ERROR TABLE

Brand: **CAT**
Models: **NR14N-25NH**
Date: **23.06.2014**

Error:	Fault:	Description:
1	Traction Fault	No CAN messages received from the traction controller (A1) to logic board (A5), CAN bus wiring should be checked if fault persists replace traction controller. Stop mode active.
2	Hydraulic Fault	No CAN messages received from the pump controller (A2) to logic board (A5), CAN bus wiring should be checked if fault persists replace pump controller. Stop mode active.
4	Input Unit Fault	No CAN messages received from the input unit (A6) to logic board (A5), CAN bus wiring must be checked if fault persists replace input unit. Stop mode active.
5	Steer Fault	No CAN messages received from the steering controller (A3) to logic board (A5), CAN bus wiring must be checked, if fault persists replace steering controller. (Old SW) Stop mode active.
6	Steer Fault	Steering controller failed to be activated via the CAN communication problems. CAN bus wiring must be checked, if fault persists replace steering controller. (Old SW) Stop mode active.
8	Service Request	Truck's scheduled maintenance period is exceeded. Truck service is to be carried out immediately. To reset alarm confirm next maintenance. (In service mode: Service -> Set Maintenance Interval). Slow Mode active.
9	Confirm – Restart	You have changed some parameter, truck needs to be restarted. Stop mode active.
10	Logic Fault	Real-Time-Clock battery is exhausted. Logic board should be replaced. Normal mode active.
11	logic, cpu ram check failed	Software checksum check failed. Program should be reloaded or unit replaced.
12	logic, cpu rom check failed	Software checksum check failed. Program should be reloaded or unit replaced.
13	logic	CN1_44 over current over 2s
14	logic,	CN1_64 over current over 2s
15	logic	CN1_62 over current over 2s
16	logic,	CN1_61 over current over 2s
17	logic,	CN1_60 over current over 2s

WARNINGS TABLE

Brand: **CAT**
Models: **NR14N-25NH**
Date: **23.6.2014**

Warning:	Fault:	Description:
4	Truck is shutting down	Voltage has dropped below 7V at XA5:19 and because of that the truck is shutting down.
10	Service Request	Truck maintenance warning time has elapsed. Normal Mode active.
36	Steering Fault	Steering motor temperature is below -50°C (Low mode active) or above 145°C (Stop mode active). Normal Mode active.
37	Steering Fault	Steering motor temperature sensor not connected or short circuit. Stop mode active.
38	Steering Fault	Steering controllers DC bus voltage is either too low or too high. Check B+ and B- to steering controller.
39	Steering Fault	One of the steering system temperatures is in a warning state and truck is in slow mode. Check for unrestricted and proper operation cooling system of steering controller and steering motor. Low Mode active.
40	Steering Fault	Current output to magnetic brake coil (Y31) is above the warning limit 2,5A. Normal Mode active.
41	Steering Fault	Current output to magnetic brake coil (Y31) is above 4A and output is set off. Normal Mode active.
42	Steering Fault	The steering controller temperature is below -20°C or above 85°C. Low Mode active.
43	Steering Fault	Steering controller (A3) internal temperature sensor not connected or short circuit. Stop mode active.
44	Steering Fault	New Application SW has been programmed into the drive. Steering controller default parameters restored. Please restart the truck. Stop mode active.
45	Steering Fault	Sensor bearing not connected or short circuit. Check wiring and sensor bearing (B32). Stop mode active.
50	Aisle detection	Aisle sensor has been detected to be active. Truck is in "aisle mode". Slow Mode active.

3. Operating environment

General Information

Use the truck in dry, indoor facilities with substantially firm, smooth, level and prepared surfaces according to standard DIN 15185-1. The truck may be continuously operated at a temperature of +5...+25°C and for short periods at a temperature of 0...+45°C. The recommended humidity is 30...95% (non-condensing). If the operating temperatures differ from those mentioned above, contact your truck dealer and acquire a truck specifically designed for cold and freezing or extremely high temperatures. A special machine for freezing conditions can be used in temperatures down to -35°C. A special machine for hot conditions can be continuously used in temperatures up to + 45 °C.

This truck conforms to the requirements of the EU machine safety directive (2006/42/EC) and thus has the CE marking.

Never use the truck:

- To transport or lift people
- At premises with risk of fire (ATEX premises)
- In explosive atmospheres
- At premises with insufficient floor load capacity
- If it is damaged
- As a mounting surface
- As an access board or a ladder
- To tow another truck
- Under the influence of intoxicating substances.

Free space

Make sure that the truck has sufficient moving space with respect to overhead structures. Before driving through aisles or door openings, ensure that there is enough space for the truck, the load and yourself.

NOTE *Always drive at a safe distance from the edge of loading platforms or bridges.*

Bearing capacity of the floor

Make sure that the combined weight of the truck and the load does not exceed the bearing capacity of the floor.

Using elevators

You need a permission from the site supervision to use an elevator to transport the truck between floors. Make sure that the combined weight of the truck, the load and yourself does not exceed the maximum load capacity of the elevator. Always drive the truck into elevators and any other narrow spaces with the load in front.

NOTE *Do not let other people enter the elevator while driving the truck in or out. The parking brake of the truck must be engaged and power switched off before the elevator starts moving.*

Driving on ramps

You need a permission from the site supervision to drive on a slope or ramp. The inclination of the ramp should not exceed the measured values listed in Chapter 12, Technical Specifications, section 5.7 in this manual. We recommend using warning signs in places where this is exceeded.

NOTE *All truck types are not suitable for driving on ramps. Make sure that the truck you are using is suitable for this purpose.*

WARNING! *Driving trucks with a gradeability of 0% is forbidden on the ramp. RISK OF OVERTURNING!*

Observe extreme caution when driving on a ramp. When the truck is loaded, travel with the load pointing uphill. To ensure steerability and braking, the grip of the ramp must be equivalent to a standard floor.

NOTE *Do not turn the steering wheel abruptly on a ramp; the truck might overturn.*

- Alert symbols (1)
- Battery charge display (2)
- Clock (3)
- Speed, fork height and weight display (4). Weight display is an optional accessory.
- Performance mode selection (5)
- Lifting height preselection (6)
- Information menu (7)
- Travel direction display (8)
- Crawling mode symbol (9)

- Raise the load so that it is clearly above the stacking height or shelf level. Note the height of the upper horizontal beam of the shelf.
- Pull in the mast and reverse from the stacking location so that the load can be freely lowered. After lowering the forks, tilt them upwards.

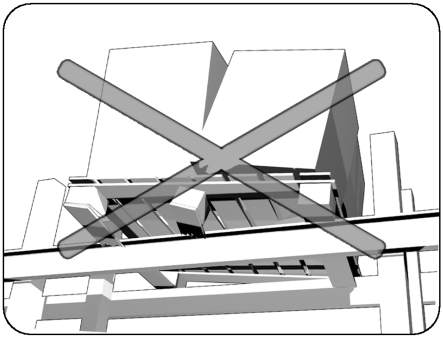
NOTE *Tilt and reach functions are available in reach trucks only.*

Collecting (order picker trucks)

- Use the lifting and lowering lever to set a suitable collecting height.
- Place the load so that its weight is distributed evenly on the forks.

WARNING! *Observe extreme caution when collecting items.*

Handling of broken pallets



WARNING! *A broken pallet or an unstable load must never be left on a shelf or stack, but must always be removed.*

The truck's type and serial number are listed on the front page of the manual or on the identification plate of the truck. The order number and name of the parts are listed on the spare part pages of the manual supplied with the truck.

Hazardous waste and disposal

Hydraulic and transmission oil and batteries are hazardous waste that must be disposed of accordingly. The truck itself is not hazardous waste, and can be recycled.

	according to EN 12053:2001 and EN ISO 487, drive/lift/idle LpA				
	Whole-body vibration according to EN 13059:2002	[m/s^2]	0,6	0,6	0,6
	Hand-arm vibration according to EN 13059:2002	[m/s^2]	< 2,5	< 2,5	< 2,5

Values in the table according to the smallest battery size.

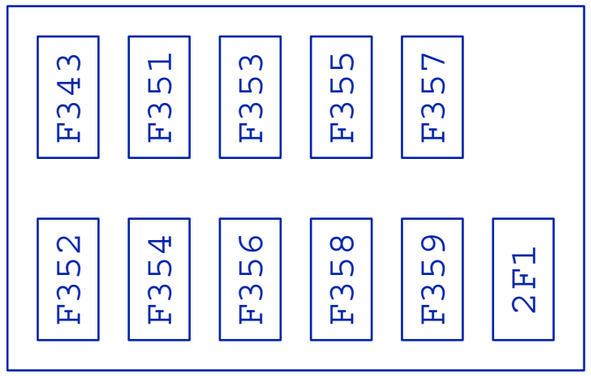
* Includes the load support

** Travel speed to the direction of the forks may be adjusted slower than announced.

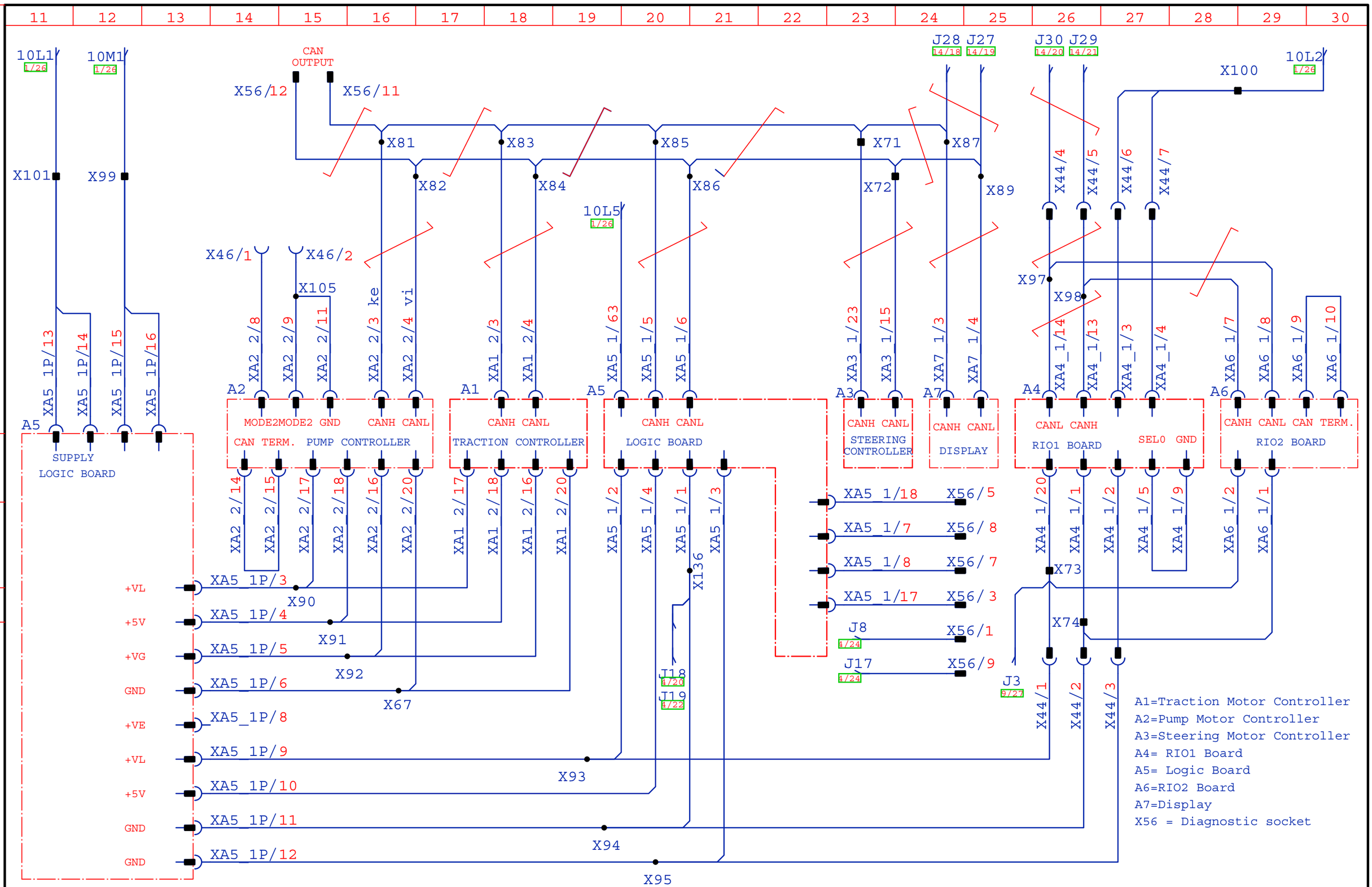
*** Uncertainty of 4 dB(A) in section 8.4.

Manufacturer reserves the right to make technical changes.

FUSE BOX RL486065



TRUCK DRIVERS' VIEW OF FUSEBOX



CAT Lift Trucks	DATE: 2005-01-28	CIRCUIT DIAGRAM TS1110212	NR_N REACH TRUCK CONTROL CIRCUIT 1	10 / 15 REV P 3-6934

parameters. It also gives information on irregular electrical maintenance tasks.

Chapter *5 Hydraulic operation* examines the hydraulic operation of the truck and provides instructions for hydraulic maintenance tasks.

Chapter *6 Mechanical maintenance* provides instructions for common mechanical maintenance procedures.

1.3. Acquiring spare parts

When you need spare parts, contact your supplier. Always use original manufacturer-approved spare parts. To ensure that you receive the correct items, have the following information ready when ordering spare parts:

1. Truck type
2. Serial number of the truck
3. Ordering numbers for the spare parts
4. Spare part product names
5. Required quantity of parts

1.4. Waste disposal

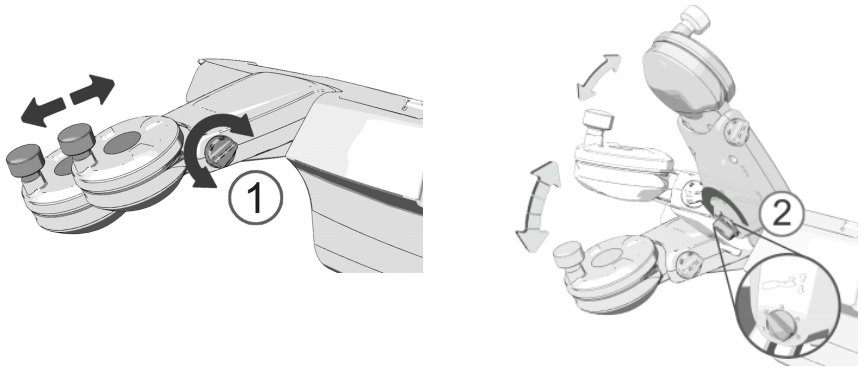
When performing maintenance tasks with or on trucks, adhere to all local regulations governing the proper disposal of produced waste. Be especially careful when handling and disposing of hazardous waste, such as hydraulic and transmission fluids, lubricants and batteries. Reuse and recycle materials when possible.

1.5. Further information

Contact your supplier or technical support when you require information on using, maintaining and repairing the truck. Before attempting any maintenance procedure, make sure that you have the correct and most current version of all the necessary documentation.

activate/deactivate foot-operated driving direction change via the truck display.

2.3.6 Steering wheel

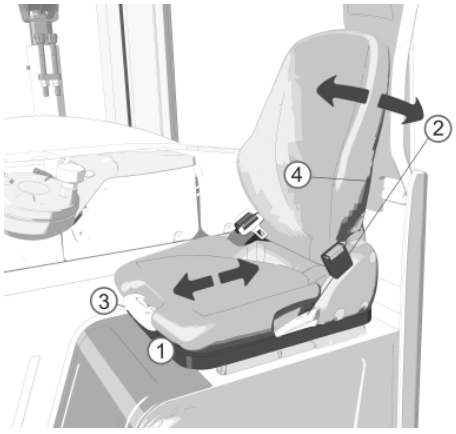


Steering wheel. The truck is equipped with an electronic steering system; refer to the User's manual for additional information (Chapter 5, "Electronic Steering System".

Length adjustment (1). Turn the adjustment knob anticlockwise to release the locking. Release the adjustment knob or turn it clockwise to lock the length adjustment. The adjustment is five-step.

Height adjustment (2). Raise the steering wheel higher by turning the adjustment knob to the left. Lower it by turning the knob to the right.

2.3.7 Seat



Seat MSG20 (mechanical suspension). You may adjust

- Seat suspension according to your weight (1).

Measure the specific gravity of the battery according to the manufacturer's instructions. The specific gravity of a fully charged battery is 1.28 to 1.30 at +30°C. The gravity is

- 1.24 when the battery is 3/4 charged.
- 1.20 when the battery is 1/2 charged.
- 1.16 when the battery is 1/4 charged.
- 1.15 when the battery is empty. Charge the battery immediately.

2.7. Acquiring a new battery

Acquire a DIN 43531-C battery for the F, S, and H models.

Acquire a DIN 43531-B battery for the C models.

When acquiring a battery for the truck, take the following sections of standard EN 1175-1 into consideration:

- 5.1 Traction batteries (includes the requirements for the protective cover of the battery case, ventilation and interior surface treatment)
- 7.4 Minimum markings (includes the requirements for the truck battery plate).

The battery plate should give at least the following information:

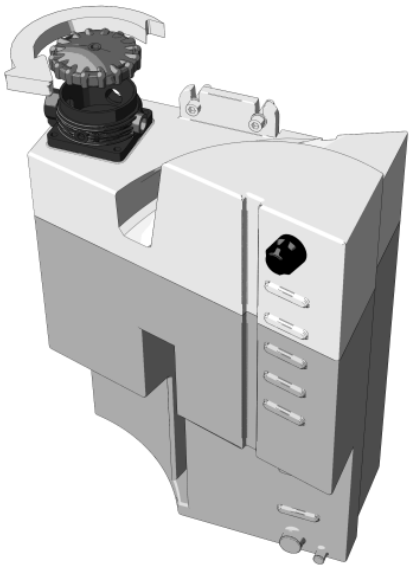
- Manufacturer
- Type
- Serial number
- Nominal voltage
- Capacity (Ah / 5h)
- Service weight.

2.8. Replacing the battery

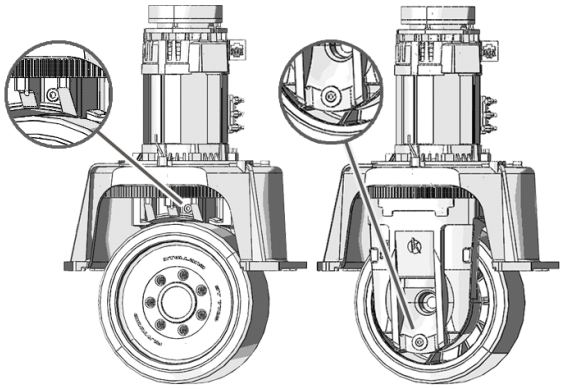
Replace the battery according to the manufacturer's instructions. When reinstalling batteries, use the appropriate tools for moving, connecting and fastening the battery securely.

Lubricant recommendation

- Hydraulic oil: ISO VG 32
- In cold storage: ISO VG 15
- In hot temperatures: ISO VG 46



- Transmission oil: SAE 80W/90, API: GL-4, fill to the volume of ~2.9 l.
- Lubricating grease: NLGI No. 2, containing molybdenum disulphide.
- In cold storage: NLGI No. 1 or No.0.



Fill the gearbox so that the oil level is at the bottom of the filling hole (The oil just begins to drain out from the filling hole)

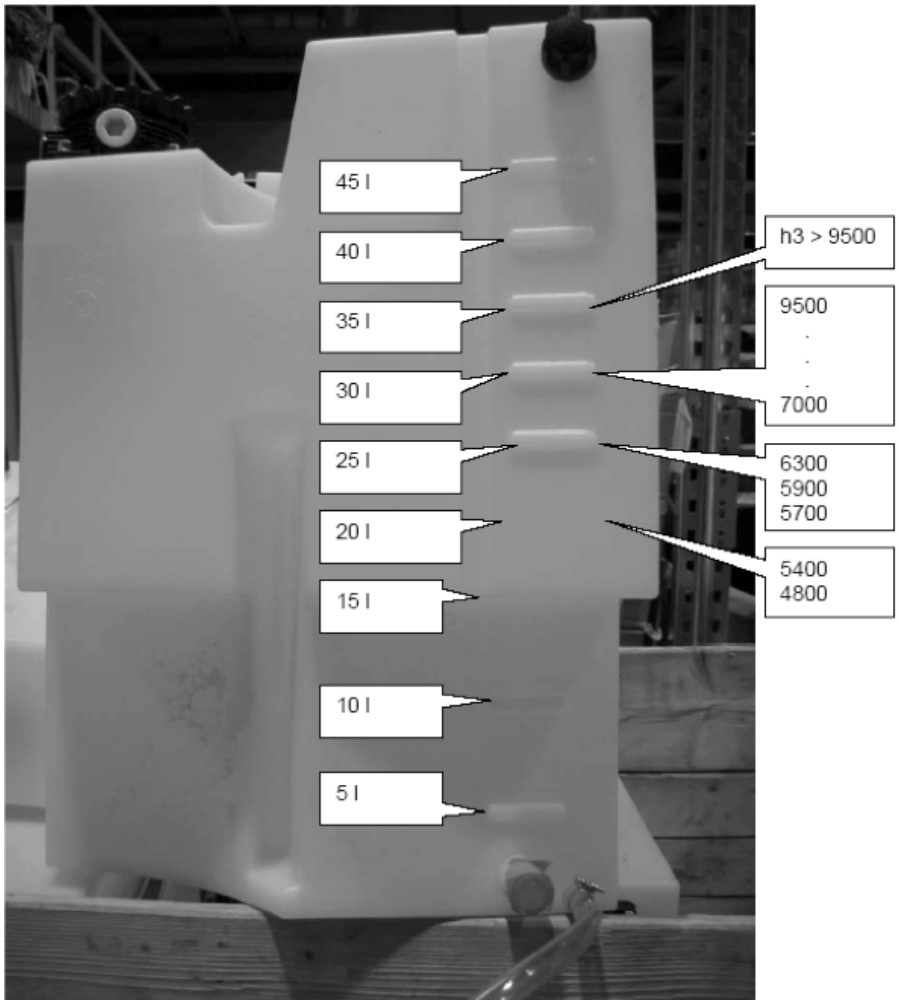


Figure: 3.7 Hydraulic tank filling levels

3.5.7 Checking the fastening bolts of the driving wheel

Check the tightness of the driving wheel fastening bolts. The required torque is 100 Nm. Use a torque wrench.

3.5.8 Checking the condition of identification plates and labelling

The main identification plates are located below the steering wheel (see *2.3 Operating devices*). Check that they are firmly in place, undamaged and fully legible. If the plate is missing or cannot be read, a new one must be fitted. In addition to the identification plate, check that other labelling and markings, such as lifting points or any warnings are in place and intact.

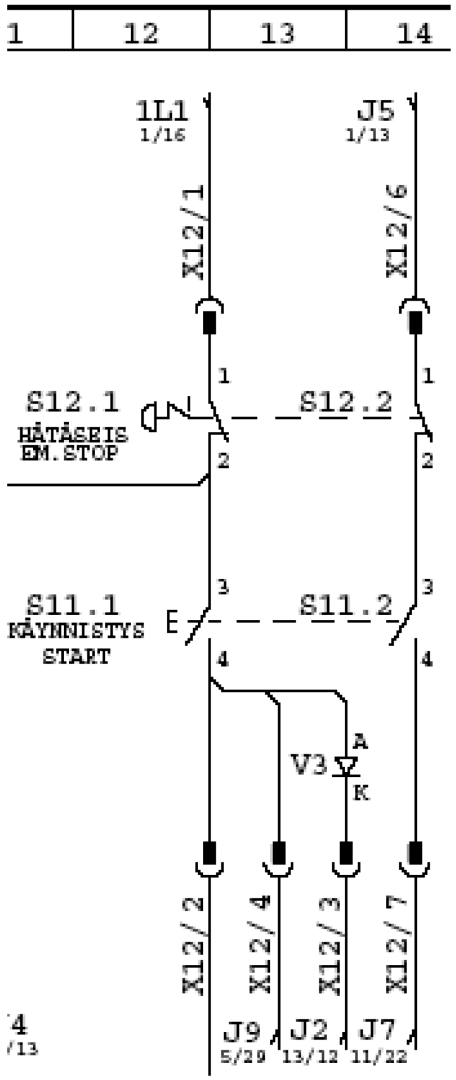


Figure: 4.3 Powering the truck

B+ current also flows to the control fuses 10F1 and 11F1, which feed B+ current to the controllers. The individual controllers (display unit, logic board, traction motor controller, pump motor controller, electric power steering controller and hydraulic valve input and output controllers) begin their internal checks to verify that all hardware is functioning properly. If all internal checks pass, the controllers engage their respective safety circuits.

The truck's Controller Area Network (see *4.5 CAN bus communication*) is now operational and the controllers can communicate their status and possible fault conditions. If all internal checks pass, the logic board controller activates the K12 contactor coil and the K12 contactor tips feed B+ current to the power fuses for the motor controllers. Should an error

speed (see chapter 5). The lowering function can also be adjusted electrically via the display unit (see section Parameters from this chapter). Please refer to *5 Hydraulic operation* for information on the operation of the lifting cylinder.

4.14. Auxiliary functions

The logic board receives control information from the fingertip controls on the control panel. This information is used to control the auxiliary functions. These functions include reaching and retracting, tilting up and down, and shifting to the left and to the right. All the auxiliary functions use the pump motor to supply hydraulic fluid to the appropriate cylinders. The speed of the auxiliary functions can be controlled. The main hydraulic manifold incorporates restrictors to reduce the flow of hydraulic fluid to the auxiliary system. It also contains the directional valves (M3, M4, M5, M6, M7, M8, M9 and M10) for the auxiliary functions. The manifold is located under the floor of the reach carriage.

The hydraulic valve controller, RIO1 board, is used to activate the valves that route the flow of hydraulic fluid. When a request from the fingertip controls is received by the logic board, the information is sent to the hydraulic valve controller RIO1 over the CAN bus. When the hydraulic valve controller RIO1 receives a message from the logic board for an auxiliary request, it first checks for internal errors. If there are no internal errors or other limiting factors, the request is accepted.

4.14.1 Reaching/retracting request

The reaching or retracting request is initiated by the fingertip module (B44), which is located on the truck's control panel. Please refer to page 7/15 and zone 15-16 of the electrical schematic diagram. The control module functions like a potentiometer, i.e. the system senses the neutral position and is able to determine movement from it. This position information is output from the module through connector XR12/2 and input into the logic board at connector XA5 1/28. The control module receives its 5 V supply from the logic board at connector XA5 1/26. The negative connection is supplied through the logic board at connector XA5 1/25.

The varying voltage produced by the control unit potentiometer is connected to the logic board at connector XA5 1/28. In the neutral position, the voltage produced by the fingertip control is approximately 2.5 V. As the control is moved to request reaching, the voltage output increases gradually to a nominal value of 4,7 V (full reaching rate). As the control is moved to request retracting, the voltage output decreases gradually to a nominal value of 0,3 V (full retracting rate).

Multipurpose Output Range/value: **0…8**

This output is used for warning light or warning sound alarm.

Purposes explained in the parameter list.

4.16. Alarms explanations

Before you start to troubleshoot, make sure all power supplies, fuses and connections are in order.

Display number:	**Description:**
!(0)	**No Alarms**
63(1)	**Trac:ControllerLost** No CAN messages received from the traction controller to the logic board. CAN bus wiring should be checked. If fault persists, replace the traction controller.
63(2)	**Pump1:Controller Lost** No CAN messages received from the pump controller to the logic board. CAN bus wiring should be checked. Iif fault persists, replace the pump controller.
68(3)	**RIO1:Lost** No CAN messages received from the RIO1 board to the logic board. CAN bus wiring should be checked. If fault persists, replace the RIO1 board.
67(4)	**RIO2:Lost** No CAN messages received from the RIO2 board to the logic board. CAN bus wiring must be checked. If fault persists, replace the RIO2 board.
71(5)	**Steer:Controller Lost** No CAN messages received from the steering controller to the logic board. CAN bus wiring must be checked. If fault persists, replace the steering controller.
71(6)	**Steer:Controller Initialization Fault**

The voltage can not be measured, replace the steering controller.

71(151) Steer:Hardware Fault

Offset for the current measurement is too high.

Offset is adjusted automatically when swithing the truck power on. Steering is powered after the K12 main contactor.

Steering controller current sensor fault. Replace steering controller.

71(152) Steer:Hardware Fault

The output current of open drain is too high. The open drain is used as a magnetic brake output.

Check the wiring and the magnetic brake coil resistance (32.1 ohms) If all is ok, replace the steering controller.

71(155) Steer: Software

CAN Open communication timeout.

Check the CAN bus wiring. Restart the truck. If fault still persists, replace the steering controller.

71(156) Steer: Software

Steering reference sensor (S31,S34) was not detected within a rotate of 100 degrees.

Check sensors and wirings and measure the depth (see figure below).

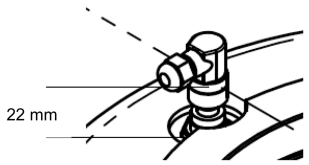


Figure: 4.9 Sensor depth

59(158) Steer: Encoder Fault

Sensor bearing (B32) feedback error.

Sensor is not connected or there is a short circuit.

59(162) Steer: Sensor Fault

Stepper motor (B11) error.

5. Hydraulic operation

TH 77 0206

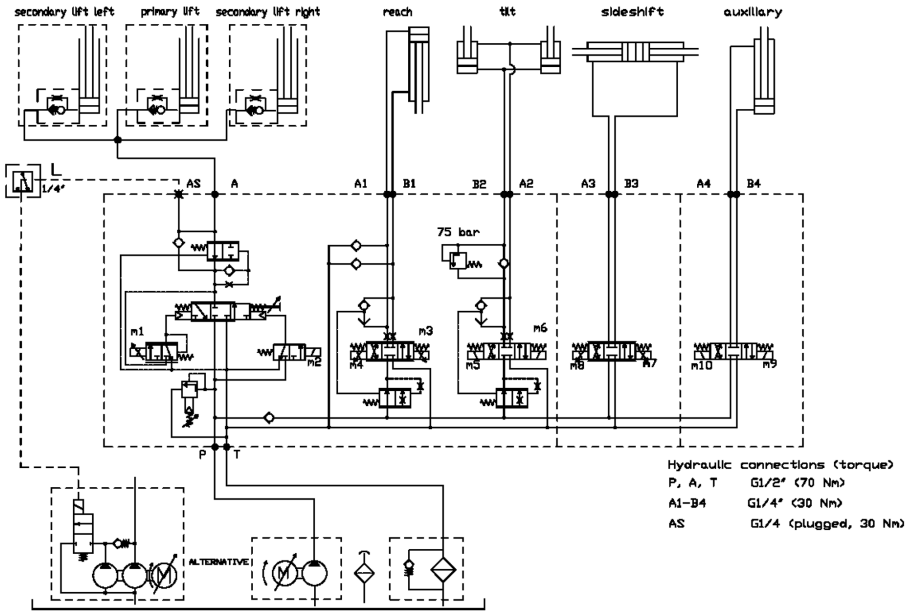


Figure: 5.1 Hydraulic schematic diagram (TH77 0206)

5.1. Hydraulic symbols

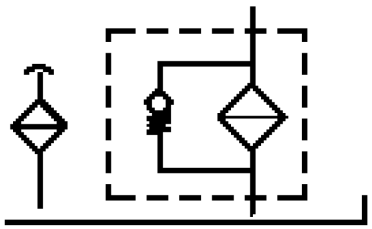


Figure: 5.2 Hydraulic fluid reservoir (screen filter and return fluid filter with bypass)

5.5. Operator requests retracting

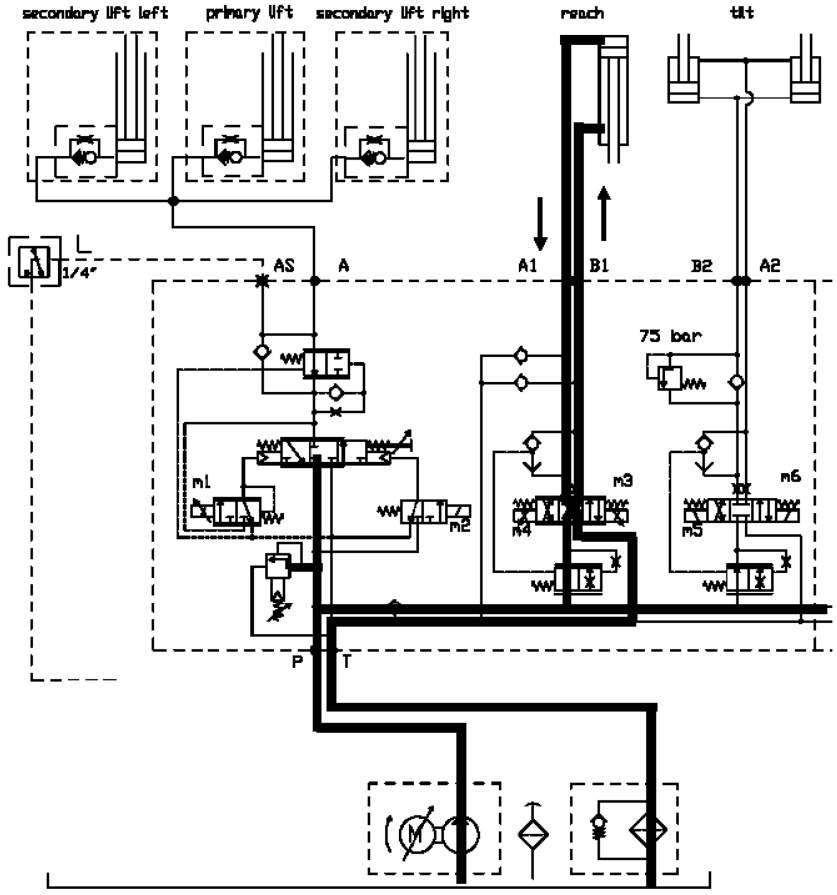


Figure: 5.23 Retracting

The retracting function operates as follows.

1. The operator requests retracting by moving the reaching/retracting fingertip control towards the retracting position.

2. The main hydraulic pump starts.

3. The M3 valve is activated, which moves the bottom envelope into the right position.

4. Pilot fluid flows from the check valve to the top of the pilot-operated flow restrictor and shifts the envelope before the M4-M3 valve.

5. Pressurised hydraulic fluid then flows through the A1 port to the ram side of the reach cylinder.