurrent 3, open/short circuit (detected high, should be low) 4, open/short circuit (detected low, should be high) 5. Broken wire 6. The output limit is no current Fault type 3-5 requires drive fault detection to be turned on	Turn off driver 4	1, The driver load is open or short 2. The connector pin or contactor coil is dirty 3. Wrong crimping or wiring of the connector 4. The driver is overcurrent, and the value of the Driver 4 Overcurrent parameter is exceeded 5. Check Programmer / Controller Setup / Outputs / Driver 4 / Driver 4 Overcurrent.

86	10-5	Driver 5 Fault Fault Type: 1. Drive short circuit 2. Drive overcurrent 3, open/short circuit (detected high, should be low) 4, open/short circuit (detected low, should be high) 5. Broken wire 6. The output limit is no current Fault type 3-5 requires drive fault detection to be turned on	Turn off driver 5	1, The driver load is open or short 2. The connector pin or contactor coil is dirty 3. Wrong crimping or wiring of the connector 4. The driver is overcurrent, and the value of the Driver 5 Overcurrent parameter is exceeded 5. View Programmer / Controller Setup / Outputs / Driver 5 / Driver 5 Overcurrent.
87	10-6	Driver 6 Fault Fault Type: 1. Drive short circuit 2. Drive overcurrent 3, open/short circuit (detected high, should be low) 4, open/short circuit (detected low, should be high) 5. Broken wire 6. The output limit is no current Fault type 3-5 requires drive fault detection to be turned on	Turn off driver 6	1, The driver load is open or short 2. The connector pin or contactor coil is dirty 3. Wrong crimping or wiring of the connector 4. The driver is overcurrent, and the value of the Driver 6 Overcurrent parameter is exceeded 5. Check Programmer / Controller Setup / Outputs / Driver 6 / Driver 6 Overcurrent.
88	10-7	Driver 7 Fault Fault Type: 1. Drive short circuit 2. Drive overcurrent 3, open/short circuit (detected high, should be low) 4, open/short circuit (detected low, should be high) 5. Broken wire 6. The output limit is no current Fault type 3-5 requires drive fault detection to be turned on	Turn off driver 7	1, The driver load is open or short 2. The connector pin or contactor coil is dirty 3. Wrong crimping or wiring of the connector 4. Driver overcurrent, exceed Driver 7 Overcurrent setting parameter value 5, check Programmer / Controller Setup / Outputs / Driver 7 / Driver 7 Overcurrent.
89	10-8	Driver Assignment Failure Fault type: 5 The drive sequence number caused the failure	Turn off the drive	1, one drive is used as 2 or more functions 2. Check Programmer/Controller Setup/IO Assignments/Coil Drivers: Main contactor drive Electromagnetic brake drive

				Pump contactor drive
90	10-9	Coil Supply Fault Fault Type: 1. With B- short circuit or hardware failure 2. The drive is short-circuited internally, causing the coil power supply to be cut off 3. Coil power start detection failure 4, coil power start prohibiting detection failure	Turn off all outputs from the controller	1, the driver load is short-circuited 2. The connector pin or contactor coil is dirty 3. Wrong crimping or wiring of the connector 4. Controller failure
91	11-1	Analog 1 Out of Range Fault Type: 1. Exceeding the upper limit 2. Below the lower limit	None, unless special treatment is added to the VCL	1, the analog 1 input voltage is higher than the Analog 1 High setting 2. The analog 1 input voltage is lower than the Analog 1 Low setting value 3. View Programmer / Controller Setup / Analog Inputs / Analog 1 4. View Programmer/Controller Setup/Analog Inputs/Configure/Analog 1 Low/Analog 1 High
92	11-2	Analog 2 Out of Range Fault Type: 1. Exceeding the upper limit 2. Below the lower limit	None, unless special treatment is added to the VCL	1, Analog 2 input voltage is higher than the Analog 2 High setting 2. The analog 2 input voltage is lower than the Analog 2 Low setting value 3. Check out Programmer / Controller Setup / Analog Inputs / Analog 2 4. View Programmer/Controller Setup/Analog Inputs/Configure/Analog 2 Low/Analog 2 High
93	11-3	Analog 3 Out of Range Fault Type: 1. Exceeding the upper limit 2. Below the lower limit	None, unless special treatment is added to the VCL	1, the analog 3 input voltage is higher than the Analog 3 High setting 2. The input voltage of Analog 3 is lower than the Analog 3 Low setting value 3. Check out Programmer / Controller Setup / Analog Inputs / Analog 3 4. View Programmer/Controller Setup/Analog Inputs/Configure/Analog 3 Low/Analog 3 High

94	11-4	Analog 4 Out of Range Fault Type: 1. Exceeding the upper limit 2. Below the lower limit	None, unless special treatment is added to the VCL	1, the analog 4 input voltage is higher than the Analog 4 High setting 2. The input voltage of Analog 4 is lower than the Analog 4 Low setting value 3. Check Programmer / Controller Setup / Analog Inputs / Analog 4 4. View Programmer/Controller Setup/Analog Inputs/Configure/Analog 4 Low/Analog 4 High
95	11-5	Analog 5 Out of Range Fault Type: 1. Exceeding the upper limit 2. Below the lower limit	None, unless special treatment is added to the VCL	1. The analog 5 input voltage is higher than the Analog 5 High setting 2. The analog 5 input voltage is lower than the Analog 5 Low setting value 3. Check out Programmer / Controller Setup / Analog Inputs / Analog 5 4. View Programmer/Controller Setup/Analog Inputs/Configure/Analog 5 Low/Analog 5 High
96	11-6	Analog 6 Out of Range Fault Type: 1. Exceeding the upper limit 2. Below the lower limit	None, unless special treatment is added to the VCL	1, the analog 6 input voltage is higher than the Analog 6 High setting 2. The analog 6 input voltage is lower than the Analog 6 Low setting value 3, View Programmer / Controller Setup / Analog Inputs / Analog 6 4. View Programmer/Controller Setup/Analog Inputs/Configure/Analog 6 Low/Analog 6 High
97	11-7	Analog 7 Out of Range Fault Type: 1. Exceeding the upper limit 2. Below the lower limit	None, unless special treatment is added to the VCL	1, the input voltage of analog 1 is higher than the Analog 7 High setting 2. The input voltage of Analog 7 is lower than the Analog 7 Low setting value 3. View Programmer / Controller Setup / Analog Inputs / Analog 7 4. View Programmer/Controller Setup/Analog Inputs/Configure/Analog 7 Low/Analog 7 High
98	11-8	Analog 8 Out of Range Fault Type: 1. Exceeding the upper limit 2. Below the lower limit	None, unless special treatment is added to the VCL	1. The analog 8 input voltage is higher than the Analog 8 High setting 2. The analog 8 input voltage is lower than the Analog 8 Low setting value 3. View Programmer / Controller Setup / Analog Inputs / Analog 8 4. View Programmer/Controller Setup/Analog Inputs/Configure/Analog 8 Low/Analog 8 High

99	11-9	Analog 9 Out of Range Fault Type: 1. Exceeding the upper limit 2. Below the lower limit	None, unless special treatment is added to the VCL	1, the analog 9 input voltage is higher than the Analog 9 High setting 2. The analog 8 input voltage is lower than the Analog 9 Low setting value 3. Check out Programmer / Controller Setup / Analog Inputs / Analog 9 4. View Programmer/Controller Setup/Analog Inputs/Configure/Analog 9 Low/Analog 9 High
100	11-11	Analog 14 Out of Range Fault Type: 1. Exceeding the upper limit 2. Below the lower limit	None, unless special treatment is added to the VCL	1, the analog 14 input voltage is higher than the Analog 14 High setting 2. The analog 14 input voltage is lower than the Analog 14 Low setting value 3. Check out Programmer / Controller Setup / Analog Inputs / Analog 14 4. View Programmer / Controller Setup / Analog Inputs / Configure / Analog 14 Low / Analog 14 High
101	11-12	Analog Assignment Fault Fault type: 9 The analog serial number caused the fault	None, unless special treatment is added to the VCL	1, one analog is used as 2 or more functions 2. An analog input is out of range 3. View Programmer/Controller Setup/IO Assignments/Controls
102	11-13	Analog 18 Out of Range Fault Type: 1. Exceeding the upper limit 2. Below the lower limit	None, unless special treatment is added to the VCL	1, the analog 18 input voltage is higher than the Analog 18 High setting 2. The analog 18 input voltage is lower than the Analog 18 Low setting value 3. Check Programmer/Controller Setup/Analog Inputs/Analog 18 4. View Programmer / Controller Setup / Analog Inputs / Configure / Analog 18 Low / Analog 18 High
103	11-14	Analog 19 Out of Range Fault Type: 1. Exceeding the upper limit 2. Below the lower limit	None, unless special treatment is added to the VCL	1. The analog 19 input voltage is higher than the Analog 19 High setting 2. The analog 19 input voltage is lower than the Analog 19 Low setting value 3. Check Programmer / Controller Setup / Analog Inputs / Analog 19 4. View Programmer/Controller Setup/Analog Inputs/Configure/Analog 19 Low/Analog 19 High
104	12-1	Branding Error	Turn off the motor, main contactor, electromagnetic brake,	1. Software and hardware brands do not match 2. Contact your local Curtis technical support to deal with the fault.

			accelerator, and brake at full power	
105	12-2	Battery Management System Cutback (BMS Cutback) 1. The battery current is reduced 2. Insufficient battery cell voltage is reduced 3. The battery cell voltage is cut too much	None, unless special treatment is added to the VCL	Fix the problem with the battery or battery
106	12-5	PWM Input 10 Out of Range	None, unless special treatment is added to the VCL	Reset the controller by returning the voltage to the allowable range
107	12-7	Analog 31 Out of Range Fault Type: 1. Exceeding the upper limit 2. Below the lower limit	None, unless special treatment is added to the VCL	1, the analog 14 input voltage is higher than the Analog 31 High setting value 2. The input voltage of analog 14 is lower than the Analog 31 Low setting value 3. Check Programmer/Controller Setup/Analog Inputs/Analog 31 4. View Programmer/Controller Setup/Analog Inputs/Configure/Analog 31 Low/Analog 31 High
108	12-8	Invalid CAN Port	No action	1, detuned dual driver CAN parameters 2. CAN node ID is conflicted because of dual drives
109	12-9	VCL Watchdog	No action	Kick Watchdog() Start and reset the specified watchdog timer

110	12-11	PWM Input 28 Out of Range 1. The input is disconnected 2. The input frequency of the measurement is lower than (PWM_Input_28_Low_Frequency)-(PWM_ frequency Input_28_Frequency Fault Tolerance) 3. The input frequency of the measurement is higher than (PWM_ Input_28_High_Frequency) + (PWM_Input_28_Frequency_ Fault Tolerance) 4. The measured duty cycle is lower than the set limit, (PWM_ Input_28_Low_Duty_Cycle) -(PWM_Input_28_Duty_Cycle_Fault_Tolerance) 5. The measured duty cycle is higher than the set limit, (PWM_ Input_28_High_Duty_Cycle) + (PWM_Input_28_Duty_Cycle_Fault_Tolerance)"	None, unless special treatment is added to the VCL	1, This troubleshooting is performed every 4 milliseconds. If no PWM signal is generated within 16 m/s, or if the measurement is not updated every 16 m/s, the input is considered disconnected. 2. Offset parameters 3, Wiring error

111	12-12	PWM Input 29 Out of Range 1. The input is disconnected 2. The measured input frequency is lower than (PWM_Input_29_Low_Frequency)-(PWM_ frequency Input_29_Frequency Fault Tolerance) 3. The input frequency of the measurement is higher than (PWM_ Input_29_High_Frequency) + (PWM_Input_29_Frequency_ Fault Tolerance) 4. The measured duty cycle is lower than the set limit, (PWM_ Input_29_Low_Duty_Cycle) - (PWM_Input_29_Duty_Cycle_Fault_Tolerance) 5. The measured duty cycle is higher than the set limit, (PWM_ Input_29_High_Duty_Cycle) + (PWM_Input_29_Duty_Cycle_Fault_Tolerance)"	None, unless special treatment is added to the VCL	1. This troubleshooting is performed every 4 milliseconds. If no PWM signal is generated within 16 m/s, or if the measurement is not updated every 16 m/s, the input is considered disconnected. 2. Offset parameters 3. Wiring error

112	12-13	Primary State Error These are internal issues that occur during startup, parameter initialization, secondary minor updates, or other runtime issues 1 = PRIMARY_DEVICE_START UP = 0, 2 = PRIMARY_WAIT_KSI_STAB LE, 3 = PRIMARY_DEVICE_START UP_VALID, 4 = PRIMARY_INITIALIZE_PAR AMETERS, 5 = PRIMARY_WAIT_FOR_FIRS T_ SIGNALS, 6 = PRIMARY_WAIT_FOR_SUP ERVISOR, 7 = PRIMARY_RESTORE_PARA METER_ FAIL, 8 = PRIMARY_SUPERVISOR_FI RST_ SIGNALS_ERROR, 9 = PRIMARY_SUPERVISOR_S TARTUP_ ERROR, 10 = PRIMARY_STARTUP_TIME R_FAILURE, 11 = PRIMARY_WAIT_CAN_ HANDSHAKING_DONE, 12 = PRIMARY_RUNNING"	The controller is not operational	Controller internal error, please reset the controller

113	13-1	Lift Input Fault	Close hoisting	This fault is triggered by a fault diagnosis associated with the hoisting input source. For example, if the hoisting input source is an analog input, then all faults related to that analog input are grouped to that fault and reported Clear: Resolve any assignment conflicts, or input out-of-range, then reset the controller"
114	13-2	Phase PWM Mismatch 0 = U phase. 1 = V phase. 2 = W phase.	Turn off the motor, main contactor, electromagnetic brake, accelerator, full power braking, turn off the oil pump	The difference between the PWM duty cycle of the phase under test and the PWM duty cycle of the phase under test is greater than the allowable value. Clearing: resetting the controller
115	13-3	Hardware Compatibility	Turn off the motor, main contactor, electromagnetic brake, accelerator, full power braking, turn off the oil pump	The OS and controller are not compatible The downloaded software and controller hardware are not compatible
116	13-4	Lower Input Fault	Close the drop	The fault is triggered by the fault diagnosis associated with the drop input source. For example, if the drop input source is an analog input, then all faults related to that analog input are grouped to that fault and reported Clear: Resolve any assignment conflicts, or input out-of-range, then reset the controller

117	13-6	"Hazardous Movement 1 = The motor speed is opposite to the direction required by the speed, and the motor cannot accelerate in the correct direction within the time set by the program. If the motor fails to accelerate to zero speed and the programmed time changes to neutral, this danger will be detected 2=Acceleration and the direction of the difference between the speed requirement of the operator and the motor are opposite. In the program time (Hazardous Throttle_ Response Time), the velocity in the direction of the instruction is more than one parameter (Hazardous Speed)"	Turn off the interlock	When the motor is asked to move, the fault detects dangerous movement. The first danger is that if the throttle drops to zero or the direction switch is not in the direction of travel, the motor will not be able to slow down. The second danger is that the motor accelerates in the wrong direction or too fast. Note: This failure only occurs when the control mode is selected on Speed Mode, Speed Mode Express, or Servo Mode Clear: Reset the controller. Setting discoverous direction Response Time=0 will disable these checks
118	13-13	IMU Failure 1 = SPI communication failure 2 = Curtis factory self-test failure 3 = Runtime check for failures, error data received from the IMU 4 = The calibration test of the gyroscope is out of range, and the maximum calibration deviation exceeds "	No action	When calibrating, check that the configuration is correct or that the vehicle is moving Reset the key switch.

Fault Code (Curtis-1220E)

No.	Controller Fault Light	Fault Name	Fault Description
1	12	Controller Overcurrent	1. Steer wires shorted. 2. Controller defective
2	13	Current Sense Fault	1. Controller defective
3	14	Precharge Fault	1. Controller defective
4	15	Controller Severe Undertemp	1. Controller is operating in extreme low temperature environment. 2. Temperature sensor is defective
5	16	Controller Severe Overtemp	1. Excessive load on vehicle. 2. Controller is operating in extreme high temp environment. 3. Improper mounting of Controller.
6	17	Severe Undervoltage	1. Battery or battery cables or battery connection defective. 2. Excessive non-Controller hydraulic system drain on battery. 3. Battery discharged or improper battery.
7	18	Severe Overvoltage	1. Battery or battery cable resistance too high for given regen current. 2. Battery disconnected while regen braking.
8	21	Motor Temp Hot Cutback	1. Excessive load on vehicle. 2. Controller is operating in extreme high temp environment

9	22	Controller Overtemp	1. Excessive load on vehicle. 2. Controller is operating at an extreme high temperature. 3. Improper mounting of Controller
10	23	Motor Polarity Fault	1. Motor polarity reversed. 2. Position feedback device polarity reversed
11	24	5V Output Failure	1. +5 output overloaded. 2. Controller defective.
12	31	Main Driver Fault	1. Internal relay coil defective. 2. Internal relay driver is open or shorted.
13	32	Relay Welded	1. Internal relay welded. 2. Controller defective.
14	33	Relay Did Not Close	1. Internal relay was commanded to close but did not close. 2. Internal relay tips oxidized.
15	34	Hardware Fault	1. Hardware error detected. 2. Motor voltage out of range. 3. IIC communication failed. 4. Power MOSFETs shorted.
16	35	Fault Output Failed	1. Incorrect Fault output wiring. 2. Controller defective.
17	36	Motor Stalled	1. Stalled steer motor. 2. steer motor encoder failure or wires open. 3. steer motor wires open. 4. Related parameters do not match with steer motor.
18	37	Motor Open	1. Steer motor wires open. 2. Faulty motor cable wiring. 3. Controller defective.

19	38	Motor Short	1. Steer motor wires shorted.
20	41	Command Analog1 Out of Range	1. Command Analog Input 1 (J1-6) is out of range. 2.Command low end (J1-4) out of range (for resistive type) 3. Incorrect parameter settings.
21	42	Command Analog2 Out of Range	1. Command Analog Input 2 (J1-13) is out of range. 2. Crosscheck on command Analog Input 1 and command Analog Input 2 failed. 3. Incorrect parameter settings.
22	43	Feedback Analog1 Out of Range	1. Positioning Analog Input 1 (J1-11) is out of range. 2. Incorrect parameter settings.
23	44	Feedback Analog2 Out of Range	1. Positioning Analog Input 1 (J1-3) is out of range. 2. The crosscheck on Position Analog Input 1 (J1-11) and Position Analog Input 2(J1-3) failed. Incorrect parameter settings. 3. Incorrect parameter settings.
24	45	Parameter Charge Fault	1. A parameter value was changed that requires a power cycle. 2. Parameters are restored to the default settings were restored to their original values.
25	46	EEPROM Failure	1. The CRC of the parameters in EEPROM does not calculate correctly. 2. Controller defective.

26	47	Encoder Fault	1. Encoder data is outside the allowed range. 2. Encoder phase A or B on the quadrature encoder is open. 3. Encoder phase B on polarity encoder is open.
27	53	Home Position Not Found	1. Home switch is defective. 2. Mounting or wiring defective
28	62	Communication Fault	Communication with traction Controller failed.
29	63	Communication Lost	1. Defective wiring on Rx (J1-8). 2. Programmer is connecting with traction Controller.
30	71	Software Fault	1. Software defective. 2. Controller defective.
31	73	Following Error	1. Incorrect parameter settings. 2.Position feedback device defective. 3. steer motor defective.
32	75	Parameter Conflict	1. Parameter settings are in conflict with each other.