



SERVICE MANUAL

NO12N2F(P)
NO20N2(P)
NO25N2(P)



The traction controller controls the traction motor. In the schematic diagram, the M1 contacts are presented on page 2. The main voltage is supplied to the terminal B+ on the traction controller.

6.5 Traction

The traction controller controls the movement of the truck. Before the truck can be operated, the battery must be connected, the key switch must be closed and the system must have passed the self-test procedure.

When the power of the truck is set to ON and the truck in the standby mode, it can be operated by turning the accelerator at the steering wheel forward or backward. In the electrical schematic diagram, the accelerator is presented on page 5. Acceleration and travel speed varies according to the movement of the accelerator.

6.6 AC motor operation

In the induction motor (= asynchronous motor), the stator is powered with alternating current and designed to create a rotating magnetic field, which rotates in time with the AC oscillations. In the induction motor, the rotor rotates at a slower speed than the stator field and thus the magnetic field through the rotor is changing (rotating). The rotor has windings in the form of closed wire loops. The rotating magnetic flux induces currents in the rotor windings as in a transformer. These currents in turn create magnetic fields in the rotor that interact with the stator field. Due to Lenz's law, the direction of the created magnetic field is such as to oppose the change in current through the windings. The cause of induced current in the rotor is the rotating stator magnetic field, so to oppose it, this rotor starts to rotate in the direction of the rotating stator magnetic field to make the relative speed between the rotor and the rotating stator magnetic field zero.

For these currents to be induced, the speed of the physical rotor must be lower than that of the stator's rotating magnetic field, or the magnetic field would not be moving relative to the rotor conductors and no currents would be induced. As the speed of the rotor drops below synchronous speed, the rotation rate of the magnetic field in the rotor increases, inducing more current in the windings and creating more torque. The ratio between the rotation rate of the magnetic field as seen by the rotor (slip speed) and the rotation rate of the stator's rotating field is called "slip". Under load, the speed drops and the slip increases enough to create sufficient torque to turn the load. For this reason, induction motors are sometimes referred to as asynchronous motors. An induction motor can be used as an induction generator, or it can be unrolled to form the linear induction motor, which can directly generate linear motion.

13 Alarm codes



TRUCKTOOL

To view the possible alarms, see the instructions of TruckTool.

NOTE: During resistance measurements, make sure that the battery connector is disconnected, and that the voltage at the measured circuit is 0 V.

Before you start to do troubleshooting to the truck:

- Make sure that all the power supplies, fuses and connections are not damaged.
- Make sure that the wiring harness is not damaged. Make sure that the related connections do not have loose pins and so on.
- Make sure that the truck frame is isolated from the battery positive and negative. Measure this from both sides of the drive contactor. Make sure that there is no short-circuit or low resistance between the positive and negative from the terminals of any controller (B+ and B- terminals).
- Make sure that the battery is not damaged. Measure the battery voltage when idle, and during full speed lift. The battery voltage must stay over 16.8 V.
- Make sure that the battery is fully charged. Low battery voltage can cause error messages.
- Set the power of the truck OFF and ON again. This can clear some error messages.
- Look at the status of the truck display (warning/alarm/info code).
- Read the alarm status from each controller. Try to make an overall picture of the root cause for the event code(s).

NOTE: During resistance measurements, make sure that the battery connector is disconnected, and that the voltage at the measured circuit is 0 V.

APPENDIX B: Truck display languages

The following truck display languages are available:

- Bulgarian – Български
- Croatian – Hrvatski
- Czech – Čeština
- Danish – Dansk
- Dutch – Nederlands
- English
- Estonian – Eesti
- Finnish – Suomi
- French – Français
- German – Deutsch
- Greek – Ελληνικά
- Hungarian – Magyar
- Italian – Italiano
- Latvian – Latviešu
- Lithuanian – Lietuvių
- Norwegian – Norsk
- Polish – Polski
- Portuguese – Português
- Romanian – Română
- Russian – Русский
- Slovak – Slovenčina
- Slovene – Slovenščina
- Spanish – Español
- Swedish – Svenska
- Turkish – Türkçe

9.3 Insulation resistance test

9.3.1 Test voltage

The insulation resistance of the truck and the traction battery are examined separately. The test voltage is greater than the nominal voltage but no more than 100 V or three times the nominal voltage:

Nominal voltage	Test voltage
24 V	50 V

9.3.2 Insulation tester check

Connect the test probe to the frame of the truck (for example, to a non-painted bolt or bracket) and the other test probe to another bolt or bracket. The tester must show a zero value.

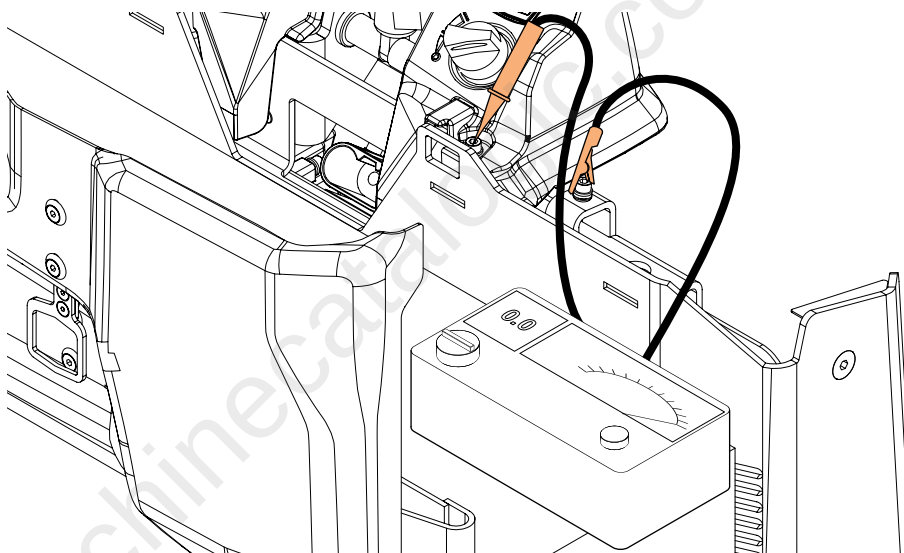


Figure 112: Insulation tester check

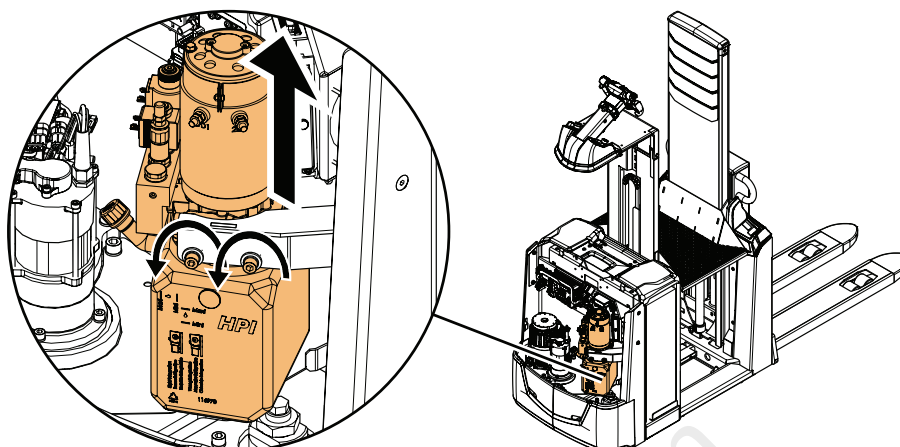
9.3.3 Measure the insulation resistance

The test is done with the battery disconnected from the truck. All the electrical components must be in place.

1. Release the emergency stop and set the key switch to the ON position.
2. Connect the test probe to the frame of the truck (for example, to a non-painted bolt or bracket) and the other test probe to the positive terminal of the battery connector.
3. Read the resistance value.
4. Measure and read the negative terminal of the battery connector in the same way.

#	Option	Description
5	Foot switch for lowering the operator's platform	Platform lowering foot switch enables the operator to lower the platform even with load in their hands.
6	Accessory rail in front	Allows mounting of various options, like scanner holder, equipment holder and so on.
7	Picking tray	This tray is used under two conditions: After picking a heavy box it can be stored temporary, for ergonomic reasons, while the platform is lowering or whilst driving to the next close-by location. For P/PF model only. Max 50 kg.
8	Scanner holder, no picking tray	Allows storage of a hand-held scanner. Not together with Picking tray option.
8	Scanner holder for picking tray	Allows storage of a hand-held scanner. Only in combination with Picking tray option.
9	Equipment holder (RAM mountings)	One or two pieces of RAM® Mounts fixed to optional Accessory bar (BAR) provides rugged mounting solution for various equipment.
10	Wrapping roll holder	Wrapping roll pole. Length 250 mm, diameter 35 mm.
11	Second level picking rail	Front, rear or both front and rear rails for 2nd level order picking, includes foldable climbing steps.
12	Load backrest	Prevents loads from falling towards the operator.
13	Sideways battery change (left side / right side)	Battery bed with rollers for quick sideways battery change with quick battery locking. Battery change from left hand side or right-hand side (towards drive direction, forks trailing).
14	Clipboard on battery cover, A4 size	For example, for a pick list or other necessary paper document.
15	Front storage boxes	Storage boxes can be used for miscellaneous items. They can prevent from dropping of pieces of tape, rope or wrap on the warehouse floor which can cause damage to bearings and axles of load wheels.
16	Storage folder on bottom of platform	Storage folder for operator's personal items, for example coats, caps or gloves.
17	Entry and exit rollers for crosswise pallet handling	Rollers on bottom side fork tip. For easy entry and exit of bottom boarded pallets.
18	Seat/backrest	Tiltable to seat position for back and feet rest. Adjustable in height. Offers extra comfort during short breaks and at long shuttles from or to the order picking area as seat or as a backrest.
19	Power supply Power supply USB 5 V	Converts 24 V to 12 V. USB-connector for charging for example, a mobile phone.
20	Heavy duty front rubber bumper	Offers extra protection to the front bumper of the power unit.
21	Raised front guard plate	Offers extra protection to the front cover.
22	Rear grab handle on backrest	Improves the operator's comfort during backwards driving.

5. Loosen the two bolts and lift the motor up.



5.11 Truck wheels

This truck has four wheels: a traction wheel, a castor wheel and two sets of load wheels.

For more information, see *Section 5.12 Traction wheel*, *Section 5.14 Castor wheel* and *Section 5.13 Load wheels*.

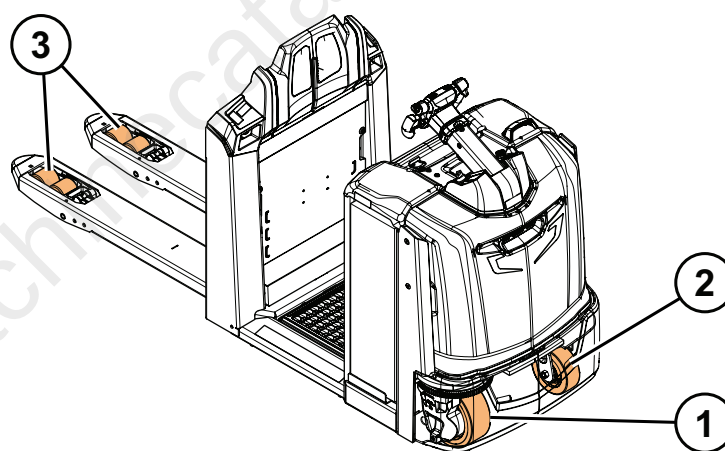


Figure 55: Wheels overview

- 1. Traction wheel
- 2. Castor wheel

- 3. Load wheels

Full Version Available

Caterpillar NO20N2P Order Picker Service, Operator and Schematic Manual (639785-EN-A)

Caterpillar NO20N2P Order Picker service manual, covers hydraulics, drive controls, wiring, alarms, and schematics. Instant PDF download.

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