BYD

PMW20

SERVICE MANUAL

<   SM-PMW202020001-EN   >

BYD
BYD FORKLIFT

This manual is applicable to the maintenance of BYD forklift for authorized personnel.

TABLE OF CONTENTS

INTRODUCTION

DAILY MAINTENANCE

REGULAR MAINTENANCE

MAINTAIN ATTACHMENTS

MAINTAIN CHASSIS

MAINTAIN THE HYDRAULIC DEVICE

INTRODUCTION

1.1 ENTIRE FORKLIFT

Fork

Operating Handle Assembly

Front Forklift Body

Rear Forkift Body

1.2 ATTACHMENTS

Cover Plate Of The Battery Box

Instrument Panel

Guard Of Tiller

Guard Plate Of The Rear Forklift Body

1.3 CHASSIS

Operating Handle Assembly

Welding Assembly of Handle Lever

Steering-Connected Assembly

Drive Assembly

Balance Mechanism

Lift Mechanism

Support Wheel Assembly

Balance Mechanism

Drive Wheel

Lift Mechanism

Support Wheel Assembly

1.4 HYDRAULIC DEVICE

Cylinder

Cylinder

Hydraulic Power Unit

1.5 ELECTRIC DEVICE

Emergency Switch

Safety Device

Instrument
Assembly

Controller Assembly

USB Charging
Connector

Electric Horn

DAILY MAINTENANCE

2.1 TIME AND ITEMS

Daily items are inspected daily (or every 8 hours) and weekly (or every 40 hours), whichever

comes first. For example, if the working hours are less than 8 hours per day, the forklift shall be inspected daily. If the working hours are more than 8 hours per day, the forklift shall be inspected every 8 hours.

The list of items to be checked are as follows:

No.	Item	1 Day	1 Week
		8 Hours	40 Hours
1	Shape	Check	
2	Wheels	Clean and tighten	Clean and tighten
3	Hydraulic Device	Check	
4	Instrument	Check	
5	Warning Apparatus	Check	
6	Brake	Check	Check
7	Driving, Steering and Operating	Check	
8	Electric Device		Check
9	Clean		Clean
10	Other Abnormalities	Check	

⚠ Note

Inspect before each operation.

Hint

Review the last failure before routine inspection.

2.2 DESCRIPTION

1. Shape

(1) Check whether the forklift is damaged or deformed.

(2) Check whether oil is leaked on the ground where forklifts are put.

(3) Check whether nameplates or signs are complete.

(4) Check whether parts are loose or fall off.

ⓘNote

If oil leaks, please identify the position and contact after-sale personnel of BYD.

2. Wheels

(1) Check whether the fastener of wheels is loose. If yes, tighten it.Remove debris embedded in the tire.

(2) If wheels are worn seriously wherein the wear between left and right wheels are uneven, or rims are found broken or bent, please replace wheels.

3. Hydraulic Device

Check the device through the level of hydraulic oil.

4. Instrument

(1) Check whether the battery voltage and power on the instrument are displayed normally.

(2) Check whether a fault indicating lamp appears on the instrument.

5. Warning Device

(1) Press "horn" button and check whether the horn can honk.

(2) Check whether other warning devices are working normally.

6. Brake Performance

Put the handle lever in the brake area and check whether the brake performance is good.

7. Driving, Steering and Checking

(1) Swing the control handle right and left and up and down. Check whether it can rotate smoothly and make sure no abnormal sound appears in the operation process.

(2) Check whether buttons can work normally.

(3) Check whether fasteners are loose or fall off.

8. Electric Check

(1) Check whether connection terminals of electric device are loose. If any, tighten it. Check whether joints among the wiring-connected sections are abnormally.

(2) Check whether the safety device of the master controller works normally. If necessary, replace it.

(3) Check whether the copper bar of the master controller is burned. If necessary, replace it.

(4) Check whether the low-voltage insurance and relay can work normally. If necessary,replace them.

⚠ Warning

Disconnect power before the electric check.

9. Clearance

Clear the entire forklift with compressed air.

10. Other Abnormal Parts

Check whether there are other abnormal parts.

REGULAR MAINTENANCE

3.1 TIME AND ITEMS

For example, if the service time within 6 weeks are less than 250 hours, the reference time will be calculated as 6 weeks. Otherwise, 250 hours are preferred. Other reference time is calculated likewise.

Category	Item	6 (Weeks)	3	6	9	12	Month
		250	500	1000	1500	2000	Hour
Hydraulic Device	Replace Hydraulic Oil					Replace	
Electric Device	Check Electric Device		Check				
Other Checks	Check Torque of Key Fasteners			Check			

ⓘ Note

If the operating conditions are relatively poor, the maintenance period should be shortened and negotiated with the after-sales personnel.

3.2 CATEGORY, DOSAGE AND MODEL OF ACCESSORIES

Item	Category	Dosage	Model
Replace Hydraulic Oil	Hydraulic Oil	1L	Anti-Wear Hydraulic Oil _Hydraul Ⅰ C-O Ⅰ L-AW46

ⓘ Note

The amount of accessories is marked with the maximum while the actual amount should be subject to use.

3.3 DESCRIPTION

1. Hydraulic device

Replace hydraulic oil regularly.

2. Electric device

(1) Check the circuit of the entire forklift.

(2) Check safety device and relay.

(3) Check the main controller.

3. Other Checks

Check the torque of key fasteners.

MAINTAIN ATTACHMENTS

This chapter will describe how to maintain attachments.

Cover Plate of the Battery Box

Instrument Panel

Guard of Tiller

Guard Plate of the Rear Forklift Body
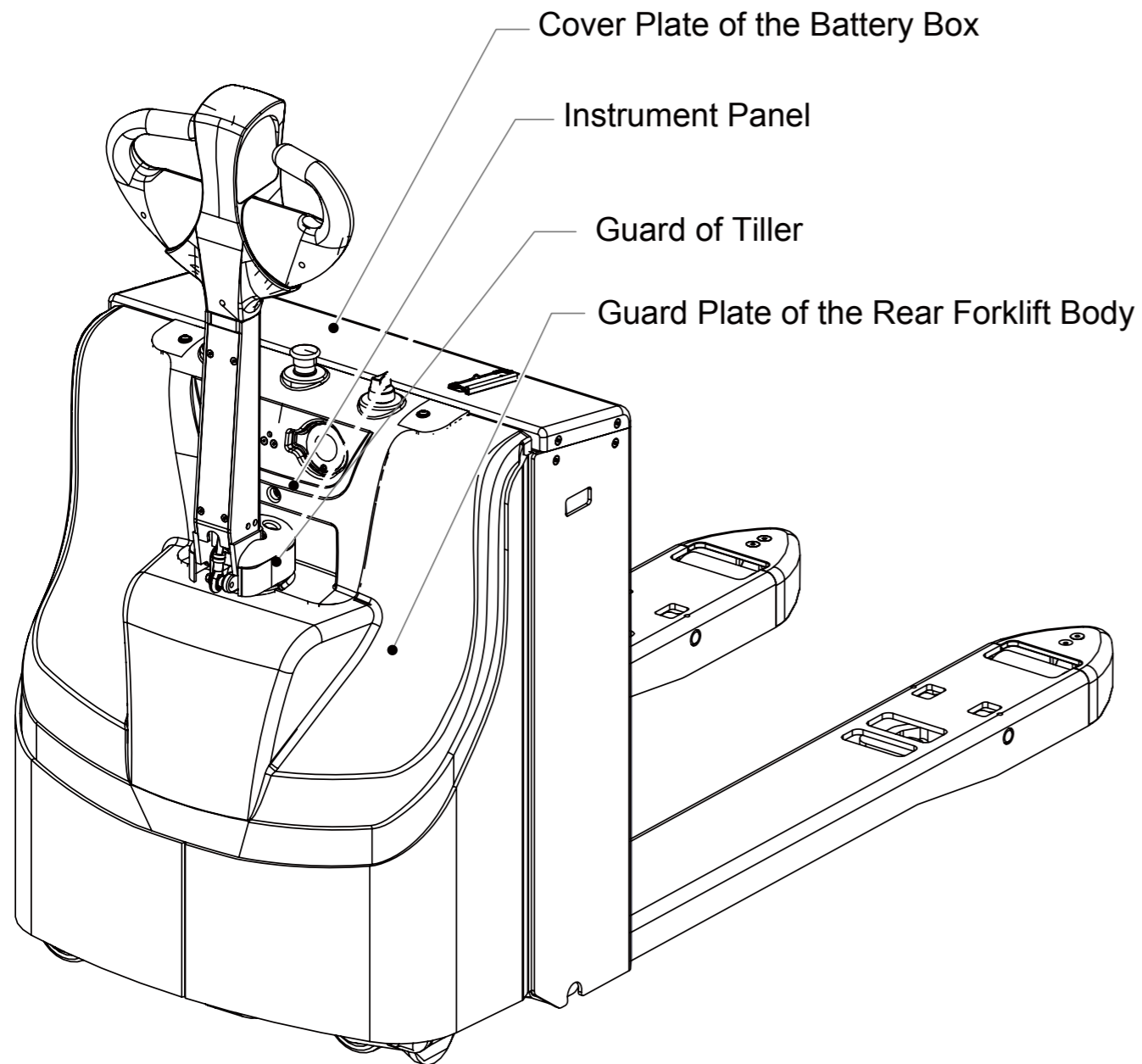
4.1 REMOVE AND INSTALL GUARD

1. REMOVE（Remove the cover plate of the battery box）

   1) Remove the guard with the cross screwdriver (Codes13/15/18).

   2) Remove the fastener on the battery cover plate with a 4mm Allen wrench (Code 10).

   3) Unscrew the instrument assembly on the instrument panel, dual USB charging connector, self-resetting ignition switch and emergency switch.

   4) Unplug the wire harness connectors (H02/G17/Ln01/Ln02/G10).

Ln 01/ Ln 02

G 17

H 02

G 10
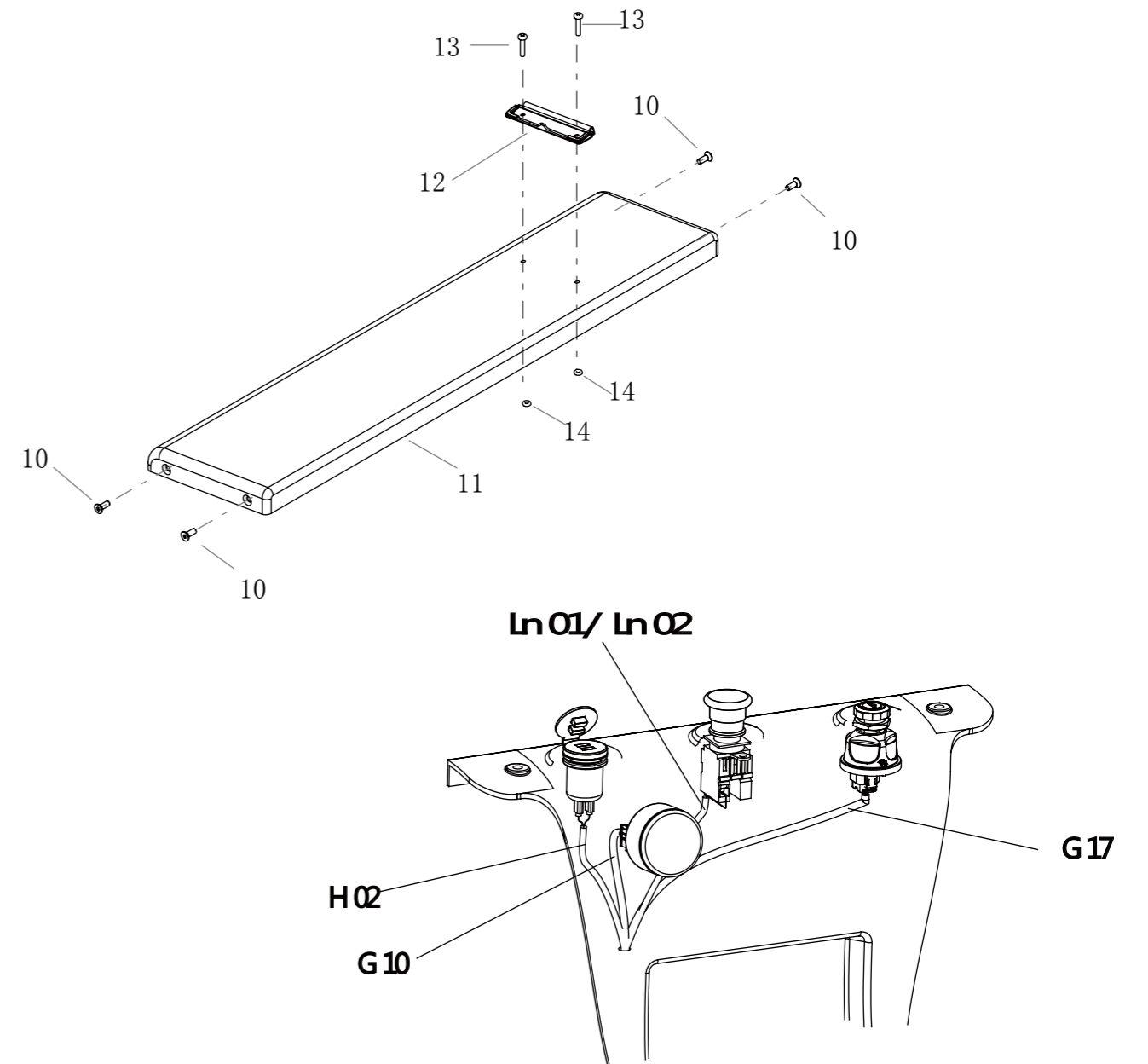
2. Remove the Guard of the Motor
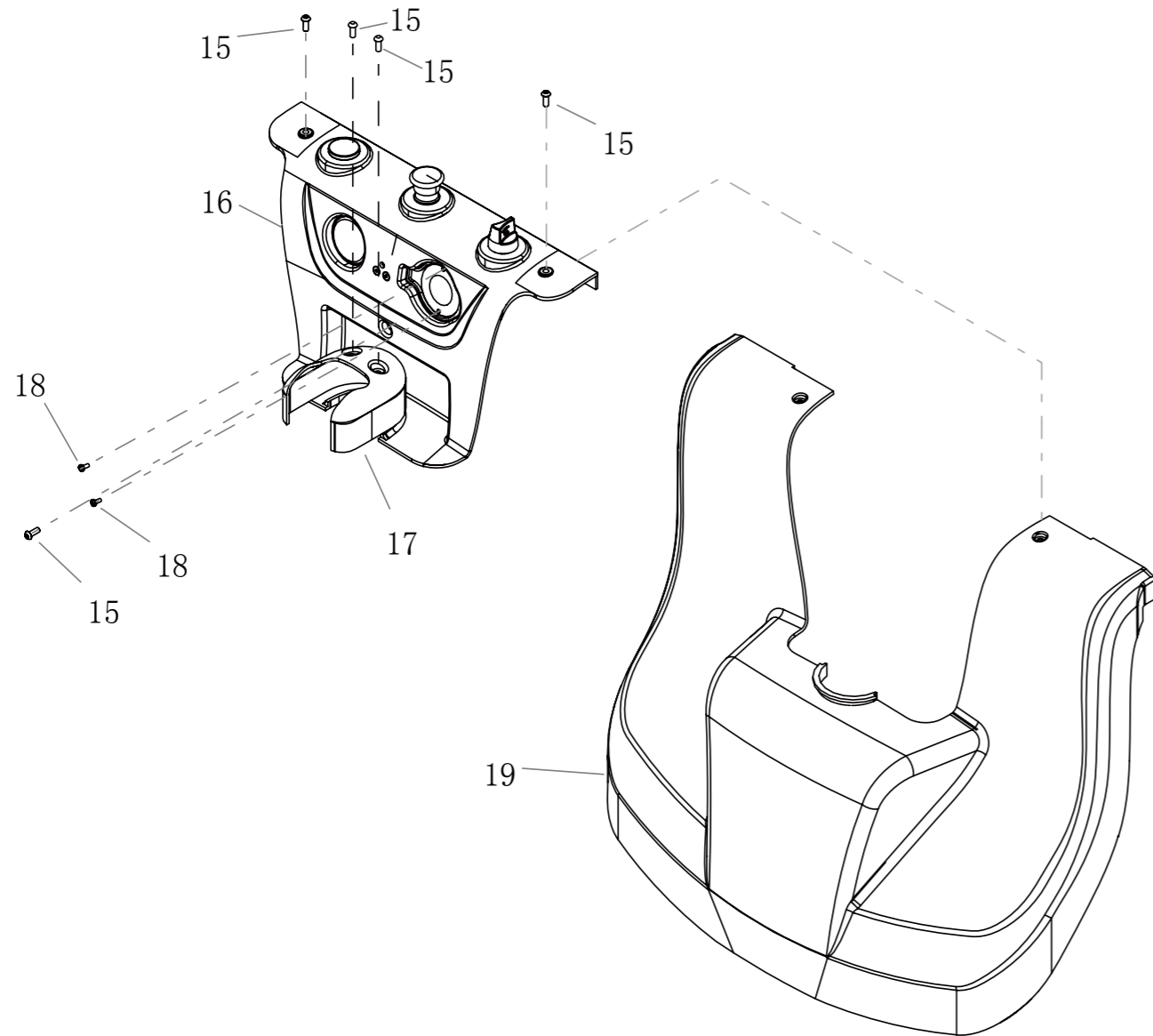
CODE	PART NAME	QTY	OTHER INFORMATION
10	HEXAGON SOCKET COUNTERSUNK HEAD CAP SCREWS _M6×16	4	
11	COVER PLATE OF THE BATTERY BOX	1	
12	DOCUMENT CLAMP	1	
13	CROSS RECESSED PAN HEAD SCREWS _M4×20	2	
14	HEXAGON THIN NUTS	2	
15	HEXAGON SOCKET PAN HEAD SCREW_M6×16	5	
16	INSTRUMENT PANEL	1	
17	GUARD OF TILLER	1	
18	CROSS RECESSED PAN HEAD SCREWS _M4×10	2	
19	GUARD PLATE OF THE REAR FORKLIFT BODY	1	

2. Install
Follow steps in reverse order to install the guard.

MAINTAIN CHASSIS

This chapter will describe how to maintain chassis.

Operating Handle Assembly

Welding Assembly Of Handle Lever

Steering-Connected Assembly

Drive Assembly

Balance Mechanism

Lift Mechanism

Support Wheel Assembly

Balance Mechanism

Drive Wheel

Lift Mechanism

Support Wheel Assembly
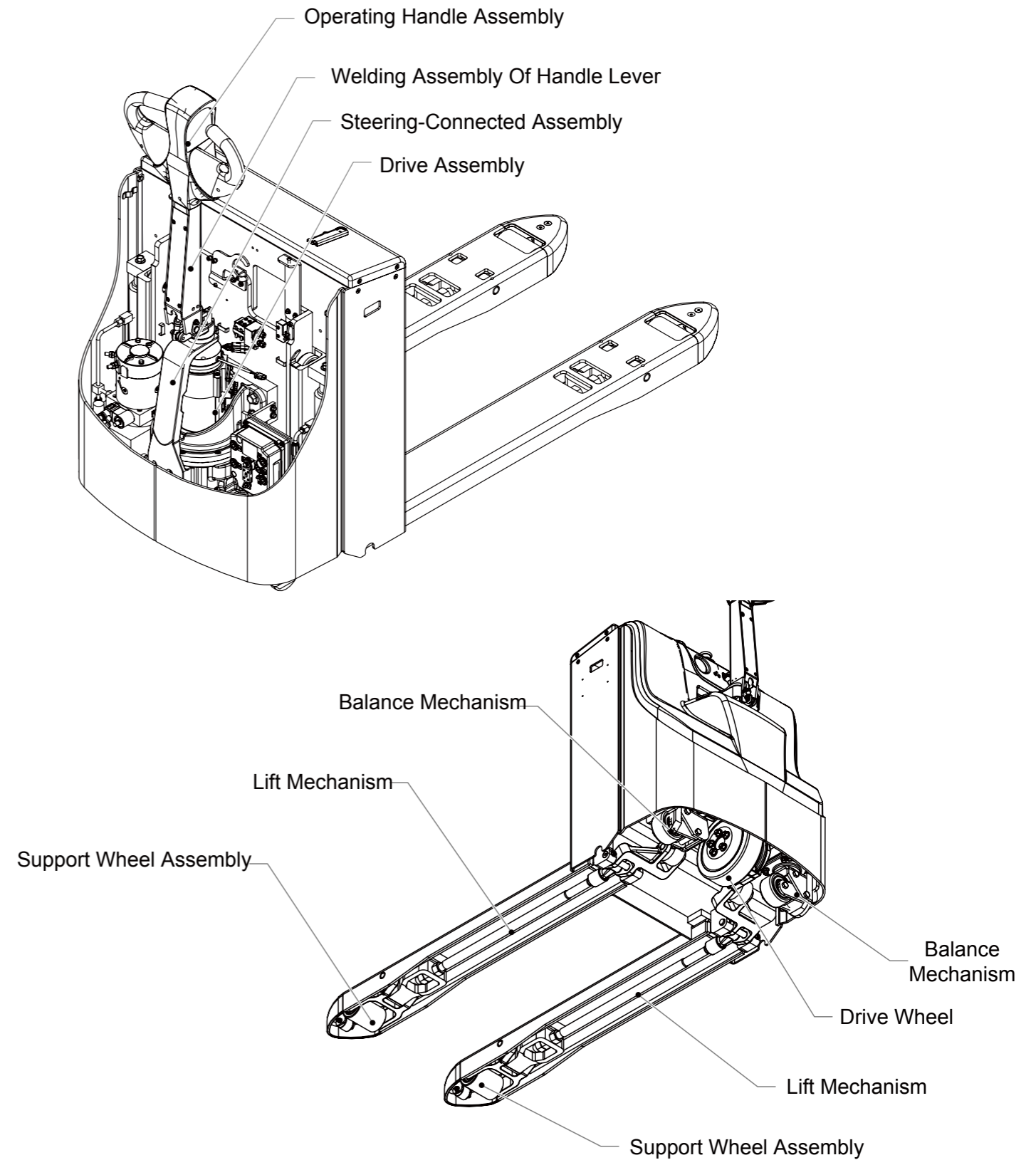
5.1 REMOVE AND INSTALL THE OPERATING HANDLE

1. Remove

(1) Unscrew the screw (Code 11) on the controlling handle with a 5mm Allen wrench and then open the upper and lower covers on the controlling handle.

(2) Remove the screw (Code 11) connecting the handle and aluminium casting witha 5mm Allen wrench and then unplug the data cable G05 (Code 13).

(3) Unscrew the screw (Code 14) on the handle connection block with a 5mm Allen wrench and then remove the controlling handle.
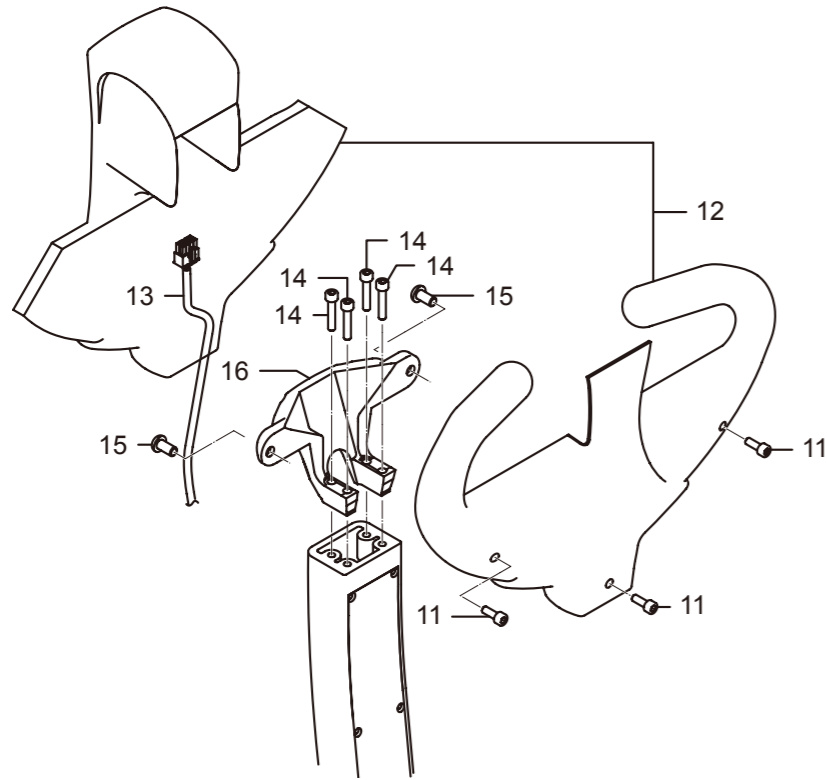
CODE	PART NAME	QTY	OTHER INFORMATION
11	HEXAGON SOCKET HEAD CAP SCREWS M6×10	3	
12	OPERATING HANDLE ASSEMBLY	1	
13	DATA CABLE	1	
14	HEXAGON SOCKET HEAD CAP SCREWS M6×30	4	
15	HEXAGON SOCKET FLAT ROUND HEAD SCREWS M8×15	2	
16	ALUMINUM CASTING CONNECTING TO THE HANDLE	1	

2. Install

1) Install the screw (Code 14) connecting the handle and aluminium casting.

2) Connect the screw (Code 15) on the lower cover and then plug the data cable (Code 13).

3) Tighten the screw (Code 11) after the upper and lower covers are closed.

4) After installation, start the key and then check whether all buttons are normal.

OPERATING HANDLE PARTS
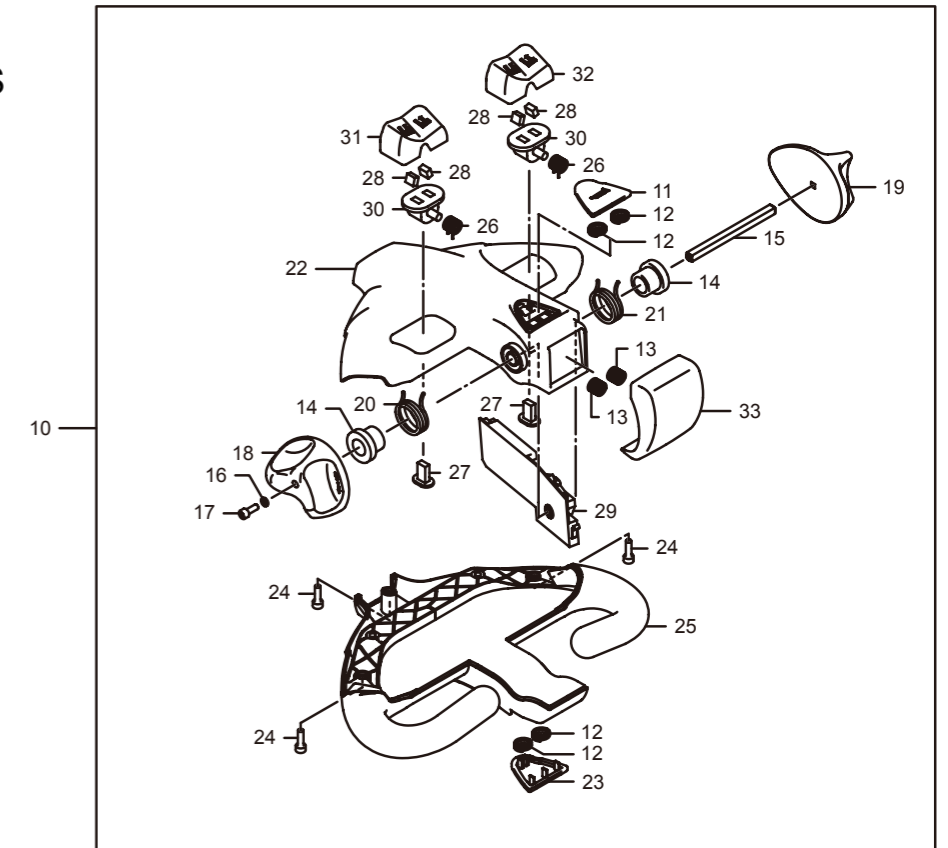
CODE	PART NAME	QTY	OTHER INFORMATION
10	OPERATING HANDLE ASSEMBLY	1	
11	COVER OF THE HORN	1	
12	SPRING 1 FOR THE HORN SWITCH 1	4	
13	SPRING FOR ANTI-COLLISION SWITCH	2	
14	PIN BUSHING	2	
15	HANDLE PIN	1	
16	SHIM	2	
17	HEXAGON SOCKET HEAD CAP SCREWS M3×16	2	
18	TORISPHERICAL BUTTON (LEFT)	1	
19	TORISPHERICAL BUTTON (RIGHT)	1	
20	HINGE SPRING (LEFT)	1	
21	HINGE SPRING (RIGHT)	1	
22	UPPER COVER	1	
23	COVER OF THE SPEED REDUCTION SWITCH	1	
24	HEXAGON SOCKET HEAD CAP SCREWS M6×10	3	
25	LOWER COVER	1	
26	HINGE SPRING	2	
27	ROCKER OF THE SENSOR	2	
28	MAGNET	4	
29	COMMUNICATION CIRCUIT BOARD	1	
30	MAGNETIC FIXED ROCKER	2	
31	LEFT ROCKER	1	
32	RIGHT ROCKER	1	
33	OVER OF THE ANTI-COLLISION SWITCH	1	

⚠ Note

Wear antistatic gloves when removing and installing circuit boards.

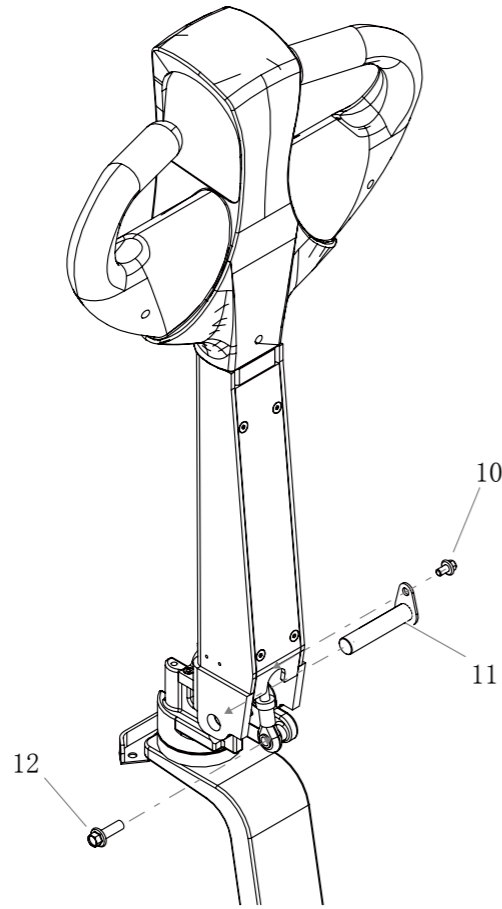## 5.2 REMOVE AND INSTALL THE HANDLE LEVER

1. Remove

  1) Remove the guard. Refer to 4.1 REMOVE AND INSTALL GUARD for details.

  2) Remove the bolt (Code 10) with a 8mm open-end wrench or socket wrench and then tap out the handle axle assembly (Code 11).

  3) Remove the bolt (Code 12) on the air-actuated spring with a 13mm wrench and then unplug the data cable connector.

CODE	PART NAME	QTY	OTHER INFORMATION
10	HEXAGON FLANGE BOLT _M6×10	1	
11	HANDLE AXLE ASSEMBLY	1	
12	HEXAGON FLANGE BOLT _M8×25	1	

2.Install

  1) Plug the data cable and then install the handle axle assembly (Code 11).

  2) Tighten the screw (Code 10).

  3) Keep the handle vertical and then install the lower end of the air-actuated spring . Tighten the bolt (Code 12).

  4) After installation, check whether the handle can rotate freely.

5.3 REPLACE THE AIR-ACTUATED SPRING

1. Remove

  1) Open the rear cover of the handle lever and remove the screw (Code 10) with a 3mm Allen wrench.

  2) Remove the bolt (Code 14) on the air-actuated spring with a 10mm open-end wrench.

  3) Remove the air-actuated spring.
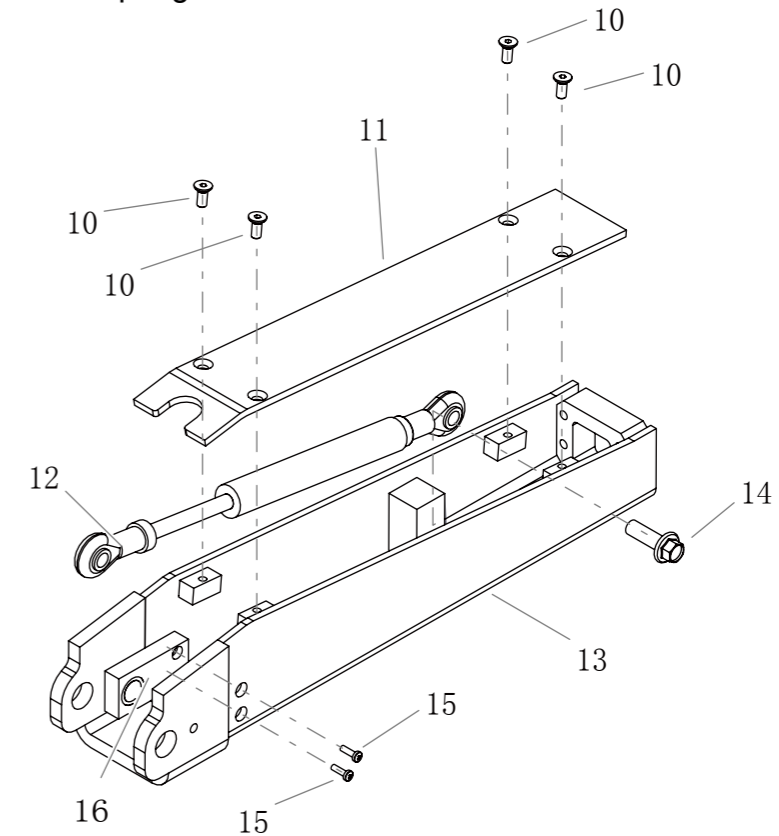
CODE	PART NAME	QTY	OTHER INFORMATION
10	HEXAGON SOCKET COUNTERSUNK HEAD CAP SCREWS _M5×12	4	
11	REAR COVER OF THE HANDLE LEVER	1	
12	AIR-ACTUATED SPRING	1	
13	WELDING ASSEMBLY OF HANDLE LEVER	1	
14	HEXAGON FLANGE BOLT_M8×25	1	
15	CROSS RECESSED PAN HEAD SCREWS _M3×10	2	
16	LIMIT SWITCH ON THE HANDLE	1	

2. Install

  1) Install the bolt (Code 14) on the air-actuated spring.

  2) Tighten the screw (Code 10) after the upper and lower covers are closed.

  3) Install the socket under the lower end of the air-actuated spring. Refer to 5.2.2.3 for details.

  4) Check the air-actuated spring after installation (Press the handle down and check whether it springs when released).

5.4 REMOVE AND INSTALL THE STEERING-CONNECTED ASSEMBLY

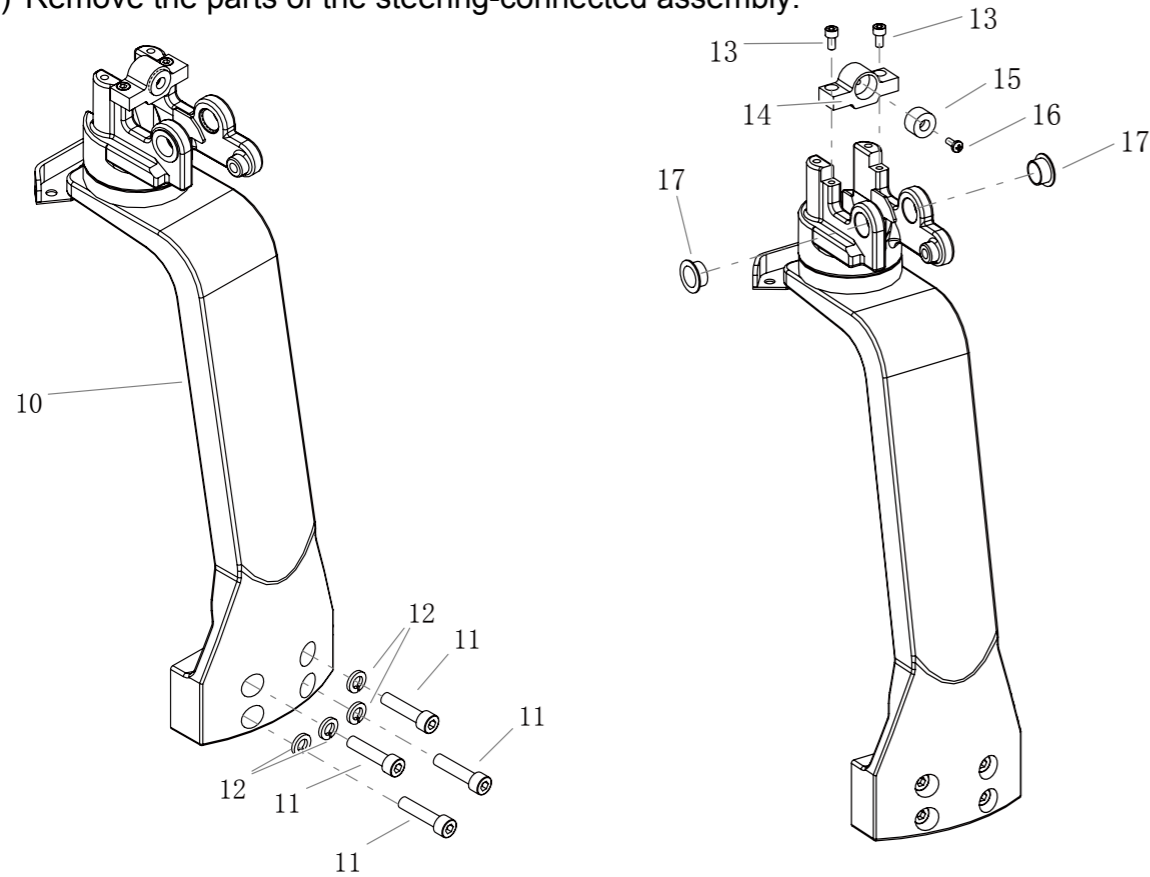1. Remove

1) Remove the handle lever. Refer to REMOVE AND INSTALL THE HANDLE LEVER for details.

2) Unscrew the screw (Code 11) with a 6mm Allen wrench and remove the steering connection assembly.

3) Remove the parts of the steering-connected assembly.

CODE	PART NAME	QTY	OTHER INFORMATION
10	STEERING-CONNECTED ASSEMBLY	1	
11	HEXAGON SOCKET HEAD CAP SCREWS _M8×35	4	
12	HEAVY TYPE SPRING WASHERS	4	
13	HEXAGON SOCKET HEAD CAP SCREWS _M5×10	2	
14	HANDLE LIMIT MOUNTING BLOCK	1	
15	HANDLE LIMIT CUSHIONING PAD	1	
16	CROSS RECESSED PAN HEAD SCREWS _M4×10	1	
17	BUSHING	2	

2. Install

1)Install the parts of the steering-connected assembly first and then install the bushing Code 17) , handle limit cushioning pad (Code 15) and the handle limit mounting block (Code 14).

2)2After the position of holes is adjusted, tighten the screw (Code 11) and heavy type spring washer (Code 12).

5.5 REMOVE AND INSTALL DRIVE ASSEMBLY

1. Remove

(1) Open the guard first and then remove the steering handle assembly.

(2) Disconnect the power line (U/V/W) on the drive motor and unplug the connectors on on the G32 drive motor temperature sensor and G07 drive motor encoder and G08 motor brake.

(3) Remove the fastener (Code 11) of the drive assembly with a 21mm socket wrench and lift the drive assembly.

(4) Place the drive assembly on the firm ground or tray.
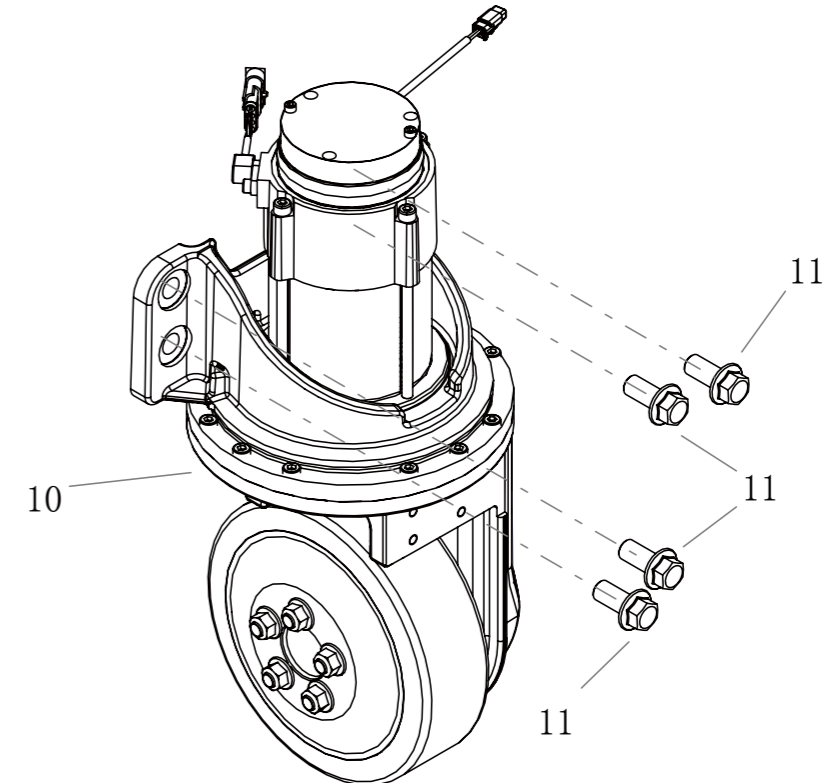
CODE	PART NAME	QTY	OTHER INFORMATION
10	FASTENER OF THE DRIVE ASSEMBLY	1	
11	HEXAGON FLANGE BOLT _M16×35	4	

2.Install

1) Lift the drive axle into the mounting position.

2) Tighten the bolt (Code 11) on the drive axle.

3) Connect the power lines (U/V/W) on the drive motor.

4) Plug the connectors on the G32 drive motor temperature sensor and G07 drive motor encoder and G08 motor brake.

G32 Drive Motor Temperature Sensor

G07 Drive Motor Encoder

G08 Motor Brake
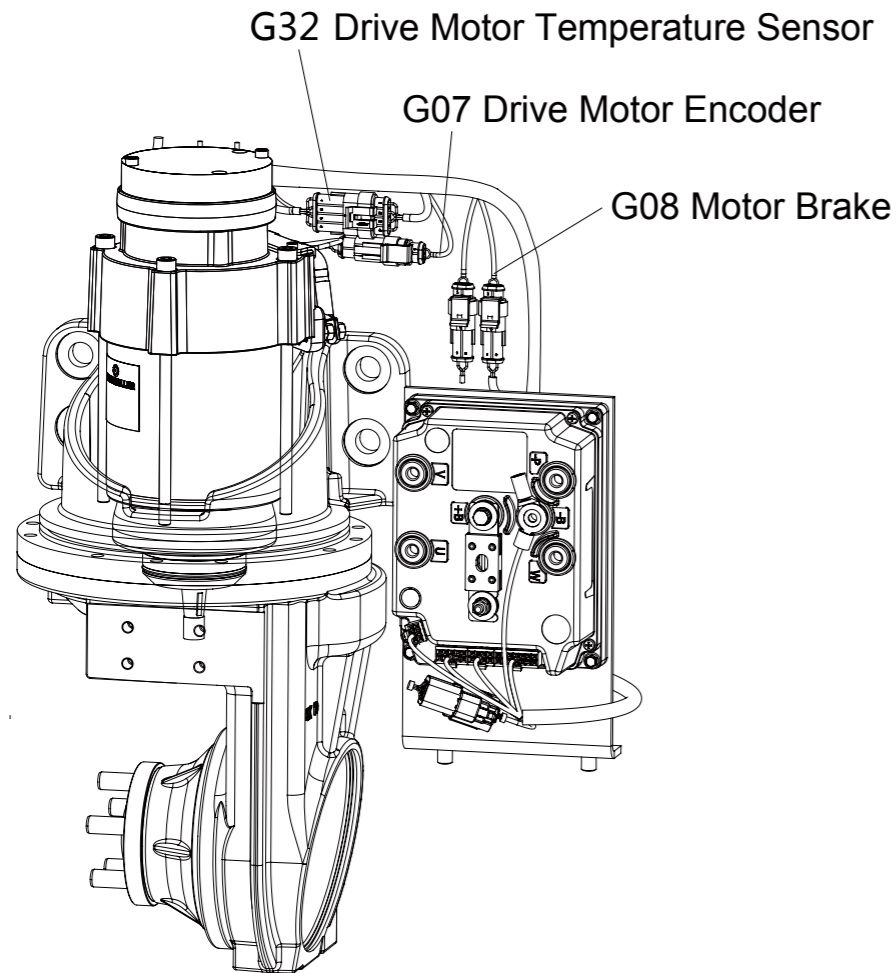
⚠ Note

Lift the heavy drive assembly with the lifting tool.

5.6 SEPARATE DRIVE MOTOR ASSEMBLY FROM REDUCTION GEARBOX ASSEMBLY

1.Remove the motor

Remove the bolt (Code 19) for the pivotal bearing of the motor and reduction gearbox with a 6mm Allen wrench and then take the motor and seal ring down.

2.Remove the Reduction Gearbox Assembly

1) Remove the bolt (Code 14) for the pivotal bearing of the reduction gearbox and reduction gearbox with a 6mm Allen wrench.

2) Remove the bolt (Code 14) for the pivotal bearing of the reduction gearbox and the bracket of the reduction gearbox with a 6mm Allen wrench.
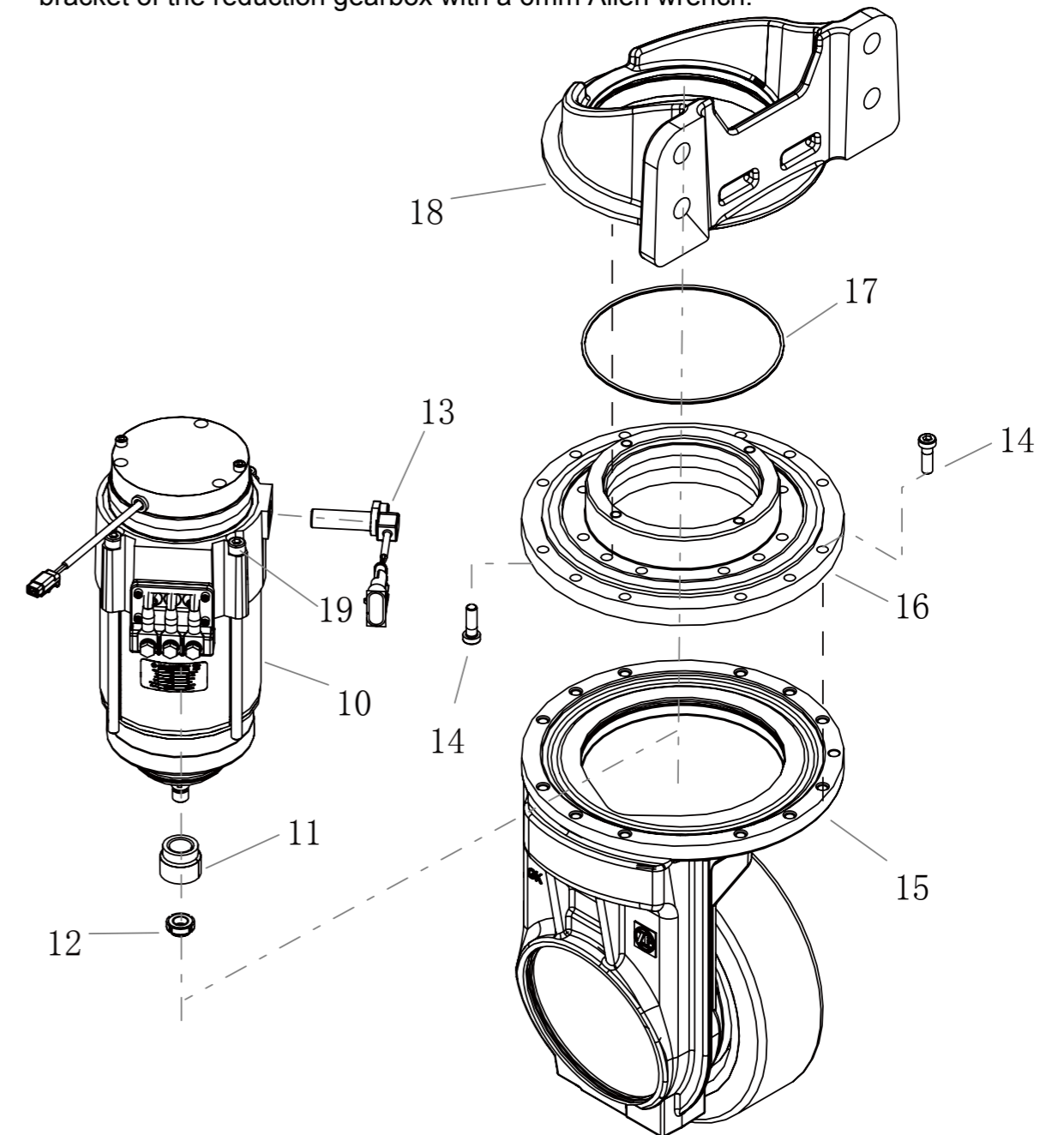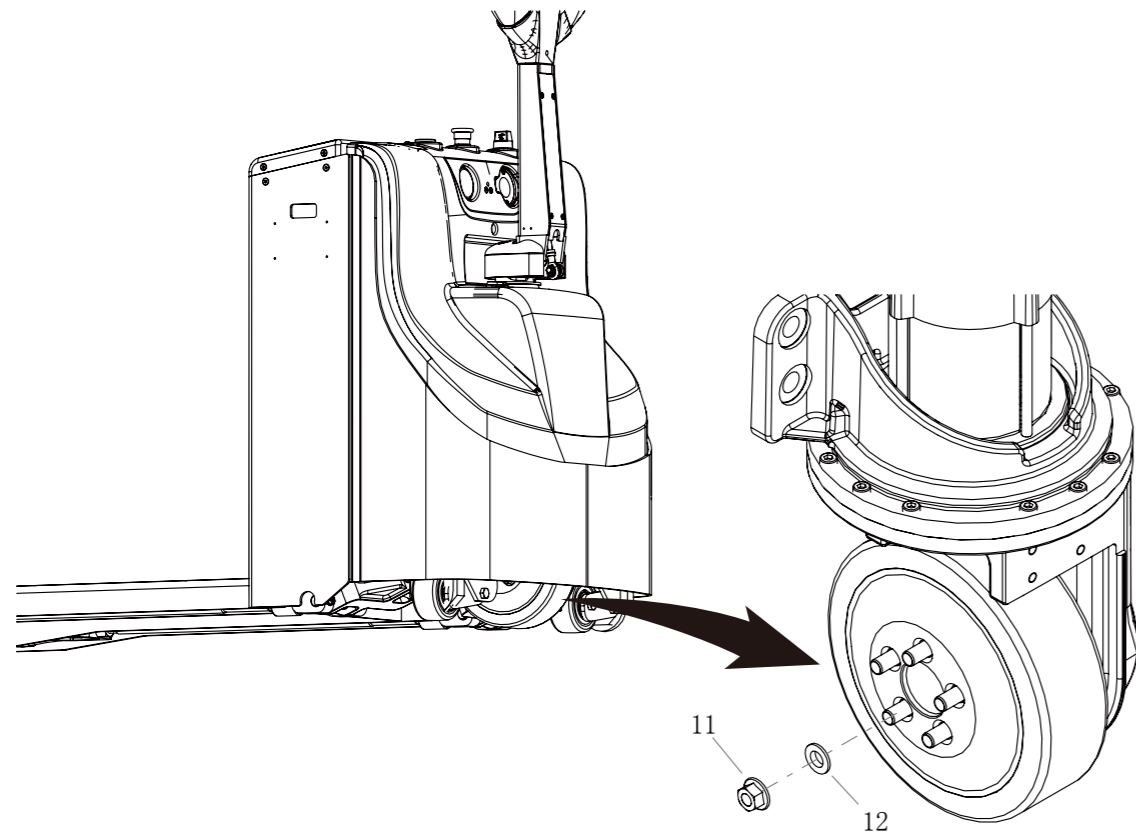
CODE	PART NAME	QTY	OTHER INFORMATION
10	MOTOR	1	
11	LEVEL-ONE REDUCTION PINION	1	
12	LOCK NUT	1	
13	ENCODER	1	
14	HEXAGON SOCKET HEAD CAP BOLTS M8X25	24	
15	REDUCTION GEARBOX	1	
16	TURNING BEARING OF THE REDUCTION GEARBOX	1	
17	NITRILE RUBBER	1	
18	FIXED SUPPORT OF THE REDUCTION GEARBOX	1	
19	HEXAGON SOCKET HEAD CAP SCREWS M8X175	4	

2.Install

1) Install the pivotal bearing of the reduction gearbox and the bracket of the reduction gearbox. After the position of holes is adjusted, tighten the bolt (Code 14) symmetrically.

2) Install the bolt (Code 14) for the pivotal bearing of the reduction gearbox and the bracket of the reduction gearbox and tighten it.

3) Install the pivotal bearings of the motor and reduction gearbox. Install the seal ring (Code 17) and then tighten the bolt (Code 19).

5.7 REPLACE DRIVE WHEELS

1) Lift the rear of the forklift with a jack ,make it has room to operate, and then fill up a solid piece of wood.

2) Unscrew the nut (Code 11) with the adjustable wrench and replace the drive wheels.

CODE	PART NAME	QTY	OTHER INFORMATION
11	HEXAGON FLANGE NUT	5	90 N-m
12	SPHERICAL RESILIENT CUSHION	5	

5.8 REPLACE BALANCE WHEELS

1) Lift the rear of the forklift with a jack ,make it has room to operate, and then fill up a solid piece of wood.

2) Unscrew the nut (Code 10) with a 18mm open-end or socket wrench and take out the bolt (Code 11) and the bushing (Code 12). Then replace the balance wheels.

3) Replace the balance wheel on the other side in the same way.
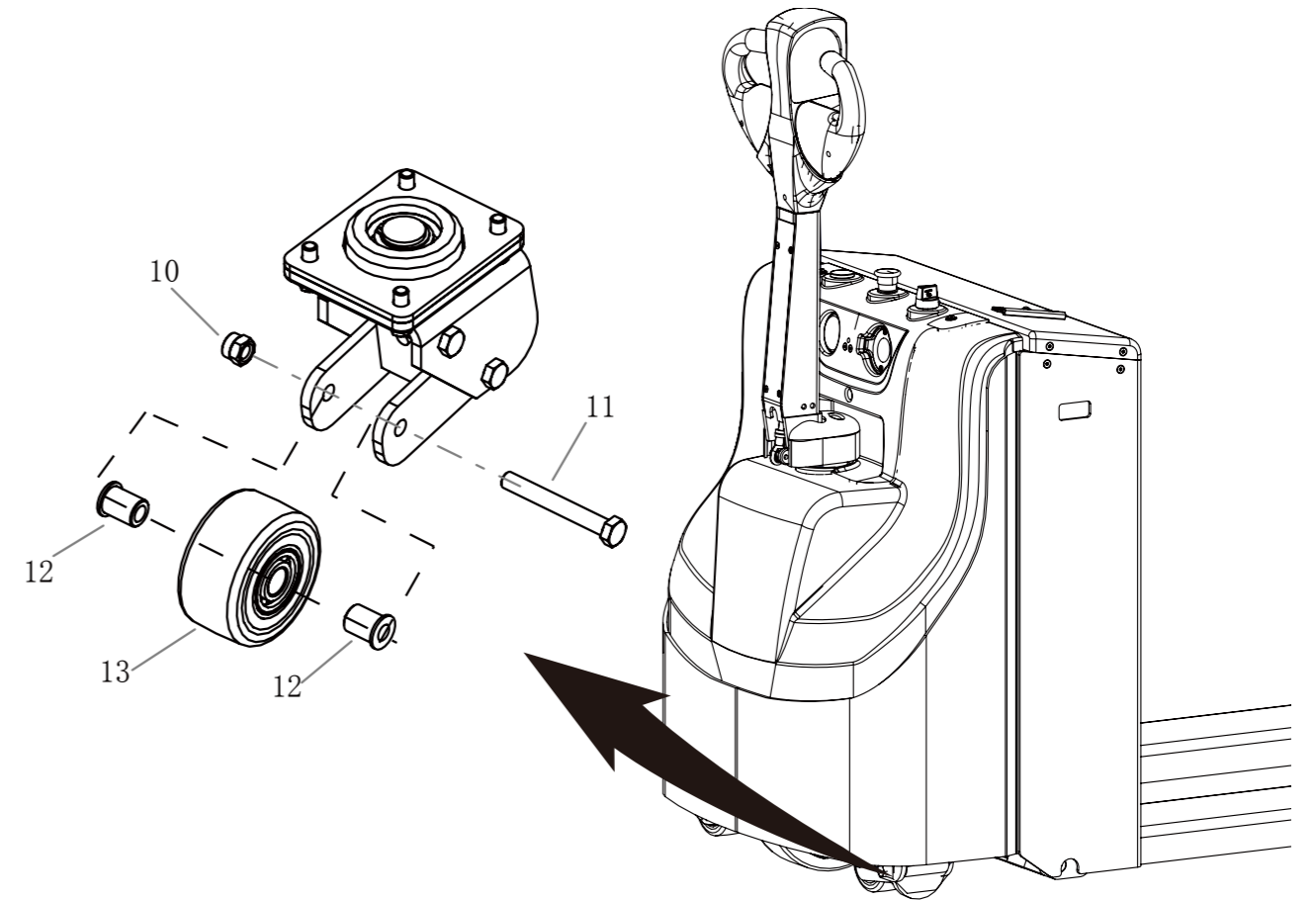
CODE	PART NAME	QTY	OTHER INFORMATION
10	TYPE 1 NON-METALLIC INSERT, HEXAGON LOCK NUT	1	
11	HEXAGON BOLT _M12X90	1	
12	MOUNTING BUSHING ON THE BALANCE WHEEL	2	
13	BALANCE WHEEL ASSEMBLY	1	

5.9 REPLACE THE BALANCE MECHANISM

5.9.1 Replace the Balance Wheel (Refer to 5.9.2 for details)

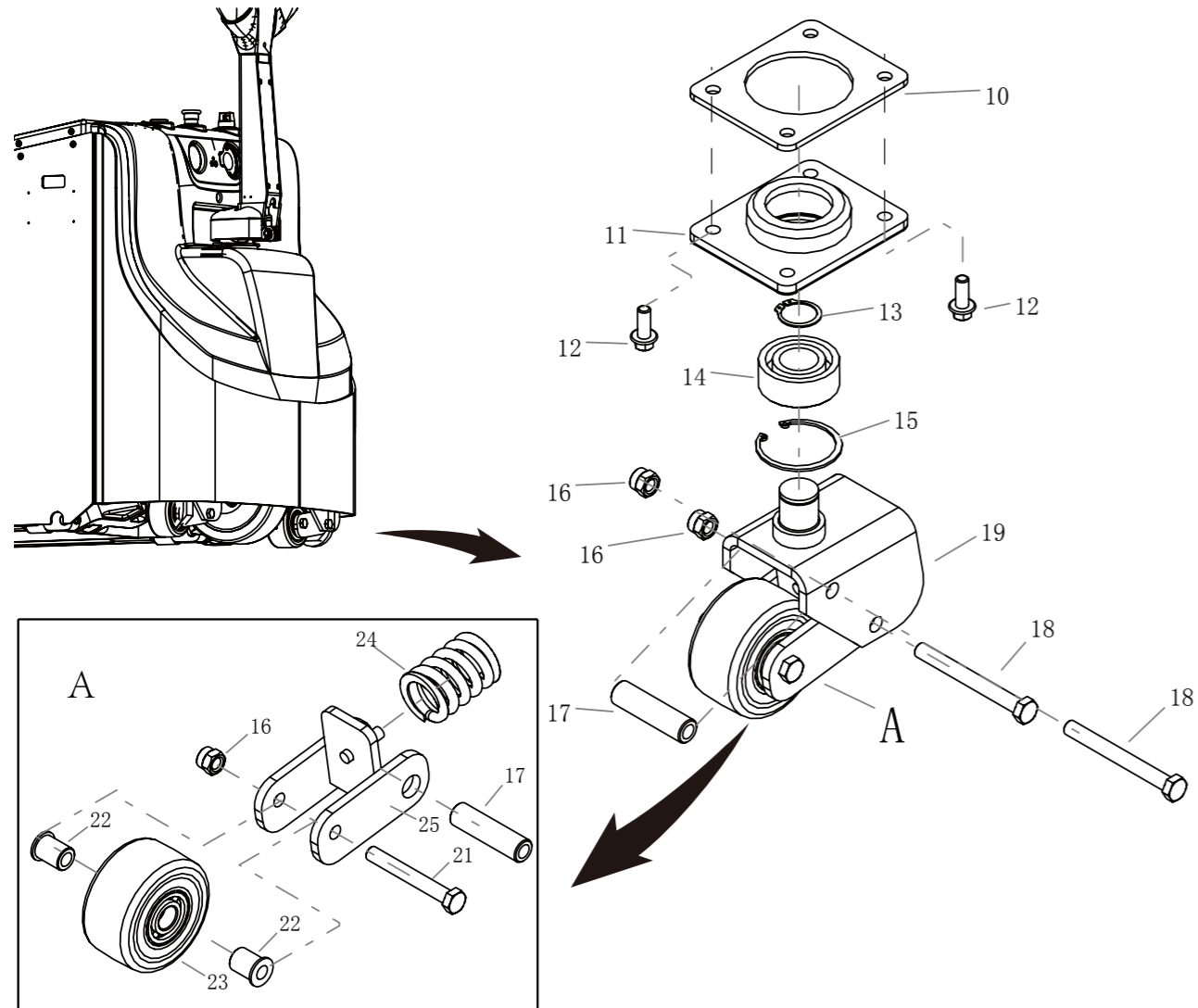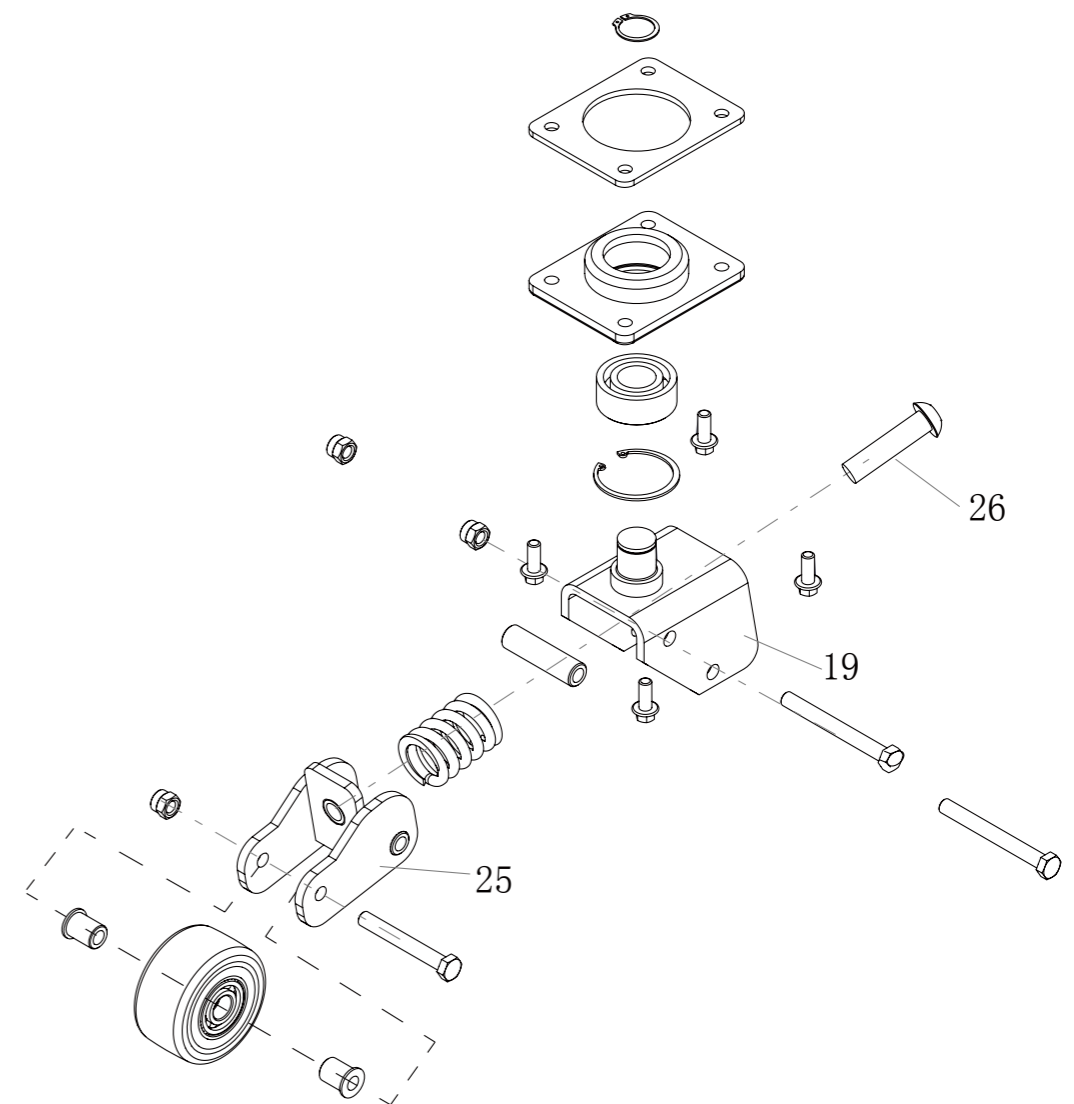| CODE	PART NAME	QTY	OTHER INFORMATION
10	BACKING PLATE OF THE BALANCE WHEELS	1	
11	BEARING SUPPORT OF THE ASSISTING WHEELS	1	
12	HEXAGON FLANGE BOLT _M10×25	4	
13	CIRCLIPS FOR SHAFT	1	
14	DOUBLE ROW ANGULAR CONTACT BALL BEARING WITH SEALING RING ON BOTH SIDES -3206A-2RS	1	
15	CIRCLIPS FOR HOLE	1	
16	TYPE 1 NON-METALLIC INSERT, HEXAGON LOCK NUT _M12	3	
17	WIDTH LIMIT SLEEVE FOR TURNING SUPPORT OF ASSISTING WHEELS	2	
18	HEXAGON-HEADED BOLT_M12×110	2	
19	TURNING FORK ASSEMBLY OF ASSISTING WHEELS	1	
21	HEXAGON-HEADED BOLT _M12×90	1	
22	MOUNTING BUSHING ON THE BALANCE WHEEL	2	
23	BALANCE WHEEL ASSEMBLY	1	
24	BUFFER SPRING OF ASSISTING WHEELS	1	
25	LIMIT FORK ASSEMBLY OF ASSISTING WHEELS	1	

5.9.2 Adjustable Balance wheels

1. Remove

1) Remove the bolt (Code 12) with a 13mm socket wrench and then remove the balance wheel assembly.

2) Remove the circlips for shaft (Code 13) with the circlip plier. Remove the bearing support of the assisting wheels (Code 11) and then turn it over. Remove the circlips for hole (Code 15) and then take out the bearing (Code 14).

3) Remove the turning fork assembly (Code 19) and limit fork assembly (Code 25). Unscrew the nut (Code 16) with a 18mm wrench.

4) Remove the limit fork assembly (Code 25) and the balance wheel assembly (Code 23). Unscrew the nut (Code 16) with a 18mm wrench.

CODE	PART NAME	QTY	OTHER INFORMATION
19	TURNING FORK ASSEMBLY OF ASSISTING WHEELS --- ADJUSTABLE	1	
25	TURNING FORK ASSEMBLY OF ASSISTING WHEELS ---- ADJUSTABLE	1	
26	HEXAGON SOCKET FLAT ROUND HEAD SCREWS _M16×75	1	

ⓘ Note

Before removing the adjustable balance wheels, remove the screws (Code 26).

2. Install

  1) Install the bushing and then tighten the nut (Code 16). Install the the limit fork
      assembly (Code 25) and the balance wheel assembly (Code 23).

  2) Install the turning fork assembly (Code 19) and limit fork assembly (Code 25). Then
      tighten the nut (Code 16).

  3) Install the bearing (Code 14) and the bearing support (Code 11). Then install the
      circlips for hole.

  4) Install the (Code 11) and the turning fork assembly (Code 19). Then install the the
      circlips for shaft (Code 13).

3. Adjustment Standard for Assisting Wheels

The lowest positions of the drive wheel and the assisting wheels on both sides are on the same horizontal level.

Assisting tool: spirit level.

Horizontal Line

Adjustable Bolt
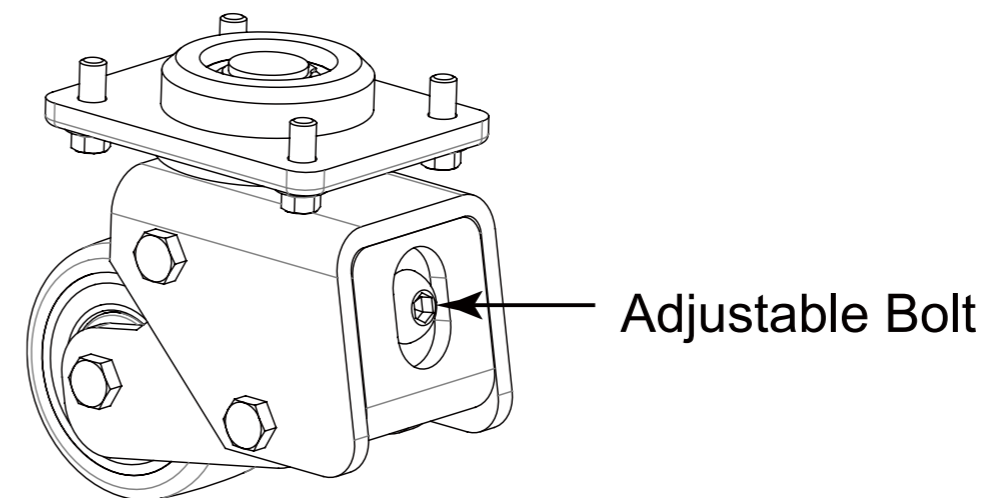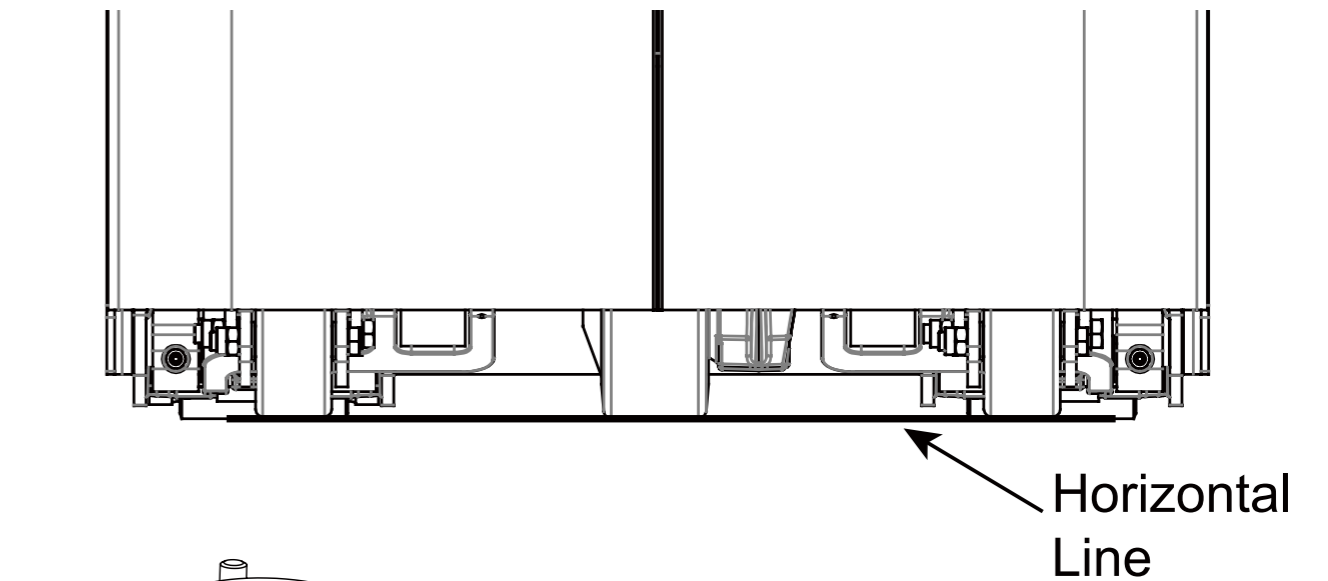
When screwing the bolt to the right, the height H will decrease.

Instead, when screwing to the left, the height H will increase.

5.10 REMOVE AND INSTALL THE ASSISTING SUPPORT ASSEMBLY

1. Remove

　1)　Lift the rear of the forklift with a jack, Unscrew the bolt (Code 13) and remove the assisting support plate.

　2)　Then unscrew the bolt (Code 11) and remove the assisting mounting plate.

　3)　Replace the assisting support assembly on the other side in the same way.

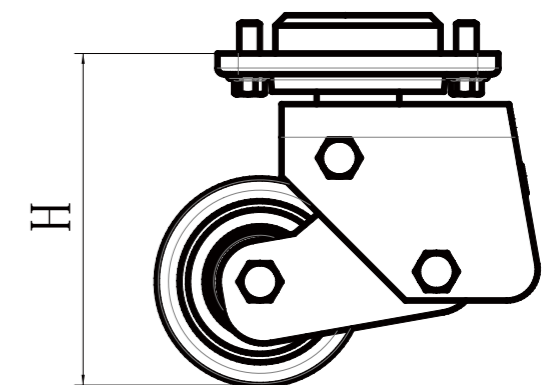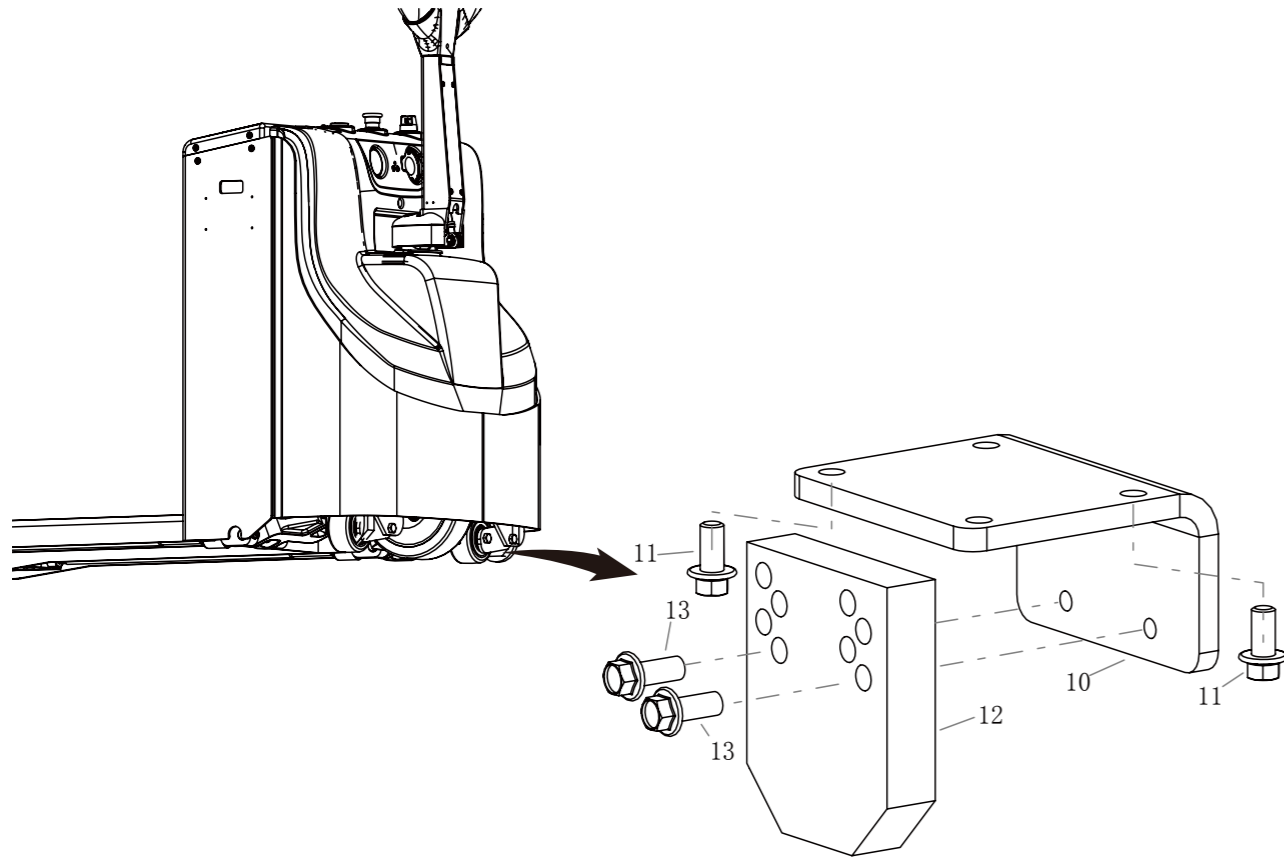| CODE	PART NAME	QTY	OTHER INFORMATION
10	ASSISTING MOUNTING PLATE	1	
11	HEXAGON FLANGE BOLT _M10×20	4	
12	ASSISTING SUPPORT PLATE	1	
13	HEXAGON FLANGE BOLT _M10×25	2	

2 Install

　1)Install the assisting mounting plate first and then tighten the bolt (Code 11).

　2)Install the assisting support plate and tighten the bolt (Code 13).

ⓘNote

When the assisting support plate (Code 12) is worn, adjust the holes on the support plate downwards in turn.

5.11 REMOVE AND INSTALL THE ASSISTING SUPPORT ASSEMBLY

　1)　Lift the front end of the fork ,fill up a solid piece of wood,press the emergency stop switch.

　2)　Unscrew the screw (Code 10) with a 13mm open-end wrench and then unscrew the screw (Code 11) with a 4mm Allen wrench. Tap out the mounting shaft for the support wheel with a copper rod (Code 12) and then replace the support wheel assembly (Code 13).

　3)　Replace the support wheel assembly of the other side of the fork.
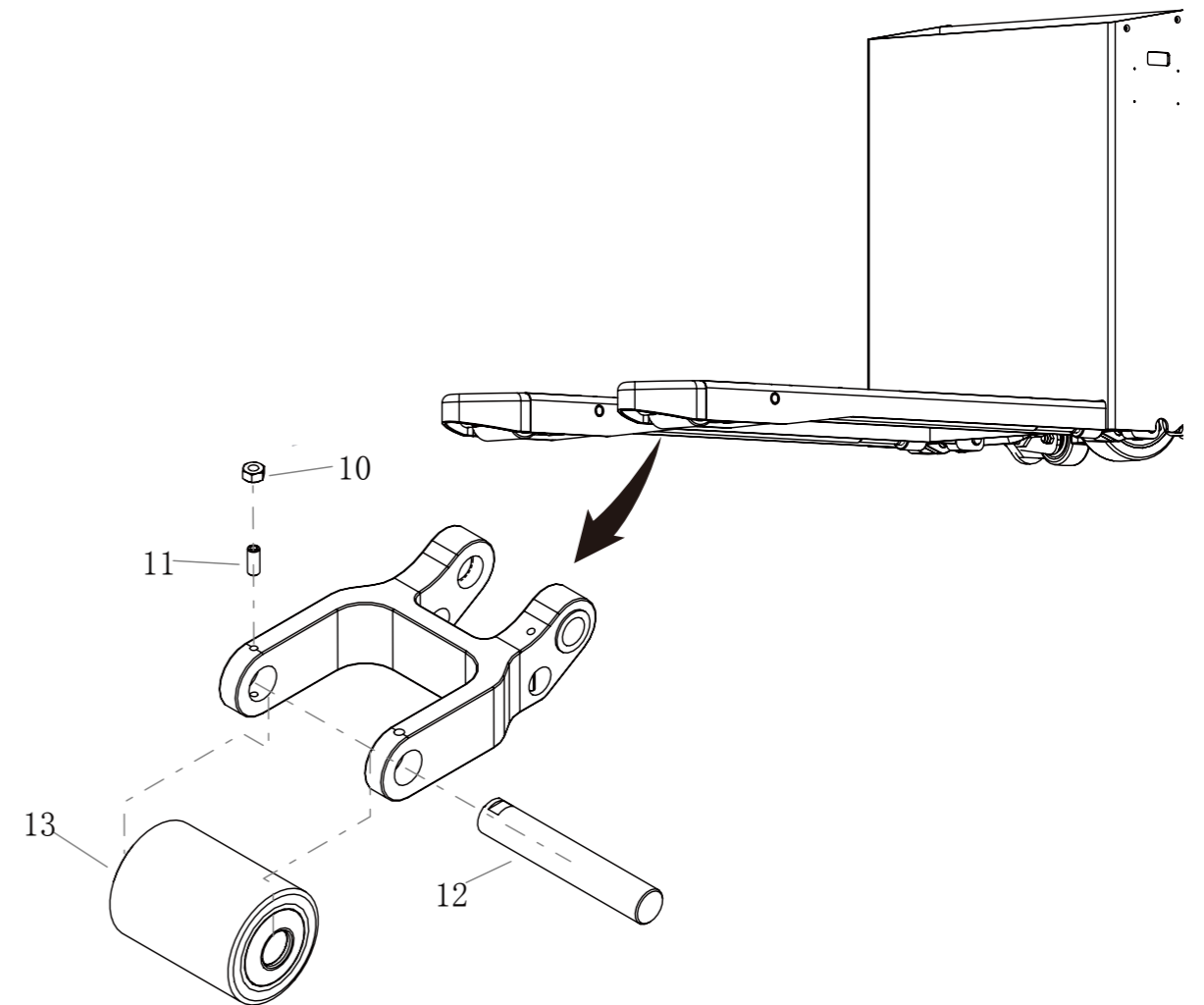
CODE	PART NAME	QTY	OTHER INFORMATION
10	TYPE 1 HEXAGON NUT _M8	1	
11	HEXAGON SOCKET SET SCREW_M8×20	1	
12	MOUNTING SHAFT FOR SUPPORT WHEELS -Φ25×144	1	
13	SUPPORT WHEEL ASSEMBLY -Φ82×110	1	

5.12 REMOVE AND INSTALL THE LIFT MECHANISM

1. Remove

1) Tap out the pin (Code 11) and the rotation shaft (Code 10) with an appropriate tool.

2) Unscrew the nut (Code 14) with a 13mm open-end wrench.

3) Unscrew the screw (Code 13) with a 4mm Allen wrench and then tap out the rotation shaft (Code 12) for removing the lift mechanism.
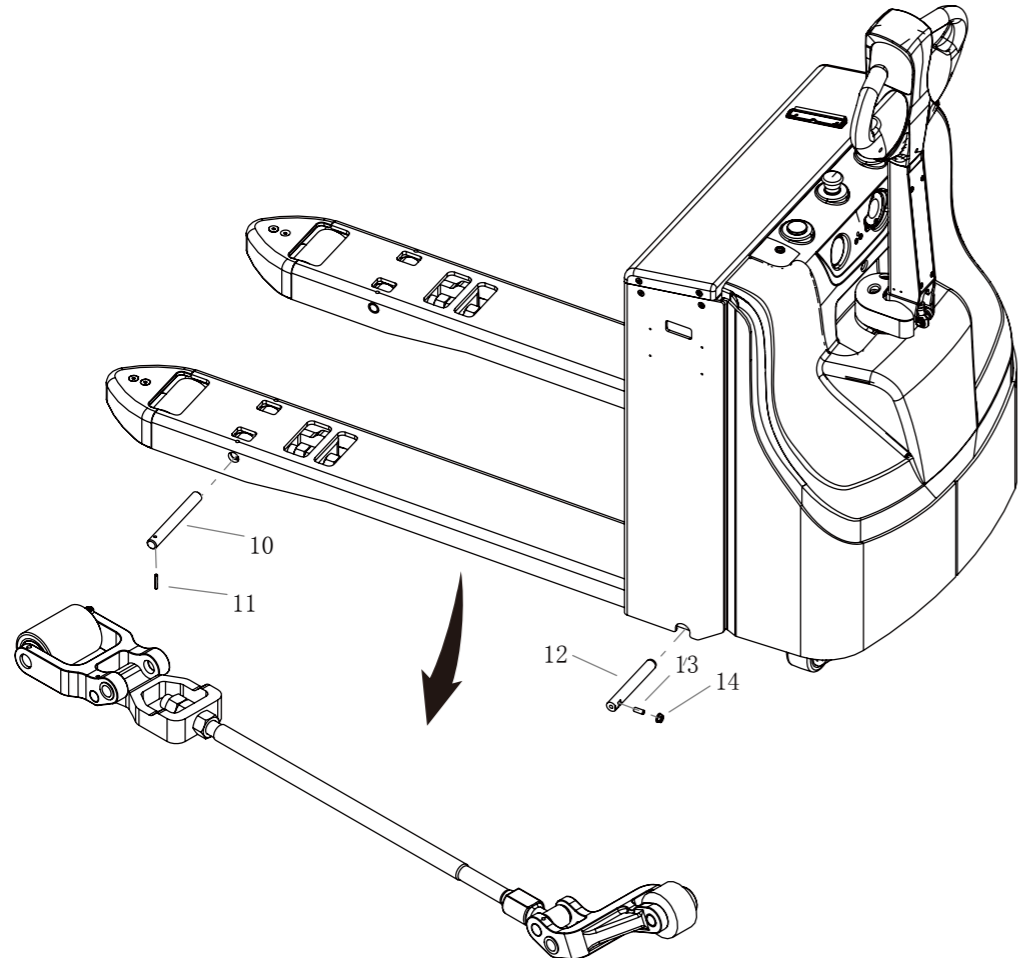
CODE	PART NAME	QTY	OTHER INFORMATION
10	ROTATION SHAFT OF THE SUPPORT WHEEL ARM	1	
11	ELASTIC ROUND PIN	1	
12	ROTATION SHAFT OF THE CONNECTION LEVER -190×550	1	
13	HEXAGON SOCKET SET SCREW	1	
14	HEXAGON FLANGE NUT_M8	1	

2. Install

1) Place the lift mechanism into the installation position.
   Hammer into the the rotation shafts (Code 10 and Code 12) with the copper bar.

2) Hammer into the pin (Code 11).

3) Tighten the screw (Code 13) and the nut (Code 14).

⚠ **Note**

If the the pull rod has been removed or the nut is loose, adjust the height of the fork timely and then tighten the nut.

3. Adjust the Height After Installation
Adjustment standard: The minimum height H is 82 ～ 83mm.
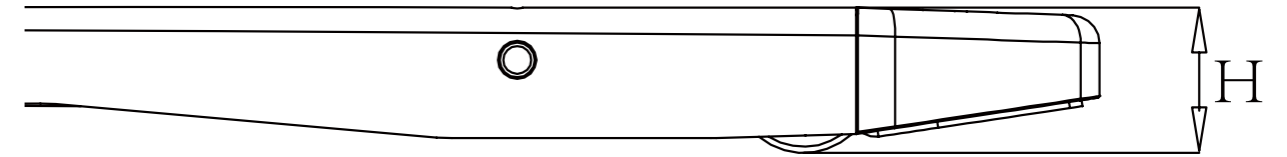
Obey the following steps to adjust the minimum height of the fork:

1) Tighten the nut 1 and leave enough room to adjust the nut 2.

2) Unscrew the nut 3 and then adjust the nut 2 until the fork reaches the height set.

3) Tighten the loose nut 3.

4) Tighten the nut 1.
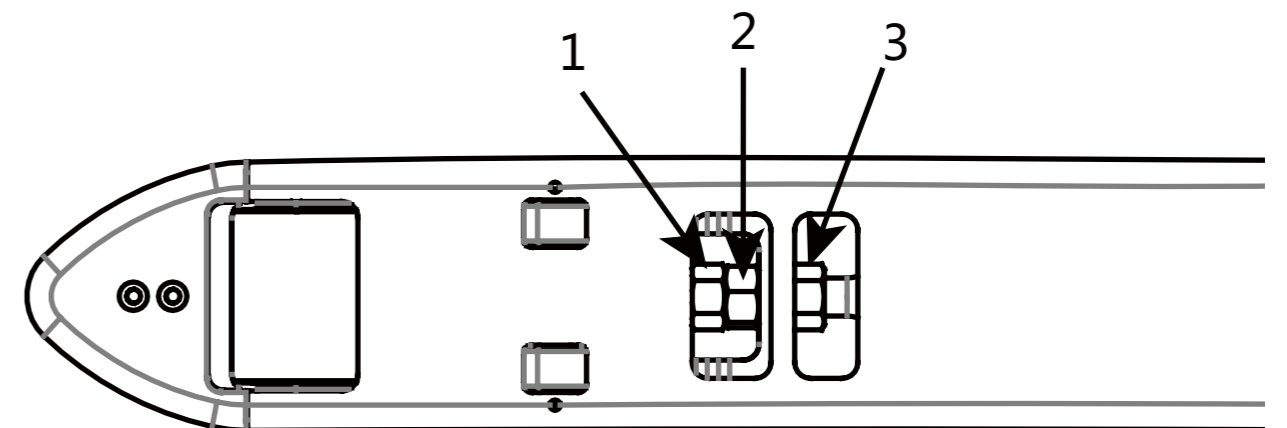
When screwing the nut to the right, the height H will decrease.

Instead, when screwing to the left, the height H will increase.

4. Parts of the Lift Mechanism
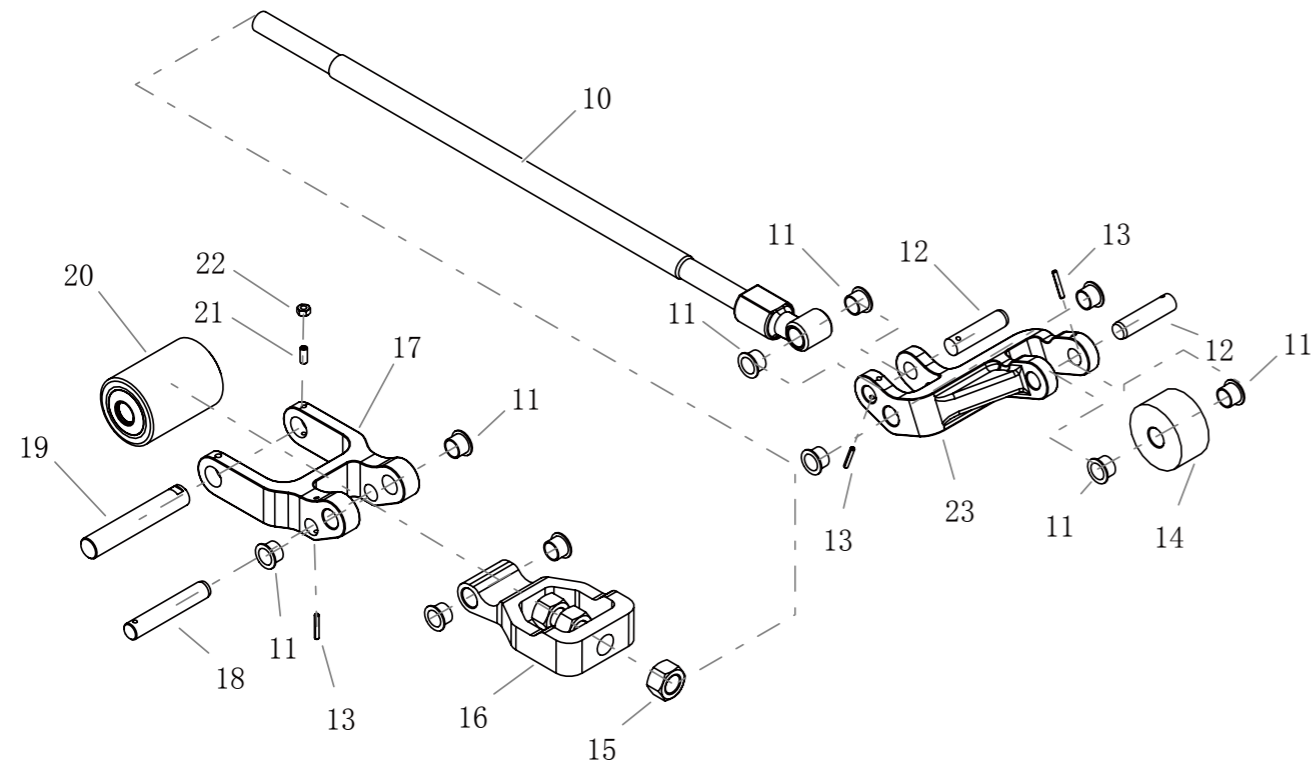
CODE	PART NAME	QTY	OTHER INFORMATION
10	SERIALIZED PULL-ROD ASSEMBLY	1	
11	BUSHING	10	
12	ROLLER SHAFT OF THE CONNECTING ROD	2	
13	ELASTIC ROUND PINS	3	
14	ROLLER OF THE CONNECTING ROD	1	
15	TYPE 1 HEXAGON NUT _M24	3	
16	PULL-ROD CONNECTOR	1	
17	ARM OF SUPPORT WHEELS-SINGLE WHEEL	1	
18	ROTATING SHAFT OF ROD CONNECTOR - SINGLE WHEEL	1	
19	MOUNTING SHAFT FOR SUPPORT WHEELS -Φ25×144	1	
20	SUPPORT WHEEL ASSEMBLY -Φ82×110	1	
21	TYPE 1 HEXAGON NUT _M8	1	
22	HEXAGON SOCKET SET SCREW	1	
23	LEFT CONNECTING SHAFT -325X685	1	

5.13 REMOVE AND INSTALL MAIN BEARING OF COMPOUND ROLLERS

1. Remove

1) Remove cylinder fasteners and relevant wiring harness thereof (Codes 1/2/3/4/5), and separate front and rear forklift bodies.

5.Power Wire (Input End) of the Charger

4.Negative and Positive Wire (Output End) of the Charger

3.Wire Outside the Battery Box

2.Positive Wire of the Battery Box

1.Negative Wire of the Battery Box
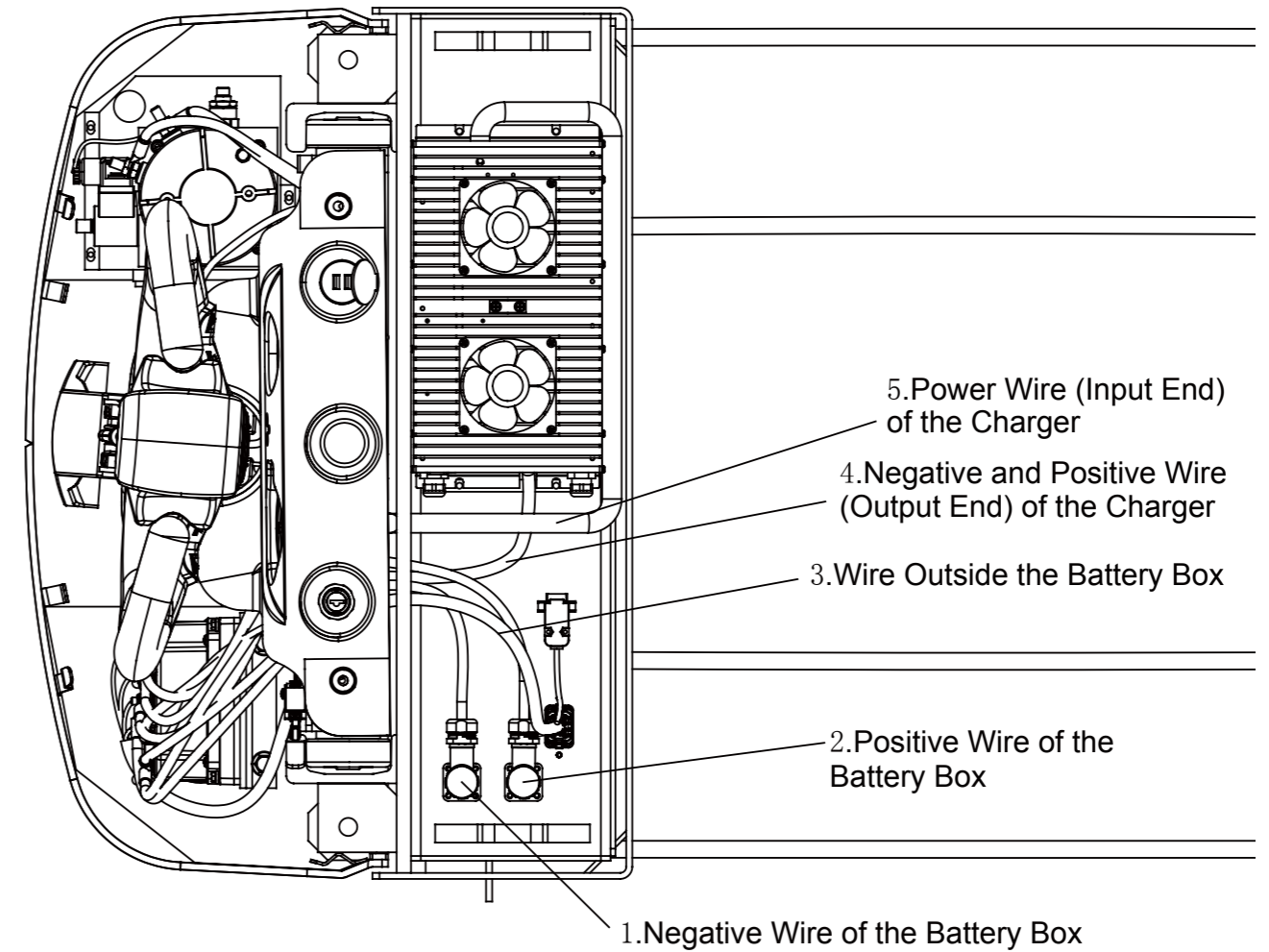
2) Remove the Circlips for shaft and use an appropriate tool to remove the main bearing of compound rollers.

< A >
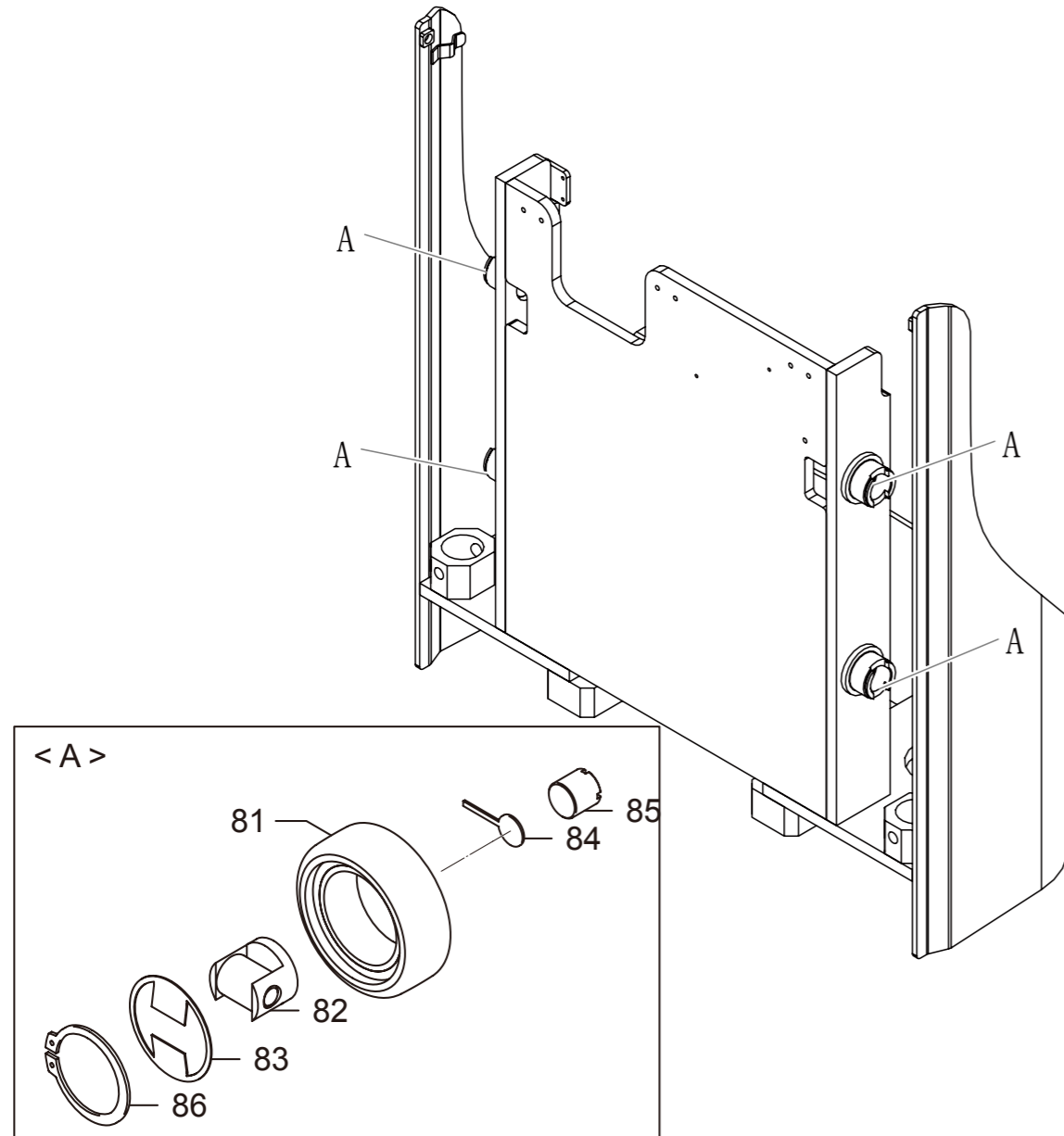
CODE	PART NAME	QTY	OTHER INFORMATION
81	MAIN BEARING OF COMPOUND ROLLERS	4	
82	SIDE BEARING OF COMPOUND ROLLERS	4	
83	DUST-PROOF PIECE OF COMPOUND ROLLERS	4	
84	ANTI-LOOSENESS PIECE OF COMPOUND ROLLERS	4	
85	ADJUSTING SCREW OF COMPOUND ROLLERS	4	
86	CIRCLIPS FOR SHAFT	4	

---

2 Install

Follow steps in reverse order to install the the main bearing of compound rollers.

ⓘ Note

Main and side rollers, and dust-proof ring are mounted to the front end of compound rollers of door bracket through circlips. The side roller is used to adjust the space by the adjustment screw on the other side. The anti-looseness piece is used to protect the adjustment screws.

1) Bend the anti-looseness piece until the adjustment screw exposes out.

2) Use the adjustment screw to adjust the guide space of the lift mechanism of the rear forklift body.

3) Bend the anti-looseness piece to protect the adjustment screw after adjustment.

MAINTAIN THE HYDRAULIC DEVICE

This chapter will describe how to maintain the Hydraulic Device.

Cylinder

Cylinder

Hydraulic Power Unit
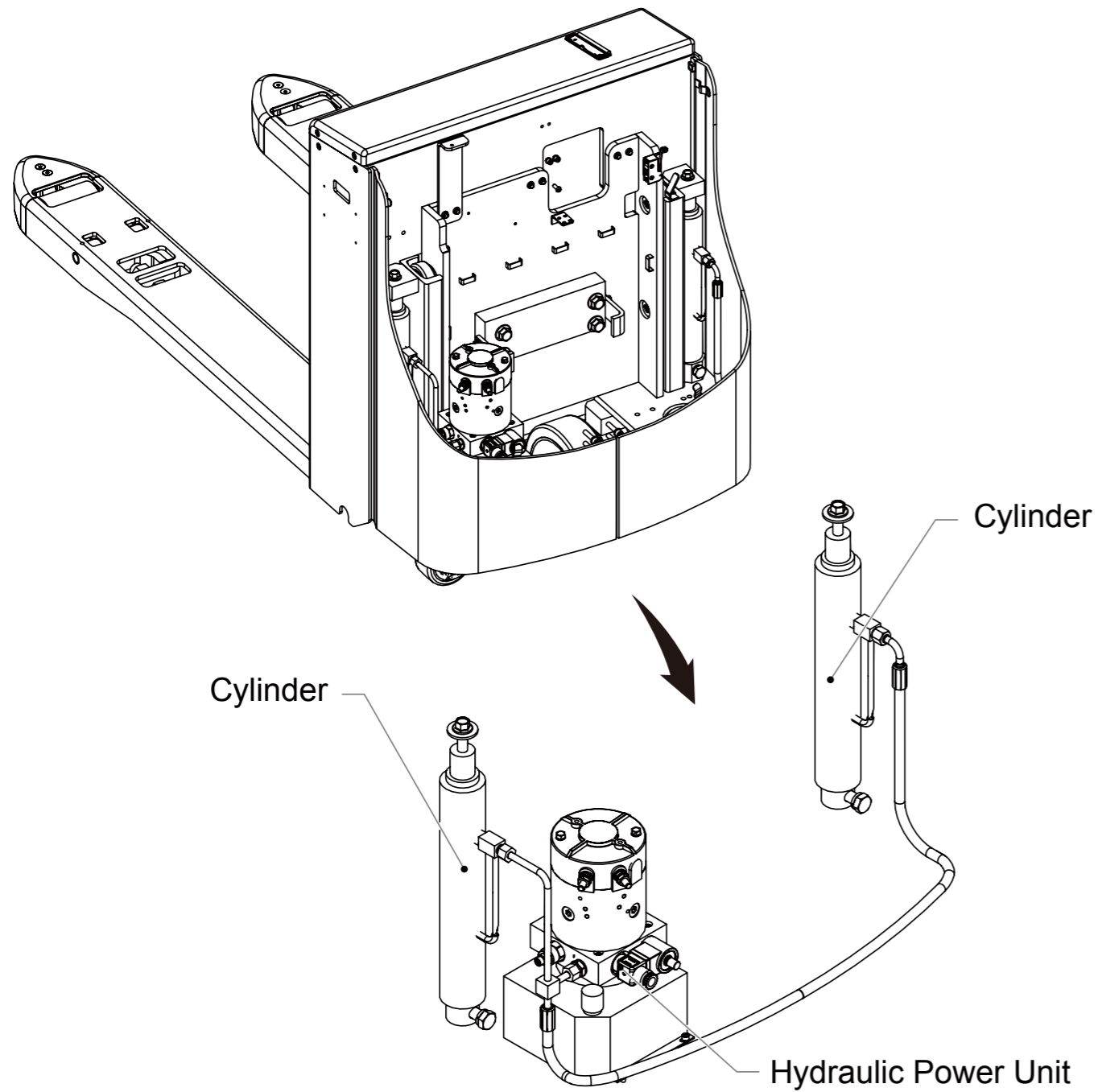
6.1 WORKING PRINCIPLE OF THE HYDRAULIC SYSTEM

In-service Condition   Out-Of-Service Condition
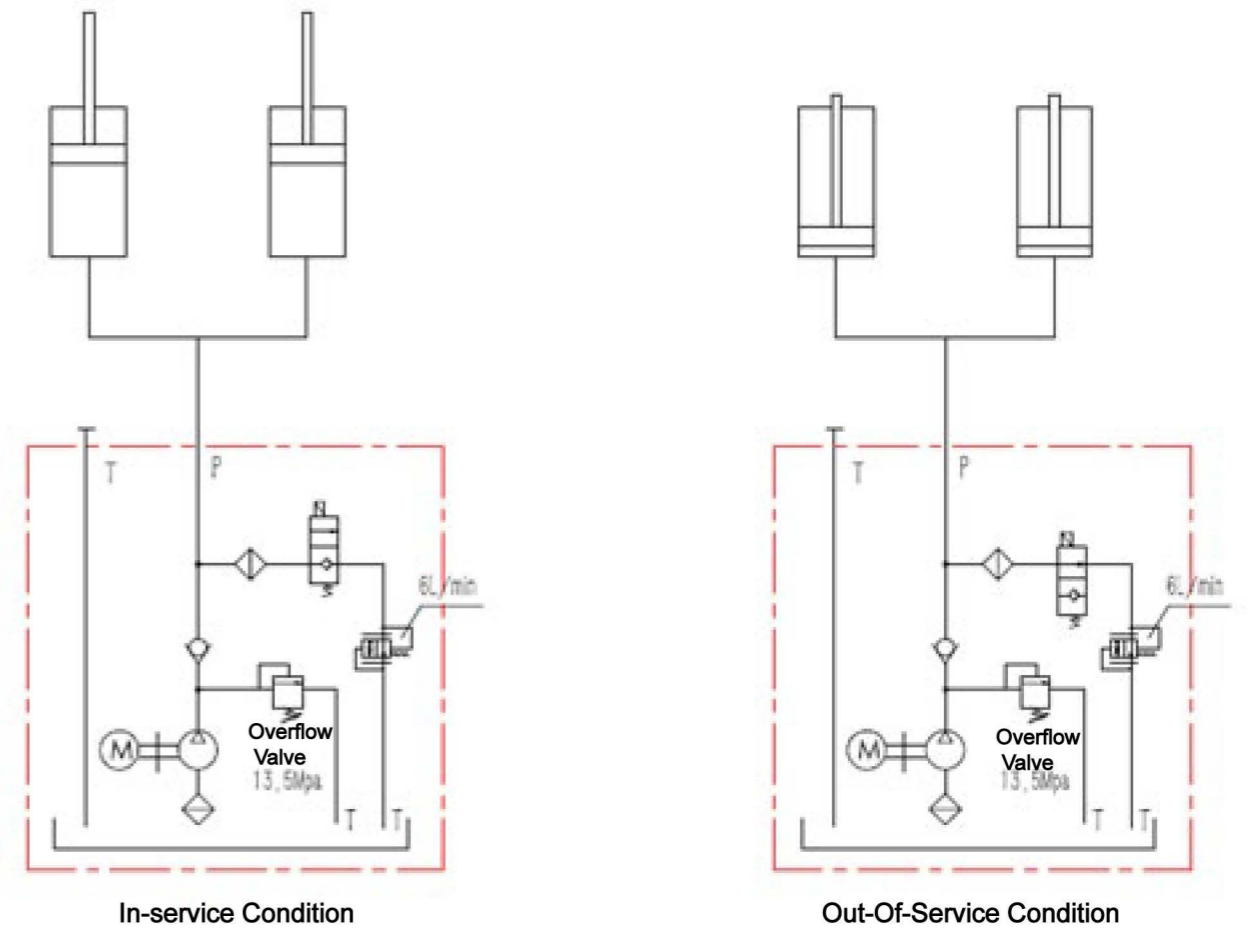
The hydraulic system is consist of the hydraulic power unit, lift cylinder and some tubes.

1) Lifting State
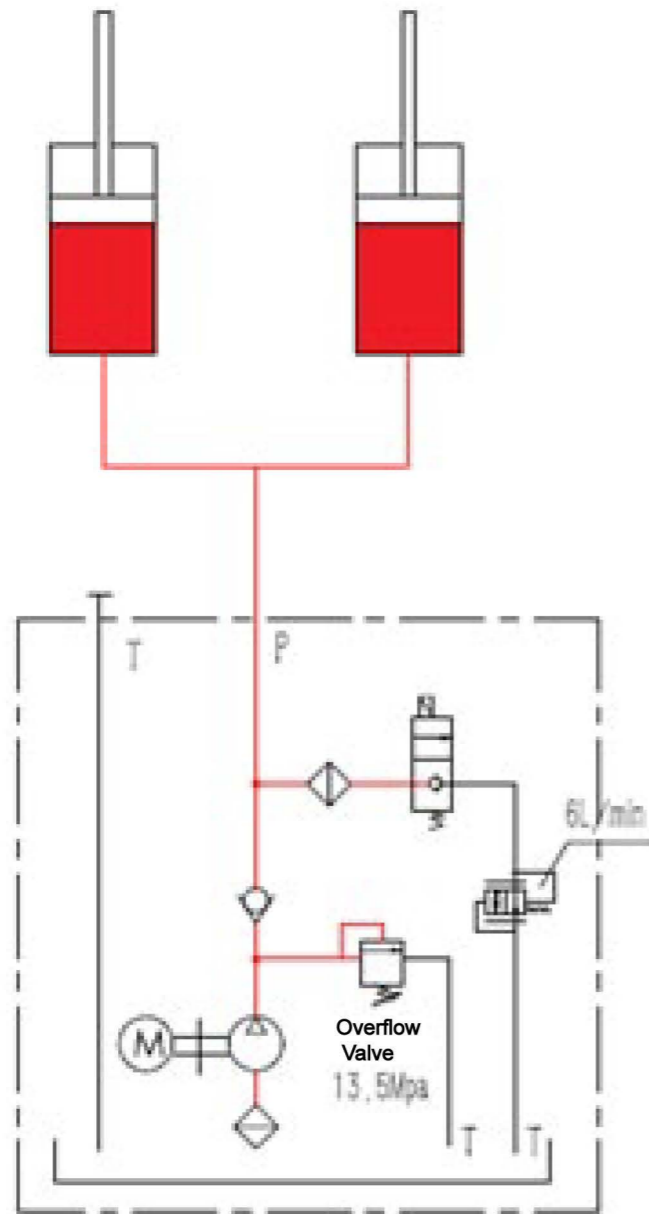
When it is in the lifting state, start the motor and extract the hydraulic oil with the oil pump. The hydraulic oil is input into the lifting cylinder through the check valve and hydraulic tube, and therefore lifting the object. Meanwhile. The solenoid valve is power off and the hydraulic will be blocked.

2) Lowering State
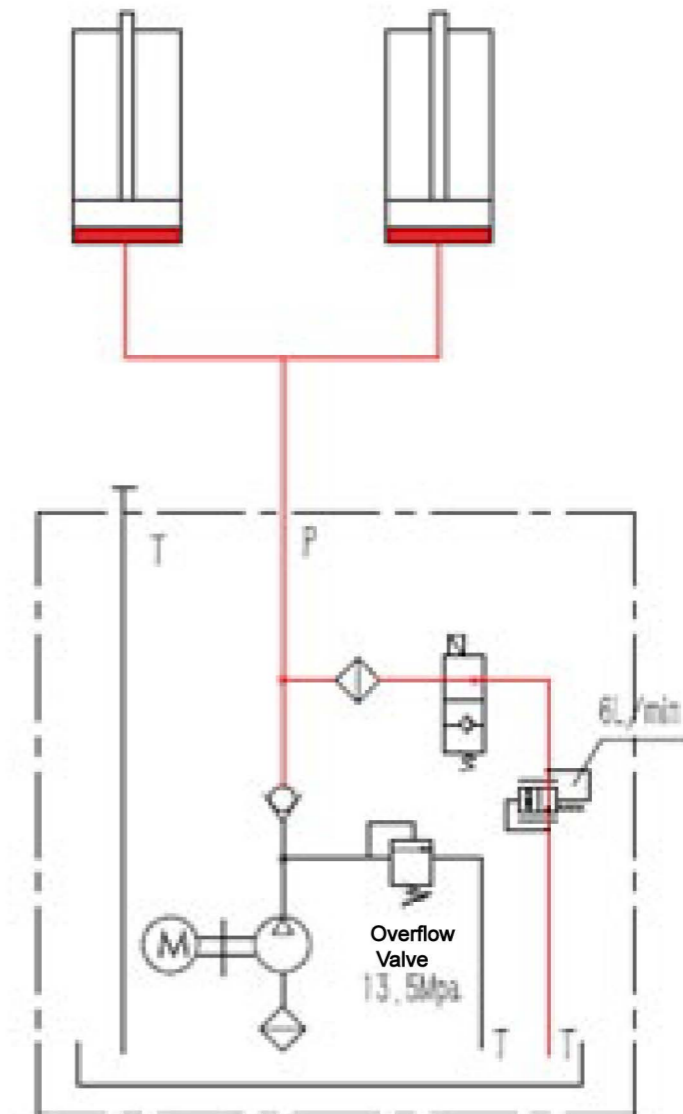
When it is in the lowering state, the motor is closed and the solenoid valve is power on (the hydraulic oil can pass). The hydraulic oil passes the lifting cylinder, hydraulic tube, solenoid valve and the oil return tank of the governor valve

3) Overload or Blockage
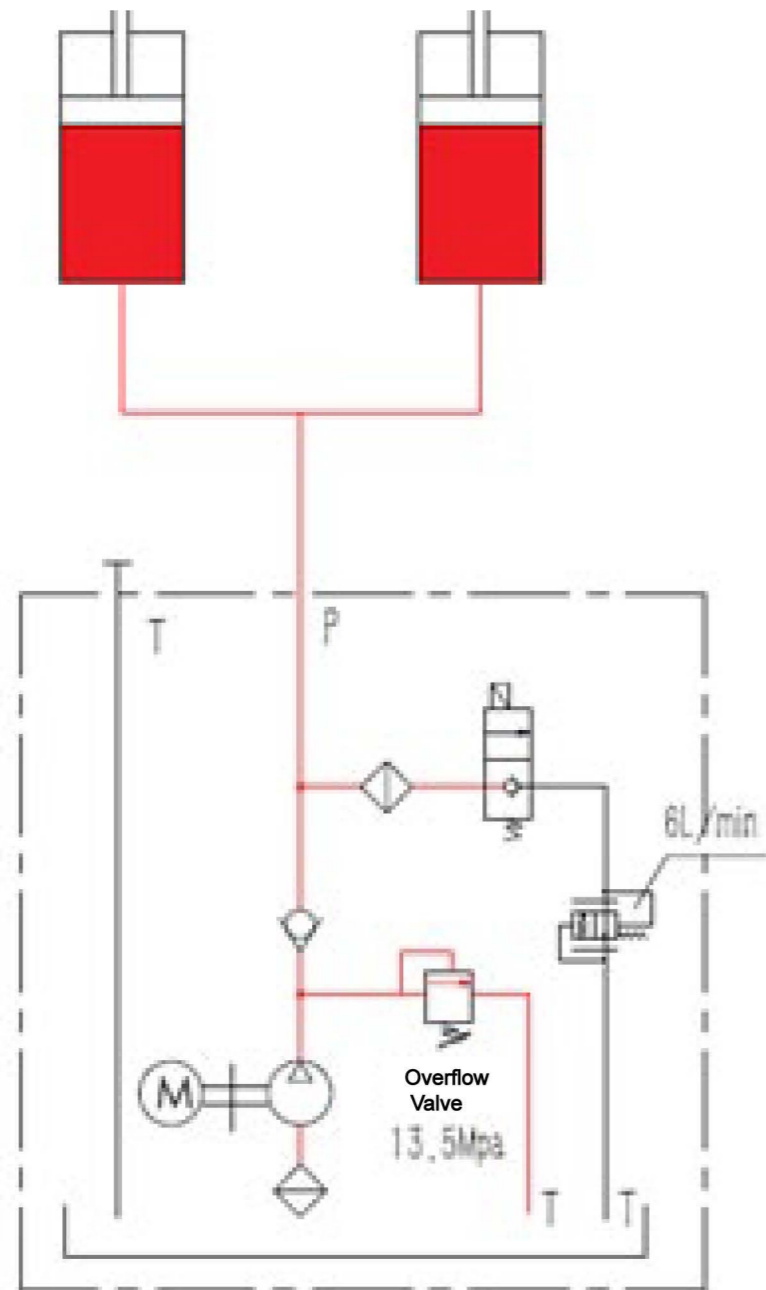
The overloaded machine and blocked oil tube will make the pressure of the system over 13.5Mp, wherein the overflow valve will be open to ensure the safety of the system.

6.2 PARTS OF THE HYDRAULIC SYSTEM

The hydraulic system of the PMW20 forklift promotes the fork to move.

Main parts of the hydraulic system:

1) Hydraulic Power Unit

2) Lift Cylinder

3) Hydraulic Oil Tube
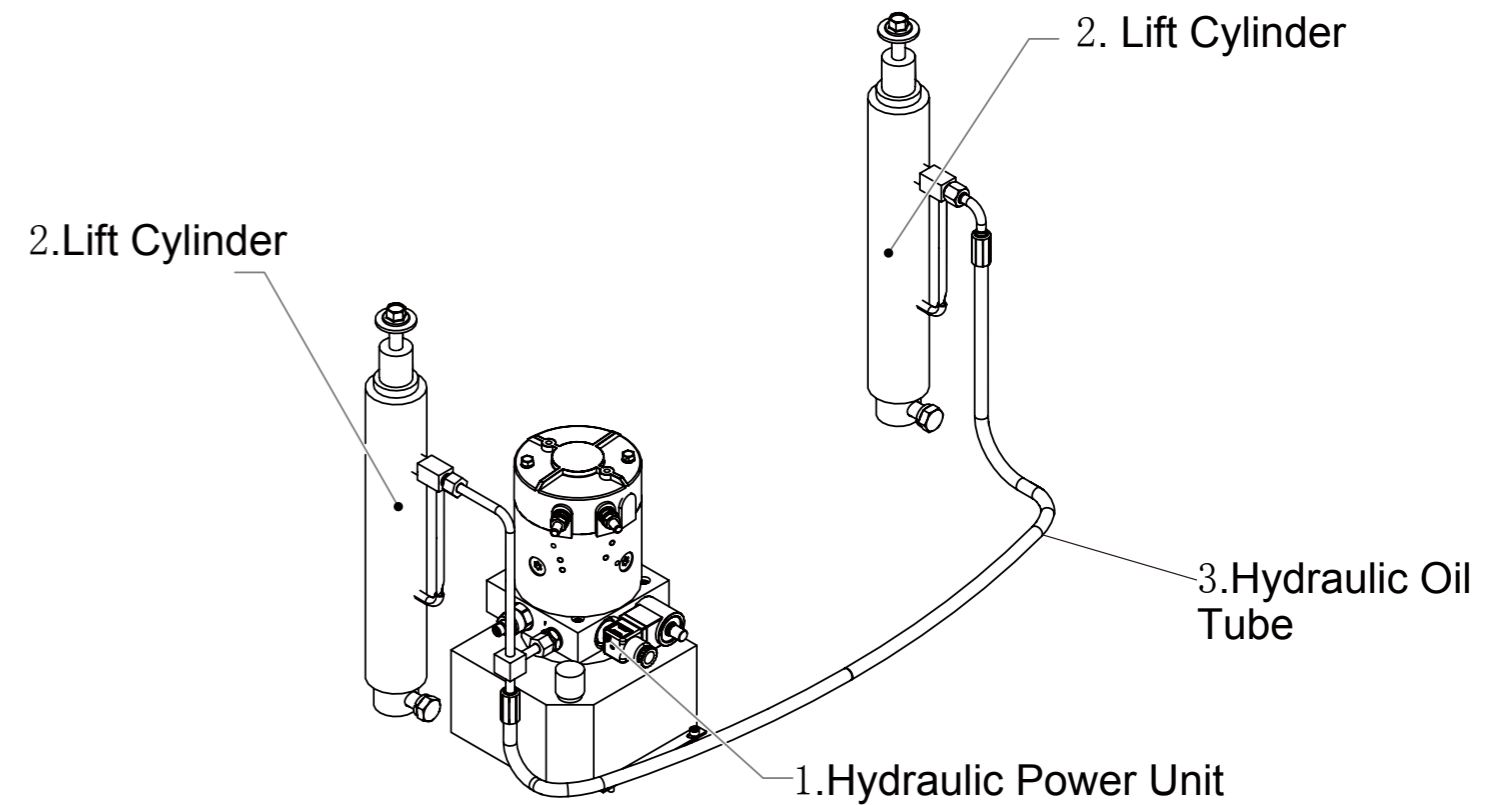
1）Schematic Diagram of the Hydraulic System

Lift Cylinder

6L/min

Hydraulic Power Unit

Overflow
Valve

13.5Mpa

In-service Condition

2）Hydraulic Power Unit

The hydraulic unit includes the hydraulic pump, electric motor, solenoid valve, overflow valve, the solenoid valve, oil tank, governor valve and etc.

The hydraulic power unit features in its output volume (ml/r), named cc.

Formula for calculating pump output flow of the hydraulic power unit: Q=q*R. The pump output flow is abbreviated as q while the rotation speed (r/min) is as R. Pay attention to the transformation of Units. Generally speaking, the unit of the flow is L/min.
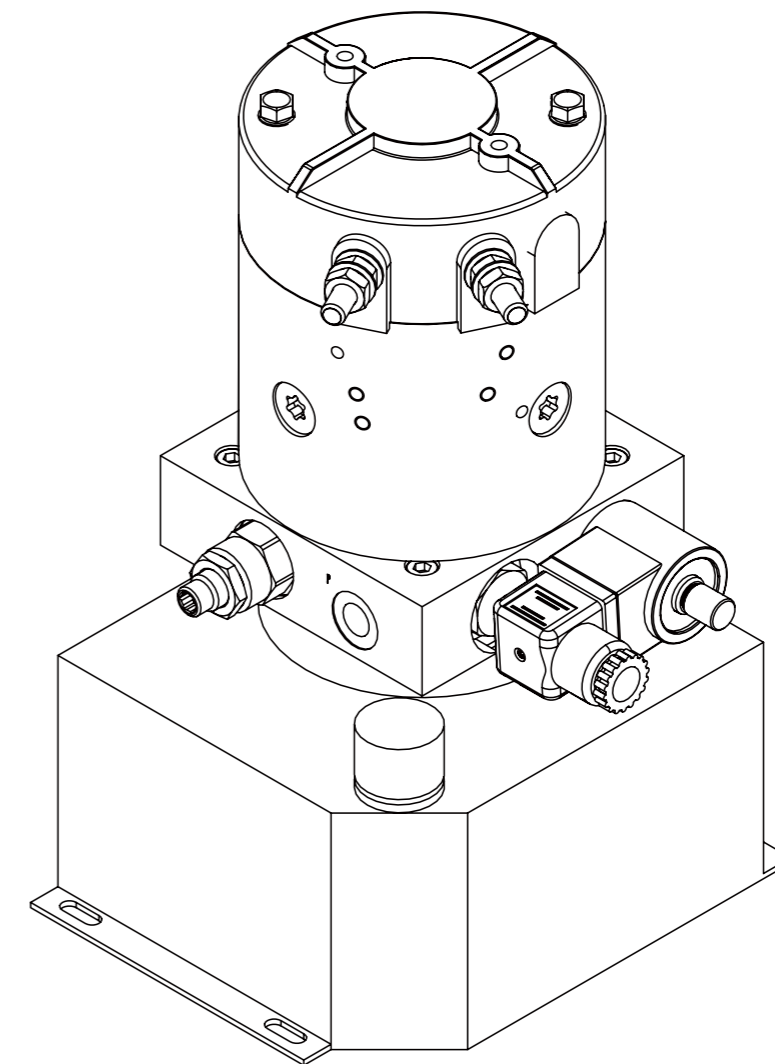
3）Lift System

The lifting system consists of an oil cylinder and a power unit and allows the fork to rise and fall.

●When it is in the lifting state, start the motor and extract the hydraulic oil with the oil pump. The hydraulic oil is input into the lifting cylinder through the check valve and hydraulic tube, and therefore lifting the object. Meanwhile. The solenoid valve is power off and the hydraulic will be blocked.

●When it is in the lowering state, the motor is closed and the solenoid valve is power on (the hydraulic oil can pass). The hydraulic oil passes the lifting cylinder, hydraulic tube, solenoid valve and the oil return tank of the governor valve.

●The governor valve is used to limit the maximum speed of descent

Lift Cylinder

Hydraulic Power Unit

**Lifting State**   **Lowering State**
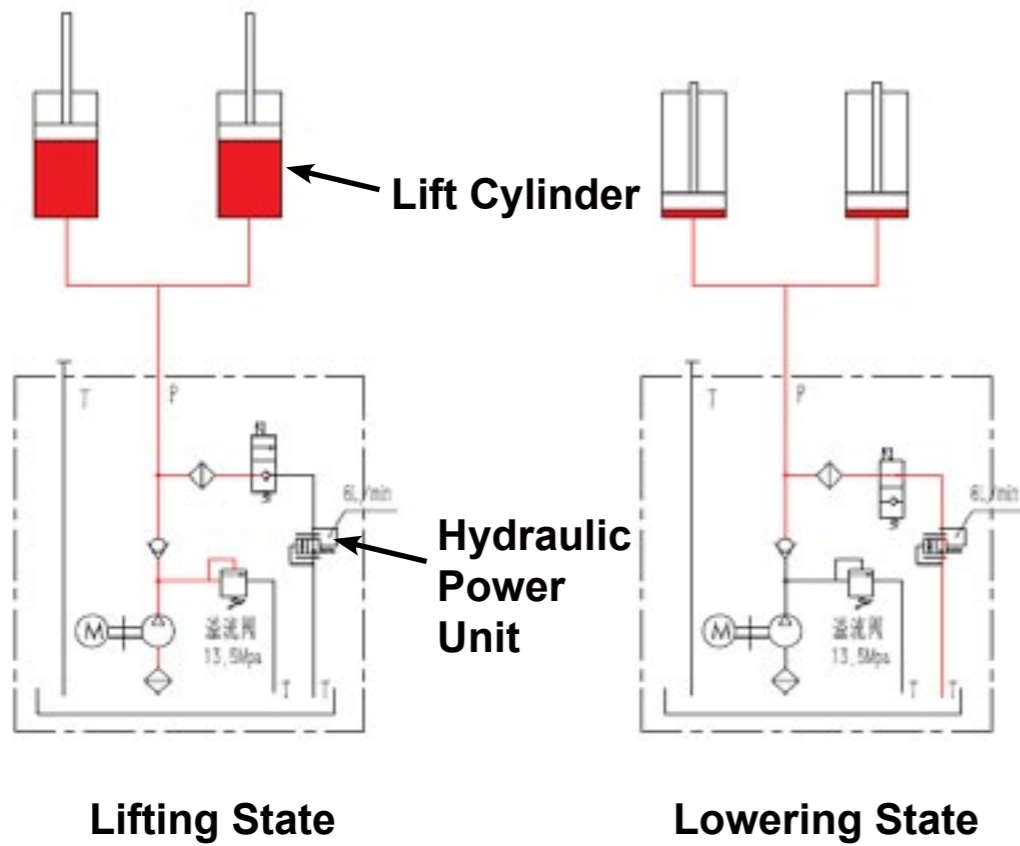
4）Safe oil passage

The overloaded machine and blocked oil tube will make the pressure of the system over 13.5Mp, wherein the overflow valve will be open to ensure the safety of the system.
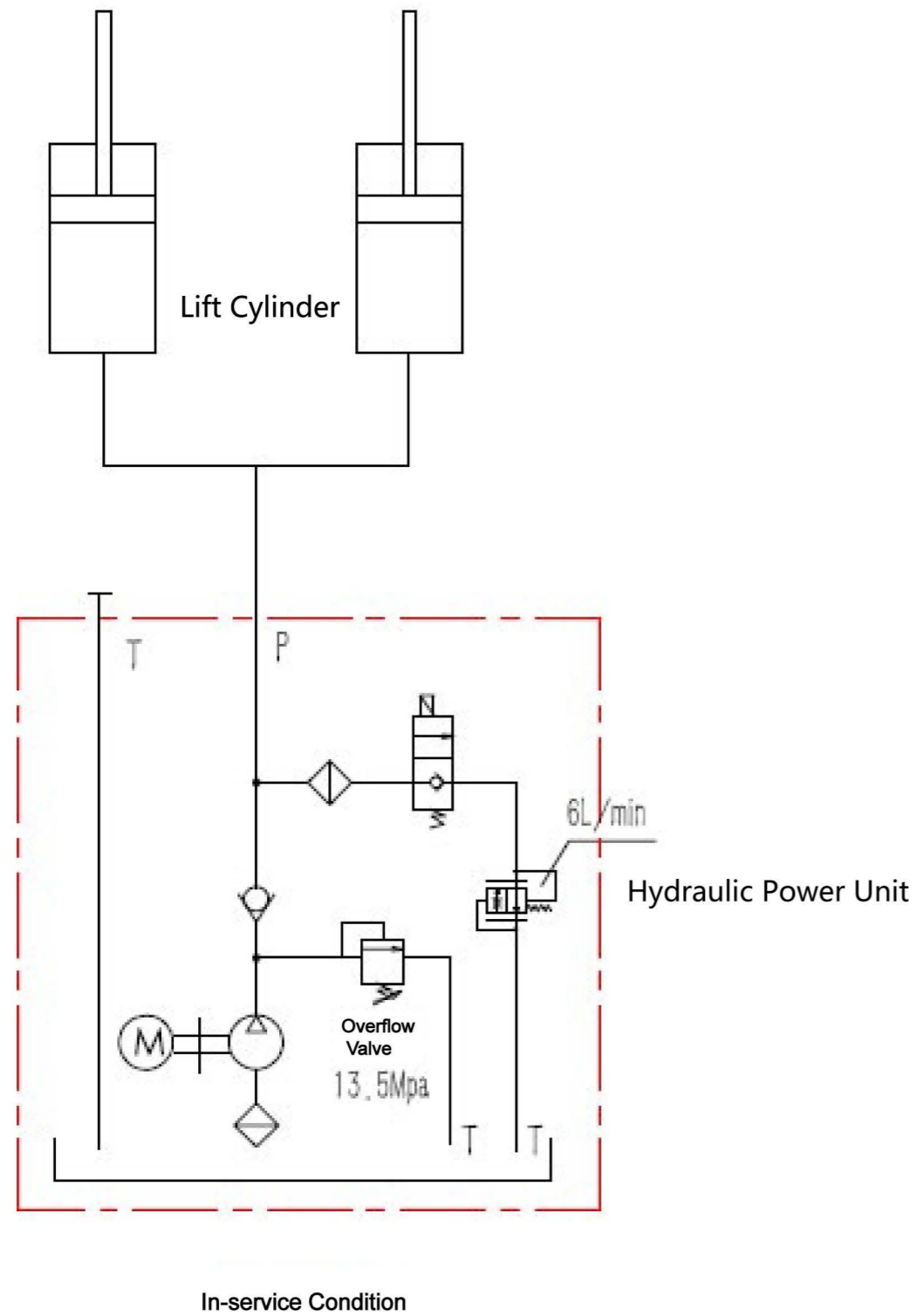

Overflow Valve

13.5Mpa
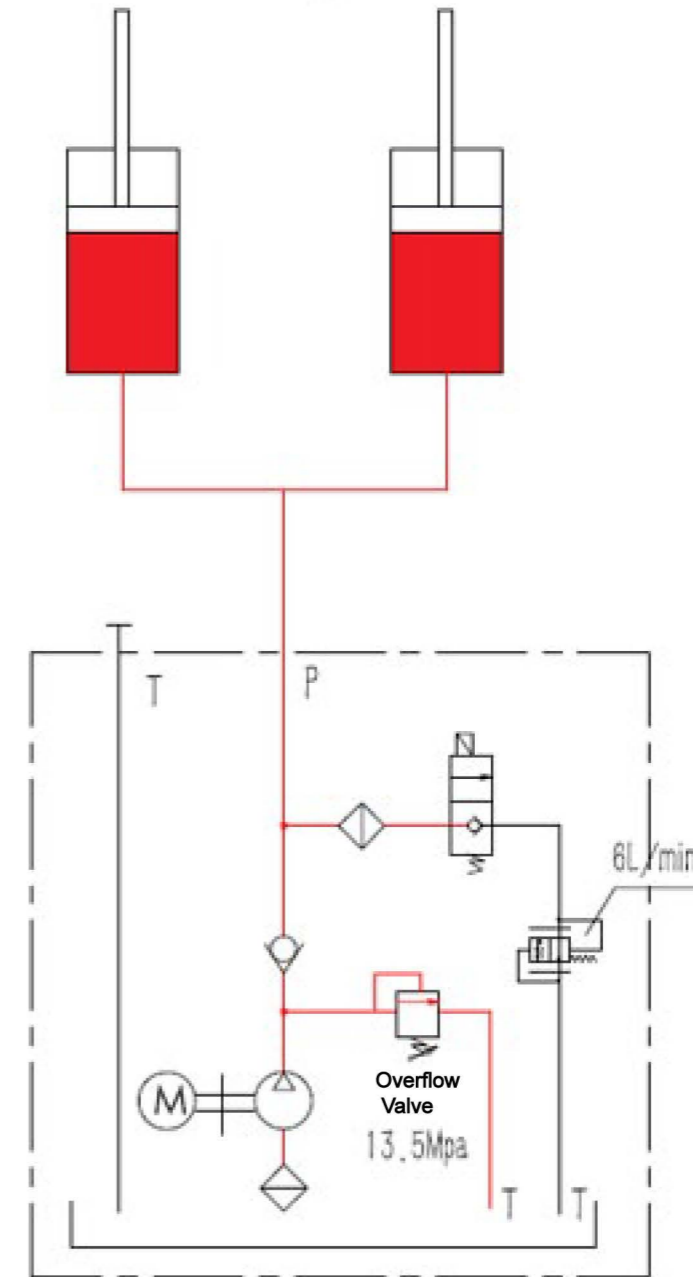
6.3 ADD HYDRAULIC OIL

1) Lower the fork to the lowest position and then open the oil filler port cap of the hydraulic power unit.

2) Pull out the oil gauge, clean the oil with a clean cloth, and then insert the oil gauge into the tank.

3) Pull out the oil gauge again and check whether the level of the hydraulic oil is within the scale.

4) If the level of the hydraulic oil is below the scale, open the filling filter lid to add oil.
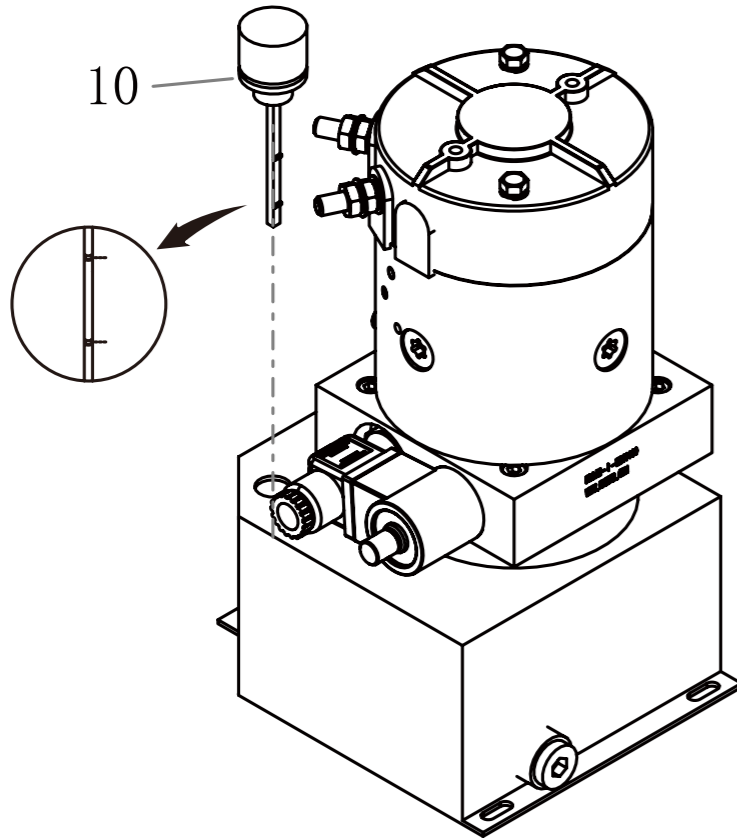
CODE	PART NAME	QTY	OTHER INFORMATION
10	AIR FILTER	1	

6.4 REMOVE AND INSTALL THE POWER UNIT

1) Lower the fork to the lowest position.

2) Unscrew the plug (Code 10) with a 8mm Allen wrench and discharge the hydraulic oil.

3) Tighten the plug (Code 10) and pull out the oil gauge. Then re-add the hydraulic oil (Refer to 6.3 for details).
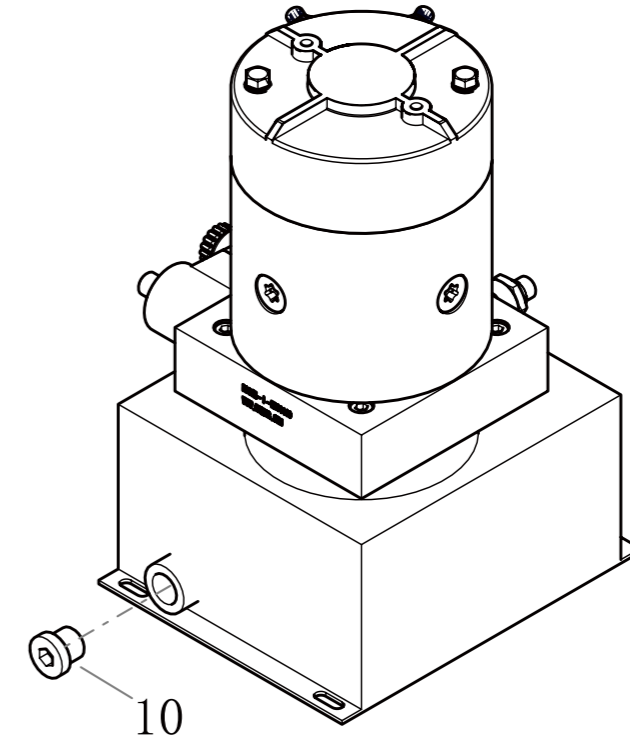
CODE	PART NAME	QTY	OTHER INFORMATION
10	PLUG _4BN-G3-8-Z_ CARBON STEEL	1	

⚠ Note

(1) Pay attention to the surroundings when filling oil and keep dust and water out of the oil tank.

(2) Don't mix the hydraulic oil.

(3) Handle the waste oil away from people. Don't dump it in waterways or on the ground.

(4) Only authorized hydraulic oil can be used. Otherwise, it will damage the hydraulic device. If you need to use other types of hydraulic oil, please contact after-sale personnel of BYD forklift.

6.5 REMOVE AND INSTALL THE POWER UNIT

1. Remove

1) Lower the fork to the lowest position,close the switch,and press the emergency stop switch.

2) Remove the screw (Code 10) with a 4mm Allen wrench.

3) Disconnect the wiring of hydraulic power unit and unplug the wire connector G13.

4) Then remove the connector of the lift tube assembly with a 18mm wrench and take out the power unit.
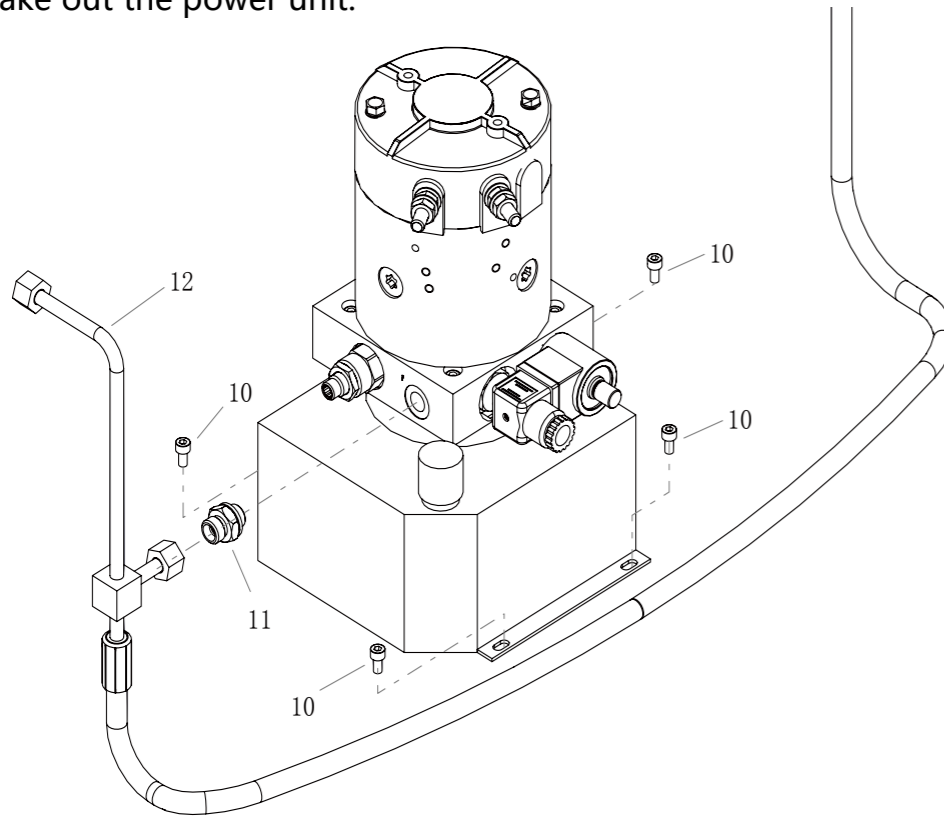
CODE	PART NAME	QTY	OTHER INFORMATION
10	HEXAGON SOCKET HEAD CAP SCREWS _M5×10	4	
11	STRAIGHT JOINT _1CG-M14-G1-4-Z	1	
12	LIFT OIL TUBE ASSEMBLY	1	

2. Install

1) Place the power unit into the installation position.

2) Tighten the bolt (Code 10).

3) Connect the power line, plug the wire connector G13 and tighten the tube connector (Code 12).

4) Start the power unit and check whether the connector of the oil tube leaks.

3. Power Unit Parts
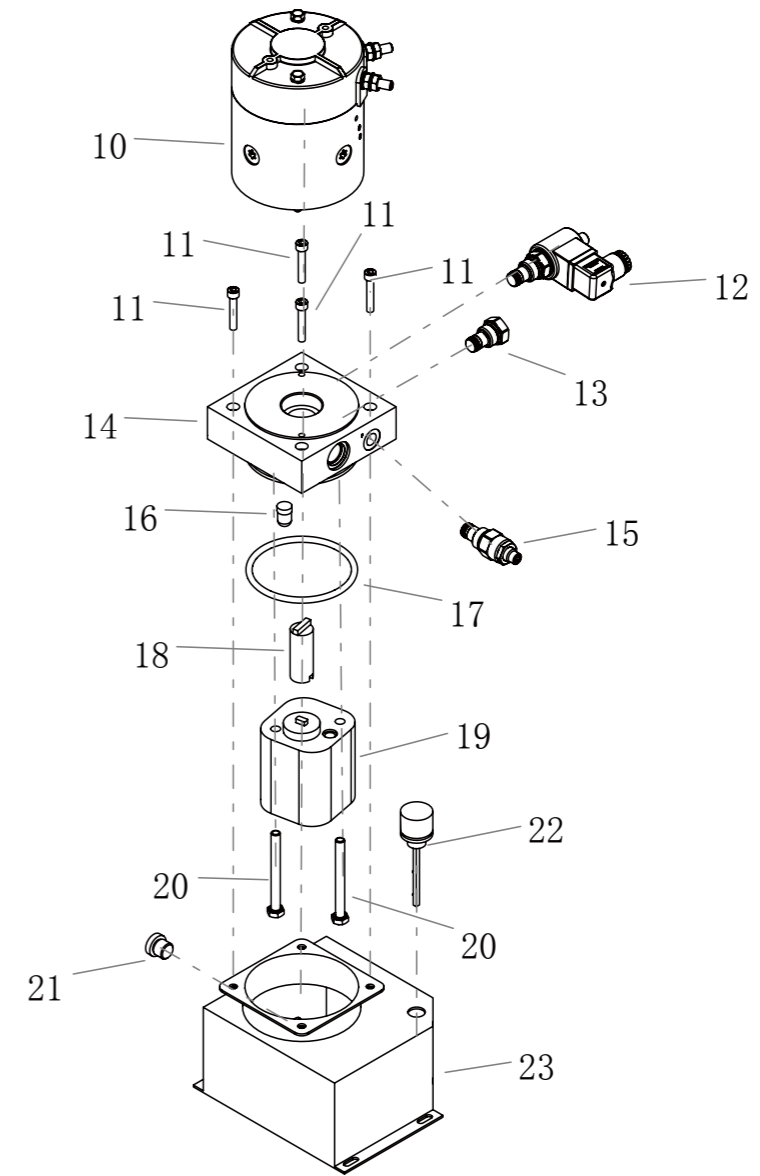
CODE	PART NAME	QTY	OTHER INFORMATION
10	LIFT MOTOR	1	
11	HEXAGON SOCKET HEAD CAP SCREWS _M6×35	4	
12	MANUAL MAGNETIC VALVE	1	
13	CHECK VALVE	1	
14	CENTER BLOCK	1	
15	OVERFLOW VALVE	1	
16	PRESSURE COMPENSATING VALVE	1	
17	O-SHAPED SEALING RING _Φ88.27×5.33	1	
18	COUPLING	1	
19	GEAR PUMP	1	
20	HEXAGON FLANGE BOLT _M8×80	2	
21	DRAIN PLUG _4BN-G3-8-Z_ CARBON STEEL	1	
22	AIR FILTER	1	
23	OIL TANK	1	

6.6 REMOVE AND INSTALL THE LIFT CYLINDER

1. Remove

1) Lower the fork to the lowest position and then open the guard (refer to 4.1 for details).

2) Remove the bolt (Code 10) with a 15mm wrench.

3) Remove the assembly (Code 13) with a 21mm wrench.

4) Lift the oil tube connector (Code 14) with a 18mm open-end wrench and take out the oil cylinder.
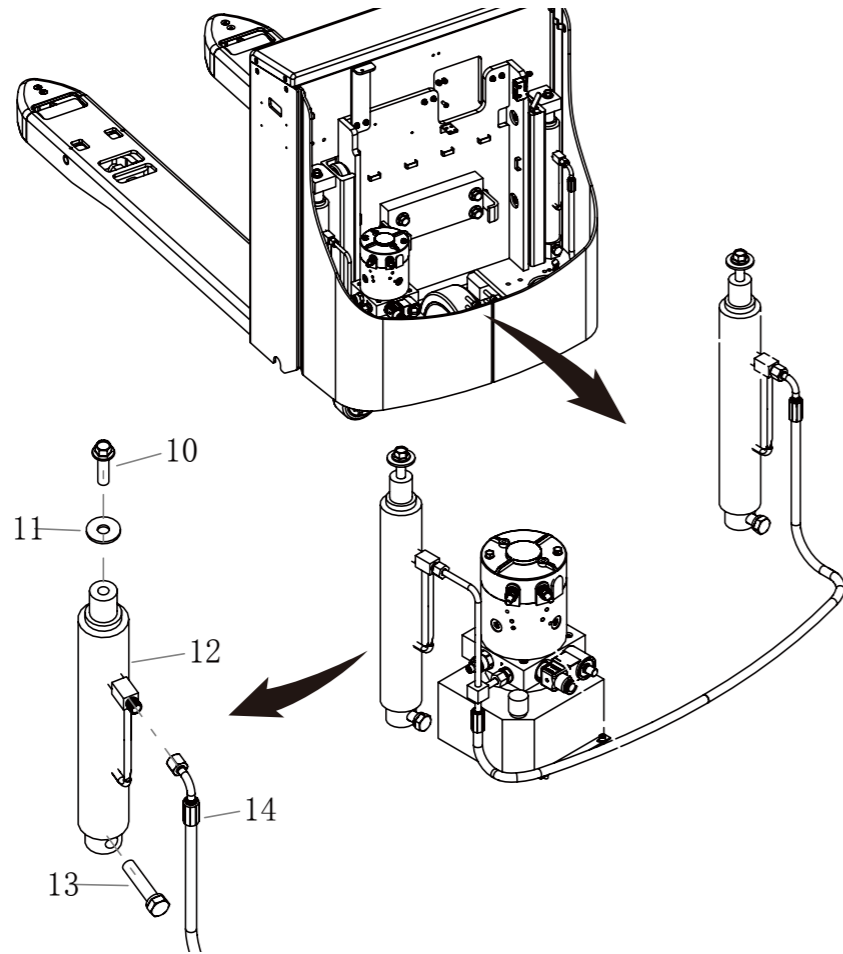
CODE	PART NAME	QTY	OTHER INFORMATION
10	HEXAGON FLANGE BOLT _M12×45	1	
11	PAD	1	
12	CYLINDER Φ40X125	1	
13	HEXAGON-HEADED BOLT AND SPRING PAD ASSEMBLY_M14×65_	1	
14	LIFT OIL TUBE ASSEMBLY	1	

2. Install

1）Place the oil cylinder into the installation position, tighten the assembly (Code 13) and the bolt (Code 10/Code 11).

2）Install the Oil Cylinder Connector (Code 14)

Drive the upper and lower lift cylinders of the forklift after installation and check whether the oil cylinder connector leaks.

6.7 COMPLETE MAINTENNACE OF THE LIFT CYLINDER

1. Remove

1) Remove the liner, then carefully remove the piston rod and piston and place them in a clean area.

2) Remove the dust-proof ring and then remove the clamp ring for taking out the circlips, washer, and oil seal. Remove the o-ring on the cylinder cover.

3) Remove the oil seal and support ring on the piston.
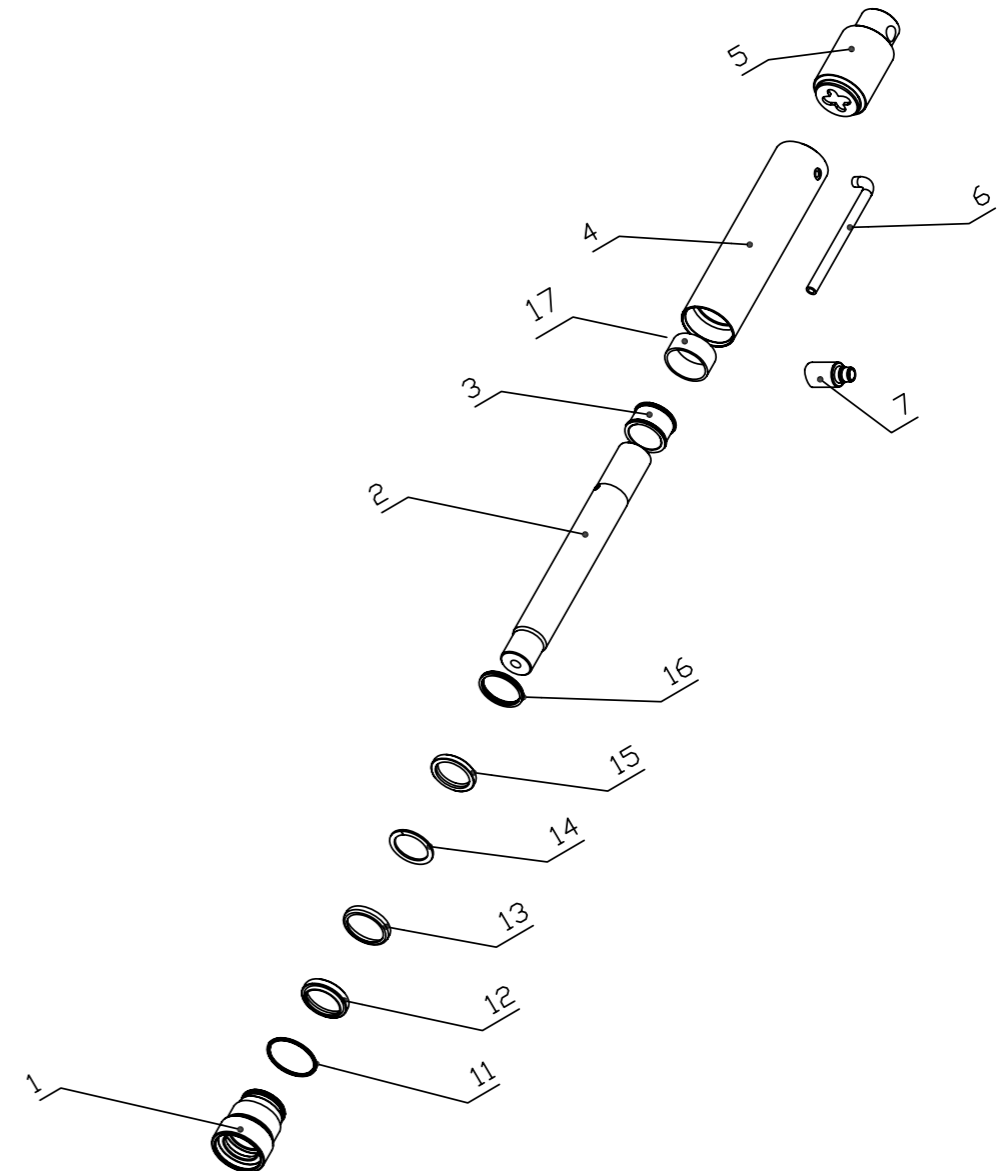
CODE	PART NAME	QTY	OTHER INFORMATION
1	CYLINDER LINER	1	
2	PISTON ROD	1	
3	PISTON	1	
4	CYLINDER SLEEVE	1	
5	CYLINDER BASE	1	
6	OIL PIPE	1	
7	OIL PIPE JOINT	1	
11	O-RING D46.2×2.65	1	
12	DUST-PROOF RING	1	
13	SEALING RING	1	
14	CIRCLIPS 45×35×2	1	
15	CIRCLIPS 45×40×1.5	1	
16	O-RING D45×3.1	1	
17	SUPPORT RING	1	

2. Check Parts

1) Clean all the parts and dry them on a clean and soft cloth.

2) Check for the cylinder liner and the dust-proof ring, o-ring, oil seal and support ring.
   Check whether any scratches, burrs, and scratches on the mounting
   grooves of the o-ring or oil seal cause possible damage to the seals to be installed.

3) Check whether there are any scratches, burrs, and scratches on the inner wall of the
   cylinder and whether the oil cylinder needs to be replaced.

3. Re-install the lift cylinder

1) Before installation, lubricate the o-ring, oil seal, support ring, piston rod, piston,
   cylinder cover and the inner wall of the cylinder.

2) Replace the dust-proof ring, o-ring, and oil seal in complete sets.

3) Insert the piston rod and piston into the cylinder carefully to avoid damaging the inner
   wall and thread of the cylinder.

4) Lubricate the thread of the cylinder and then install the cylinder cover onto the
   cylinder to avoid damaging the o-ring and oil seal.

5) Check whether the piston can move smoothly and then tighten the cylinder cover.

MAINTAIN ELECTRIC DEVICE

This chapter will describe how to maintain electric device.

Emergency Switch

Safety Device

Instrument Assembly

Controller Assembly

USB Charging Connector

Electric Horn
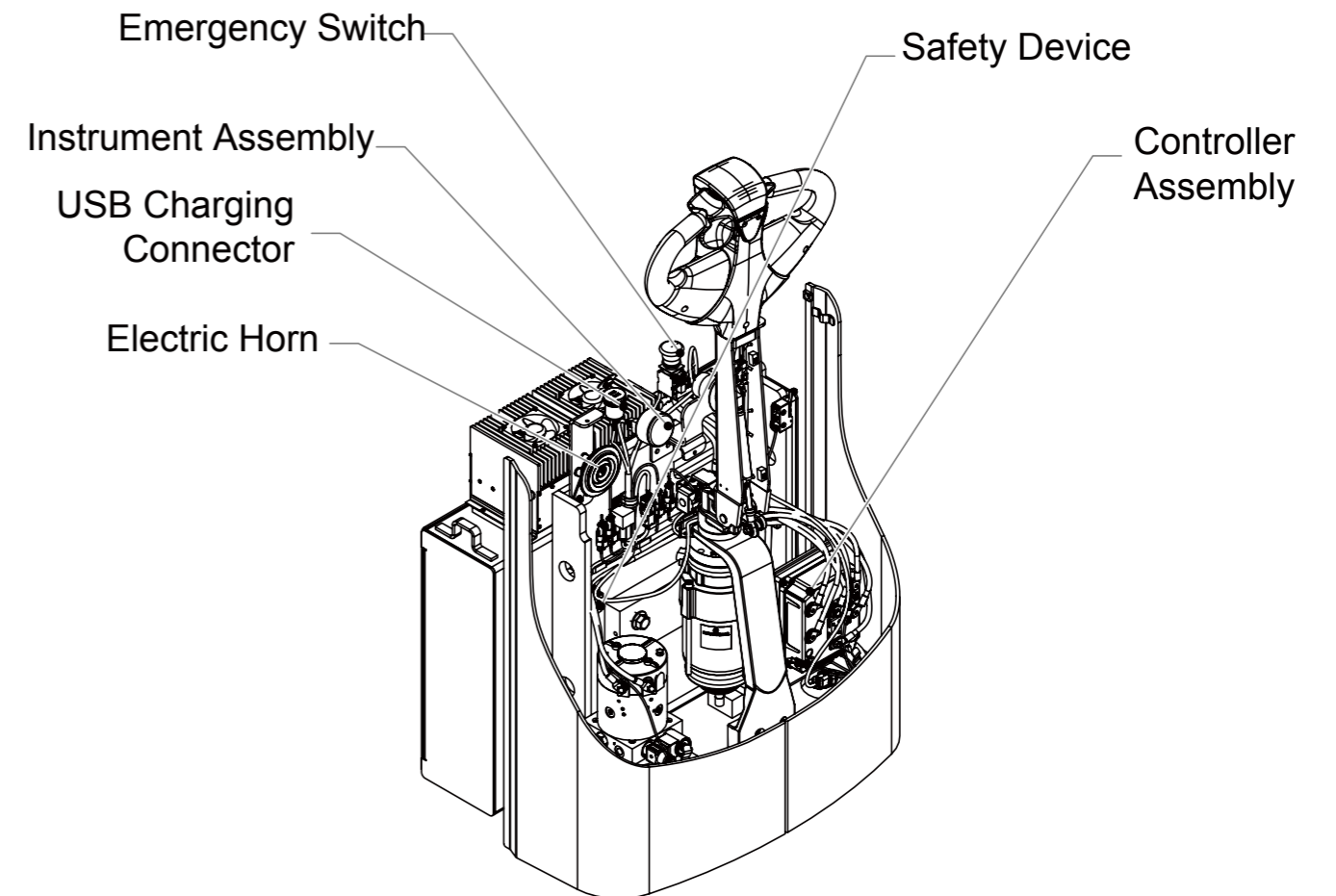
7.1 ELECTRIC CHECK

⚠ Warning

Disconnect power before the electric check. Refer to 5.13 for details.

CHECK CIRCUIT

a) Check whether connection terminals of the electric device are loose. If any, tighten it.

b) Check whether the wiring connection is normal (for example, whether it is burnt).

c) Check whether the connection sheath is loose. If any, tighten it.

CHECK SAFETY DEVICE AND RELAY

Check whether the safety device and relay work normally. If necessary, replace them.
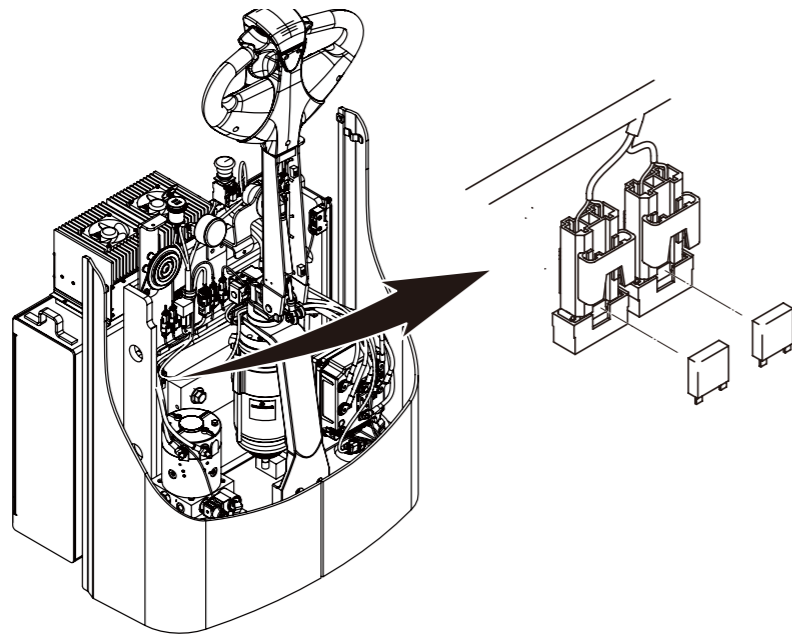
7.2 CHECK THE MAIN CONTROLLER

a) Check whether connection terminals of the main controller are loose. If any, tighten it.

b) Check whether the safety device of the main controller works normally. If necessary, replace it.

c) Check whether the copper bar of the main controller is burnt. if any, replace it.
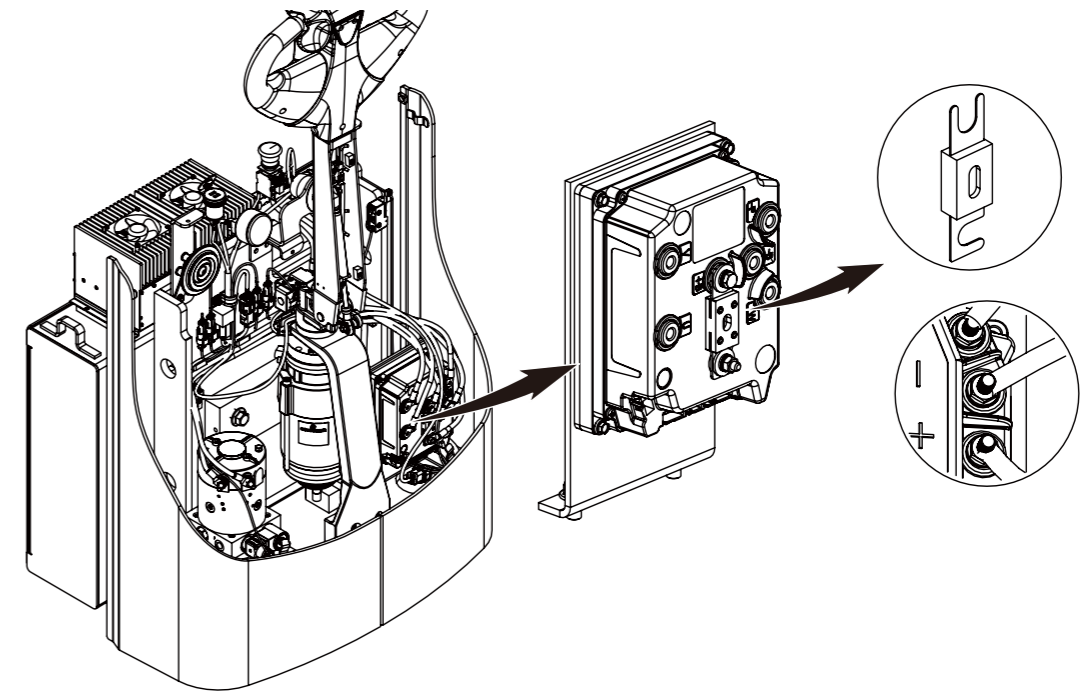
7.3 REMOVE THE MAIN CONTROLLER

1) Before replacing the faulty controller, close the battery power of the forklift and disconnect the output connection of the battery.

2) Unplug the MOLEX connector terminals of G01, G02, G03 and G04 controllers.

3) Remove the B+, B- and -P of the faulty controller as well as the high pressure wire harness of the U, V and W phases.

4) Remove the four screws (shown in the figure) and then remove the faulty controller.

5) Install a new controller on the same position and operate in a reverse order. Install the high voltage wire in the correct position. Do not connect the positive pole or the positive pole line of the lifting motor to U phase.

6) Check whether the forklift works normally.
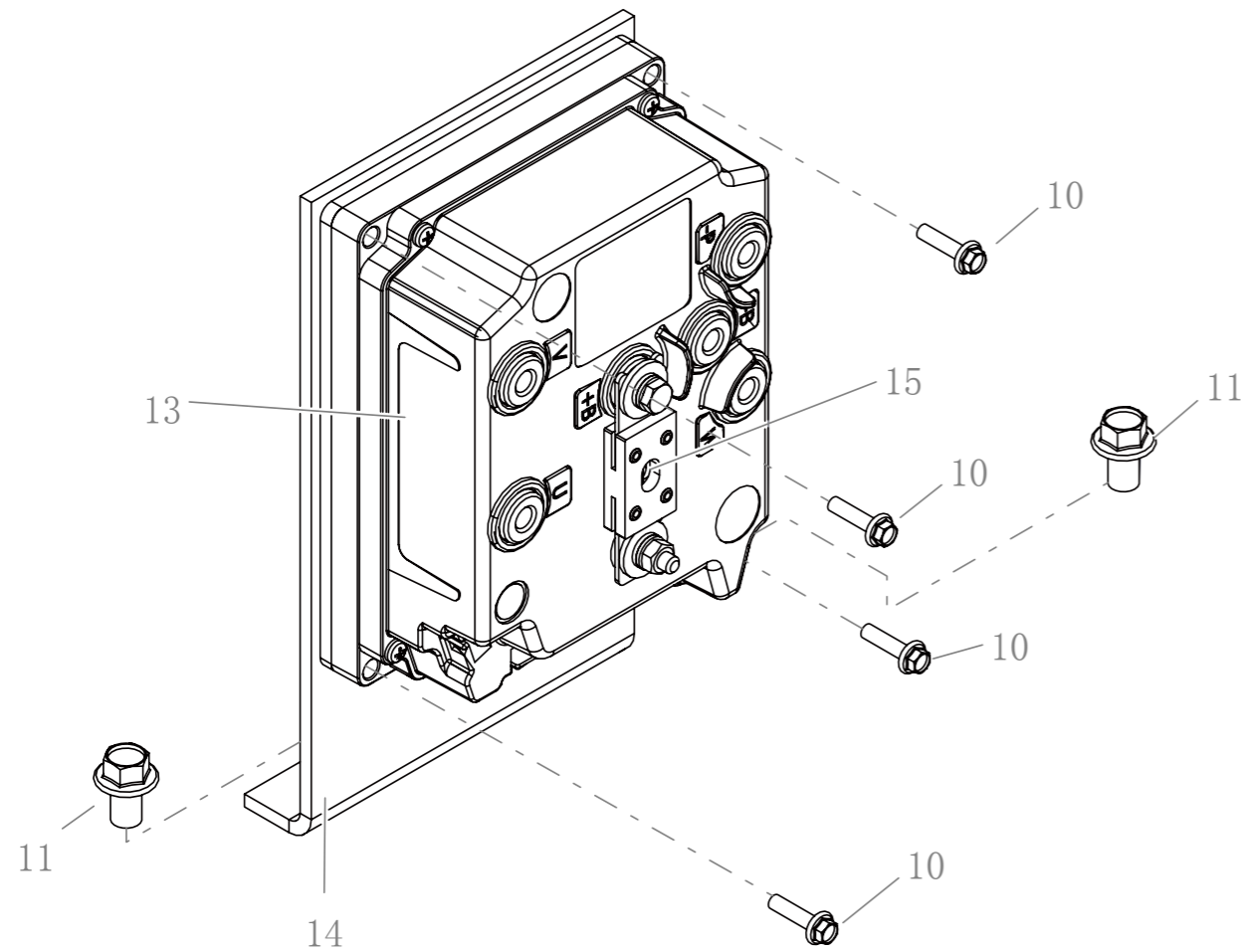
CODE	PART NAME	QTY	OTHER INFORMATION
10	HEXAGON FLANGE BOLT _M5×20	4	
11	HEXAGON FLANGE BOLT _M10×16	2	
13	CONTROLLER ASSEMBLY	1	
14	MOUNTING PLATE OF THE MAIN CONTROLLER	1	
15	SAFETY DEVICE 350A	1	

7.4 REMOVE THE HORN

1) Remove the guard. Refer to 4.1 for details.

2) Unplug the wire connector G14.

3) Remove the bolt for fixing the horn with a 10mm wrench and take out the electric horn.

7.5 REMOVE THE MAIN CONTACTOR

1) Remove the guard. Refer to 4.1 for details.

2) Unplug the wire connector G09.

3) Remove the wire.

4）Remove the set screw with a cross screwdriver and take out the main contactor.

7.6 REMOVE THE LIMIT SWITCH

1）Remove the wire G09A/G09B with a cross screwdriver.

2）Remove the set screw with a cross screwdriver and take out the limit switch.
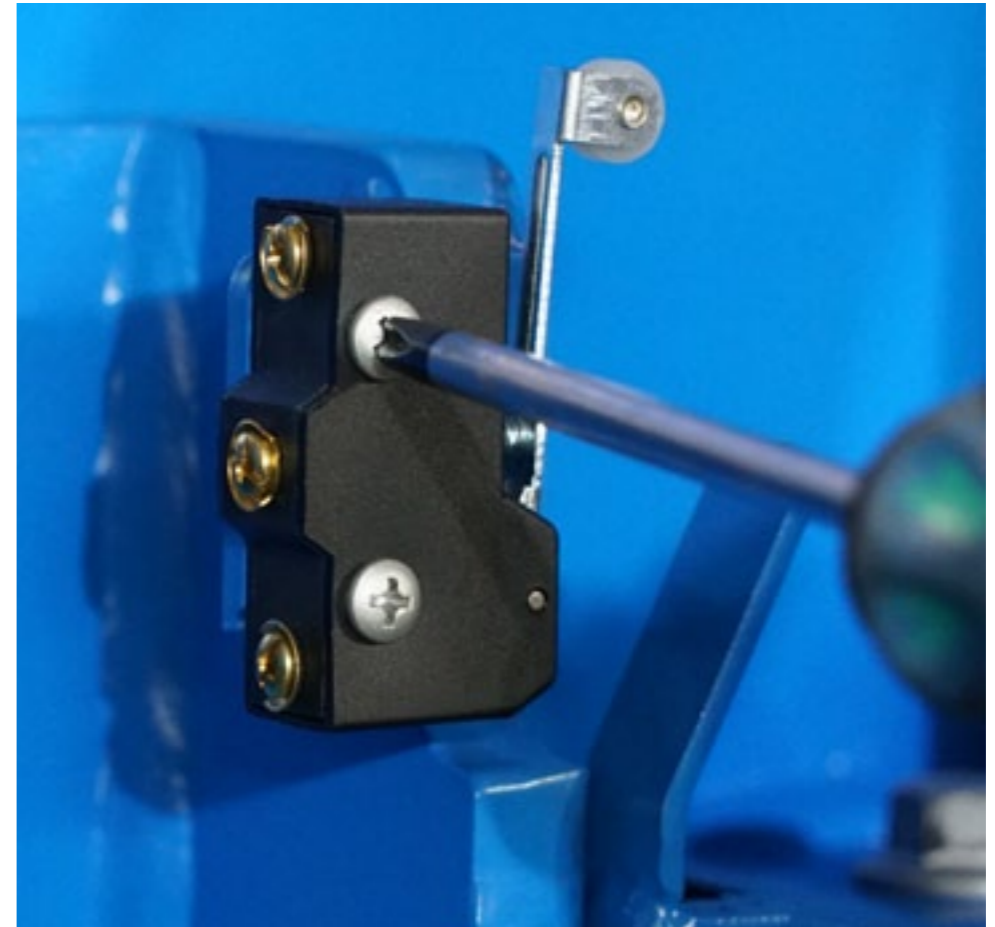
TROUBLE SHOOTING

1) This chapter introduces instructions about the display faults, controller faults, and other electrical fault. You can find and solve the electrical faults in accordance with the display error codes and controller alarm error codes.

2) In the troubleshooting process, a multimeter is necessary. When solving some problems, you have to use a computer and the data cable of Kvaser controller.

3) The chapter is designed for professionally trained technical personnels. These technical personnels should be able to use the multimeter to measure and get relevant information, and find and troubleshoot fault causes according to the attached schematic diagram. They are required to have received specialized training about using BYD softwares.

Please refer to the Electrical Schematic Diagram in the Appendix for troubleshooting process.

Danger	
	Only trained maintenance personnels can perform maintenance operations! The warranty provides proper service of the forklift.Only original spare parts areallowed.

Warning	
⚠	All spare parts of the forklift must be original. Please contact BYD for the original spare parts.
⚠	BYD shall not assume any responsibility for any modification to the forklift and related parts by the customer without BYD's consent.
⚠	When the forklift breaks down, please contact the professional maintenance personnel to do the service.
❗	Only professional technical personnels are allowed to do the collector parameters setting.

Check message shown on the forklift display and follow the instructions provided when starting trouble shooting. Refer to Appendix 10.5 for details.

Before contacting maintenance personnels, please obey the follows:

●Check whether the battery is fully charged (Low battery power and voltage can cause an error message)

●Restart the forklift (Clear some error messages)

8.1 ELECTRICAL MAINTENANCE DIAGNOSIS

1) The alarm code of the display is shown as "Exx" while the alarm error code of the controller is displayed as "number".

2) If there is no fault, it is green background. Instead, it is red background.

8.2 COMPARISON TABLE OF THE DISPLAY ERROR CODES AND CONTROLLER ERROR CODES

ID	PARAMETER (CONTROLLER) DATA DOMAIN 3	FAULT CODES (DISPLAY)	DEFINITION
0x288	66	02A66	BATTERY LOW
0x288	247	02A00	DATA ACQUISITION
0x288	249	02A00	CHECK UP NEEDED
0x288	8	02A08	WATCHDOG
0x288	221	02A09	FLASH CHECKSUM
0x288	231	02A08	WATCHDOG#2
0x288	212	02A10	WRONG RAM
0x288	209	02A11	STALL ROTOR
0x288	17	02A17	LOGIC FAILURE #3
0x288	244	02A27	PHASE KO
0x288	28	02A28	PUMP VMN LOW
0x288	29	02A29	PUMP VMN HIGH
0x288	31	02A31	VMN HIGH
0x288	203	02A32	PUMP VMN NOT OK
0x288	254	02A40	AUX DRIV.SHRT
0x288	251	02A41	WRONG BATTERY
0x288	246	02A42	AUX DRIV.OPEN
0x288	241	02A49	LIFT + LOWER
0x288	228	02A51	TILLER OPEN
0x288	52	02A52	PUMP I=0 EVER
0x288	53	02A53	STBY I HIGH
0x288	252	02A58	WRONG ZERO
0x288	19	02A54	LOGIC FAILURE #1
0x288	18	02A55	LOGIC FAILURE #2
0x288	217	02A56	PUMP I NO ZERO

ID	PARAMETER (CONTROLLER) DATA DOMAIN 3	FAULT CODES (DISPLAY)	DEFINITION
0x288	250	02A73	WRONG RAM MEM
0x288	250	02A61	THERMIC SENS. KO
0x288	62	02A62	TH. PROTECTION
0x288	204	02A63	WAIT MOT.P STILL
0x288	238	02A64	TILLER ERROR
0x288	65	02A65	MOTOR TEMPERAT
0x288	218	02A69	SENS MOT TEMP KO
0x288	248	02A67	NO CAN MSG
0x288	222	02A59	SMARTDIVER KO
0x288	224	02A68	WAITING FOR NODE
0x288	13	02A71	EEPROM KO
0x288	212	02A71	WRONG REM MEN
0x288	30	02A72	VMN LOW
0x288	207	02A72	INIT VMN LOW
0x288	74	02A03	DRIVER SHORTED
0x288	213	02A74	AUX BATT. SHORT
0x288	234	02A14	DRV. SHOR. EV
0x288	37	02A75	CONTACTOR CLOSED
0x288	75	02A75	CONTACTOR DRIVER
0x288	232	02A75	CONT. DRV. EV
0x288	220	02A76	KEY OFF SHORTED
0x288	223	02A02	COIL SHOR. MC-EB
0x288	235	02A04	COIL SHOR. EV
0x288	38	02A77	CONTACTOR OPEN
0x288	238	02A05	TILLER ERROR

ID	PARAMETER (CONTROLLER) DATA DOMAIN 3	FAULT CODES (DISPLAY)	DEFINITION
0x288	78	02A78	VACC NOT OK
0x288	79	02A79	INCORRECT START
0x288	242	02A79	PUMP INC START
0x288	80	02A80	FORW + BACK
0x288	82	02A82	ENCODER ERROR
0x288	205	02A84	CAN BUS KO BMS
0x288	226	02A85	VACC OUT RANGE
0x288	229	02A86	POS. EB. SHORTED
0x288	233	02A88	POWER MOS SHORT
0x288	236	02A92	CURRENT GAIN
0x288	237	02A96	ANALOG INPUT
0x288	247	02A98	PEV NOT OK
0x288	253	02A99	SLIP_PROFILE
0x288	239	02A12	CONTROLLER MISM
0x288	13	02A13	PARAM RESTORE
0x288	30	02A30	INIT VMN HIGH
0x288	203	02A32	PUMP VMN NOT OK
0x288	240	02A48	EVP DRIVER OPEN
0x288	215	02A57	EVP DRIV. SHORT

8.3 PROGRAM AND SOFTWARE

1) This section will introduce how to update the controller program (EPF file). The program is designed for the controller of the forklift. Different types of programs can match with corresponding forklifts so as to complete the control for the forklift.

2) This section provides some examples of burning ways of the controller softwares ZpCanConsole, ZpCanFlasher. Only trained qualified technical personnels can operate the sophisticated burning way.

Softwares: ZpCanConsole and ZpCanFlasher
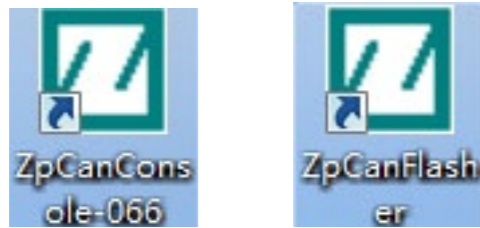
Tools:

1. IXXAT, as shown in Fig.1.1 .1

Electric forklift accessories _CAN wire _AT0001

2. Kvaser Leaf Light, as shown in Fig.1.1.2

Electric forklift accessories _CAN wire _KvaserLeafLightHS-GI

Fig.1.1.1   Fig.1.1.2

Steps:

1. Open the software "ZpCanFlasher", as shown in Fig.1.1.3.
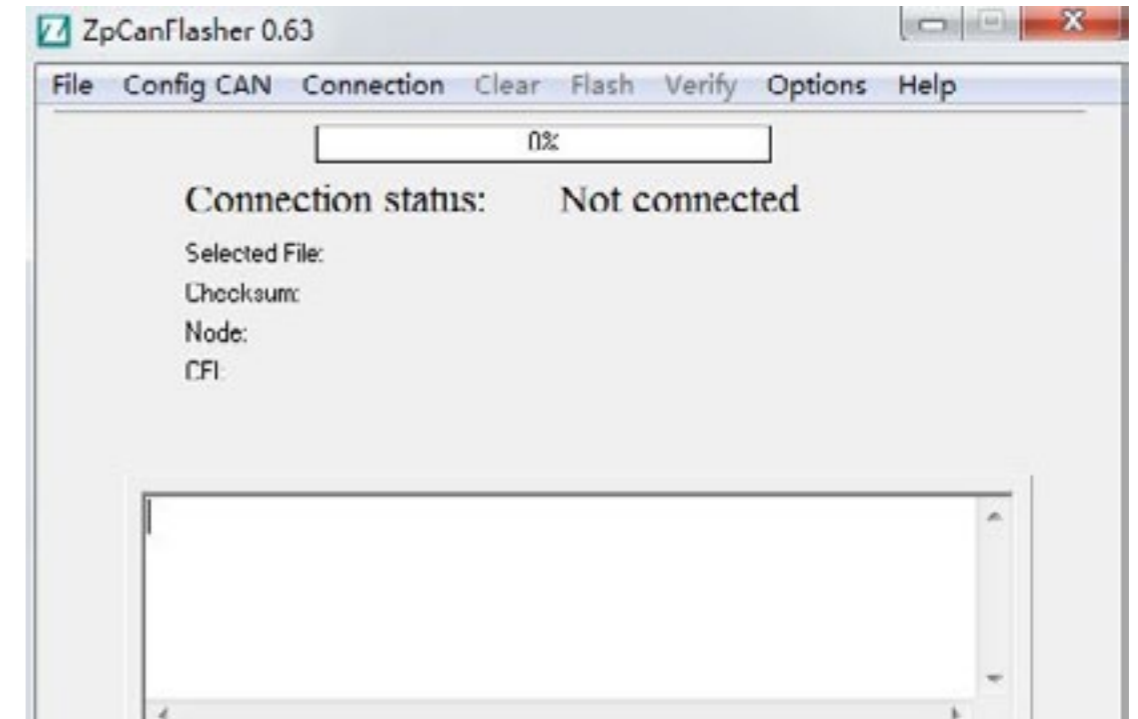
Fig.1.1.3

2. Click "File" → "Load ConfigFlash Ctrl+C", as shown in Fig. 1.1.4.
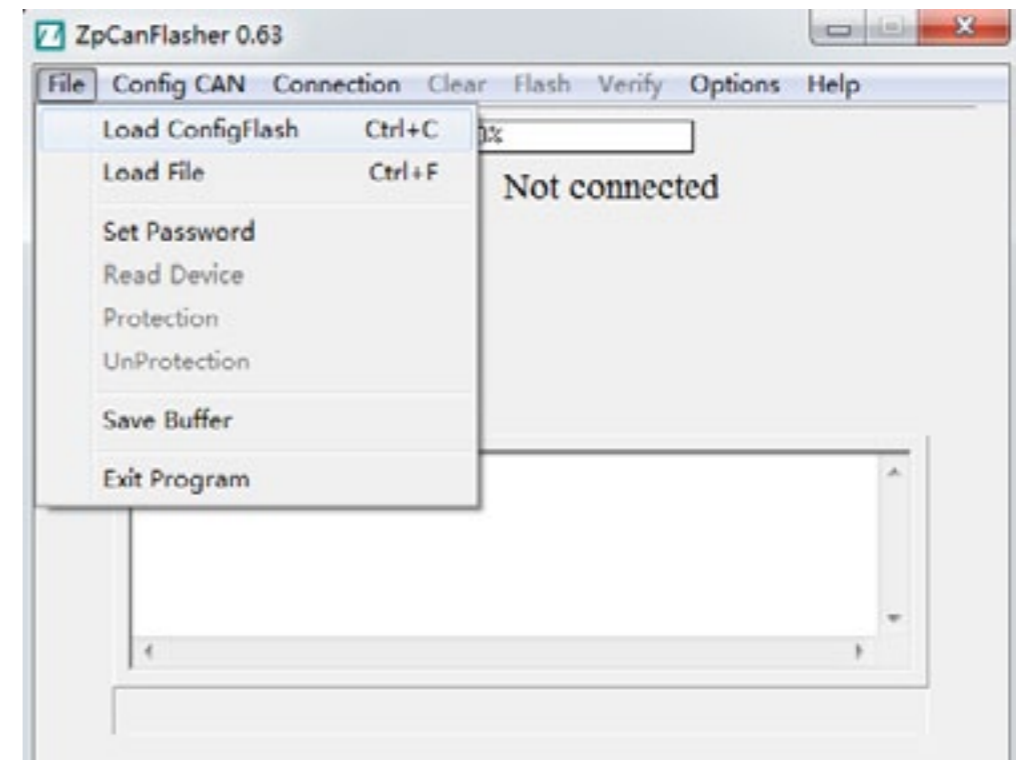
Fig.1.1.4

3. Select the File Format of cfi

The cfi file required for the main controller model COMBIACX is "adx_zp002（2560）.cfi". The default path of the file is "my computer C dish" → "Zpconfig" → "cfi", as shown in Fig. 1.1.5.
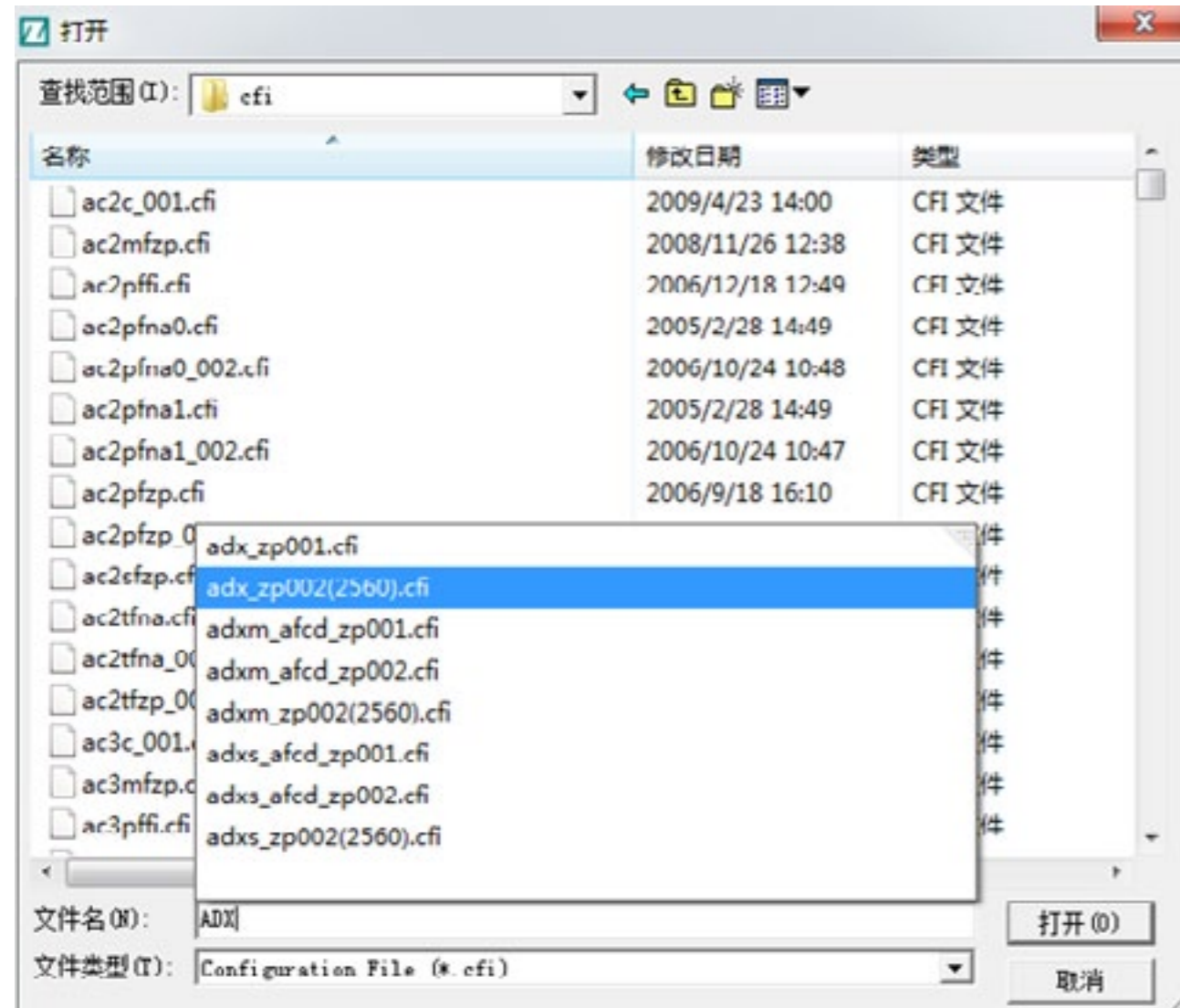
Fig.1.1.5

The controller and its relevant "cif" file

Type of controller	.cfi	Note
COMBIACX	adx_zp002(2560).cfi	
EPS-AC0	epsm003.cfi	

4.Click Config CAN → Init CAN device, as shown in Fig. 1.1.6.

Fig.1.1.6

Special Notes:
If you select IXXAT CAN box, see Fig.1.1.7. If you select CAN box of Kvaser Leaf Light, see Fig. 1.1.8. Select corresponding device and Baud rate 125Kbps, click OK, and enter "next step".

Fig.1.1.7
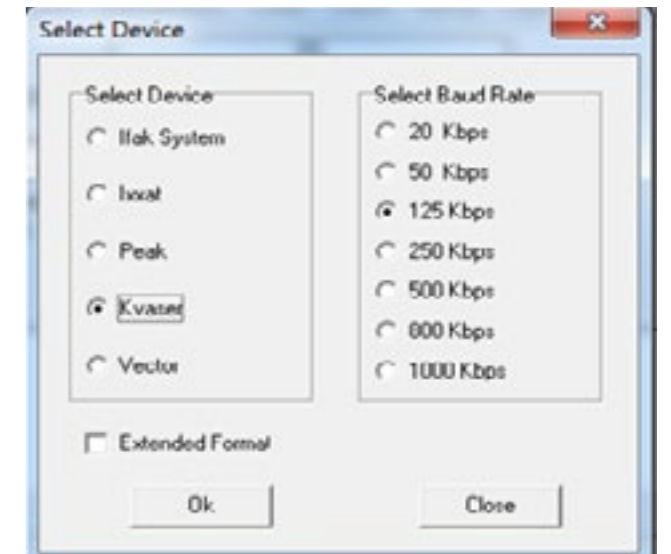
Fig.1.1.8

Click OK, as shown in Fig.1.1.9 and Fig.1.1.10.
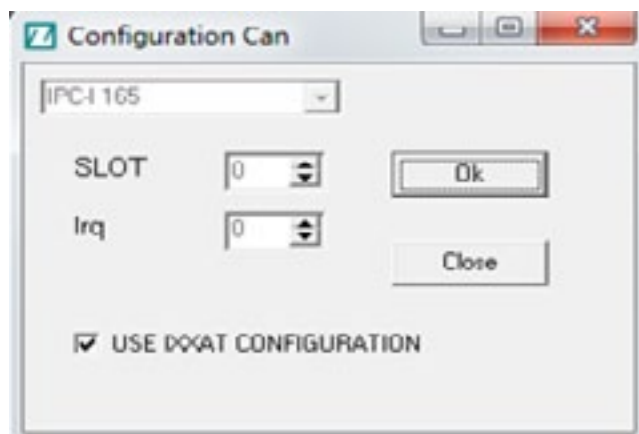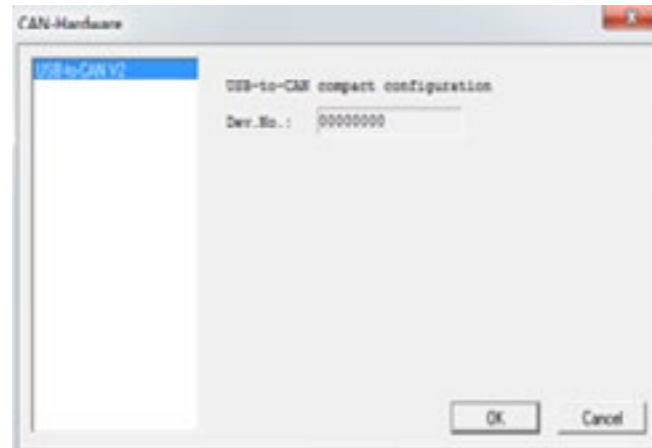
Fig.1.1.9　　　　　　　　　　　　Fig.1.1.10

5. Select the controller software and click "File" → "Load File", as shown in Fig.1.1.11.
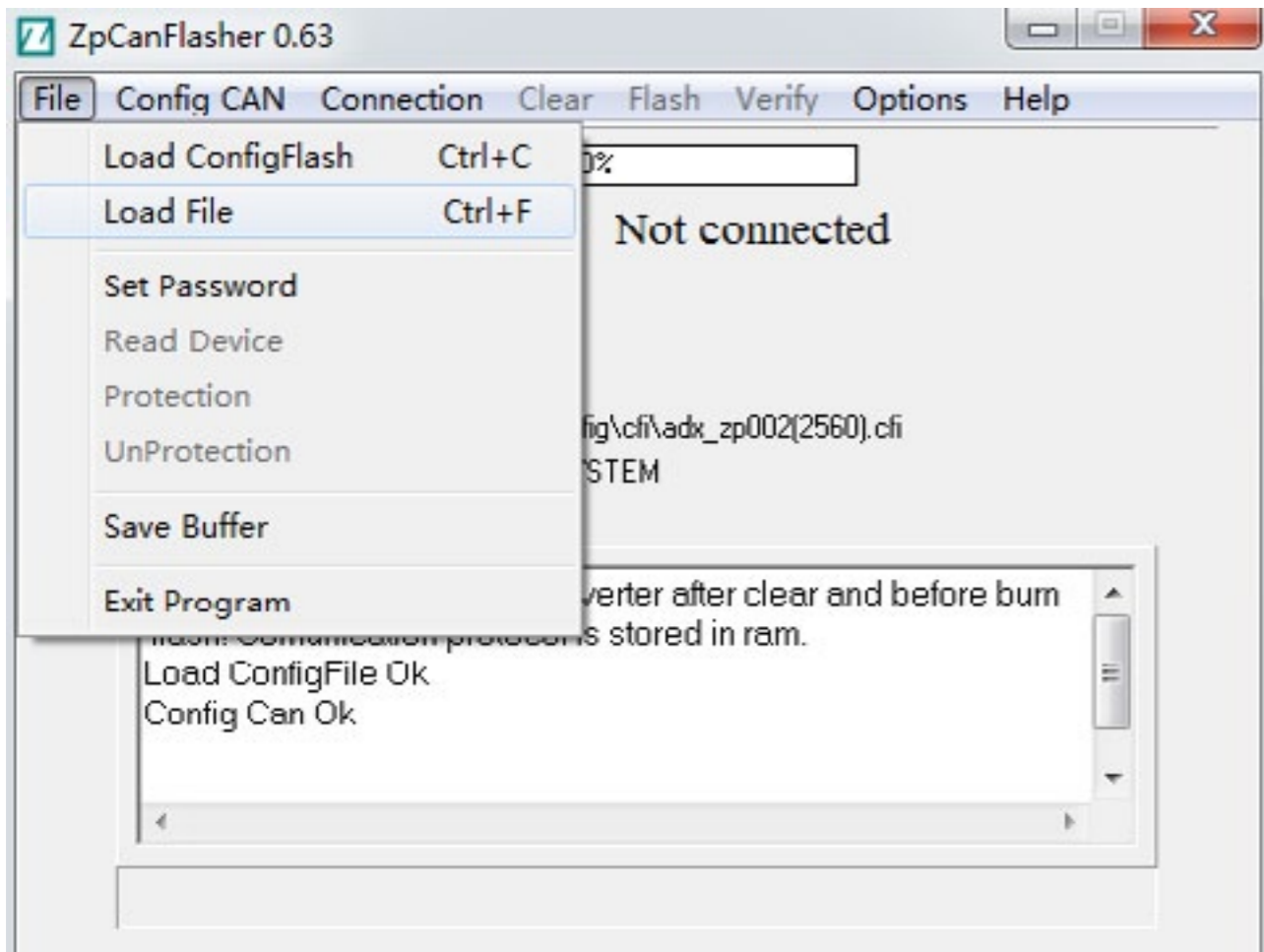
Fig.1.1.11

Open it and find the software required by the controller in the corresponding folder, as shown in Fig.1.1.12.
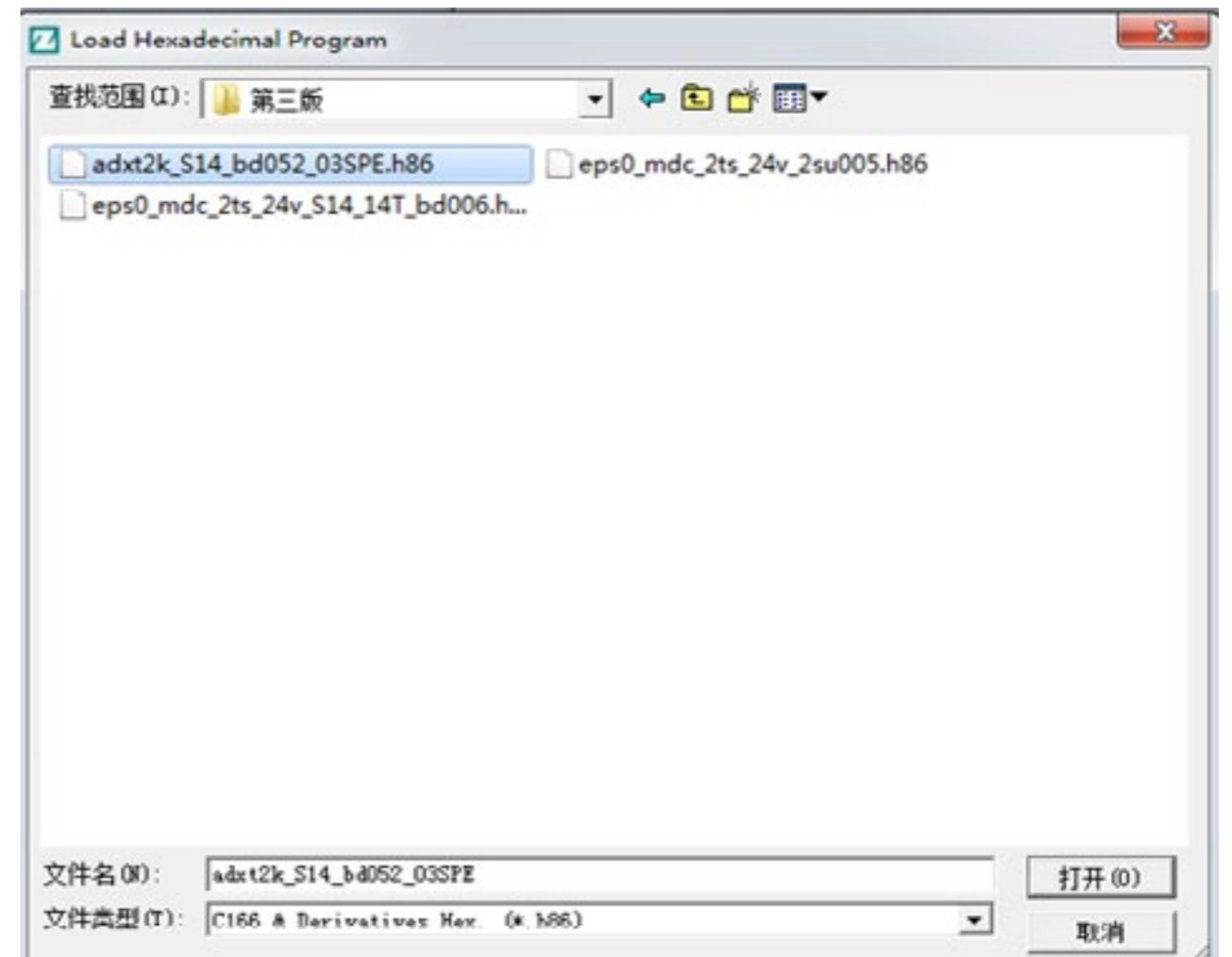
Fig.1.1.12

6. Connect the Controller

Turn on the ignition switch first and run the controller.

Click"connection"→"start".

When "CONNECTED" appears, it shows that the controller has been connected normally and that you can start to write software, as shown in Fig.1.1.13.
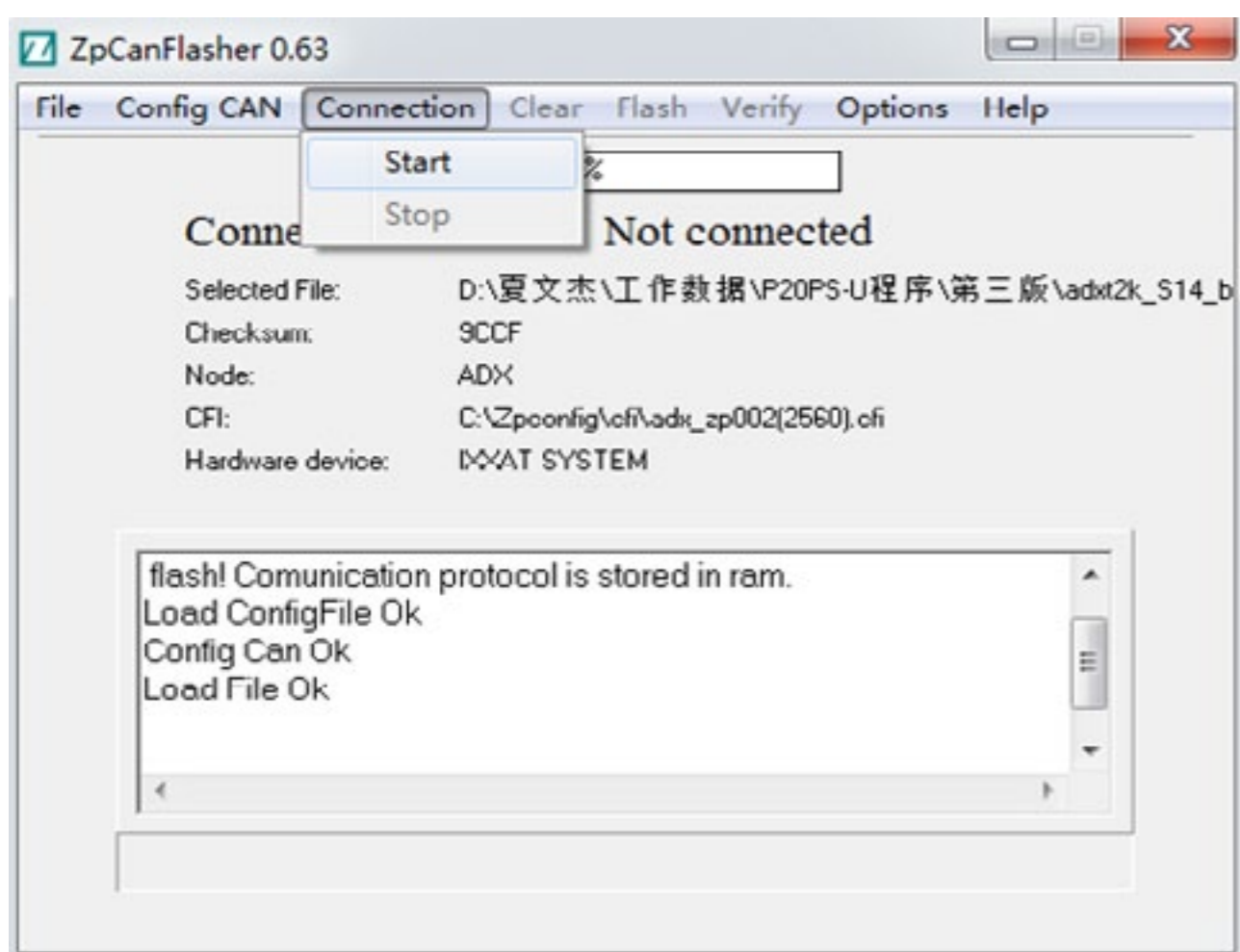
Fig.1.1.13

7. Burning Software

Click "Clear" first and then the "Erase Ok" will appear in the dialog. At this time, the

software has been erased, as shown in Fig.1.1.14.

Fig.1.1.14

8.Then click "Flash" and wait until the burning software finishes.

Select "YES" and start burning software.

9.When the software is written successfully, "Write Flash Ok" will appear in the dialogue, as shown in Fig.1.1.16 and Fig.1.1.15.
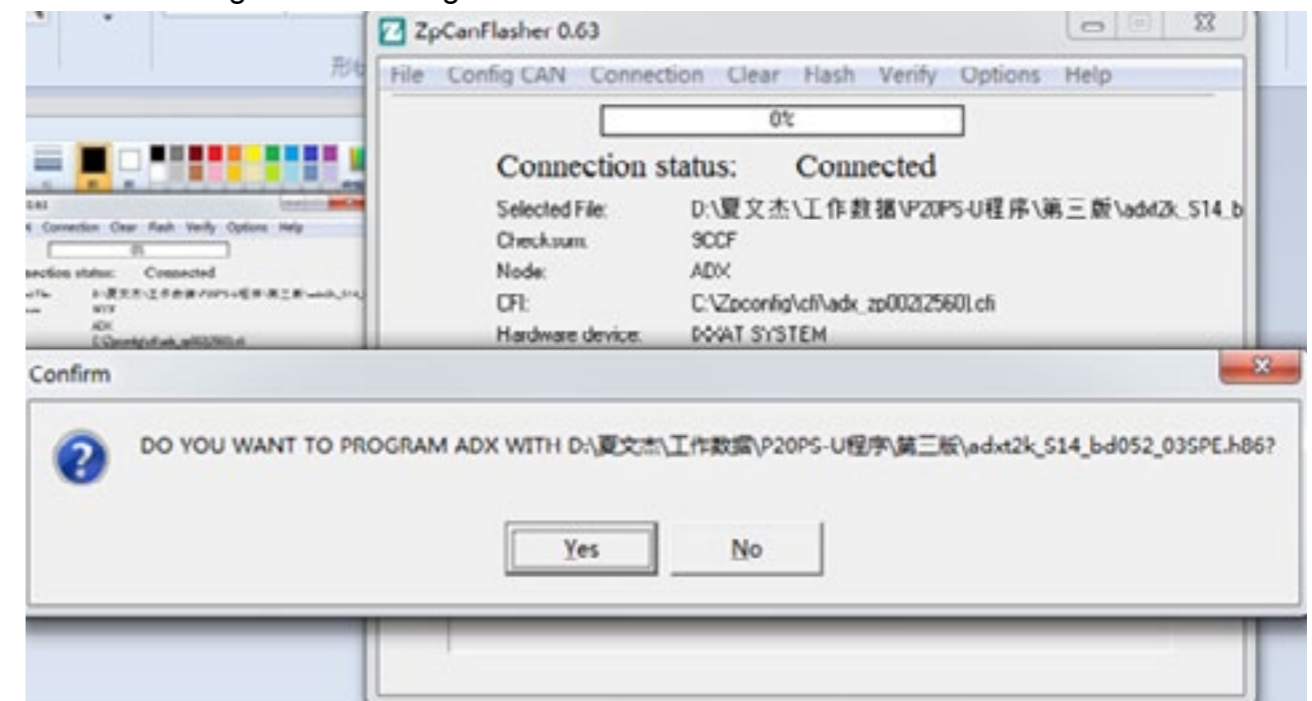
Fig.1.1.15

9. When the software is written successfully, "Write Flash Ok" will appear in the dialogue, as shown in Fig.1.1.16.
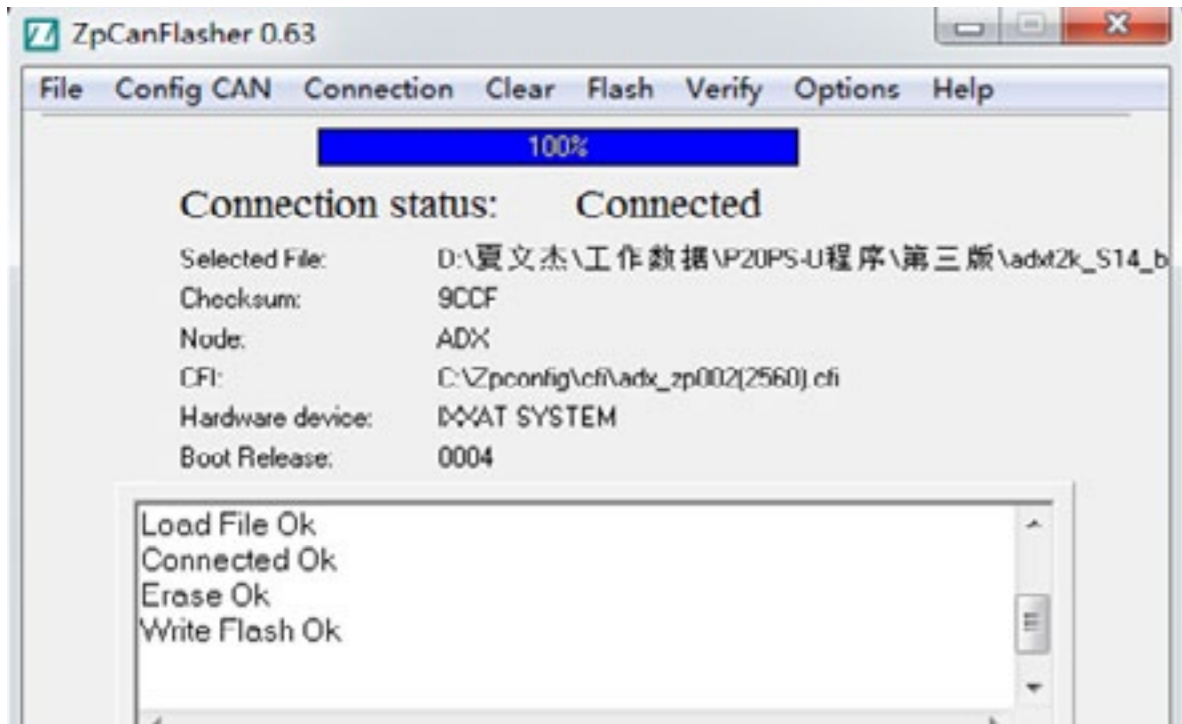
Fig.1.1.16

10. Finally click "Connection" → "stop", as shown in Fig.1.1.17.
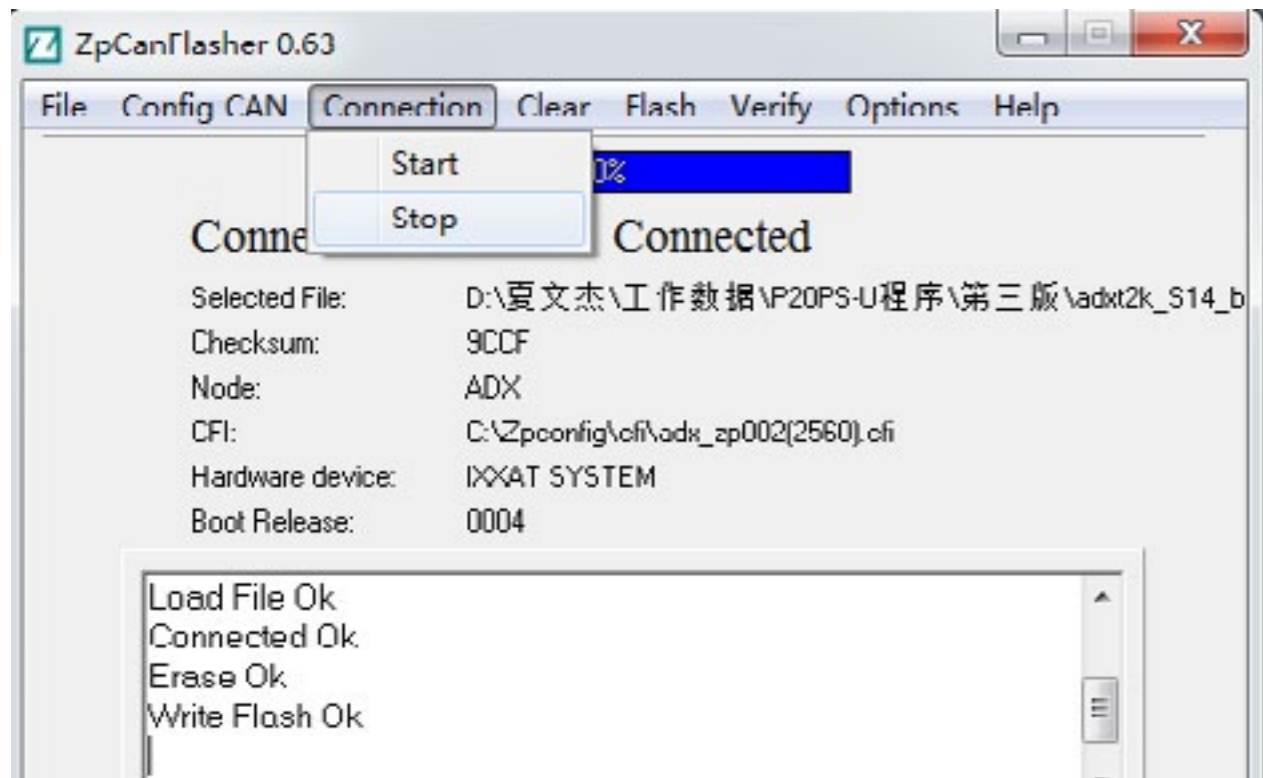
Fig.1.1.17

1.2 Remove Parameters

1. Open "ZpCanConsole", select the icon, and connect CAN box, as shown in Fig.1.2.1.

Fig.1.2.1

Or select the CONNECTION STATUS on the main menu, as shown in Fig.1.2.2.
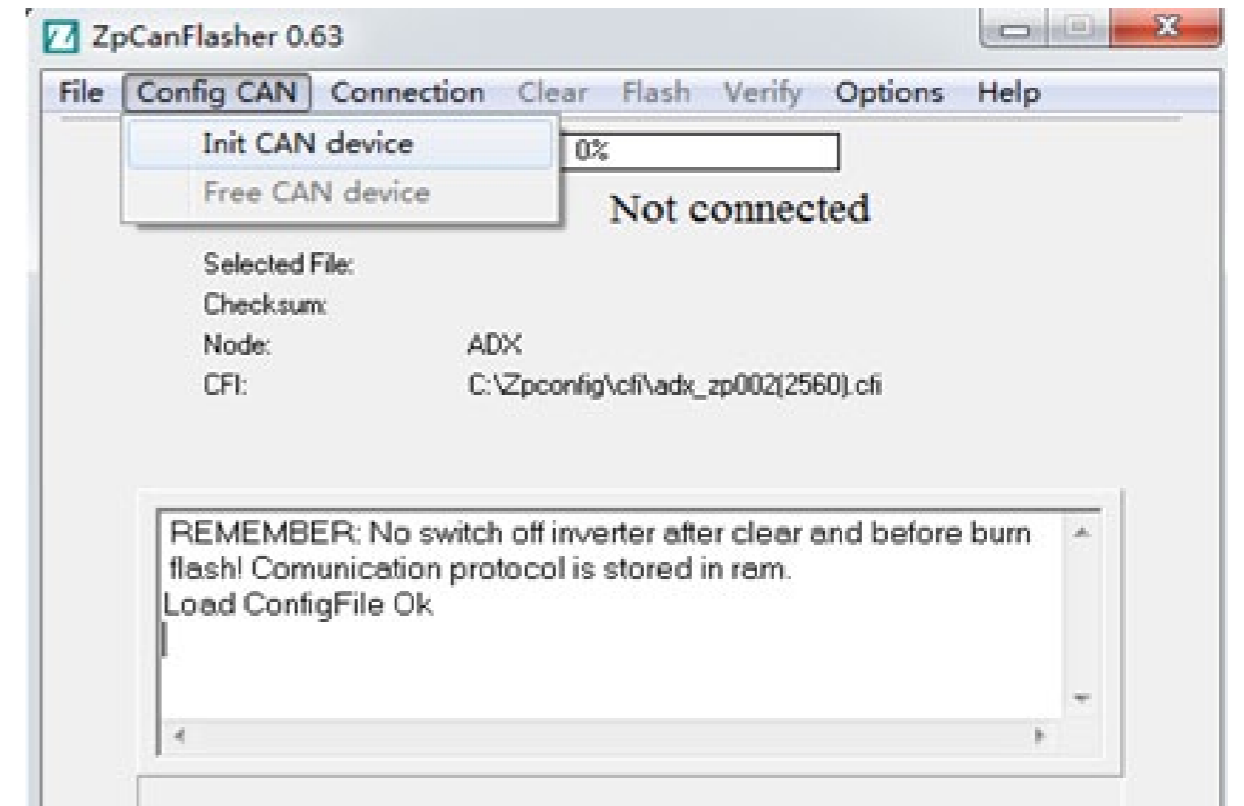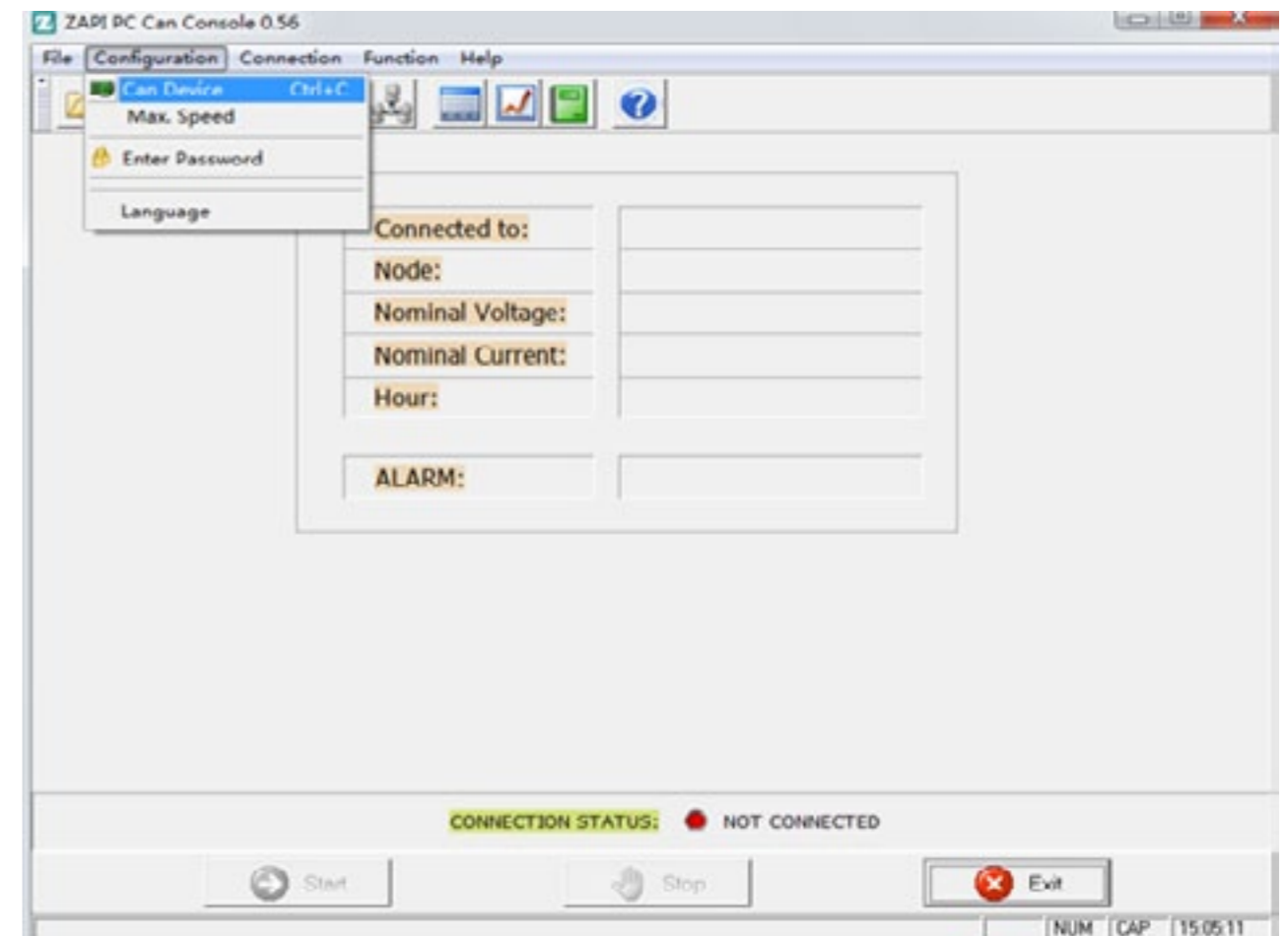

Fig.1.2.2

If you select IXXAT CAN box, see Fig.1.2.3. If you select CAN box of Kvaser Leaf Light, see Fig.1.2.4.

Select corresponding device and Baud rate 125Kbps, click OK, and enter "next step".
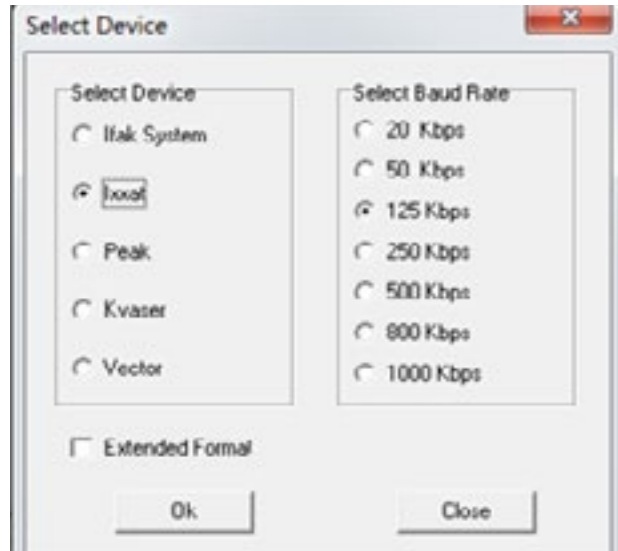
Fig.1.2.3
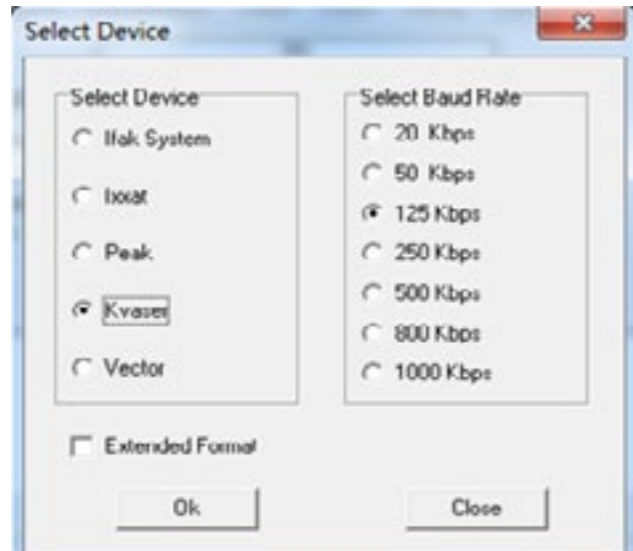
Fig.1.2.4

Click OK respectively, as shown in Fig.1.2.5 and Fig.1.2.6.
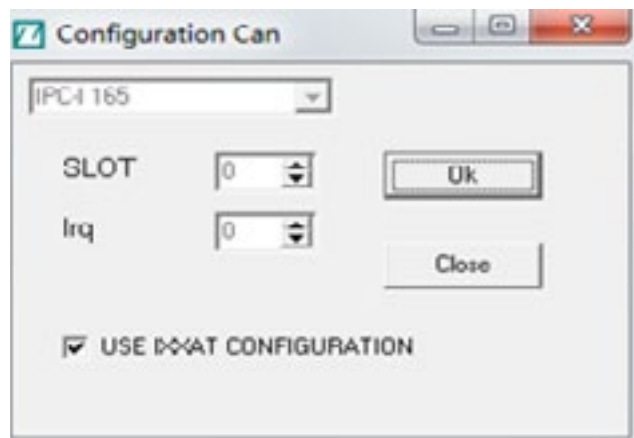
Fig.1.2.5
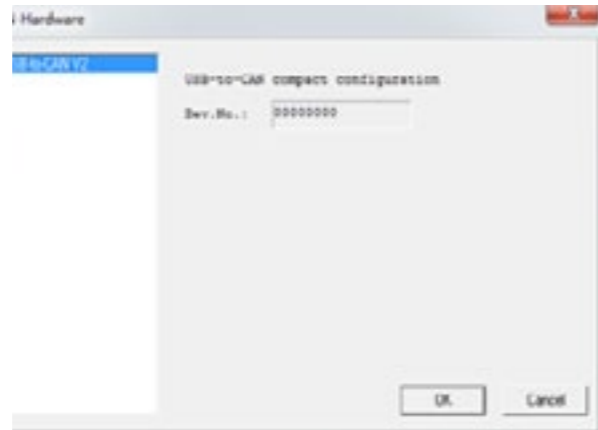
Fig.1.2.6

After successful connection, the main menu connection icon and site selection icon will light up,as shown in Fig.1.2.7.
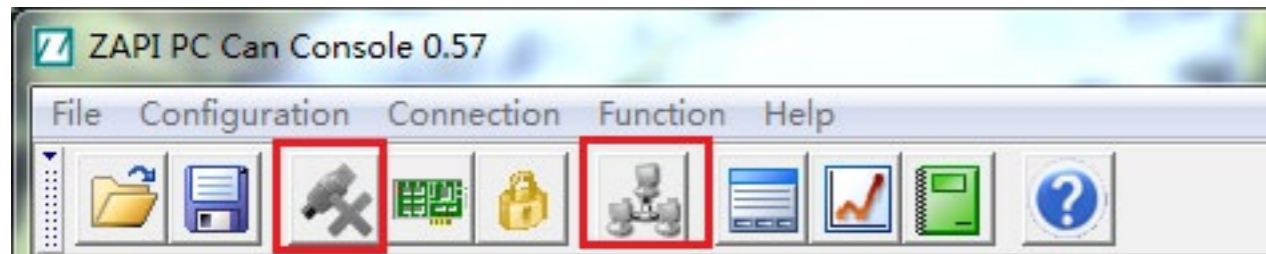
Fig.1.2.7

Lightening icons show successful connection, as shown in Fig.1.2.8.
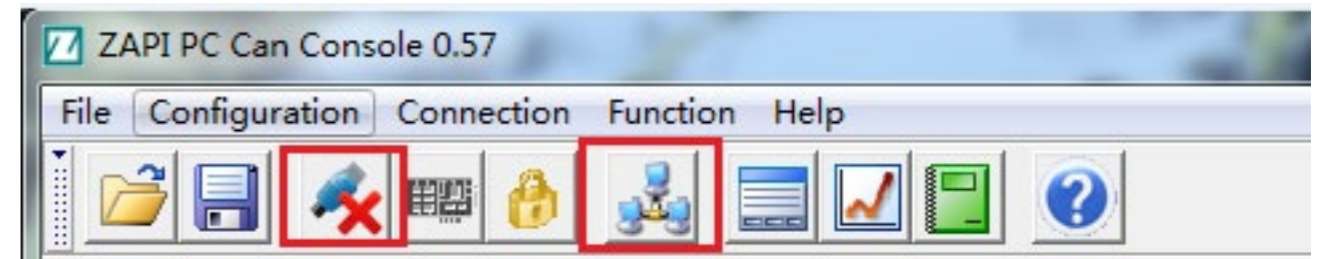
Fig.1.2.8

Enter password of the upper computer: ZAPI, shown in Fig.1.2.11.
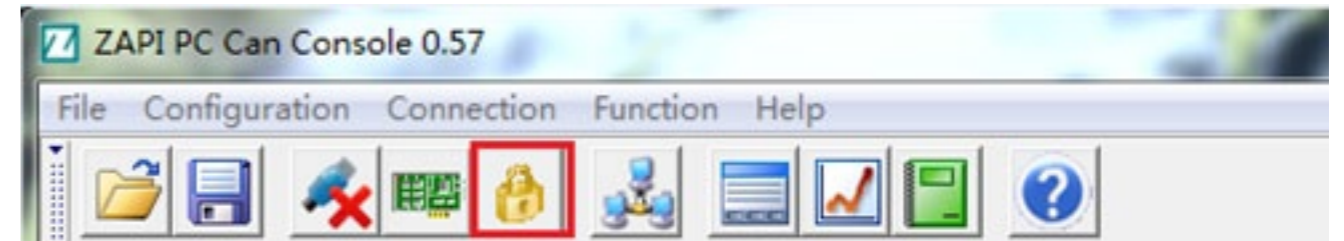
Fig.1.2.9

Select shortcut icon, as shown in Fig.1.2.9. Or select options of the main menu, as shown in Fig.1.2.10.
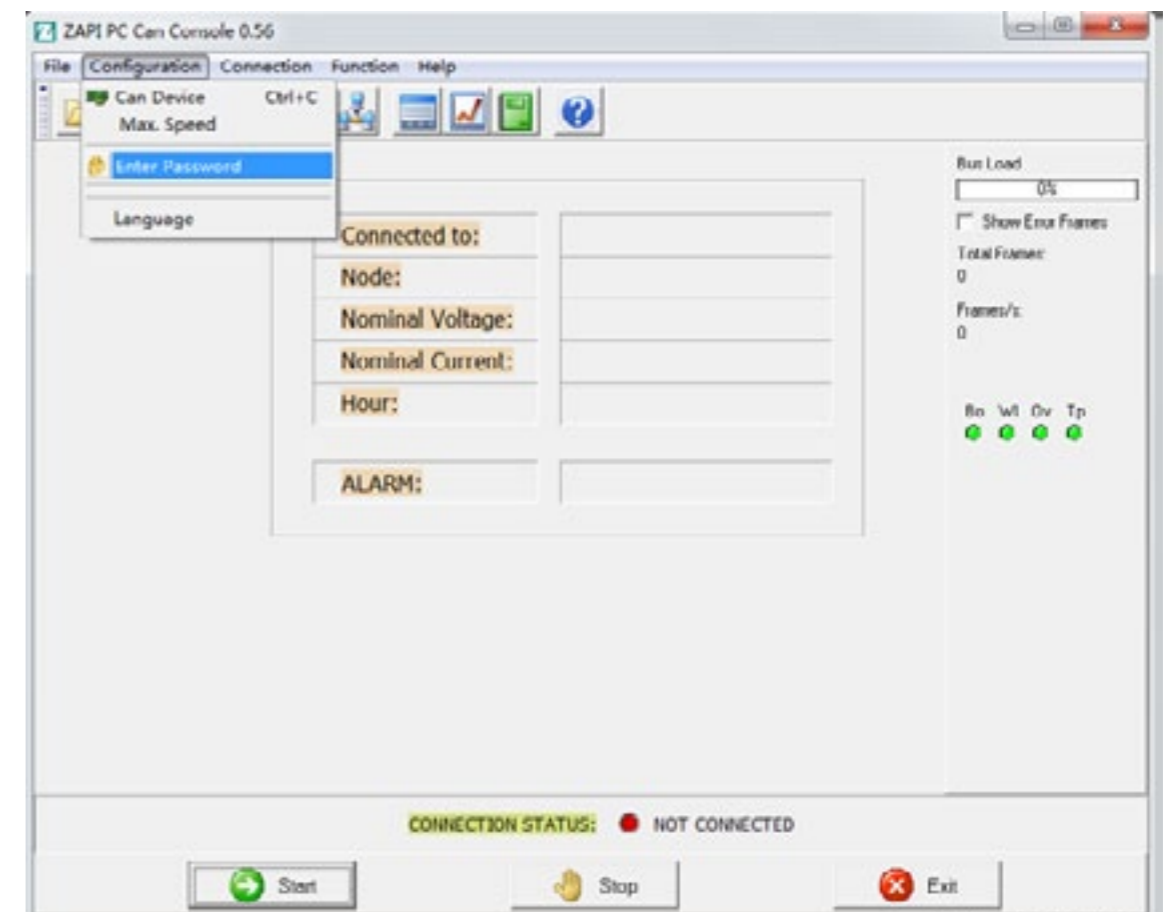
Fig.1.2.10

Enter password of the upper computer: ZAPI, shown in Fig.1.2.11.
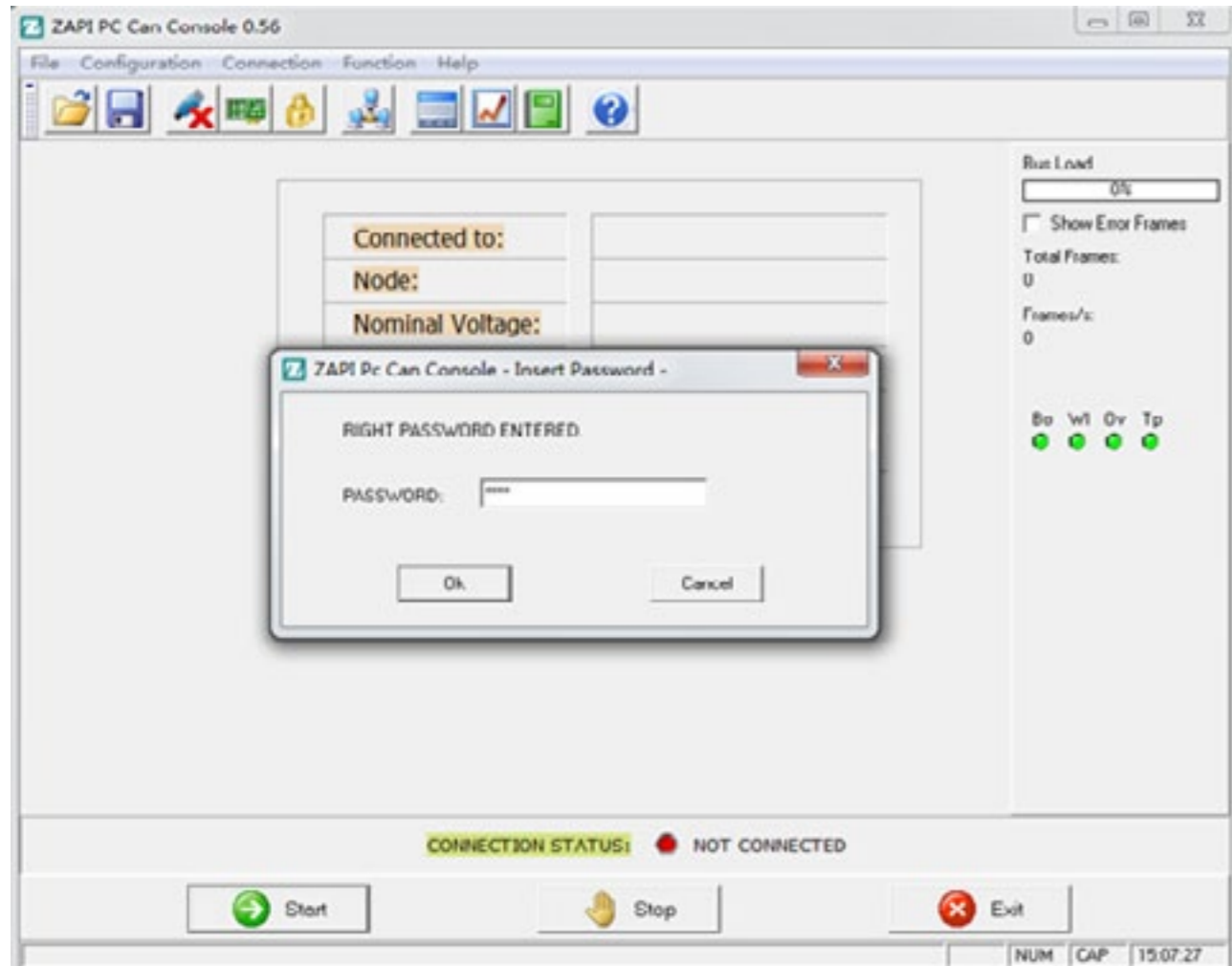
Fig.1.2.11

Select the site: enter by clicking the shortcut icon. Station 2 is the drive controller (main controller), and station 6 is the steering controller, as shown in figure 1.2.12.
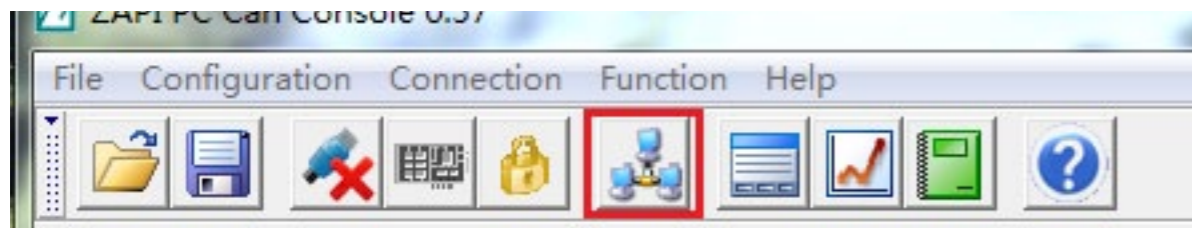
Fig.1.2.12

Or enter by clicking the main menu, as shown in Fig.1.2.13.
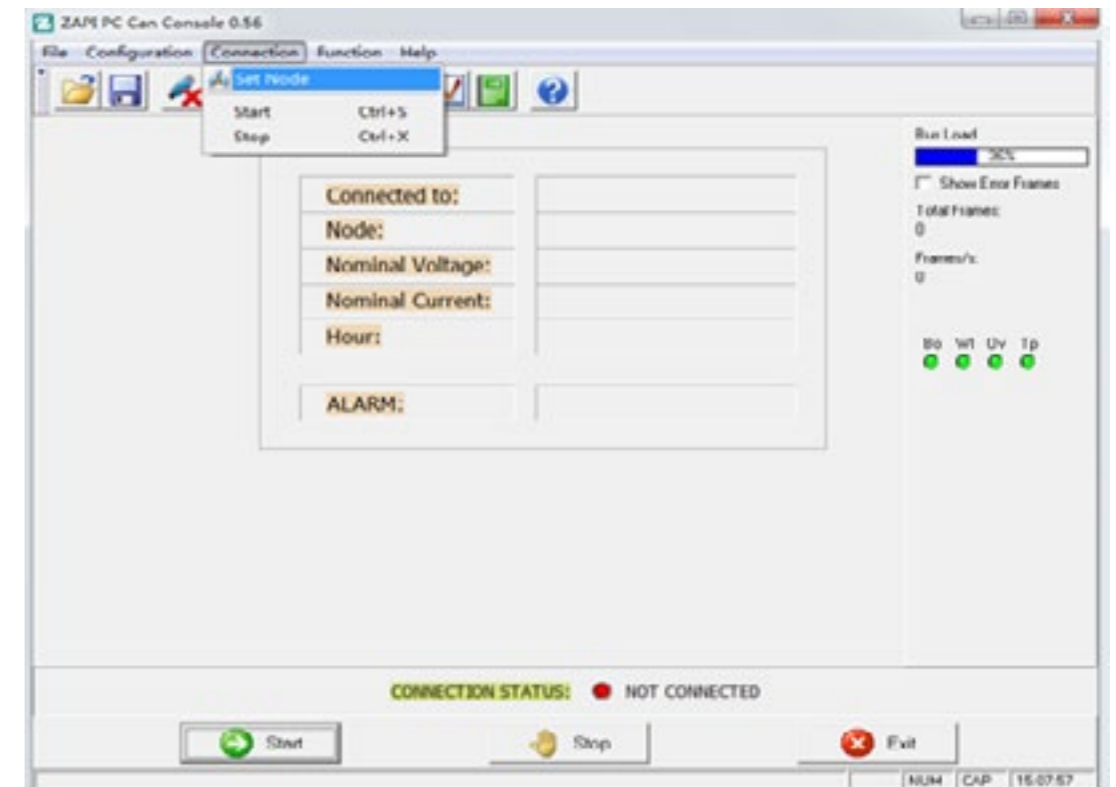
Fig.1.2.13

Select the corresponding site, as shown in Fig.1.2.14.
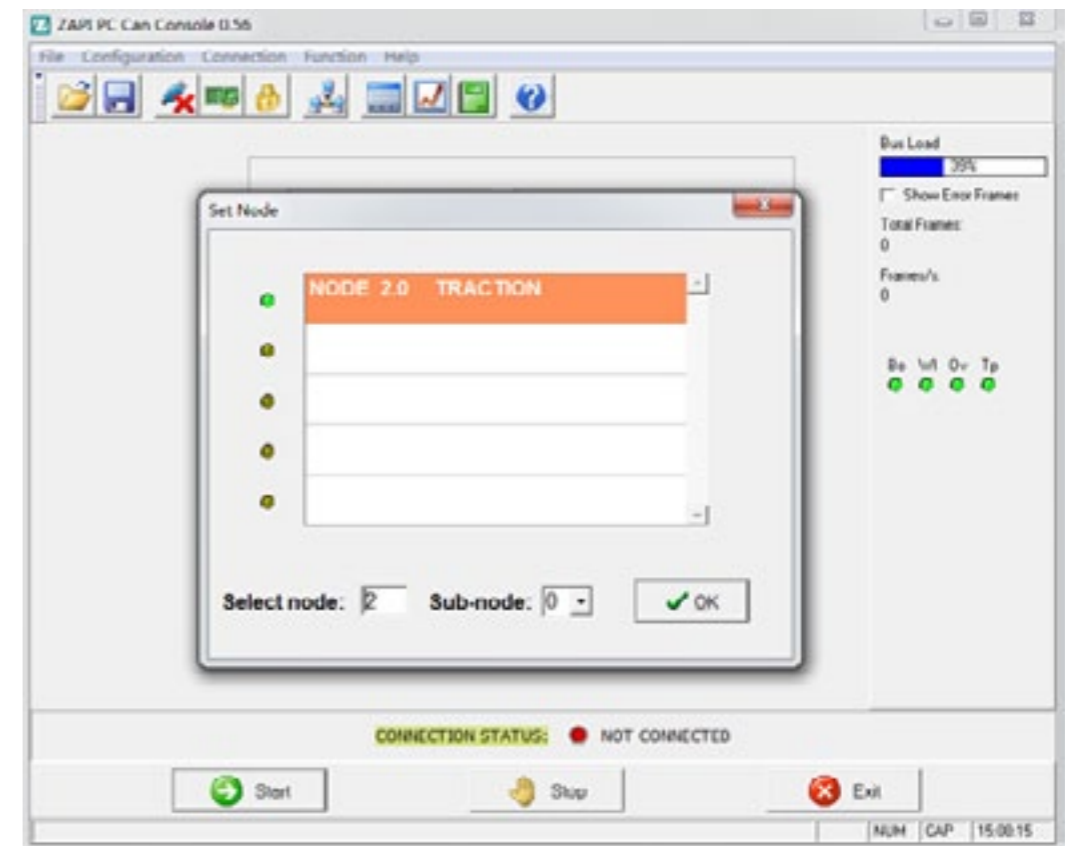
Fig.1.2.14

After entering the site, the version information thereof will be displayed, as shown in Fig.1.2.15.
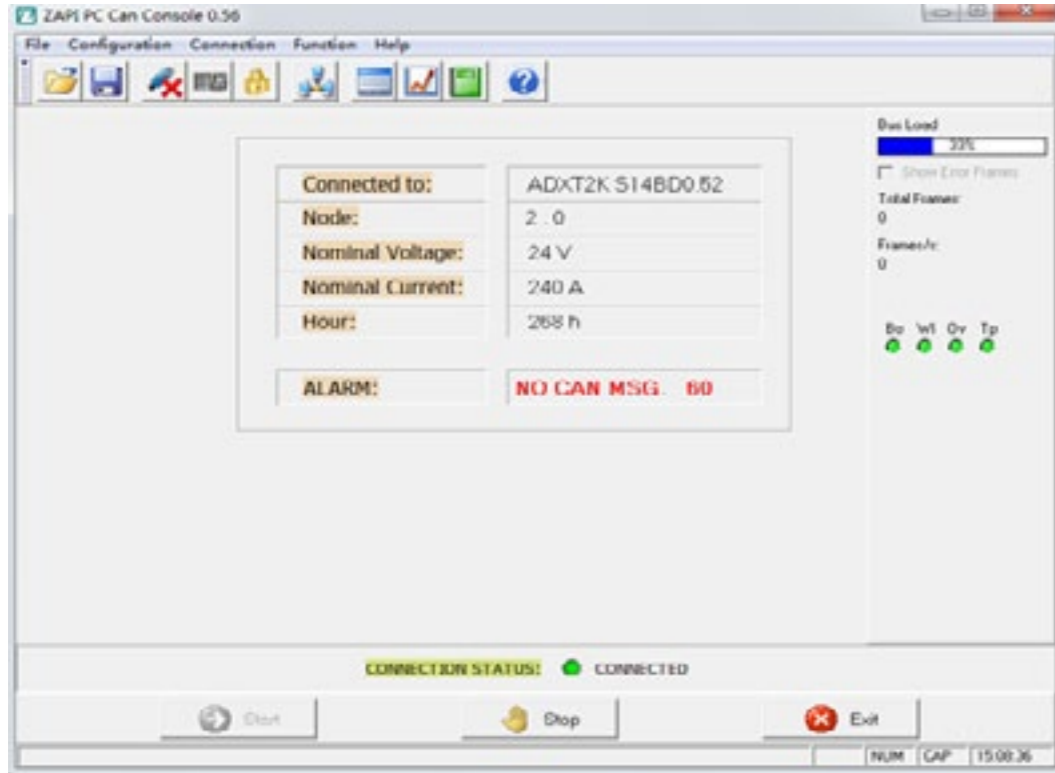
Fig.1.2.15

Then click "Function" → "EEPROM Function", as shown in Fig.1.2.16.6.
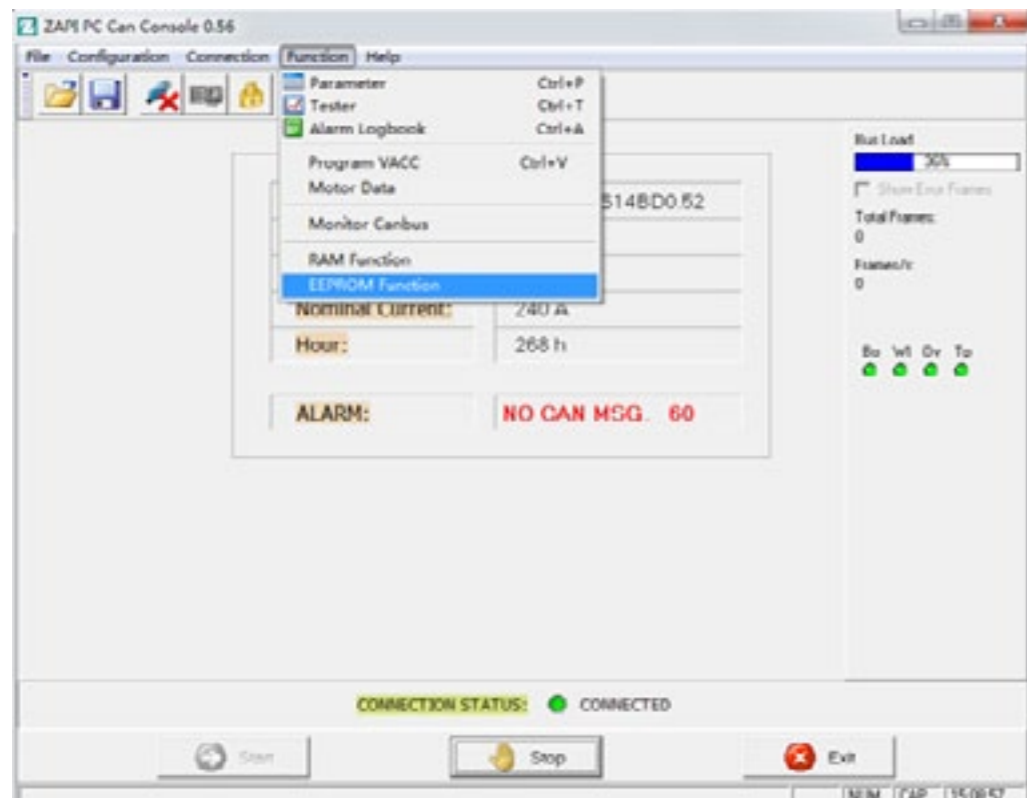
Fig.1.2.16

Click the button "Clear Eeprom", as shown in Fig.1.2.17.
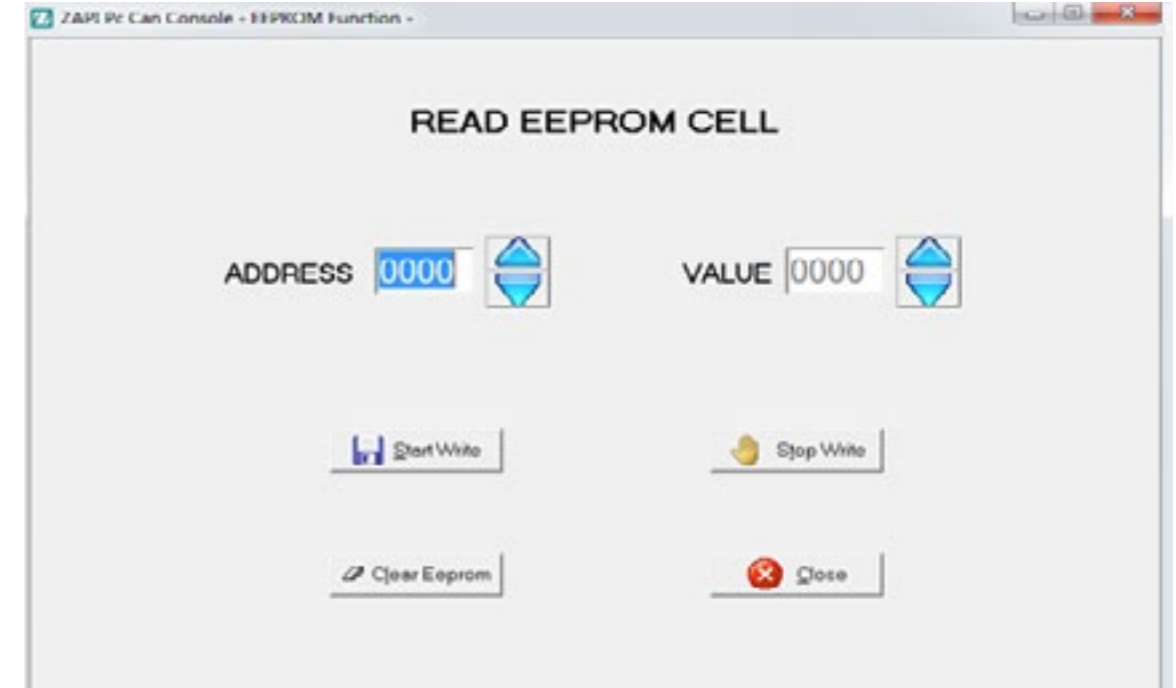
Fig.1.2.17

Click two consecutive prompts "OK", as shown in Fig.1.2.18 and Fig.1.2.19.
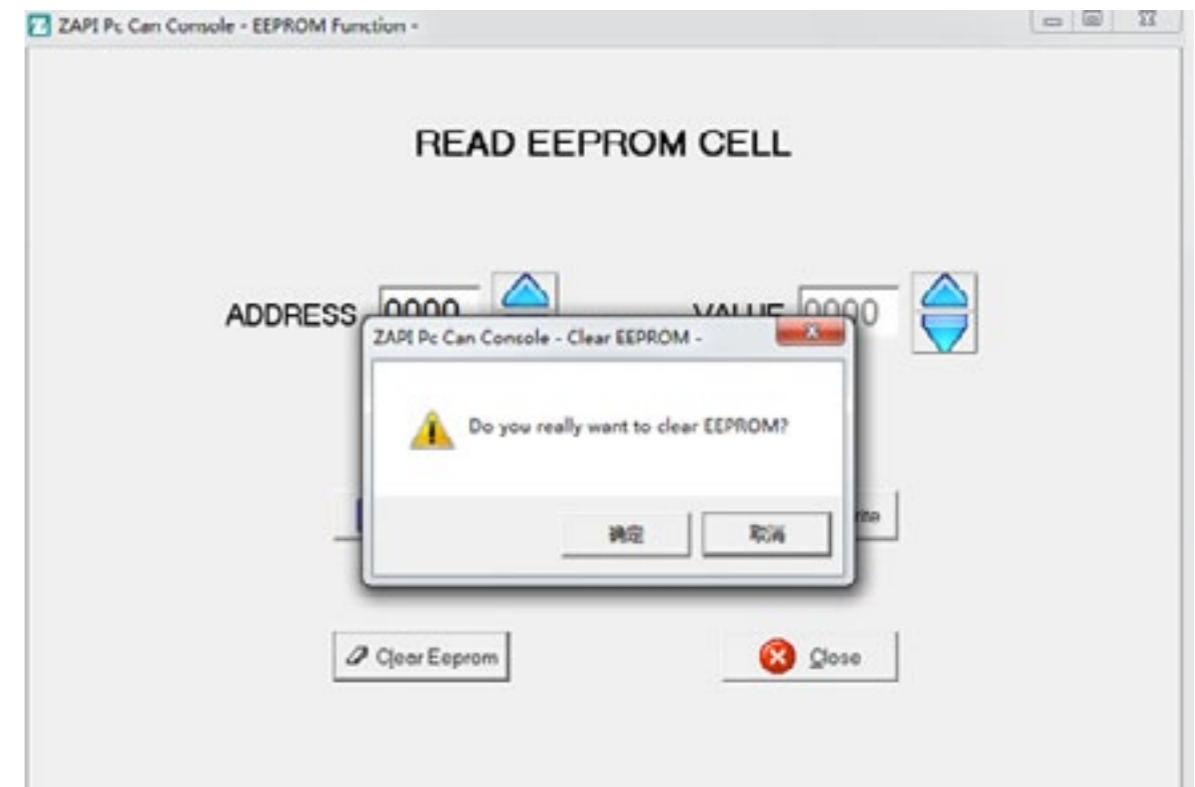
Fig.1.2.18

Fig.1.2.19

After clicking "OK", restart the key switch and click "Close" back to the main interface. If it prompts whether to reconnect the software, click "YES". Or close the software and restart connection again.

1.3 Import Parameters

Enter the parameter interface and click the shortcut icon on the interface as shown in Fig.1.3.1.
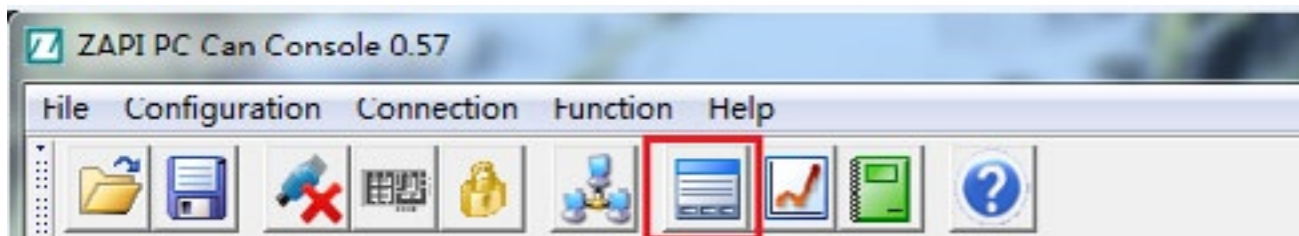
Fig.1.3.1

Or enter by clicking the icon on the main menu, as shown in Fig.1.3.2.
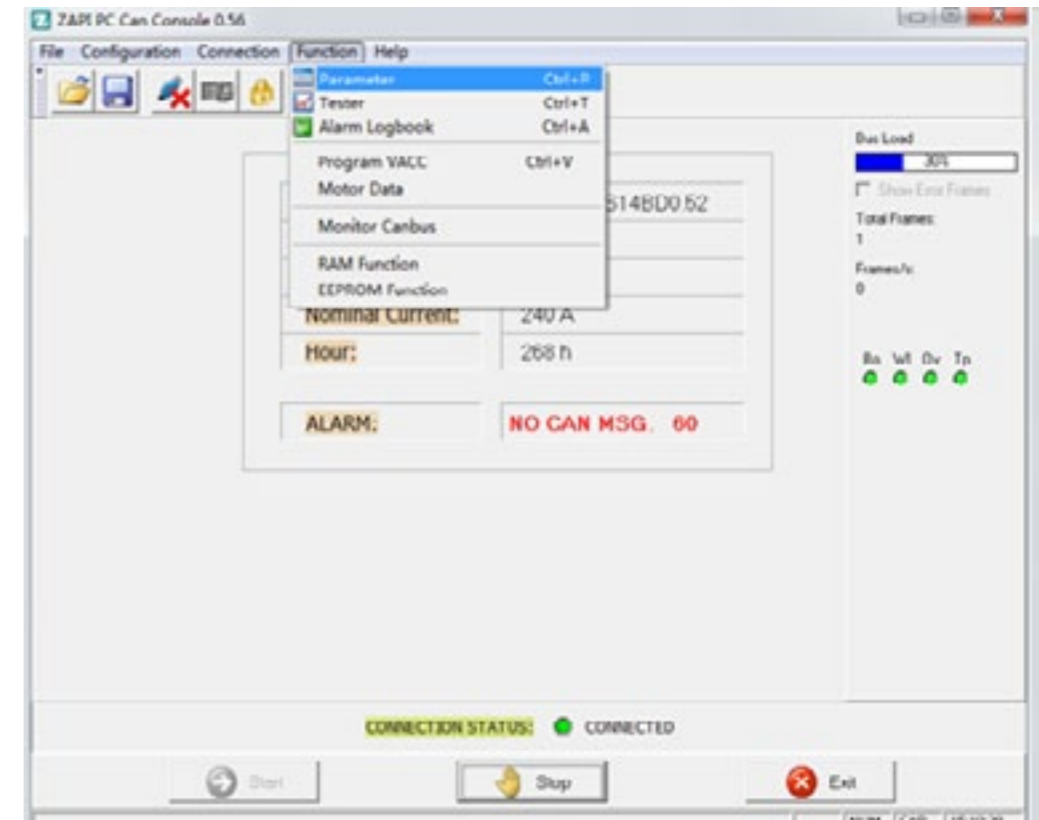
Fig.1.3.2

Click "File" → "Open" and select parameters to be imported, as shown in Fig.1.3.3 and Fig.1.3.4.
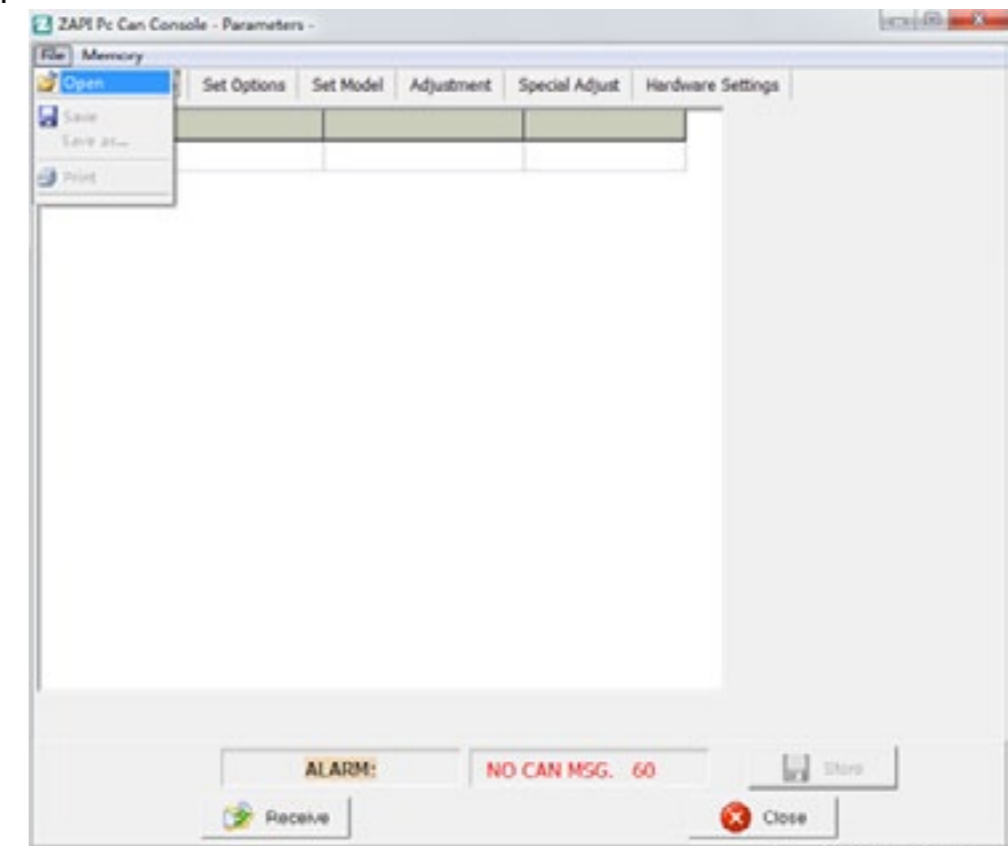
Fig.1.3.3
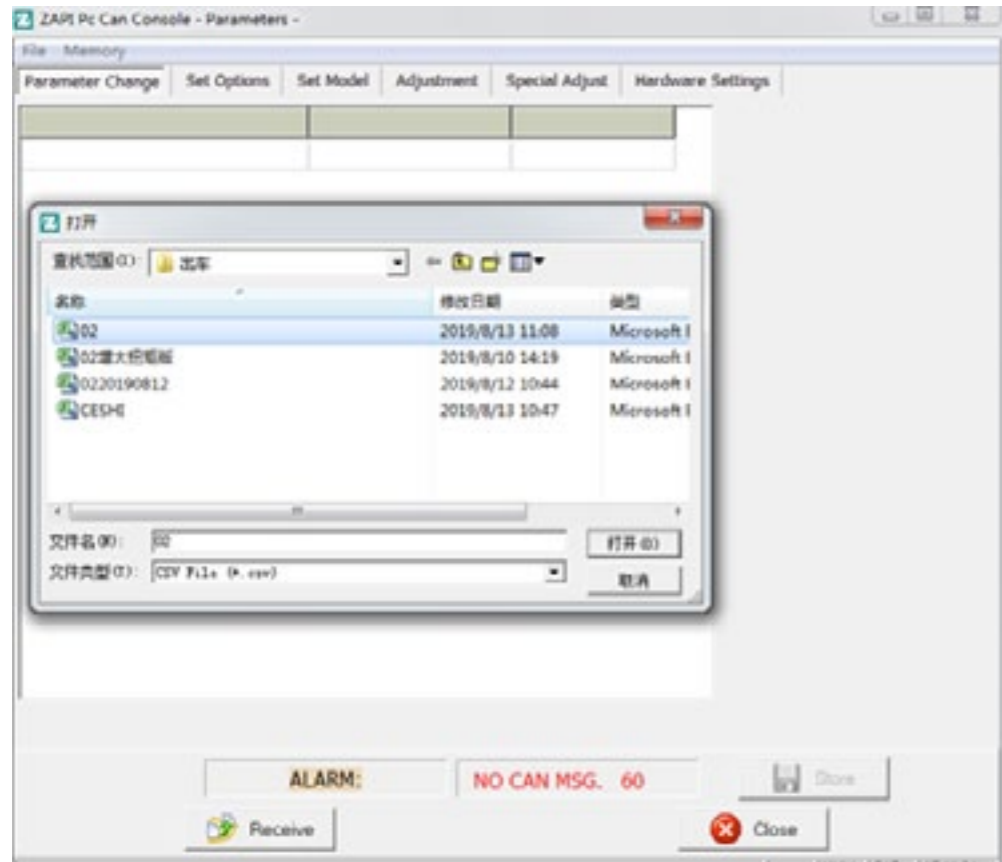
Fig.1.3.4

Open parameters and enter the interface. Click the button "TxFile" and start to import parameters. After finished, click "Close", as shown in Fig.1.3.5.
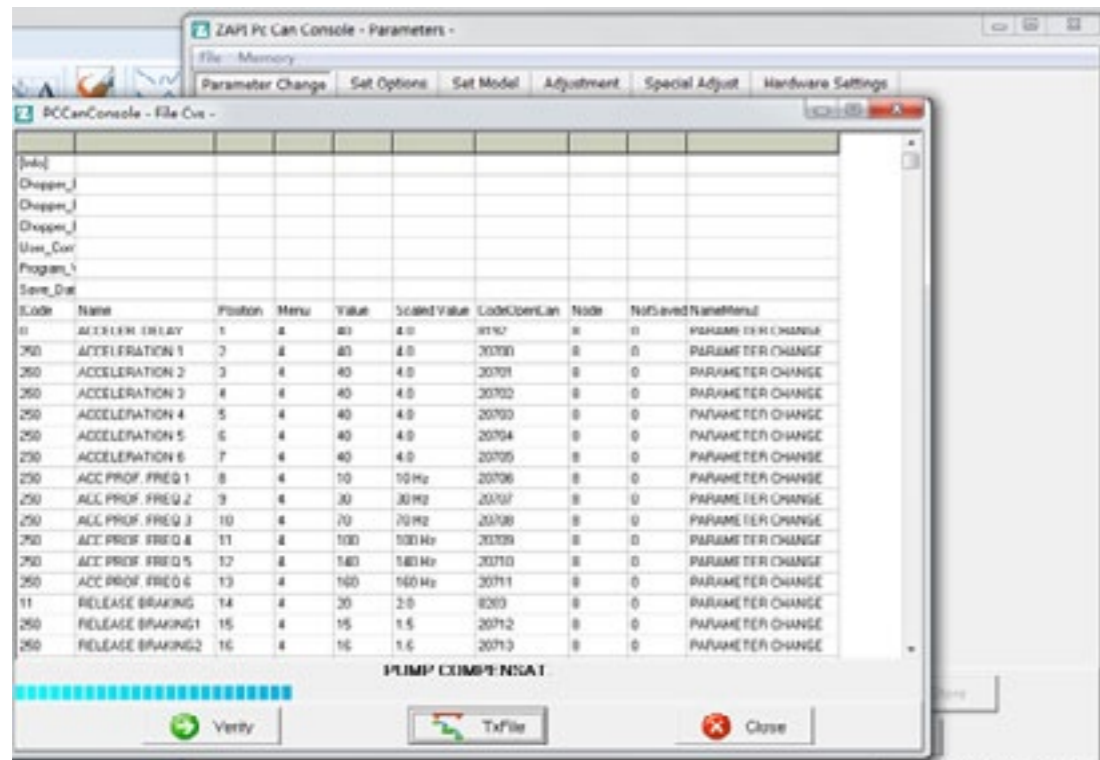
Fig.1.3.5
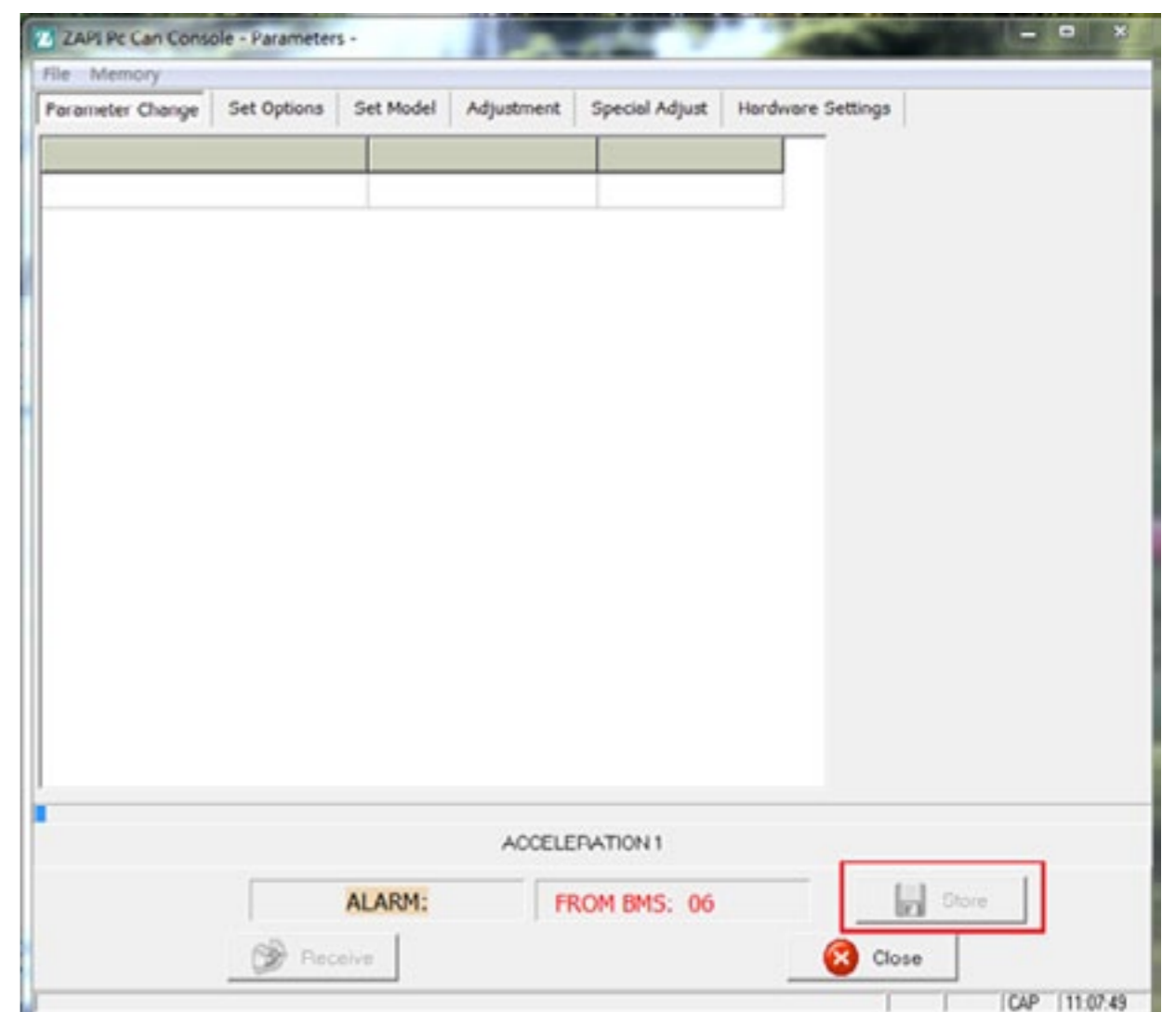
Fig.1.3.6

Note

After parameters are imported successfully, the lower right button will become clickable where you should click "Save", as shown in Fig.1.3.6. Otherwise, restart the software or re-import parameters.

The above are procedures about burning procedures of the main controller and importing parameters. The way of burning procedures is different from that of importing parameters, which depends on the cif file. The cfi file of the steering controller is "epsm003.cfi", as shown in Fig.1.3.7.

Controller and its corresponding " .cif " file

Type of the Controller	.cfi	Note
COMBIACX	adx_zp002(2560).cfi	
EPS-DC0	epsm003.cfi	
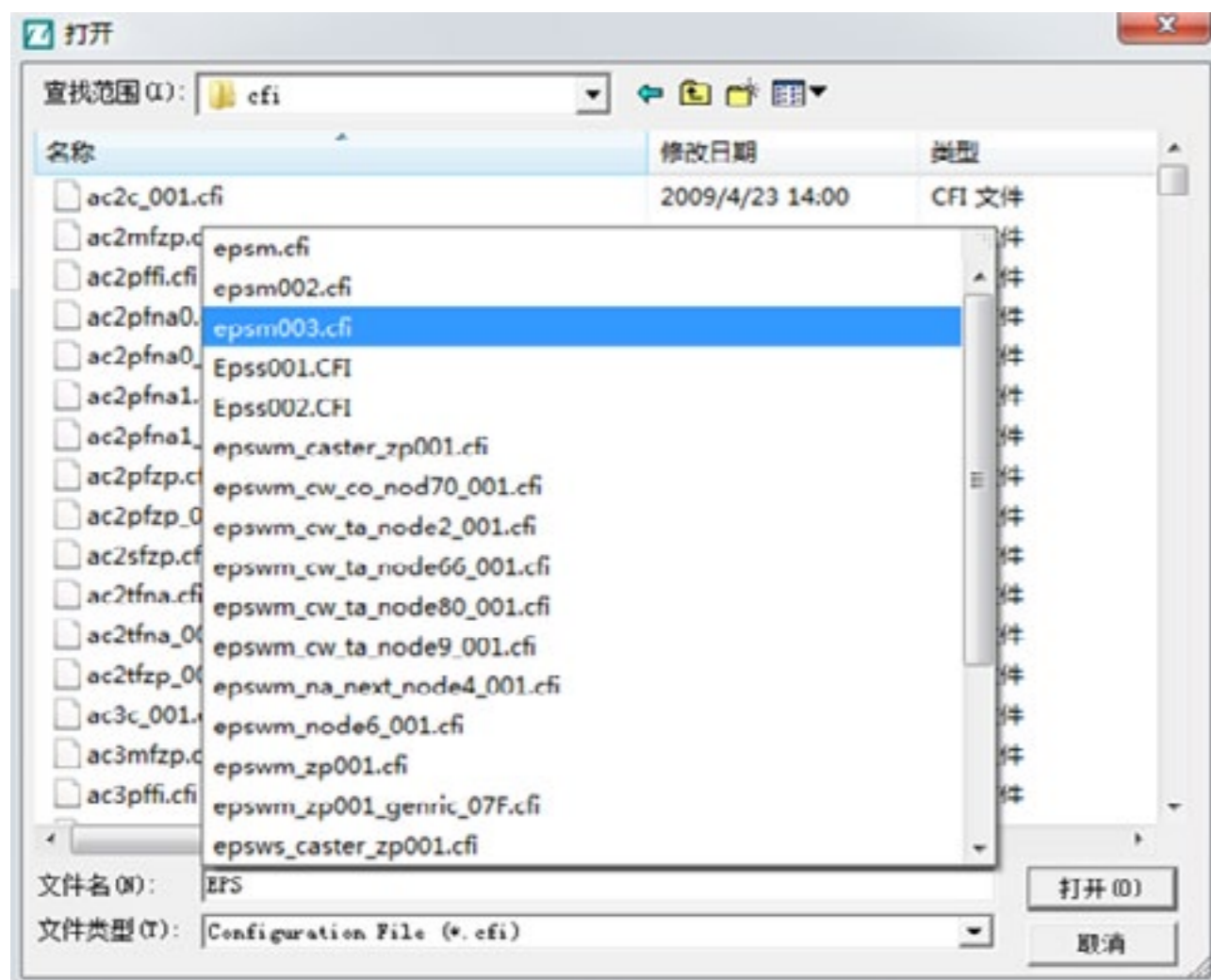
Fig.1.3.7

8.4 ADJUST PARAMETERS

1 . Parameter Description

Select a same way to enter the parameter interface, but select different sites. As shown in Fig.2.1.1, NODE 2.0 is for drive (main controller) while NODE 6.0 is for steering controller. Other sites displayed should be neglected.
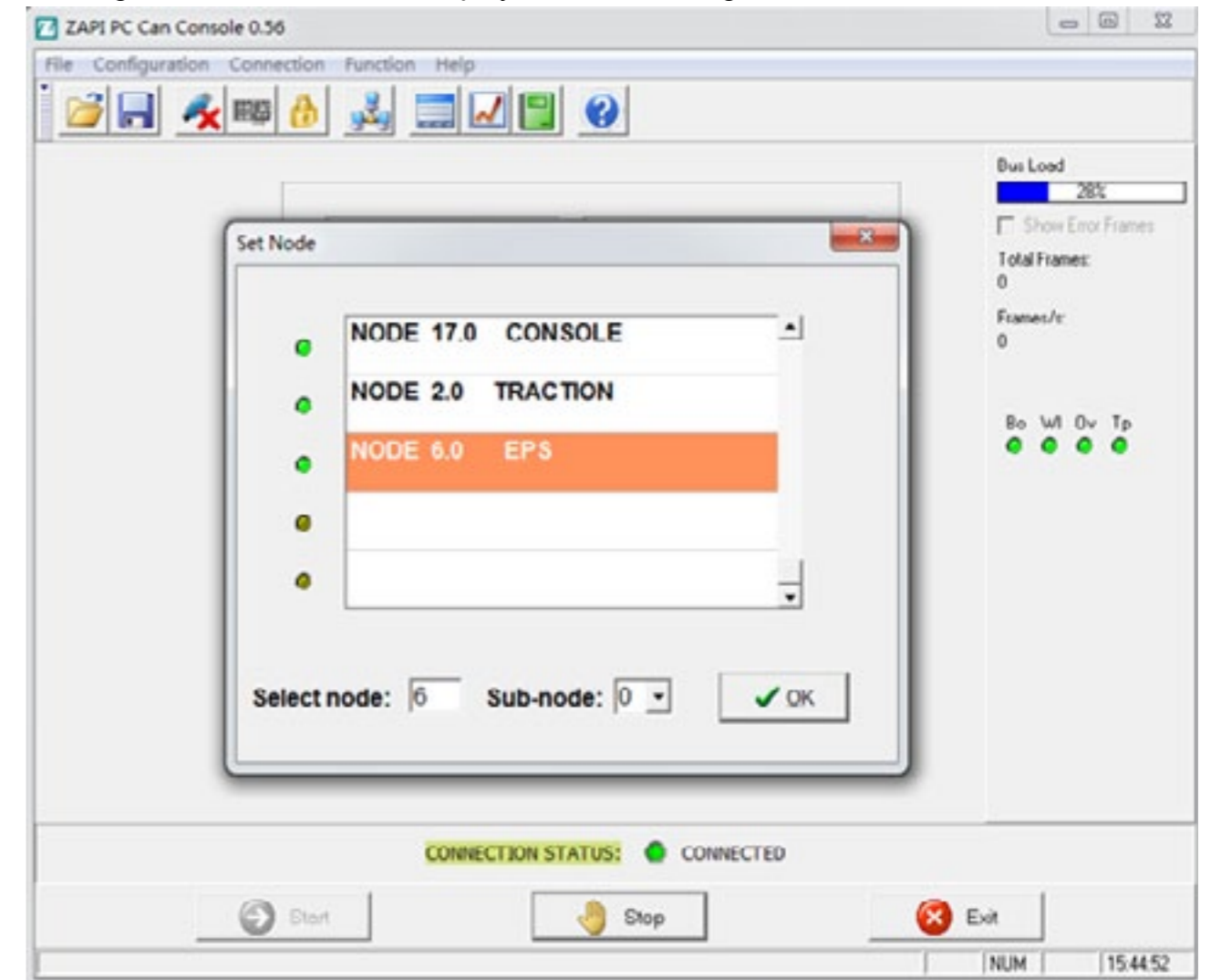
Fig.1.1

If it is NODE 2.0 (main controller), 5 parameters will be displayed on the top of the interface, as shown in Fig.1.2.

There are PARAMETER CHANGE, SET OPTIONS, ADJUSTMENT, SPECIAL ADJUST, and HARDWARE SETTING on the interface, wherein most of them can be modified in accordance with customer usage and requests, SET OPTIONGS is the configuration for logical functionality and other parameters, as the default setting values of vehicle performance and main controller, are not necessary to be modified.
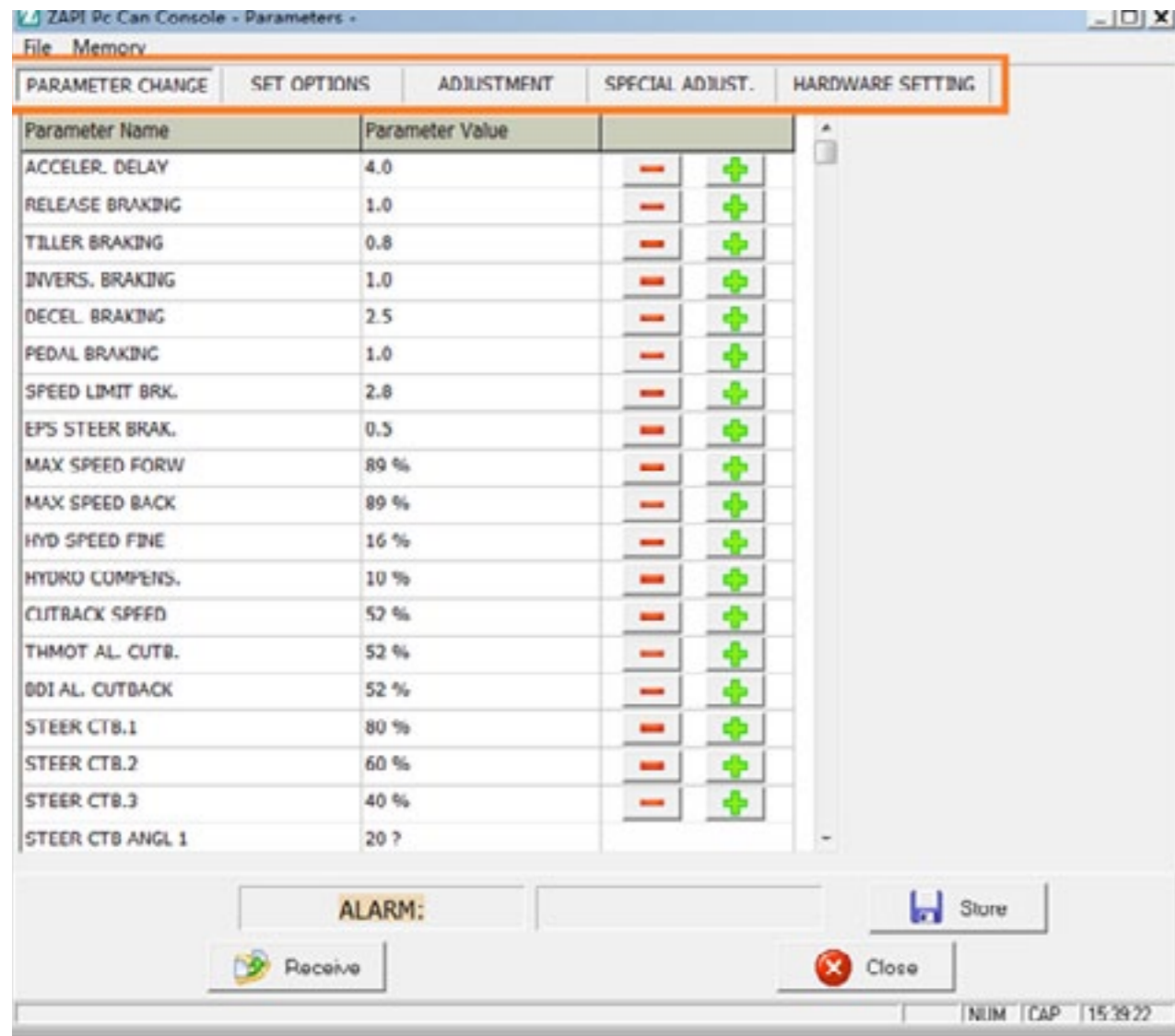
Fig.1.2

PARAMETER CHANGE

PARAMETER NAME	PARAMETER DESCRIPTION	MENU
ACCELER. DELAY	ACCELERATION DELAY IS SHOWN AS ACCELERATION RATE. THE LOWER THE VALUE, THE SHORTER THE ACCELERATION TIME.	PARAMETER CHANGE
RELEASE BRAKING	HANDLE ACCELERATOR RELEASES BRAKING RATE.	PARAMETER CHANGE
TILLER BRAKING	RESPONSE TIME OF INTERLOCKING AND CLOSING THE HANDLE	PARAMETER CHANGE
UPRIGHT BRAKING	UNUSED, HIGH SPEED LIMIT BRAKING	PARAMETER CHANGE
INVERS. BRAKING	RESPONSE TIME OF BRAKING IN INVERSION	PARAMETER CHANGE
DECEL. BRAKING	REDUCTION RATE OF THE MOTOR	PARAMETER CHANGE
PEDAL BRAKING	PEDAL BRAKING, UNUSED	PARAMETER CHANGE
SPEED LIMIT BRK.	INSTRUMENT FAULT, SWITCH TO THE REDUCTION RATE WITH A SLOW SPEED (GENERALLY SHOWN AS BALANCING WEIGHT), UNUSED.	PARAMETER CHANGE
EPS STEER BRAK.	BRAKING WHEN STEERING FAULT APPEARS	PARAMETER CHANGE
MAX SPEED FORW	MAXIMUM FORWARD SPEED	PARAMETER CHANGE

MAX SPEED BACK	MAXIMUM BACKWARD SPEED	PARAMETER CHANGE
HYD SPEED FINE	ADJUST PROPORTIONAL VALVE (COARSE TUNING) SO THAT PUMP MOTOR WORKS NORMAL AT AN APPROPRIATE SPEED.	PARAMETER CHANGE
HYDRO COMPENS.	ADJUST PROPORTIONAL VALVE (FINE TUNING) SO THAT PUMP MOTOR WORKS NORMAL AT AN APPROPRIATE SPEED	PARAMETER CHANGE
CUTBACK SPEED	LOW-SPEED MODE PERFORMED BY LOW-SPEED KEY ON THE HANDLE	PARAMETER CHANGE
H&S CUTBACK	SPEED OF UPRIGHT WALKING MODE	PARAMETER CHANGE
THMOT AL. CUTB.	IF MOTOR TEMPERATURE IS LOWER THAN THE SET PERCENT, THE SPEED THEREOF WILL REDUCE	PARAMETER CHANGE
BDI AL. CUTBACK	IF MOTOR POWER IS LOWER THAN THE SET PERCENT, THE SPEED THEREOF WILL REDUCE.	PARAMETER CHANGE
STEER CTB.1	IT IS REDUCTION RATE OF ANGLE SET BY STEER CTB ANGL1	PARAMETER CHANGE
STEER CTB.2	IT IS REDUCTION RATE OF ANGLE SET BY STEER CTB ANGL2	PARAMETER CHANGE
STEER CTB.3	IT IS REDUCTION RATE OF ANGLE SET BY STEER CTB ANGL3	PARAMETER CHANGE
STEER CTB ANGL 1	SEGMENTATION SETTING OF STEERING ANGLE 1	
STEER CTB ANGL 2	SEGMENTATION SETTING OF STEERING ANGLE 2	
STEER CTB ANGL 3	SEGMENTATION SETTING OF STEERING ANGLE 3	
TURTLE H&S TIME	PRESS THE TIME KEY AND ENTER THE UPRIGHT WALKING MODE.	PARAMETER CHANGE
RETURN TIME	TIME ON CANCELING OPERATION AUTOMATICALLY UNDER THE UPRIGHT WALKING MODE	PARAMETER CHANGE
TURTLE TIME DISP	UPRIGHT WALKING MODE	PARAMETER CHANGE
FREQUENCY CREEP	THE SPEED OF THE MOTOR WHEN THERE IS NO ANALOG QUANTITY FORWARD OR BACKWARD.	PARAMETER CHANGE
MAXIMUM CURRENT	OUTPUT RATE OF CONTROLLER CURRENT	PARAMETER CHANGE
ACC SMOOTH	ACCELERATION CURVE	PARAMETER CHANGE
INV SMOOTH	ACCELERATION CURVE WHEN MOTOR REVERSES.	PARAMETER CHANGE
STOP SMOOTH	THE FREQUENCY AT THE END OF THE SMOOTH EFFECT OF ACCELERATION PARABOLA.	PARAMETER CHANGE
BRK SMOOTH	DECELERATION CURVE	PARAMETER CHANGE
STOP BRK SMOOTH	THE FREQUENCY AT THE END OF THE SMOOTH EFFECT OF DECELERATION PARABOLA.	PARAMETER CHANGE
AUXILIARY TIME	AUXILIARY TIME（AN ELECTRIC BRAKING FORM AND A FUNCTION OF BALANCING WEIGHT）	PARAMETER CHANGE
HYDRO TIME	THE DURATION OF THE PUMP MOTOR AFTER RELEASING HYDRAULIC PRESSURE	PARAMETER CHANGE
PUMP IMAX	THE CURRENT (SPEED) LEVEL OF THE PUMP MOTOR	PARAMETER CHANGE
PU. ACCELER. DEL	ACCELERATION DELAY OF THE PUMP MOTOR (PUMP CONTROL IS EFFECTIVE)	PARAMETER CHANGE
PU. DECELER. DEL	DECELERATION DELAY OF THE PUMP MOTOR (EFFECTIVE PUMP CONTROL)	PARAMETER CHANGE
MAX SPEED LIFT	MAXIMUM LIFT SPEED (LEVEL SET BY CURRENT PUMP CURRENT)	PARAMETER CHANGE
PUMP CREEP SPEED		PARAMETER CHANGE
PUMP COMPENSAT.		PARAMETER CHANGE
MIN EVP	MINIMUM CURRENT OFFERED TO LOWERING VALVE	PARAMETER CHANGE
MAX EVP	MAXIMUM CURRENT OFFERED TO LOWERING VALVE	PARAMETER CHANGE

EVP OPEN DELAY	OPEN DELAY OF LOWERING VALVE PORT	PARAMETER CHANGE
EVP CLOSE DELAY	CLOSE DELAY OF LOWERING VALVE PORT	PARAMETER CHANGE
SPEED RED 1	LOGIC SPEED REDUCTION 1	PARAMETER CHANGE
SPEED RED 2	LOGIC SPEED REDUCTION 2	PARAMETER CHANGE
ACC DELAY BELLY	ACCELERATION RATE OF EMERGENCY REVERSE	PARAMETER CHANGE
DEC DELAY BELLY	DECELERATION RATE OF EMERGENCY REVERSE	PARAMETER CHANGE
TILLER DELAY	INTERLOCK DELAY	PARAMETER CHANGE

Parameter Description of SET OPTIONS
This part of the parameter is subject to the modified type and no change is required.

PARAMETER NAME	PARAMETER DESCRIPTION	MENU
TILLER SWITCH	TYPE OF LIMIT SWITCH ON THE HANDLE	SET OPTIONS
EB ON TILLER BRK	ELECTRIC BRAKE CLOSES WHEN THE LIMIT SWITCH ON THE HANDLE CLOSES	SET OPTIONS
HOUR COUNTER	WORKING WAY OF HOUR COUNTER (TIMING AFTER OPENING KEY OR CONTROLLER)	SET OPTIONS
EVP TYPE	TYPE OF THE LOWERING VALVE	SET OPTIONS
BATTERY CHECK	TYPE OF BATTERY	SET OPTIONS
BATT.LOW LED TSH	ALARM WHEN THE BATTERY POWER IS LOWER THAN THE VALUE	SET OPTIONS
BATT.LOW TRESHLD	LIFT WHEN THE BATTERY POWER IS LOWER THAN THE VALUE AND LOWER DOWN SPEED	SET OPTIONS
STOP ON RAMP	ELECTRIC PARKING SYSTEM	SET OPTIONS
QUICK INVERSION	TYPE OF QUICK INVERSION	SET OPTIONS
SET MOT.TEMPERAT	SET TYPE OF THE TEMPERATURE SENSOR	SET OPTIONS
EPS	OPEN OR CLOSE STEERING SWITCH	SET OPTIONS
MC HSD ON EPS	OPEN OR CLOSE STEERING SWITCH	SET OPTIONS
DEBUG ON CAN	/	SET OPTIONS
EV1	TYPE 1 LOWERING VALVE	SET OPTIONS
EV2	TYPE 2 LOWERING VALVE	SET OPTIONS
EV3	TYPE 3 LOWERING VALVE	SET OPTIONS
HORN	TYPE OF THE HORN	SET OPTIONS
M.C. FUNCTION	OPEN THE QUICK INVERSION MODE AND PRESS "OFF"	SET OPTIONS
HYDRO FUNCTION	/	SET OPTIONS
M.C. FUNCTION	CONTROL THE OPENING WAY OF THE MAIN CONTACTOR	SET OPTIONS
AUX OUT FUNCTION	CONTROL THE OPENING WAY OF MAGNETIC BRAKE	SET OPTIONS
DISPLAY TYPE	TYPE OF THE INSTRUMENT	SET OPTIONS
REMA TILLER CAN	USE REMACAN HANDLE	SET OPTIONS
LIFT MODE	LIFT MODE	SET OPTIONS
SPEED ON MDI	CHECK WHETHER THE INSTRUMENT DISPLAYS THE SPEED	SET OPTIONS
BMS	THE TYPE OF BATTERY, IT DEPENDS ON WHETHER IT IS NECESSARY TO CHOOSE BMS	SET OPTIONS

2.2 Median Adjustment Of Drive Wheels
Except that it is necessary to adjust the 0-position for steering potentiometer, other parameters of NODE 6.0 steering controller are set by the default system and are needless to be changed.
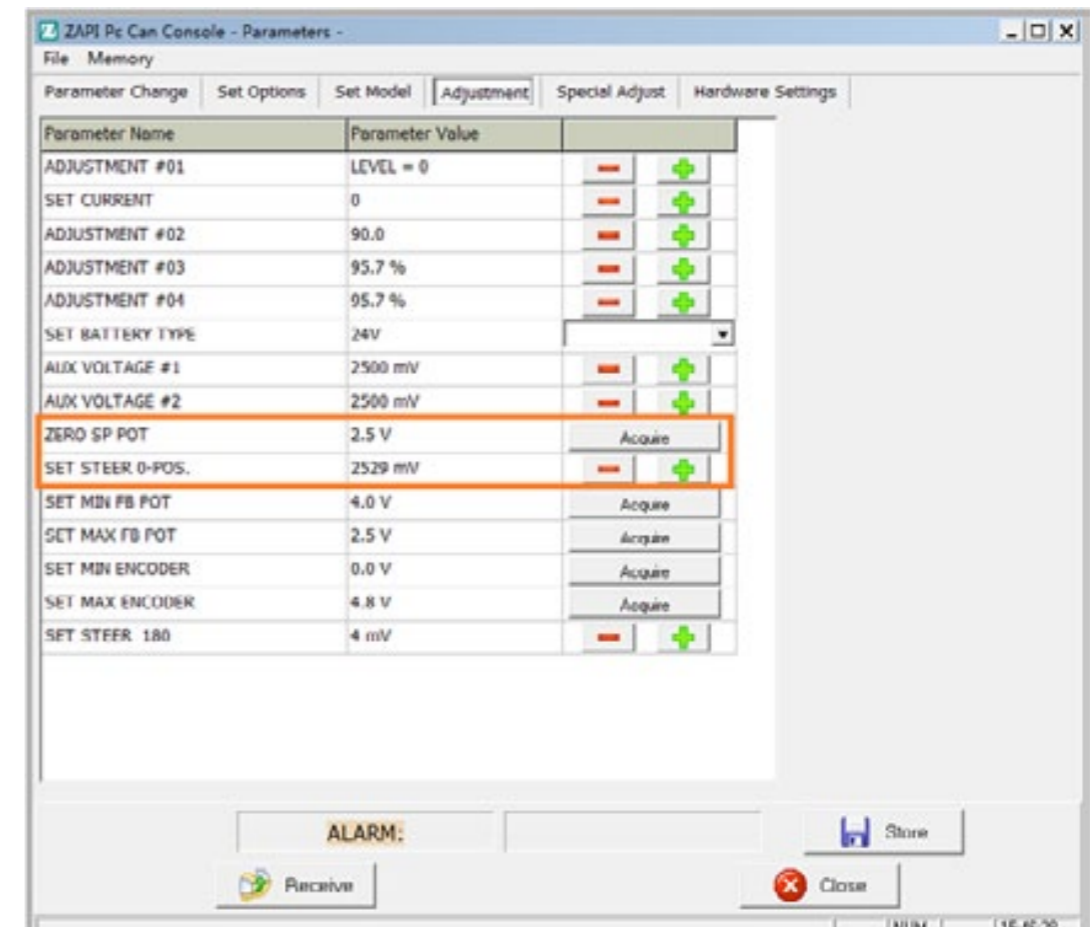
Fig.2.2.1

ZERO SP POT: The handle is turned to the middle where the driver wheel is also in the middle of the median voltage (with a default value 2.5V). The voltage increases gradually from left to right with the direction of the stroke while the range is subject to the specification of the potentiometer used. SET STEER 0-POS: Adjust the middle position to the left or right.

The two sets of values can be modified and thereby solving vehicle deviation problem caused by the steering potentiometer or other causes. Specific operation procedures are as follows :

1. Set the median value of ZERO SP POT first: turn the handle to the median position, click Acquire to learn current voltage, and the click Store. If the median value on the Acquire is quite different from 2.5V, you need to manually remove the gear plate fixed by the potentiometer so that there is no friction between the plate and the gear when rotating manually. Then turn the potentiometer manually and then adjust its median value as 2.5V (the value has to be displayed on the Acquire). Besides, the gear where the potentiometer is located is engaged and fixed with the gear posited in the middle of the handle position.
2. If the forklift moves towards the right side, the actual voltage vale will exceed the current median value where you should decrease the value of SET STEER 0-POS (The specific adjustment value is subject to the actual performance). Otherwise, increase the value.

2.3 ACQUIRE THE VOLTAGE INFORMATION OF THE ACCELERATOR Function: When it alarms the fault VACC NOT OK or VACC OUT RANGE, acquire the voltage information of the accelerator. Operating procedures are as follows: Connect the CAN box, input the password, select the site and then click the option "FUNCTION → Program VACC" to enter the acquire interface, as shown in the Fig.2.3.1.

Fig.2.3.1

The initial page is as shown in the Fig.2.3.2.
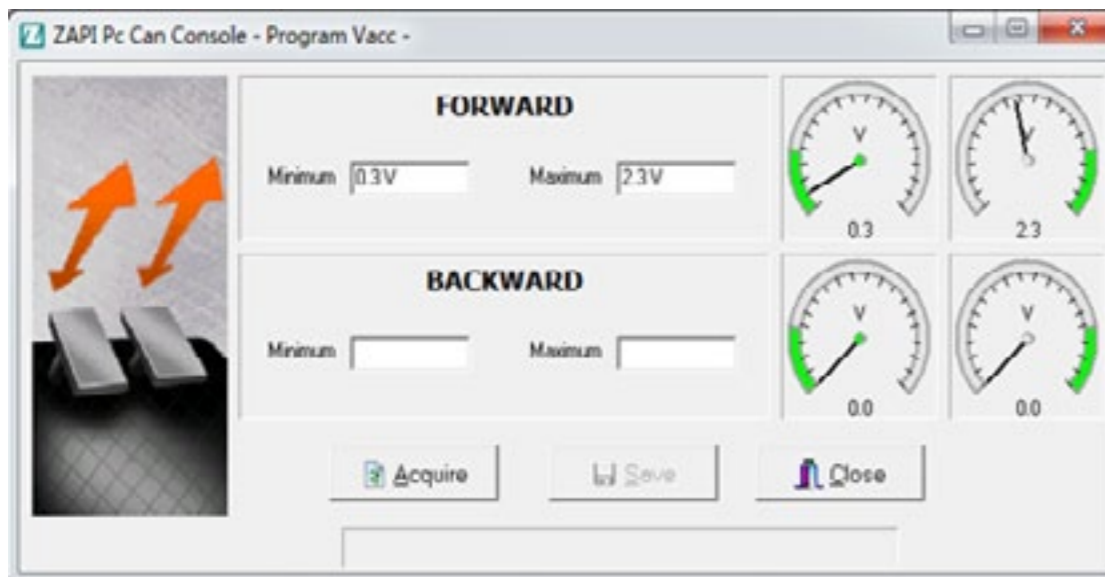
Fig.2.3.2

Click "Acquire", as shown in Fig.2.3.3.
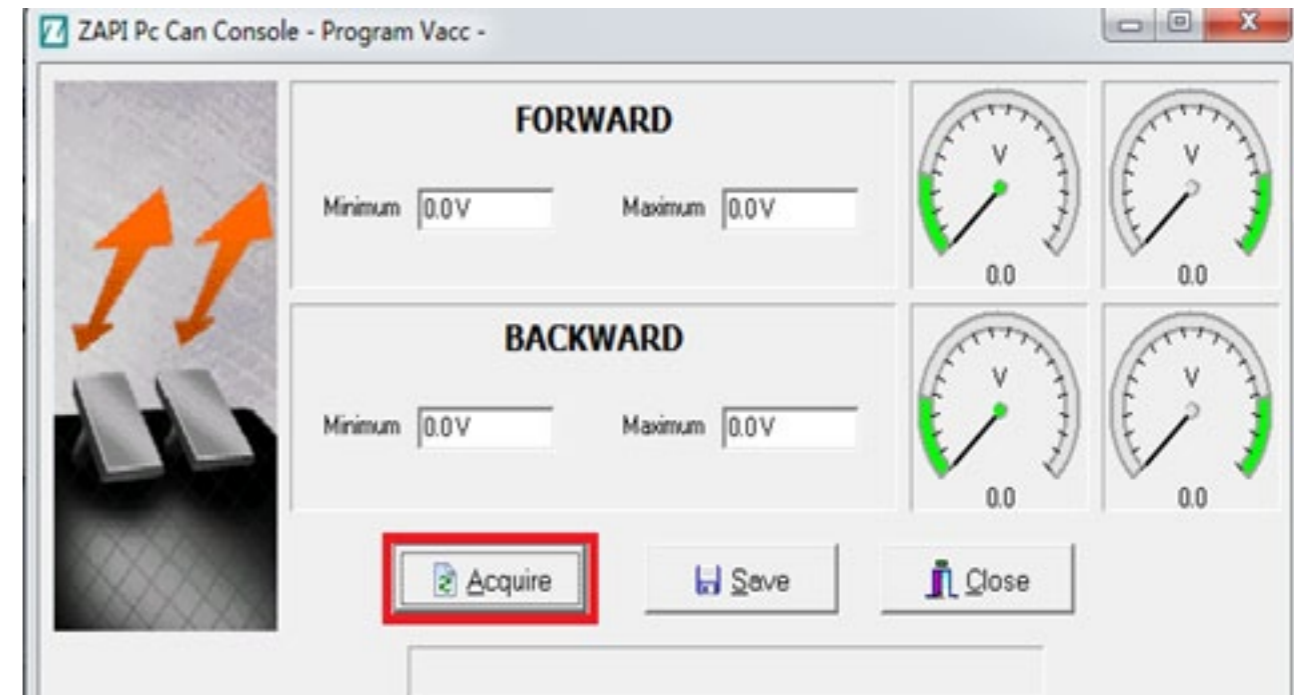
Fig.2.3.3

Press the handle and operate the accelerator towards the fork, as shown in the Fig.2.3.4.
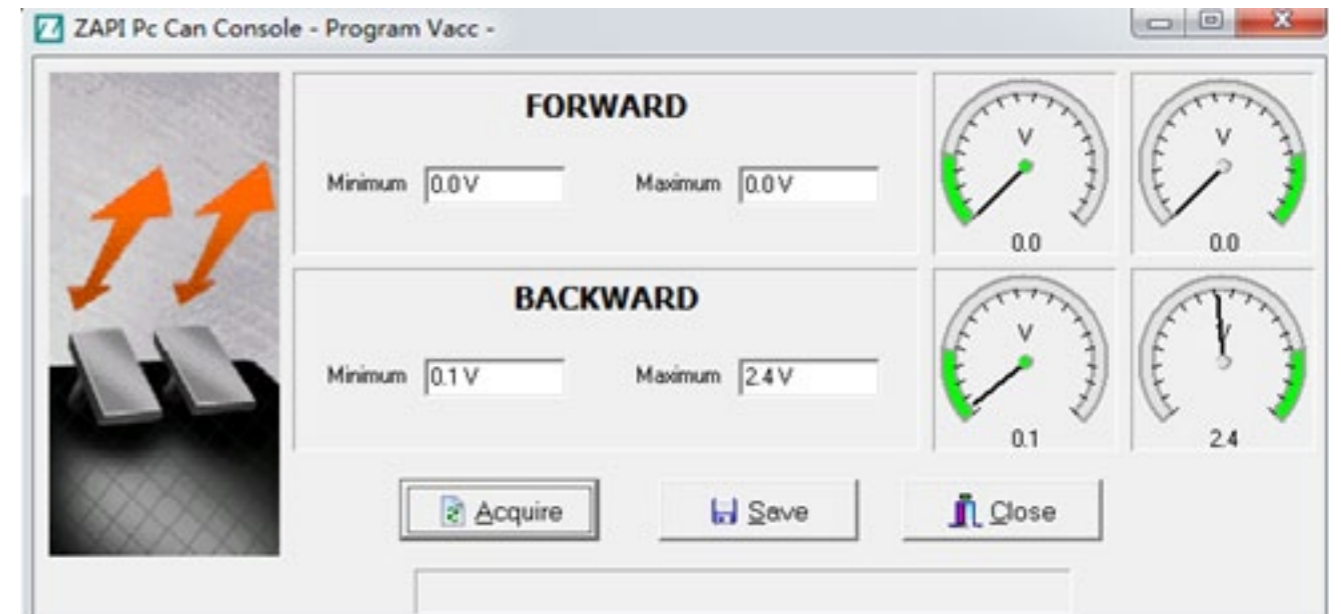
Fig.2.3.4

Press the handle and operate the accelerator towards the operator, as shown in the Fig.2.3.5.
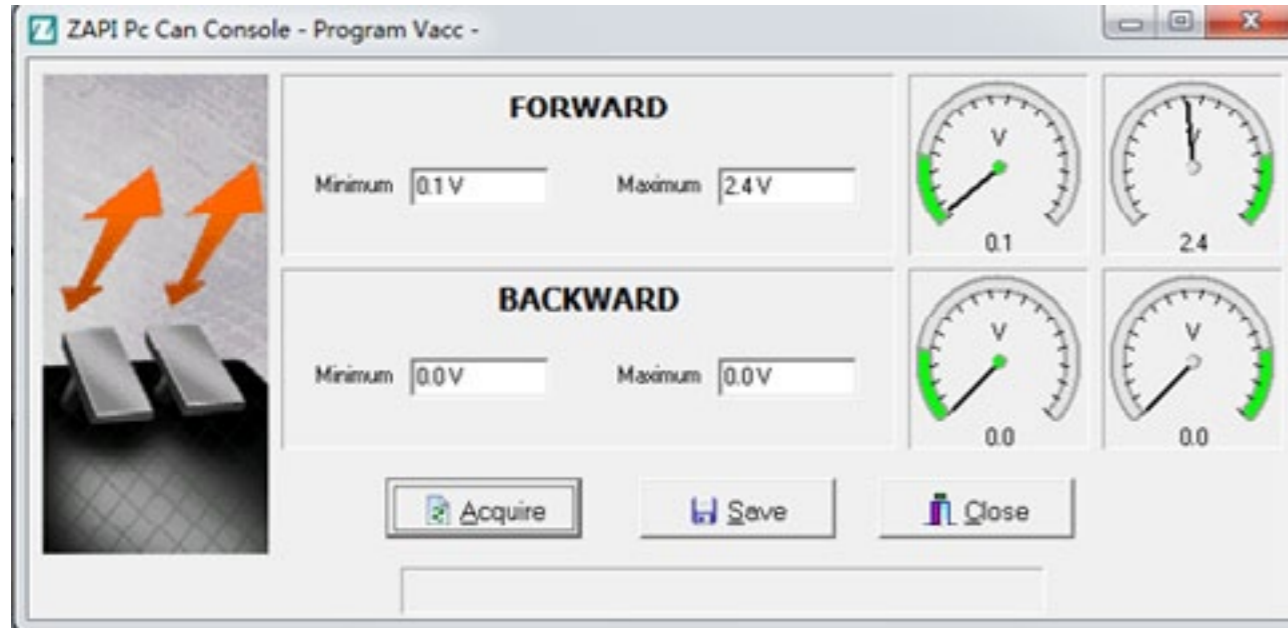
Fig.2.3.5

Click "Save" and finish the acquisition, as shown in the Fig.2.3.6.
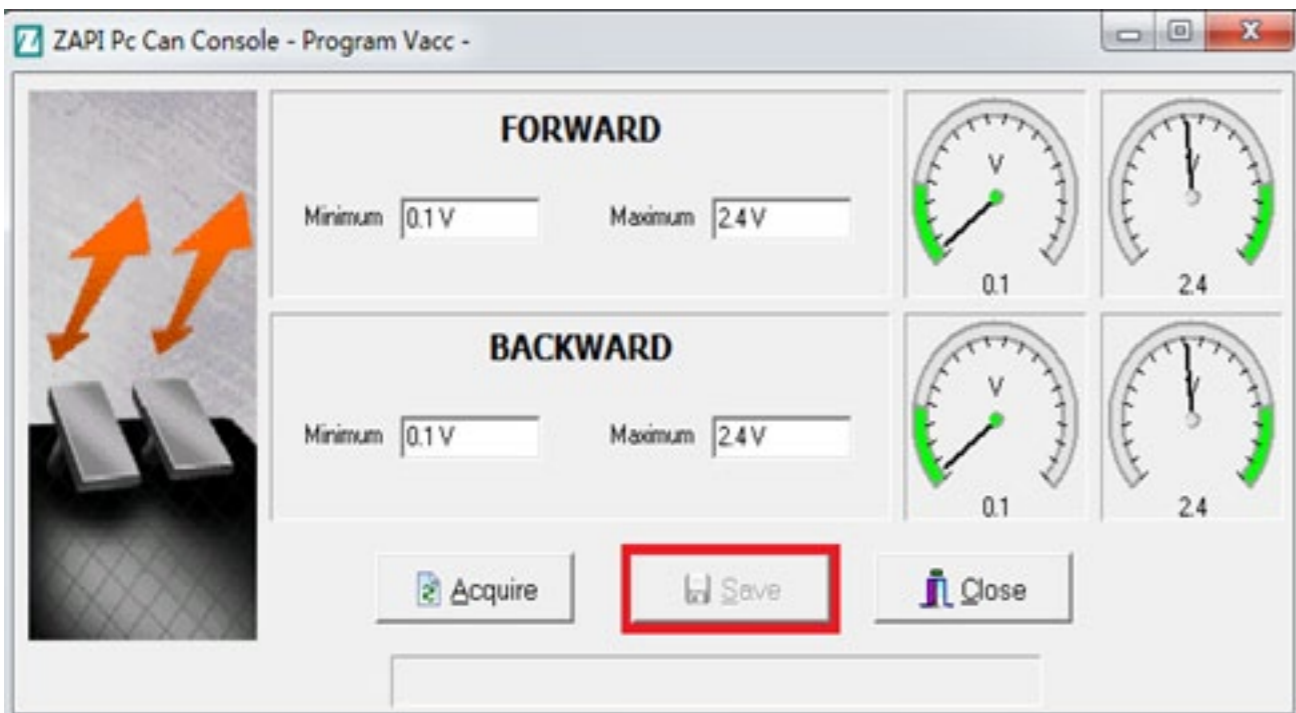
Fig.2.3.6

8.5 MONITOR DATA

1. Monitor Menu

Function: Troubleshoot faults by monitoring the current or operating state of the part in use

Operating procedures: Connect the CAN box, input the password, select the site and then click the monitor menu, as shown in the Fig1.1.

Note: The NODE 2.0 station is for the main controller data while the NODE 6.0 is for the monitoring interface of the steering controller.
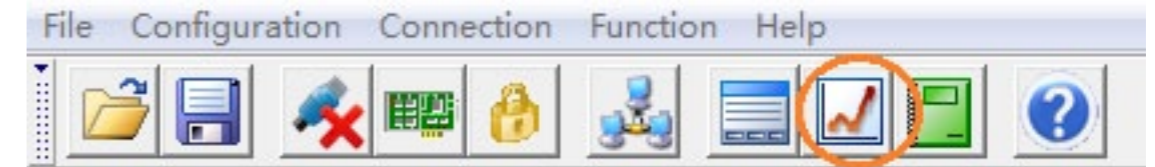
Fig.1.1

The following interface can be acquired automatically. The monitoring options are selected on the left side while relevant data will appear on the right side. It can monitor up to four options at a time, as shown in the Fig.1.2.
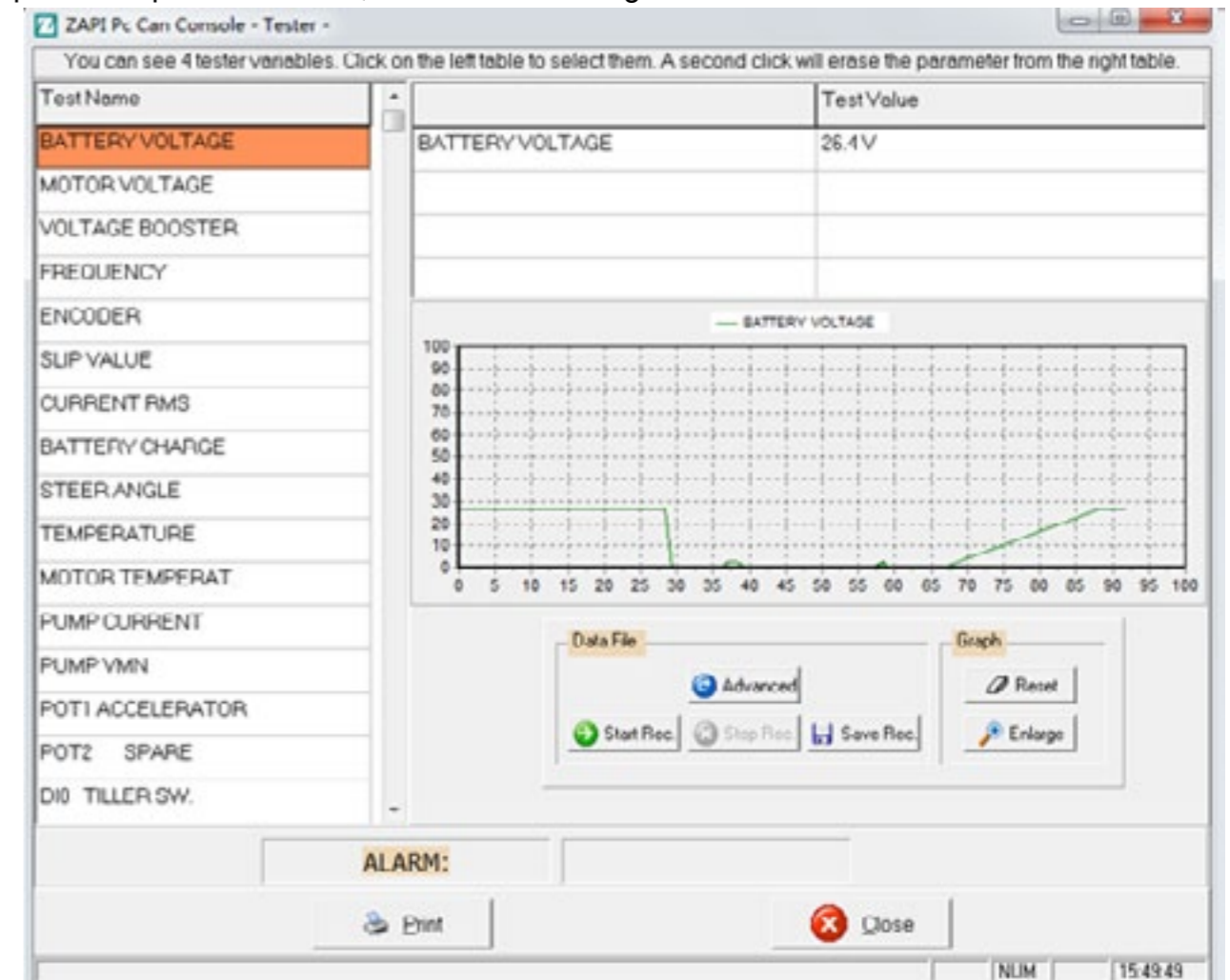
Fig.1.2

COMMON MONITORING PARAMETERS TABLE

ITEM	DESCRIPTION	STATIONARY STATE	TRIGGERING / RUNNING
BATTERY VOLTAGE	BATTERY VOLTAGE	CURRENT STATE	CURRENT REAL VALUE
MOTOR VOTAGE	VOLTAGE OF DRIVE MOTOR		CURRENT REAL VALUE
FREQUENCY	ACTUAL FREQUENCY OF DRIVE MOTOR		CURRENT REAL VALUE
ENCODER	COMMAND FREQUENCY OF DRIVE ENCODER		CURRENT REAL VALUE
SLIP VALUE	FREQUENCY OF DRIVE SLIP		CURRENT REAL VALUE
CURRENT RMS	CURRENT RMS OF DRIVE MOTOR		CURRENT REAL VALUE
BATTERY CHARGE	PERCENT OF BATTERY POWER	CURRENT VALUE	CURRENT REAL VALUE
STEER ANGLE	VALUE OF STEERING ANGLE	CURRENT VALUE	LEFT VALUE: -95; MEDIAN VALUE: 0; RIGHT VALUE: 95 (OR MINOR DEVIATION).
TEMPERATURE	TEMPERATURE OF DRIVE CONTROLLER	CURRENT VALUE	CURRENT REAL VALUE
MOTOR TEMPERAT	TEMPERATURE OF DRIVE MOTOR	CURRENT VALUE	CURRENT REAL VALUE
PUMP CURRENT	LIFT CURRENT		CURRENT REAL VALUE
PUMP VMN	PUMP-ENABLED PERCENT		LIFT ENABLED PERCENT: 0 -100%
POT2 SPARE	CHANGE OF LIFT VOLTAGE		CURRENT REAL VALUE
DI0 TILLER SW.	LIMIT SWITCH ON THE HANDLE	OFF	ON
BELLY	QUICK INVERSION SWITCH	OFF	ON
D12 CUTBACK2	SIGNAL CORRESPONDING TO CONTROLLER A12	OFF	ON
FORWRAD SW.	FORWARD SWITCH	OFF	ON
BACKWARE SW.	BACKWARD SWITCH	OFF	ON
HORN	HORN SWITCH	OFF	ON
LOWERING	LOWERING SWITCH	OFF	ON
CUTBACK 3 SW.	SPEED REDUCTION SWITCH	OFF	ON
D12 LIFTSTOP	LIFTSTOP SWITCH	OFF	ON
GUARD BAR SW.	GUARDRAIL SWITCH	OFF	ON
PLATE FOLDED SW.	PEDAL FOLDED SWITCH	OFF	ON
ST PERSON SW.	SWITCH SENSITIVE TO PERSON	OFF	ON
OUTPUT HORN	HORN OUTPUTS	OFF	ON
MAIN CONT.VOLT	VOLTAGE OF MAIN CONTACTOR		100% TRIGGERS VOLTAGE WHILE 80% KEEPS VOLTAGE.
ELEC.BARKE VOLT	VOLTAGE OF MAGNETIC BRAKE		100% TRIGGERS VOLTAGE WHILE 80% KEEPS VOLTAGE.

2 . Export Parameters

Function: The parameters need to be saved or exported to the technician for troubleshooting.

Operating procedures: Connect the CAN box, input the password, select the site and then click the parameter menu, as shown in the Fig.2.1.

Note: The NODE 2.0 station is for the main controller parameters while the NODE 6.0 is for the parameters of the steering controller.
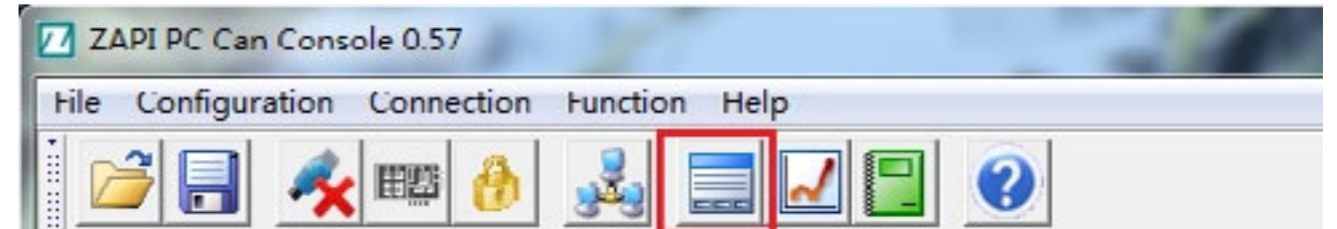
Fig.2.1

Click the button "Receive", as shown in the Fig.2.2.
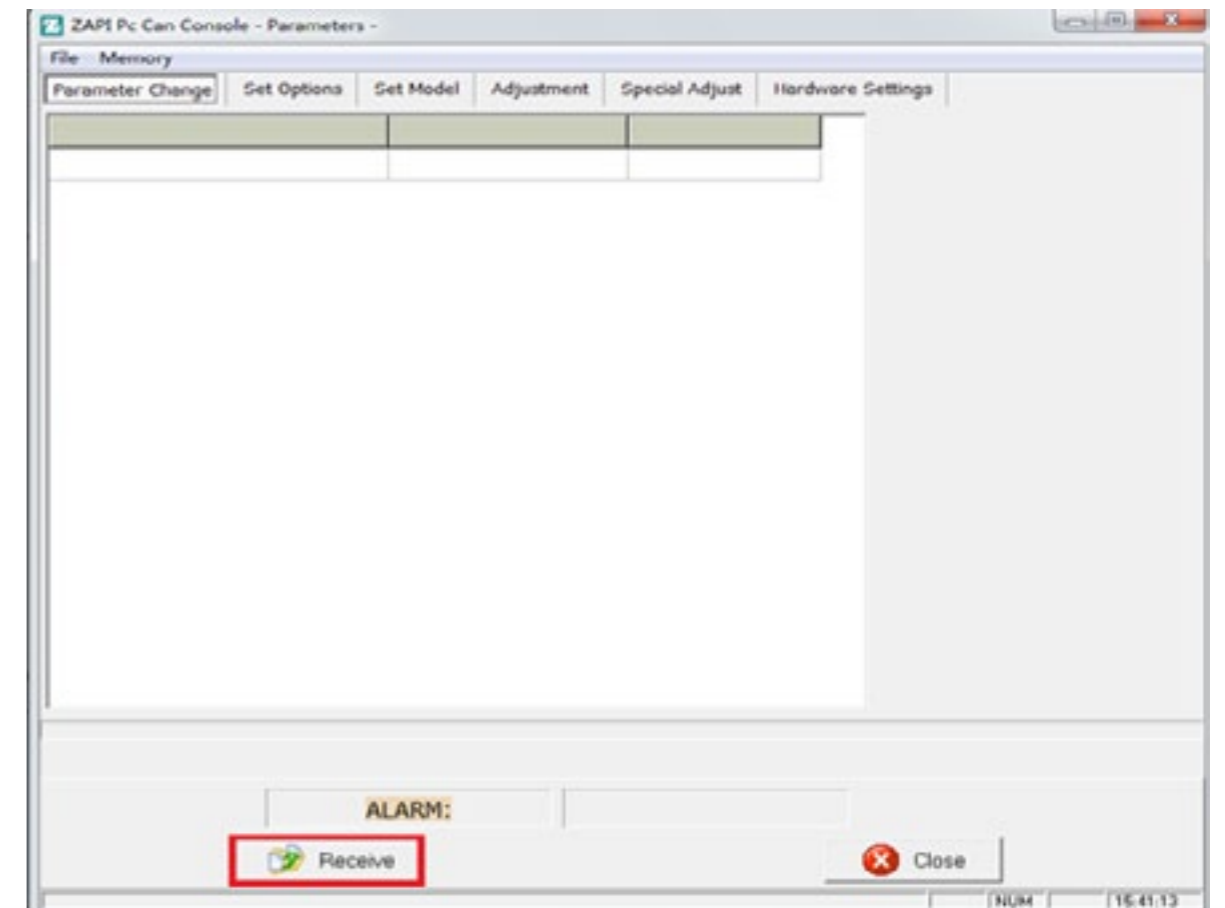
Fig.2.2

Receive data, as shown in the Fig.2.3.
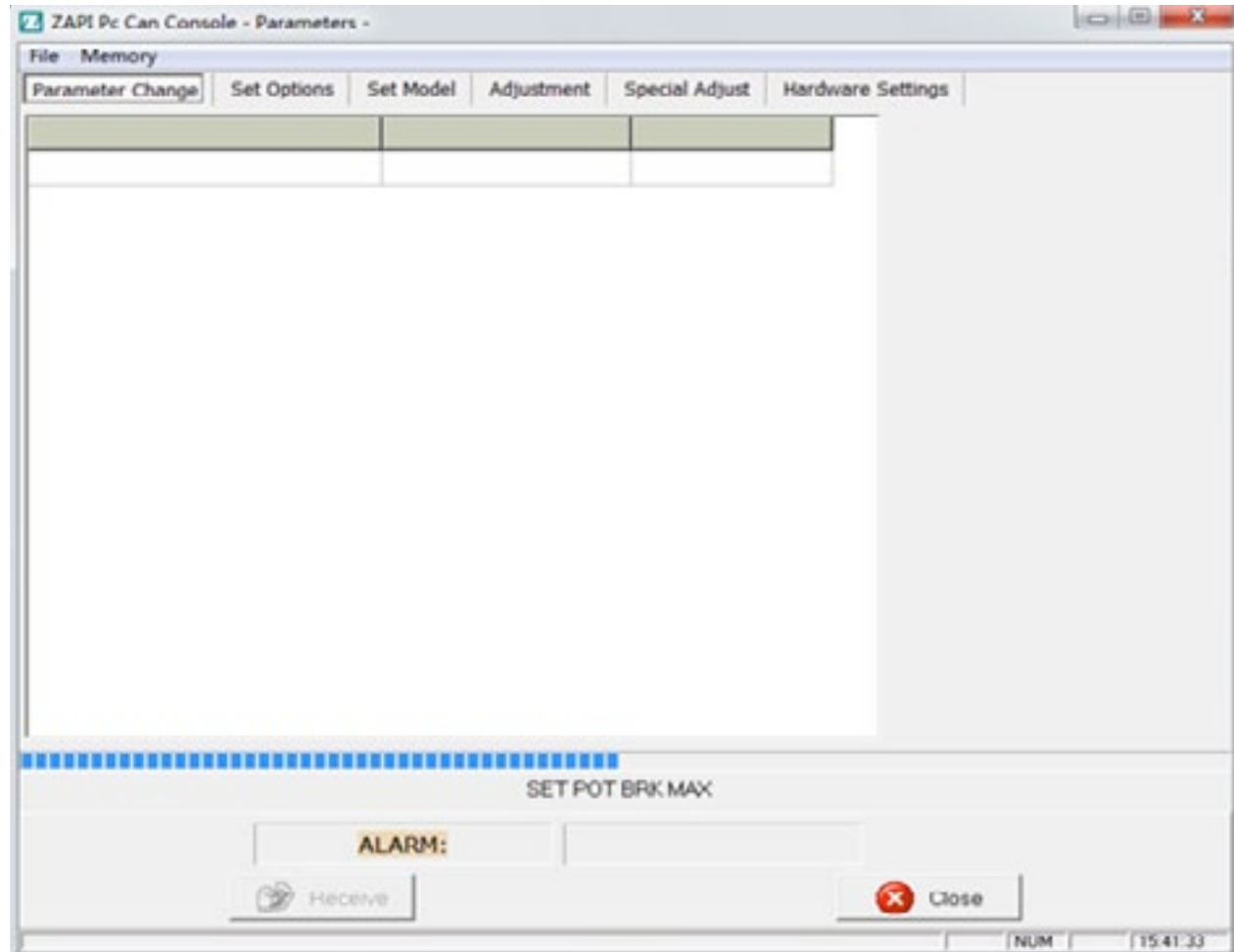
Fig.2.3

Click the option "File——Save" and export parameters, as shown in the Fig.2.4 and Fig.2.5.
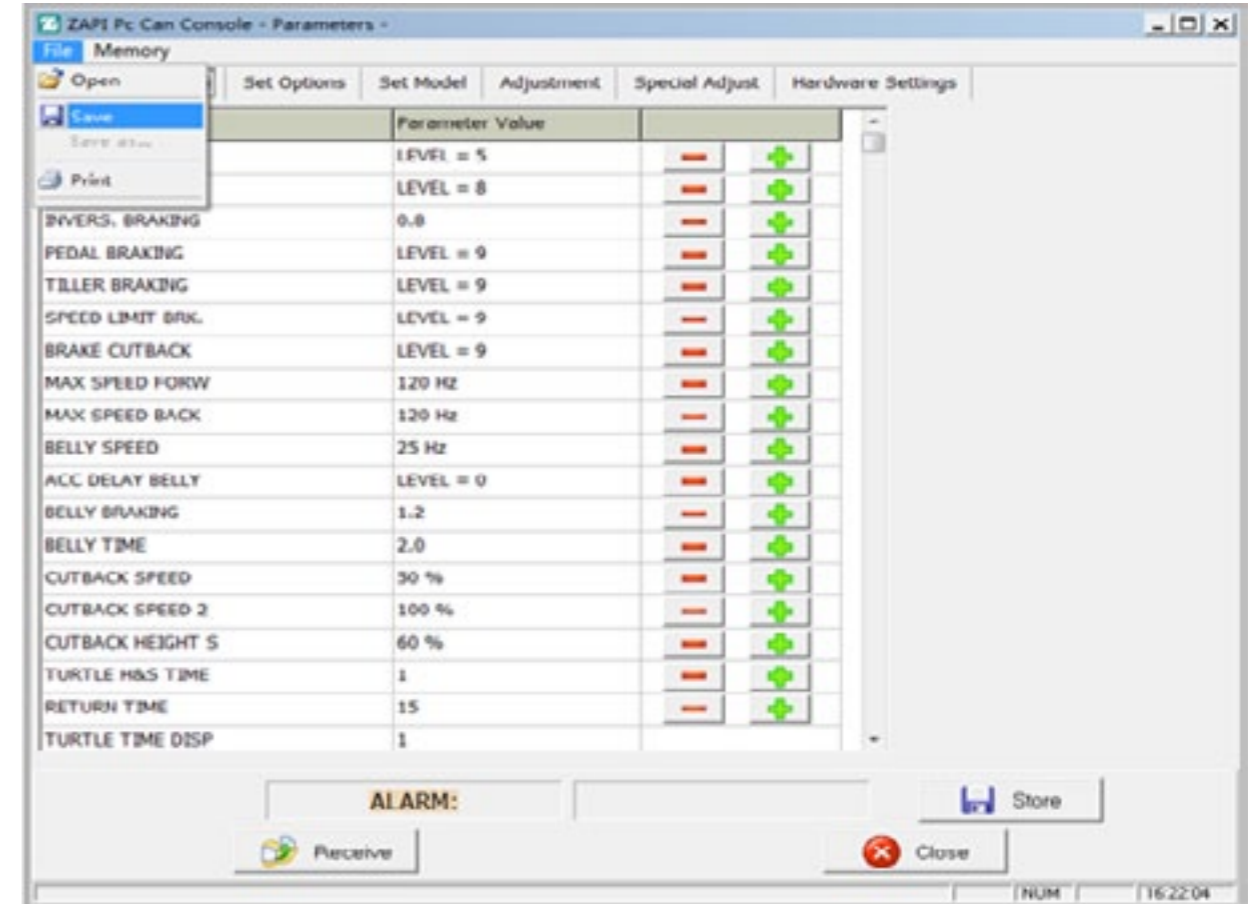
Fig.2.4
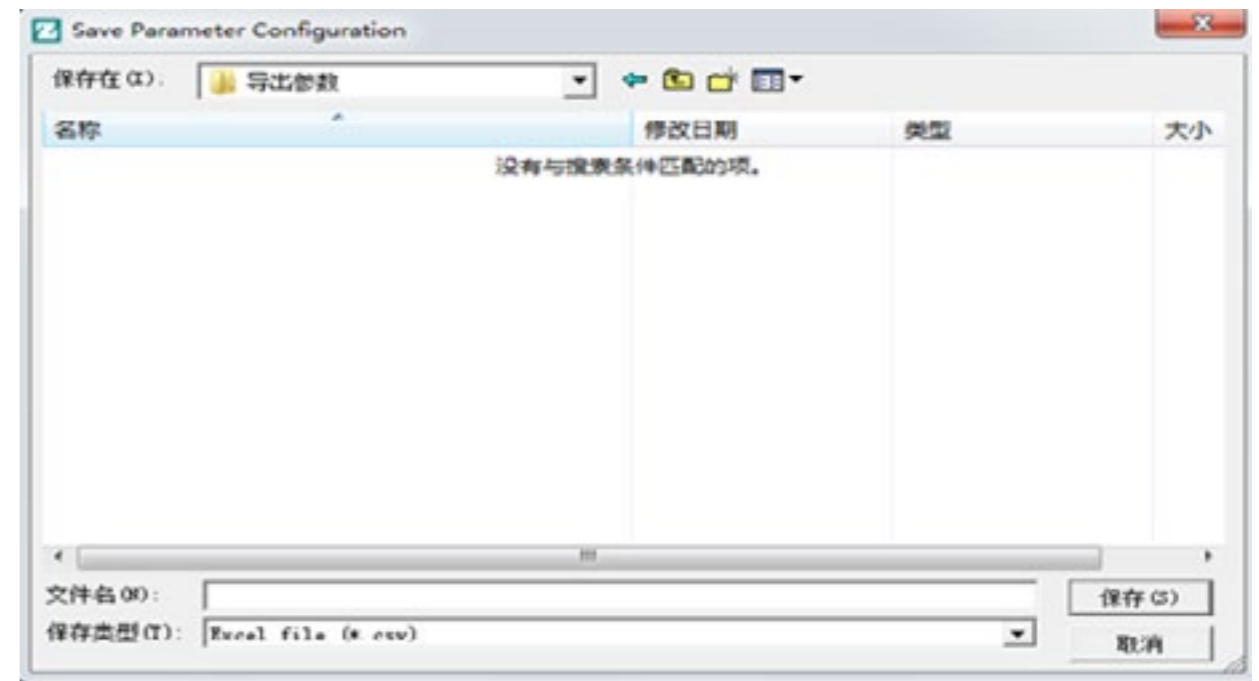
Fig.2.5

Enter the name of the parameter table, as shown in the Fig.2.6.
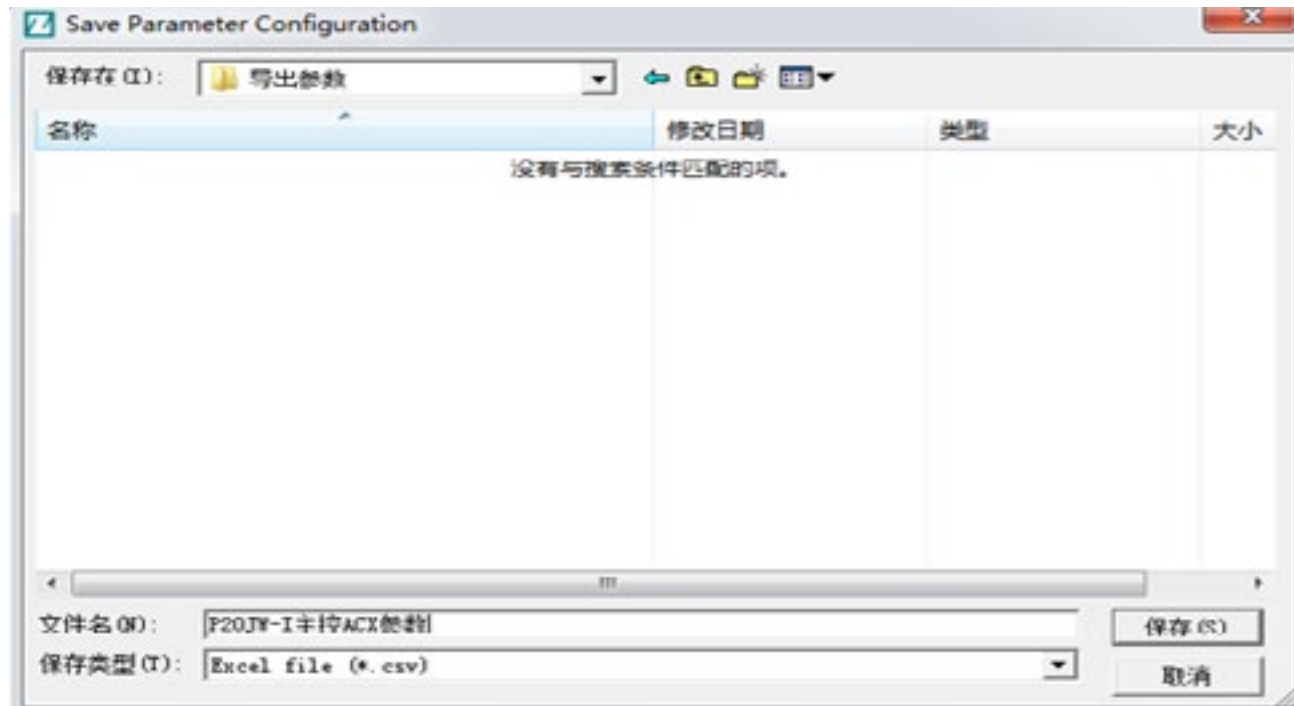
Fig.2.6

Enter comments or any letters. Enter ZAPI and click the button "OK ", as shown in the Fig.2.7.
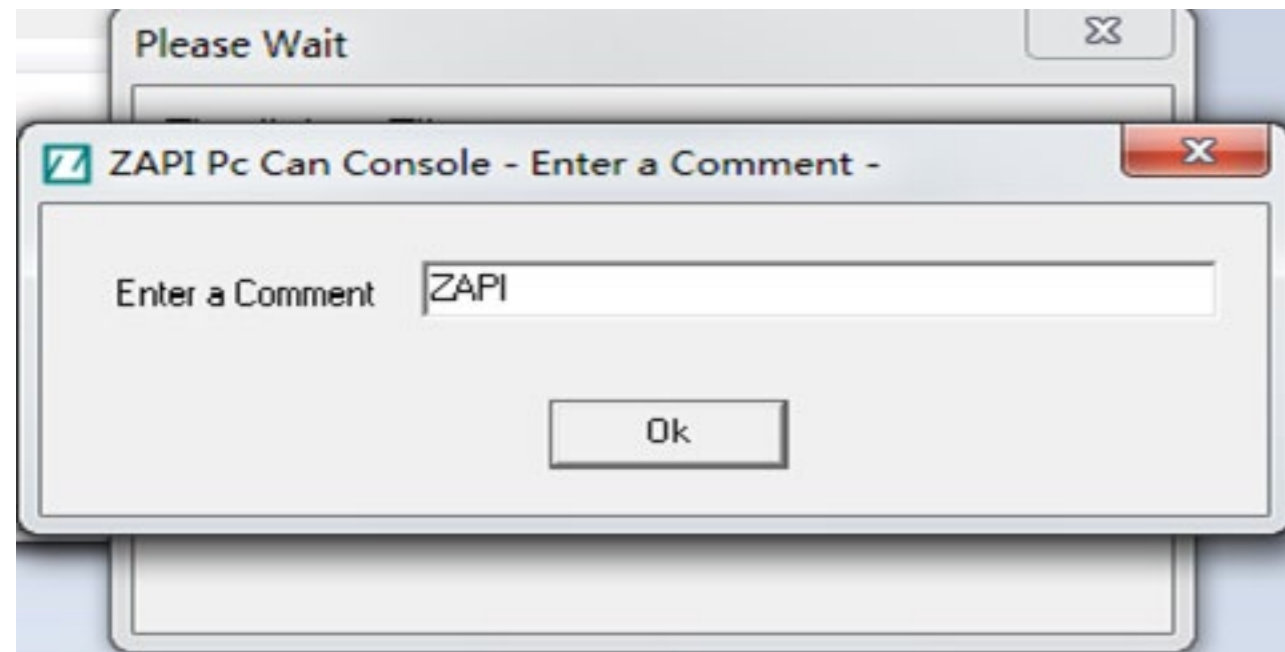
Fig.2.7

Parameter export is finished, as shown in the Fig.2.8.
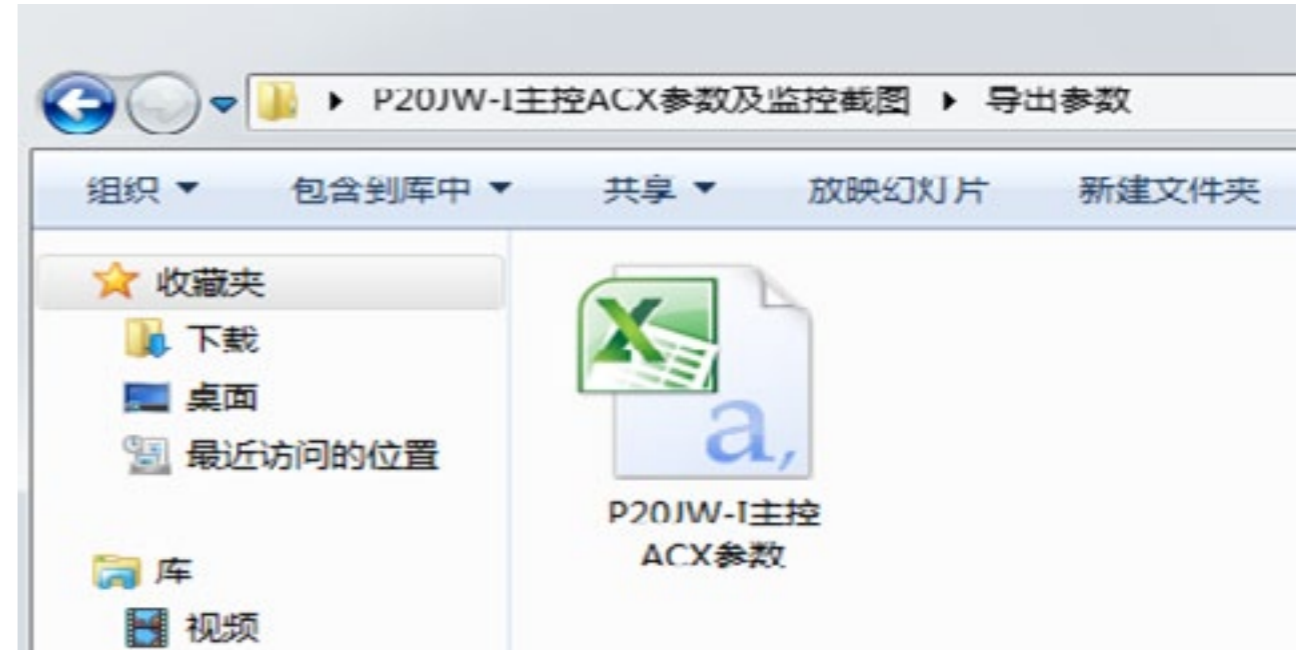
Fig.2.8

8.6 BURNING PROCEDURES OF THE SERIAL PORT

1. AC-0 Program Burning

The burning way is applicable to the burning software ZpWinFlaher whose

ZAPI mode is AC-0.

Flash
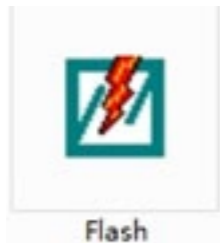
Burning Tool

Parts of the Forklift _ Serial Port Data Cable _AZ1002

connect to the controller serial port

Connect to the computer USB
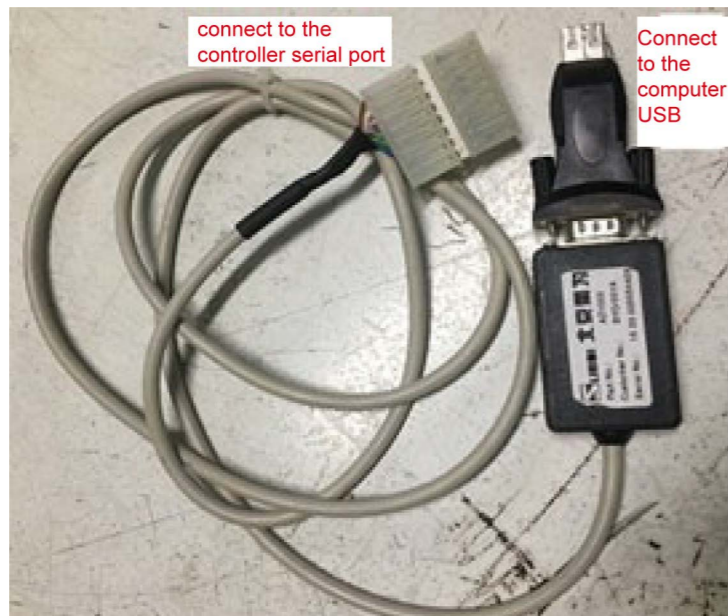
The interface location of the controller is as shown in the Fig.1.1.

Burning the controller serial port

Fig.1.1

Operating Procedures:

1. Select the drive file: After the device is connected, enter the software→

"Select Decice"→"Select Decice", as shown in the Fig.1.2.

Fig.1.2

Select the drive file (its main control model is AC-0) as shown in figure 1.3. Then double-click the file.

Note: Since the drop-down bar on the right side shows limited files, you need to use the down key "↓" on the computer keyboard to find and select the driver file.

Fig.1.3

Note: This step only needs to be set once and can be default in the next time.

2. Import the program: Click "Actions"→"Load file" and select the program. Taking the P20PS forklift as an example, the controller mode of the forklift is AC-0, as shown in the Fig.1.4.
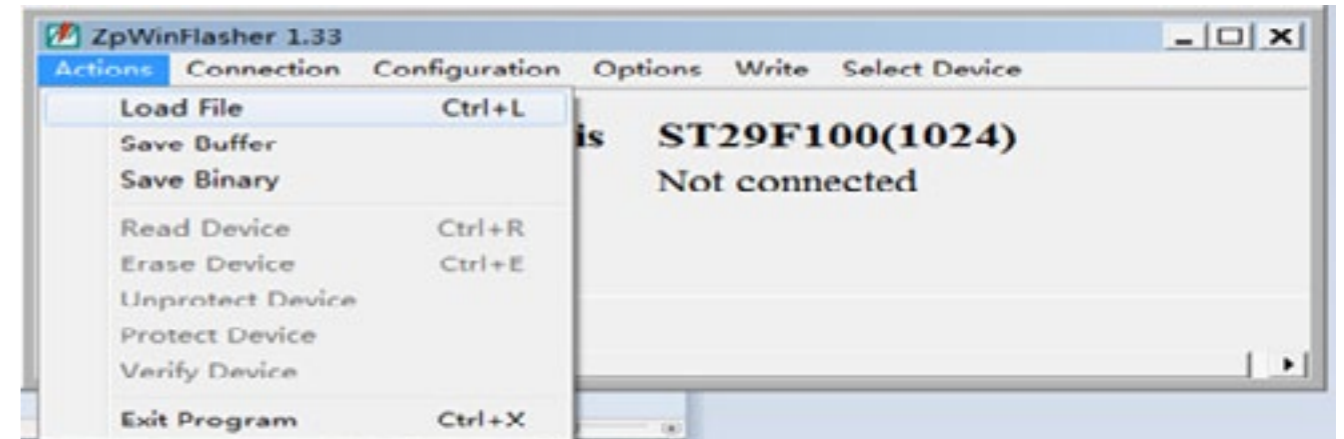
Fig.1.4

Select the software and then click the button "Open", as shown in the Fig.1.5.
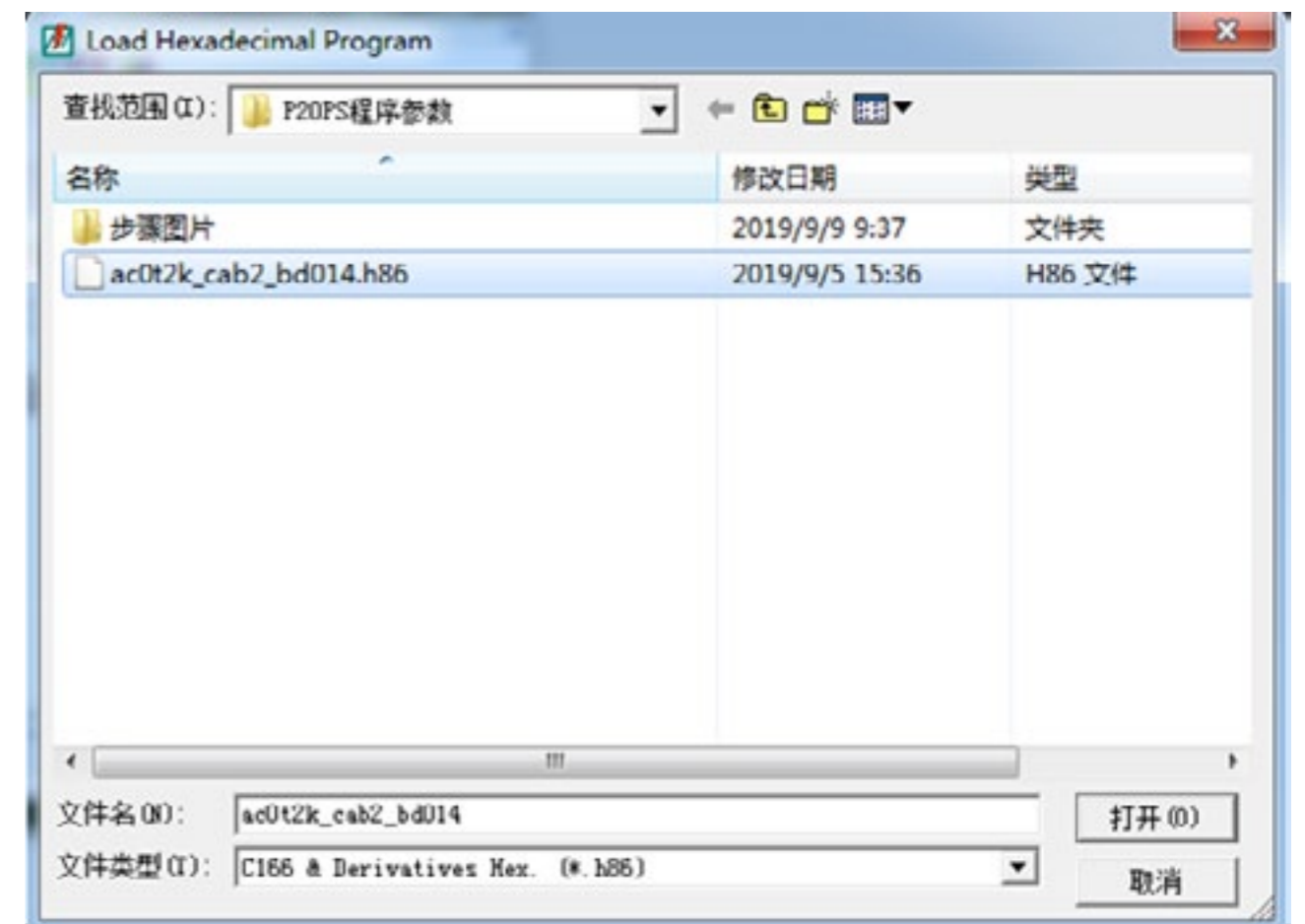
Fig.1.5

Click the button "OK", as shown in the Fig.1.6.
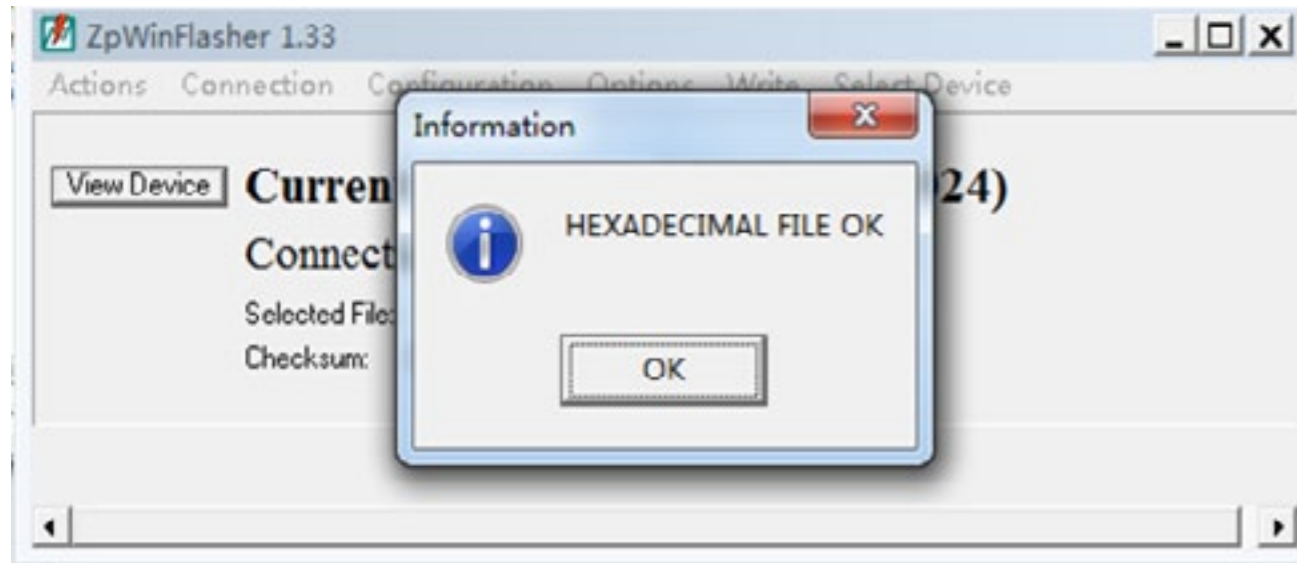
Fig.1.6

3. Select the option "Configuration", as shown in the Fig.1.7.

Fig.1.7

Enter the following interface. Except that port settings in the box depend on usage, other

port settings can not be changed. If you want to check ports, please click "Device

Manager" →"Port" and click the button "OK" after the setting is finished, as shown in

Fig.1.8 and Fig.1.9.
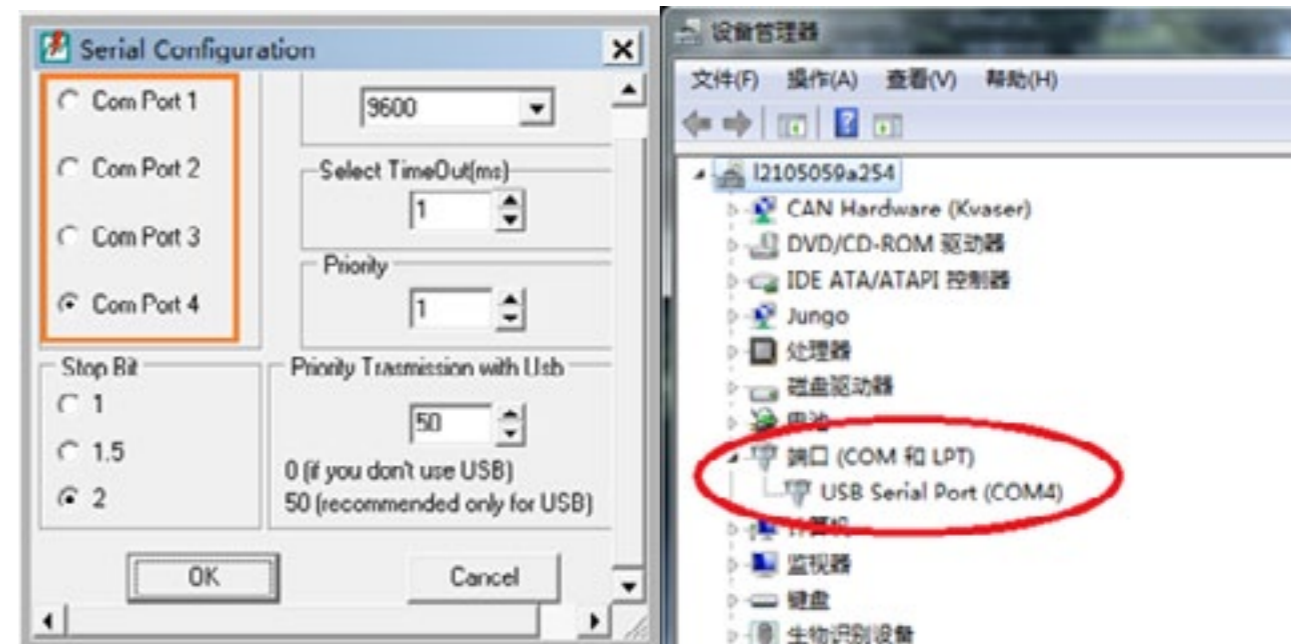
Fig.1.8   Fig.1.9

4. Connect: Click "Connection"→"star" and then open the ignition key switch→"OK", as shown in Fig.1.10.

Fig.1.10

5. Erase the previous program and click "Actions"→"Erase Decice", as shown in Fig.1.11.
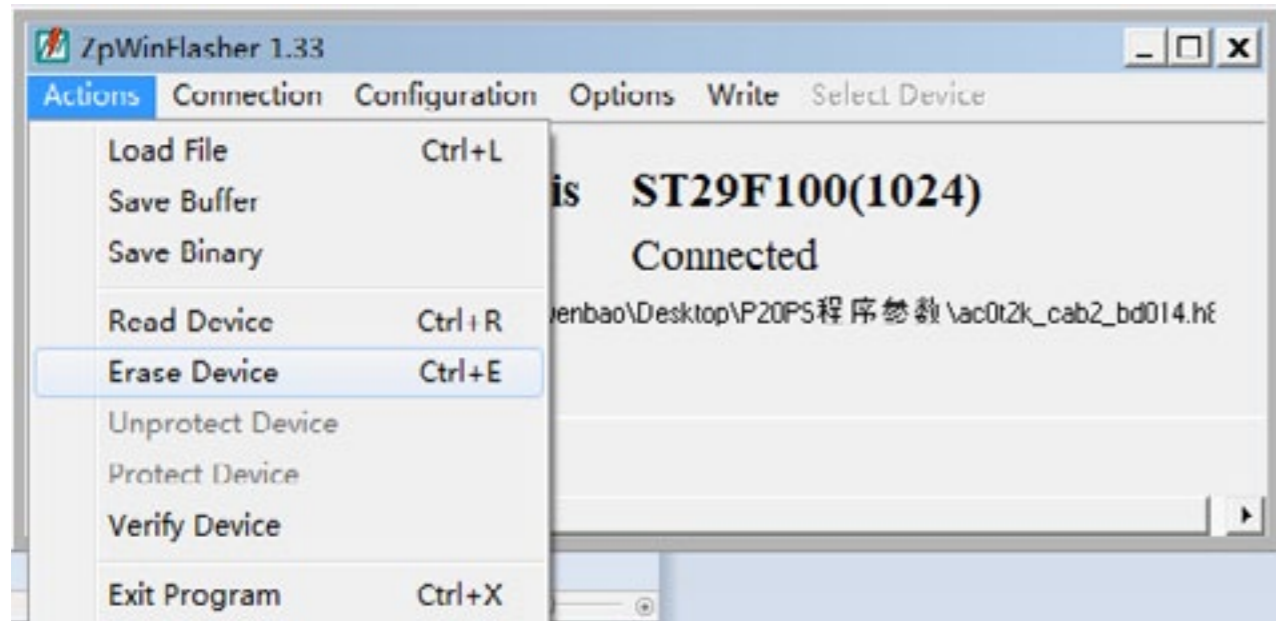
Fig.1.11

The confirm command interface pops up and then click "OK", as shown in the Fig.1.12.
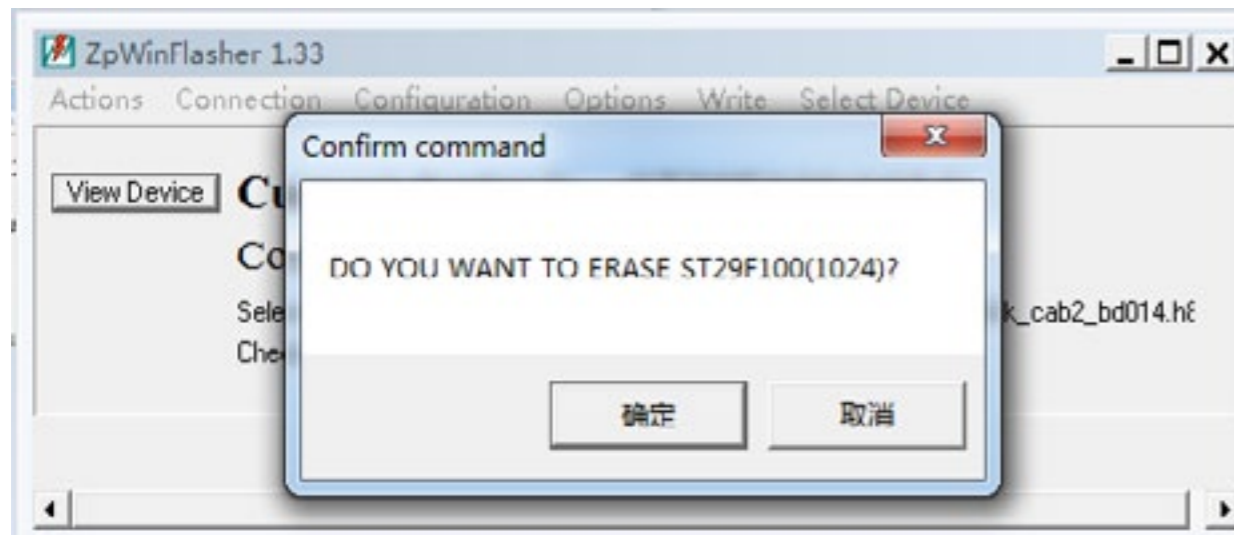
Fig.1.12

The device is erased, as shown in the Fig.1.13.
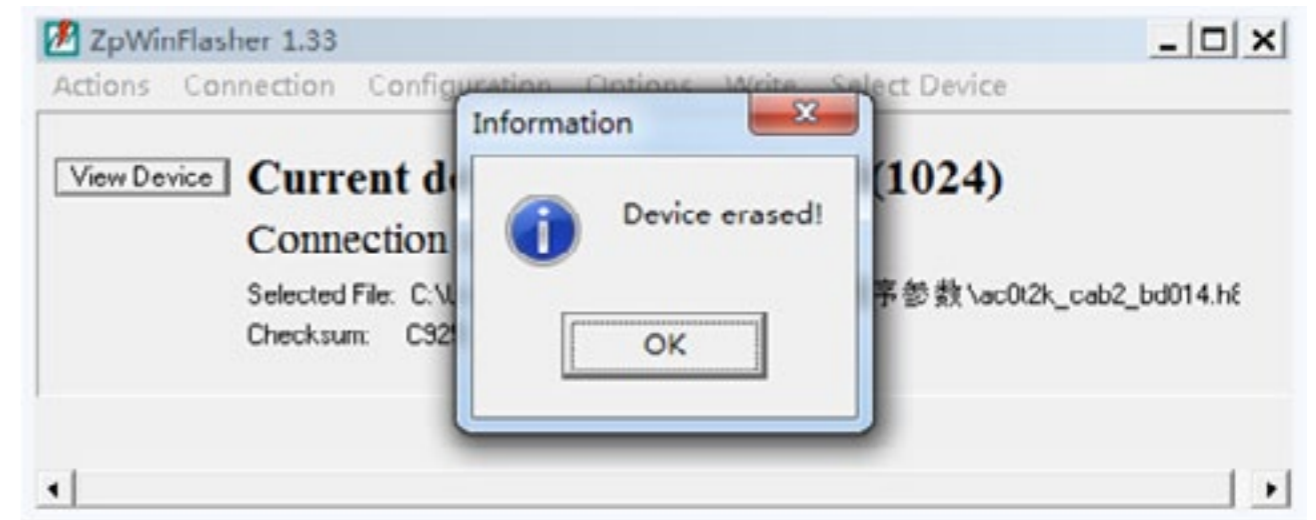
Fig.1.13

6. Write Program: Click the option "Write", as shown in the Fig.1.14.

Fig.1.14

Start reading and then verify it, as shown in the Fig.1.15.
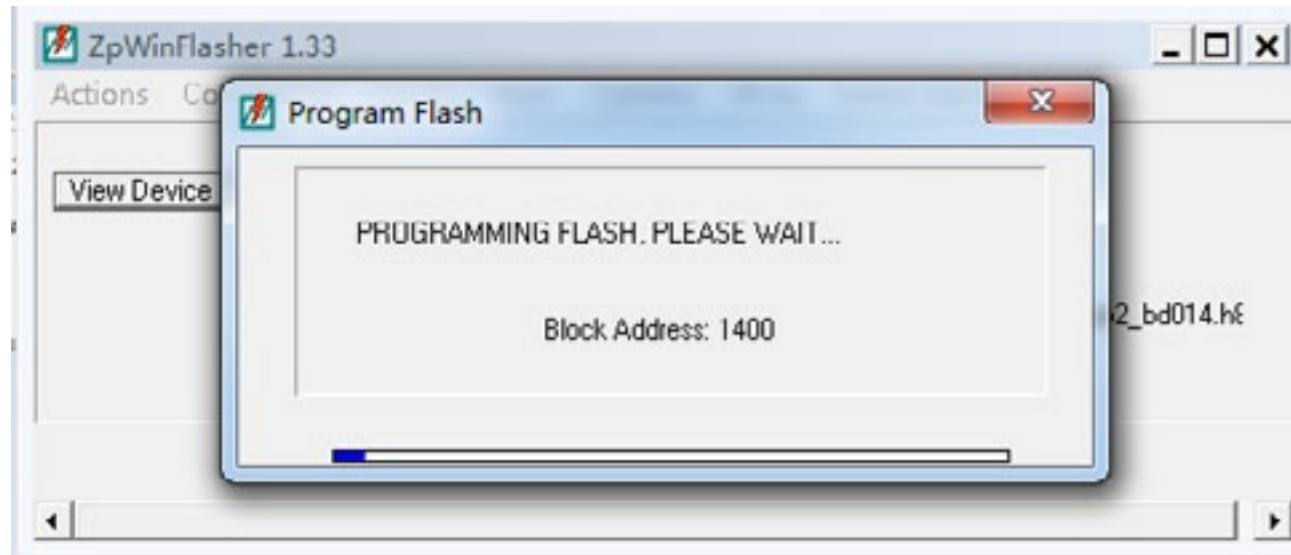
Fig.1.15

After the writing and verification is complete, click the button "OK", as shown in the Fig.1.16.
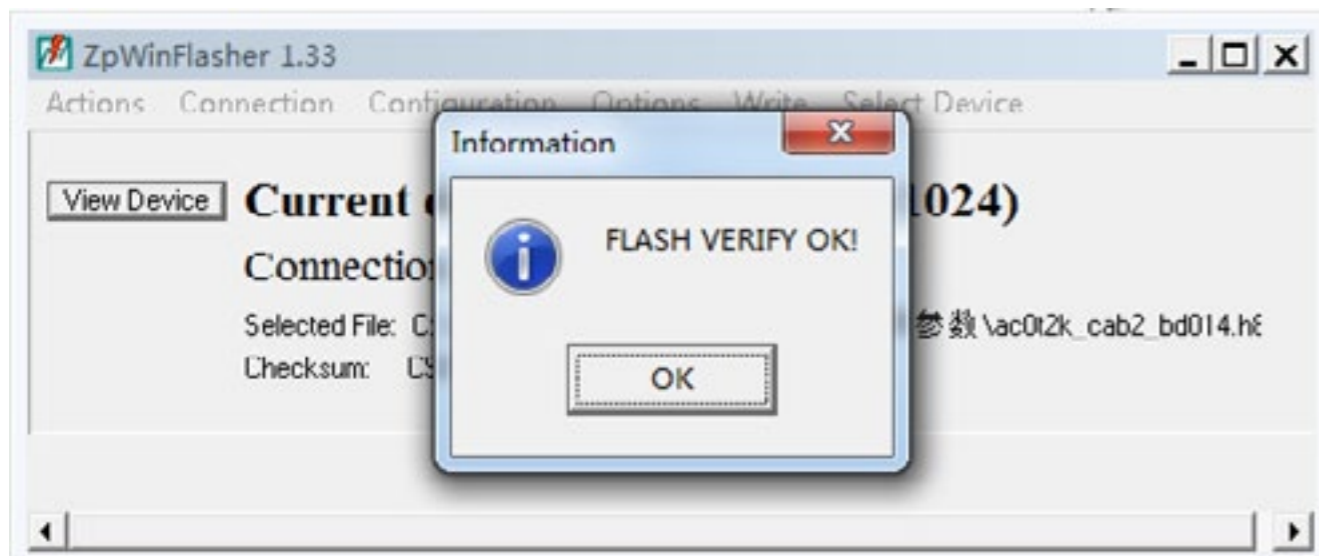
Fig.1.16

7. Click "connection"→"stop" and then finish the burning, as shown in the Fig.1.17.

Fig.1.17

Please pull out the device and then use ZpCanConsole and corresponding CAN box to import the connection parameters.

ⓘ Hint

Only trained and qualified technical personnels can perform the burning way of the controller COMBIACX and AC-0 .

8.7 TABLE OF FAULT CODES

FAULT CODE	FAULT	REMEDY
02A00	BATTERY LOW	If parameters of "BATTERY CHECK" are not set as "0", the fault will be reported, and the lifting function will be locked when the battery power is less than 15% and no bars are displayed on the instrument. Please charge in time. If the battery is electric, check whether the value of "ADJUST BATTERY" on the controller is consistent with that of battery voltage.
	EPS RELE OPEN	
	DATA ACQUISITION	If the fault is activated to show that it is in a phase of data acquisition, please wait until data is acquired completely.
	DATA ACQUISITION	When the maintenance time is up, check it.
		Revise CHECK UP DONE into ON. Shut down and restart.
02A01	WRONG CONFIG	Clear EEPROM
02A08	WATCHDOG	Watchdog circuit will be activated before software starts. Under working or standby states, the signal of watchdog is ineffective (warning state). Fault analysis: a broken state has been seen in the watchdog hardware circuit or the microcontroller output part. If both of the above two are irrelevant with outer parts, replace the controller.
	FLASH CHECKSUM	After the key is turned on, the value of flash checksum on the program is positive. If it is negative, the signal of fault will appear. Fault analysis: It is blamed for the flash memory of microcontroller. The flash checksum may be broken, or the program stored suffered from damage. Try to reset the pro-gram of the logic card. If the fault continues, it should be blamed for the microcontroller. Replace the controller.
	WATCHDOG#2	Cause: The Watchdog circuit will be activated before software starts. Under working or standby states, the signal of watchdog is ineffective (warning state). Fault analysis: A broken state has been seen in the watchdog hardware circuit or the microcontroller output part. If both of the above two are irrelevant with outer parts, replace the controller.
02A10	WRONG RAM	Find faults when performing tests for main ram: the registration address is "DIRTY". The fault will limit the operability of forklifts. Fault analysis: lose the key switch and open again. If the fault still exists, replace the controller.
02A11	STALL ROTOR	1.Motor stalls. 2.Fault appears in the encoder of the motor. 3.Wiring harnesses is broken or fault is found in the wiring. 4.The encoder is disabled in its power supply.
02A13	EEPROM KO	1.Restart the electric lock. Please replace the controller if the fault still exists. 2.Restart the electric lock. Please reset parameters if the fault disappears.
		Perform CLEAR EEPROM. If the fault disappears, change the parameters as set values singly. Instead, try to replace the controller.
	PARAM RESTORE	If CLEAR EEPROM has been performed, change the prompt parameters of fault as a default value. If not, there is a fault inside the controller.
02A16	AUXOUTPUT KO	Check whether the coil of electromagnetic brake is normal. If not, replace the controller.
02A17	LOGIC FAILURE#3	The output circuit of coil suddenly disconnects during operation. A fault is found in the current protection function of the logic card. Replace the controller.
02A18	LOGIC FAILURE#2	1. Check whether the circuit of motor power line is normal, including the safety device of the controller. 2. Check the parameter list. 3. If it is bot blamed for the above two, replace the controller.
02A21	CHARGE SAFETY	When it is charging, any movement of forklifts will report the fault. It can protect forklifts from being operated when charging.
02A27	PHASE KO	Check whether the connection among U/V/W is normal.

02A28	PUMP VMN LOW	Cause: When the machine starts, the low-end voltage of MOS transistor is 10% higher than that of normal battery or the phase voltage is 50% higher than battery voltage. Possible causes: 1.The wiring of the motor is incorrect or a fault is found in the circuit of the motor; check whether the three-phase connection is correct; check whether there is electric leakage in the motor connecting to the ground; check whether the coil of the motor is broken. 2.Replace the controller.
02A29	PUMP VMN HIGH	Cause: When the machine starts, the low-end voltage of MOS transistor is 10% higher than that of normal battery or the phase voltage is 50% higher than battery voltage. Possible causes: 1.The wiring of the motor is incorrect or a fault is found in the circuit of the motor; check whether the three-phase connection is correct; check whether there is electric leakage in the motor connecting to the ground; check whether the coil of the motor is broken. 2.Replace the controller.
02A30	VMN LOW	Check the three-phase
02A31	VMN HIGH	Cause: When the machine starts, the low-end voltage of MOS transistor is 10% higher than that of normal battery or the phase voltage is 50% higher than battery voltage. Possible causes: 1.The wiring of the motor is incorrect or a fault is found in the circuit of the motor; check whether the three-phase connection is correct; check whether there is electric leakage in the motor connecting to the ground; check whether the coil of the motor is broken. 2.Replace the controller.
02A37	CONTACTOR CLOSED	Check whether the master contactor adheres.
02A38	CONTACTOR OPEN	1.The circuit of the master contactor coil disconnects. 2.The main contactor is broken.
02A40	AUX DRIV SHRT	The drive circuit for electromagnetic brake or auxiliary electrical brake is short-circuited.Check whether the short circuit or low impedance push-pull output exists between A16 and –BATT. If a circuit fault appears in the driver of the logic card, replace the controller.
02A41	WRONG BATTERY	When starting, check battery voltage with the controller and determine whether it reaches what is allowed. 1.check whether the value of BATTERY VOLSIGNE on the TESTER menu is consistent with that on the voltmeter. If not, use ADJUST BATTERY function and change the battery voltage to match the measured value. 2.Replace the battery.
02A42	AUX DRIV OPEN	The driving circuit of the auxiliary coil can't drive load. The device itself or driving coil is broken. Replace the controller.
02A47	EVP2 NOT OK	Check whether the input voltage of NAUX2 is normal. If not, re-mark the maximum and minimum values of NAUX2 and restart the key. Then the fault disappears.
02A48	EVP1 NOT OK	Check whether the input voltage of NAUX1 is normal. If not, re-mark the maximum and minimum values of NAUX1 and restart the key. Then the fault disappears.
02A49	LIFT + LOWER	1.Operation is inappropriate. 2.It is blamed for faults of lifting and descending switches. 3.Replace the controller.
	i=0 EVER	If the three-phase connection is correct, replace the controller.
02A50	EVP1COIL OPEN	Check whether the coil of NAUX1 is set as the open circuit or whether the type of EVPI is set correctly.
02A51	EVP2COIL OPEN	Check whether the coil of NAUX1 is set as the open circuit or whether the type of EVPI2 is set correctly.
	TILLER OPEN	When the handle input switch disconnects, the master contactor will disconnect and report an alarm after about 30 seconds. The alarm will not disappear until the master contactor runs again.
02A52	PUMP I=0 EEVER	Check whether it is correct in the connection among power lines of the oil-pump motor; if yes, replace the controller.
02A53	STBY I HIGH	The signal output from the current sensor, detected by the microcontroller, exceeds what is allowed by the inactive current. Since the fault is irrelevant with peripheral components, just replace the controller.
	WRONG ZERO	When it starts, the feedback value on the high-end voltage of VMN is not around 2.5V. The circuit of the controller is broken. Fault analysis: recommend to check the following items. Connection inside the motor. Connection among motor power cables. Drain current between the motor and the forklift housing. If the connection of the motor is good, check the controller and replace it.

02A54	LOGIC FAILURE#1	It is a fault caused by low-voltage or over-voltage protection. Under a 24V system, the controller de-tects that the voltage is over 45V or below 9V; while under a 45V system, it is over 65V or below 11V. Possible causes: 1.Check whether a short circuit appears in the circuit system, such as DC-DC, brake coil, or check whether the input power of the controller is connected well. 2.Check whether the battery voltage is too low or too high. 3.Detect B+ and B, and check whether the power cable over the binding post of the master contactor is tightened well. 4.Check whether calibration parameters of controller voltage are consistent with those of actual voltage. 5.For the hardware circuit fault with overvoltage protection on the logic card, replace the controller.
02A55	LOGIC FAILURE#2	For it is a fault on the phase-voltage feedback hardware circuit of the logic card, replace the controller.
02A56	PUMP I NO ZERO	Replace the controller.
02A60	CAPACITOR CHARGE	When the electric lock is turned on, the controller will charge the capacitance through a power resistor and detect whether the capacitance is overcharged in the regulated time. If the capacitance is in insufficient power and voltage thereof is still 20% lower than that of the battery, the controller will alarm and thereby the master contactor will not closed down. Possible causes: 1、If peripheral devices such as DC-DC and motor, or other devices interfere with the charging of the controller, interference on these devices should be eliminated. 2、If the charging resistance disconnects and faults are found in the charging circuit and power models, the controller should be replaced.
02A61	THERMIC SENS. KO	The output signal of temperature sensor of the controller exceeds what is allowed. Since the fault is irrelevant with peripheral components, just replace the controller.
	HIGH TEMPERATURE	Measure the temperature of the controller board.
02A62	TH. PROTECTION	Drop the temperature of the controller below 85°. If the fault still exists, it may be blamed for the temperature sensor or the logic board of the controller itself. Replace the controller at this time.
02A64	TILLER ERROR	Replace the controller.
02A65	MOTOR TEMPERAT	1.The fault appears when the temperature digital switch of the motor turns on or when the analog sig-nal exceeds the switch-off value. 2.When the temperature of the motor reaches 120℃, the controller will alarm. By this time, the forklift still can move, but the maximum current is cut and the performance of the forklift is reduced. When the temperature of the motor reaches 125℃, the motor stalls working where it should be cooled down. 3.If the fault still exists when the motor cools down, check the circuit. If necessary, replace the con-troller.
02A67	SENS MOT TE	The output signal of temperature sensor of the controller exceeds what is allowed. Check the value of the sensor and the connection of cables. Otherwise, it should be blamed for the inside of the controller.
	NO CAN MSG	It is a fault about CAN communication between the steering and traction. Check the setting of CAN connection and the software, and version information.
02A68	SMARTDRIVER KO	Check whether there is a short circuit between the high-end driver of the electromagnetic brake (CNB#1) and B-. Otherwise, the internal drive model may be damaged.
	WAITING FOR NODE	If a controller connected to another controller can't communicate smoothly under the CAN commu-nication network, it will be always in a waiting state until all the CAN communication network works smoothly. Find out the reason why those model connection can't communicate smoothly, and check the version of the software or set of parameters is correct.
02A70	ENCODER ERROR	Check the encoder of the motor.
02A71	EEPROM KO	If a fault is found in the storage area of parameters, the forklift will stop moving. If the fault still exists after the electric lock is closed repeatedly, the logic card shall be replaced. If the fault disappears, parameters stored previously will be replaced by wrong ones and thereby being reset.

02A72	VMN LOW	Causes: when starting, the high-end voltage of MOS transistor is 66% lower than that of the capacitance or it is lower than what is required during the operation of the motor. Possible causes: 1.The connection or circuit of the motor is incorrect; check the threephase connection of the motor is correct; check whether there is electric leakage in the motor connecting to the ground or the coil of the motor disconnects. 2.Check whether the suction of the master contactor is firm and whether the contact is worn. 3.Replace the controller.
02A73	sens-Motor temn ko	Check wire harness of the temperature sensor of the motor.
02A74	DRIVER SHORTED	Check whether a short circuit appears in the coil output by the controller. If any, replace the controller.
	AUX BATT. SHORT.	Check whether the connection between B1 and B5 is correct. If yes, replace the controller.
	DRV. SHOR. EV	Check whether a short circuit appears between the low-end of EV1/EV2/EV3 and B-. If yes, replace the controller.
02A75	CONTACTOR CLOSED	Before closing down the coil of the master contactor, the controller detects whether contacts of the master contactor adhere at first. Try to discharge the capacitor. If the capacitor voltage reduces the battery voltage by 20%, a fault may occur. Recommend to check whether contacts of the contactor adhere or to replace the controller.
	CONTACTOR CLOSED	When the electric lock is closed down, microcontroller will detect whether a short circuit appears in the driver of the main contactor. If any, it will alarm. Check whether a short circuit appears when the positive pole of the main contactor coil connects to A16 or the negative pole of power supply . If the outer part is normal, replace the controller.
	CONT. DRV. EV	Replace the controller
02A76	KEY OFF SHORTED	In the starting phase, a fault will appear when the controller detects that a low logic level signal is found in disconnecting the key switch. Fault analysis: it is likely that the voltage is too low. Recommend to check the following items: -The key switch is based on external load. (For example, DC-DC converter starts, and the input signal of the relay or contactor is lower than starting voltage.) -Check the connection among the power cable and positive and negative terminals of battery, and that among the power cable and –BATT and +BATT of the master contactor and controller. Use screws to con-nect with a torque range of 13NM÷15NM. -Voltage drop will be detected on the power supply cable when the key switch is turned ON every time. Fault signal: The fault may occur in the hardware of the controller and thereby it is necessary to replace the controller.
	COIL SHOR MC-EB	1.Check whether the output and load of the controller are too high. 2.Replace the controller.
	COIL SHOR EV	If there is a fault in a coil driven by PEV, check whether the connection between the coil driven by PEV and the coil itself is good.
	COIL SHORTED	Check whether a short circuit appears in the coils of the master contactor and oil pump contactor.
02A77	coil shorted	1.The coil of the master contactor disconnects. 2.The master contactor is broken.
02A78	VACC NOT OK	Detecting time: the standby state The alarm displays that the voltage of the accelerator is at least 1V higher than the minimum value set in the accelerator sinal(PROGRAM VACC). Possible causes: 1.The upper and lower voltage limits of the accelerator are not collected. Enter the PROGRAM VACC menu and Recollect again. 2.Error occurs in the accelerator wherein its pedal doesn't return, or error occurs inside the accelerator. 3.A fault occurs in the controller.
02A80	FORW+BACK	The controller will always detect and alarm when requests from two directions run signals at the same time. Possible causes are as follows: 1. The wire is broken. 2. A fault appears in the direction switch. 3. The operation is improper. 4. If a fault cannot be eliminated, the controller shall be replaced.

02A79	INCORRECT START	1. The direction switch has been closed before starting. 2. The operation sequence is wrong. 3. The wire connection is incorrect. 4. If a fault cannot be eliminated, the controller shall be replaced.
	PUMP INC START	The pump startup sequence is not correct. Possible reasons are as follows: 1. The lifting, tilting and other switches have been closed and before starting the machine. 2. The operation sequence is wrong. 3. The wire connection is incorrect. 4. If a fault cannot be eliminated, the controller shall be replaced.
02A82	ENCODER ERROR	The controller detects that the two consecutive speed readings of the encoder are quite different. Since the encoder inside the system is impossible to change the speed to a large degree in a very short time, the encoder may fail (The wiring of one or two encoders is worn or broken). Check mechanical and circuit functions of the encoder. The alarm may be caused by electromagnetic interference on the sensor bearing. If not the above causes, replace the controller. Please note: Manual operation may also cause that the controller displays the fault, and thereby the forklift needs to be powered off to restart. For example: 1. The forklift bumps into an obstacle suddenly, making itself impossible to move. 2. A driver slams on the brakes when the forklift is moving at high speed.
02A84	CAN BUS KO BMS	Check whether the BMS communication circuit is normal.
	canbus ko bms	Check the BMS communication circuit.
02A86	PEDAL WIRE KO	Check whether positive and negative terminals of the accelerator are connected to the controller.
	POS.EB.SHORTED	When the interlock is not closed down, the high-end driver of the electromagnetic brake outputs high voltage. 1.Check if any other high voltage circuits are connected to the highend outlets of the electromagnetic brake. 2.Otherwise, the high voltage still exists and the driving circuit inside the controller has been broken.
02A89	POWER MOS SHORT	The software will check the power bridge before the master contactor closes down wherein the power bridge will be converted into low-end power and phase voltage will be reduced to –BATT (rise to+BATT). If the phase voltage value doesn't vary with the indicator, the fault signal will occur. Replace the controller.
	PUMP VACC NOT OK	Detecting time: the standby state The alarm displays that the voltage of the accelerator is at least1V higher than the minimum value set in the accelerator signal（PROGRAM VACC）. Possible causes: 1.The upper and lower voltage limits of the accelerator are not collected. 2.Enter the PROGRAM VACC menu and Recollect again. 3.The controller has been broken.
02A90	PUMP VACC RANGE	1. The upper and lower voltage limits of the accelerator are not collected. Enter the PROGRAM VACC menu and Recollect again. 2. Check whether the lift speed-sensor is connected correctly.
	LIFT+LOWER	Check whether the signal of the handle switch is normal.
02A91	LIFT LOW ACTIVE	Check the lowering switch triggered at startup.
02A92	CURRENT GAIN	The maximum current gain parameter is the factory set value, showing that the program of maximum cur-rent adjustment parameter has not been enabled. Solutions: ZAPI technicians set thecurrent gain parame-ters correctly.
	CARD TILLER	BYD system is unused.
	CANBUS KO TILLER	Handle communication fault .
02A93	WRONG BATTERY	Check whether the battery works normally.
02A94	DATA ACQUISTION	It is not allowed to change the set of controller parameters when the controller works.
02A96	ANALOG INPUT	When A/D input by analog signals is converted into a fixed value, the fault signal appears where delay time exceeds 400ms. The function is used to detect A/D converter fault or analyze conversion fault of analog signal. If the fault persists, replace the controller.

02A66	BDI low	Since the battery is running low, please charge it.
17A01	batter y high temp.waring	Power it off. Put it aside and then restart it.
17A02	batter y high temp.alarm	Power it off. Put it aside and then restart it.
17A05	battery Status Alarm	Restart it. If there is any other problems, please contact the after-sale staff.
17A06	BDI low	Since the battery is running low, please charge it.
17A07	BDI low	Since the battery is running low, please charge it.
17A08	BDI low	Since the battery is running low, please charge it.
16A06	CAN BUS KO .60	Check whether the handle connector or instrument connector is connected normally. If yes, restart for reporting the error and contact the after-sales staff.

8.8 ELECTRICAL MAINTENANCE DIAGNOSIS

In this section, you can read the error codes through MDI display. The error code of the controller is shown as 02AXX, the error code of the steering controller is shown as 06AXX and the error code of the display is shown as 17AXX.

Use the BYD forklift to read the current fault codes   **ALARM:**   and the record information of the historical faults.

Analyze and detect the reading information and therefore finishing the maintenance of the forklift.

If the forklift works abnormally, read error codes on the MDI display first and then check the current error codes in ALARM.

If there are no error codes in ALARM, then check the error record table   for the error code in the recent history records.

1. Error ID: 02A66
Error description: BATTERY LOW
Cause A:

When the battery level is less than 10%, it alarms. Meanwhile, the speed will decline and the lifting function is prohibited.
M1: Use the multimeter to detect the battery voltage.
If parameters of "BATTERY CHECK" are not set as "0", the error will be reported, and the lifting function will be locked when the battery power is less than 15% and no bars are displayed on the display. Please charge in time. If the battery is electric, check whether the value of "ADJUST BATTERY" on the controller is consistent with that of battery voltage.
For ADJUST BATTERY, the current voltage can be acquired automatically. When the battery level is not accurate, click "Acquire" and then store it, as shown in the following figure.
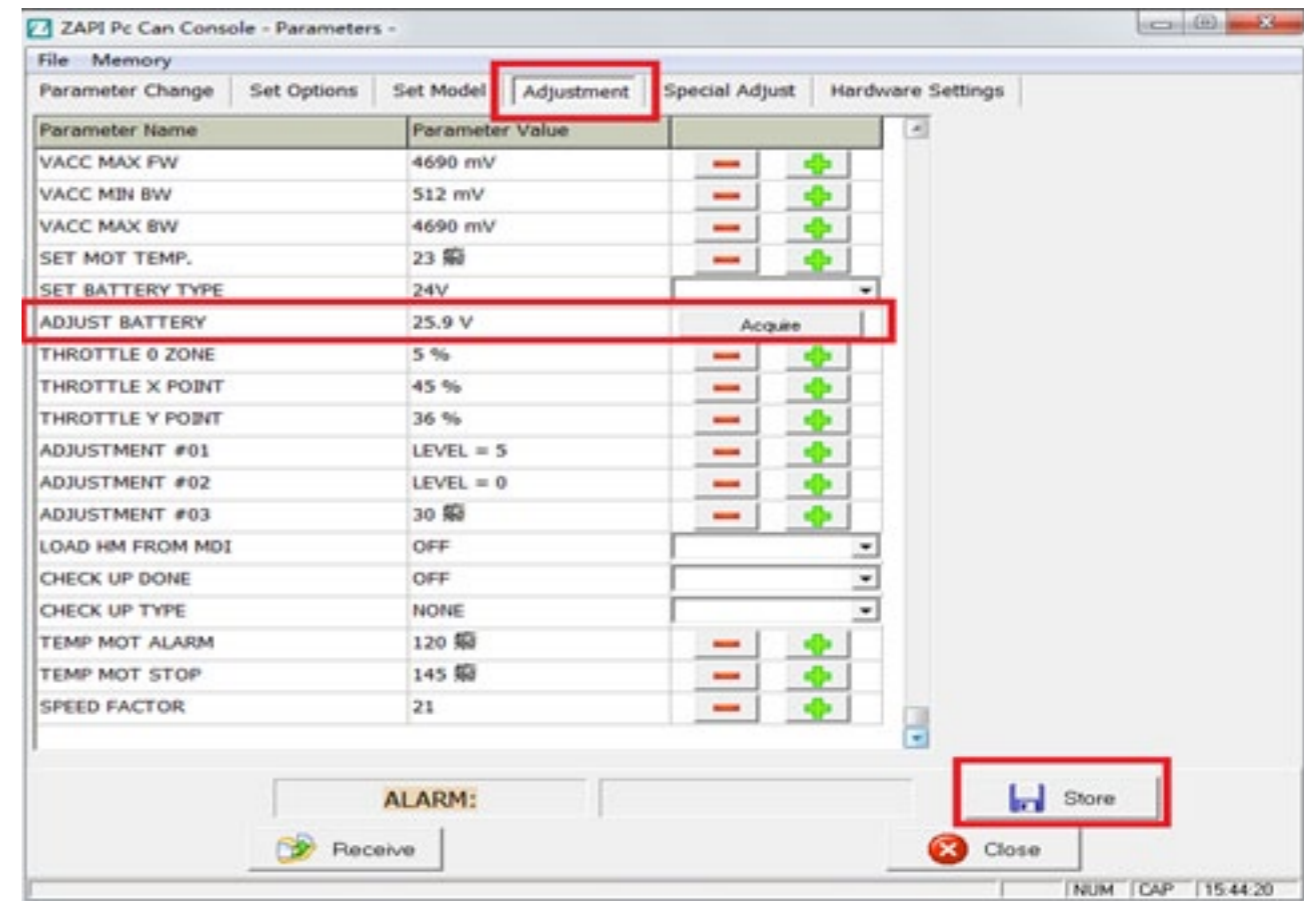
2. Error ID: 02A00
Error Description: DATA ACQUISITION
In case of several faults, check the internal faults of traction and steering control. Cause A
If the fault is activated to show that it is in a phase of data acquisition, please wait until data is acquired completely.
Handling Method: In the process of adjusting the maximum current of the controller. Note: The error only appears when testing the Zapi. If it is found in the user, replace the controller. For the P20JW forklift, the main controller is COMBIACX.
If the display shows the error 02A00 and the error is detected on the host computer, replaced the faulty controller.
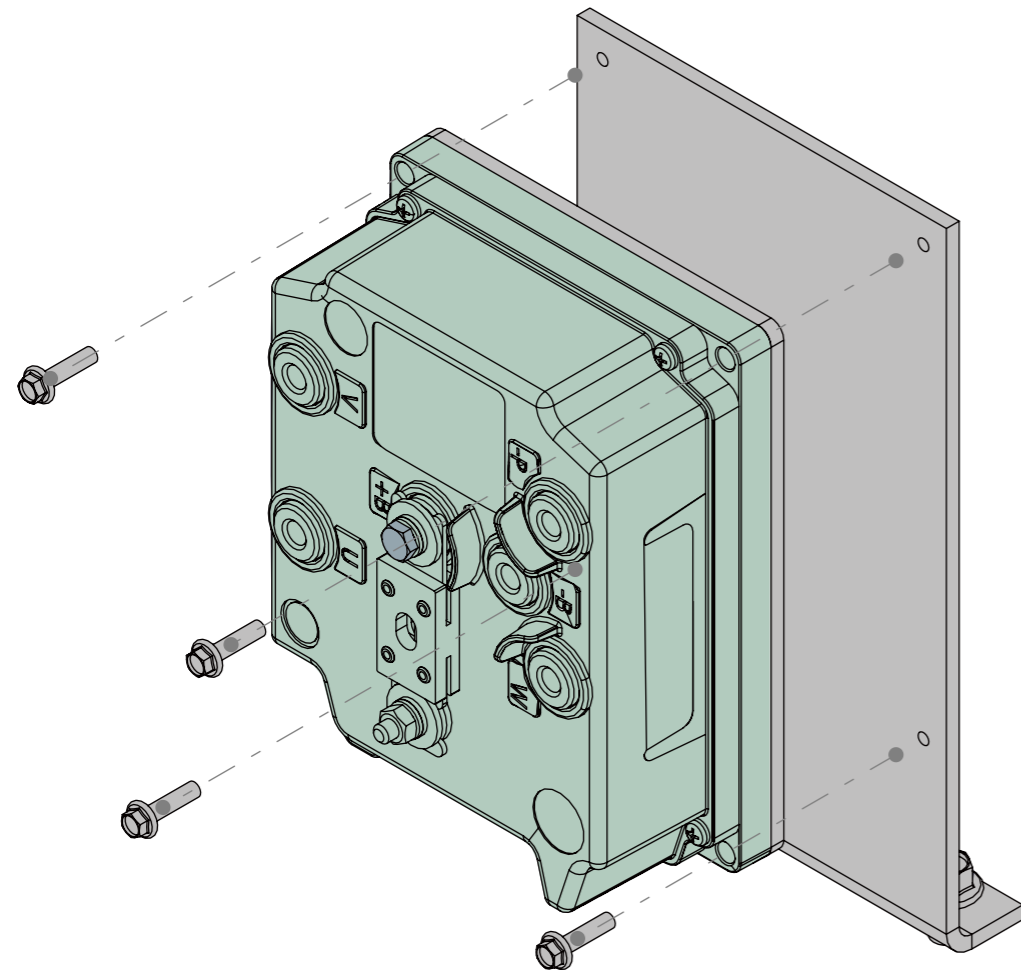
1.Replace the damaged controller.

2.If the forklift can not work normally, update the program of the main controller. Refer to 7.3.1 for details.

3.Error ID: 02A00
Since the error code of the display is defined variously, read the error
through the host computer.
Cause A
When the maintenance time is up, check it.
Handling Method:
In the item adjustment, change the state of CHECK UP DONE (from ON to OFF). Cancel
the function for alarming maintenance time.

4.Error ID: 02A08
Error Description: WATCHDOG
Since the error code of the display is defined variously, read the error
through the host computer.
Cause A
Watchdog circuit will be activated before software starts. Under working or standby states,
the signal of watchdog is ineffective (warning state).
Handling Method:
A broken state has been seen in the watchdog hardware circuit or the micro-controller
output part. If both of the above two are irrelevant with outer parts, replace the controller.
The operating method is same as that of the error code 02A00.

5.Error ID: 02A09
Error Description: FLASH CHECKSUM
Cause A
The CHECKSUM program fails to save the flash contents.
Handling Method: Re-download the software. If there is still an error, replace the controller.
The operating method is same as that of the error code 02A00.

6. Error ID: 02A08

Error Description: WATCHDOG 2

The error code of the display is defined variously. Before solving the error, check the

internal error of traction and steering controller.

Cause A

Watchdog circuit will be activated before software starts. Under working or standby states,

the signal of watchdog is ineffective (warning state).

Handling Method:

A broken state has been seen in the watchdog hardware circuit or the micro-controller

output part. If both of the above two are irrelevant with outer parts, replace the controller.

The operating method is same as that of the error code 02A00.

7. Error ID: 02A10

Error Description: WRONG RAM

Cause A

Find errors when performing tests for main ram: the registration address is "DIRTY". The fault will limit the operability of forklifts.

Handling Method:

Restart the key switch. If the error still exists, replace the controller. The operating method is same as that of the error code 02A00.

8. Error ID: 02A11

Error Description: STALL ROTOR

Cause A

The controller detected a significant difference between the two continuous speed readings of the encoder. The internal encoder can not change the speed in a very short time, resulting in the error.

Handling Method:

The encoder is faulty [The phase A (D1) and phase B (D4) wire is worn or broken]. Check for the mechanical and circuit functions of the encoder. Check whether iron filings adsorbed by the encoder cause the interference and therefore resulting in the alarm. Power it off and then restart the forklift. Check whether manual operation causes to this error displayed on the controller.

For example:

1) The forklift bumps into the barrier, making the forklift unable to move.

2) The forklift is stopped suddenly at a high speed.

If the above is irrelevant, replace the controller. The operating method is same as that of the error code 02A00.

9. Error ID: 02A17

Error Description: LOGIC FAILURE#3

Cause A

The protection function of the logic card current is faulty. Replace the controller.

Handling Method:

Restart the key switch. If the error still exists, replace the controller. The operating method is same as that of the error code 02A00.

10. Error ID: 02A27

Error Description: U/V/W PHASE KO

Cause A

The controller and the U, V and W wires of the drive motor are disconnected.

Handling Method:

Check whether the connection among U/V/W is normal.

11. Error ID: 02A28

Error Description: PUMP VMN LOW

Cause A

At startup, the high-end voltage of the MOS tube is less than 66% of the capacitor voltage, or the voltage is less than the required value during the operation of the motor.

Handling Method:

1) The wiring of the lift motor is incorrect or a fault is found in the circuit of the lift motor.

2) Check whether the positive and negative wire connection is correct.

3) Check whether there is electric leakage in the lift motor connecting to the ground; check whether the coil of the motor is broken.

4) Check whether the main contactor KM3 is firm, and whether the contact is worn.

If the above is irrelevant, replace the controller. The operating method is same as that of the error code 02A00. (DATA A)

12.Error ID: 02A29

Error Description: PUMP VMN HIGH

Cause A

When the machine starts, the low-end voltage of MOS transistor
is 10% higher than that of normal battery or the phase voltage is 50% higher than
battery voltage.

Handling Method:

1) The wiring of the lift motor is incorrect or a fault is found in the circuit of the lift motor.

2) Check whether the positive and negative wire connection is correct.

3) Check whether there is electric leakage in the lift motor connecting to the ground;

   check whether the coil of the motor is broken.

4) Check whether the main contactor KM3 is firm, and whether the contact is worn. If

   the above is irrelevant, replace the controller. The operating method is same as that

   of the error code 02A00.

13. Error ID: 02A31

Error Description: VMN HIGH

Cause A

When the machine starts, the low-end voltage of MOS transistor is 10% higher than that of
normal battery or the phase voltage is 50% higher than battery voltage.

Handling Method:

1) The wiring of the drive motor is incorrect or a fault is found in the circuit of the drive
   motor.

2) Check whether the three-phase connection is correct.

3) Check whether there is electric leakage in the motor connecting to the ground; check
   whether the coil of the motor is broken.

4) Check whether the main contactor KM3 is firm, and whether the contact is worn.
   If the above is irrelevant, replace the controller. The operating method is same as that
   of the error code 02A00.

14. Error ID: 02A32

Error Description: Pump Controller VMN

Before the contactor is turned on, the software can check the output voltage of controller -
P and preset it at a steady state value (The forklift type option is set as LEVEL=1). If the
voltage is too low, an alarm will be reported.

Cause A

1) The internal wire of the pump motor

2) The cable connection of the pump motor

3) There is leakage between the pump motor cable and the forklift body

Handling Method:

1) The lift motor is not connected properly, or there is something wrong with the circuit
   of the lift motor.

2) Check whether the positive and negative connection of the lift motor is correct.

3) Check whether there is leakage between the lift motor and the ground, and whether
   the motor coil breaks.

If the above is irrelevant, replace the controller. The operating method is same as that of
the error code 02A00.

15. Error ID: 02A40

 Error Description: AUX DRIV SHRT

Cause A

The driver of the electromagnetic brake is short-circuited.

Handling Method: Check whether there is a short or low impedance among B5, B1, A4
and -BATT.

If the above is irrelevant, it may be circuit error of the logic card driver. Replace the
controller. The operating method is same as that of the error code 02A00.

16. Error ID: 02A41

Error Description: WRONG BATTERY

When starting, check battery voltage with the controller and determine whether it reaches
what is allowed.

Cause A

The controller detects that the battery voltage is not within the nominal range.

Handling Method:

1) Check whether the value of BATTERY VOLSIGNE on the TESTER menu is
   consistent with that on the voltmeter. If not, use ADJUST BATTERY function and
   change the battery voltage to match the measured value.

2) Check if the battery is broken. If yes, replace the battery.

If the above parameters are set correctly, replace the controller. The operating method is same as that of the error code 02A00.

Handling Method:

Step 1: Measure the battery voltage with the multimeter and compare it with the

BATTERY VOLTAGE value in the TESTER menu. If the two values are inconsistent,

move on to the step 2.

BATTERY VOLTAGE in the TESTER menu:

Step 2: Acquire the current voltage automatically.

For ADJUST BATTERY, the current voltage can be acquired automatically. When the battery level is not accurate, click "Acquire" and then store it.

17. Error ID: 02A42

Error Description: A UX DRIV OPEN MDI ALARM

The driving circuit of the auxiliary coil can't drive load.

Cause A

The device itself or driving coil is broken.

Handling Method:

    1) Check whether there is short circuit or low impedance pull-down output between B1 and B5.

    2) It is the drive circuit error of the controller. Replace the controller.

The operating method is same as that of the error code 02A00.

18. Error ID: 02A49

Error Description: The lifting and lowering buttons are activated at the same time.

Cause A

The lifting and lowering buttons are activated at the same time.

Handling Method 1:

1) Check whether the lifting and lowering buttons are activated at the same time.

2) Re-operate the lifting and lowering buttons.

Cause B

It is blamed for faults of lifting and descending switches.

Handling Method 2:

1) Check whether the lifting and lowering switches of the handle switch is broken.

2) Check whether the circuit of the lifting and lowering switches is short-circuited.

 If the above is irrelevant, replace the controller. The operating method is same as that of the error code 02A00.

19. Error ID: 02A51

TILLER OPEN

Cause A

When the handle limit switch S3 outputs to the controller pin C6 and is disconnected for 30 seconds, the contactor will be power off and the controller will give a reminder that the handle has been disconnected.

Handling Method: This error will not be displayed on the display. When the handle limit switch S3 switch is closed again, the error will disappear automatically and the contactor will be firm. If the error persists, check whether the handle limit switch and controller pin C6 are normal for eliminating the outer error.

20. Error ID: 02A52

Error Description: Current Sensor Error

Cause A

The main controller cannot detect the current of the oil pump motor, and the power line of the oil pump motor is not connected.

Handling Method:

Check whether it is correct in the connection among power lines of the oil-pump motor; if yes, replace the controller.

The operating method is same as that of the error code 02A00.

21. Error ID: 02A53

Error Description: STBY I HIGH

Cause A

The signal output from the current sensor, detected by the micro-controller, exceeds what is allowed by the inactive current.

Handling Method:

Since the fault is irrelevant with peripheral components, just replace the controller.

The operating method is same as that of the error code 02A00.

23. Error ID: 02A58

Error Description: Initialize Error

Cause A

When the controller is initialized, the amplifier measures a voltage value beyond the allowable range. When the voltage signal value is greater than 3V or less than 2V, the error will appear.

Handling Method: recommend to check the following items.

1) Connection inside the motor.

2) Connection among motor power cables.

3) Drain current between the motor and the forklift housing.

4) If the connection of the motor is good, check the controller and replace it.

The operating method is same as that of the error code 02A00.

24. Error ID: 02A54

Error Description: LOGIC FAILURE#1

Cause A

Under a 24V system, the controller detects that the voltage is over 45V or below 9V; while under a 45V system, it is over 65V or below 11V.

Handling Method:

1. Check whether a short circuit appears in the circuit system, such as DC-DC, brake coil, or check whether the input power of the controller is connected well.

2.Check whether the battery voltage is too low or too high.

3.Detect B+ and B, and check whether the power cable over the binding post of the

master contactor is tightened well.

4.Check whether calibration parameters of controller voltage are consistent with those of

actual voltage.

5.For the hardware circuit error with over-voltage protection on the logic card, replace the

controller.

The operating method is same as that of the error code 02A00.

25. Error ID: 02A55

Error Description: LOGIC FAILURE#2

Cause A

It is a fault on the phase-voltage feedback hardware circuit of the logic card.

Handling Method:

For it is a fault on the phase-voltage feedback hardware circuit of the logic card, replace

the controller.

The operating method is same as that of the error code 02A00.

26. Error ID: 02A56

Error Description: PUMP I NO ZERO

Cause A

In standby mode (the pump motor is not activated), the current sensor on the pump

controller shows a value beyond the allowable range.

Handling Method:

The hardware problem of the controller may result from the fault of the current sensor or

the power module. Just replace the controller. The operating method is same as that of

the error code 02A00.

27. Error ID: 02A60

Error Description: CAPACITOR CHARGE

Cause A

Charging capacitor system:
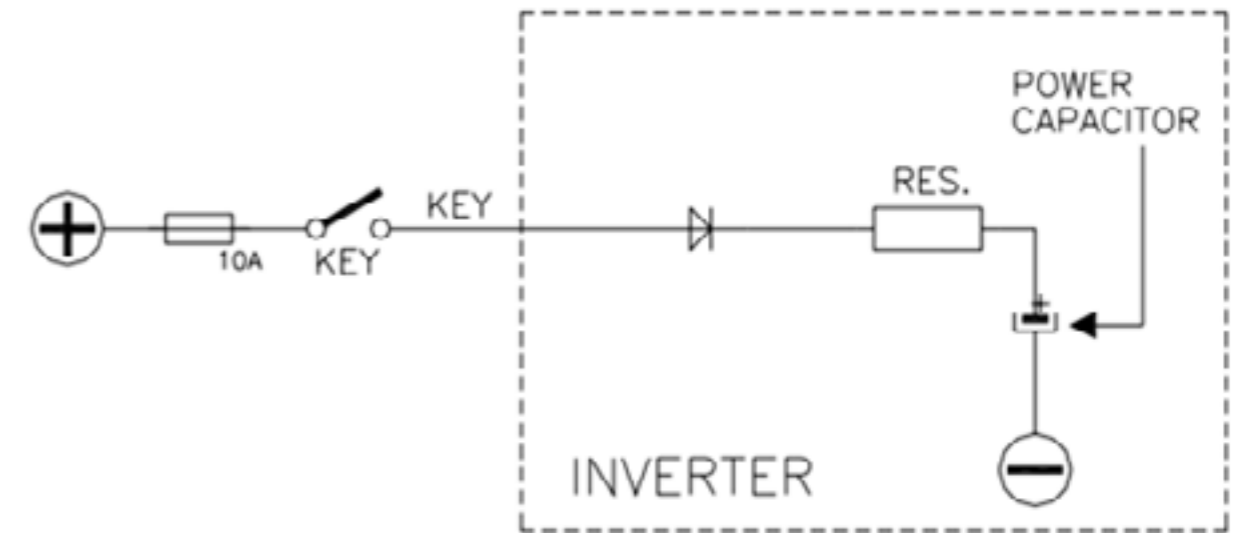
When the electric lock is turned on, the controller will charge the capacitance through a

power resistor and detect whether the capacitance is overcharged in the regulated time. If

the capacitance is in insufficient power and voltage thereof is still 20% lower than that of

the battery, the controller will alarm and thereby the master contactor will not closed down.

Handling Method:

1. If peripheral devices such as DC-DC and motor, or other devices interfere with the

charging of the controller, interference on these devices should be eliminated.

2. If the charging resistance disconnects and faults are found in the charging circuit and

power models, the controller should be replaced.

The operating method is same as that of the error code 02A00.

28. Error ID: 02A73

Error Description: RAM error

Cause A

Restart the key switch. If the error still exists, replace the controller.

Handling Method:

Restart the key switch. If the error still exists, replace the controller.

The operating method is same as that of the error code 02A00.

29. Error ID: 02A61

Error Description: THERMIC SENS. KO

Cause A

The output signal of temperature sensor of the controller exceeds what is allowed.

Handling Method:

1. Based on the monitoring menu, compare the controller temperature, and motor

temperature or the environment temperature. Check whether the temperature displayed

on the controller is correct. If not, replace the controller.

The operating method is same as that of the error code 02A00.

30. Error ID: 02A62

Error Description: TH. PROTECTION

Cause A

 1) The forklift may be overloaded.

 2) The sudden brake results in a large current and causes the controller over-heated.

 3) The heat dissipation performance of the electric control system is not good.

Handling Method:

 1) Drop the temperature of the controller below 85°. If the fault still exists, it may be
    blamed for the temperature sensor or the logic board of the controller itself. Replace
    the controller at this time.

 2) The poor heat dissipation performance of the controller causes that the heat can not
    be transmitted timely. Improve the heat dissipation performance by applying the
    heat-conducting silicone grease evenly (Between the controller and the bottom plate,
    between the bottom plate and the counterweight or frame)
    The operating method is same as that of the error code 02A00.

31. Error ID: 02A63
Error Description: The pump motor can not be stopped.
Cause A
Handling Method: Check whether the pump motor and the pump contactor work normally.
If not, replace the controller.
The operating method is same as that of the error code 02A00.

32. Error ID: 02A64

Error Description: The handle switch is disconnected.

The sequence from the handle limit switch S3 output to the controller C6 pin input is

wrong.

Cause A

The direction switch and accelerator have input in advance before the handle limit

switch S3 is closed.

Handling Method:

    1) Check whether the accelerator has output in advance.

    2) Check whether the direction switch is closed before the handle limit switch S3.

    3、Turn off the key. Reset handle limit switch C6 and then re-open the key switch.

33. Error ID: 02A65
Error Description: The temperature of the motor is high.
Cause A
    1) The forklift may be overloaded.
    2) The sudden brake results in a large current and causes the controller over-heated.
    3) The heat dissipation performance of the electric control system is not good.
Handling Method:

  1) The fault appears when the temperature digital switch of the motor turns on or when
     the analog sig-nal exceeds the switch-off value.
  2) When the temperature of the motor reaches 150℃, the controller will alarm. By this
     time, the forklift still can move, but the maximum current is cut and the performance
     of the forklift is reduced. When the temperature of the motor reaches 160℃, the
     motor stalls working where it should be cooled down.
  3) If the fault still exists when the motor cools down, check the circuit and resistance
     value of the temperature sensor (D3/D6). If necessary, replace the controller. < Refer
     to Comparison Table of Temperature Sensor and Resistance Temperature>
     P20JW: KTY84-130
 Comparison Table of Temperature Sensor and Resistance Temperature:

KTY84-130

AMBIENT TEMPERATURE		TEMP. COEFF.	KTY84-130			
(°C)	(°F)	(%/K)	RESISTANCE (Ω)			TEMP. ERROR (K)
			MIN.	TYP.	MAX.	
−40	−40	0.84	340	359	379	±6.48
−30	−22	0.83	370	391	411	±6.36
−20	−4	0.82	403	424	446	±6.26
−10	14	0.80	437	460	483	±6.16
0	32	0.79	474	498	522	±6.07
10	50	0.77	514	538	563	±5.98
20	68	0.75	555	581	607	±5.89
25	77	0.74	577	603	629	±5.84
30	86	0.73	599	626	652	±5.79
40	104	0.71	645	672	700	±5.69
50	122	0.70	694	722	750	±5.59
60	140	0.68	744	773	801	±5.47
70	158	0.66	797	826	855	±5.34
80	176	0.64	852	882	912	±5.21
90	194	0.63	910	940	970	±5.06
100	212	0.61	970	1000	1030	±4.9
110	230	0.60	1029	1062	1096	±5.31
120	248	0.58	1089	1127	1164	±5.73
130	266	0.57	1152	1194	1235	±6.17
140	284	0.55	1216	1262	1309	±6.63
150	302	0.54	1282	1334	1385	±7.1
160	320	0.53	1350	1407	1463	±7.59
170	338	0.52	1420	1482	1544	±8.1
180	356	0.51	1492	1560	1628	±8.62
190	374	0.49	1566	1640	1714	±9.15
200	392	0.48	1641	1722	1803	±9.71
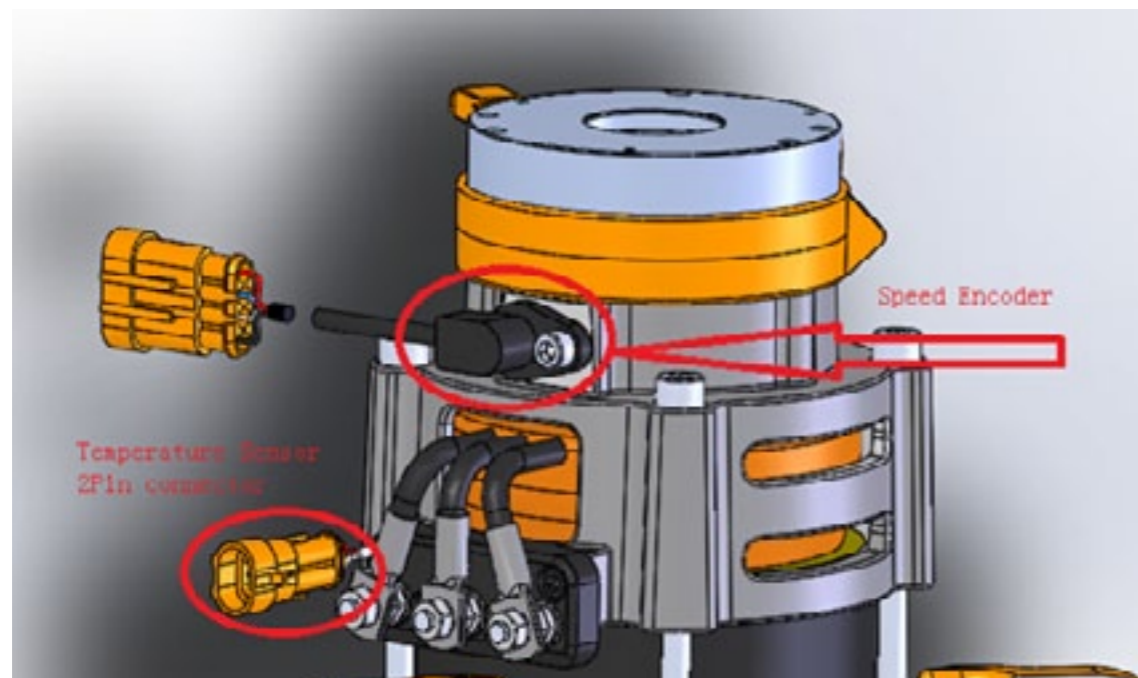
34. Error ID: 02A69

Error Description:SENS MOT TEMP KO

Cause A

　1)The motor temperature sensor type is set incorrectly.

　2)The motor temperature sensor is out of range.

　3)The motor temperature sensor wiring fault.

　4)The controller is damaged.

Handling Method:

　1)The motor temperature sensor type is set incorrectly. It should be set to OPTION # 1. SET MOTOR TEMPERATURE in SET OPTION:

OPTION # 1: The temperature sensor is KTY 84-130 PTC (Positive Thermal Coefficient Resistance)

OPTION # 2: The temperature sensor is KTY-83 PTC.

DIGITAL: Digital (on / off) sensor for monitoring motor temperature is connected to the input CND # 3.

NONE: No temperature sensor connected.

　2)The motor temperature sensor is out of range.

　3)The motor temperature sensor wiring D3 and D6 fault.

　4)The controller is damaged. < Reference correspondence resistance temperaturetable>
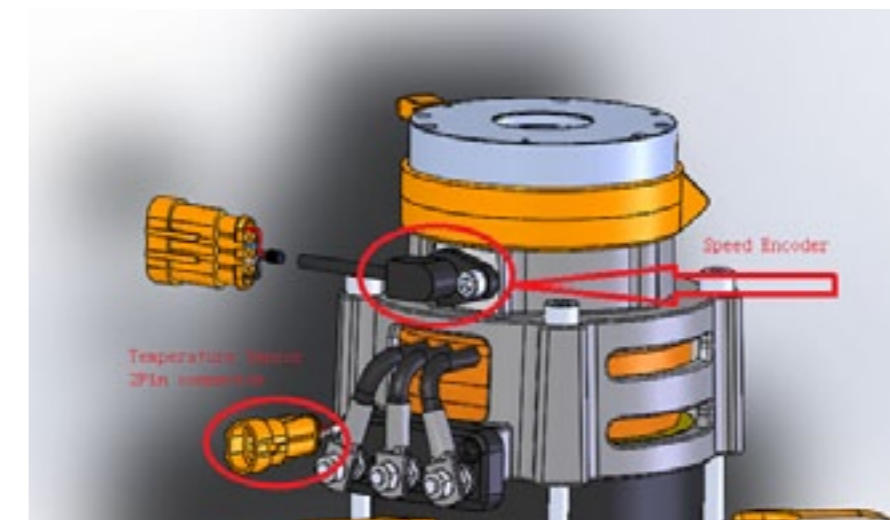
35. Error ID: 02A67

Error Description: NO CAN MSG

Cause A

It is a fault about CAN communication between the steering and traction.

Handling Method:

1) Turn off the power, stay all wires, and use the device at 200 ohm range to measure whether the resistance between CAN H and CAN L is 60 ohm, if not go to the next step.

2) Check whether the connections of the C10 CAN H wire and C5 CAN L wire of the traction controller and the A4 CAN H wire and A3 CAN L wire of the monitor is normal.

3) Software settings and version information.

36. Error ID: 02A59

Error Description: SMARTDIVER KO

Cause A

The coil drive circuit cannot drive the load.

Handling Method:

The above failures occur when there is a problem with the contactor or valve coil.

Possible causes are:

1) The coil is short-circuited, open-circuited or disconnected.

2) Controller driver is short-circuited.

3) Coil plug failure or controller failure.

37. Error ID: 02A68

Error Description: WAITING FOR NODE

Cause A

If a controller connected to another controller can't communicate smoothly under the CAN communication network, it will be always in a waiting state until all the CAN communication network works smoothly.

Handling Method:

1) Check whether the communication line is normal.

2) Check the resistance of the communication line is 60 ohm.

3) Check whether the version of the software or set of parameters is correct.

Use the "ZAPI CAN Console" software to check if you can connect to the site and check the program version information.

Site: NODE 2.0 means the driving controller
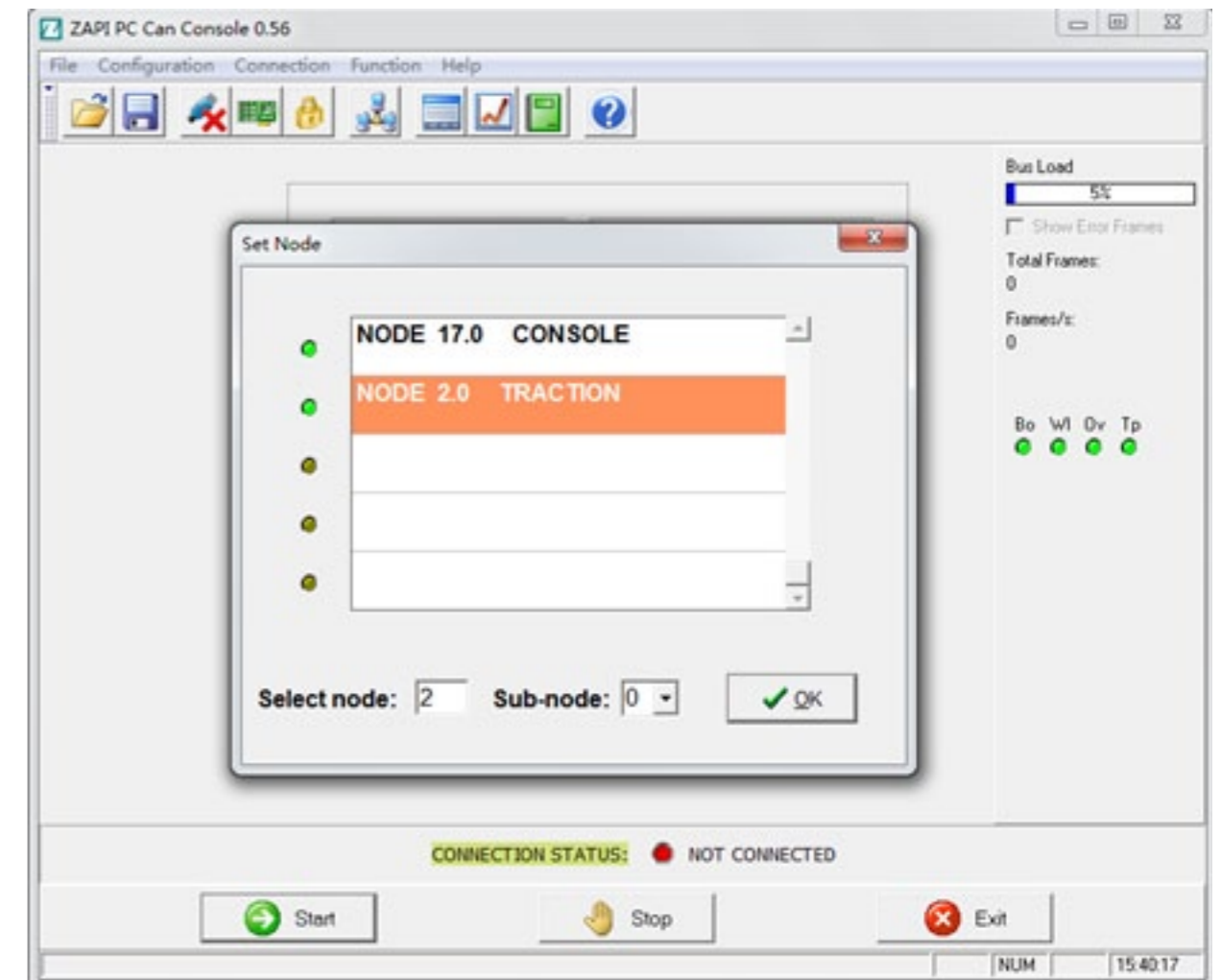
Connected to means correspondence program version number
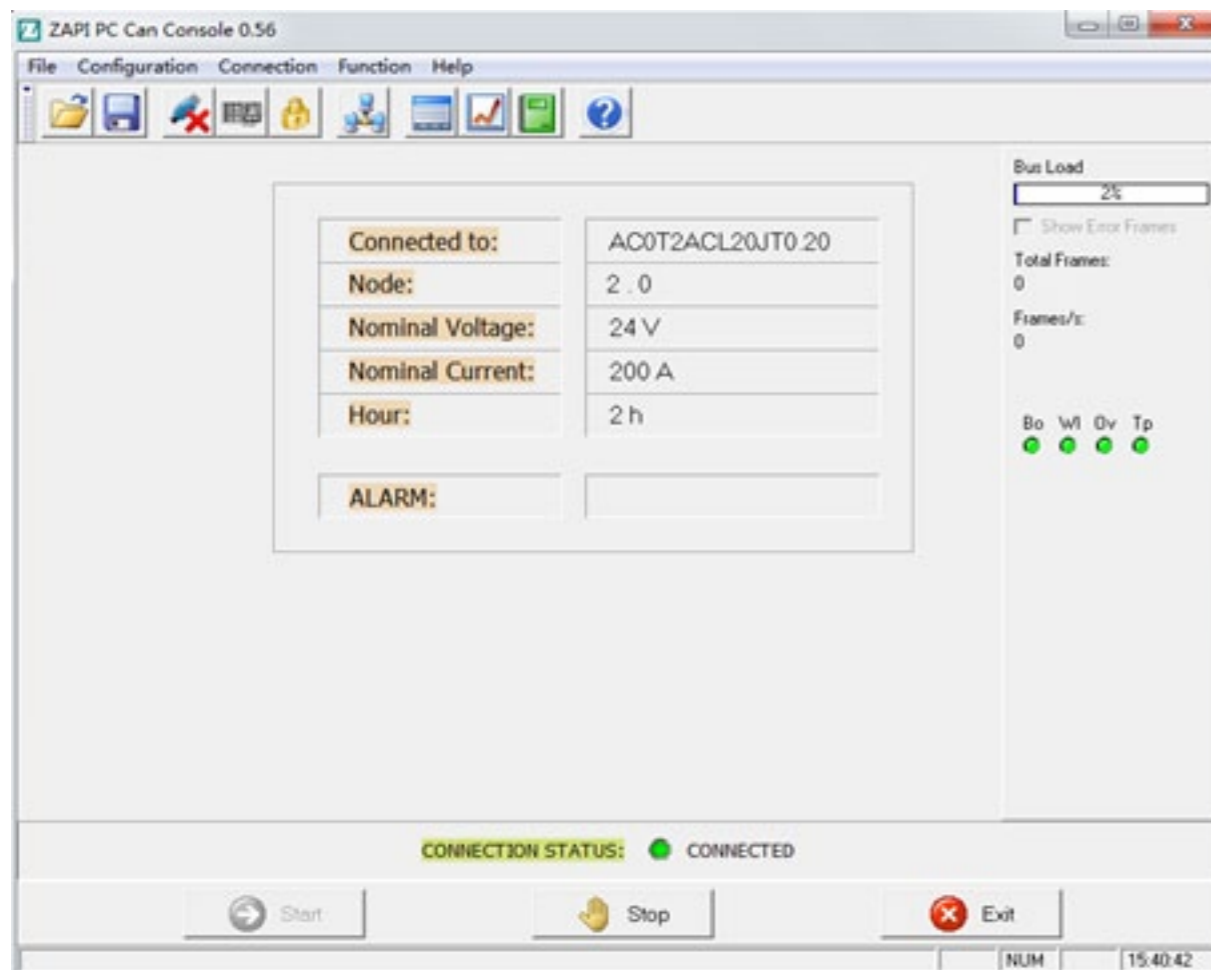
38. Error ID: 02A71

Error Description: EEPROM KO

Cause A

If a fault is found in the storage area of parameters, the forklift will stop moving.
Handling Method:

If the fault still exists after the electric lock is closed repeatedly, the logic card shall be replaced. If the fault disappears, parameters stored previously will be replaced by wrong ones and thereby being reset. Please refer to the Chapter Two, Parameter Adjustment Instructions.

According to the finalized parameter table, change each one to consistent. (Get the latest parameter table from BYD technicians)

COMBI ACX
V018 Parameter
Table.xlsx

39. Error ID: 02A71

Error Description: WRONG REM MEN

Cause A

RAM register error.

Handling Method: Replace the controller.

Operation method is the same as the Error ID 02A00.

44. Error ID: 02A72

Error Description: VMN LOW

Cause A

During start-up test, if the high-side voltage of the MOS tube is less than 66% of the capacitor voltage, it will alarm.

Handling Method:

If the error occurs once it is turned on, check:

    1) The connection inside the motor (coil resistance).

    2) Check whether the three-phase wire connection of the motor is correct.

    3) Whether there is electric leakage in the motor connecting to the frame or the coil of the motor disconnects.

If the motor wiring is normal, it is the problem inside the motor and replace the controller.
Operation method is the same as the Error ID 02A00.

Cause B

Motor running test: run the motor, turn on the bridge, and test the motor voltage feedback; if it is less than the command value, it will enter the fault state. (The error occurs when the motor is running)

Handling Method:

If the error occurs when the motor is running, check:

    1) Whether the motor wiring is normal.

    2) Whether there is electric leakage in the motor connecting to the frame or the coil of the motor disconnects.

    3) Check whether the suction of the master contactor is firm and whether the contact is worn.

If the motor wiring is normal, it is the problem inside the motor and replace the controller.

Operation method is the same as the Error ID 02A00.

39. Error ID: 02A72

Error Description: INIT VMN LOW

Cause A

The controller initialization output is lower than the predetermined value.

Handling Method:

    1) The circuit inside the motor.

    2) Motor cable connection.

    3) There is leakage between the motor cable and the forklift body.

40. Error ID: 02A03

Error Description: DRIVER SHORTED

Cause A

When the electric lock is closed, the controller will detect whether the drive of the master contactor is short-circuited or disconnected. If it is short-circuited or disconnected, it will alarm.

Handling Method:

Check whether the two wires of the master contactor coil, B6, and the wire of the steering controller, A4, are short-circuited or not connected to the contactor coil. (Controller with steering) check whether the two wires of the master contactor coil, B6 and C1, are short-circuited or not connected to the contactor coil. (Controller without steering) If the outer part is normal, replace the controller.

Operation method is the same as the Error ID 02A00.

41. Error ID: 02A74

Error Description: AUX BATT. SHORT

Cause A

The auxiliary driver is short-circuited.

Handling Method:

Check whether the connection between B1 and B5 is correct. If yes, replace the controller; (electromagnetic brake of the driving motor)

Operation method of replacing the controller is the same as the Error ID 02A00.

42. Error ID: 02A14

Error Description: DRV. SHOR. EV

Cause A

When the key switch is closed, the controller will detect whether the driver of the master contactor is short-circuited or disconnected. If it is short-circuited or disconnected, it will alarm.

Handling Method:

Check whether the wires at both ends of the coil, A1/A2/A8/A6 and B2, are short-circuited or not connected to the contactor coil. If the outer part is normal, replace the controller.

Operation method of replacing the controller is the same as the Error ID 02A00.

43. Error ID: 02A75

Error Description: CONTACTOR CLOSED

Cause A

Before closing down the coil of the master contactor, the controller detects whether contacts of the master contactor adhere at first. Try to discharge the capacitor. If the capacitor voltage reduces the battery voltage by 20%, a fault may occur.

Handling Method:

1) Recommend to check whether contacts of the contactor adhere.

2) Check whether the power line or the copper bar is short-circuited with the car body.

3) Check the battery for serious leakage.

4) Or replace the contactor.

Refer to 7.5 for contactor replacement.

Contactor
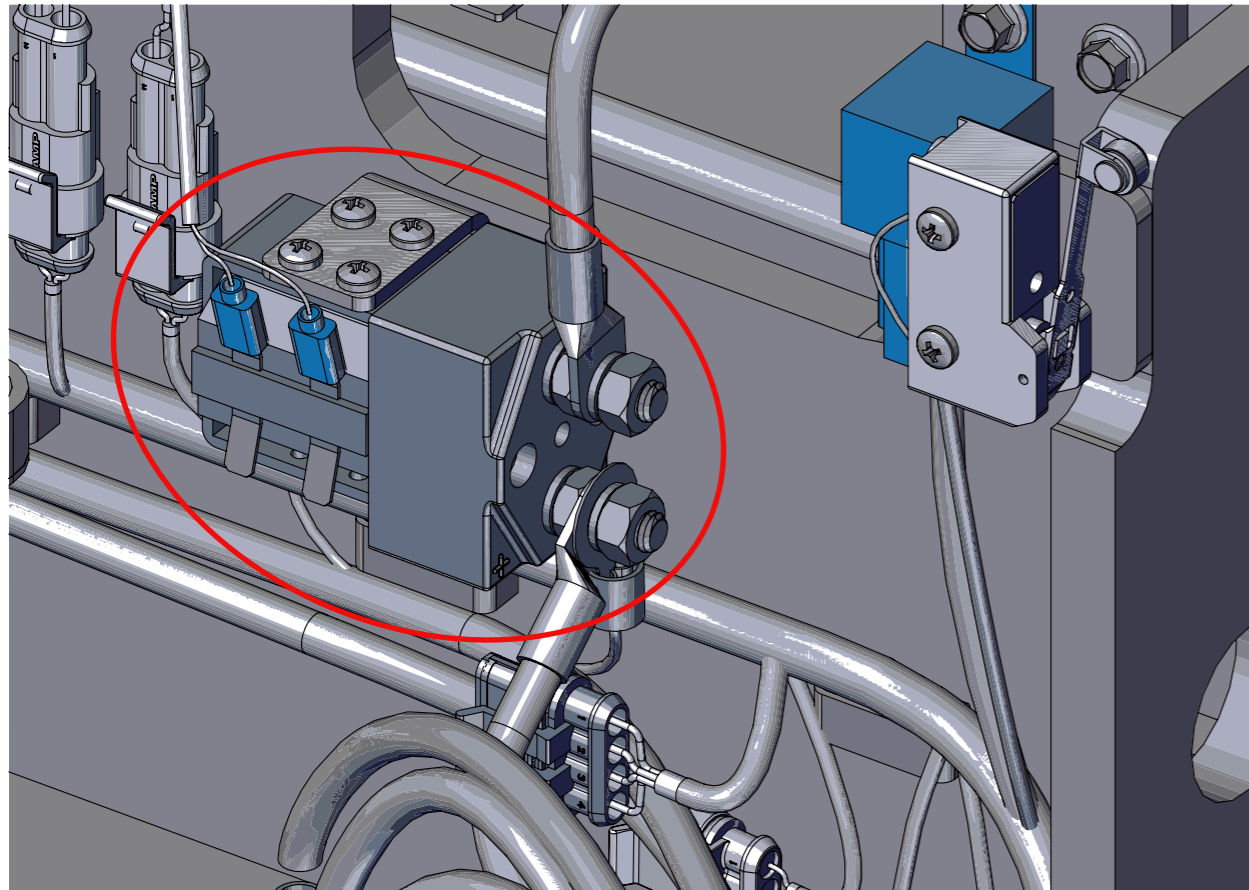
44. Error ID: 02A75

Error Description: CONTACTOR DRIVER

Cause A

When the electric lock is closed down, microcontroller will detect whether a short circuit appears in the driver of the master contactor. If any, it will alarm.

Handling Method:

Check whether the two wires of the master contactor coil, B6, and the wire of the steering controller, A4, are short-circuited or not connected to the contactor coil. If the outer part is normal, replace the controller.

Operation method of replacing the controller is the same as the Error ID 02A00.

45. Error ID: 02A75

Error Description:CONT. DRV. EV

Cause A

1) The drive circuit of the controller coils (A1/A2/A8) cannot drive the load.

2) The coils (A1/A2/A8) are short-circuited or there are persistent currents greater than 6A through the coils.

Handling Method:

1) Check whether there is short circuit or low impedance pull-down output between A1/A2/A8 and B2 of electromagnetic brake drive.

2) The driver circuit of controller logic card failure, replace the controller. Operation method of replacing the controller is the same as the Error ID 02A00.

46.Error : KEY OFF SHORTED

KEY OFF SHORTED   MDI ALARM: 02A76

Cause A

The input voltage of the key switch is pulled down by external load.

M1:

It is likely that the voltage is too low. It is recommended to check the following items.

1) The input voltage of the key switch is pulled down by external load, such as DC converter, coil, or contactor switch action.

2) Check whether the battery power line is connected correctly, whether there is loose or virtual connection.

3) Check whether the terminals of the controller and the contactor are connected firmly.

4) The controller is damaged.

Operation method of replacing the controller is the same as the Error ID 02A00.

47. Error ID: 02A02

Error Description: COIL SHOR. MC-EB, Master contactor or Electromagnetic brake coil

Cause A

1) The drive circuit of the master contactor or the electromagnetic brake coil cannot drive the load.

2) The drive circuit of the master contactor or the electromagnetic brake coil is short-circuited or there is persistent currents greater than 6A through the coil.

Handling Method:

1) Check whether there is a short circuit or low impedance pulling down the output between the electromagnetic brake driver B1 and B5.

2) The drive circuit of the controller logic card failure, replace the controller. Operation method of replacing the controller is the same as the Error ID 02A00.

48. Error ID: 02A04

Error Description: COIL SHOR. EV

Cause A

1)The drive circuit of the controller coil A1/A2/A8 cannot drive the load.

2)The coil A1/A2/A8 is short-circuited or there is persistent currents greater than 6A through the coil.

Handling Method:

1)Check whether there is a short circuit or low impedance pulling down the output between the electromagnetic brake drivers A1/A2/A8.

2)The drive circuit of the controller logic card failure, replace the controller. Operation method of replacing the controller is the same as the Error ID 02A00.

49. Error ID: 02A77

Error Description: CONTACTOR OPEN

Cause A

The logic card has driven the master contactorcoil, but the contactor does not close;

Handling Method:

1) Contactor mechanical failure, stuck etc.

2) The contact of the contactor is poor.

3) If the contactor works normally, replace the controller.

Operation method of replacing the controller is the same as the Error ID 02A00.

50. Error ID: 02A05

Error Description: TILLER ERROR

Cause A

The sequence from the handle limit switch S3 output to the controller C6 pin input is wrong;

M1:

The direction switch and accelerator have input in advance before the handle limit switch is closed.

1) Check whether the accelerator has output in advance.

2) Check whether the direction switch is closed before the handle limit switch.

3) Or the error disappears automatically after resetting the handle limit switch.

---

51. Error ID: 02A78

Error Description: VACC NOT OK

Cause A

Detection time: the standby state, the alarm displays that the voltage Of the accelerator is at least 1V higher than the minimum value set in the accelerator signal (PROGRAM VACC).

Handling Method:

The upper and lower voltage limits of the accelerator are not collected. Enter the PROGRAM VACC menu and recollect again. Accelerator voltage collection steps:

1) Open ZAPI CAN CONSOLE → FUNCTION → program VACC → click acquire

2) Rotate the handle and a value appears. Save, restart the key.

Refer to the 2.3 accelerator voltage collection and debugging steps in chapter 2 of the ZAPI controller tutorial for details.

3) Error occurs in the accelerator wherein its pedal does not return, or error occurs inside the accelerator.

4) Accelerator connection line failure or controller failure.

Operation method of replacing the controller is the same as the Error ID

52. Error ID: 02A79

Error Description: INCORRECT START

Cause A

Before the key switch is closed, the start sequence of the valve control switch or hoist speed sensor is wrong.

Handling Method:

The startup sequence is not correct. Possible reasons:

1) The direction switch has been closed before starting.

2) The operation sequence is wrong, the C6 handle limit switch has not been triggered when operating moving or lifting functions.

3) The wire connection is incorrect.

4) If a fault cannot be eliminated, the controller shall be replaced.

Operation method of replacing the controller is the same as the Error ID 02A00.

53. Error ID: 02A79

The fault needs to be read by the upper computer for multiple definitions of instrument fault codes.

Error Description: PUMP INC START

Cause A

Before the key switch is closed, the start sequence of the valve control switch or hoist speed sensor is wrong.

Handling Method:

The pump startup sequence is not correct.

Possible reasons:

1) The lifting, tilting and other switches have been closed and before starting the machine .

2) The operation sequence is wrong.

3) The wire connection is incorrect.

4) If a fault cannot be eliminated, the controller shall be replaced.

 Operation method of replacing the controller is the same as the Error ID 02A00.

54. Error ID: 02A80

Error Description: FORW + BACK (Direction switch adhesion);

Cause A

The controller will always detect and alarm when requests from two directions run signals at the same time.

Handling Method:

Possible causes:

1) Handle logic board failure.

2) The wire is broken.

3) A fault appears in the direction switch.

4) The operation is improper.

5) If a fault cannot be eliminated, the controller shall be replaced.

 Operation method of replacing the controller is the same as the Error ID 02A00.

55. Error ID: 02A82

Error Description: ENCODER ERROR

Cause A

The controller detects that the two consecutive speed readings of the encoder are quite different. Since the encoder inside the system is impossible to change the speed to a large degree in a very short time, the encoder may fail.

Handling Method:
Encoder failure [Encoder lines of phase A (D1) and phase B (D4) are worn or broken].
Check the mechanical and electrical functions of the encoder; the alarm may be caused by the interference of iron filings adsorbed by the encoder. If none of the above, replace the controller.

Please note that manual operation may also cause that the controller displays the fault, and thereby the forklift needs to be powered off to restart. For example:

1) The forklift bumps into an obstacle suddenly, making itself impossible to move.

2) A driver slams on the brakes when the forklift is moving at high speed.

3) The operation is improper.

4) If a fault cannot be eliminated, the controller shall be replaced.

 Operation method of replacing the controller is the same as the Error ID 02A00.

Speed Encoder on the Drive Motor
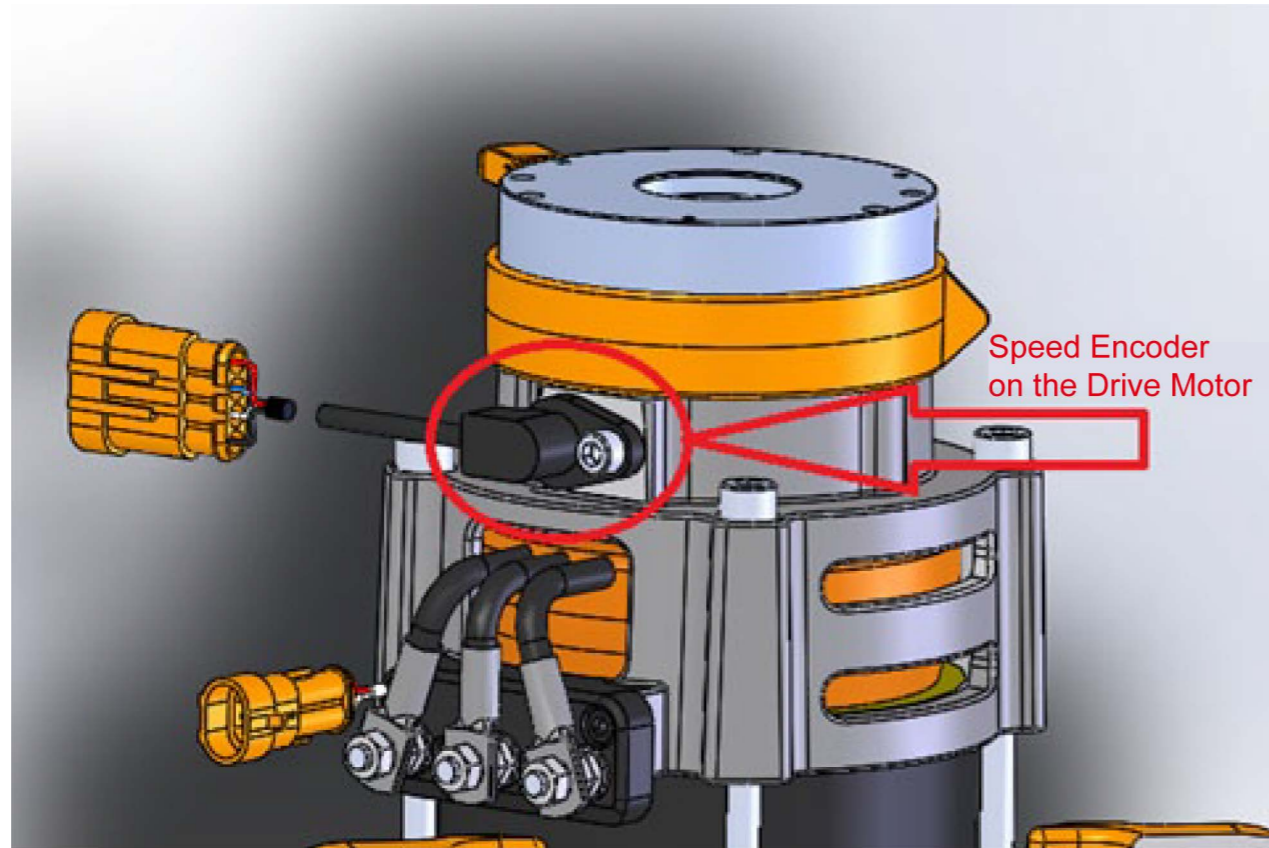
56. Error ID: 02A84

Error Description: CAN BUS KO BMS

Cause A

BMS communication failure.

Handling Method:

Check whether the BMS communication circuit is normal.

57. Error ID: 02A85

Error Description: VACC OUT RANGE

Cause A

Detection time: standby mode.

The alarm displays that the voltage of the accelerator is at least 1V higher than the minimum value set in the accelerator signal(PROGRAM VACC).

Handling Method:

The upper and lower voltage limits of the accelerator are not collected. Enter the PROGRAM VACC menu and collect again. Accelerator voltage collection steps:

1) Open ZAPI CAN CONSOLE → FUNCTION → program VACC → click acquire

2) Rotate the handle and a value appears. Save, restart the key.

Refer to the 2.3 Accelerator Voltage Collection and Debugging Steps in Chapter 2 of the ZAPI Controller Tutorial for details.

3) Accelerator error. The accelerator pedal may not return, or the accelerator internal error.

4) Check whether the accelerator cable is properly connected;

5) If a fault cannot be eliminated, the controller shall be replaced.

58. Error ID: 02A86

Error Description: POS. EB. SHORTED

Cause A

When the interlock is not closed down, the high-end driver of the electromagnetic brake outputs high voltage.

Handling Method:

1) Check whether there is a short circuit or low impedance pulling down the output between B1 and B5.

2) If the high-end outlet of the electromagnetic brake is not connected, this high voltage still exists and the driving circuit inside the controller has been broken;

Pin B1 outputs the positive power supply of the brake coil (equal to B+).

The driver of the brake coil B5 output; PWM control; 2.5A maximum consistent current (drive to B-).

B1 is internally installed the freewheeling diode.

59. Error ID: 02A88

Error Description: POWER MOS SHORT MDI ALARM : 02A88

Cause A

Before the master contactor is closed, the software checks the power bridge: convert to the low-end power of the MOS tube, the phase voltage value drops to –BATT (rises to +BATT). If the change of the phase voltage value is inconsistent with the command, the fault signal is generated.

Handling Method:
Part of thesteps of detecting controller power:

1) Power off the controller.

2) Remove the three phases, U, V, W, of the motor from the controller.

3) Disconnect the batteries B+ and B-.

4) Turn the digital multimeter to the position of the measuring diode.

   a) The red test probe connects to B-, the black test probe connects to the controller. It is normal if the readings of U, V, W are 0.3V-0.6V.

   b) The black test probe connects to B+, the red test probe connects to the controller. It is normal if the readings of U, V, W are 0.3V-0.6V.

60. Error ID: 02A92

Error Description: CURRENT GAIN

Cause A

The maximum current gain parameter is the factory set value, showing that the program of maximum current adjustment parameter has not been enabled.

Handling Method:
The technical staff will set the current gain parameters correctly. Please use ZAPIConsole software to download the controller parameters and send them to BYD technical support;

CAN Console software – Connect CAN box – Start forklift – Connect controller – Enter password ZAPI - Enter the parameter page – Receive – File – Save (as shown below)
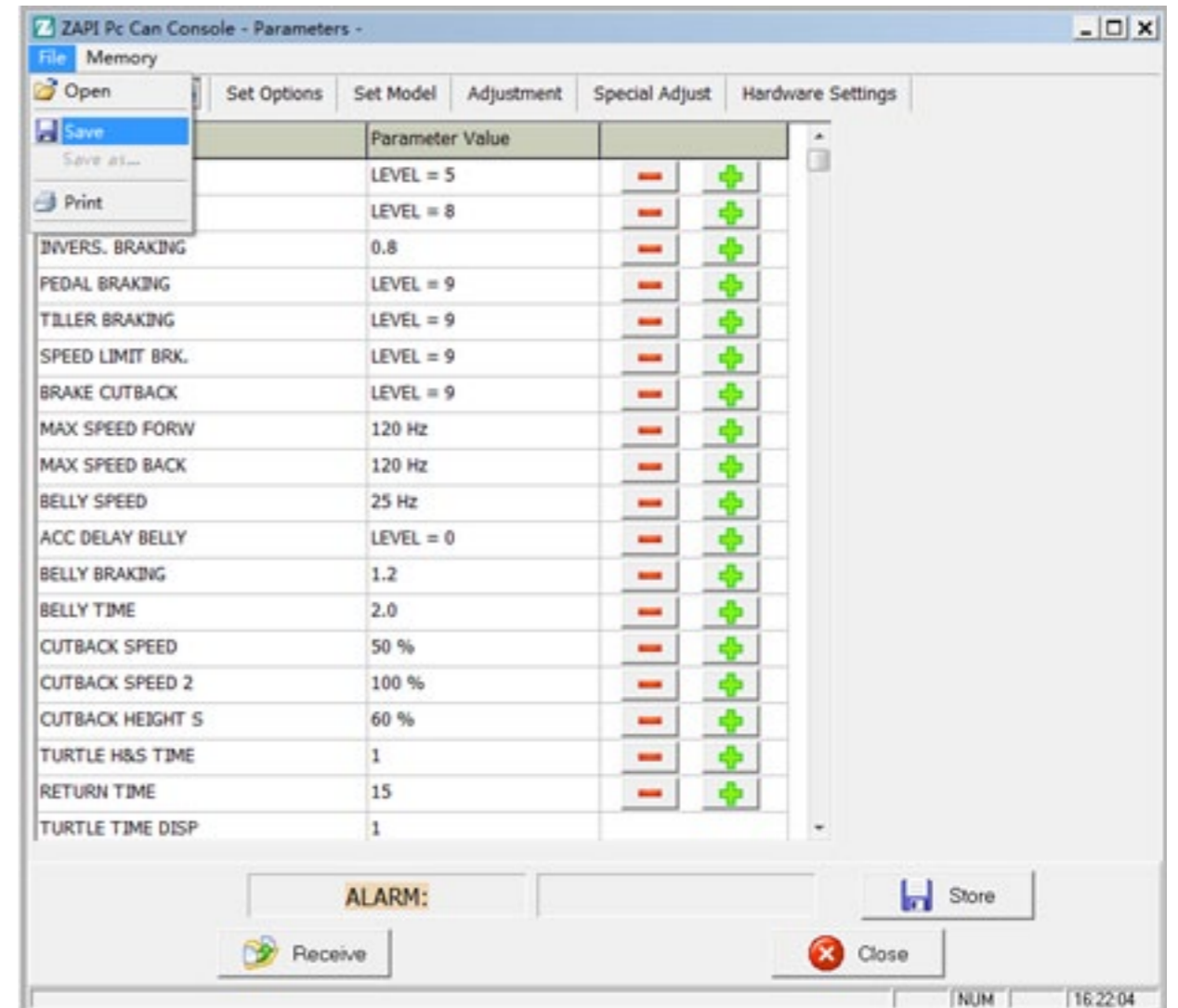
61. Error ID: 02A96

Error Description: ANALOG INPUT

Cause A

When A/D input by analog signals is converted into a fixed value, the fault signal appears where delay time exceeds 400ms. The function is used to detect A/D converter fault or analyze conversion fault of analog signal.

Handling Method:

Check each analog quantity and circuit. If the error persists, replace the controller.

Operation method of replacing the controller is the same as the Error ID 02A00. (DATA ACQUISITION)

62. Error ID: 02A98

Error Description: PEV NOT OK

Cause A

　　1)The drive circuit of the controller coils (B3/B7/A1/A2/A8) cannot drive the load.

　　2)The coils (B3/B7/A1/A2/A8) are short-circuited or there are persistent currents greater than 6A through the coils.

Handling Method:

　　1)Check whether there is a short circuit or low impedance pulling down the output between the driver B3/B7/A1/A2/A8 and B2.

　　2)Pin B2 must be connected to the post that is energized after the contactor is closed, otherwise this error will occur.

63. Error ID: 02A99

Error Description: SLIP_PROFILE

Cause A

Parameter selection of SLIP PROFILE is wrong.

Check the setting of SLIP value in the hardware setting parameters.

Handling Method:

For detailed steps of parameter download, please refer to the 3.2 Export Parameters and Check the Setting of These Values in the Hardware Setting Parameters in Chapter 3 of ZAPI Controller User Manual.

Use ZAPIConsole software to download the controller parameters and send them to BYD technical support;

64. Error ID: 02A12

Error Description: CONTROLLER MISM

Cause A

The software does not match the controller.

Handling Method:

The software does not match the controller or configuration parameter adjustment error.

Re-burn the procedure. For the detailed procedure of procedure burning, please refer to Chapter 1, Burn Procedure, of ZAPI Controller User Manual.

65. Error ID: 02A13

Error Description: PARAM RESTORE

Cause A

Prompt to save parameters

Handling Method:

If the error still exists after closing the key switch repeatedly, replace the controller.

Operation method of replacing the controller is the same as the Error ID 02A00.

66. Error ID: 02A30

Error Description: INIT VMN HIGH

Cause A

Before the contactor is opened, the software will check whether the controller drives it. The software expects the pull-in voltage to be at a "steady state" value. If it is too high, it will alarm.

Handling Method:

1) The motor is not connected properly, or there is something wrong with the motor circuit; check whether the three-phase connection of the motor is correct; whether the motor has leakage to ground, whether there is motor coil open-circuited.

2) Replace the controller.

Operation method of replacing the controller is the same as the Error ID 02A00.

67. Error ID: 02A32

Error Description: PUMP VMN NOT OK

Cause A

Before the contactor is opened, the software will check the output voltage of controller -P and expect it to be in the "steady state" value (The truck type option is set to LEVEL = 1). If the voltage is too low, it will alarm.

Handling Method:

1) The motor is not connected properly, or there is something wrong with the motor circuit; check whether the three-phase connection of the motor is correct; whether the motor has leakage to ground, whether there is motor coil open-circuited.

2) Replace the controller.

Operation method of replacing the controller is the same as the Error ID 02A00.

68. Error ID: 02A48

Error Description: EVP DRIVER OPEN

Cause A

The driving circuit of the auxiliary coil cannot drive load.

Handling Method:

1) Check whether there is a short circuit or low impedance pulling down the output between B3 and B2.

2) The drive circuit of the controller failure, replace the controller.

Operation method of replacing the controller is the same as the Error ID 02A00.

69. Error ID: 02A57

Error Description: EVP DRIV. SHORT

Cause A

The driving circuit of the proportional valve coil cannot drive load.

Handling Method:

1) Check whether there is a short circuit or low impedance pulling down the output between B3 and B2.

2) The drive circuit of the controller failure, replace the controller.

Operation method of replacing the controller is the same as the Error ID 02A00.

8.9 Description of Electrical Component System Control

Power System of the Entire Forklift

Part	Position	Function
Battery Box	In the battery compartment	Provide electric energy for the entire forklift
BMC (centralized)	In the battery box	Monitor the status of the power battery, and control the charging and discharging of the power battery according to the status of the entire forklift and the power battery
Hall Sensor	In the battery box	Monitor battery charge and discharge current and feedback to BMC
Master Controller	In the middle of the forklift body	Control the drive system of the entire forklift
Handle	On the handle assembly	Send commands of forward, backward, hoisting and falling, turtle speed and horn
Display	On the instrument panel	Display the power, speed, fault and other information of the entire forklift
Speed Sensor	On the motor	Detect the motor speed and transfer the data to the corresponding controller
Horn	On the front panel of battery pack	As a warning function, the horn switch is located in the middle of the steering wheel, human operation can make the horn work
Emergency Stop Switch	On the front mounting panel	Push the the emergency stop switch in an emergency can power off the entire forklift
Handle Brake Switch	On the handle bracket	If the controller does not receive the handle switch signal when the handle is in pressed or upright state,the controller provides reverse current to stop the motor.

Part	Position	Function
Sleep Relay	In the battery box	To achieve the sleep function. When the forklift is in a state of electric static without any operation (ie, the BMS detects that the battery output current is less than or equal to 5A for 1 hour, or when the minimum single-section voltage of the battery is less than or equal to 2.5V, the entire

8.9.1.1 Warehouse Forklift with 24V Battery Power System
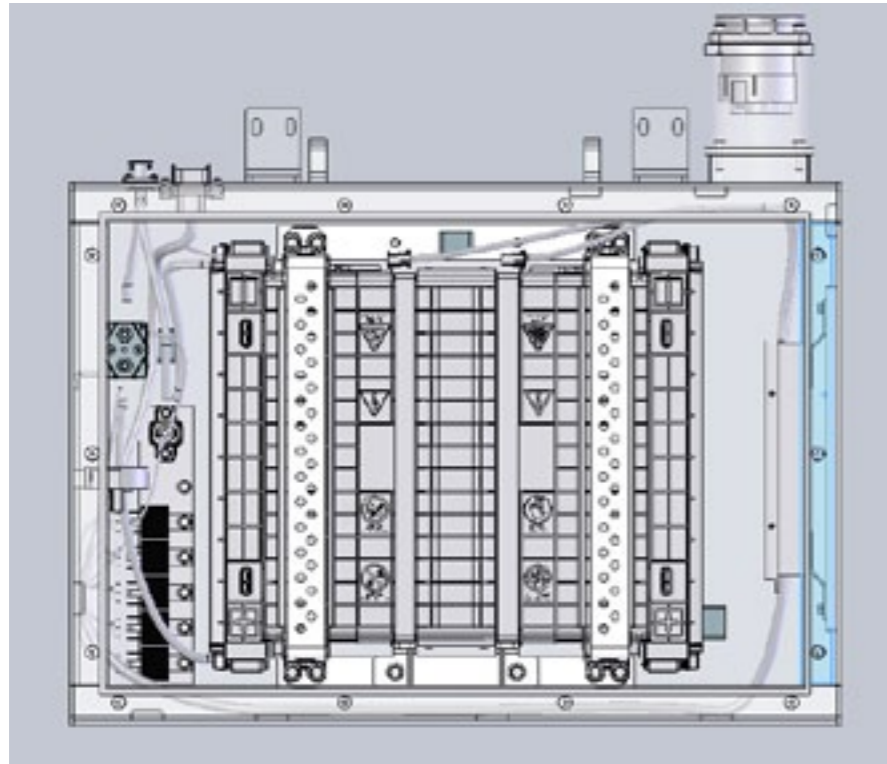
National Standard Rechargeable Battery
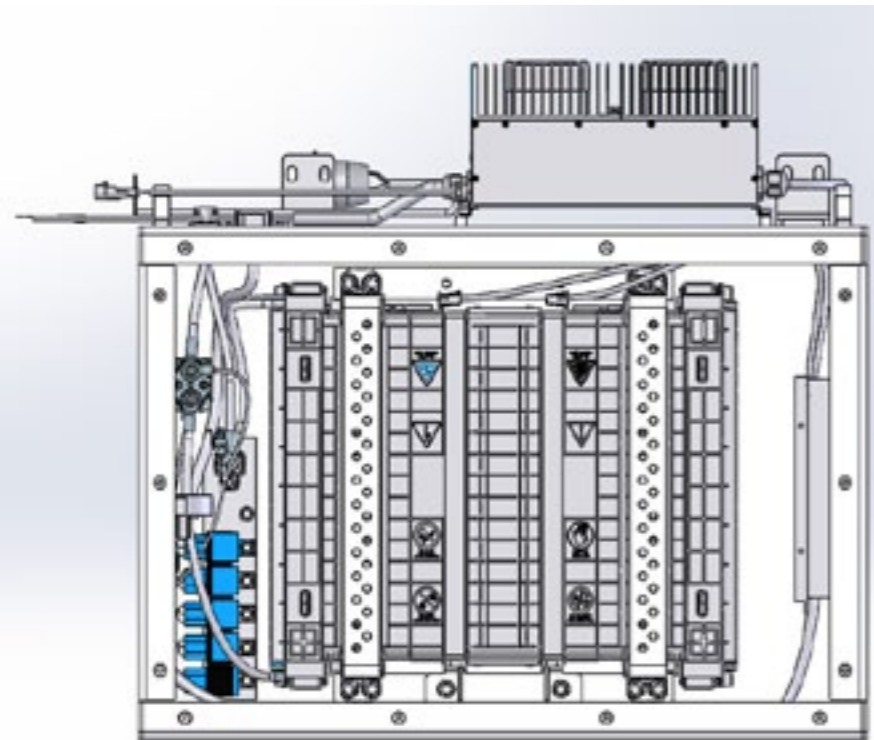
On-board Rechargeable Battery
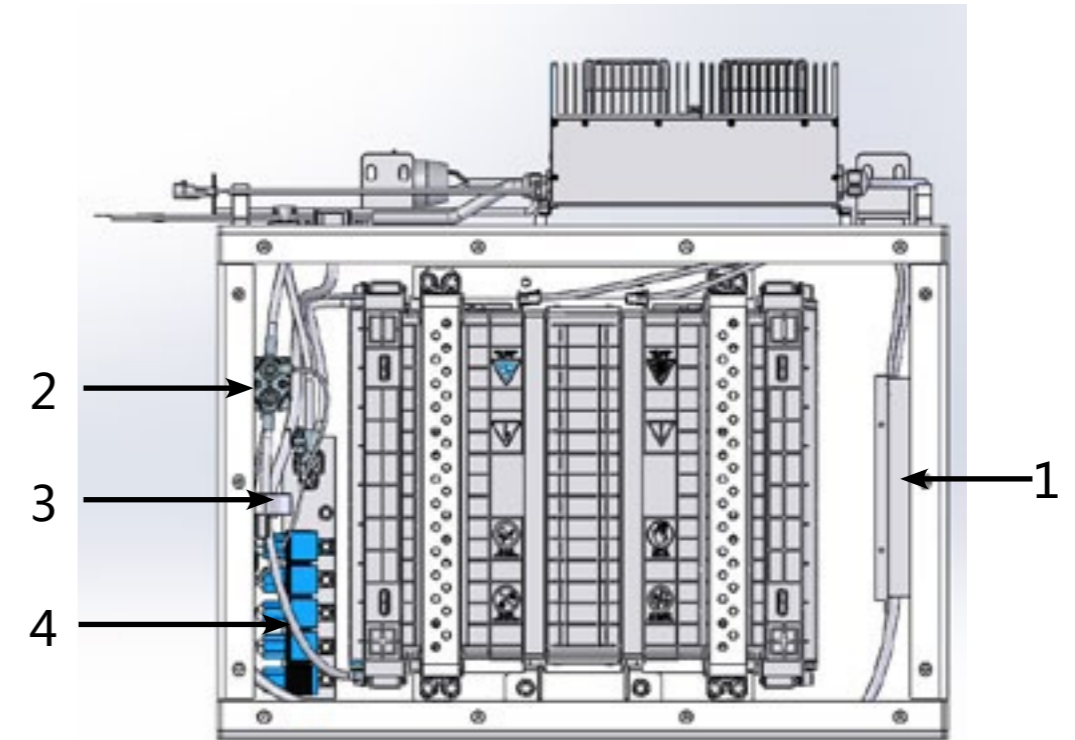
1) BMS：Monitor the status of the power battery, and control the charging and discharging of

the power battery according to the status of the entire forklift and the power battery.

2) 24V Charging and Discharging Contactor KM3：Switch on and off the charge and discharge circuit.

3) Hall Sensor：Monitor battery charge and discharge current.

4)24V BMS Relay KA1/ Charging Relay KA2/ Controller Relay KA3/ Sleep Relay KA4/

Ignition Relay KA5：Interlock charge and discharge and realize sleep function.

8.9.1.2 National Standard Port Charging
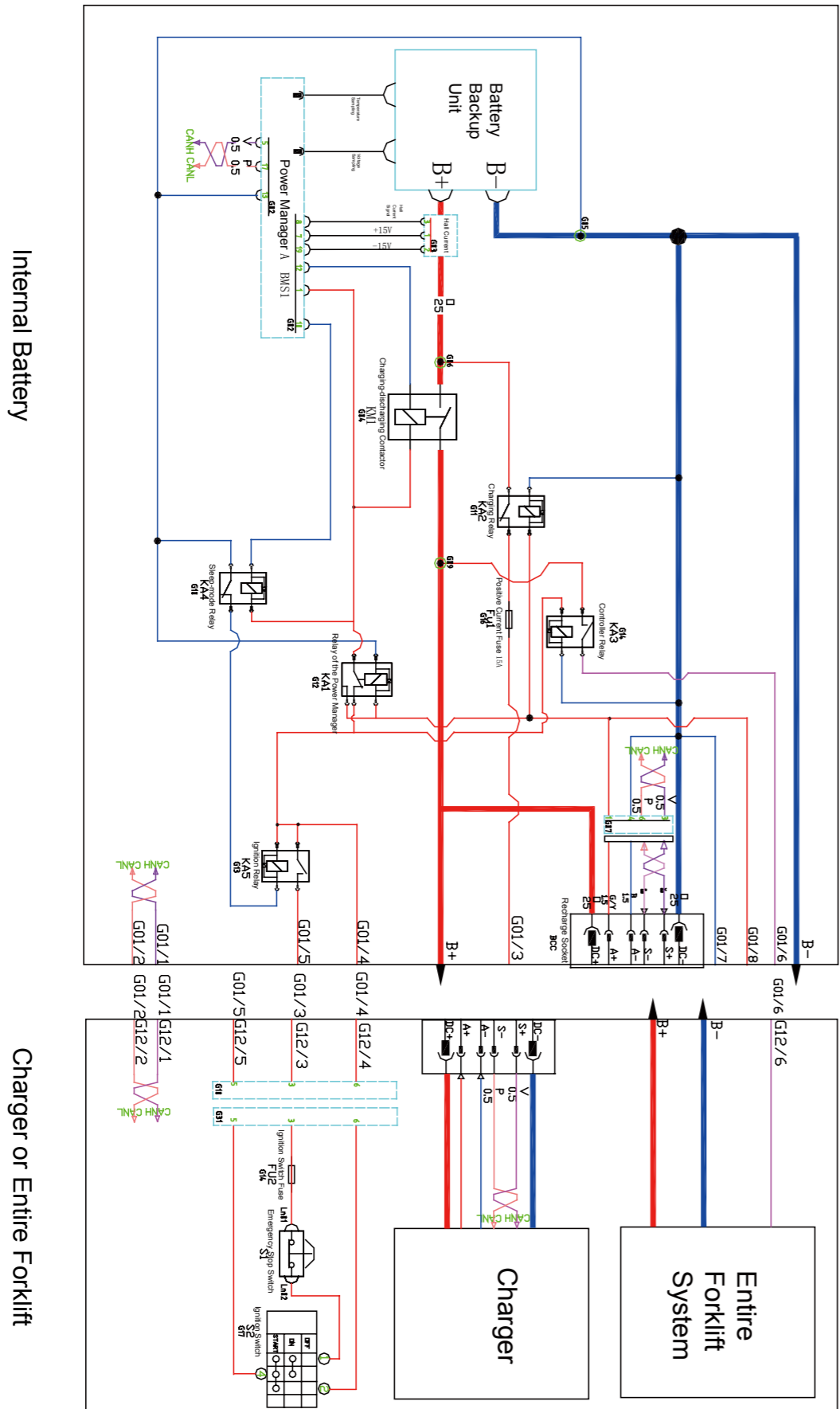
8.9.1.3 On-board Charging

8.9.1.4 CAN Handle
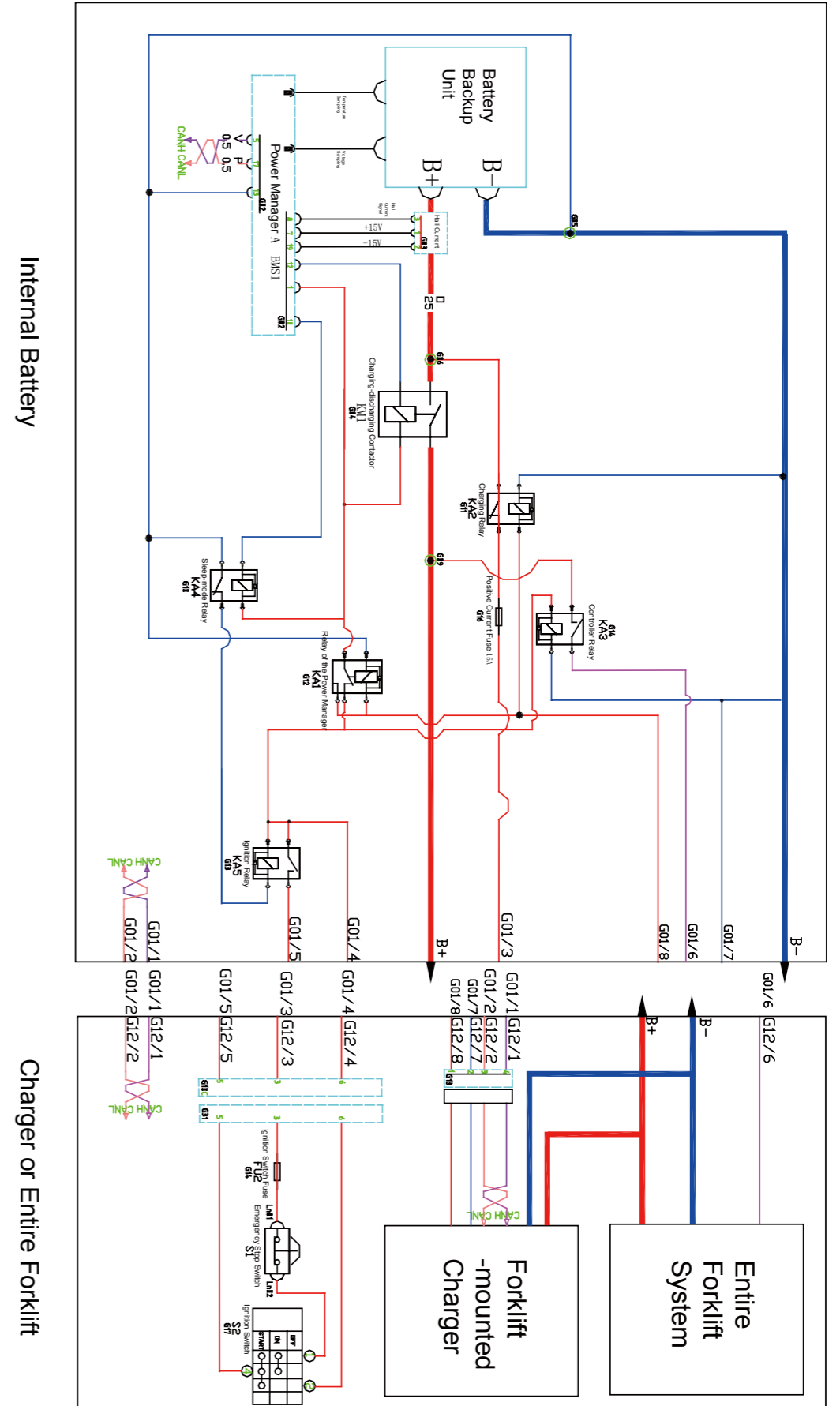
8.9.1.5 Mechanical Handle
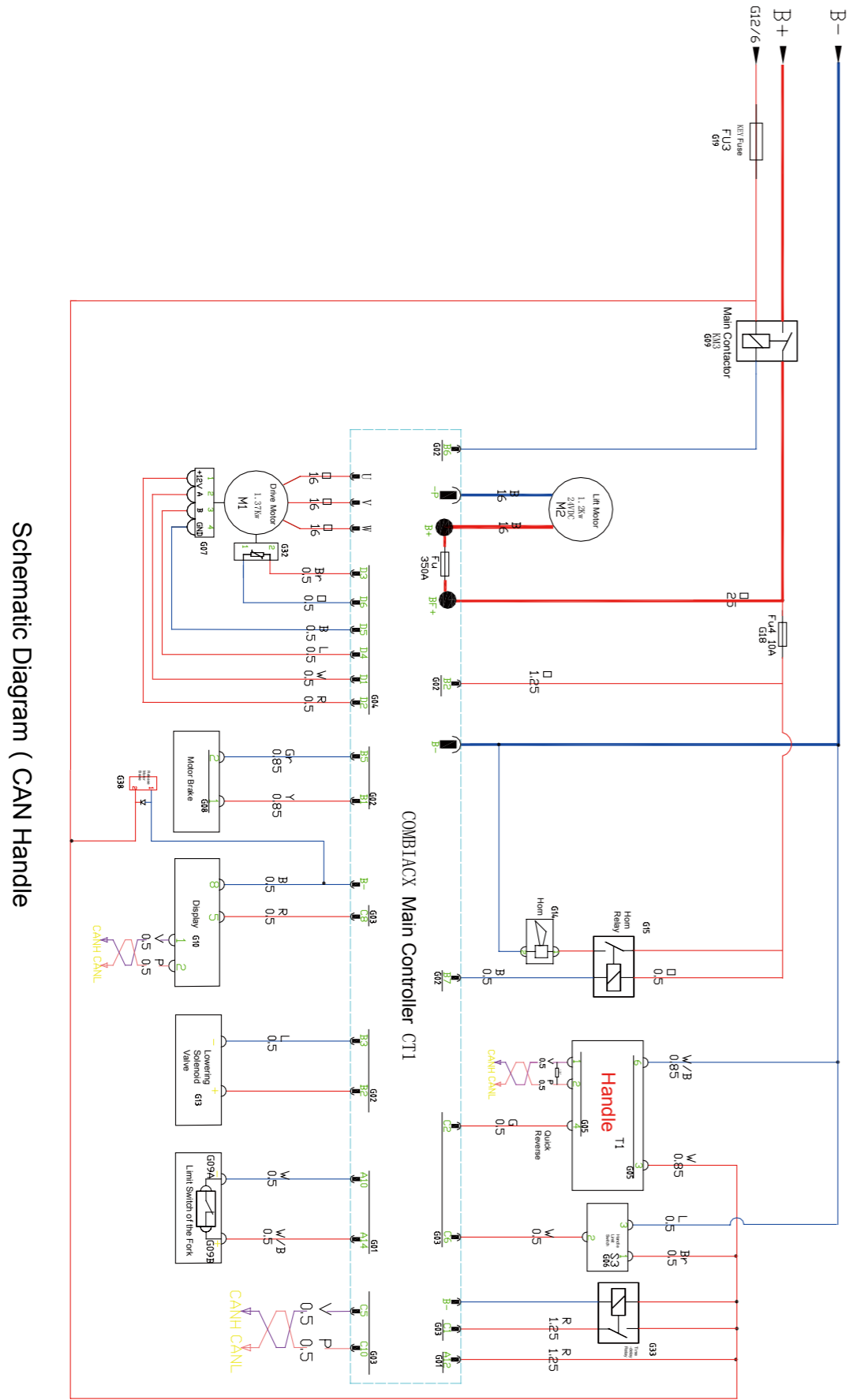
Schematic Diagram (CAN Handle)
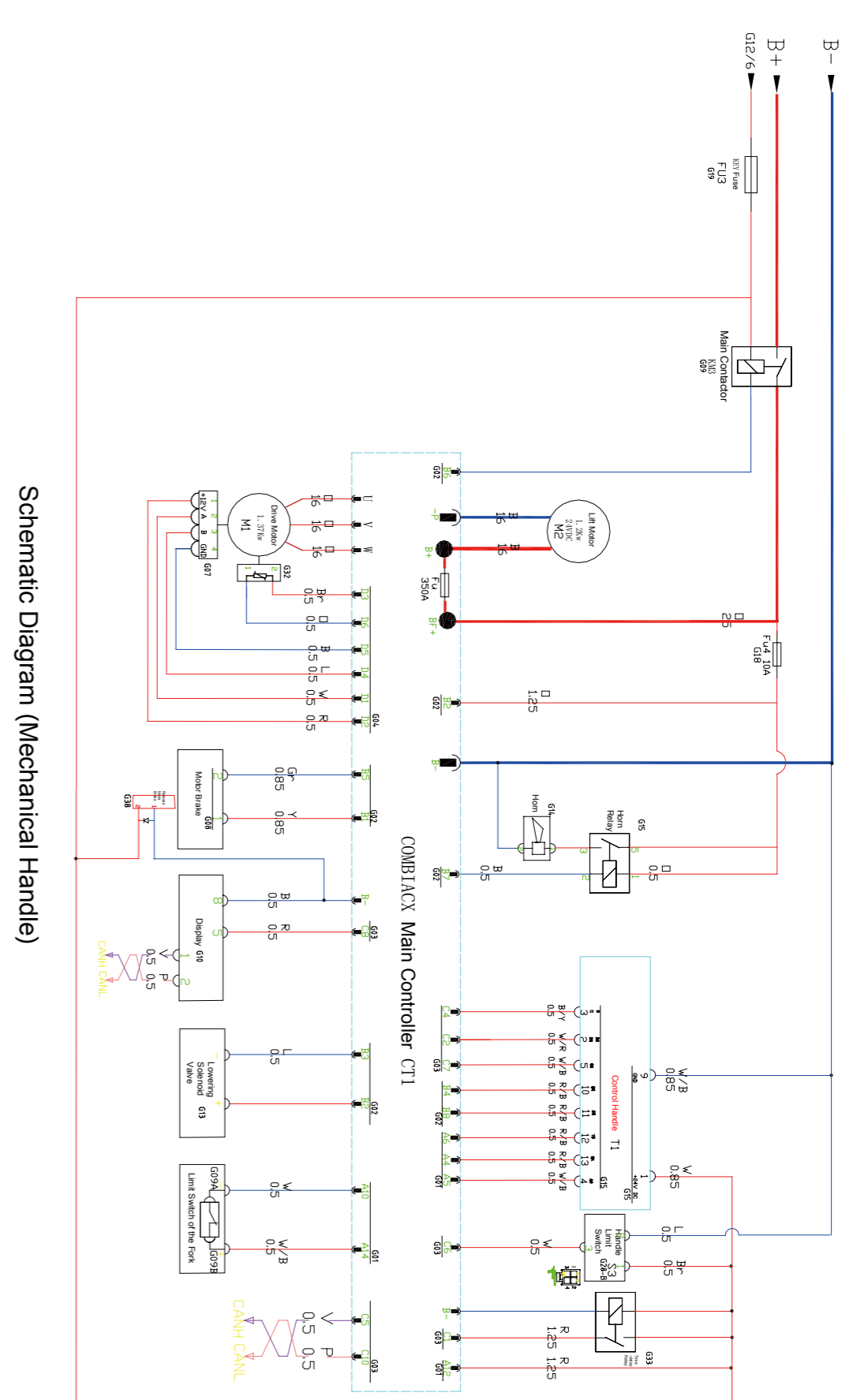
Schematic Diagram (Mechanical Handle)

8.9.1.6 Process of Power Supply

● The battery's 24V positive pole——Charging relay KA2 contact——Positive current fuse FU1—— Connector G01-3——Ignition switch fuse FU2——emergency stop switch S1——Ignition switch S1 first gear. As shown in Figure 1, the current trend direction is 1——2（Ignition switch S1 first gear）.
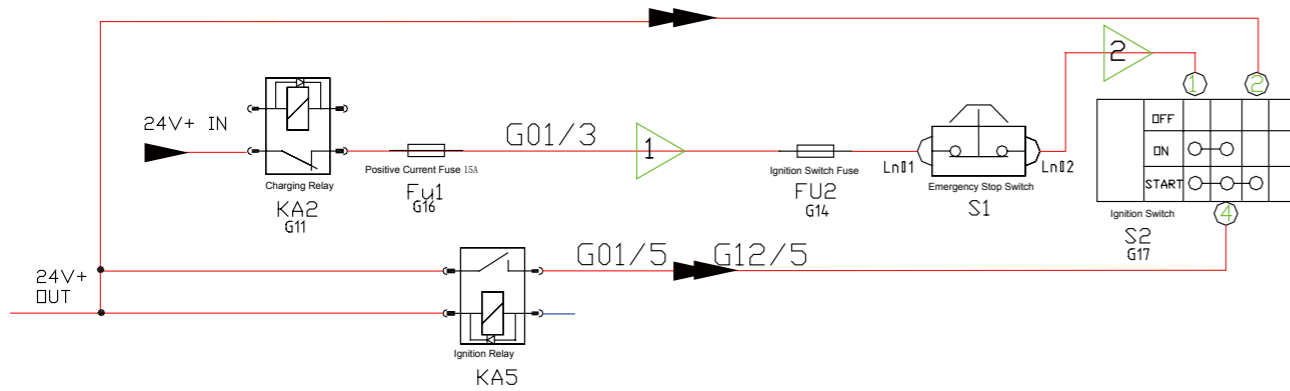
Fig. 1

●Turn the ignition switch S1 to the second gear, the ignition relay KA5 is not energized to supply power. As shown in Figure 2, the current trend direction is 1——2——3（Ignition switch S1 second gear）.
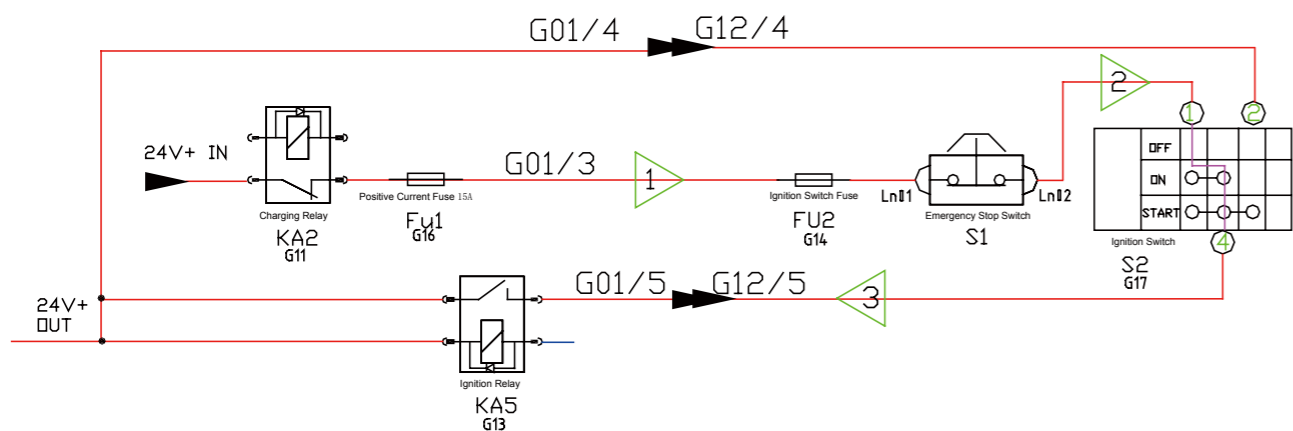
Fig. 2

●Turn the ignition switch S1 to the third gear, the ignition relay KA5 is energized to supply power. As shown in Figure 3, the current trend direction of ignition relay KA5 is 1——2——4——5——6（Ignition switch S1 third gear）.

●At this time, keep the ignition switch S1 to the third gear and the BMS is energized. Supply power after self-inspection and the current trend direction is 1——2——4——5——8——9（Ignition switch S1 third gear）.
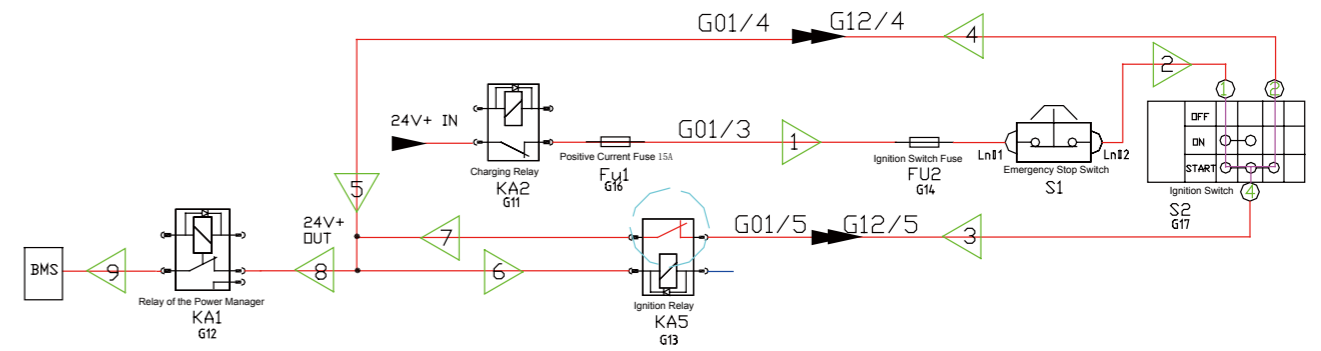
Fig. 3

●Turn the ignition switch S1 to the third gear, the BMS is energized. The charge and discharge contactor KM1 has a positive pole, and the controller relay KA3 pulls in. The BMS collects the battery voltage and temperature information and conducts a self-inspection, then controls the charging and discharging contactor KM1 to pull in and outputs 24V high voltage from the battery box.At the same time, the 24V power is input to the main drive controller pin C1 and the handle and other appliances through the connector G01-6 and the closed contact of the controller relay KA3.

●Release the key and reset the ignition switch S1 to the second gear. During this process, the ignition relay is always in pull-in status. As shown in Figure 4, the current trend direction of the entire forklift is 1——2——3——7——8——9（Ignition switch S1 is reset to the second gear）.
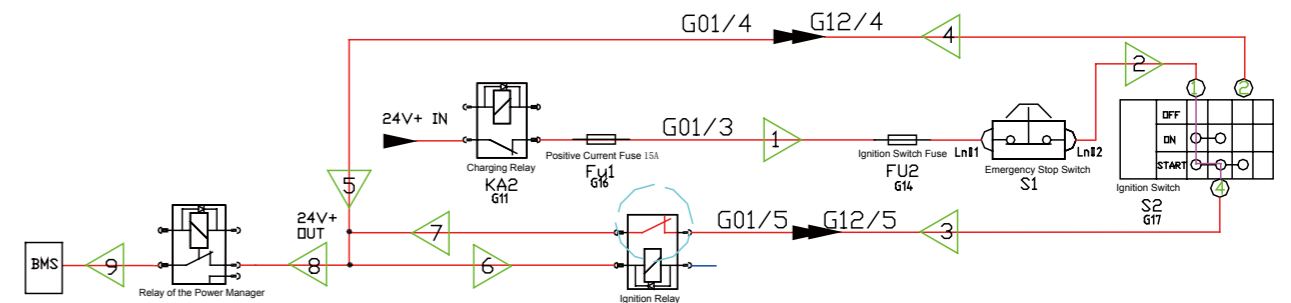
Fig. 4

8.9.1.7 Sleep Process

●The entire forklift is powered on and is stationary without any operation. As shown in Figure 5, the current trend direction of the entire forklift is 1——2——3——7——8——9 (Ignition switch S1 second gear).
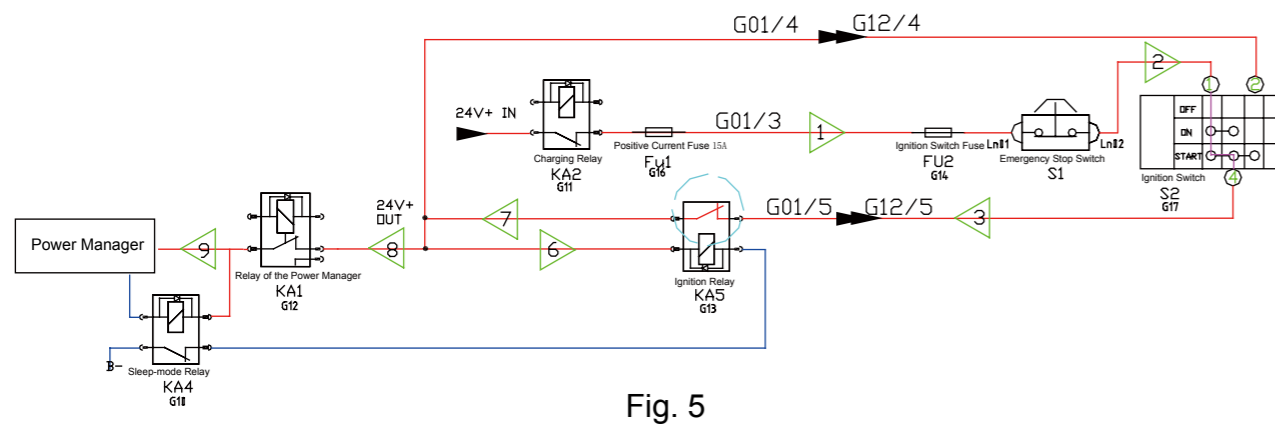
Fig. 5

●During the discharge process, if the BMS detects that the discharge current is below 5A for 60min through the current hall or samples that the minimum single-section voltage is less than or equal to 2.5V, then it enters the low power consumption mode and the BMS G02-12 pin does not pull down the output. The main contactor KM1 is disconnected, and at the same time the G02-3 pin pulls down the output. When the sleep relay KA4 is disconnected, the ignition relay KA5 loses its negative pole and the ignition relay KA5 contact is disconnected, the entire forklift loses power and enters sleep status, as shown in figure 6.
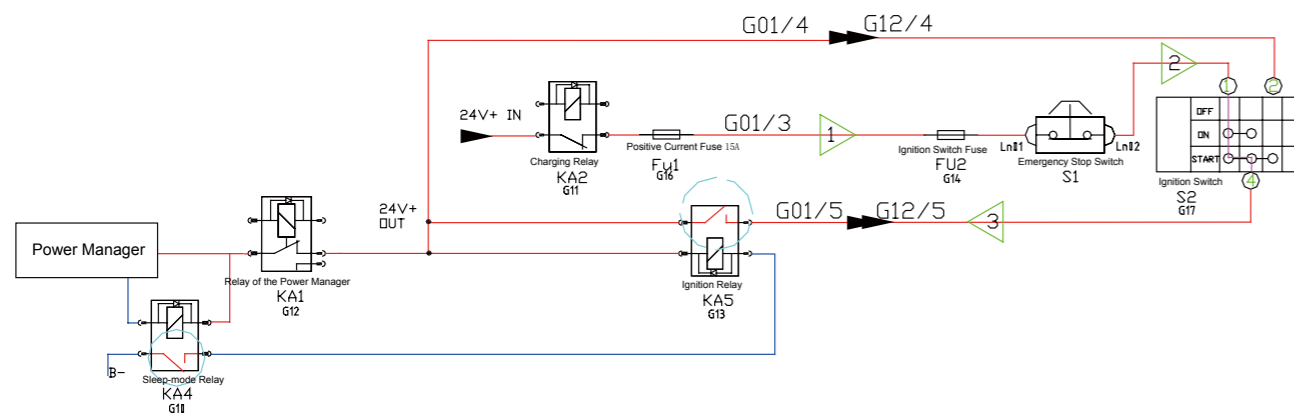
Fig. 6

8.9.1.8 Charging Process（National Standard Port）
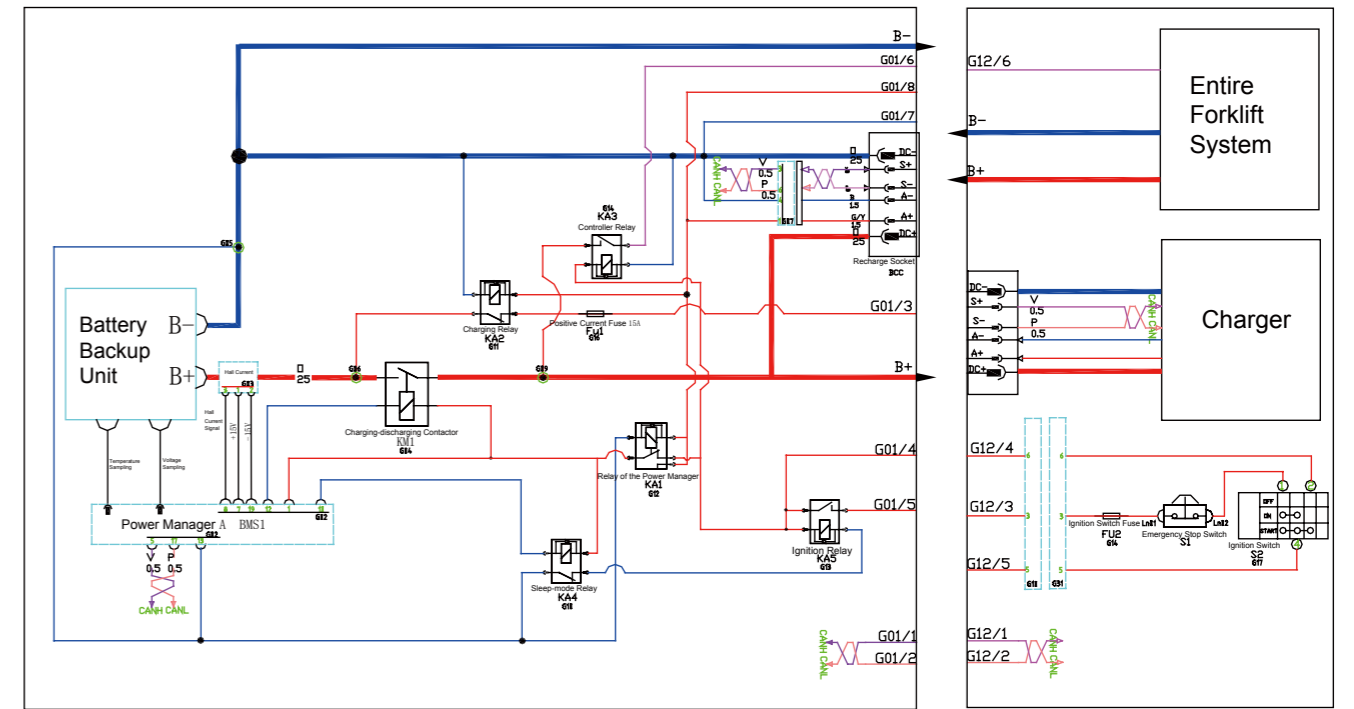
Internal Battery   Charger or Entire Forklift

●Connect the charger BCC, charging port inputs 24V power (A +, A- pin outputs 24V power supply), the normally open contact of BMS relay KA1 pulls in, the BMS is energized, and the positive pole of the charge and discharge contactor coil is energized.

●Connect the charging pile BCC, charging port inputs 24V power (A +, A- pin outputs 24V power supply), the charging relay KA2 and the ignition switch circuit are disconnected, the entire forklift cannot be powered on.

●The BMS collects the voltage and temperature information of the battery. If there is no abnormality in the battery, it controls the charging and discharging contactor KM1 to pull in and connect the positive and negative electrodes of the battery to the positive and negative electrodes of the charger to start charging. If there is abnormality in the battery, the contactor does not pull in, and the charger cannot charge the battery.

8.9.1.9 Charging Process （On-board charger）
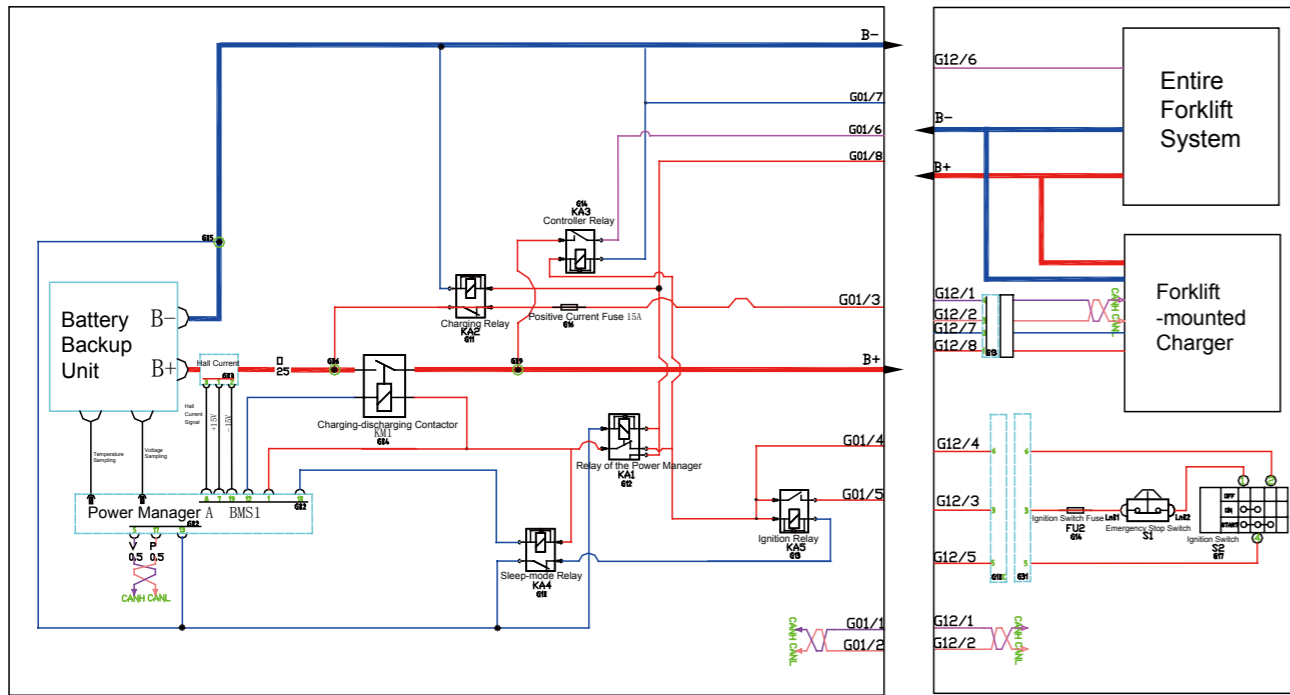
Internal Battery   Charger or Entire Forklift

- When the on-board charger is connected to the power grid, the auxiliary power supply outputs 24V, and the power is supplied through (G13-1, G13-2) —— (G12-8, G12-7) —— (G01-8, G01-7). The normally open contact of BMS relay KA1 pulls in, the BMS and the positive pole of the charge and discharge contactor coil are energized.

- When the on-board charger is connected to the power grid, the auxiliary power supply outputs 24V, and the power is supplied through (G13-1, G13-2) —— (G12-8, G12-7) —— (G01-8, G01-7). The charging relay KA2 and the ignition switch circuit are disconnected, and the entire forklift cannot be powered on.

- The BMS collects the voltage and temperature information of the battery. If there is no abnormality in the battery, it controls the charging and discharging contactor KM1 to pull in and connect the positive and negative electrodes of the battery to the positive and negative electrodes of the on-board charger to start charging. If there is abnormality in the battery, the contactor does not pull in, and the on-board charger cannot charge the battery.

8.9.2 Control System
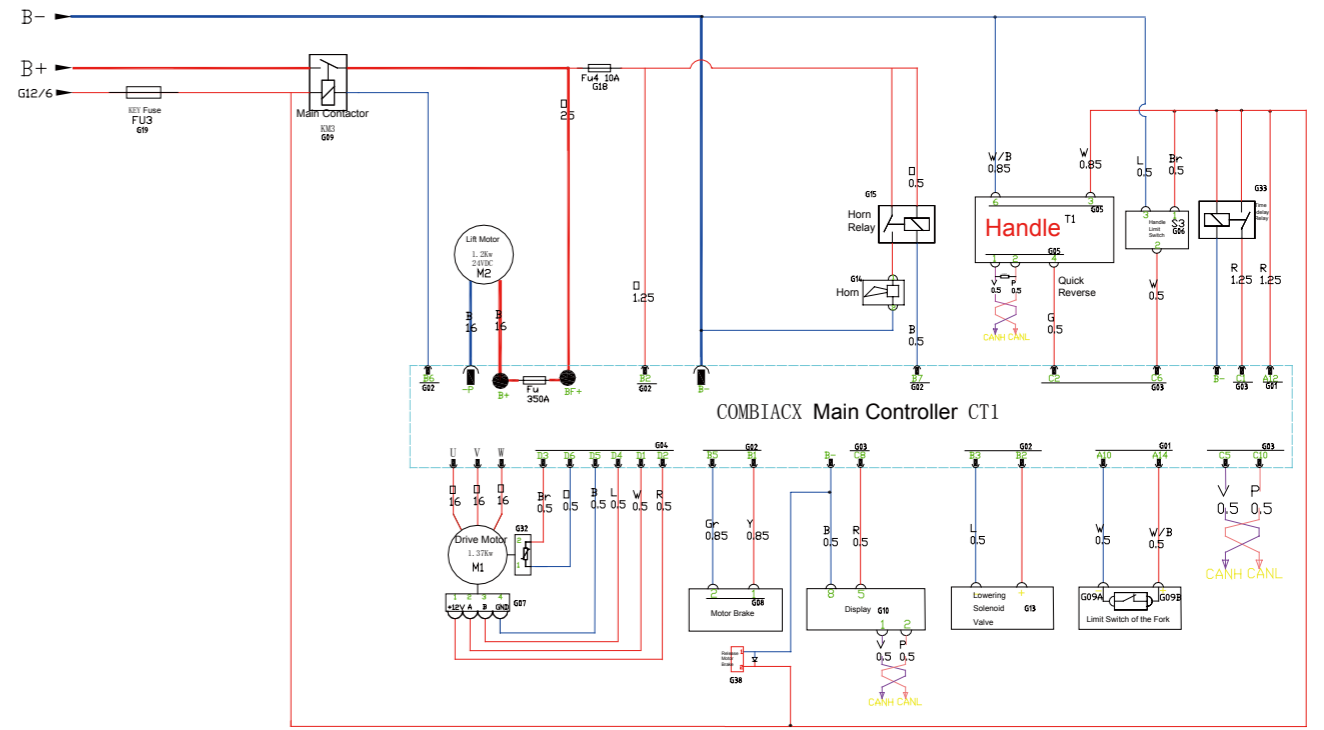
- If the charging and discharging contactor KM1 inside the battery box pulls in, the contactor KM3 has 24V power at the battery box end.

- If the controller relay pulls in and the main controller C1 hole gets 24V voltage, the controller logic circuit starts to work.

- The controller starts the self-inspection work. If there is no serious fault, the main controller controls the contactor KM3 to pull in, and the controller B + gets electricity.

Contactor coil KM3：

- The contactor coil used on the controller is 24V, the coil power is provided by the controller B6 hole and the battery G01-6 hole. When the coil is energized, the main contactor contact pulls in, and the 24V power from the battery box will reach B +.

- When the handle is placed vertically for a period of time without use, the main contactor KM3 will disconnect automatically. When the handle is returned to the proper position again, the contactor KM3 will pull in automatically.

8.9.2.1 Driving Function

● When the handle is pressed to the proper position, the handle limit switch is closed and hole C6 receives a high level signal. The main contactor KM3 will pull in first if it is not in the pull-in state.

● Manually toggle the handle to move forward or backward, when the main controller receives the forward or backward switch command and the throttle analog quantity is within the effective range, the main controller pin B5 / B1 outputs power to the motor brake and the brake is released. The main controller determines the command speed of the drive motor according to the value of the throttle analog quantity, and outputs the current to make the motor reach the command speed. The main controller synchronously converts the motor speed into kilometers and sends it to the instrument to display the forklift speed through the CAN bus.

● When the throttle is released or the handle is pressed down to brake, the forklift speed decelerates to 0 first and the motor brake locks；

● In the above driving process, the motor speed encoder detects the motor speed and transmits it to the controller, and the motor temperature sensor detects the motor temperature and transmits it to the controller.

● The speed encoder outputs two pulse signals with a phase difference of 90 °, and determines the rotation direction of the motor according to the phase sequence of the two pulse signals; at the same time, it counts the pulse signals fed back by the motor and calculates the motor speed. The drive motor rotates once, and the encoder outputs 32 pulses.

● The temperature sensor detects the motor temperature and feeds back the signal to the controller. When the motor temperature is too high, the controller controls the motor to decelerate or stop.

8.9.2.2 Instrument - Dashboard Indicator Lights and Buttons
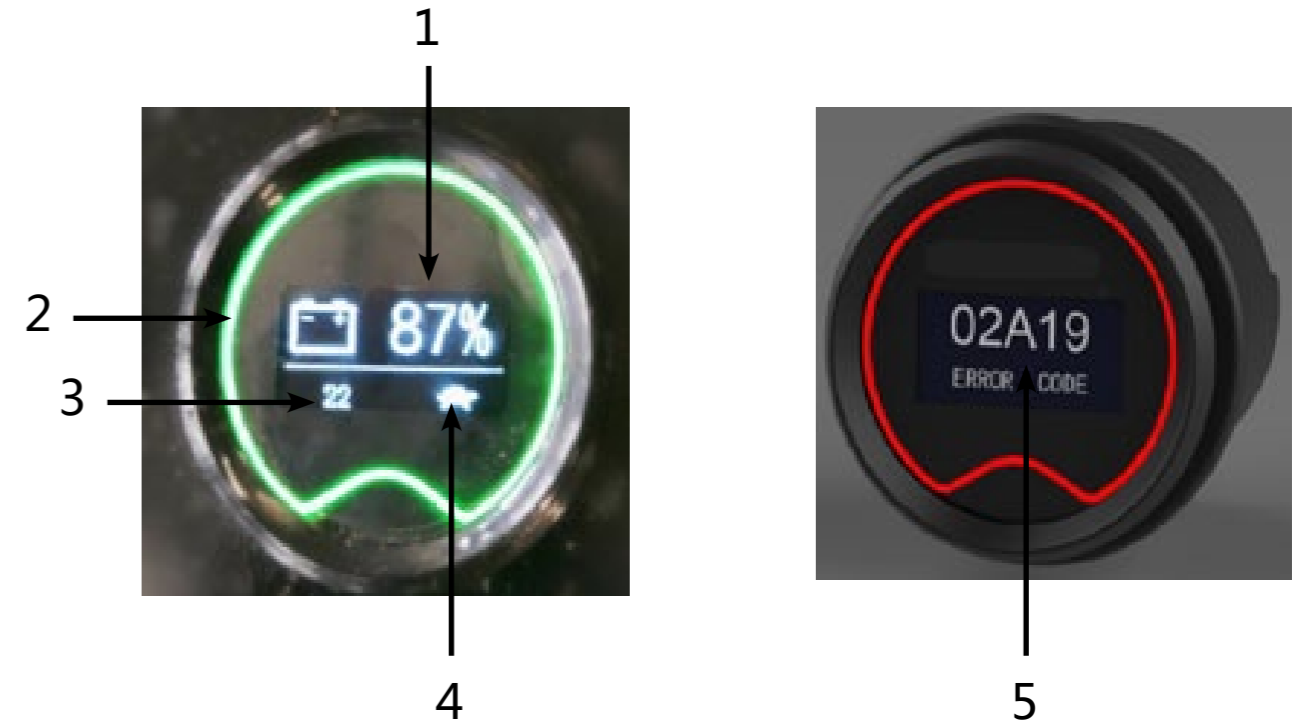
1) Battery lev

2) Green background when there is no fault, r background and fault code when there is a fault

3) Display cumulative time when not running; displ driving speed when running

4) Display constant speed rating; light on in the tortoi speed state

5) Green background when there is no fault, r background and fault code when there is a fault

8.9.2.3 Instrument - Dashboard Low Power Alarm Function

● When the battery power SOC is less than or equal to 10%, the master controller will send a low power alarm to the instrument, and the instrument will alarm and display 02A66, prompting charging and the master controller will prohibiting lifting and the travel speed halved.

8.9.2.4 Instrument Pin Definition

Plug Model	Figure	Pin Model	Socket Code
Molex 8 Pin connector,Molex No. 39-01-2085		39-00-0038(24AWG)or 39-00-0078(16AWG)	8 4 5 1

Code	Name	Code	Name
1	CAN_H	5	B+
2	CAN_L	6	RS232-RX
3	NC	7	CAN_T
4	NC	8	B-

8.9.2.5 Lifting System
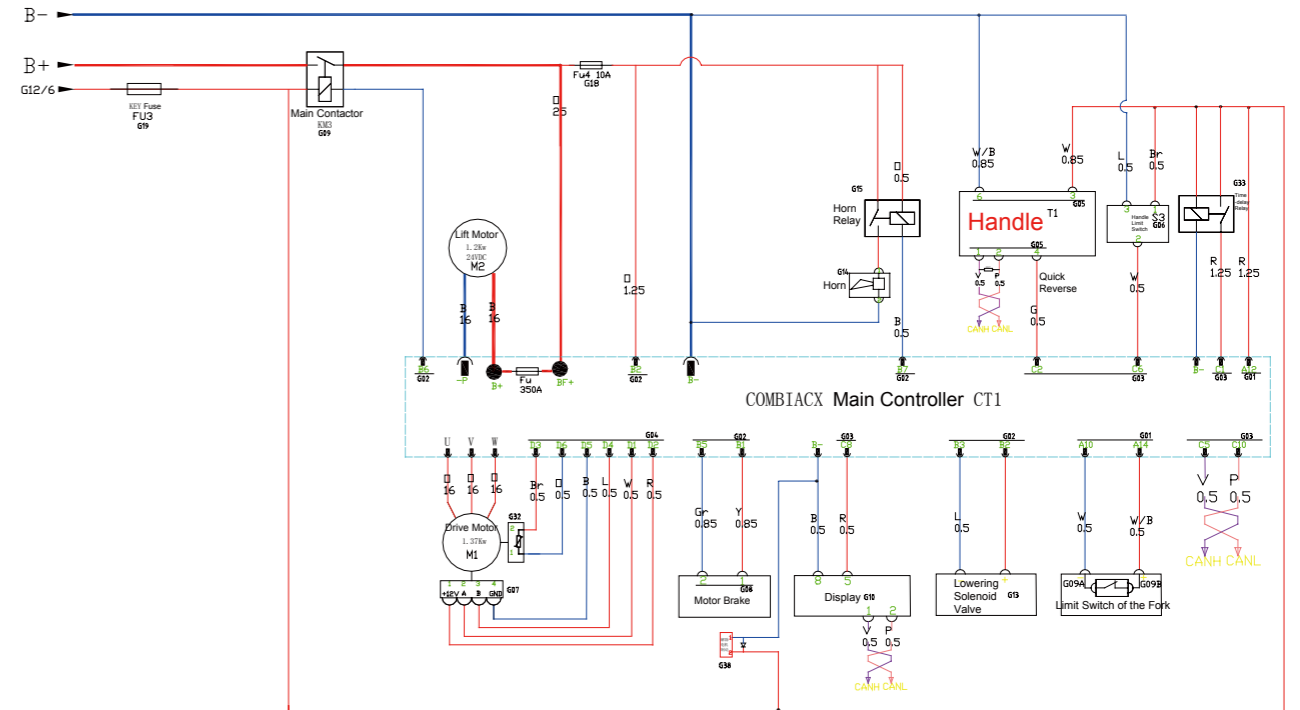
For the CAN handle, the lift signal is sent to the main controller through the CAN message; for the mechanical handle, the lift signal is sent to the main controller directly through the hardware signal.

Lifting Process

The lifting motor is connected to -P and B +of the main controller. When the main controller receives the lifting switch signal, it outputs DC power to make the lifting motor work. When it reaches the top and triggers the lifting limit switch, the lifting limit switch is disconnected. The signal stops the output current and the lifting motor stops.

Lowering Process

The lowering switch is closed and the main controller outputs 24V power between its B3 hole and B+ hole. Energize the lowering valve by opening its port and lowering down the fork.

8.9.2.6 Brake System
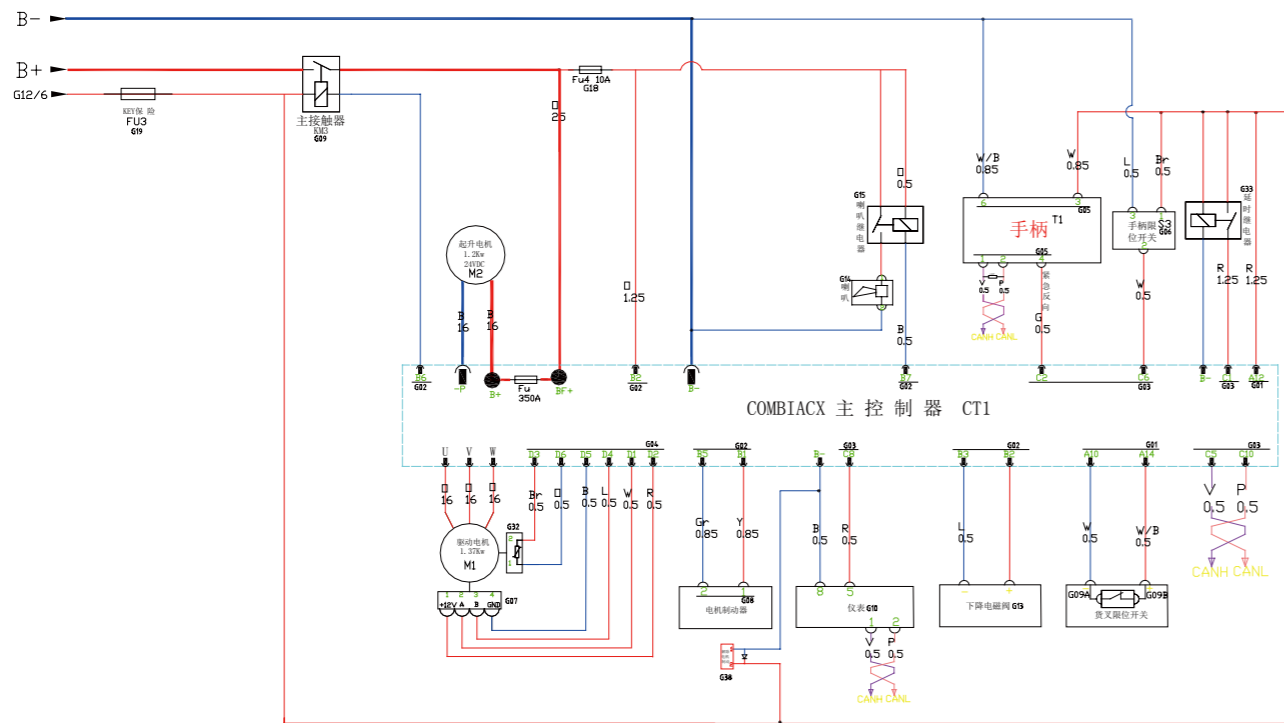
2.4.1 Braking Process

●Press the handle down when operating the forklift. The handle limit switch is disconnected and the main controller identify it as the brake indicator.

●The controller provides the reverse current to the motor. Slow down the drive motor at a preset speed until it is stopped. In this process, a part of the motor's kinetic energy is converted into electrical energy and returns to the battery through the controller. Another part is converted into heat, and then the motor brake is locked.

2.4.2 Regenerative Braking for Zero-speed

●Function form: When starting the regeneration signal, the excitation current will increase. The armature current is adjusted to the regeneration current limit (the adjustment of the regeneration current limit is controlled by the acceleration configuration settings). As the forklift decelerates, the excitation current continues to increase and the armature begins to pulse on time. The excitation current will increase until it reaches 100% of the on time.

●When the armature pulsates on time and the excitation current reaches the conduction time of 100%, the regenerative current will not be maintained any more and the braking function will be cancelled. When the rotor stops reversing, the vehicle will return to electric state according to the operator's operation.

●Part of the energy generated by the motor during regeneration is returned to the battery, and part of it is dumped into the motor in the form of heat. The advantage of this system is that the drive motor has less heat and the brush life of the drive motor is longer.

MAINTAIN TUQUE

9.1 CHECK THE TORQUE OF THE KEY FASTENERS
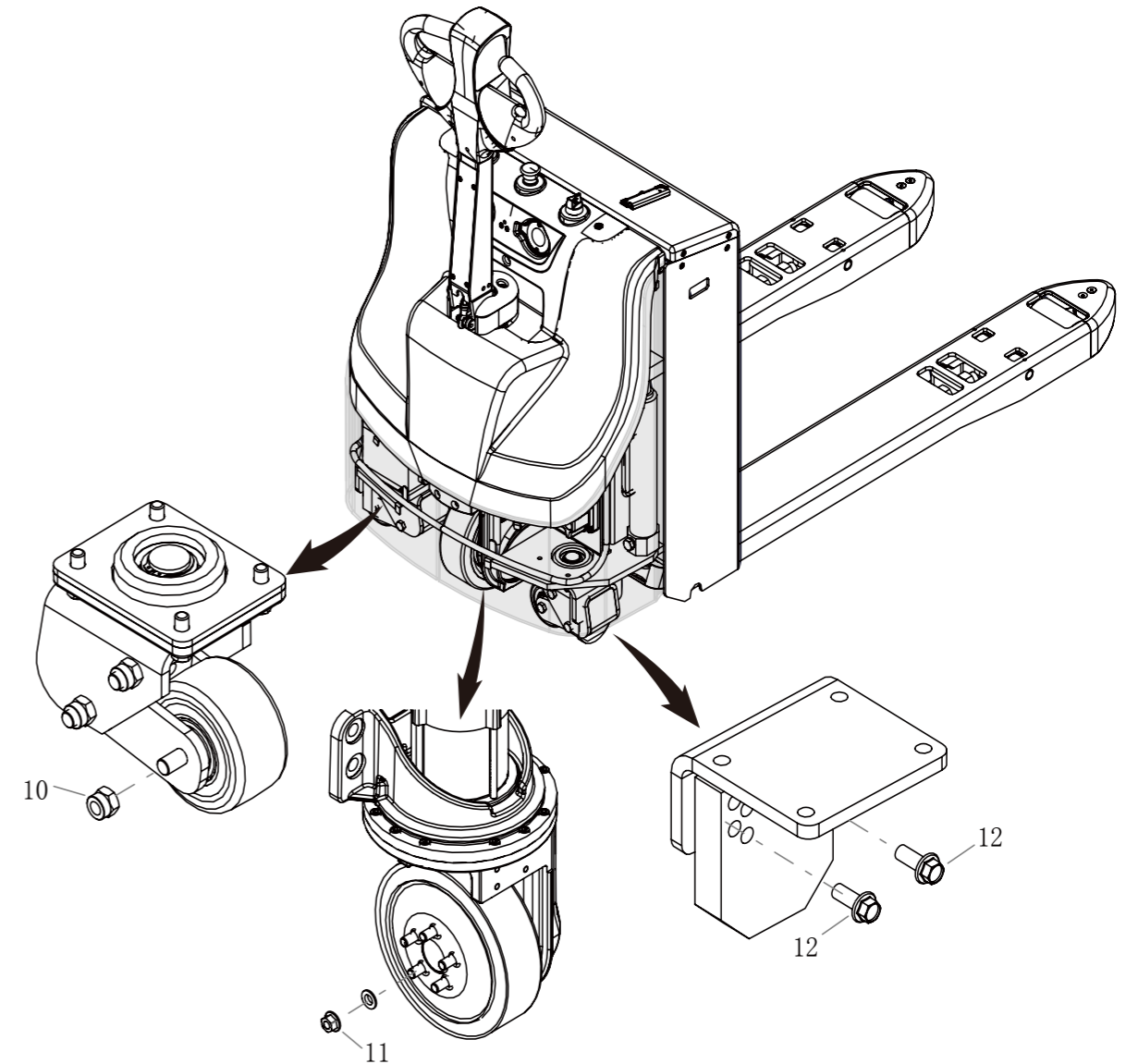
CODE	PART NAME	QTY	OTHER INFORMATION
10	TYPE 1 NON-METALLIC INSERT, HEXAGON LOCK NUT _M12_	1	55 N-m
11	Hexagon flange bolt _M12×1.5	5	90N.m
12	HEXAGON FLANGE BOLT _M10×25	2	50 ~ 60N.m

APPENDIX

10.1 TABLE OF THE TORQUE VALUE

Torque Value for Tightening Bolts

Nominal Diameter mm	Quality Class of the Bolts					
	4.8	5.8	6.8	8.8	10.9	12.9
	Proof Stress MPa					
	310	380	440	600	830	970
	Tightening Torque N ● m					
M6	5~6	7~8	8~9	10~12	14~17	17~20
M8	13~15	16~18	18~22	25~30	34~41	41~48
M8×1	14~17	17~20	20~23	27~32	37~43	43~52
M10	26~31	31~36	36~43	49~59	68~81	81~96
M10×1	28~34	35~41	41~48	55~66	76~90	90~106
M12	45~53	55~64	64~76	86~103	119~141	141~167
M12×1.5	47~56	57~67	67~79	90~108	124~147	147~174
M14	71~85	87~103	103~120	137~164	189~224	224~265
M14×1.5	77~92	94~110	110~131	149~179	206~243	243~289
M16	111~132	136~160	160~188	214~256	295~350	350~414
M16×1.5	118~141	144~170	170~200	228~273	314~372	372~441
M18	152~182	186~219	219~259	294~353	406~481	481~570
M18×1.5	171~205	210~247	247~291	331~397	457~541	541~641
M20	216~258	264~312	312~366	417~500	576~683	683~808
M20×1.5	239~287	294~345	345~407	463~555	640~758	758~897
M22	293~351	360~431	416~499	568~680	786~941	918~1099
M22×1.5	322~386	395~473	458~548	624~747	863~1034	1009~1208
M24	373~446	457~547	529~634	722~864	998~1195	1167~1397
M24×2	406~486	497~595	576~689	785~940	1086~1300	1269~1520
M27	546~653	669~801	774~801	1056~1264	1461~1749	1707~2044
M27×2	589~706	723~865	837~1002	1141~1366	1578~1890	1845~2208
M30	741~887	908~1087	1052~1259	1434~1717	1984~2375	2318~2775
M30×2	820~982	1005~1203	1164~1393	1587~1900	2196~2629	2566~3072
M36	1295~1550	1587~1900	1838~2200	2506~3000	3466~4150	4051~4850
M36×3	1371~1641	1680~2011	1946~2329	2653~3176	3670~4394	4289~5135
M42	2071~2479	2538~3039	2939~3519	4008~4798	5544~6637	6479~7757
M42×3	2228~2667	2731~3269	3162~3786	4312~5162	5965~7141	6921~8345
M48	3110~3723	3813~4564	4415~5285	6020~7207	8327~9969	9732~11651
M48×3	3387~4055	4152~4970	4807~5755	6556~7848	9069~10857	10598~12688

10.2 ONBOARD TOOL
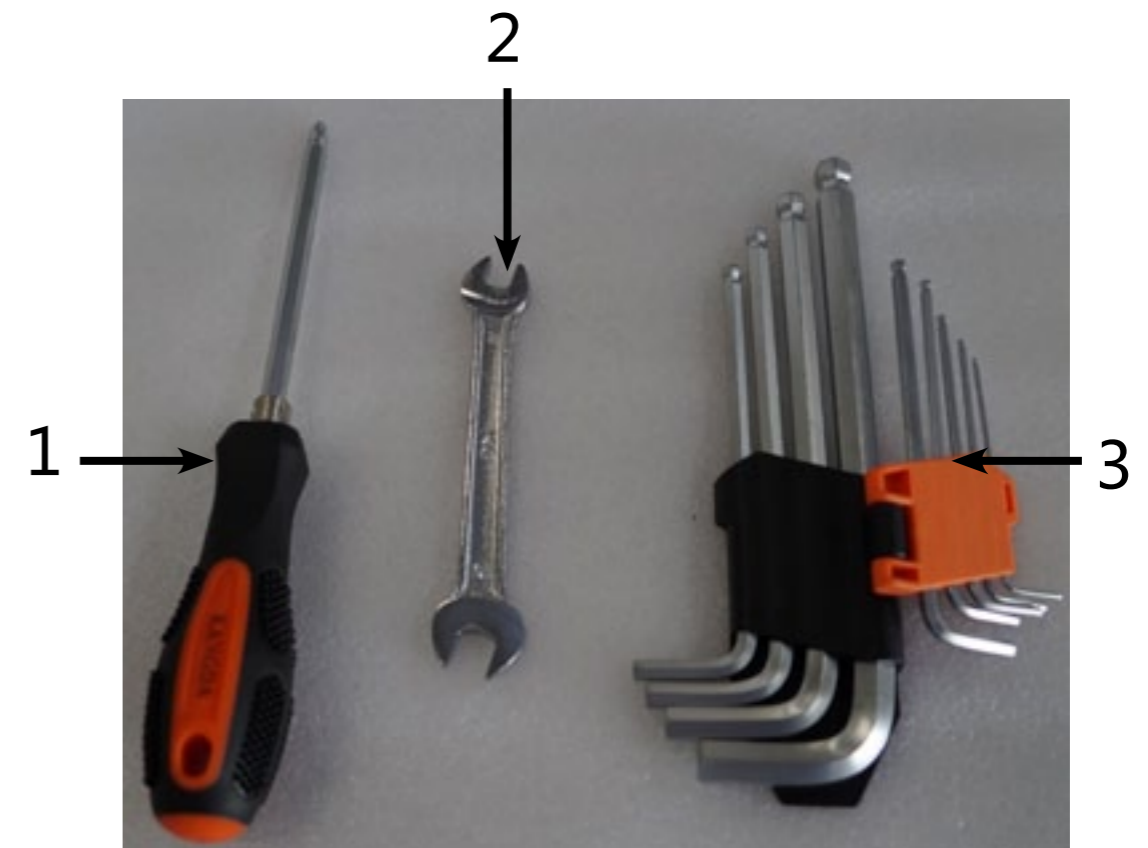
CODE	NAME & SPECIFICATION	QTY
1	DUAL-PURPOSE SCREW DRIVER	1
2	OPEN-END WRENCH 8*10	1
3	HEXAGON SOCKET WRENCH WITH EXTENDED BALL HEAD IN METRIC SYSTEM	1

10.3 WIRING HARNESS

10.3.1 LOW-VOLTAGE WIRING HARNESS ASSEMBLY

G01   Connect to port A of the main controller

G02   Connect to port B of the main controller

G03   Connect to port C of the main controller

G04   Connect to port D of the main controller

G05   Connect to the handle wire harness

G06   Connect to the handle limit switch

G07   Connect to the drive motor encoder

G08   Connect to the motor brake lock

G09   Connect to the main contactor

G09A   Connect to the lift limit switch of the fork

G09B   Connect to the lift limit switch of the fork

G10   Connect to the display

G11   Connect to the negative pole of controller

G13   Connect to the lowering proportional valve

G14   Connect to the electric horn

G15   Connect to the relay of the electric horn

G17   Connect to the self-reset ignition switch

G18   Connect to the horn fuse

G19   Connect to the key fuse

G21   Connect to the output end of the main controller

G31   Connect to the connector beside the wire harness

G32   Connect to the temperature sensor of the drive motor

G33   Connect to the time-delay relay

G38   Connect to the diode

H02   Connect to USB

H03   Connect to the 24V reserved connector 1

H04   Connect to the electric brake relief

Ln01   Connect to the emergency stop switch

Ln02   Connect to the emergency stop switch

10.3.2 WIRING HARNESS FOR THE BATTERY BOX

10.3.2.1 POWER MANAGER HARNESS

G01   Connect to the 8pin connector of the battery box

G02   Connect to the power manager

G03   Connect to Hall Sensor

G04   Connect to the main contactor

G05   Connect to the negative pole of the battery pack

G06   Connect to the main contactor terminal (positive pole of the battery pack)

G07   Connect to the charging port

G09   Connect to the main contactor terminal (output side)

G10   Connect to the sleep-mode relay

G11   Connect to the charging relay

G12   Connect to the relay of the power manager

G13   Connect to the relay of the ignition switch

G14   Connect to the relay of the controller

G16   Connect to the positive current fuse 10A
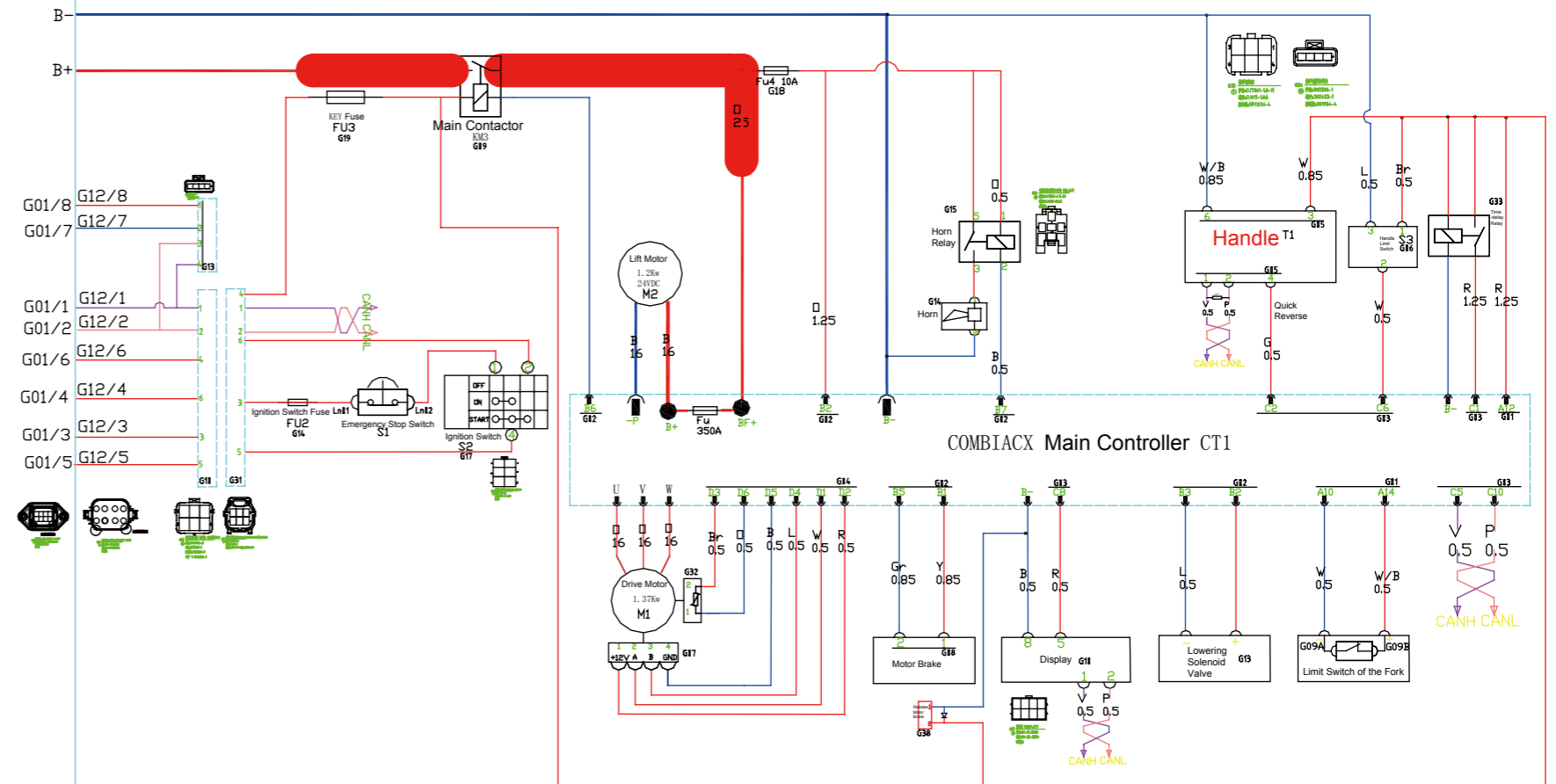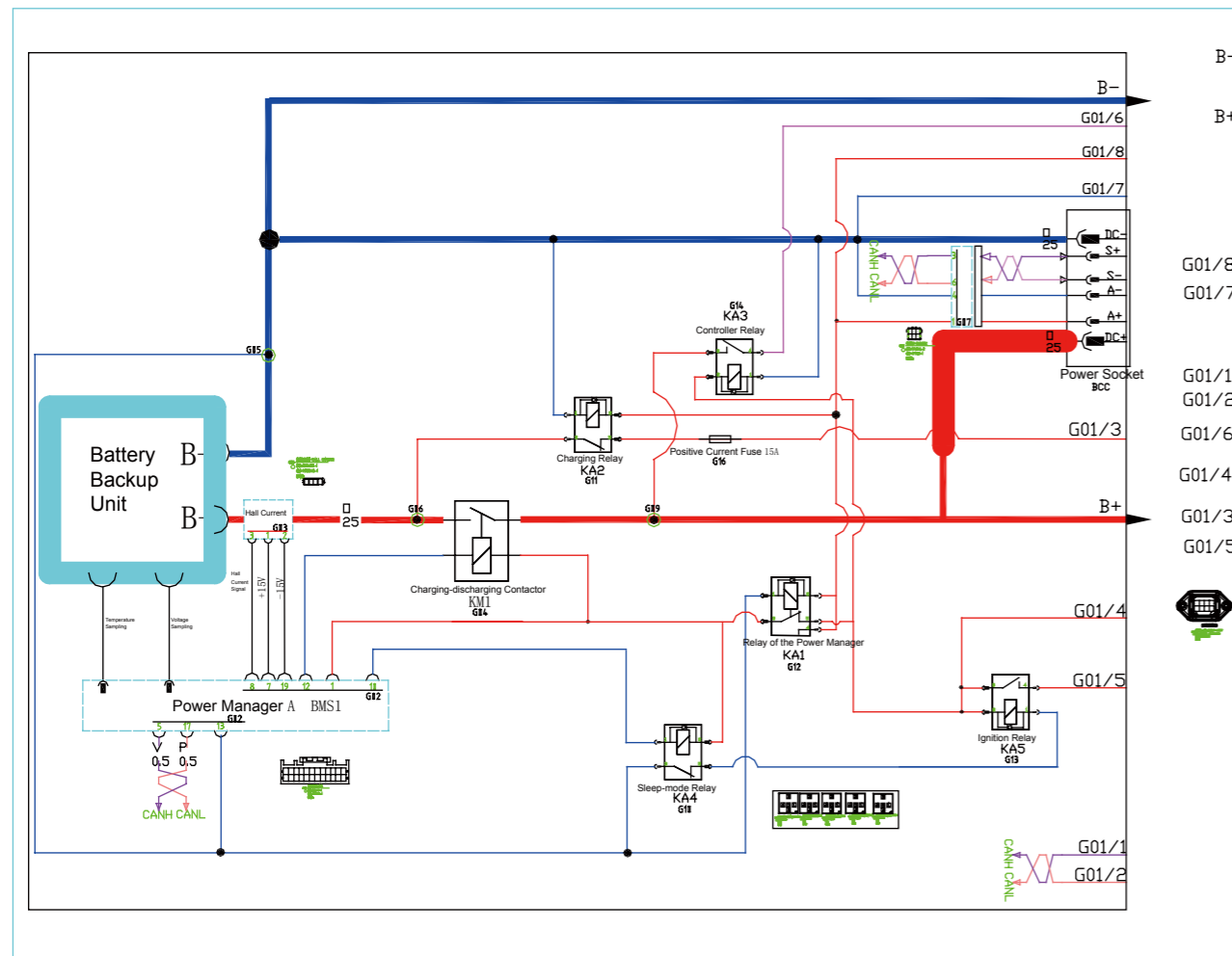
10.3.2.2 BATTERY SAMPLING HARNESS

G01   Connect the sampling port of 24pin module

G02   Connect the sampling port of 28pin module

G03   Connect to the temperature sampling harness of the power manager

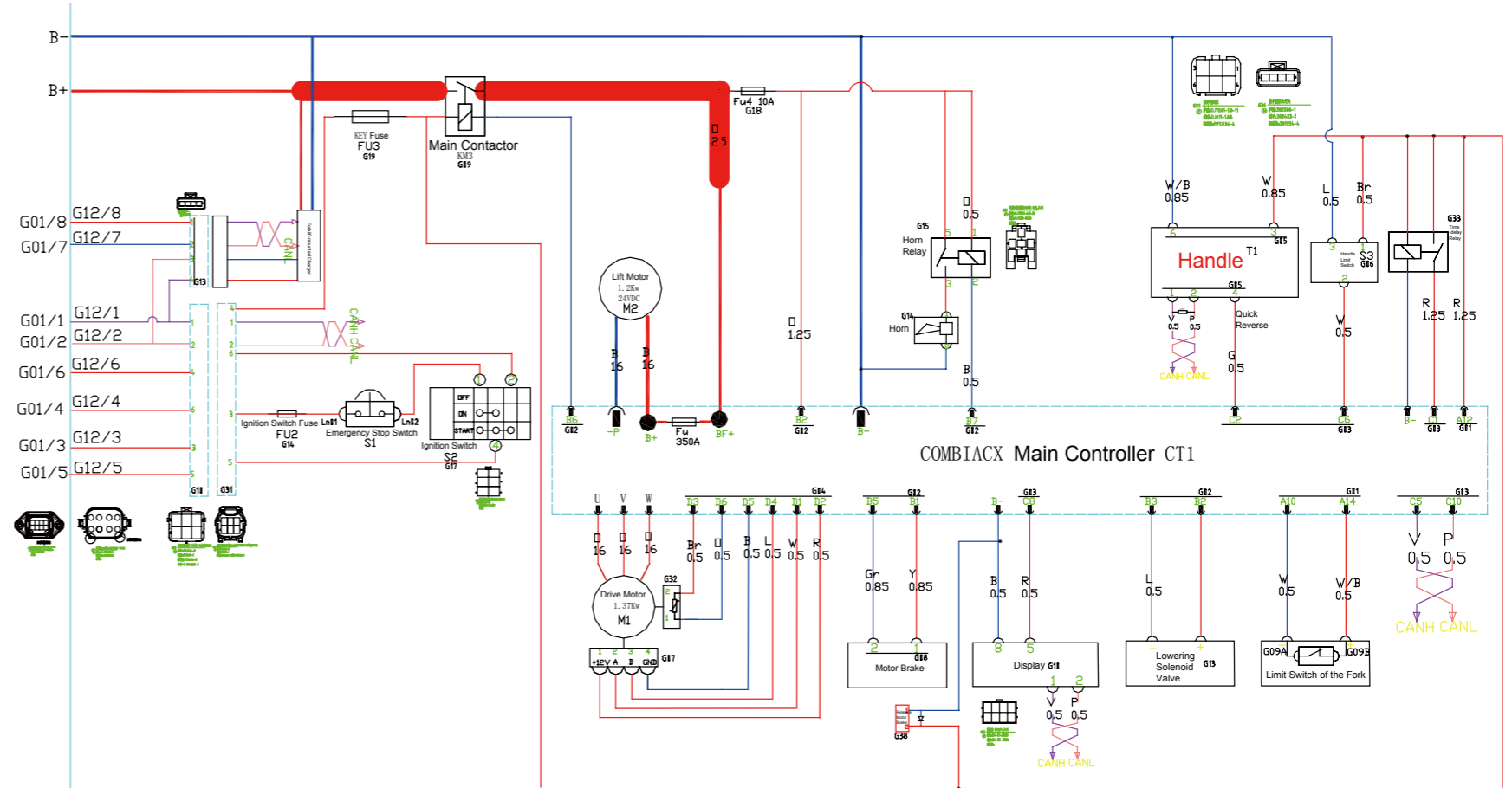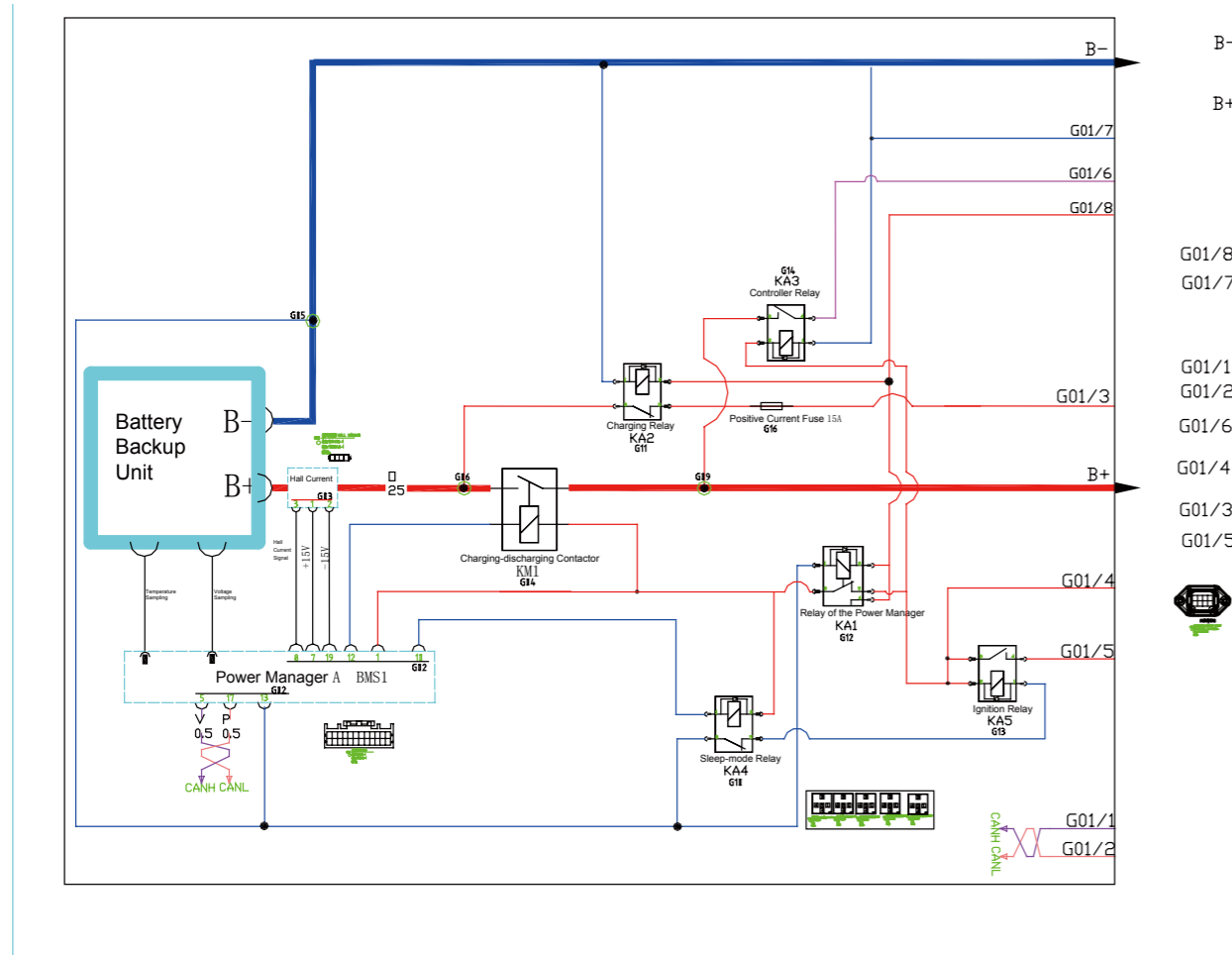G04   Connect to the voltage sampling harness of the power manager

10.4 ELECTRICAL SCHEMATIC DIAGRAM

1. GB +CAN

2. Forklift-mounted +CAN

10.5 PARAMETERS OF THE CONTROLLER

Name	Current Value	Menu	Description
ACCELER. DELAY	1.5	Parameter Change	Time (Unit:S) required when the motor accelerates from 0H to 100Hz
RELEASE BRAKING	0.8	Parameter Change	Time (Unit:S) required when the accelerator is released and the motor accelerates from 0H to 100Hz
TILLER BRAKING	0.4	Parameter Change	Time (Unit:S) required when the tiller switch is closed and the motor decelerates from 100H to 0Hz
UPRIGHT BRAKING	3.5	Parameter Change	Deceleration rate of upright braking
INVERS. BRAKING	0.5	Parameter Change	Time (Unit:S) required when the switch reverses rapidly and the motor decelerates from 100H to 0Hz
DECEL. BRAKING	2.5	Parameter Change	Time (Unit:S) required when the accelerator is partly released and the motor accelerates from 0H to 100Hz
PEDAL BRAKING	1	Parameter Change	Time (Unit:S) required when the brake switch is closed and the motor decelerates from 100H to 0Hz (except for the pallet truck)
SPEED LIMIT BRK.	2.8	Parameter Change	Speed reduction rate
EPS STEER BRAK.	0.5	Parameter Change	(Except for the mechanical steering pallet truck)
MAX SPEED FORW	90%	Parameter Change	Percent showing max. speed forward
MAX SPEED BACK	90%	Parameter Change	Percent showing max. speed backward
HYD SPEED FINE	16%	Parameter Change	Unused
HYDRO COMPENS.	10%	Parameter Change	Unused
CUTBACK SPEED	50%	Parameter Change	Unused
H&S CUTBACK	35%	Parameter Change	Unused

Name	Current Value	Menu	Description
THMOT AL. CUTB.	50%	Parameter Change	Temperature sensor alarm for speed limit 50%
BDI AL. CUTBACK	50%	Parameter Change	Battery level is 10% and the speed limit is 50%.
STEER CTB.1	80%	Parameter Change	Unused state. Relevant with electric steering. Speed limit at curves.
STEER CTB.2	60%	Parameter Change	Unused state. Relevant with electric steering. Speed limit at curves.
STEER CTB.3	40%	Parameter Change	Unused state. Relevant with electric steering. Speed limit at curves.
STEER CTB ANGL 1	20 ?0	Parameter Change	Unused state. Relevant with electric steering. The angle of the handle is 20 degrees. Speed is declined to 80%. Speed limit at curves.
STEER CTB ANGL 2	40 ?0	Parameter Change	Unused state. Relevant with electric steering. The angle of the handle is 40 degrees. Speed is declined to 60%. Speed limit at curves.
STEER CTB ANGL 3	80 ?0	Parameter Change	Unused state. Relevant with electric steering. The angle of the handle is 80 degrees. Speed is declined to 40%. Speed limit at curves.
TURTLE H&S TIME	1	Parameter Change	Enter handle upright mode (Long press the turtle speed).
RETURN TIME	10	Parameter Change	Return time of the handle upright mode
TURTLE TIME DISP	1	Parameter Change	Flashing frequency of the turtle icon
FREQUENC Y CREEP	0.60 Hz	Parameter Change	Unused state. Creep frequency can only appear through the direction switch.
MAX IMUM CURRENT	100%	Parameter Change	The maximum current output of the controller (in walking mode). Not adjusted.
ACC SMOOTH	1	Parameter Change	Acceleration smoothness (rarely used). The minimum value is 1S.

Name	Current Value	Menu	Description
INV SMOOTH	1	Parameter Change	Deceleration smoothness in reverse (rarely used). The minimum value is 1S.
STOP SMOOTH	20 Hz	Parameter Change	Parking smoothness (rarely used). It can only be adjusted downward.
BRK SMOOTH	1	Parameter Change	Brake smoothness (rarely used). The minimum value is 1S.
STOP BRK SMOOTH	20 Hz	Parameter Change	Parking brake smoothness (rarely used). It can only be adjusted downward.
AUXILIARY TIME	0.5	Parameter Change	Unused state. The auxiliary time is used in conjunction with STOP ON RAMP.
HYDRO TIME	5	Parameter Change	The pump motor stops in delay.
PUMP IMAX	LEVEL = 9	Parameter Change	Maximum output current of the Pump motor is controlled.
PU. ACCELER. DEL	0.5	Parameter Change	Pump acceleration is delayed.
PU. DECELER. DEL	0.5	Parameter Change	Pump deceleration is delayed.
MAX SPEED LIFT	100%	Parameter Change	Maximum lifting speed
PUMP CREEP SPEED	10%	Parameter Change	Minimum speed when the pump starts.
PUMP COMPENSAT.	10%	Parameter Change	Pump speed compensation
MIN EVP	6.3	Parameter Change	The minimum output value of the lowering solenoid valve
MAX EVP	97.6	Parameter Change	The maximum output value of the lowering solenoid valve
EVP OPEN DELAY	0.3	Parameter Change	The lowering solenoid valve opens in delay.
EVP CLOSE DELAY	0.3	Parameter Change	The lowering solenoid valve closes in delay.
SPEED RED 1	55%	Parameter Change	Unused
SPEED RED 2	30%	Parameter Change	Unused
ACC DELAY BELLY	0.3	Parameter Change	Time when the motor declines to 0 in quick reverse.

Name	Current Value	Menu	Description
DEC DELAY BELLY	0.3		The motor declines to 0 in quick reverse and then accelerate to the preset speed in reverse.
TILLER DELAY	0.1		Tiller is delayed.
TILLER SWITCH	HANDLE	Set Options	Interlock type. Handle switch. Seat-typed.
EB ON TILLER BRK	OFF	Set Options	Show whether the electromagnetic brake is locked when the handle is in emergency braking
HOUR COUNTER	RUNNING	Set Options	Hour counter. It is running time.
EVP TYPE	DIGITAL	Set Options	The lowering solenoid valve is switching mode (on/off) or analog quantity. Default option.
BATTERY CHECK	LEVEL = 1	Set Options	Unused
B AT T.LOW LED TSH	20%	Set Options	An alarm for battery level 20%. The lifting function is not limited.
BAT T .LOW TRESHLD	10%	Set Options	An alarm for battery level 10%. The lifting function is limited and the driving speed is reduced to 50%.
STOP ON RAMP	ON	Set Options	Stop on ramp
QUICK INVERSION	TIMED	Set Options	Quick inversion function
SETMOT. TEMPERAT	OPTION #1	Set Options	Set the type of the motor temperature sensor.
EPS	NONE	Set Options	Show whether there is electric steering.
MC HSD ON EPS	ABSENT	Set Options	Unused
DEBUG ON CAN	ON	Set Options	Unused
EV1	DIGITAL	Set Options	Unused
EV2	DIGITAL	Set Options	Unused
EV3	DIGITAL	Set Options	Lift solenoid valve
HORN	DIGITAL	Set Options	Horn relay

Name	Current Value	Menu	Description
INVERSION MODE	OFF	Set Options	Mode of the quick inversion switch
HYDRO FUNCTION	NONE	Set Options	Unused state. Hydraulic auxiliary steering function
M.C. FUNCTION	PRESENT	Set Options	Main contactor function
AUX OUT FUNCTION	PRESENT	Set Options	Electromagnetic brake output function
DISPLAY TYPE	4	Set Options	Display specification
REMA TILLER CAN	ON	Set Options	Show if REMA CAN tiller can be used.
LIFT MODE	OPTION #1	Set Options	Working mode of the lift motor
SPEED ON MDI	ON	Set Options	The speed shown on the display
RESET HOURMETER	OFF	Set Options	Reset the Hour meter. Setting it ON means it will reset to 0.
BMS	PRESENT	Set Options	Select the battery type as the lithium battery or lead battery.
CONNECTED TO	TRACTION	Set Model	Show the function of the current controller such as working controller, pump controller and eps steering controller.
SET BATTERY TYPE	24V	Adjustment	Set the battery voltage
ADJUST BATTERY	26.52 V	Adjustment	Current battery voltage and voltage between KEY and B-.
THROTTLE 0 ZONE	5%	Adjustment	Accelerator dead zone (can be set up arbitrarily)
THROTTLE Y POINT	60%	Adjustment	Accelerator curve setting (acceleration rate)
THROTTLE X POINT	40%	Adjustment	Accelerator curve setting (acceleration rate)
THROT.0 LEFT LFT	5%	Adjustment	Unused
THROT.X LEFT LFT	40%	Adjustment	Unused
THROT.Y LEFT LFT	60%	Adjustment	Unused
THROT.0 LEFT LOW	5%	Adjustment	Unused
THROT.X LEFT LOW	40%	Adjustment	Unused
THROT.Y LEFT LOW	60%	Adjustment	Unused

Name	Current Value	Menu	Description
THROT.0 RIGH.LFT	5%	Adjustment	Unused
THROT.X RIGH.LFT	40%	Adjustment	Unused
THROT.Y RIGH.LFT	60%	Adjustment	Unused
THROT.0 RIGH. LOW	5%	Adjustment	Unused
THROT.X RIGH. LOW	40%	Adjustment	Unused
THROT.Y RIGH. LOW	60%	Adjustment	Unused
BAT. MIN ADJ.	LEVEL = 3	Adjustment	For the setting with lead battery, unused state.
BAT. MAX ADJ.	LEVEL = 5	Adjustment	For the setting with lead battery, unused state.
BDI ADJ STARTUP	LEVEL = 5	Adjustment	For the setting with lead battery, unused state.
CHECK UP DONE	OFF	Adjustment	Unused
CHECK UP TYPE	NONE	Adjustment	Unused
MC VOLTAGE	100%	Adjustment	Initial voltage of the main contactor
MC VOLTAGE RED.	80%	Adjustment	Sustaining voltage of the main contactor
EB VOLTAGE	100%	Adjustment	Initial voltage of the brake
EB VOLTAGE RED.	80%	Adjustment	Sustaining voltage of the brake
PWM EV2	100.00%	Adjustment	Unused
PWM EV3	100.00%	Adjustment	Unused state. Percent of the output voltage of the lifting solenoid valve.
CUTBACK SENS CNT	20	Adjustment	Unused
BELLY TIME	1	Adjustment	Adjustable Belly time in reverse.
DEBOUNCING TIME	3	Adjustment	Unused
SPEED FACTOR	213	Adjustment	Check the speed on the display.
IRAP SPEED	40 Hz	Adjustment	Alarm for over speed
SPEED FACTOR	213	Adjustment	Check the speed on the display.

Name	Current Value	Menu	Description
IRAP SPEED	40 Hz	Adjustment	Alarm for over speed
TEMP MOT ALARM	120 ?0	Adjustment	An alarm for motor temperature. The driving speed is reduced to 50% and the lifting function is not limited.
TEMP MOT STOP	145 ?0	Adjustment	An alarm for motor temperature. The driving speed is reduced to 0 and the lifting function is not limited.
ADJUSTMENT #02	72%	Special Adjust	Do not adjust it
SET CURRENT	240 A	Special Adjust	Do not adjust it
SET TEMPERATURE	26℃	Special Adjust	Do not adjust it
ADJUSTMENT #03	63%	Special Adjust	Do not adjust it
SET CURRENT PUMP	270 A	Special Adjust	Do not adjust it
HIGH ADDRESS	0	Special Adjust	Do not adjust it
DITHER AMPLITUDE	2.50%	Special Adjust	Do not adjust it
DITHER FREQUENCY	31.2 Hz	Special Adjust	Do not adjust it
CAN BUS SPEED	125	Special Adjust	Do not adjust it
POSITIVE E.B.	LEVEL = 0	Hardware Settings	Do not adjust it
TOP MAX SPEED	130 Hz	Hardware Settings	Do not adjust it
TRUCK TYPE	LEVEL = 1	Hardware Settings	Do not adjust it
COMPENSATION	ON	Hardware Settings	Do not adjust it
SLIP CONTROL	ON	Hardware Settings	Do not adjust it
DC-LINK COMPENS.	ON	Hardware Settings	Do not adjust it
CONT.CLOSED DIAG	ON	Hardware Settings	Do not adjust it
SAT FREQUENCY	90 Hz	Hardware Settings	Do not adjust it
BRAKING MODUL.	80 Hz	Hardware Settings	Do not adjust it
MINIMUM VOLTAGE	3.10%	Hardware Settings	Do not adjust it
BOOST AT LO FREQ	10%	Hardware Settings	Do not adjust it
BOOST AT HI FREQ	45%	Hardware Settings	Do not adjust it
BOOST CORNER FRE	50 Hz	Hardware Settings	Do not adjust it

Name	Current Value	Menu	Description
BRAKING BOOSTER	0%	Hardware Settings	Do not adjust it
MOTOR RESISTANCE	LEVEL = 0	Hardware Settings	Do not adjust it
SLIP COEFFICIENT	LEVEL = 0	Hardware Settings	Do not adjust it
MAXSLIP RESET	0.60 Hz	Hardware Settings	Do not adjust it
MAXSLIP 0	7.0 Hz	Hardware Settings	Do not adjust it
MAXSLIP 1	7.0 Hz	Hardware Settings	Do not adjust it
FREQSLIP 1	45 Hz	Hardware Settings	Do not adjust it
MAXSLIP 2	7.4 Hz	Hardware Settings	Do not adjust it
FREQSLIP 2	75 Hz	Hardware Settings	Do not adjust it
MAXSLIP 3	7.3 Hz	Hardware Settings	Do not adjust it
FREQSLIP 3	120 Hz	Hardware Settings	Do not adjust it
MAXSLIP 4	7.3 Hz	Hardware Settings	Do not adjust it
FREQSLIP 4	160 Hz	Hardware Settings	Do not adjust it
MAXSLIP 0 BRK	5.0 Hz	Hardware Settings	Do not adjust it
MAXSLIP 1 BRK	5.0 Hz	Hardware Settings	Do not adjust it
FREQSLIP 1 BRK	45 Hz	Hardware Settings	Do not adjust it
MAXSLIP 2 BRK	5.5 Hz	Hardware Settings	Do not adjust it
FREQSLIP 2 BRK	80 Hz	Hardware Settings	Do not adjust it
MAXSLIP 3 BRK	7.0 Hz	Hardware Settings	Do not adjust it
FREQSLIP 3 BRK	120 Hz	Hardware Settings	Do not adjust it
MAXSLIP 4 BRK	7.0 Hz	Hardware Settings	Do not adjust it
FREQSLIP 4 BRK	160 Hz	Hardware Settings	Do not adjust it
OPTION 07	LEVEL = 1	Hardware Settings	Do not adjust it
OPTION 08	LEVEL = 6	Hardware Settings	Do not adjust it
OPTION 06	LEVEL = 6	Hardware Settings	Do not adjust it
AUX VOLTAGE #1	110.00%	Hardware Settings	Do not adjust it
AUX VOLTAGE #2	120.00%	Hardware Settings	Do not adjust it

OTHER INFORMATION

BYD (SHAOGUAN) CO.,LTD.

Production Address：No.1, BYD Road, Zhenjiang Industrial Zone, Shaoguan,
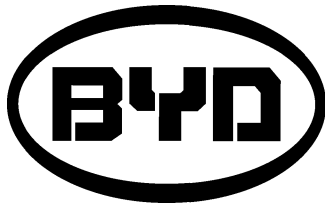
Guangdong, 512040, P.R.China

Zip Code：512040

Tel：+86-751-810 8888

After-sales address: 2nd floor, A4, BYD Industrial Park, 1 Yan'an Road, Kwai

Chung Street, Dapeng New District, Shenzhen，Zip Code：518119

Tel：+86-755-2386 0828

Wbesite：www.bydforklift.com

BYD

Build Your Dreams