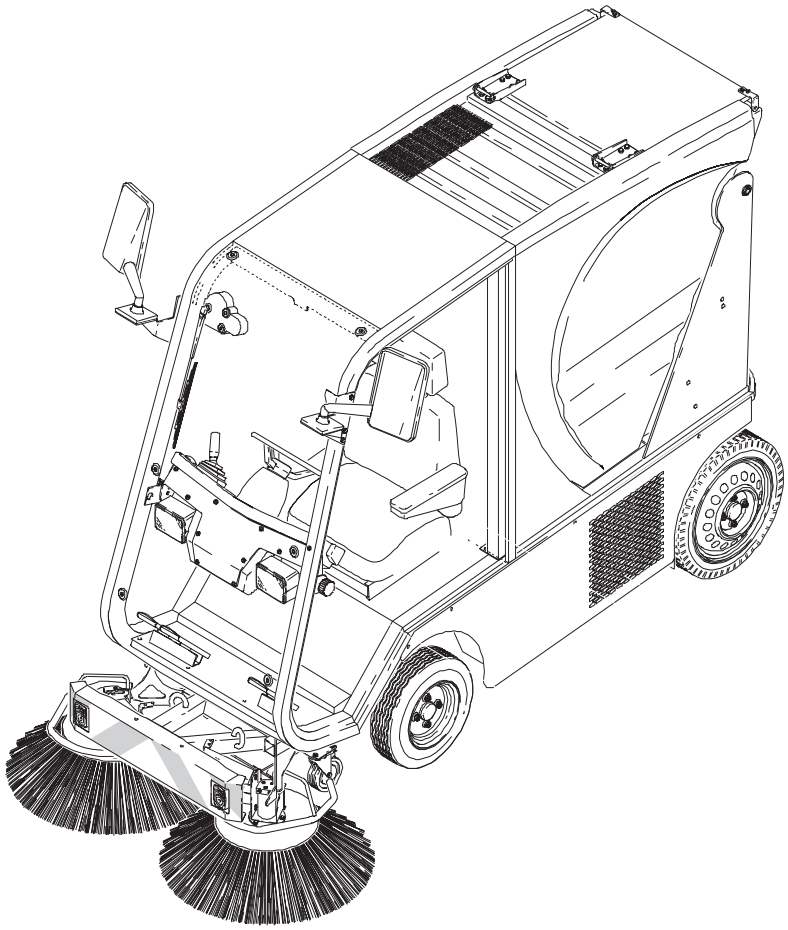
KÄRCHER

Service Manual



ICC 1 S D

1.142-...

5.905-432
03.01

Foreword

Good servicing requires extensive and relevant training as well as comprehensible reference documents.

We therefore regularly offer all service technician both basic and advanced training courses for the full range of our products.

In addition we produce service handbooks for the major equipment which can be used initially as instructional material and later as sources of reference.

Furthermore we regularly distribute service information bulletins that provide details about further developments to the products.

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Technical Features

The ICC 1 S D is a high-performance sweeping machine designed for professional use in industrial service and municipal fleet applications.

The unit may be licensed for road traffic.

Depending on the country of operation, single-unit approval by the responsible Highway Traffic Authority may be required.

Drive power

– 3-cyl. Kubota D722 water-cooled diesel engine (similar to KMR 1700 D).

– Forward and reverse, variable speed control with two separate foot pedals.

Brake

– Foot brake serves as operating brake, acting on both front wheels via brake cables. Parking brake can be set via separate brake lever.

– Braking action on rear wheels only via hydraulic system.

Sweeping system

– 2 inward rotating side brushes

– Sweeping roller not required

Vacuum system

– Sweeping debris is shredded by impeller fan, picked up by vacuum stream, and conveyed into debris container.

– Impeller fan, driven via magnetic clutch and V-belt with magnetic brake.

Water system

– Water tank with filter and water pump

– Water jets on side brushes and in air channel to reduce dusting, and for lubricating air channel.

Steering

– Hydraulic steering on front wheels

Hydraulic system

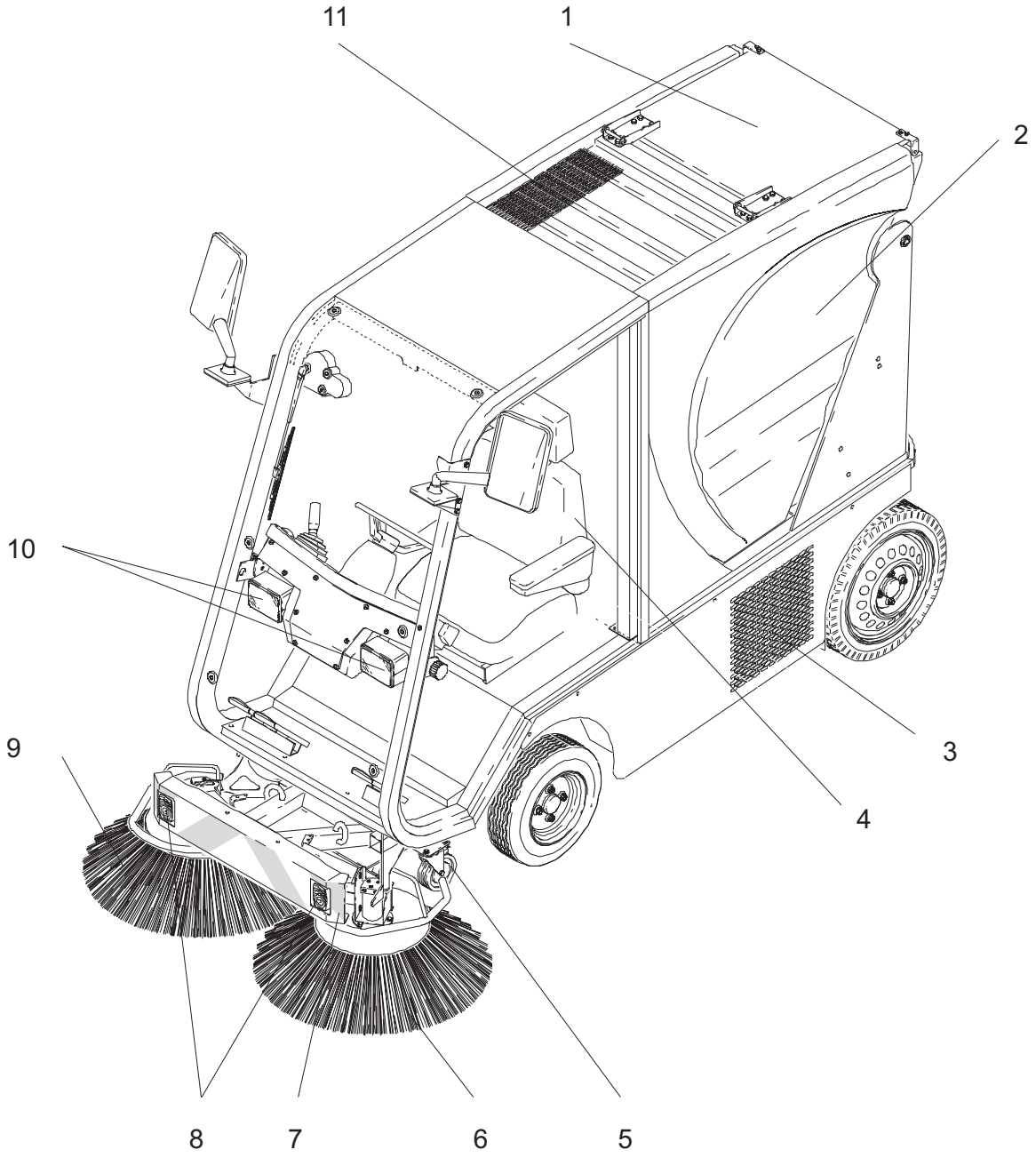
– Rear wheels, individually powered by hydraulic motors.

– 2 side brushes, individually powered by hydraulic motors, and raised by hydraulic cylinders.

– Debris container, raised by two hydraulic cylinders.

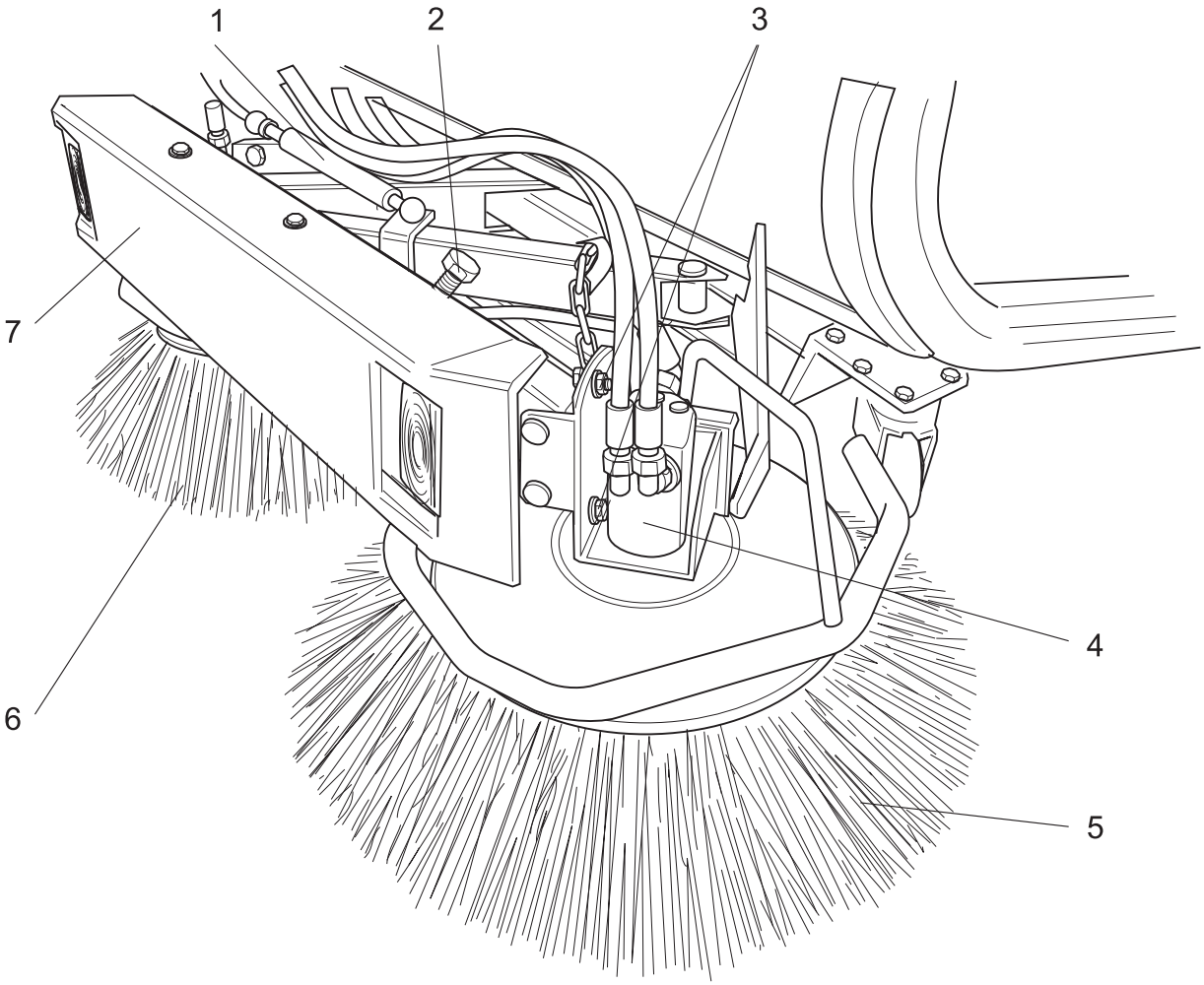
– Electrical cooling fan for hydraulic fluid and engine cooling.

Equipment Features – Front view



1 Cover, debris container
2 Debris container
3 Dual-circuit radiator (hydraulic fluid / engine coolant)
4 Operator seat
5 Support caster, vacuum intake
6 Side brush, LH
7 Bumper
8 Turn signals
9 Side brush, RH
10 Head lamps
11 Air exhaust, debris container

Equipment Features – Sidebrush view



1 Pressurized gas spring, side brush

2 Stop screw, side brush bottom position

3 Adjusting screws, side brush sweeping pattern

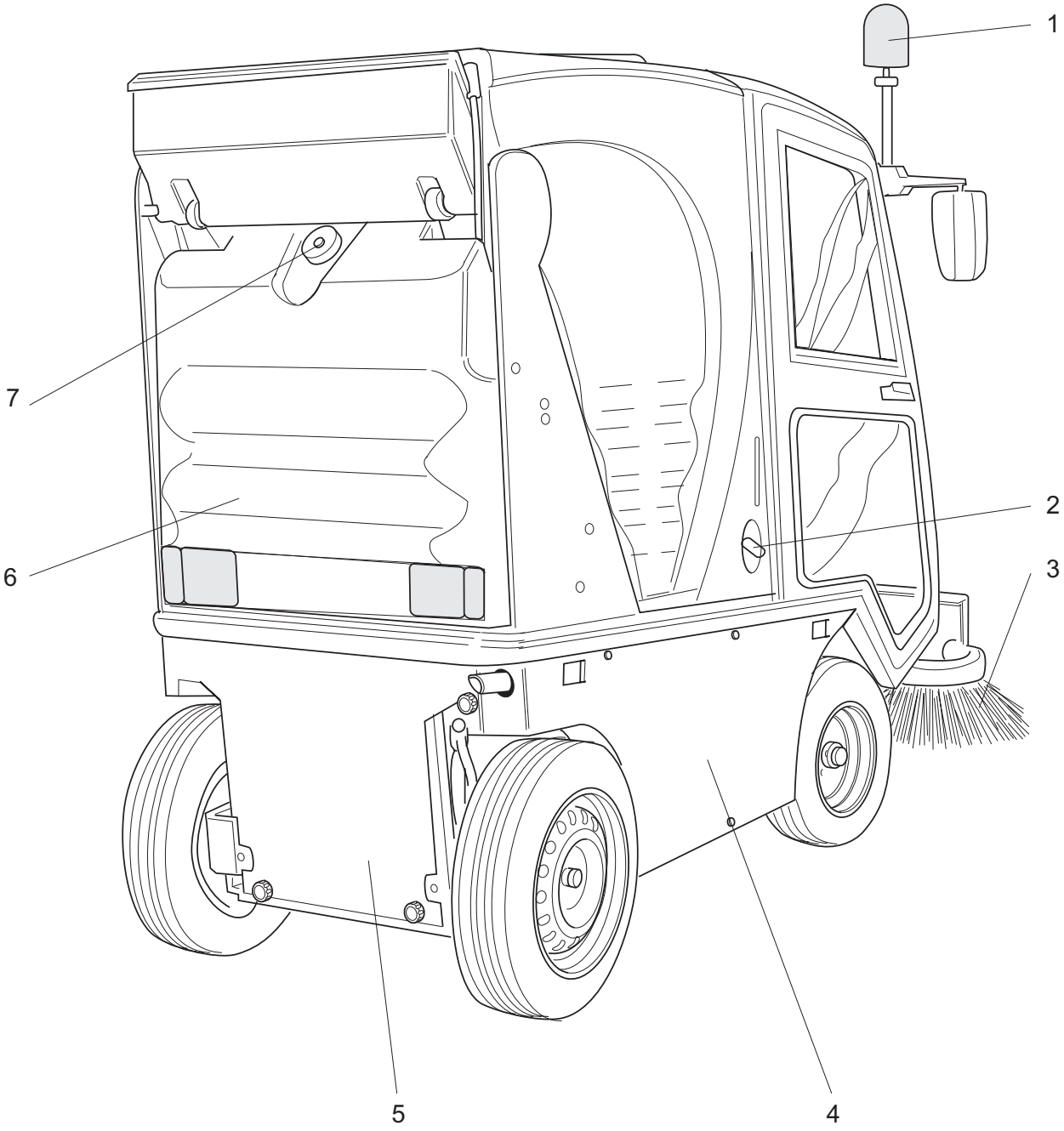
4 Hydraulic motor, LF side brush

5 LH side brush

6 RH side brush

7 Bumper

Equipment Features – Rear view



1 Safety beacon

2 Filler neck, fuel tank

3 RH side brush

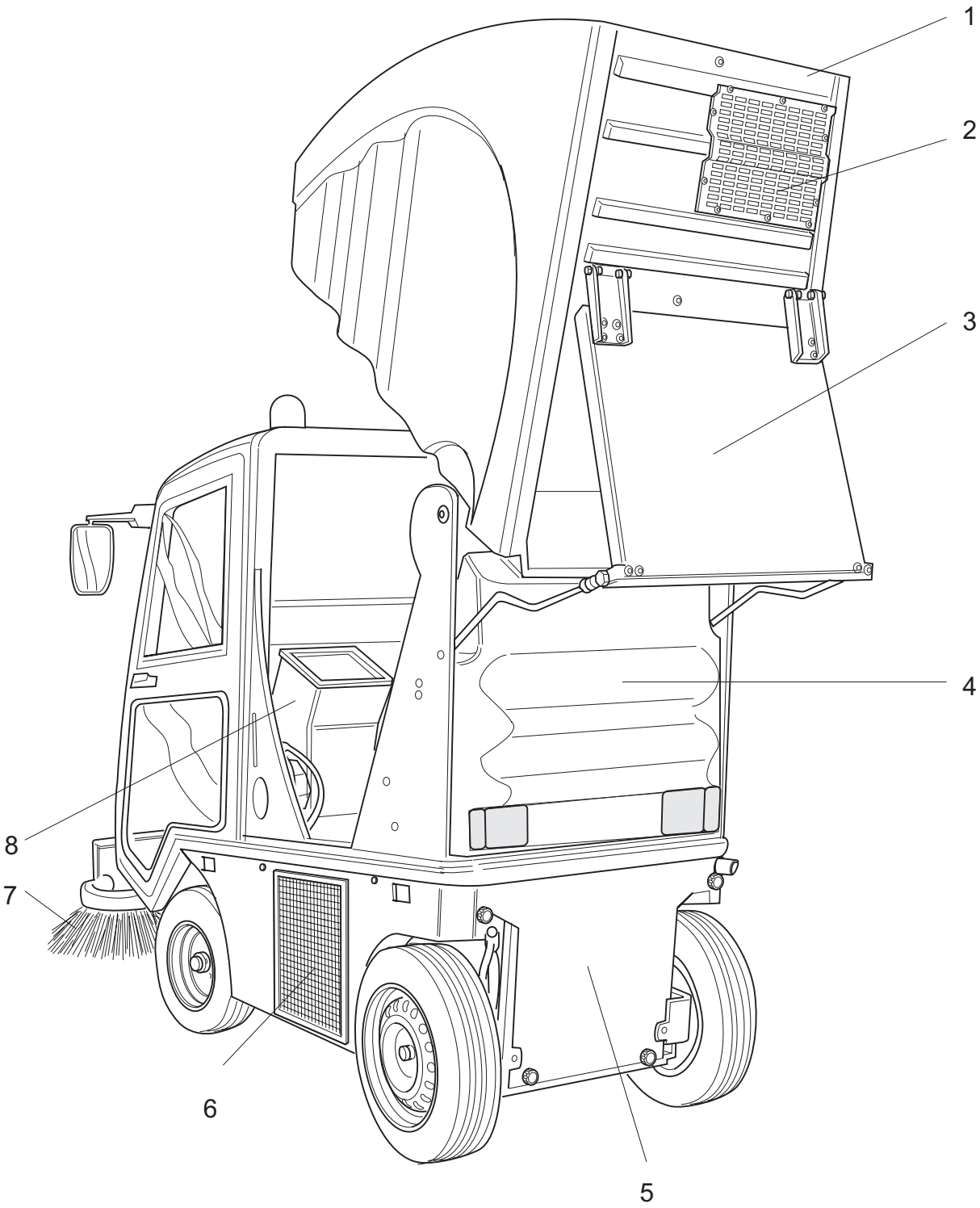
4 Side cover panel

5 Rear cover panel

6 Water tank

7 Filler neck, water tank

Equipment Features – Raised debris container view



1 Debris container

2 Air exhaust

3 Debris container cover

4 Water tank

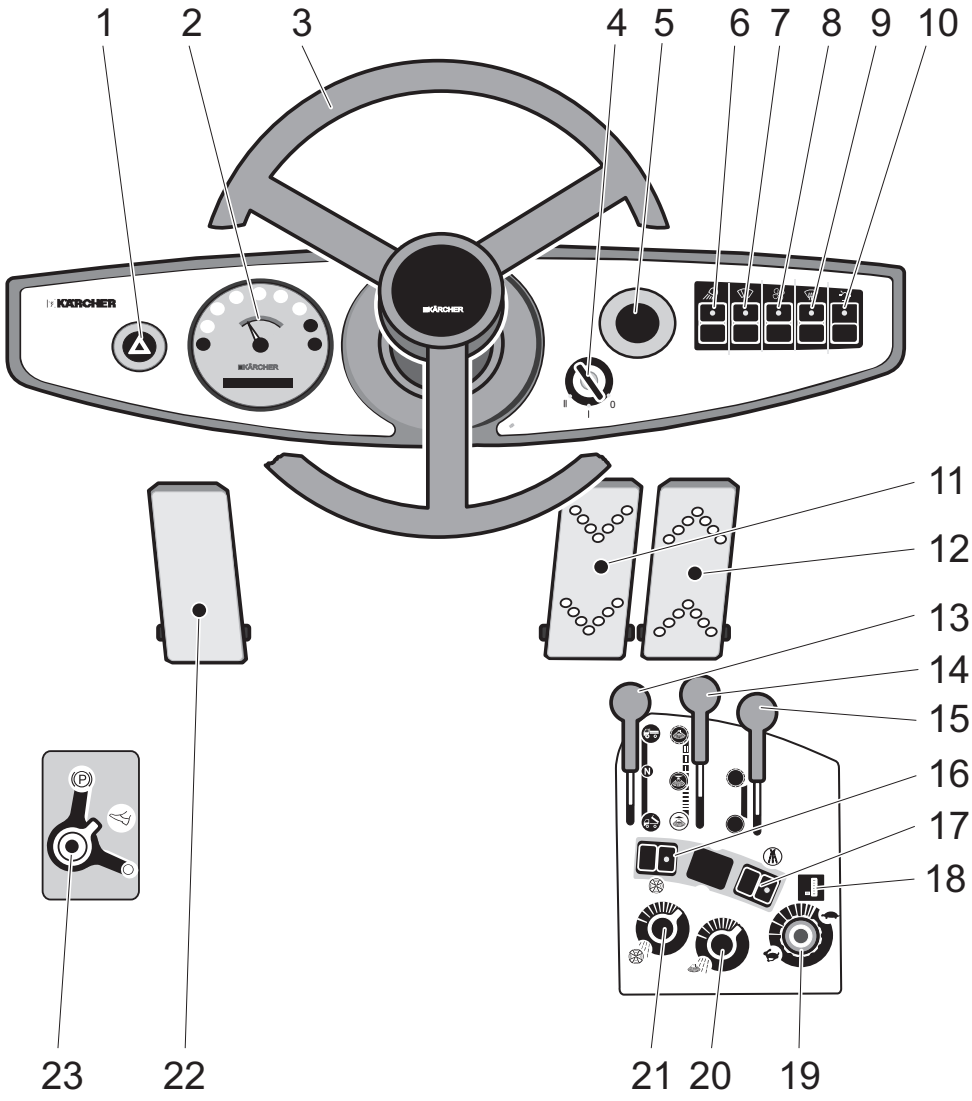
5 Rear cover panel

6 Removable grille, dual-circuit radiator (hydraulic fluid / engine coolant)

7 LH side brush

8 Vacuum channel

Equipment Features – Control elements



1 Switch, four-way flashers (S12)

2 Combination instrument (P1)

3 Steering wheel

4 Ignition switch (S1)

5 Combination switch (S13)

6 Switch (S16), working spotlights (option)

7 Switch, windshield wiper (S6)

8 Switch, cabin heater fan (S7)

9 Switch, windshield defroster fan (S15)

10 Switch, safety beacon (S14)

11 Drive pedal, reverse

12 Drive pedal, forward

13 Lever, Raise / Lower debris container

14 Lever, Raise / Lower side brush and vacuum inlet (with brush speed control)

15 Lever, Open / Close coarse debris flap

16 Switch, impeller fan (S9)

17 Switch, water pump (S8)

18 Operating hours counter, impeller fan (option) (P2)

19 Manual throttle, engine speed control

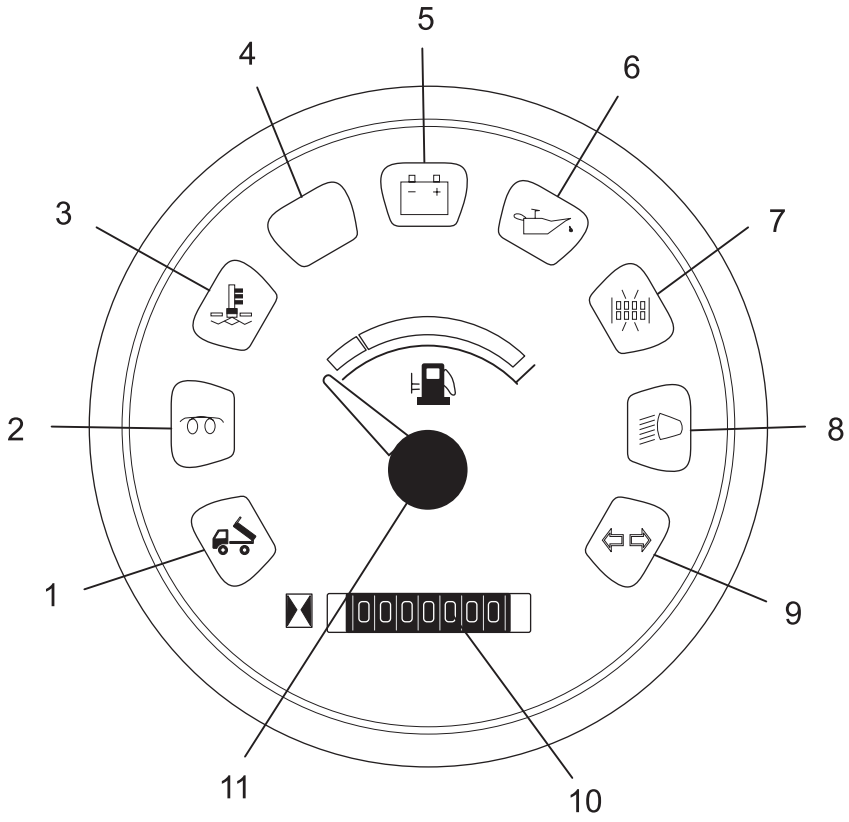
20 Metering valve, side brush water volume

21 Metering valve, vacuum channel water volume

22 Pedal, parking brake / operating brake

23 Changeover button, parking brake / operating brake

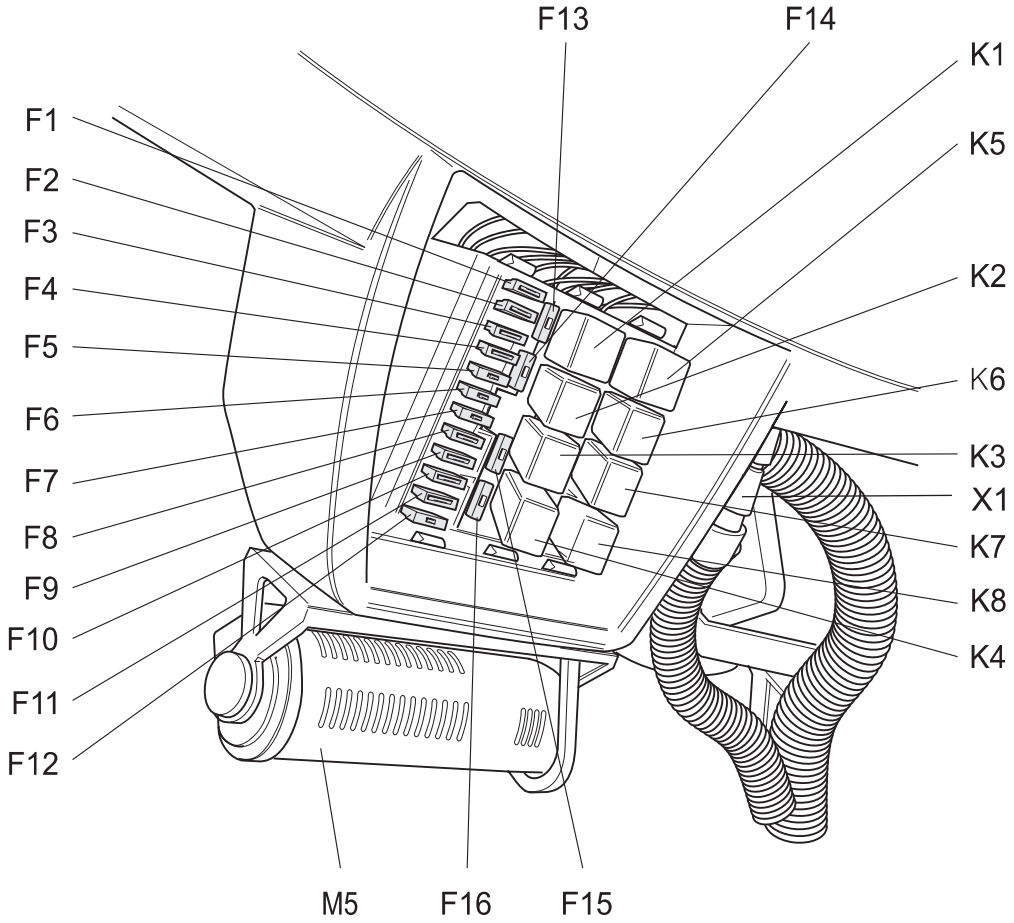
Equipment Features – Combination instrument



Indicator lights and displays

1 Debris container raised
2 Pre-glow cycle activated
3 Excessive engine coolant temperature
4 Spare
5 Low charging current warning
6 Low engine oil pressure warning
7 Blocked air cleaner warning
8 Headlamps ON
9 Turn signal ON
10 Operating hours counter
11 Fuel level indicator

Equipment Features – Fuse box



Fuses

F1 Ignition switch
F2 Four-way flashers
F3 Impeller fan brake
F4 Magnetic clutch
F5 Water pump
F6 Fan, cabin heater
F7 Windshield wiper
F8 Turn signals / horn
F9 Headlamps
F10 Position lamps, RH
F11 Position lamps, LH
F12 Engine stop solenoid
F13 Safety beacon
F14 Fan, windshield defroster
F15 Stop lights
F16 Headlamps

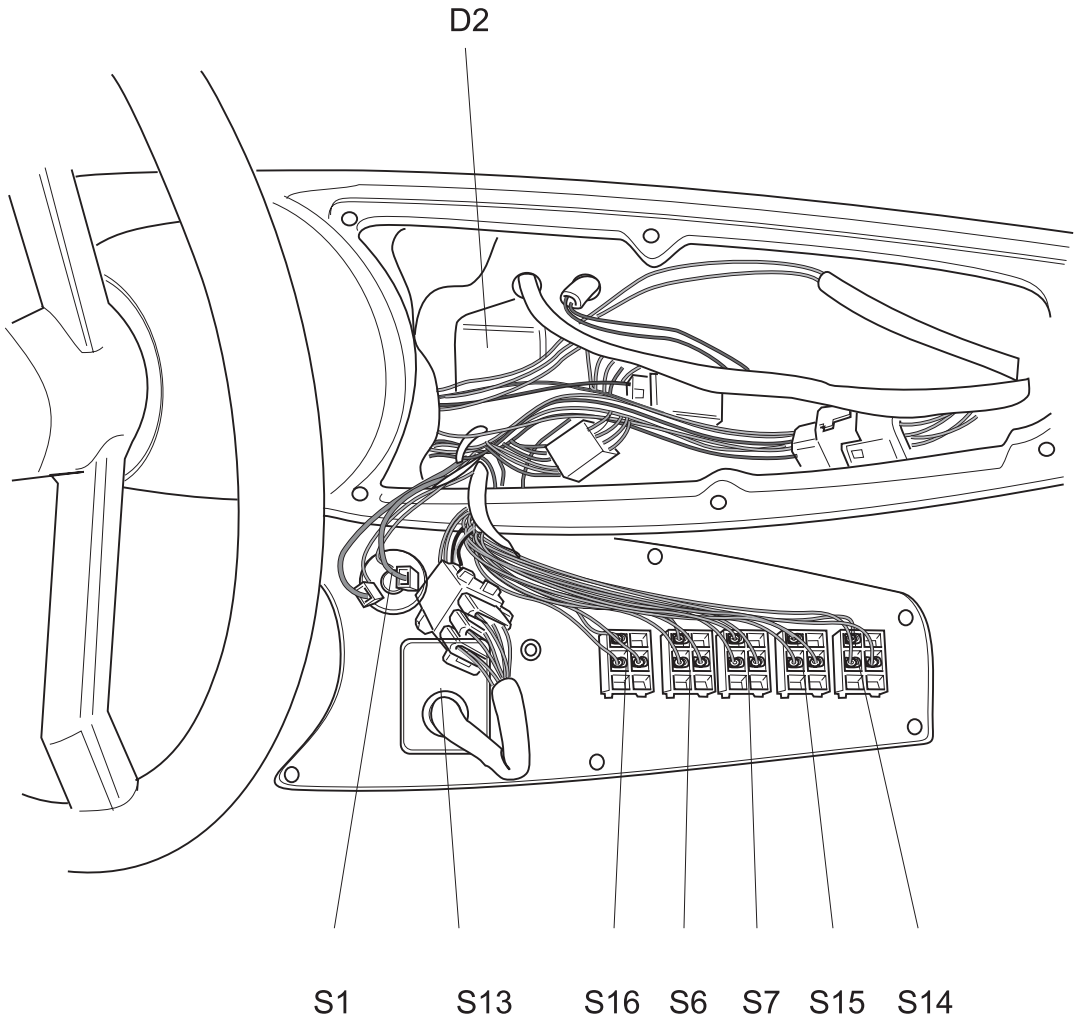
Relays

K1 Ignition switch
K2 Fan, cabin heater
K3 Water pump
K4 Safety beacon
K5 Turn signals
K6 Windshield wiper
K7 Fan, windshield defroster
K8 Headlamps

M5 Fan, windshield defroster
X1 Plug connector

Note:
The fuse box is located below the instrument panel.

Equipment Features – Control console, open view



D2 Control module, engine shut-off solenoid

S14 Switch, safety beacon

S15 Switch, windshield defroster fan

S7 Switch, cabin heater fan

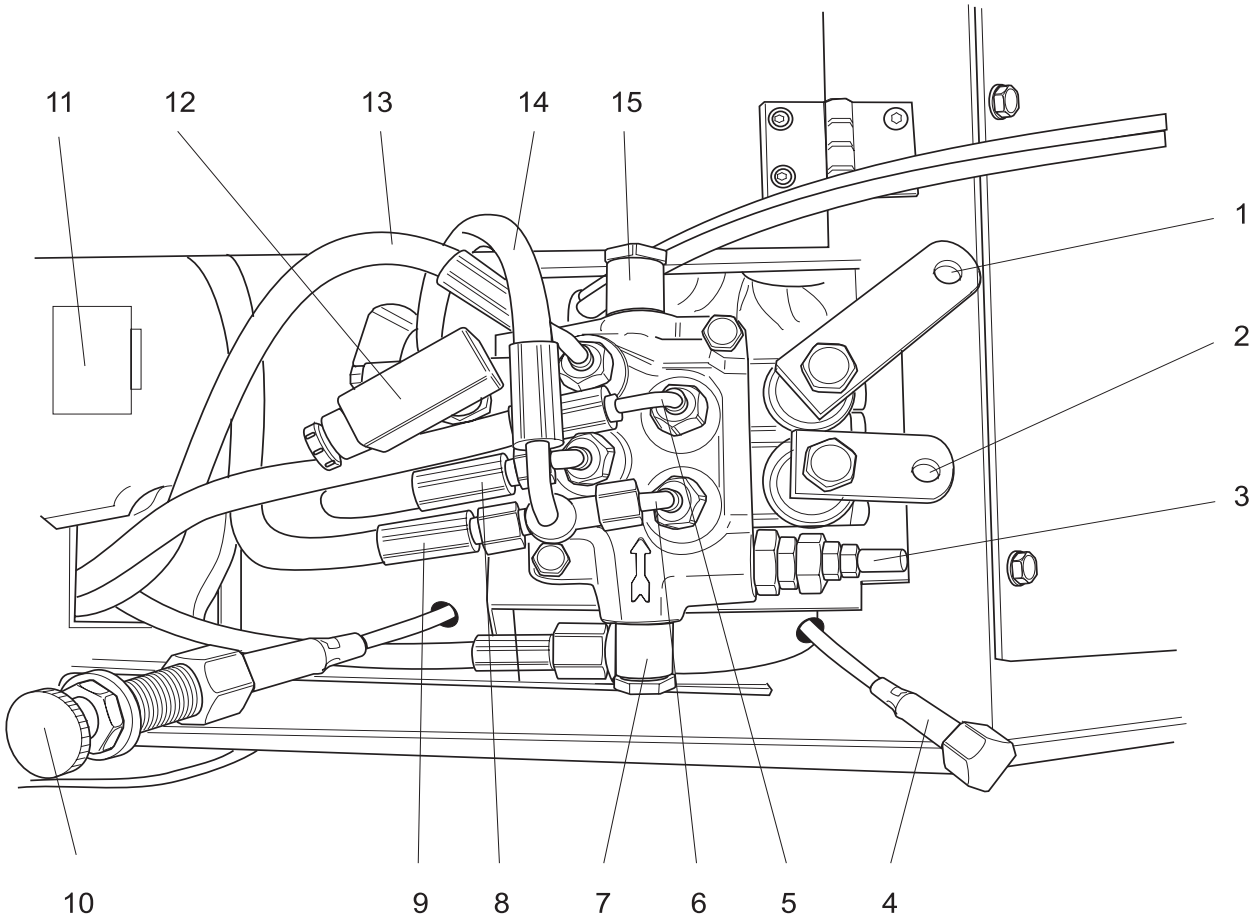
S6 Switch, windshield wiper

S16 Switch, working spotlights (option)

S13 Combination switch

S1 Ignition switch

Equipment Features – Side console, open view



1 Mounting thread for lever, Raise / Lower debris container

2 Mounting thread for lever, Raise / Lower side brush and vacuum intake

3 Pressure relief valve

4 Bowden cable, coarse debris flap

5 Hydraulic line, Lower debris container

6 Hydraulic line, Lower brushes, Sweeping

7 Hydraulic fluid inlet

8 Hydraulic line, Raise brushes

9 Hydraulic line, Lower brushes

10 Manual throttle

11 Control module, impeller fan brake (D3)

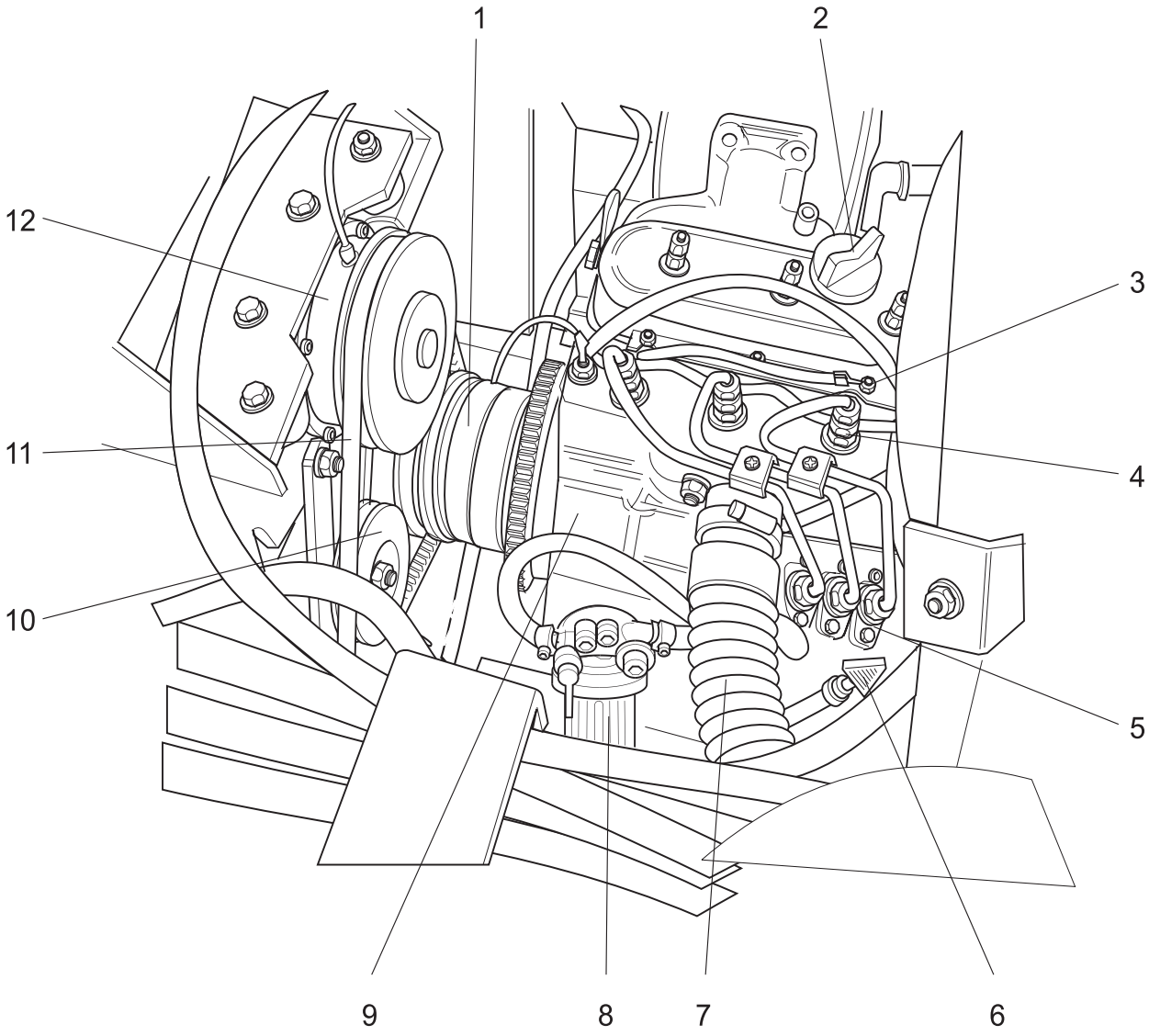
12 Switch, debris container warning buzzer (S18)

13 Hydraulic line, Raise debris container

14 Hydraulic line, Sweeping operating

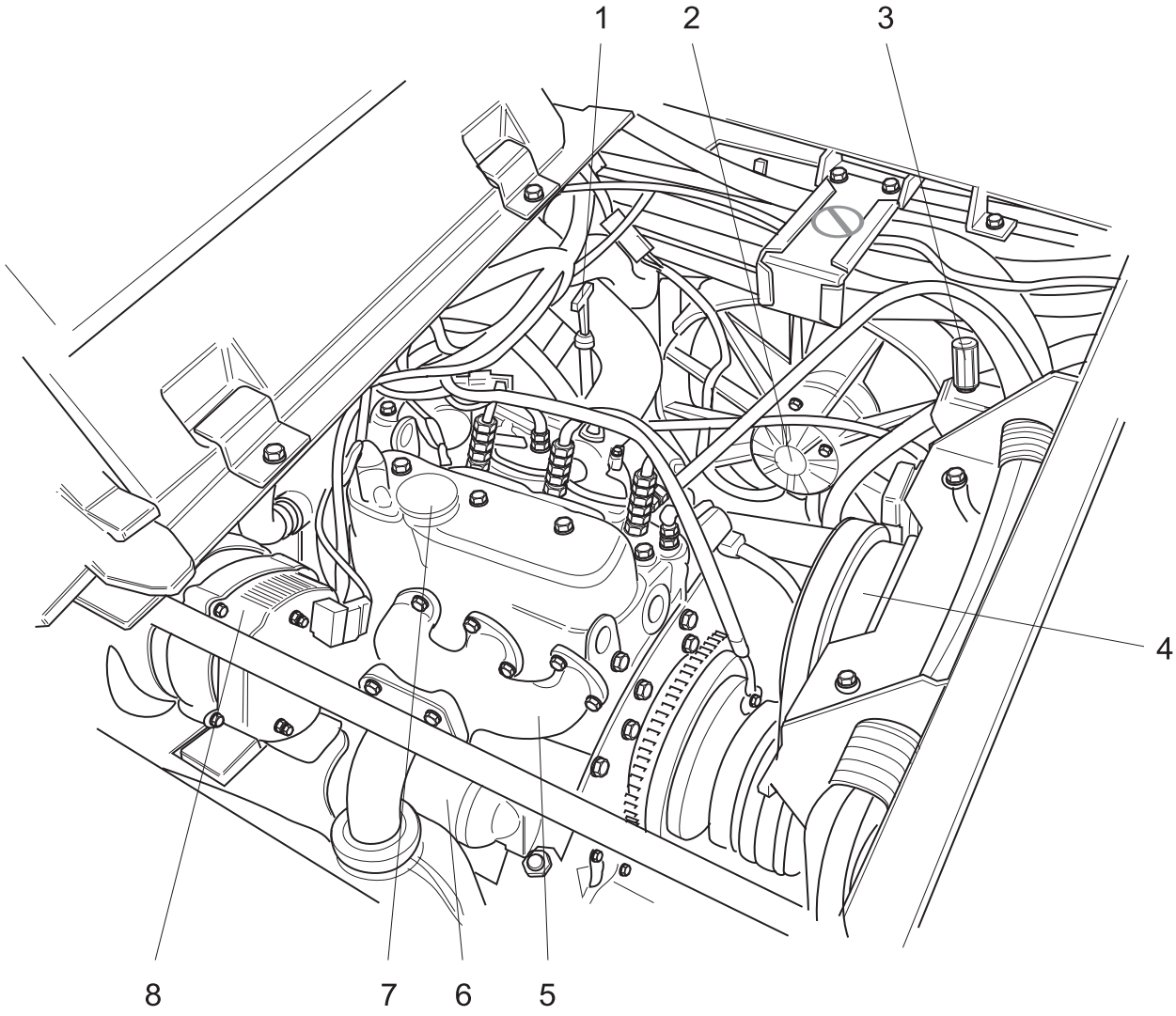
15 Hydraulic line to hydraulic fluid tank

Equipment Features – Engine compartment, view from left



1	Magnetic clutch, vacuum impeller fan	8	Fuel filter
2	Filler neck, engine oil	9	Engine
3	Glow plug	10	Tension roller, V-belt
4	Injector nozzle	11	V-belt
5	Injection pump	12	Magnetic brake, vacuum impeller fan
6	Oil dip stick		
7	Air intake hose		

Equipment Features – Engine compartment, view from right



1 Oil dip stick

2 Coolant radiator electric fan

3 Adjustment screw, V-belt tension

4 Magnetic brake, vacuum impeller fan

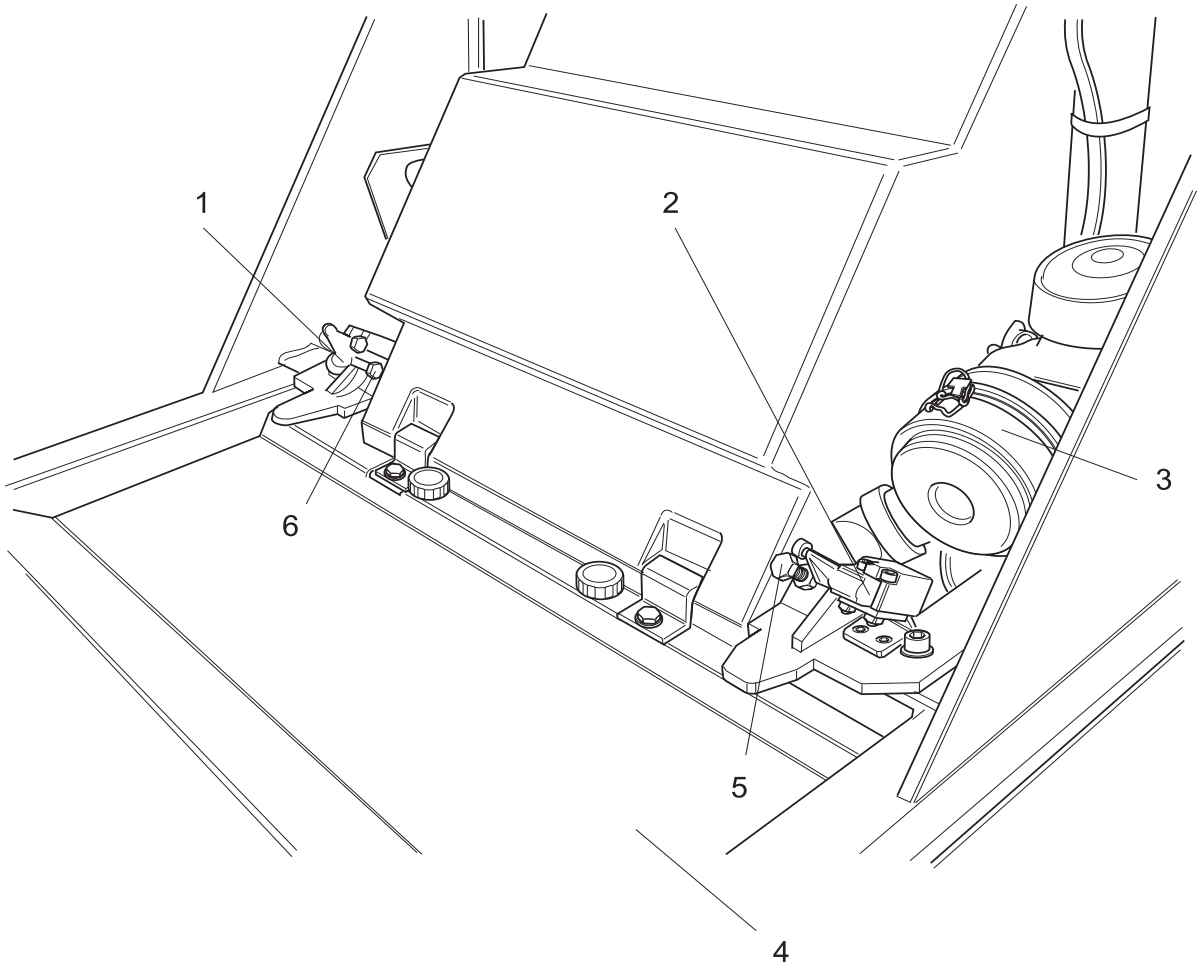
5 Exhaust manifold

6 Starter

7 Oil filler neck

8 Alternator

Equipment Features – Engine compartment, view toward rear



1 RH limit switch, debris container (S10)

2 LH limit switch, debris container (S11)

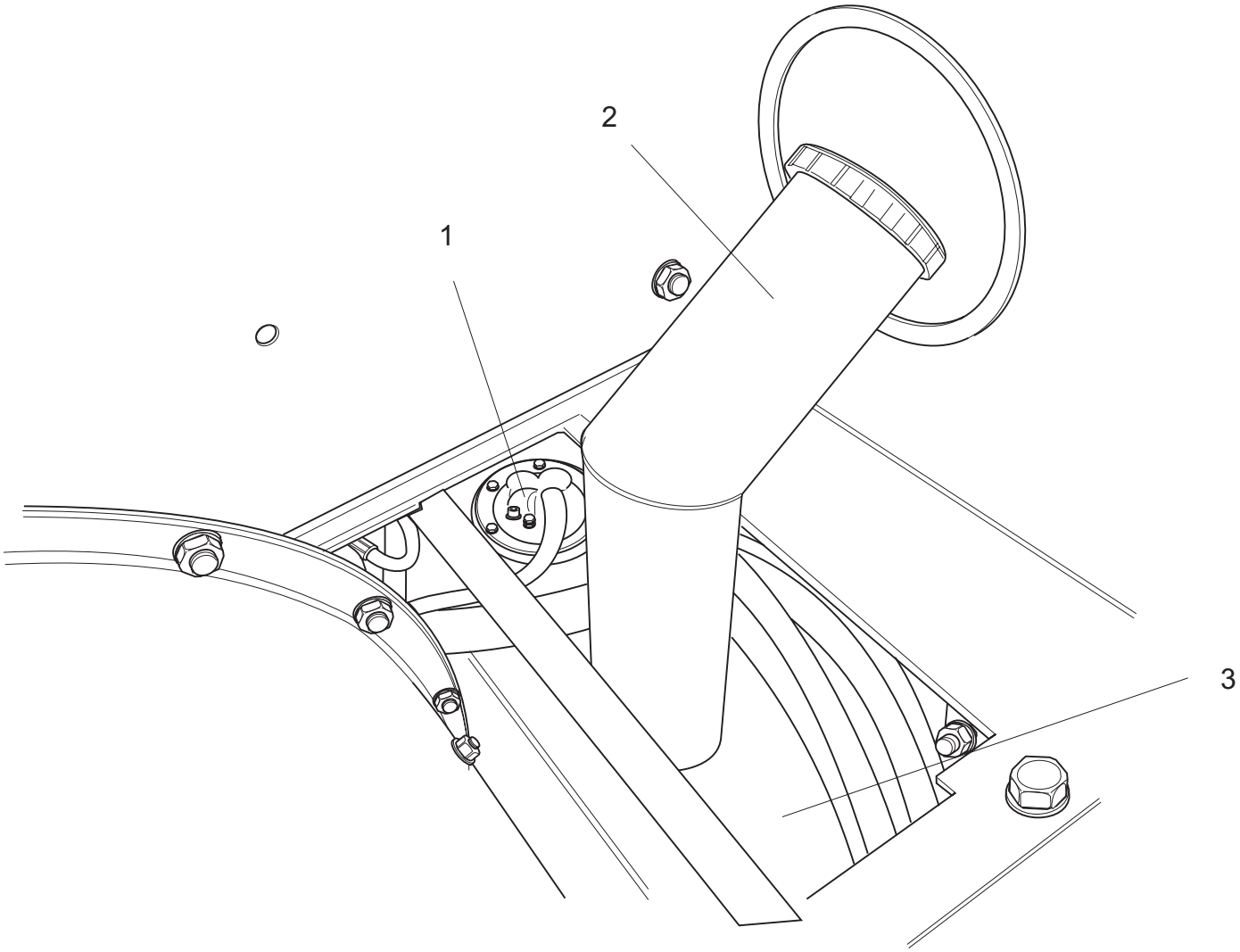
3 Air cleaner

4 Engine cover

5 LH stop screw, debris container

6 RH stop screw, debris container

Equipment Features – Fuel tank

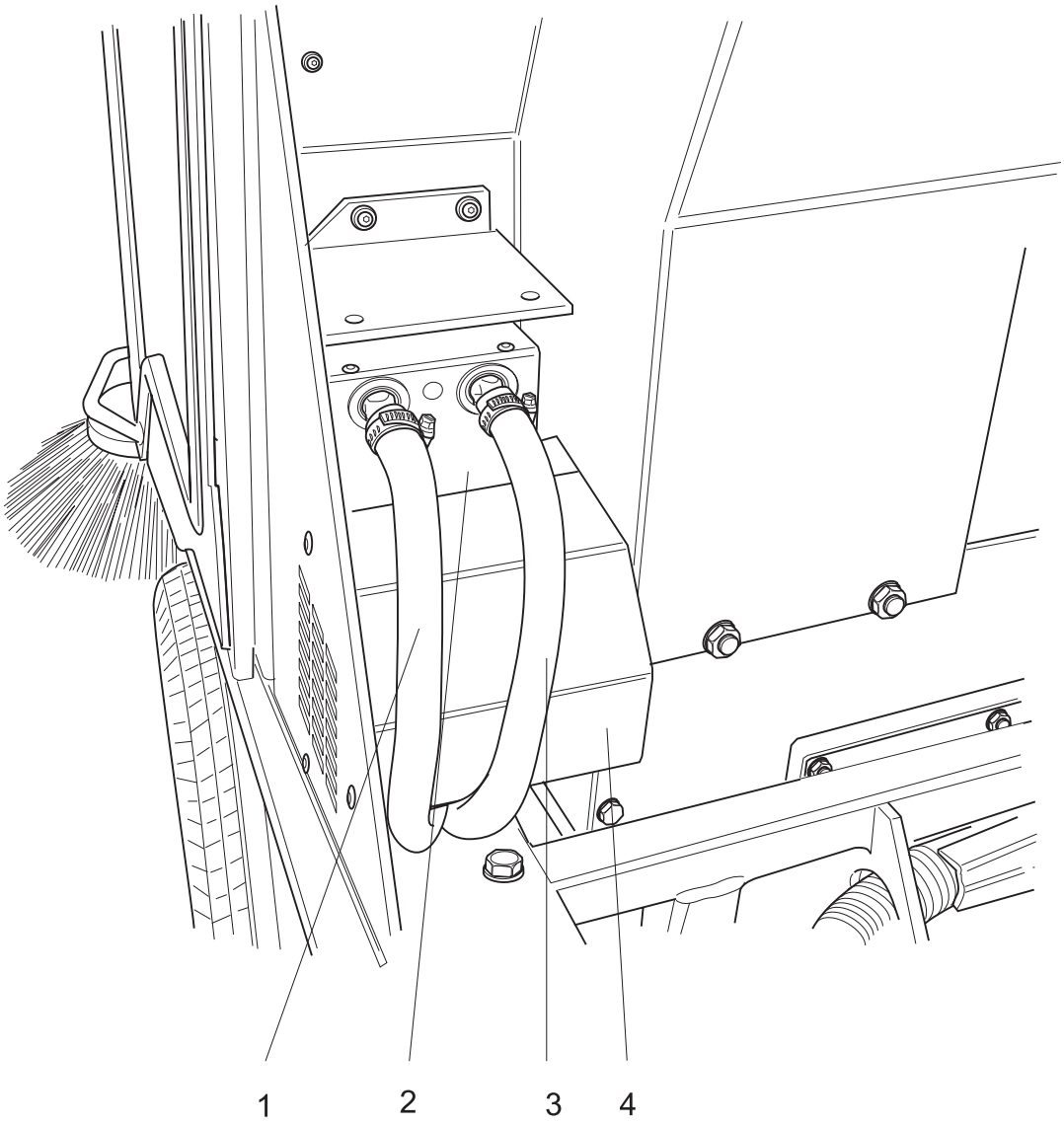


1 Fuel level sensor

2 Fuel filler neck

3 Fuel tank

Equipment Features – Heater



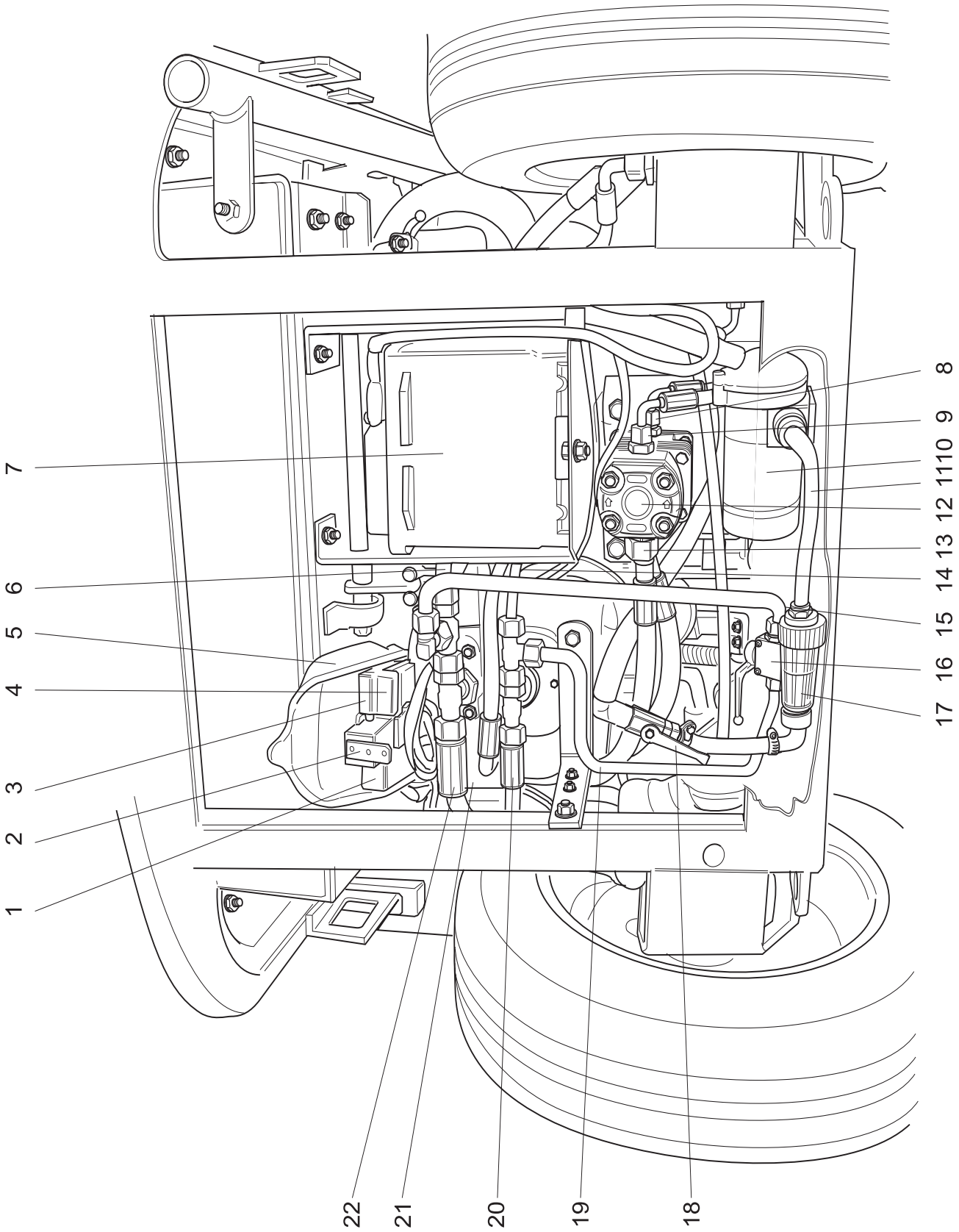
1 Hot water supply hose

2 Heat exchanger

3 Warm water return hose

4 Heater fan shroud

Equipment Features – Engine compartment, view from rear



Equipment Features – Engine compartment, view from rear

1 Relay, radiator fan (K9)

2 Control module, pre-glow (D1)

3 Fuse, radiator fan (F18)

4 Fuse, glow plugs (F17)

5 Splash water guard

6 Hydraulic line, to hydraulic motor, RR wheel

7 Battery

8 Hydraulic line, to steering valve

9 Hydraulic line, to side brushes / debris container control block

10 Water pump

11 Hose, to water pump inlet

12 Hydraulic pumps, side brushes / debris container, steering

13 Hydraulic line, to hydraulic fluid tank

14 Hydraulic line, to hydraulic motor, RR wheel

15 Hydraulic line, from bypass valve

16 Bypass valve, with changeover lever, free-wheel

17 Water filter

18 Water shut-off valve

19 Hydraulic line, to bypass valve

20 Hydraulic line, to hydraulic motor, LR wheel

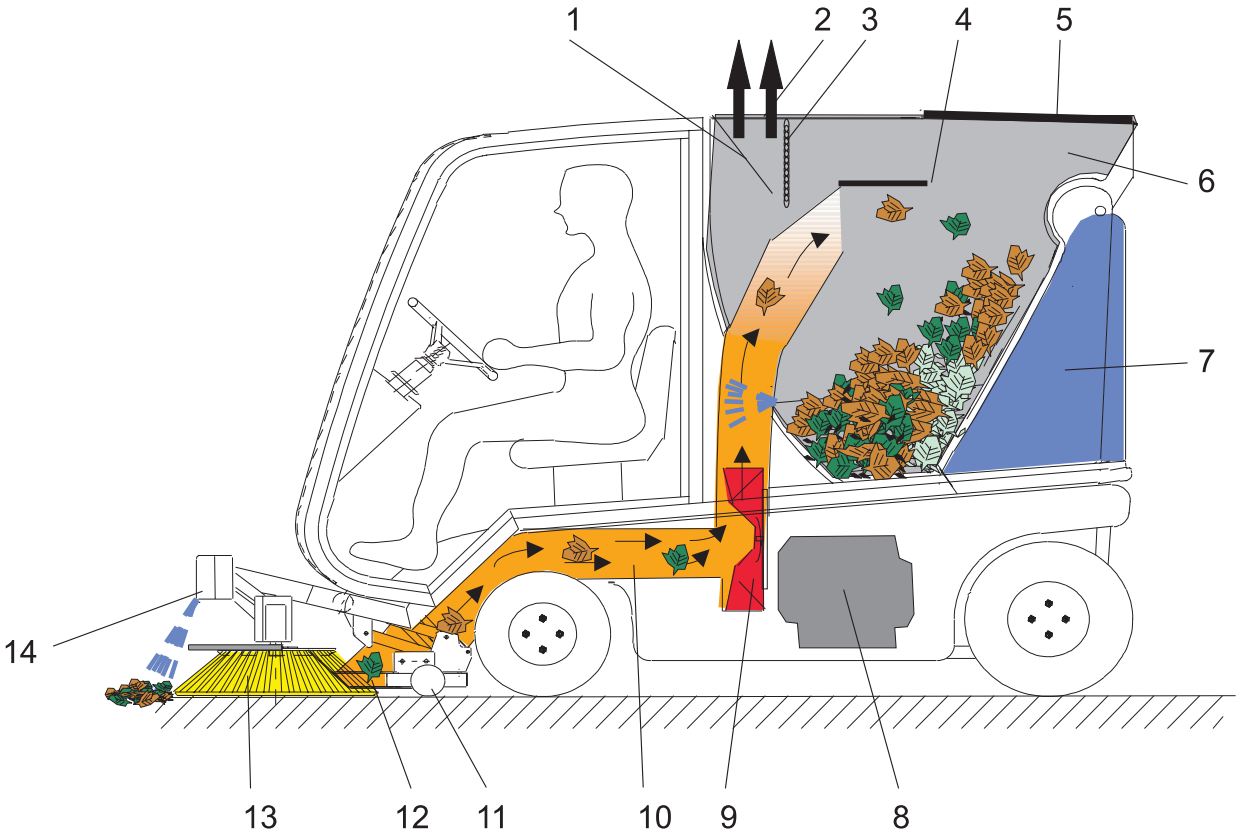
21 Hydraulic pump, driving operation

22 Hydraulic line, to hydraulic motor, LR wheel

Note:

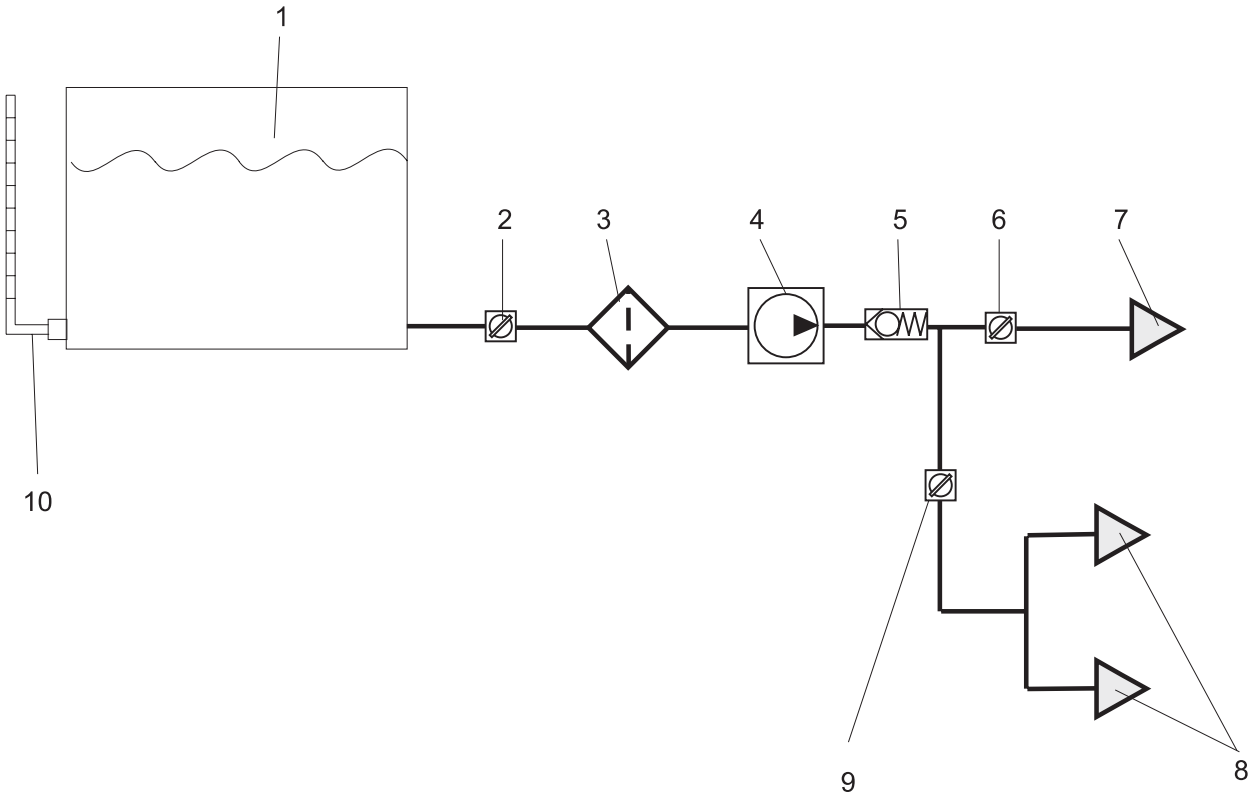
When removing the battery, start by disconnecting the negative terminal (-), and then remove the positive terminal (+).

Function Groups – Sweeping & Vacuum system



1	Grille plate, deflection plate	10	Vacuum duct
2	Air exhaust	11	Support casters
3	Chain curtain	12	Vacuum inlet
4	Deflection plate	13	Side brush
5	Cover	14	Spray nozzles
6	Debris container		
7	Fresh water tank		
8	Engine		
9	Impeller fan		

Function Groups – Water system



1 Water tank

2 Shut-off valve

3 Water filter

4 Water pump

5 Non-return valve *

6 Metering valve, vacuum channel

7 Spray nozzle, vacuum channel

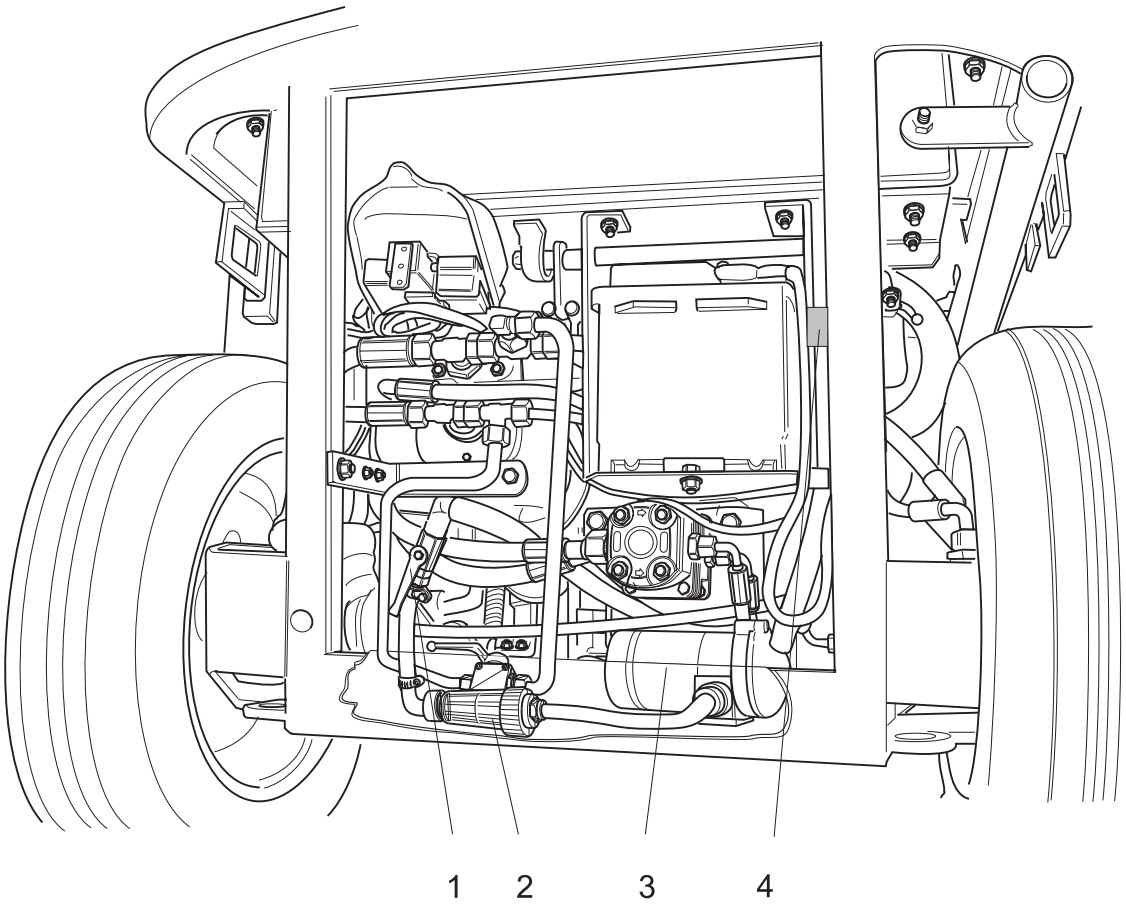
8 Spray nozzle (2x), side brushes

9 Metering valve, side brushes

10 Tank fill level indicator in operator cab

* Effective with serial no. 10200, solenoid valve was replaced by non-return valve.

Function Groups – Water system



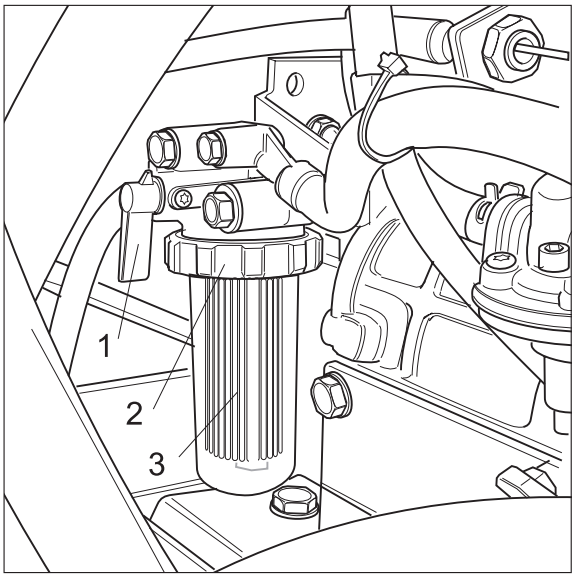
1 Shut-off valve

2 Water filter

3 Water pump

4 Solenoid valve, water pump

Engine – Fuel



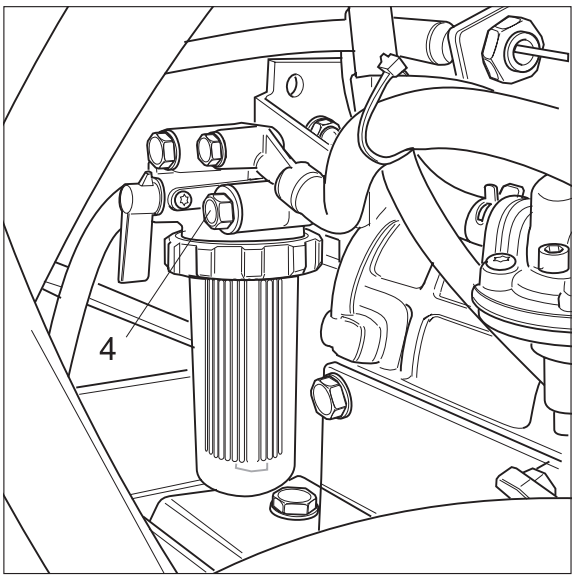
Cleaning fuel system

Cleaning fuel filter

– Close fuel shut-off valve (1) by turning counter-clockwise one-quarter turn.

– Loosen and unscrew knurled retaining ring (2), and remove fuel filter bowl (3) complete with contents.

– Replace fuel filter insert (3).



Bleeding air from fuel system

Bleeding air from fuel system

– Loosen air bleeding screw (4) approx. 2 turns.

– Start engine, and allow to run until exiting fuel no longer contains air bubbles.

– Tighten air bleeding screw (4) while engine is running.

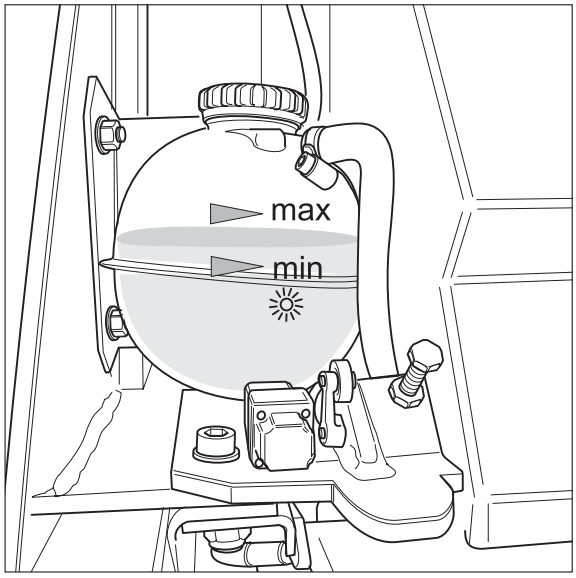
1 Fuel shut-off valve

2 Knurled retaining ring

3 Fuel filter bowl

4 Air bleeding screw

Engine – Cooling



Checking engine coolant level in expansion tank

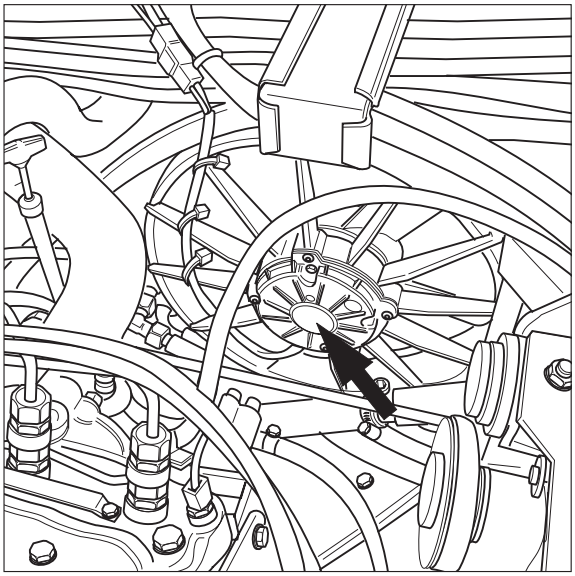
Checking / topping up engine coolant

Prior to checking coolant level, allow engine to cool. The proportion of antifreeze in the engine coolant must not exceed 50 percent.

– Raise the debris container.

– Check coolant level in expansion tank.

– With engine cold, top up engine coolant to the "min" mark in expansion tank.



Checking cooling fan motor

Checking cooling system for leaks

The radiator is a combination of two cooling circuits, one for hydraulic fluid, the other for engine coolant. The fan transports the cooling air from the outside into the engine compartment, passing it through the dual-circuit radiator. Check all radiator hoses, connections and the radiator itself for leaks.

Checking cooling fan functions

The fan must start as soon as the ignition key is turned to position "1".

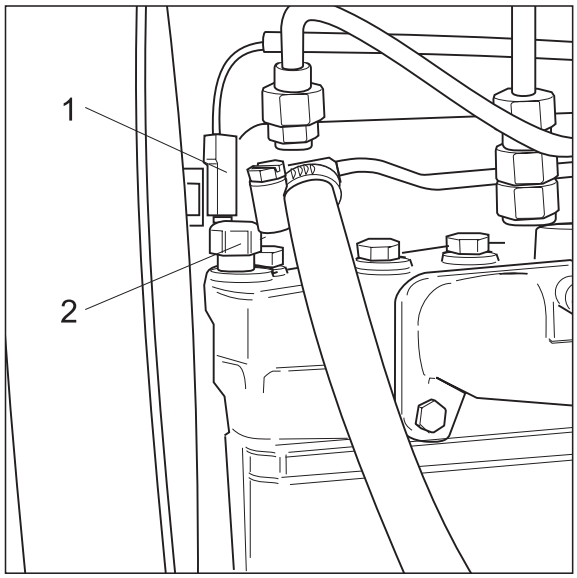
– Check electrical connections and fuses, and replace as required.

– Measure voltage applied to electric motor.

– If required, replace connecting cable / relay / electric motor.

When replacing the fan, it must be noted that the cable inlet connection on the electric motor points downward.

Engine – Cooling



Checking engine coolant temperature switch

1 Plug-in connector

2 Engine coolant temperature switch (S3)

Checking engine coolant temperature switch

– Start engine.

– If the "Engine Coolant Temperature" indicator light on the combination instrument illuminates also when the engine is cold, the connecting cable must be checked for a short-circuit against vehicle ground.

– With engine running, bridge the connector (1) to vehicle ground (indicator lamp must illuminate and buzzer must sound).

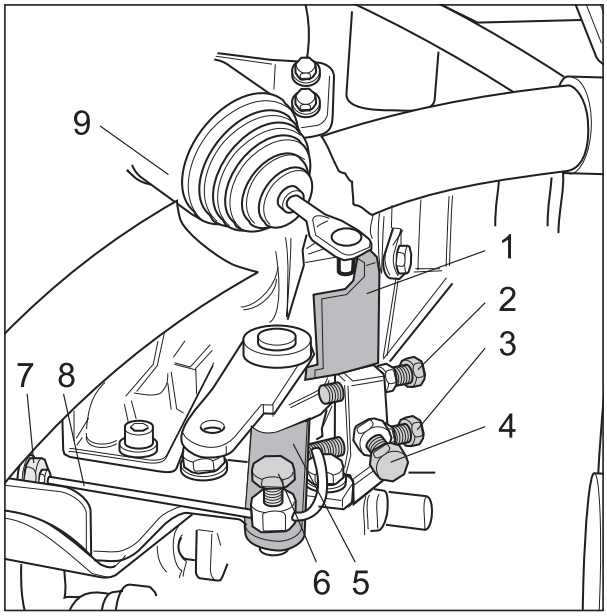
– Replace temperature switch (2) as required.

Note:

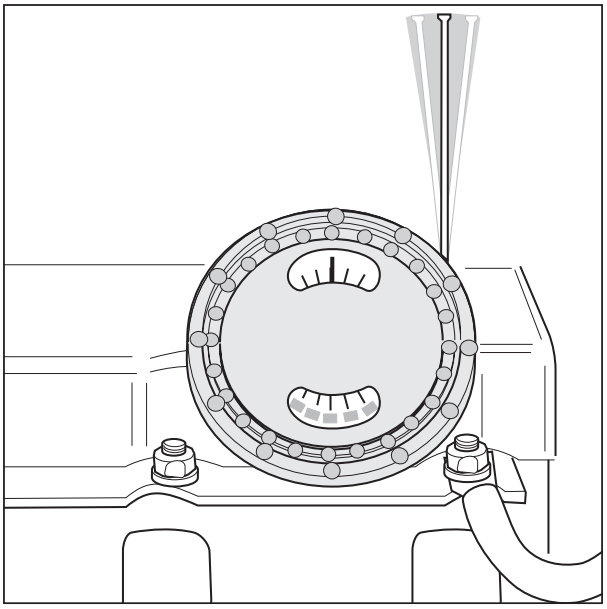
A radiator that is blocked by dirt and debris will cause overtemperature of engine coolant and hydraulic fluid. Therefore, when the indicator lamp illuminates, the first step to be taken should be to investigate the radiator for free air passage.

When the indicator lamp lights up, the engine will not be shut off.

Engine – Speed adjustments



Adjusting idle speed



Checking engine speed with vibration tachometer

1 Lever, engine shut-off solenoid

2 Stop screw, engine shut-off solenoid

3 Adjusting screw, idle speed

4 Adjusting screw, operating speed

5 Throttle lever

6 Clamp bolt, Bowden cable

7 Adjusting nut, Bowden cable

8 Bowden cable

9 Solenoid valve, engine shut-off

Adjusting idle speed

Note:

Engine speed may be checked with the use of a stroboscope, digital tachometer or vibration tachometer (refer to Special Tools).

– Push manual throttle lever on right-hand side panel all the way in.

– Adjust Bowden cable (8) in such a way that throttle lever (5) contacts adjusting screw (3). Make necessary corrections on clamp bolt (6) or adjusting nut (7) as required.

– Refer to Specifications for idle speed settings.

Adjusting operating speed

– Accelerate engine until operating speed has been reached.

– Hold tachometer in close contact with valve cover or engine block.

– Turn rotating plate of vibration tachometer until resonance spring attains maximum deflection.

– Read engine speed on tachometer.

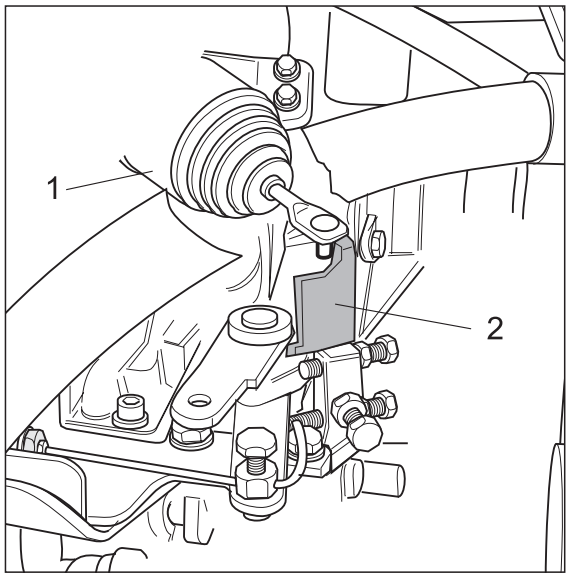
– Adjust Bowden cable (8) in such a way that throttle lever (5) touches adjusting screw (4). Make necessary corrections on clamp bolt (6) or adjusting nut (7) as required.

– Refer to Specifications for operating speed settings.

Note:

The adjusting screws (3 and 4) are preset and sealed at the factory. They must not be adjusted. Breaking the seal will void manufacturer's warranty and operating license.

Engine – Engine shut-off solenoid valve



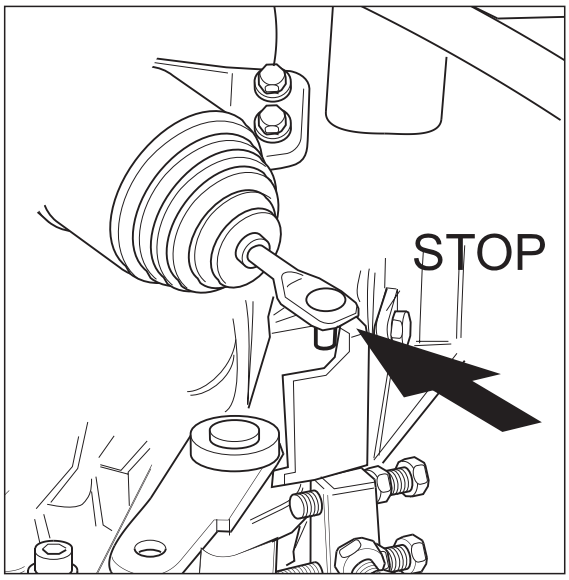
Engine shut-off solenoid valve

Engine shut-off solenoid valve

As soon as the ignition switch (S1) is set to position "0" with the engine running, the engine shut-off control responds, and the solenoid valve (1) attracts. This shuts off the fuel supply inlet, causing the engine to stop. After about 15 seconds, solenoid valve switches off again, and opens fuel supply inlet.

1 Solenoid valve, engine shut-off

2 Lever, engine stop



Manual actuation of engine shut-off solenoid valve

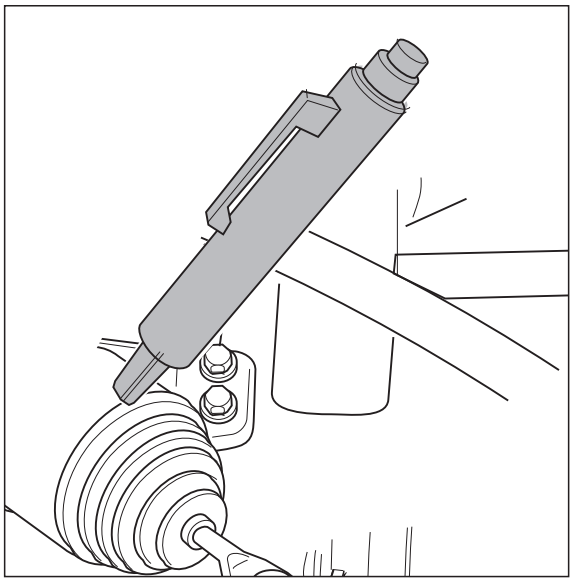
In the event that the solenoid valve (1) fails to shut off the fuel supply when the ignition key is set to position "0", the solenoid valve can also be actuated manually.

Shut off engine:

– Move engine shut-off lever in direction of arrow until it stops, and hold until engine comes to a standstill.

Caution!

Stay clear of rotating components!



Checking magnetic field

Checking engine shut-off solenoid valve

– Check fuse F 12.

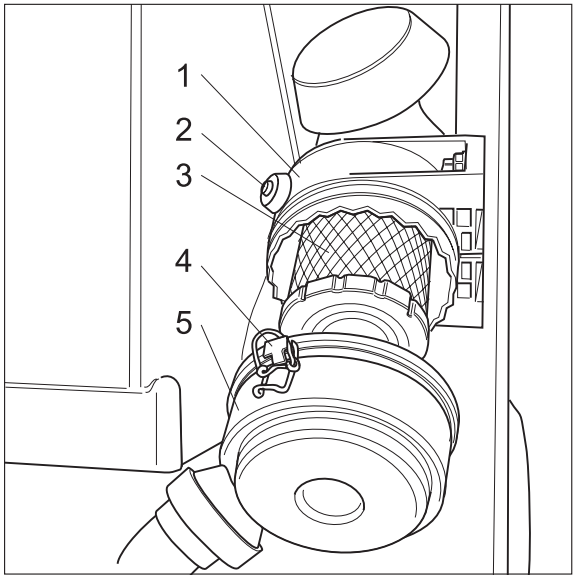
– Set ignition switch to "0" position.

– Measure magnetic field on solenoid valve no later than 5 seconds after setting ignition key to "0" position.

– If a switching voltage is present, and the solenoid valve does not attract, it must be replaced.

– If no switching voltage is present, connecting cables and D2 engine shut-off control module must be checked and replaced as required.

Engine – Air cleaner



Checking air cleaner

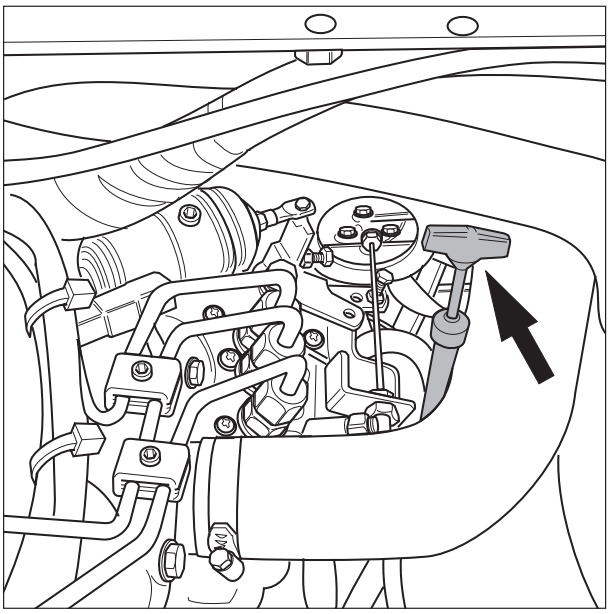
1 Air cleaner housing
2 Warning switch/reset button
3 Filter cartridge
4 Clamp
5 Air cleaner cover

Checking / replacing air cleaner

When the "Air Cleaner Warning" indicator light in the combination instrument illuminates, the air cleaner must be cleaned or its cartridge replaced.

– Detach air cleaner cover (5), and clean together with air cleaner housing (1), do not wash.
– Loosen clamp (4).
– Clean or replace filter cartridge (3).
– Press in warning switch button (2) to reset.

Engine – Engine oil



Checking engine oil level

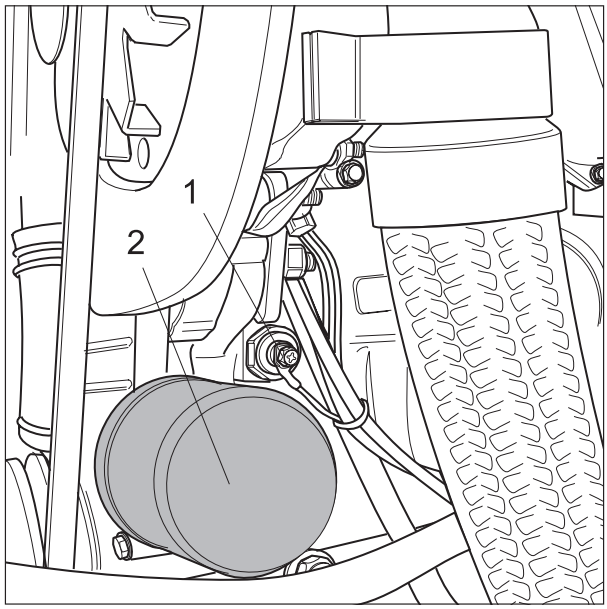
Checking engine oil level

– After shutting off engine, allow at least five minutes to pass before checking oil level.

– Oil level must be between "MIN" and "MAX" marks on oil dip stick (arrow).

– If oil level is found to be below "MIN" mark, top up with engine oil immediately.

– Do not overfill engine oil to above "MAX" mark! Refer to Specifications for type of engine oil required.



Changing oil filter / Checking oil pressure switch

1 Oil pressure switch

2 Oil filter

Changing oil filter

– Drain engine oil.

– Remove oil filter (2) using cartridge wrench.

– Clean sealing surface at filter base.

– Apply thin film of engine oil to rubber seal of new filter cartridge.

– Start new filter cartridge on threaded base, and turn until hand-tight.

Checking oil pressure switch

– Start engine. Oil pressure indicator lamp must extinguish.

– If indicator lamp fails to extinguish, check / top up engine oil first.

– Check for switching voltage on terminal of connecting cable.

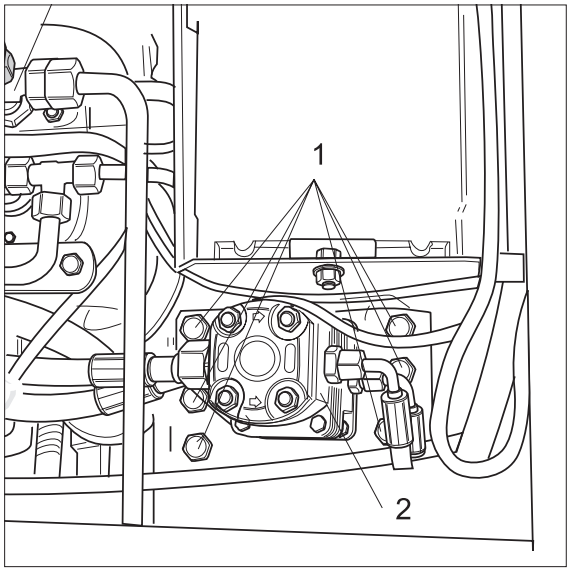
– If a voltage is present, oil pressure switch must be replaced.

– If no voltage is present, connecting cable must be checked for possible short-circuit against vehicle ground.

Note:

When the indicator lamp lights up, the engine will not be shut off.

Engine – Drive Pump belt



Engine mounted pumps

Changing drive pump belt

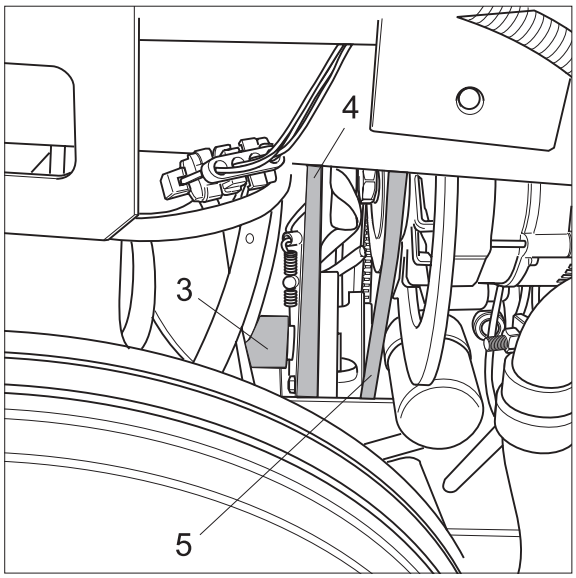
– Loosen and remove six mounting bolts (1).

– Pull pumps (2) far enough toward the rear to separate coupling sleeve (3) from engine drive shaft (gap wide enough to allow drive belt to be passed through).

– Loosen belt tensioning roller.

– Replace drive pump belt (4).

– Re-adjust belt tention roller.



Alternator V-belt

1 Mounting screws (6x)

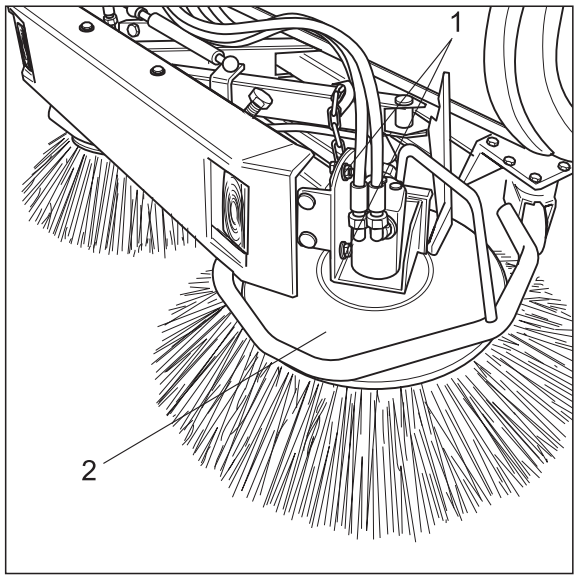
2 Pumps

3 Coupling sleeve

4 Belt, drive pump

5 V-belt, alternator

Sweeping Mechanism – Sweeping pattern



Adjusting sweeping pattern

Adjusting sweeping pattern

– Check tire pressure (see Specifications).

– Loosen clamp bolts (1).

– Adjust lateral inclination of side brush (2)

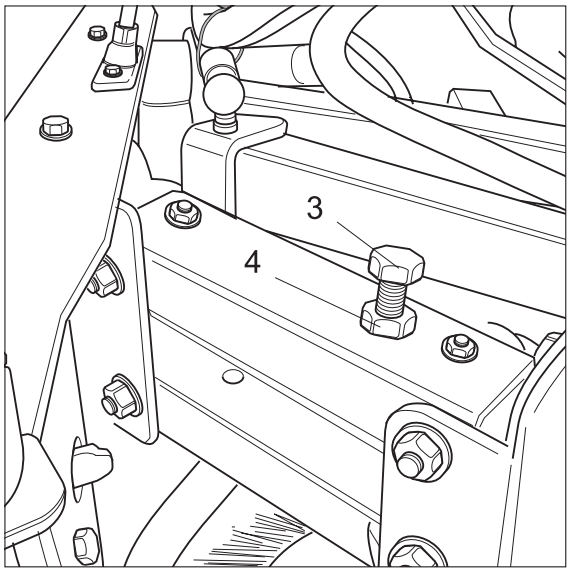
– Tighten clamp bolts (1).

1 Clamp bolts (2x)

2 Side brush

3 Stop screw

4 Lock nut

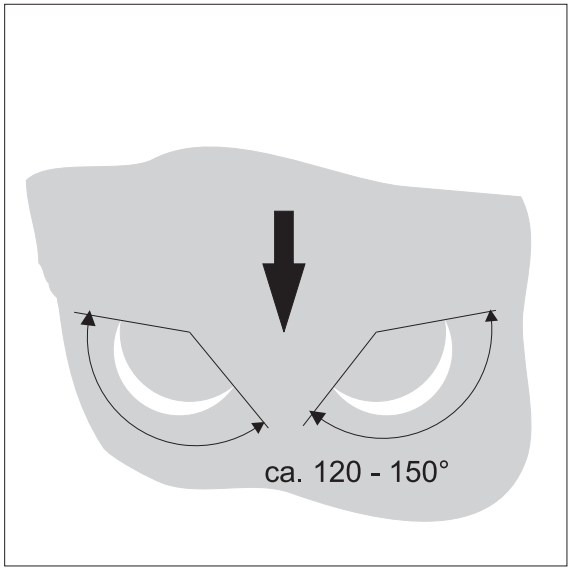


Adjusting brush contact pressure

– Loosen lock nut (4).

– Turn stop screw (3) to adjust side brush contact pressure on ground.

– Tighten lock nut (4).



Checking sweeping pattern

Checking sweeping pattern

The sweeping pattern should be formed like a moon-shaped sickle (approx. 120° to 150°).

– Raise side brushes.

– Drive sweeping machine onto flat and level ground that is evenly covered with dust.

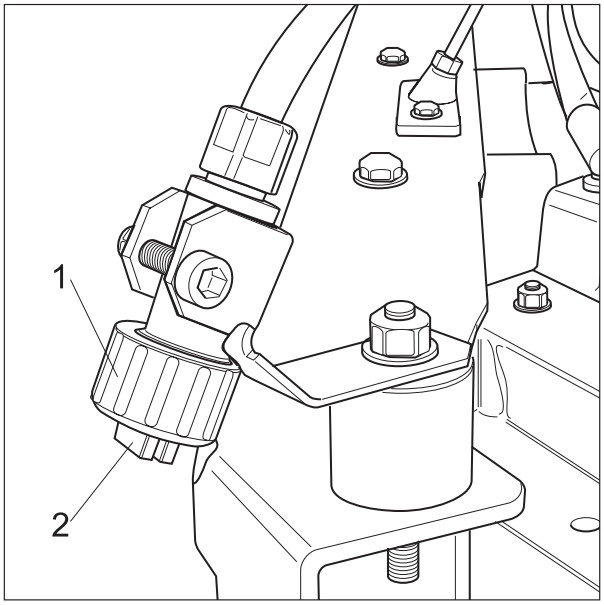
– Lower side brushes, and allow to run for a few seconds.

– Raise side brushes, back up machine.

– Check sweeping pattern.

Direction of travel

Sweeping Mechanism – Spray nozzles



Spray nozzles on side brush

1 Union nut

2 Spray nozzle

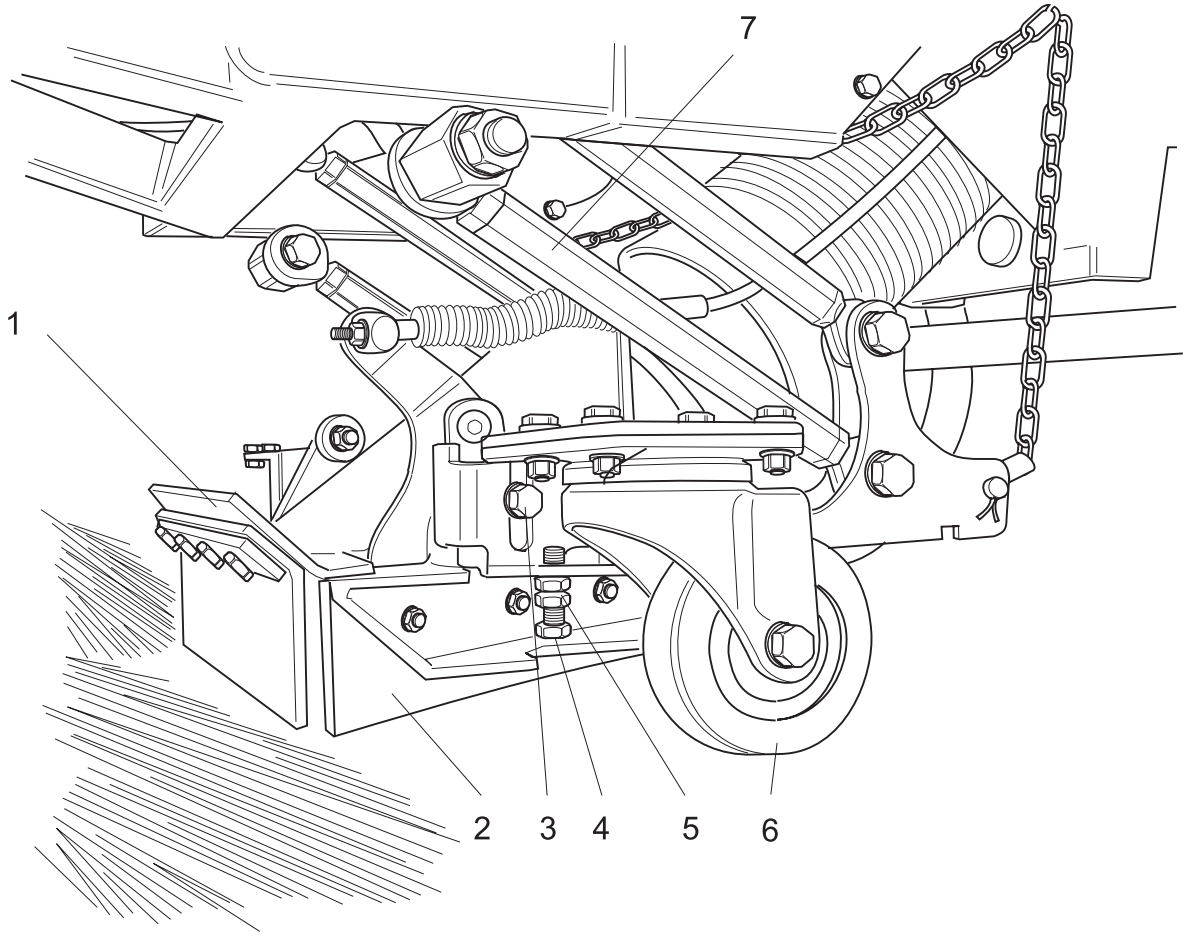
Cleaning spray nozzles on side brush

– Loosen union nut (1), and remove nozzle.

– Blow out spray nozzle with pressurized air from front (2). Replace as required.

– Install spray nozzle (2), and tighten union nut (1).

Sweeping Mechanism – Vacuum intake



1 Coarse dirt flap

2 Sealing lip

3 Caster adjusting clamp bolt (4x)

4 Adjusting screw

5 Lock nut

6 Support caster, vacuum intake

7 Adjusting guide rods (2x)

Adjusting vacuum intake

– Lower vacuum intake.

– Loosen clamp bolts (3) on both sides.

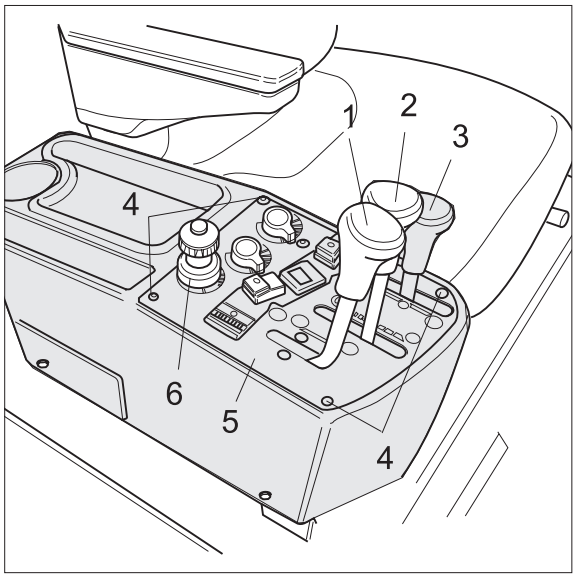
– Loosen lock nuts (5) on both sides.

– Using adjustment screws (4), adjust vacuum intake in such a way that the front sealing lip (2) at the coarse dirt flap (1) has about 0 to 1 mm ground clearance.

– Using guide rods (7), adjust sealing lip (2) to provide about 10 to 18 mm ground clearance at rear.

– After each adjustment, again check the other measurements.

Sweeping Mechanism – Warning buzzer, debris container



Opening side console

Adjusting warning buzzer switch

– Pull knobs off control levers (2, 3).

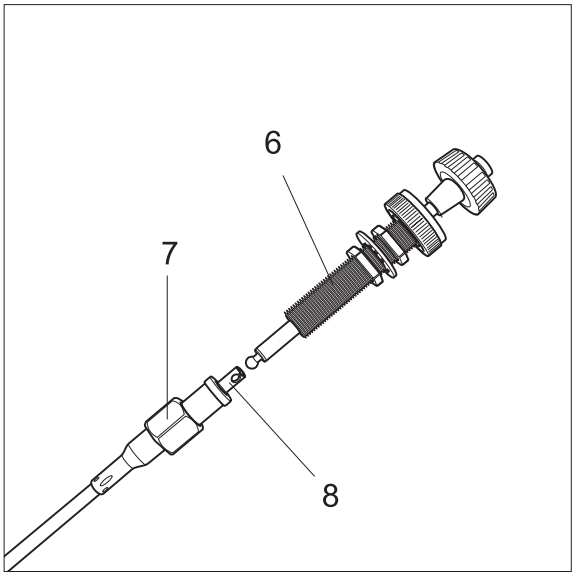
– Remove panel mounting screws (4).

– Detach Bowden cable at injection pump (see page 28).

– Lift cover panel (5).

– Unscrew union nut (7).

– Detach Bowden cable (8).



Bowden cable, detached

1 Lever, coarse dirt flap

2 Lever, side brushes and vacuum intake

3 Lever, debris container

4 Panel mounting screws (4x)

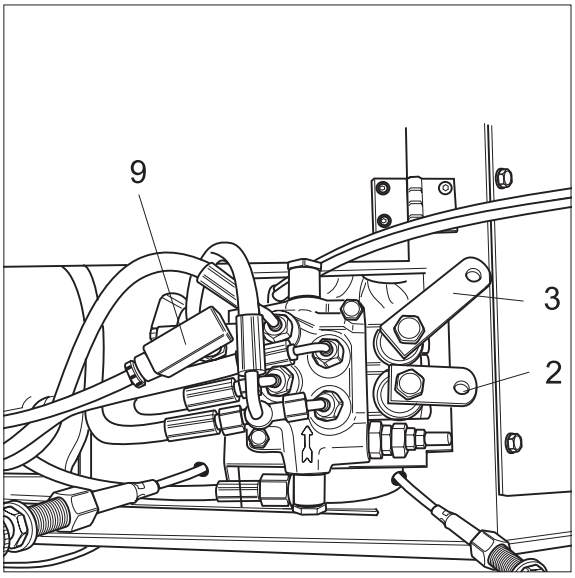
5 Cover panel

6 Manual throttle

7 Union nut

8 Bowden cable

9 Switch, warning buzzer (S18)



Adjusting warning buzzer switch

– Set lever (3) to "Neutral" position.

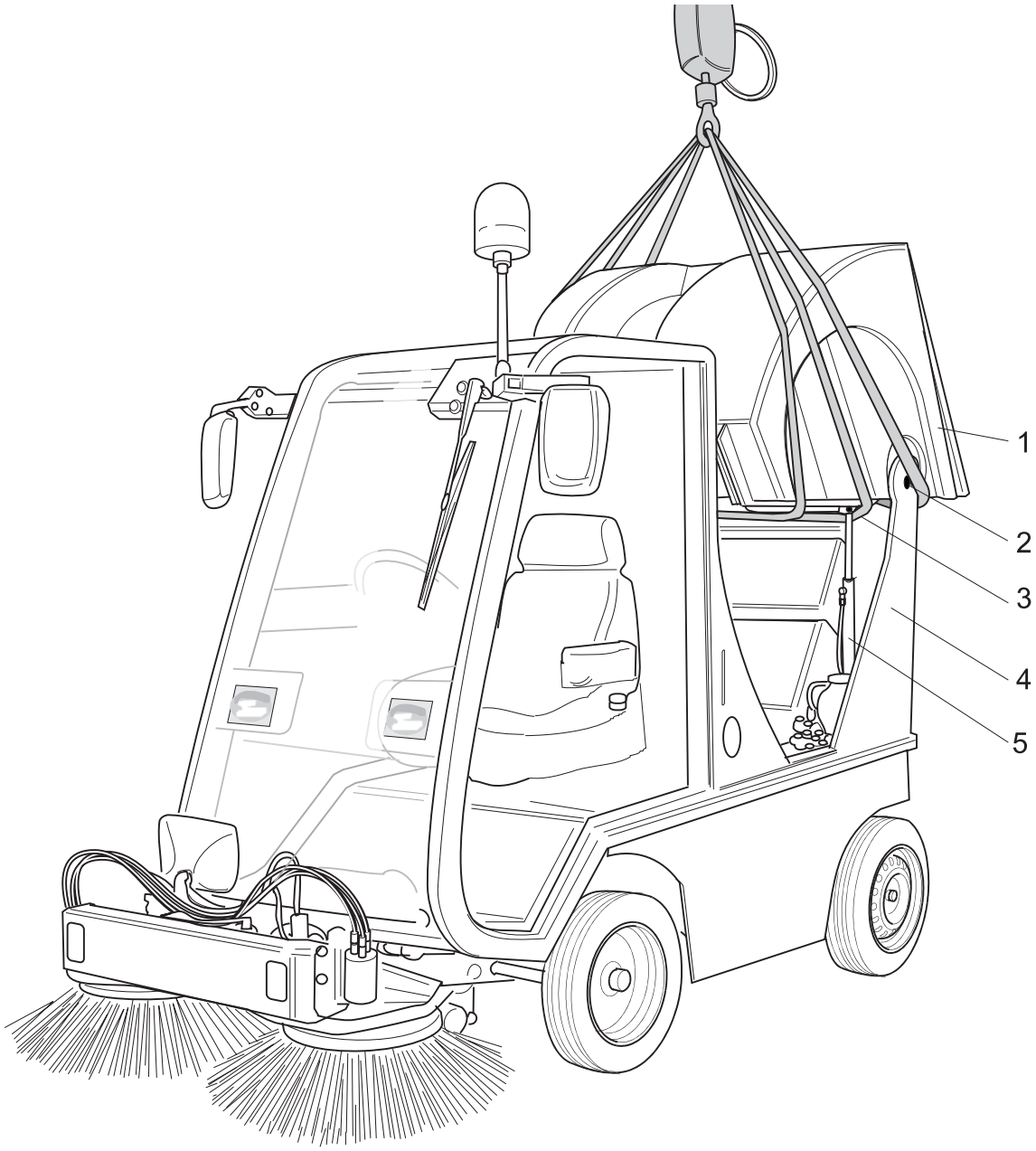
– Turn switch clockwise until (9) switching noise is heard.

– Turn switch (9) counter-clockwise one-half turn.

Note:

Due to confined working space, removal or rotation of hydraulic hoses on control block may be required.

Sweeping Mechanism – Debris container



1 Debris container

2 Container swivel bolt (2x)

3 Lifting cylinder retaining bolt (2x)

4 LH side panel

5 LH lifting cylinder

Removing debris container

– Raise debris container until level, and shut off engine.

– Attach rope slings to crane hook and debris container as shown.

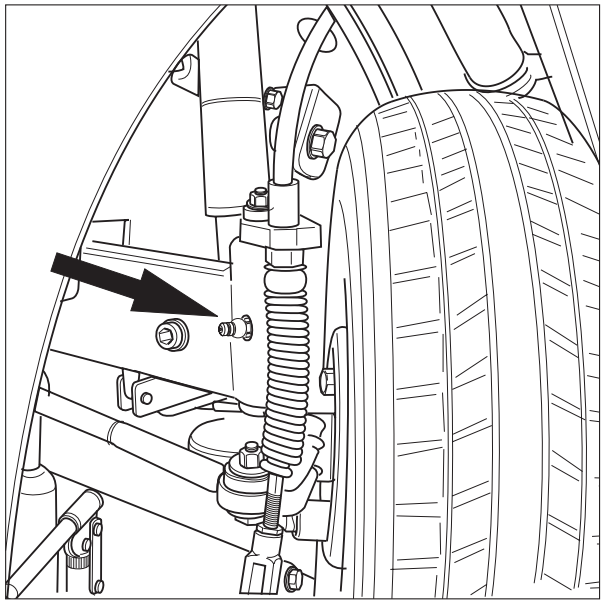
– Carefully raise crane hook until rope is taut.

– Remove retaining bolts (3) on LH and RH lifting cylinders.

– Remove both container swivel bolts (2) on LH and RH side panels.

– Using suitable tools, push LH and RH side panels outward, and raise crane hook to lift off debris container.

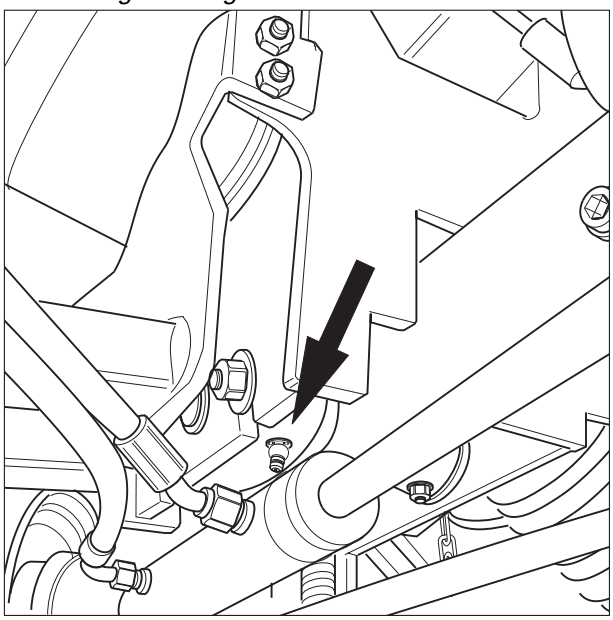
Running Gear – Grease fittings



Lubricating steering knuckle

Lubricating steering knuckles

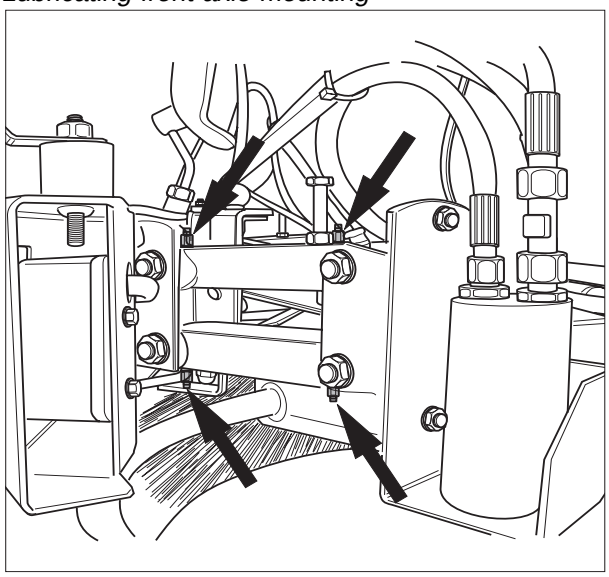
– Lubricate grease fittings on both steering knuckles (arrow) on front axle with 3-5 shots from grease gun.



Lubricating front axle mounting

Lubricating axle mounting

– Lubricate grease fittings (arrow) on front axle mounting with 3-5 shots from grease gun.

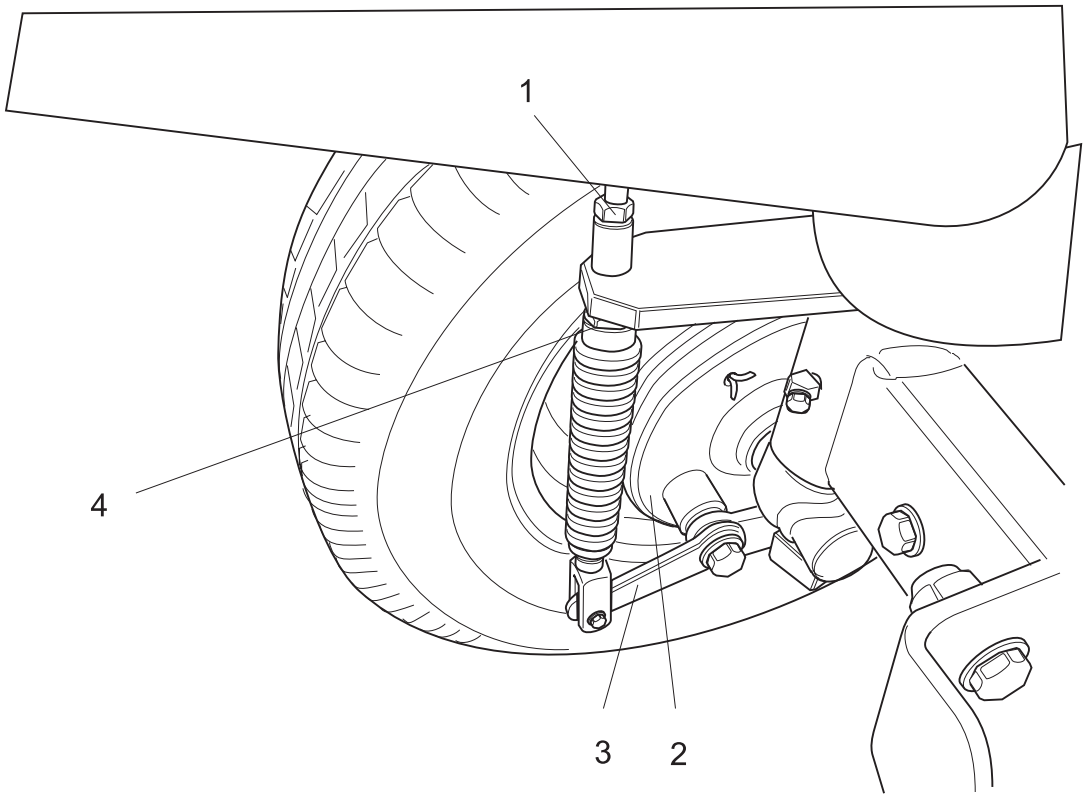


Lubricating side brush suspension

Lubricating side brush suspension

– Lubricate grease fittings (arrow) on side brush suspension with 3-5 shots from grease gun.

Running Gear – Brake



1 Adjusting screw

2 Drum brake

3 Brake lever

4 Lock nut

Adjusting brakes

> **Note:**
>
> Parking barke and operating brake act on both front wheels via brake cables (drum brake). Braking action on rear wheels is by hydraulics only.

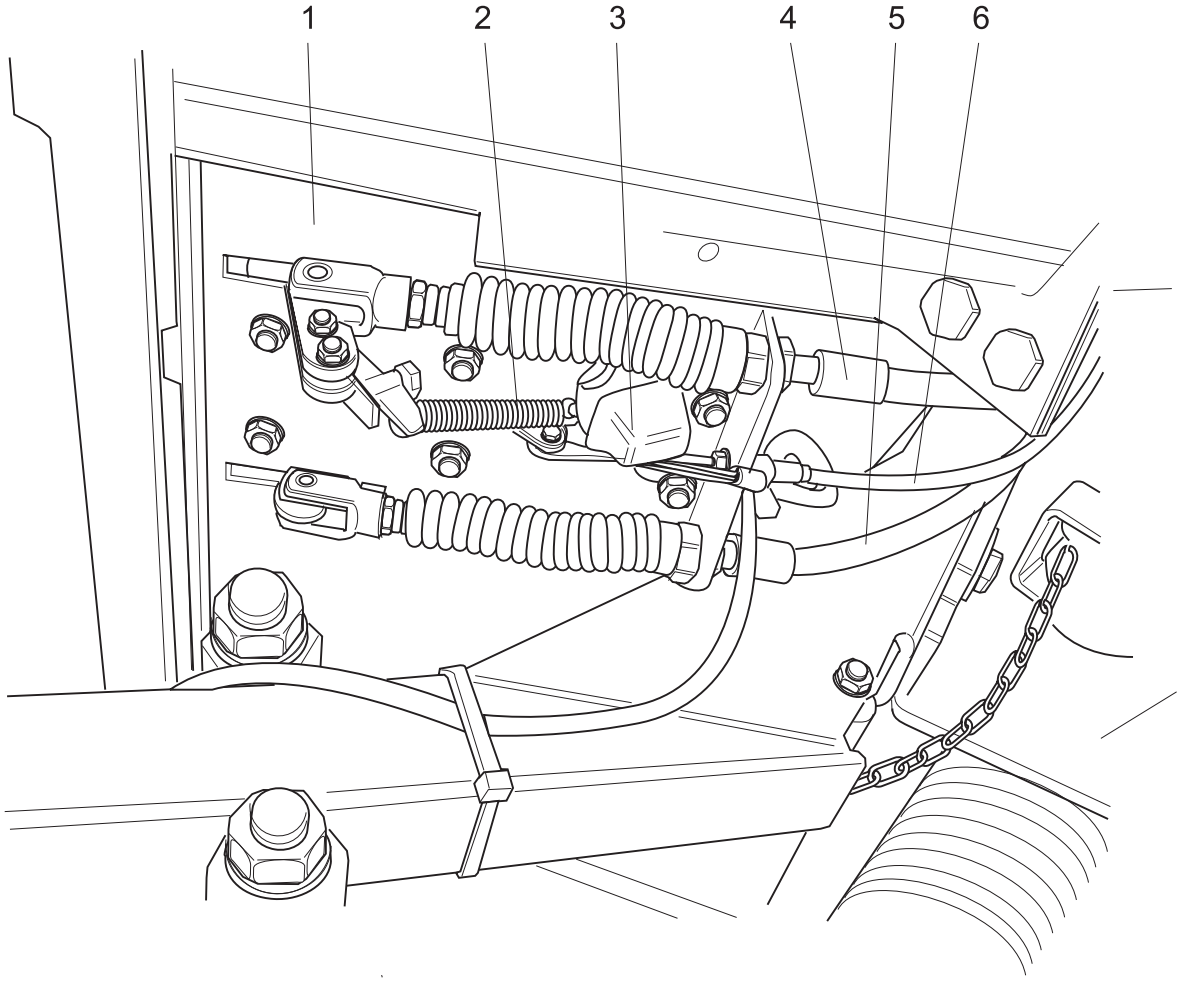
The Bowden brake cables are adjusted by means of the adjusting screw (1).

– Loosen lock nut (4).

– Turn adjusting screw (1) to adjust brake.

When the front wheel is raised with a floor jack, it must turn freely without chafing of brake linings on brake drum.

Running Gear – Brake (view from below)



1 Floor panel

2 Actuating spring, stop light switch

3 Protective cap, stop light switch (S 19)

4 Bowden cable, to LH drum brake

5 Bowden cable, to RH drum brake

6 Bowden cable, for setting parking brake

Replacing stop light switch

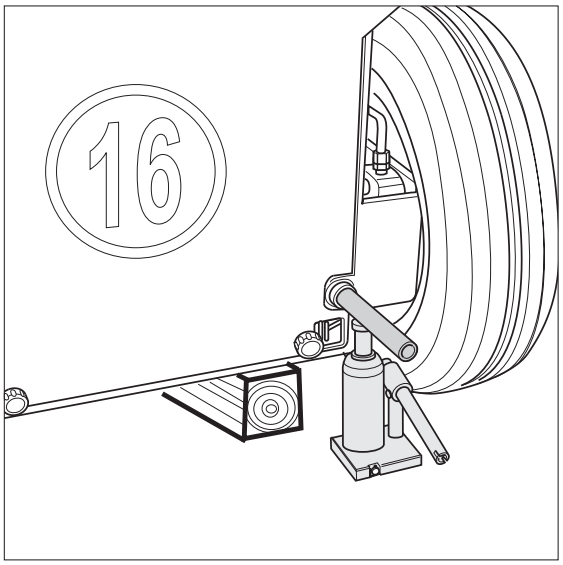
– Remove actuating spring from eyelet (2).

– Pull off protective cap (3) from stop light switch.

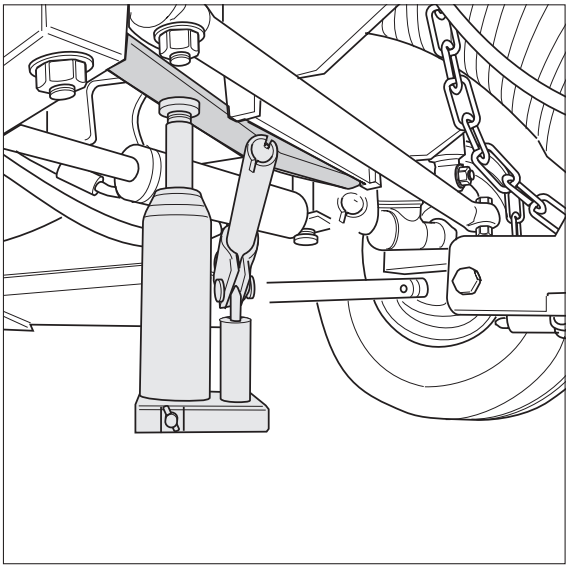
– Remove electrical cable.

– Replace stop light switch.

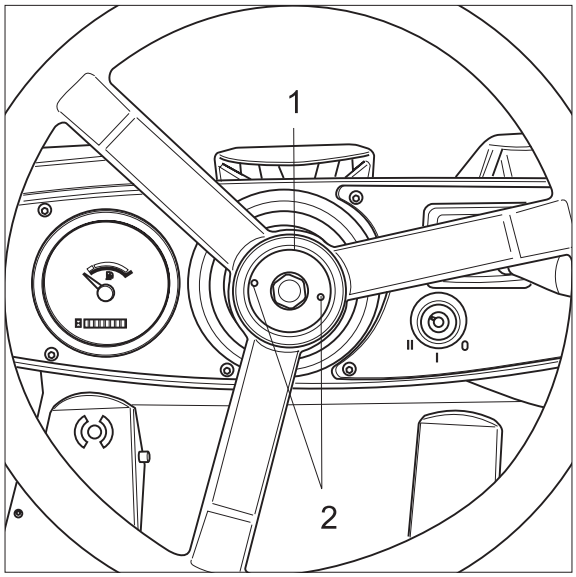
Running Gear – Wheel change / Steering wheel



Jacking eye at rear



Front axle jacking point



Removing steering wheel

Changing rear wheel

– Secure unit to prevent rolling, and loosen wheel bolts.

– Insert round steel bar (20 mm dia.) into rear jacking eye.

– Place hydraulic jack under protruding round bar, and jack up unit.

– Support unit with block.

– Change wheel, tighten wheel nuts, then torque to finish (refer to Specifications for torque rating).

Note:

Round steel bar must be cradled in jack head notch.

Changing front wheel

– Secure unit to prevent rolling, and loosen wheel bolts.

– Place hydraulic jack under front axle near wheel to be changed, and jack up unit.

– Support unit with block.

– Change wheel, tighten wheel nuts, then torque to finish (refer to Specifications for torque rating).

Removing steering wheel

– Pull center cap off steering wheel (1).

– Remove center nut from steering shaft.

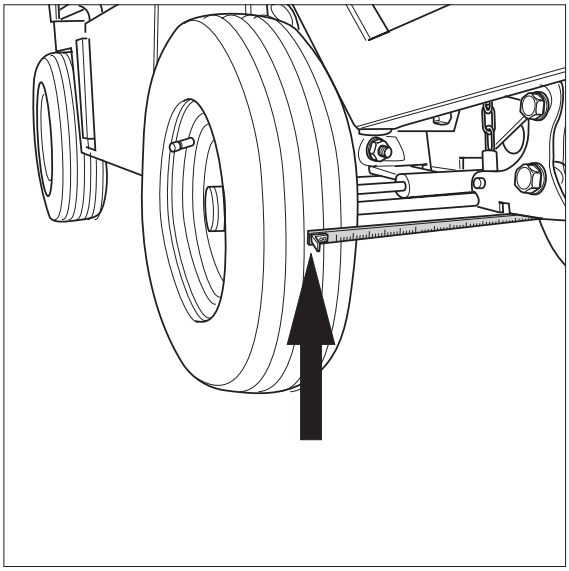
– Install suitable pulling tool using tapped holes (2).

– Pull off steering wheel.

1 Steering wheel

2 Tapped holes (2x)

Running Gear – Toe-in adjustment

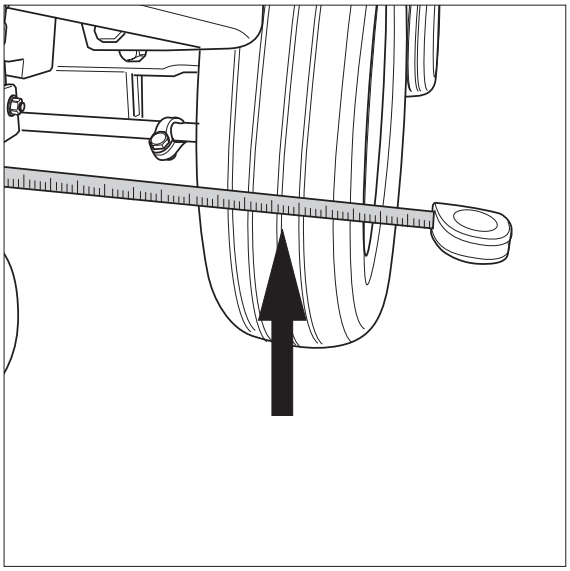


Hooking measuring tape into tread groove

Adjusting toe-in

– Set steering wheel for straight-ahead travel.

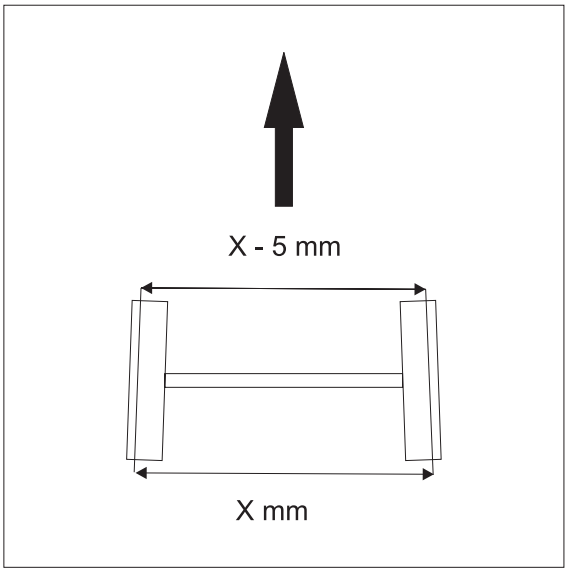
– Hook measuring tape into one of the tire tread grooves.



Measuring front wheel toe-in

– Pass measuring tape under unit and across to opposite wheel.

– Read mesaurement "x" on tread groove corresponding to opposite wheel.

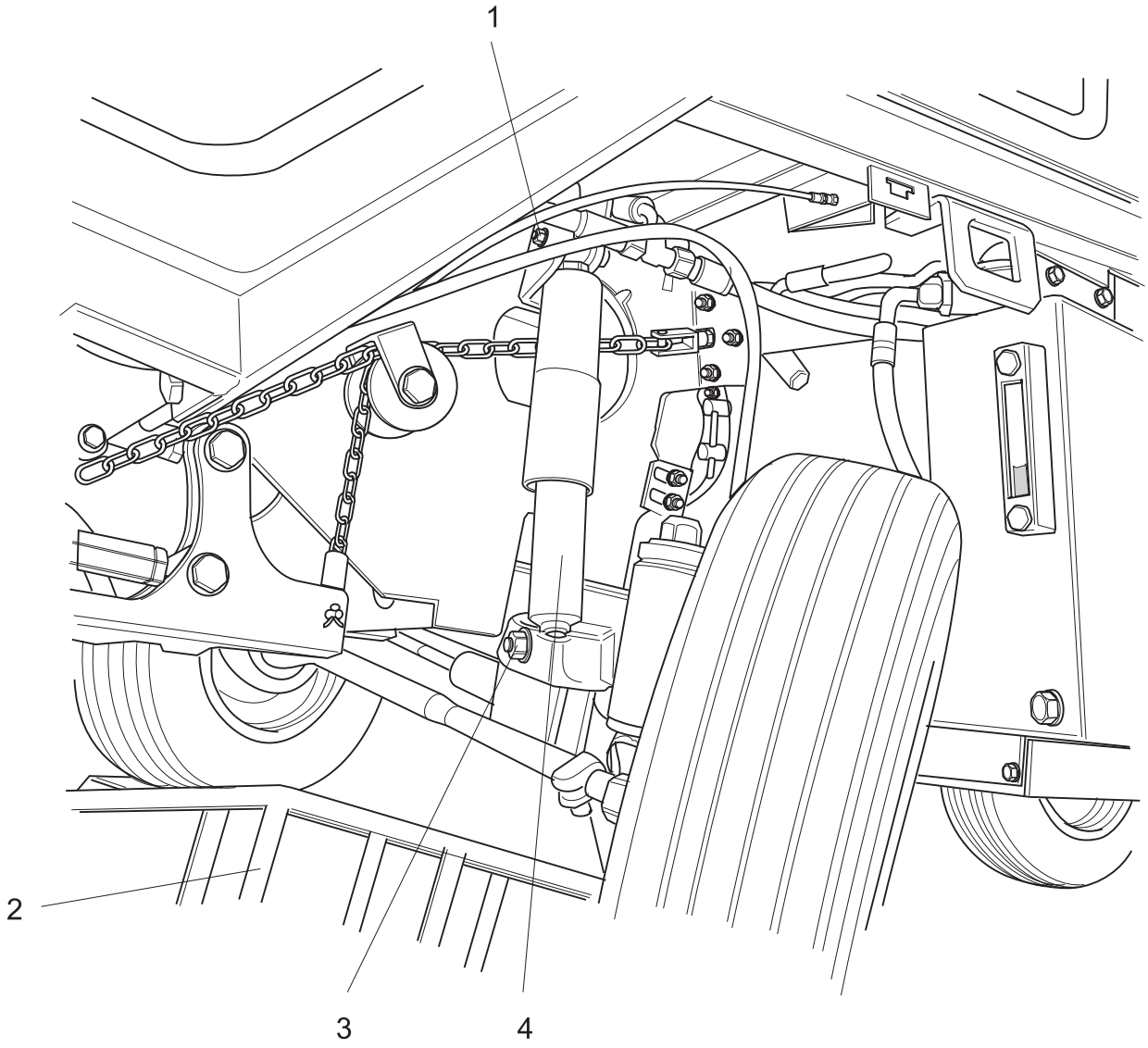


Correct front wheel toe-in adjustment

With toe-in properly adjusted, dimension "x" at the front of tyres is 5 mm smaller than the dimension at rear of tyres.

Direction of travel

Running Gear – Shock absorber



1 Upper mounting bolt

2 Loading ramp

3 Lower mounting bolt

4 Shock absorber

Replacing shock absorber

– Move unit with one wheel onto loading ramp (2) of approx. 150 mm height.

– Turn steering wheel to the left or right.

– Remove upper shock absorber mounting bolt (1).

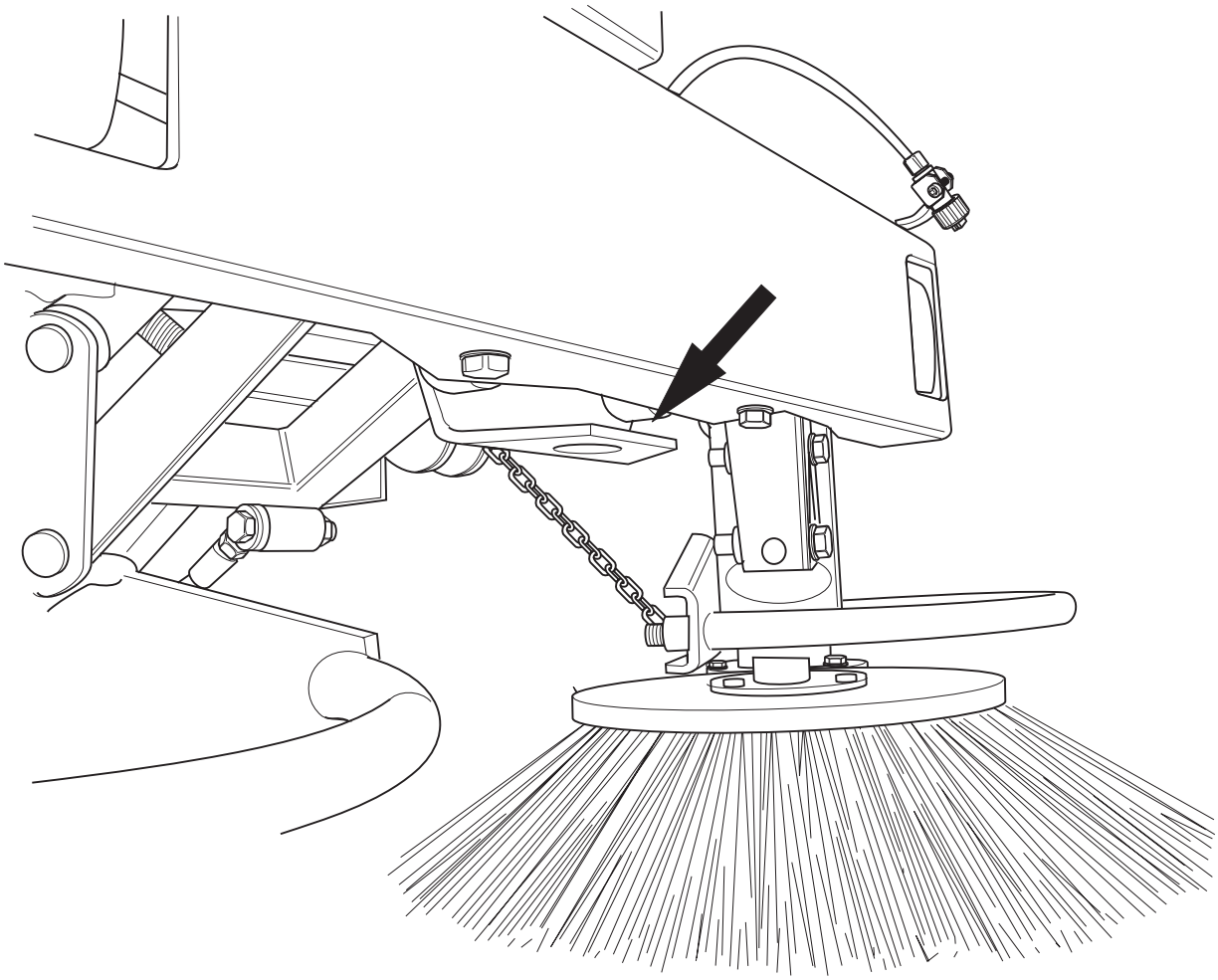
– Remove lower shock absorber mounting bolt (3).

– Take out shock absorber (4).

Note:

New shock absorber must be manually extended to proper length before installation.

Running Gear – Towing and transport



Important:

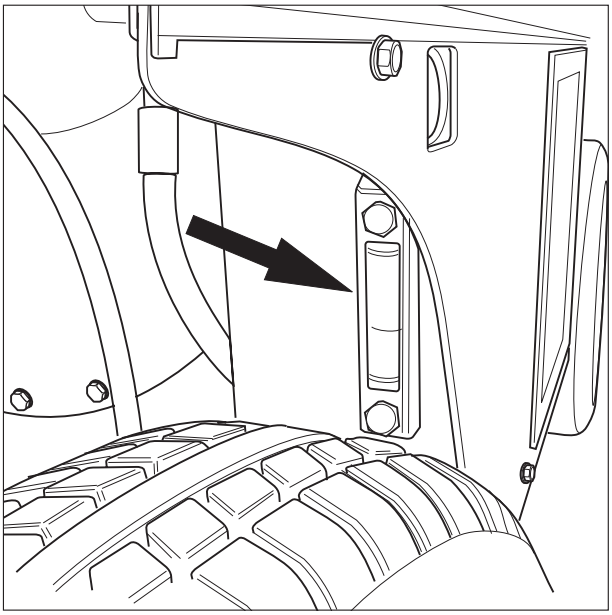
The unit may be towed only with bypass valve open. Towing with closed bypass valve will damage hydraulic drive components.

Towing speed must not exceed walking speed, and towed distance must be less than 250 m. Otherwise, hydraulic motors on rear wheels may be damaged.

– Attach tow rope to towing eye (arrow).

– Winch unit onto transport vehicle, and secure to tie-down points.

Hydraulic System – Hydraulic fluid



Inspection glass, hydraulic fluid tank

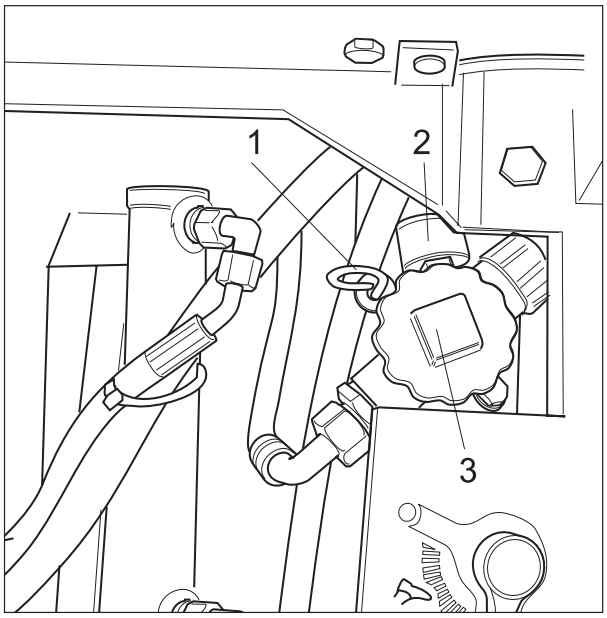
Note:

When carrying out procedures on the hydraulic system, care must be taken to maintain extreme cleanliness throughout.

Even minor contaminations may cause component damage or complete system failure.

Checking hydraulic fluid level

The inspection glass for checking the level in the hydraulic fluid tank is located in the front left wheel well.



Filler neck, hydraulic fluid

Topping up hydraulic fluid

The filler neck is located beneath the operator seat.

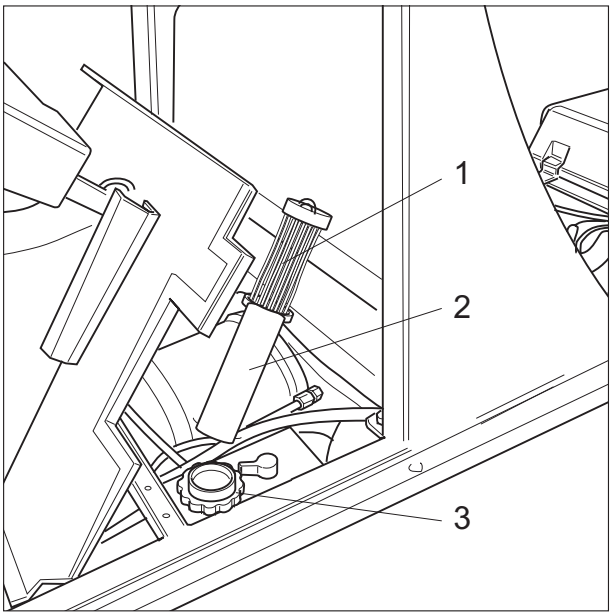
Note:

When installing the threaded cover, ensure that it can be turned easily. Otherwise, thread damage through cross-threading may result.

Install cover only hand-tight.

1 Dip stick
2 Pressure gauge, return pressure
3 Cover

Hydraulic System – Hydraulic fluid filter



Hydraulic fluid filter

1 Filter element

2 Protective tube

3 Filler neck

Replacing hydraulic fluid filter

Replacement of the hydraulic fluid filter is required when indication of pressure gauge is in red range.

Note:

Engine must be shut off before the filter can be changed.

– Tilt up operator seat.

– Unscrew filler neck cover.

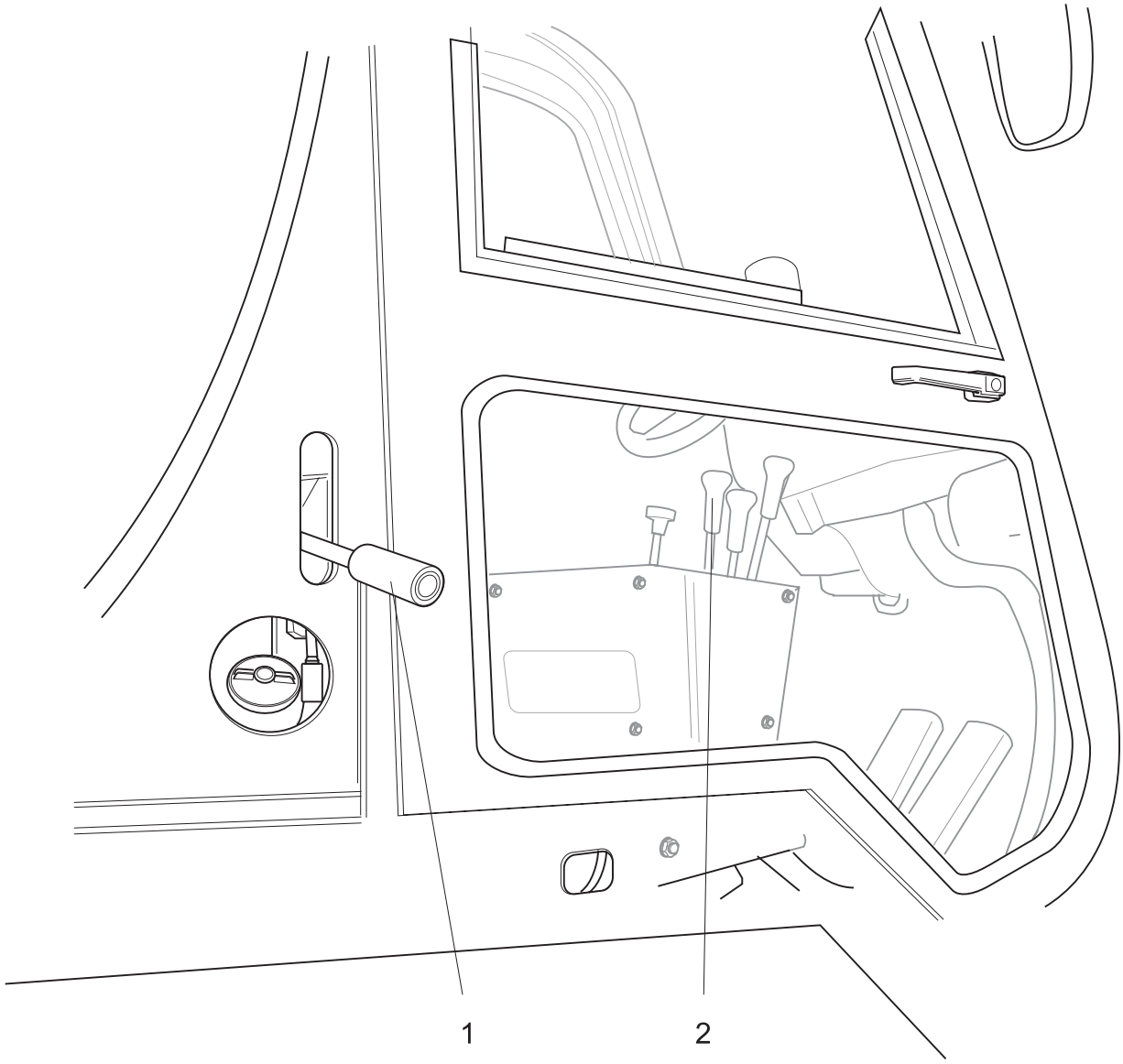
– Remove filter element (1) with protective tube (2) by pulling both out of filler neck (3).

– Insert new filter element (1) in protective tube (2).

– Install protective tube (2) with filter element (1) in filler neck (3).

– Replace cover, start thread clockwise, and turn until hand-tight.

Hydraulic System – Emergency pump (option)



1 Lever, emergency pump

2 Lever, Raise / Lower debris container

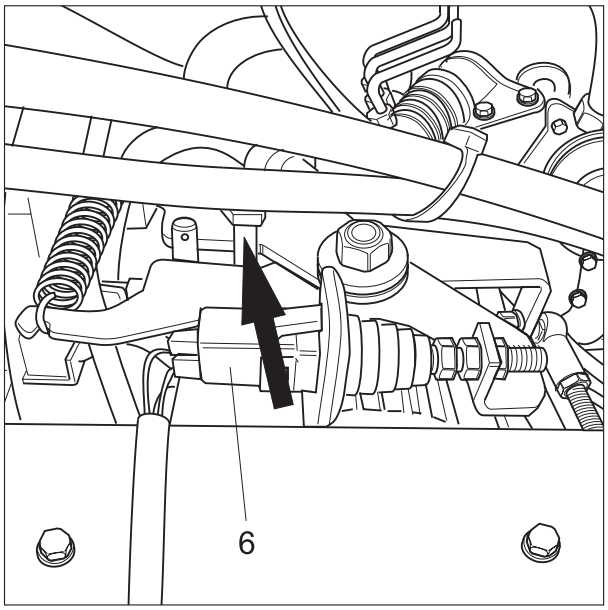
Raise / Lower debris container

To carry out repairs, the emergency pump (1) can be used to raise the debris container without the need to start the engine.

– To raise debris container, set the "Debris Container" lever (2) on the side console to "Raise" position, hold lever, and actuate emergency pump lever (1) in a pumping motion until debris container has been raised to desired height.

– To lower debris container, set the "Debris Container" lever (2) on the side console to "Lower" position, hold lever, and actuate emergency pump lever (1) in a pumping motion until debris container has been lowered to desired position.

Hydraulic System – Drive pedal



Setting NEUTRAL position on hydraulic pump

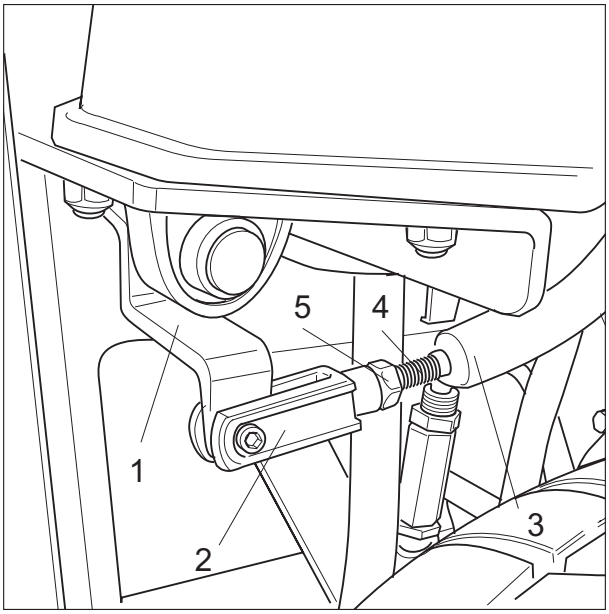
Setting NEUTRAL on hydraulic drive pump

If the unit creeps forward or backward without drive pedals being actuated, setting the NEUTRAL position on the hydraulic drive pump will be required.

– Loosen lock nut on cam bolt.

– Turn cam bolt (arrow) until unit no longer creeps.

– Tighten lock nut on cam bolt.



Pedal linkage

1 Lever

2 Fork (adjuster)

3 Pedal linkage

4 Threaded rod

5 Lock nut

6 Reverse drive switch

Adjusting drive pedal inclination

When in rest position, the "Forward" drive pedal must be positioned in parallel with the "Reverse" drive pedal. The drive pedal position can be adjusted at each linkage pivot point.

– Detach fork (2) from lever (1).

– Loosen lock nut (5).

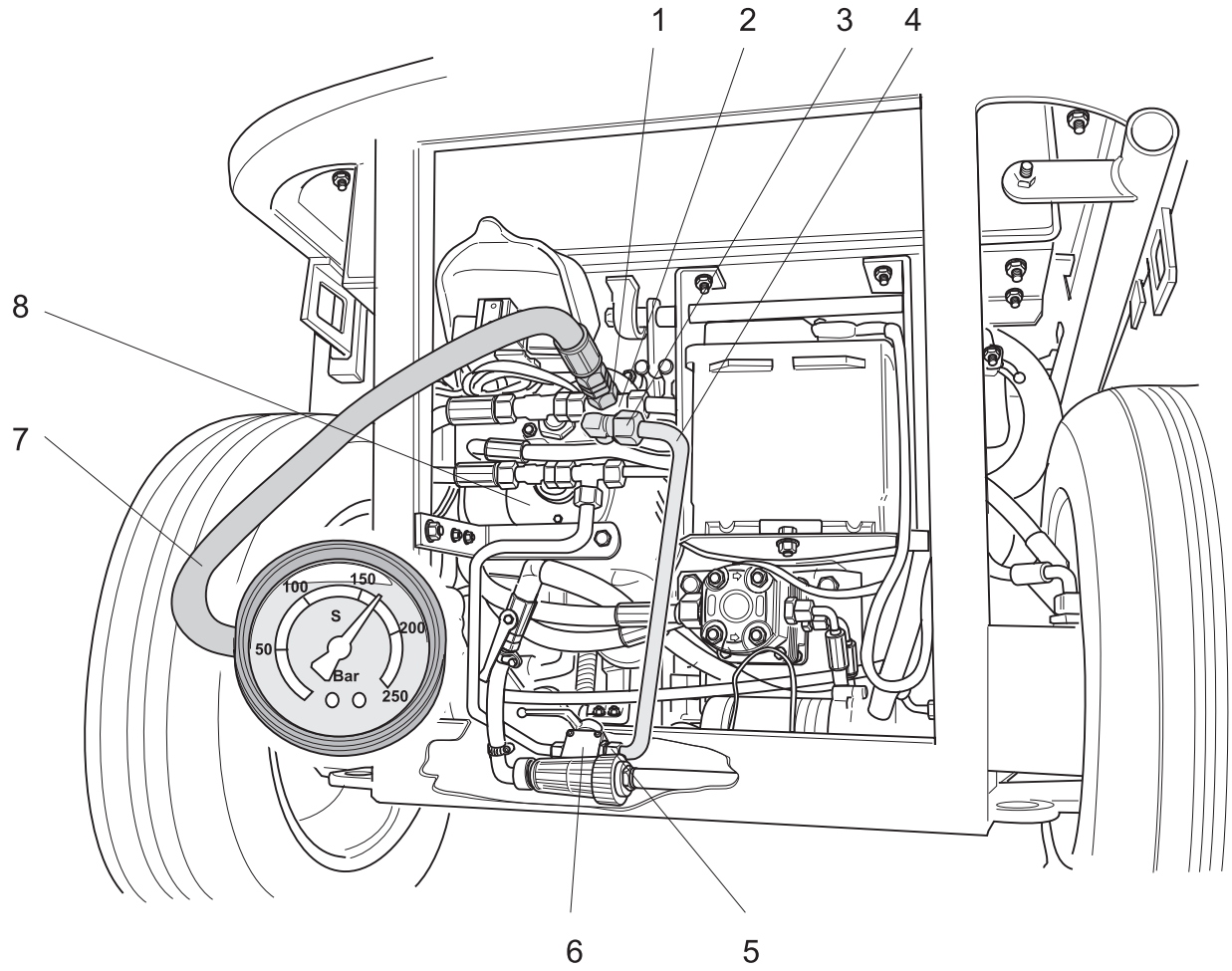
– Turn fork (2) on the threaded rod (4) in pedal linkage (3) clockwise or counter-clockwise as required.

– Reattach fork (2) to lever (1).

Note:

When making adjustments, ensure that pedal linkage travels freely and without chafing.

Hydraulic System – Checking working pressures



1 Connecting union on testing setup

2 T-joint

3 Connecting union on bypass line

4 Bypass line

5 Connecting union on bypass valve

6 Bypass valve

7 Testing set (special tool)

8 Hydraulic drive pump

Note:

A pressure reading below 100 bar indicates a defective drive pump or drive motor.

Checking drive hydraulic pressure

– Secure unit by setting parking brake.

– Unscrew connecting union (3) from T-joint (2).

– Loosen connecting union (5) from bypass valve (6). Swivel bypass line (4) sideways.

– Close bypass line (4) with blind plug to prevent admission of contaminants.

– Screw connecting union (1) of testing set (7) onto T-joint (2), and tighten.

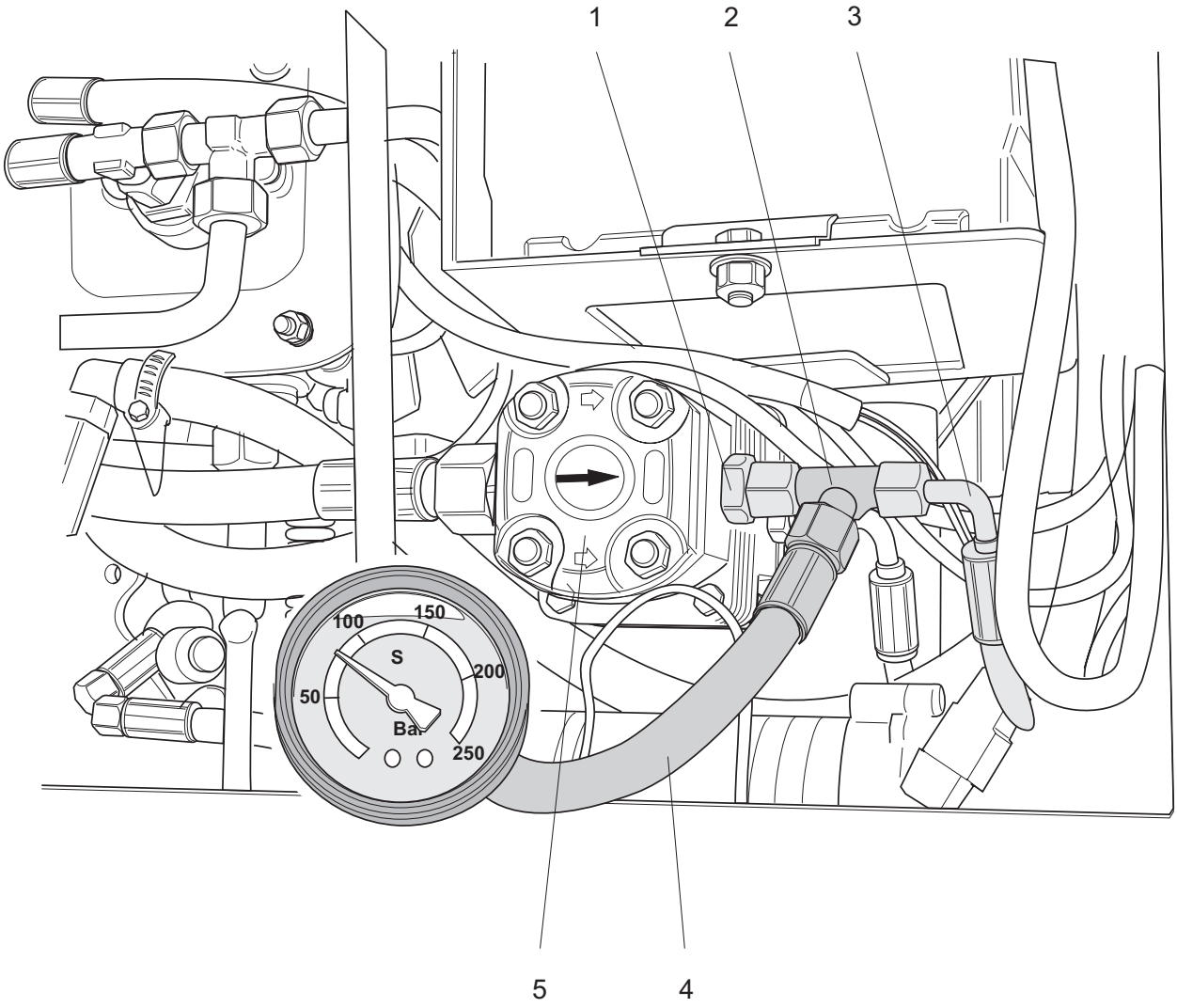
– Start engine, and run at full throttle.

– Fully depress "Forward" drive pedal.

– With all hydraulic components working properly, a pressure of 150 to 180 bar must be indicated on testing gauge.

– After conclusion of pressure test, remove testing set, and return all hydraulic connectors to their previous positions. Ensure that connections are tight.

Hydraulic System – Checking working pressures (continued)



1 Pressure-side connection

2 T-joint

3 Pressure line to control block, side console

4 Testing set (special tool)

5 Hydraulic pump, side brushes and debris container

Checking hydraulic pressure for side brushes and debris container

– Unscrew pressure line to control block (3) from pressure-side connection (1).

– Install T-joint (2) between pressure-side connection (1) and pressure line (3).

– Install testing set (4) on T-joint (2).

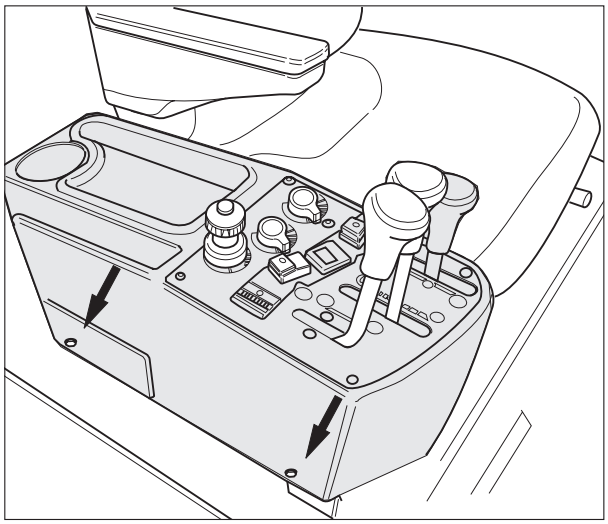
– Start engine, and run at full throttle.

– Raise side brush cylinders until they rest against the stops.

– With side brushes engaged and rotating, a pressure of 60 to 80 bar must be indicated on testing gauge.

– For adjustment of pressure relief valve, refer to page 51.

Hydraulic System – Pressure relief valve

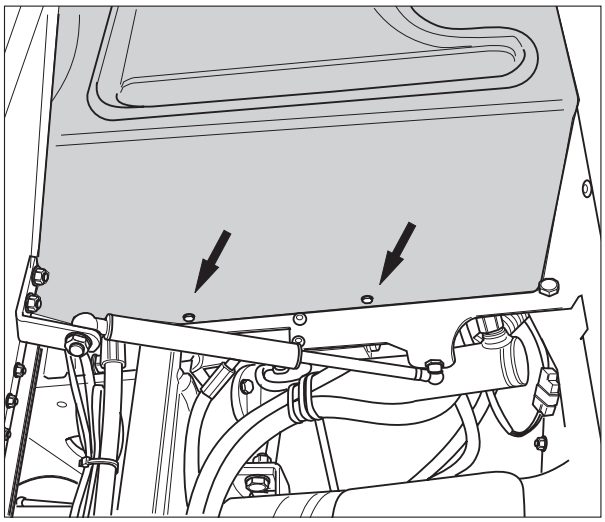


Side console, view from right

Adjusting pressure relief valve

The pressure relief valve is used to adjust the working pressure for functions such as "Raise / Lower Debris Container" and raising / lowering side brushes and vacuum intake.

– Remove mounting screws (2x), see arrows



Side console, view from left, seat tilted forward

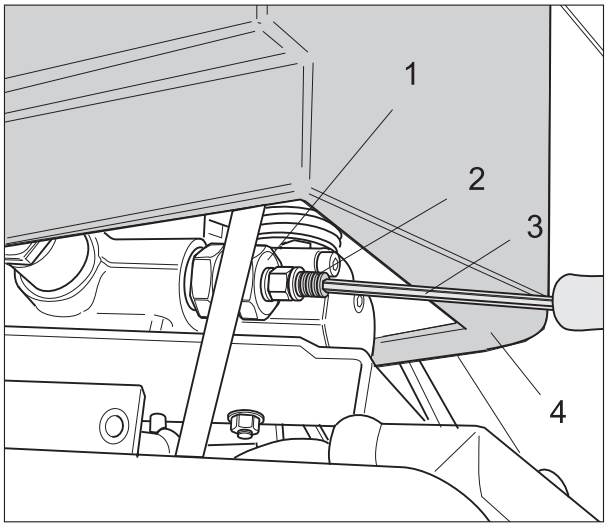
– Tilt up seat.

– Remove mounting screws (2x), see arrows.

– Lift side console approx. 30 mm until pressure relief valve can be seen.

Note:

As a prerequisite, the unit must have been prepared as described on page 50.



Side console raised, adjusting pressure relief valve

– Loosen lock nut (1).

– Using Allen wrench (3), adjust pressure by turning screw (2).

– Turning clockwise increases pressure.

– Turning counter-clockwise reduces pressure.

For nominal value, refer to Specifications.

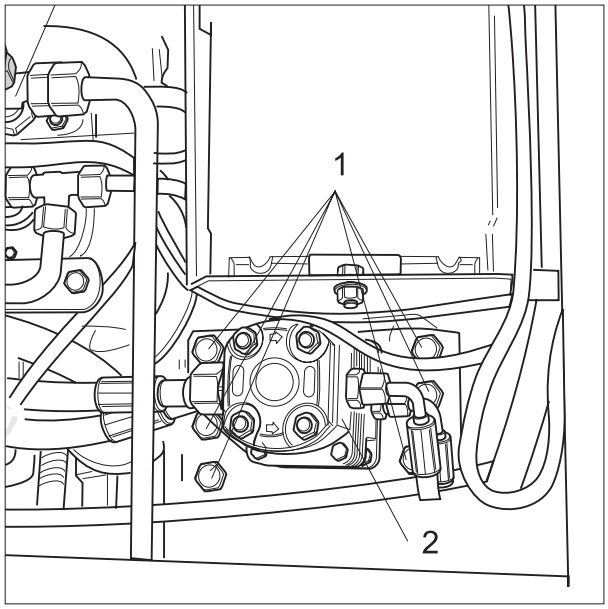
1 Lock nut

2 Adjusting screw

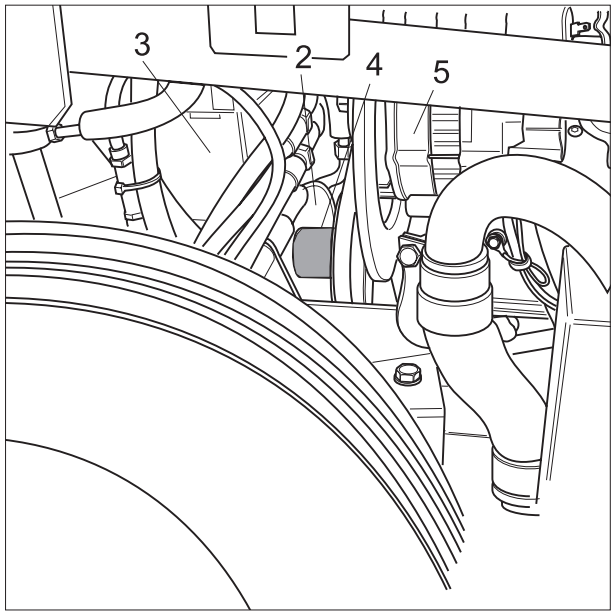
3 Allen wrench, 5 mm size

4 Side console, raised

Hydraulic System – Pumps



Removing hydraulic pumps



Installing hydraulic pumps

1 Mounting bolts

2 Hydraulic pumps

3 Battery

4 Connecting sleeve, engine/hydraulic pump

5 Alternator

Removing hydraulic pumps

The hydraulic pumps powering the working hydraulics and steering are mounted beneath the battery (3) as an extension of the engine drive shaft.

– Drain hydraulic fluid into clean container.

– Remove all hydraulic lines from pumps (2).

– Remove a total of six mounting bolts (1).

– Pull pumps off toward the rear.

Installing hydraulic pumps

– Install pumps, complete with connecting sleeve (4), engine drive shaft.

– Install, then tighten, a total of six mounting bolts (1).

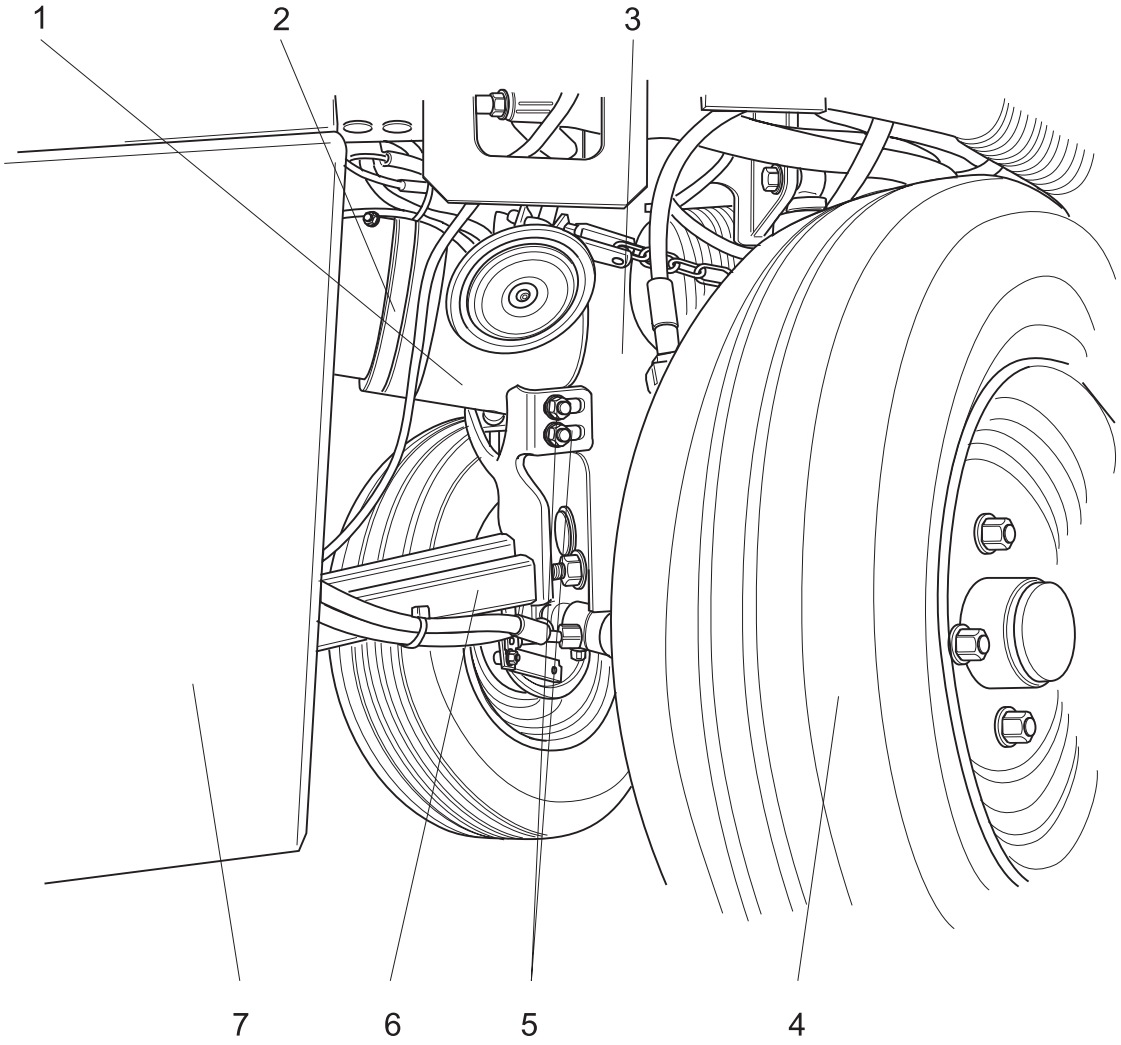
– Connect all hydraulic lines.

Note:

When mounting bolts have been thightened, connecting sleeve (4) must still have free axial travel.

Binding connecting sleeves may cause damage to hydraulic pump bearings and to engine.

Impeller fan



1 Vacuum hose

2 Hose clamp

3 Front axle carrier

4 Front wheel

5 Mounting bolts

6 Strut (frame support)

7 Fuel tank

Changing impeller fan

– Raise front of unit approx. 200 mm or drive on inclined ramp.

– Raise debris container to highest position and secure.

– Loosen and remove bolts (5) on strut (6) attached to front axle carrier (3).

– Remove heater assembly, and place toward rear with heater hoses still attached.

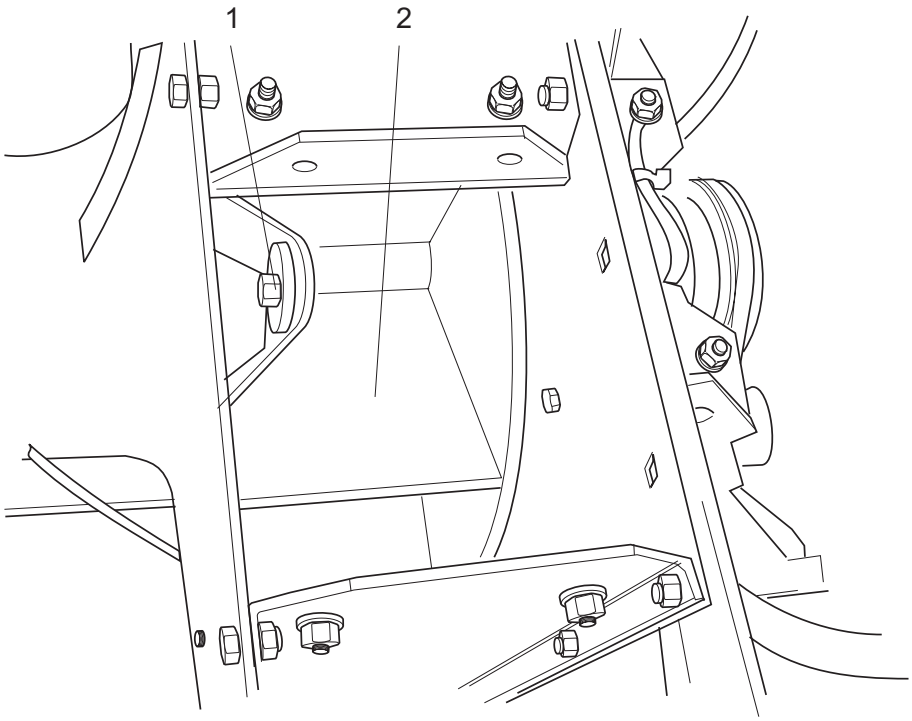
– Remove seat.

– Tilt up seat panel (90° angle), and detach pressurized gas spring.

– Loosen hose clamp (2) on vacuum hose (1), and pull off vacuum hose toward the front.

– Remove mounting screws from impeller fan front panel, leaving suction channel in place.

Impeller fan (continued)



1 Retaining bolt

2 Impeller fan

Changing impeller fan (continued)

– Deflect steering all the way to the left.

– Remove hydraulic lines from steering cylinder.

– Detach accelerator cable at side panel (see page 36).

– Slide out impeller fan front panel sideways between fuel tank and axle.

– Remove center bolt and washer (1) from impeller fan (2).

– Pull off impeller fan (2) toward the front.

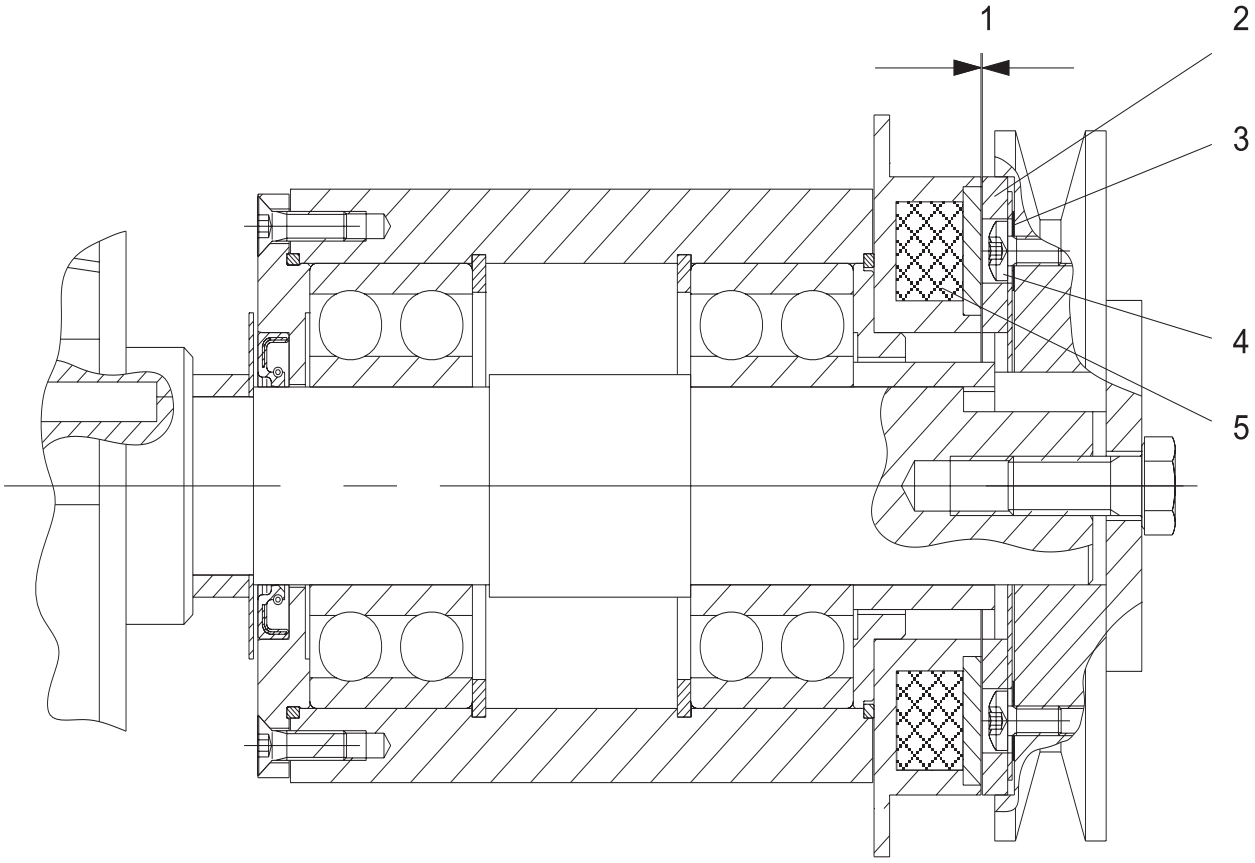
– Grease impeller shaft.

– Install new impeller fan on shaft. Install retaining bolt and washer (1), and tighten.

– Assemble all components in reverse order of disassembly.

– Ensure proper seating of seal between vacuum channel and debris container.

Impeller fan



1 Air gap

2 Brake lining

3 Shim (7.343-026)

4 Bolt

5 Magnet coil

Adjusting magnetic brake

To ensure proper functioning of the magnetic brake, the air gap (1) between brake lining (2) and drive plate must be adjusted.

An adjustment will be required only if the magnetic brake has been replaced.

– Using the feeler gauge, check air gap (1) once around the entire circumference.

– To adjust air gap, add a sufficient number of shims (3) under the bolts (4) until an even air gap of 0.3 ± 0.1 mm has been achieved.

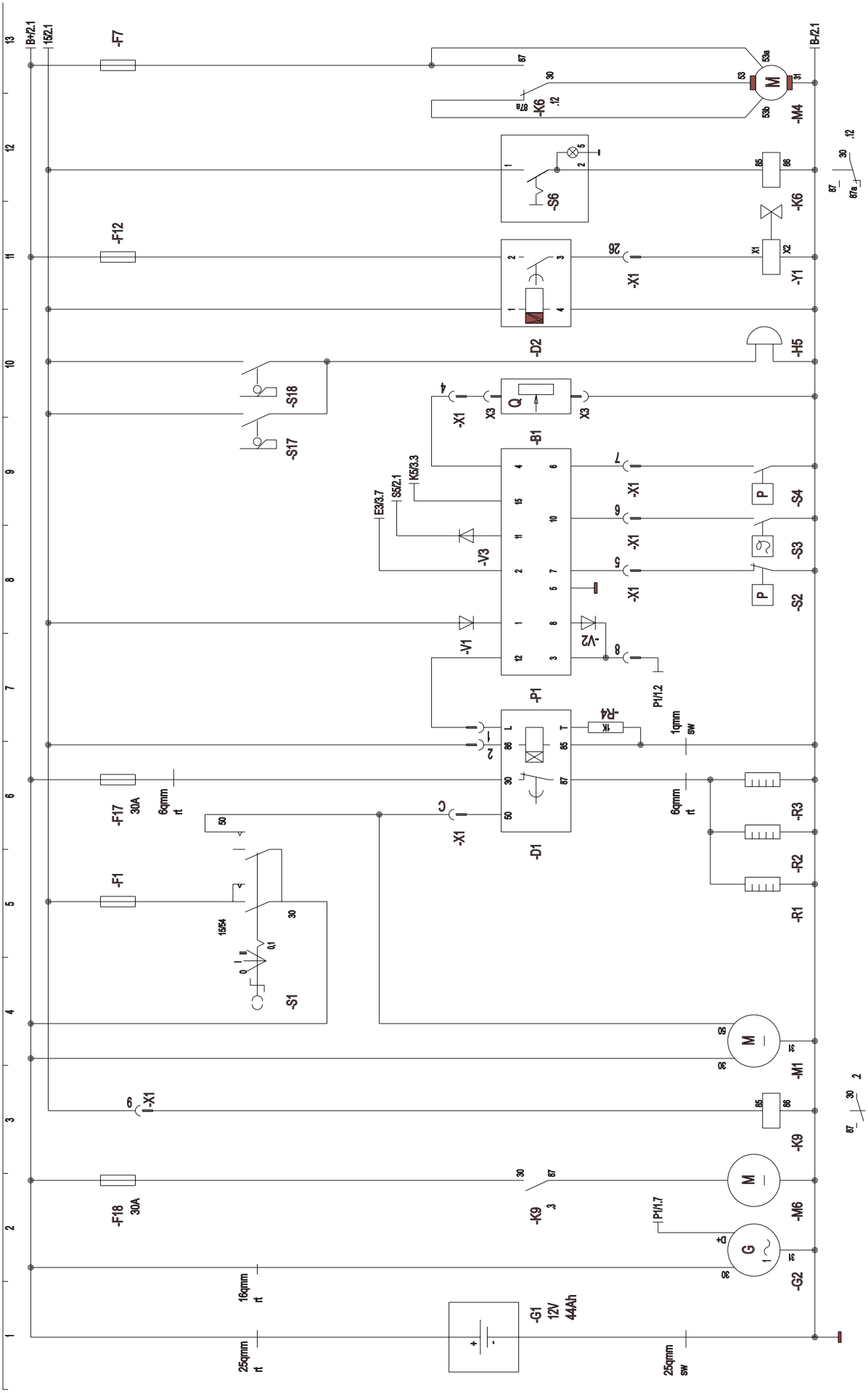
Troubleshooting

Problem	Remedy
Starter fails to turn engine	– Check / replace fuse F1 – Check ground connection between engine and chassis – Check battery G1 (voltage, electrolyte level & density) – Check / replace ignition switch S1 – Check voltage at starter relay – Check voltage at starter terminals – Check / replace starter
Starter turns engine but engine does not start	– Check battery voltage – Check fuel level, top up as required – Check / replace fuel filter – Check / replace air cleaner element – Check / replace fuse F12 – Check / replace fuse F1 – Check / replace glow plug control module D1 – Check / replace engine shutoff solenoid valve Y1 – Check starter drive gear
Battery Charge indicator lamp illuminates	– Check cable connections on alternator – Check alternator – Check / adjust V-belt tension
Multifunctional display – Excessive engine coolant temperature	– Check engine coolant level, top up as required – Check / adjust V-belt tension (alternator,water pump) – Check radiator for leaks and clogging – Check / replace cooling fan motor
Oil Pressure indicator lamp illuminates	– Check / top up engine oil level – Check / replace oil pressure switch S2, connections and lamps
Defective vehicle lighting	– Check / replace fuses, connectors, lamps
Warning beacon without function	– Check plug connectors – Check / replace fuse F13 – Check / replace lamp
Windshield wiper without function	– Check / replace fuse F7 – Check / replace relay K6 – Check / replace wiper motor M4
Windshield wiper fails to return to parking position	– Replace wiper motor M4
Stop light without function	– Check / replace fuse F15 – Check / replace stop light switch S19
Engine runs but machine fails to move	– Release parking brake – Close bypass valve – Check brake pedal return – Check throttle linkage – Check / adjust pressure on drive hydraulics

Troubleshooting

Problem	Remedy
Engine cannot be shut off	– Check engine shutoff control module D2 – Check / replace ignition switch S1 – Check / replace engine shutoff solenoid valve Y1
No fuel tank level indication	– Check / replace fuel level sensor B1
Brushes fail to rotate or rotate too slowly	– Check pressure in working hydraulic circuit – Adjust pressure relief valve
Blower without function	– Check / replace switches S10 / S11 on debris container – Check / replace relay K1 – Check / replace fuse F4 – Check / adjust V-belt – Check magnetic clutch
Vacuum intake cannot be lowered / raised	– Check linkage for obstruction or blockage – Check / replace valve on control block – Check pressure in working hydraulic circuit – Adjust pressure relief valve
Debris container cannot be raised	– Check / replace valve on control block – Check pressure in working hydraulic circuit – Switch off side brushes – Adjust pressure relief valve
Debris container cannot be lowered	– Check / replace valve on control block – Switch off side brushes
Engine emits black smoke	– Check / replace air cleaner element – Check fuel return lines
Machine fails to develop sufficient suction	– Check / clean chain curtain in debris container – Check vacuum intake – Check impeller fan – Check / adjust / replace sealing lips on vacuum intake – Check vacuum intake condition / remove blockage – Check / replace seal in vacuum channel – Check / adjust / replace seals on debris container
Clogged suction tube	– Check / adjust water feed volume – Check / clean / replace spray nozzles at vacuum intake
No water at spray nozzles	– Check / top up water tank – Check / clean water filter – Check / replace water pump M2 – Check position of water shutoff valve – Check / replace solenoid valve Y3
Water pump without function	– Check / replace fuse F5 – Check / replace relay K3 – Check / replace water pump M2

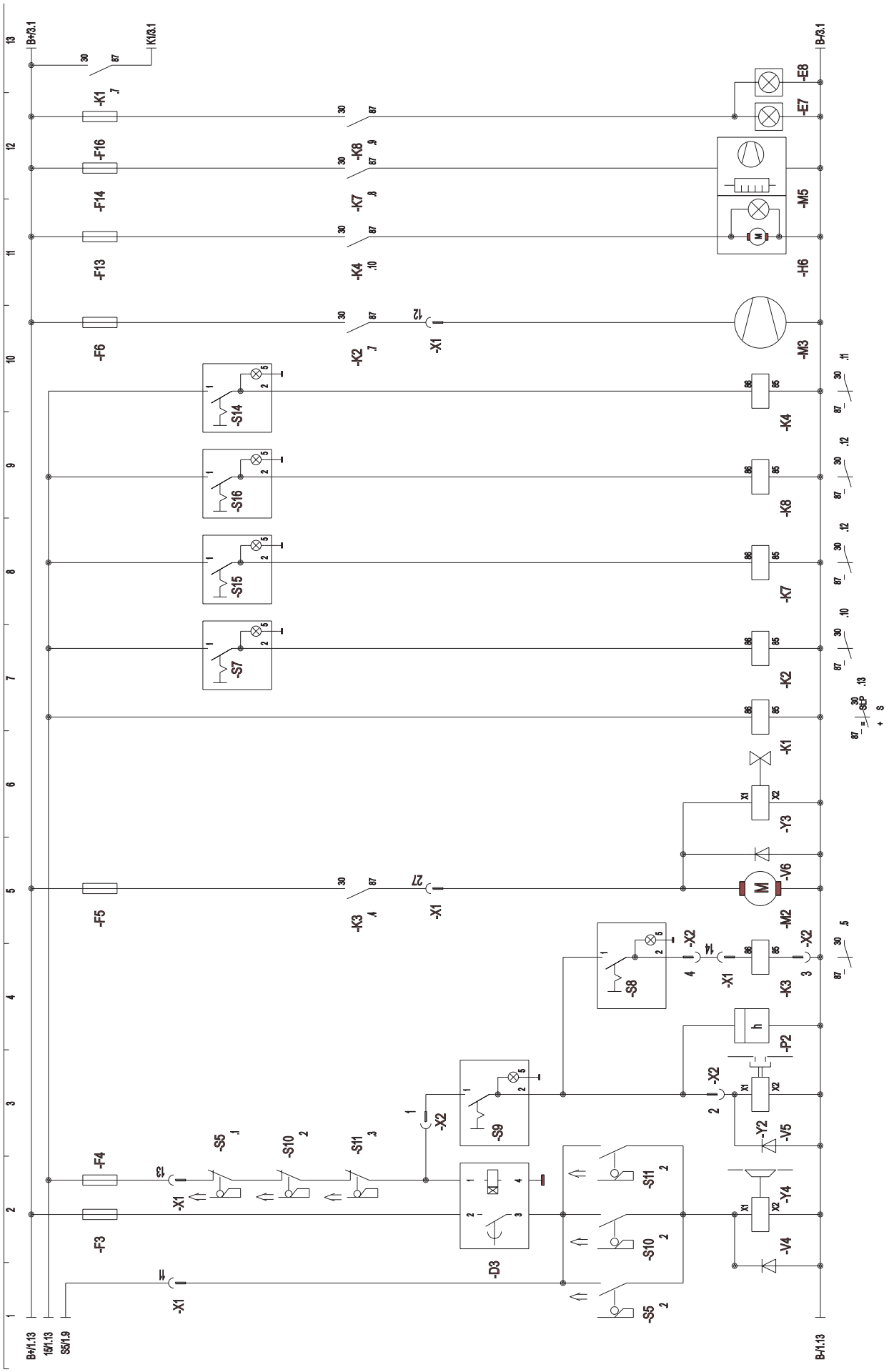
Circuit diagram 0.088-215, page 1



Pos	Designation	Installed location
S1	Ignition switch	Cab control console
S2	Oil pressure switch	Engine compartment
S3	Temperature switch, engine coolant	Engine compartment
S4	Vacuum switch, air cleaner	Air cleaner housing
S17	Switch, reversing buzzer	Throttle linkage / rear panel
S18	Switch, warning buzzer, Raise/Lower debris container	Inside control console cover
V1 - V3	Diodes	On connecting wire of unit
X1	Plug connector	Control console
X3	Plug connector, fuel level sensor	Fuel tank
Y1	Solenoid valve, engine shutoff	Engine compartment

Pos	Designation	Installed location
B1	Level sensor	Fuel tank
D1	Module, preglow	Rear fuse box
D2	Module, engine shutoff	Control console
F1	Fuse, ignition switch	Front fuse box
F7	Fuse, windshield wiper	Front fuse box
F12	Fuse, engine shutoff	Front fuse box
F17	Fuse, glow plugs	Rear fuse box
F18	Fuse, radiator fan	Rear fuse box
G1	Battery	Rear cover panel
G2	Alternator	Engine compartment
H5	Warning buzzer	Behind LH rear body panel
K6	Relay, windshield wiper	Front fuse box
K9	Relay, radiator blower	Front fuse box
M1	Starter	Engine compartment
M4	Windshield wiper motor	Cab
M6	Motor, radiator fan	Engine compartment
P1	Combination instrument	Instrument panel
R1-R3	Glow plugs	Engine compartment
R4	Resistor	Fuse box, rear

Circuit diagram 0.088-215, page 2

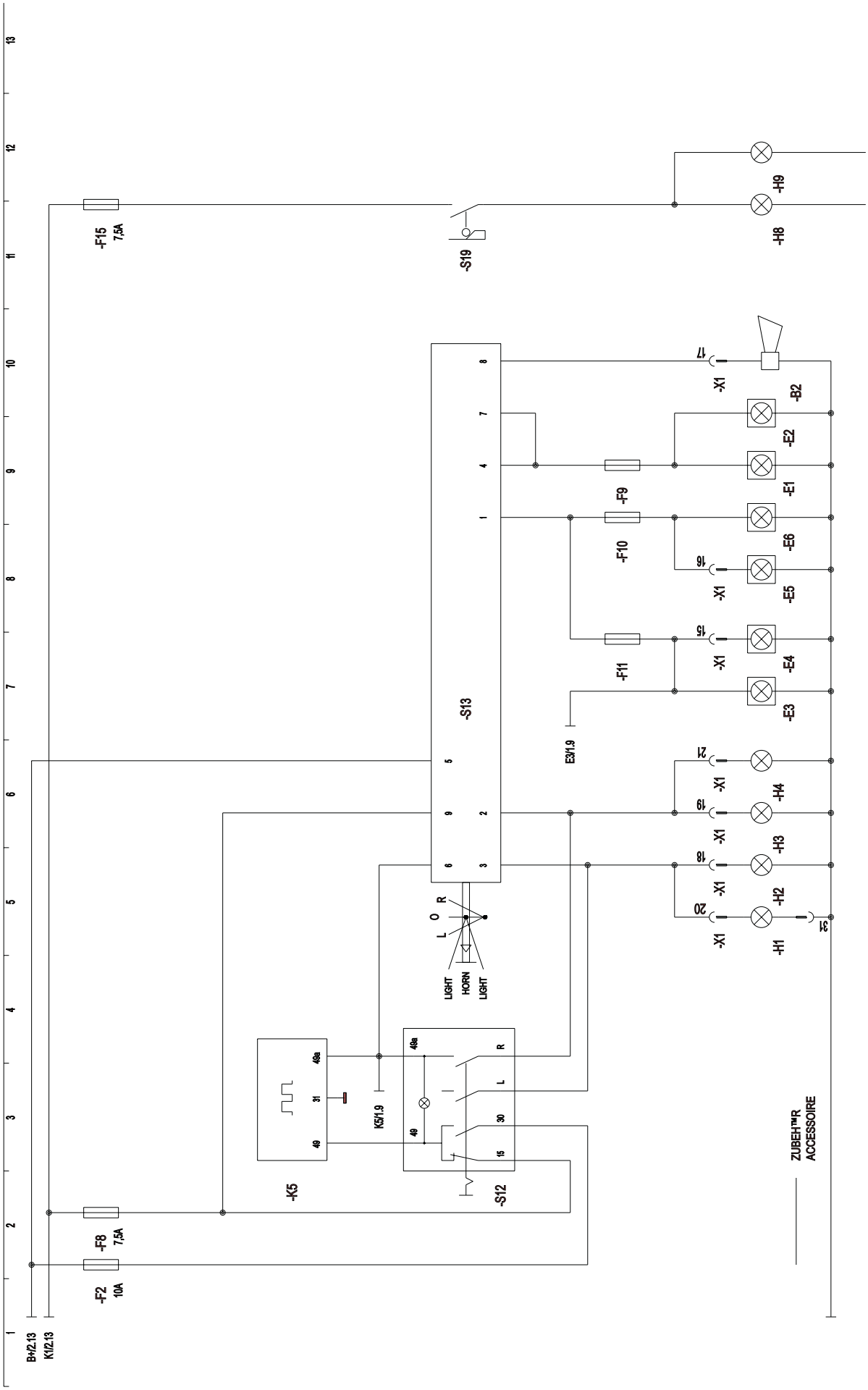


Circuit diagram 0.088-215, page 2

Pos	Designation	Installed location
S5	Switch, folding seat	Cab, under seat
S7	Switch, heater fan	Control console
S8	Switch, water pump	Control console
S9	Switch, magnetic clutch	Side console
S10	LH limit switch, debris container	Water tank, raise debris container
S11	RH limit switch, debris container	Water tank, raise debris container
S14	Switch, warning beacon	Control console
S15	Switch, windshield defroster	Control console
S16	Switch, working spotlights	Control console
V4 - V6	Diodes	On connecting wire of unit
X1	Plug connector	Control console
X2	Plug connector	Side console
Y2	Magnetic clutch, impeller fan	Engine compartment
Y3	Solenoid valve, water pump	Rear cover panel
Y4	Impeller fan brake	Engine compartment

Pos	Designation	Installed location
D3	Control, impeller fan brake	Side console
E7	LH working spotlight	Cab
E8	RH working spotlight	Cab
F3	Fuse, impeller fan brake	Front fuse box
F4	Fuse, magnetic clutch	Front fuse box
F5	Fuse, water pump	Front fuse box
F6	Fuse, heater fan	Front fuse box
F13	Fuse, warning beacon	Front fuse box
F14	Fuse, windshield defroster	Front fuse box
H6	Warning beacon	Cab roof
K1	Relay, ignition switch	Front fuse box
K2	Relay, heater fan	Front fuse box
K3	Relay, water pump	Front fuse box
K4	Relay, warning beacon	Front fuse box
K7	Relay, windshield defroster	Front fuse box
K8	Relay, working spotlights	Front fuse box
M2	Water pump	Rear panel, below battery
M3	Heater fan, cab	LH cab rear wall
M5	Fan, windshield defroster	Cab

Circuit diagram 0.088-215, page 3



Circuit diagram 0.088-215, page 3

Pos	Designation	Installed location
K5	Relay, turn signals	Front fuse box
S12	Switch, four-way flashers	Instrument panel
S13	Combination switch	Instrument panel
S19	Switch, stop lights	Brake pedal assy.
X1	Plug connector	Fuse box, right side

Pos	Designation	Installed Location
B2	Horn	Front bumper
E1	Headlamp, L	Windshield
E2	Headlamp, R	Windshield
E3	Position light, LF	Front bumper
E4	Position light, LR	Windshield
E5	Position light, RF	Front bumper
E6	Position light, RR	Windshield
F2	Fuse, four-way flashers	Front fuse box
F8	Fuse, horn	Front fuse box
F9	Fuse, headlamps	Front fuse box
F10	Fuse, position lights, L	Front fuse box
F11	Fuse, position lights, R	Front fuse box
F15	Fuse, stop light	Front fuse box
H1	Turn signal, LF	Front bumper
H2	Turn signal, RR	Water tank
H3	Turn signal, LF	Front bumper
H4	Turn signal, RR	Water tank
H8	Stop light, L	Water tank
H9	Stop light, R	Water tank

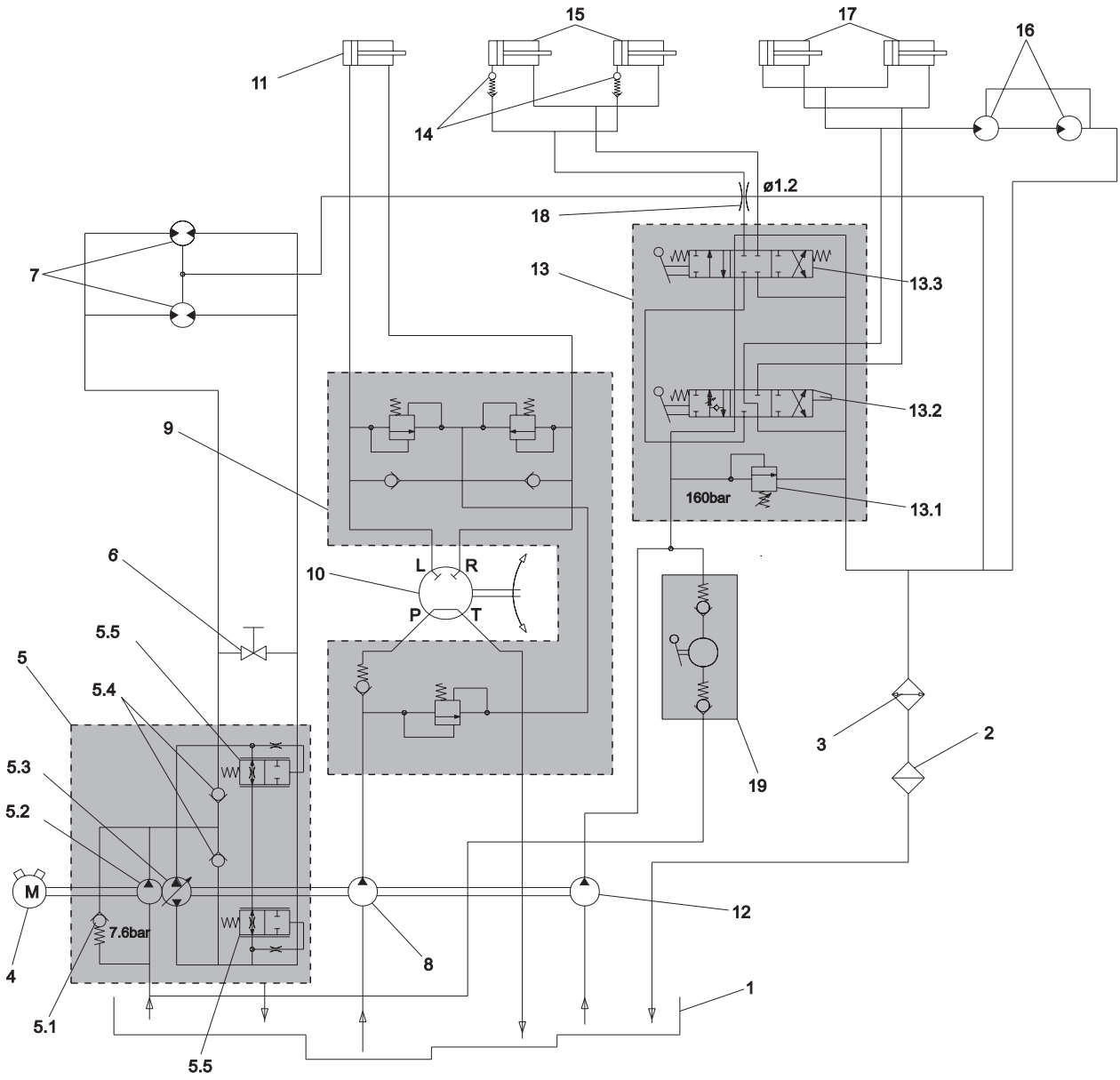
Circuit Diagram – Search List

Pos	Designation	Installed location	C/D
B1	Level sensor, fuel	Fuel tank	1
B2	Horn	Front bumper	3
D1	Control module, preglow	Rear fuse box	1
D2	Control module, engine shutoff	Control console	1
D3	Control module, impeller fan brake	Side console	2
E1	Headlamp, L	Windshield	3
E2	Headlamp, R	Windshield	3
E3	Position light, LF	Front bumper	3
E4	Position light, LR	Water tank	3
E5	Position light, RF	Front bumper	3
E6	Position light, RR	Water tank	3
E7	Working spotlight, L (option)	Cab	2
E8	Working spotlight, R (option)	Cab	2
F1	Fuse, ignition switch	Front fuse box	1
F2	Fuse, four-way flashers	Front fuse box	3
F3	Fuse, impeller fan brake	Front fuse box	2
F4	Fuse, magnetic clutch	Front fuse box	2
F5	Fuse, water pump	Front fuse box	2
F6	Fuse, heater fan	Front fuse box	2
F7	Fuse, windshield wiper	Front fuse box	1
F8	Fuse, turn signals / horn	Front fuse box	3
F9	Fuse, headlamps	Front fuse box	3
F10	Fuse, position lights, R	Front fuse box	3
F11	Fuse, position lights, L	Front fuse box	3
F12	Fuse, engine shutoff	Front fuse box	1
F13	Fuse, warning beacon	Front fuse box	2
F14	Fuse, windshield defroster	Front fuse box	2
F15	Fuse, stop lights	Front fuse box	3
F16	Fuse, headlamps	Front fuse box	2
F17	Fuse, glow plugs	Rear fuse box	1
F18	Fuse, radiator fan	Rear fuse box	1
G1	Battery	Rear cover panel	1
G2	Alternator	Engine compartment	1
H1	Turn signal, LF	Front bumper	3
H2	Turn signal, LR	Water tank	3
H3	Turn signal, RR	Water tank	3
H4	Turn signal, RF	Front bumper	3
H5	Warning buzzer, reversing, debris container	Rear cover panel	1
H6	Warning beacon	Cab	2
H8	Stop light, L	Water tank	3
H9	Stop light, R	Water tank	3
K1	Relay, ignition switch	Front fuse box	2
K2	Relay, heater fan	Front fuse box	2
K3	Relay, water pump	Front fuse box	2
K4	Relay, warning beacon	Front fuse box	2
K5	Relay, turn signals	Front fuse box	3
K6	Relay, windshield wiper	Front fuse box	1
K7	Relay, windshield defroster	Front fuse box	2
K8	Relay, headlamps	Front fuse box	2
K9	Relay, radiator fan	Rear fuse box	1

Pos	Designation	Installed location	C/D
M1	Starter	Engine compart.	1
M2	Water pump	Engine compart.	2
M3	Heater fan, cab	Cab rear wall	2
M4	Windshield wiper	Cab	1
M5	Fan, windshield defroster	Cab	2
M6	Radiator fan	Engine compart.	1
R	Glow plugs	Engine compart.	1
R4	Resistor	Fuse box	1
S1	Ignition switch	Instument panel	1
S2	Oil pressure switch	Engint compart.	1
S3	Temperature switch, engine coolant	Engine compart.	1
S4	Vacuum switch, air cleaner	Air cleaner	1
S5	Switch, folding seat	Cab, under seat	2
S6	Switch, windshield wiper	Control console	1
S7	Switch, heater fan	Control console	2
S8	Switch, water pump	Side console	2
S9	Switch, magnet. clutch, impeller fan	Side console	2
S10	Switch, debris container, LH	Engine compart.	2
S11	Switch, debris container, RH	Engine compart.	2
S12	Switch, four-way flashers	Instument panel	3
S13	Combination switch	Instument panel	3
S14	Switch, warning beacon	Control console	2
S15	Switch, windshield defroster fan	Control console	2
S16	Switch, working spotlight (option)	Control console	2
S17	Switch, warning buzzer, reversing	Engine compart.	1
S18	Switch, warning buzzer, debris contain.	Side console	1
S19	Switch, stop lights	Brake pedal	3

Pos	Designation	Installed location	C/D
P1	Combination instrument	Instrument panel	1
V1	Diode	On connecting wire	1
V2	Diode	On connecting wire	1
V3	Diode	On connecting wire	1
V4	Diode	On connecting wire	2
V5	Diode	On connecting wire	2
V6	Diode	On connecting wire	2
X1	Plug connector	Fuse box, right side	1-3
X2	Plug connector	Side console	2
X3	Plug connector	Fuel tank	1
Y1	Solenoid valve, engine shutoff	Engine compartment	1
Y2	Magnetic clutch,impeller fan	Engine compartment	2
Y3	Solenoid valve, water pump	Engine compartment	2
Y4	Impeller fan brake	Engine compartment	2

Hydraulic block diagram 0.088-258



Hydraulic block diagram 0.088-258

1 Hydraulic fluid tank

2 Hydraulic fluid filter, return line

3 Oil cooler

4 Combustion engine

5 Assembly, drive components

5.1 Precharge valve

5.2 Precharge pump

5.3 Hydraulic pump, drive

5.4 Non-return valve

5.5 Control valve, low acceleration

6 Bypass valve

7 Hydraulic motor, R & L drives

8 Hydraulic pump, steering

9 Valve block, steering

10 Steering valve

11 Steering cylinder

12 Hydraulic pump, side brushes / debris container

13 Control block

13.1 Pressure relief valve

13.2 Proportional valve for pos. 16 and 17

13.3 Control valve, debris container

14 Pipe-break safety valve

15 Hydraulic cylinder, debris container

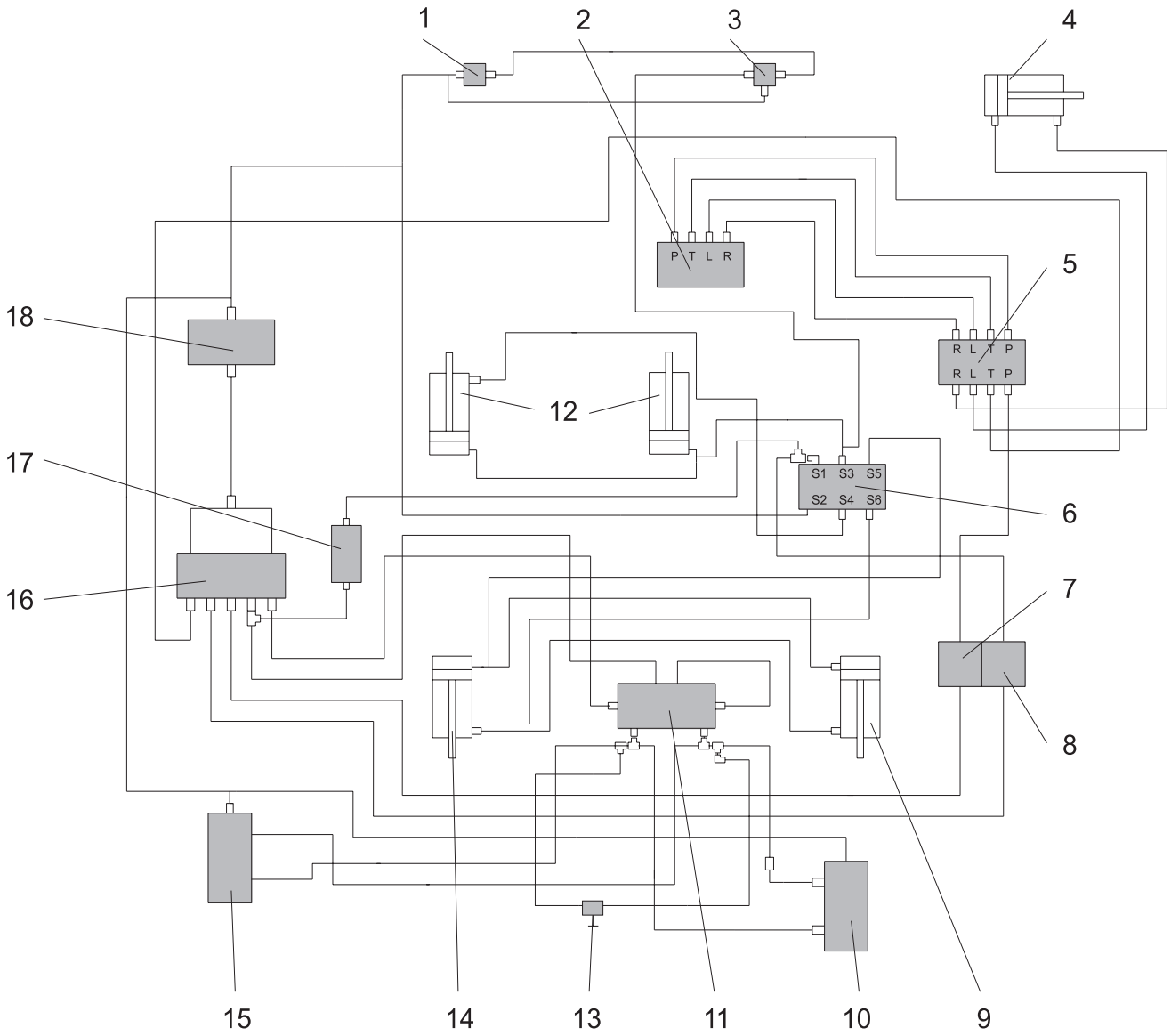
16 Hydraulic motors, side brushes

17 Hydraulic cylinder, side brushes / vacuum intake

18 Throttle valve

19 Emergency hand pump (option)

Hydraulic line diagram 2.706-010



Hydraulic line diagram 2.706-010

1 Hydraulic motor, LH side brush

2 Steering valve

3 Hydraulic motor, RH side brush

4 Hydraulic cylinder, steering

5 Valve block, steering

6 Control block, side console

7 Hydraulic pump, steering

8 Hydraulic pump, side brushes and debris container

9 Hydraulic cylinder, debris container

10 Hydraulic motor, RH drive motor

11 Hydraulic pump, drive components

12 Hydraulikzylinder, side brushes and vacuum intake

13 Bypass valve

14 Hydraulic cylinder, debris container

15 Hydraulic motor, LH drive motor

16 Hydraulic fluid tank

17 Emergency pump (option)

18 Hydraulic oil cooler

Specifications

Diesel engine	Type	KUBOTA D722
Operating speed	RPM	2650 – 2800
Idle speed	RPM	800 – 900
Oil type, diesel engine	Type	10 W 40
Oil capacity, diesel engine	l	3.8
Sound noise level	dB(A)	78
Battery, voltage	V	12
Battery low-maintance, capacity	Ah	44
Driving speed, forward max.	km/h	14 – 16
Driving speed, reverse max.	km/h	4 – 6
Width of sweeping path, total	mm	1400
Side brushes, max. speed	RPM	160 – 180
Ground clearance, w/ side brushes raised	mm	30
Ground clearance, w/ vacuum intake lowered	mm	15– 20
Ground clearance, w/ vacuum intake raised	mm	150
Debris container, raised height	mm	1350
Hydraulic fluid type		HV 46
Hydraulic fluid capacity, total	l	35
Hydraulic pressure, drive system	bar	150-180
Hydraulic pressure, side brushes at operating speed	bar	60 - 80
Pressure relief valve (side brushes, debris container)	bar	160
Tyre size, front		145 / 80 R 10
Tyre size, rear		165 / 65 R 13
Tyre pressure, front / rear	bar	2.9 / 2.9

Fuses

F1	Ignition switch	5 A
F2	Four-way flashers	10 A
F3	Impeller fan brake	5 A
F4	Magnetic clutch	5 A
F5	Water pump	15 A
F6	Heater fan	7.5 A
F7	Windshield wiper	7.5 A
F8	Turn signals / horn	7.5 A
F9	Headlamps	7.5 A
F10	Position lamps, R	5 A
F11	Position lamps, L	5 A
F12	Engine shutoff	15 A
F13	Warning beacon	10 A
F14	Windshield defroster fan	20 A
F15	Stop lights	7.5 A
F16	Headlamps	7.5 A
F17	Glow plugs	30 A
F18	Radiator fan	30 A

Special tools

Testing equipment	2.639-387
Tachometer	6.491-361
Magnetic field tester	6.803-003

Assembly torque ratings

Rear wheels	100 Nm
Front wheels	90 Nm