Capacities

Engine crank case

Specification:	**TUTELA UNITEK CJ-4 ENGINE OIL SAE 10W-40(API CJ-4)**
Capacity:	
With filter change	**8.00 l (8.45 US qt)**

NOTE: *Refer to the Recommended operating temperature range chart located in this manual to determine the appropriate oil type for your operating environment.*

Fuel tank

Specification:	No. 2 ultra-low sulfur diesel
Capacity:	**119 l (31 US gal)**

Cooling system

Specification:	**CNH XHD PREMIX (50 %** water and **50 %** ethylene glycol)
Capacity:	**16.1 l (17.0 US qt)**

Hydraulic system

Specification:	**CASE AKCELA HY-TRAN® ULTRA™ HYDRAULIC TRANSMISSION OIL**
Capacity:	
Total system	**68.1 l (72.0 US qt)**
Reservoir with filter change	**55.0 l (58.1 US qt)**
Reservoir without filter change	**53.0 l (56.0 US qt)**

Transmission

Specification:	**CASE AKCELA HY-TRAN® ULTRA™ HYDRAULIC TRANSMISSION OIL**	
Capacity:		
Manual (Power shuttle)		
	Two wheel drive	Four wheel drive
Total system	**18.5 l (19.5 US qt)**	**20.8 l (22.0 US qt)**
Refill (with or without filter change)	**11.9 l (12.6 US qt)**	**14.4 l (15.2 US qt)**

Front drive axle

Specification:	**TUTELA TRANSAXLE FLUID SAE 80W-140**
Capacity:	
Differential	**14.4 l (15.2 US qt)**

Rear steer axle — Four Wheel Drive (4WD)

Specification:	**TUTELA TRANSAXLE FLUID SAE 80W-140**
Capacity:	
Differential	**5.5 l (5.8 US qt)**
Each planetary hub	**0.7 l (0.7 US qt)**

Brake master cylinder

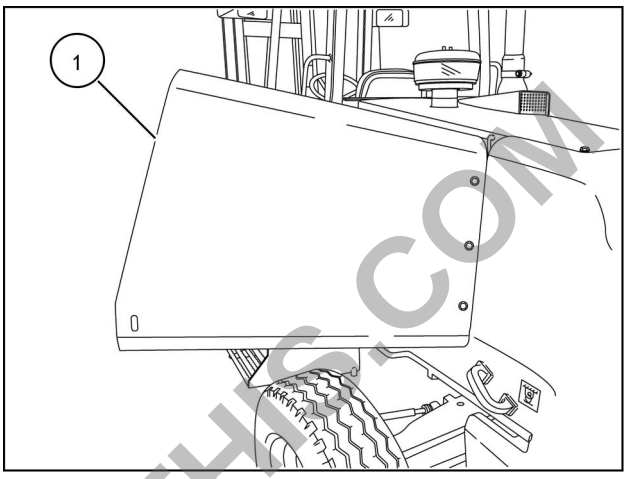
Brake fluid supplied by the hydraulic system.

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Engine - Remove

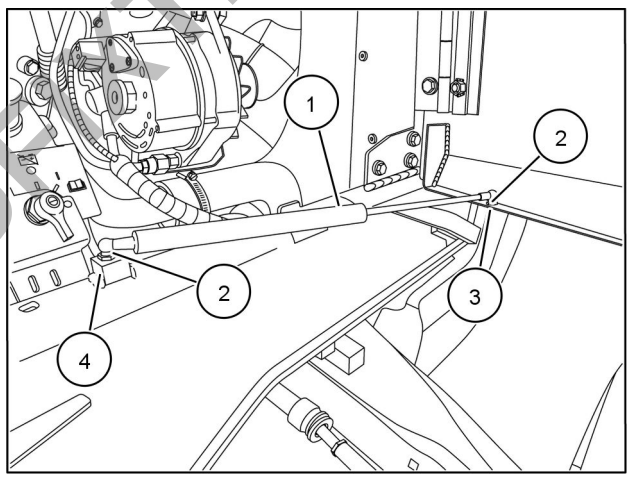
Remove the engine side panels

1. Prepare the machine for service.
2. Open the side panel **(1)**.



RAPH12FRK0026BA 1

3. Remove the nut **(3)** securing the first strut screw fitting **(2)** to the side panel.
4. Unscrew the second strut screw fitting from the welded block **(4)**, and remove the hydraulic strut **(1)**.



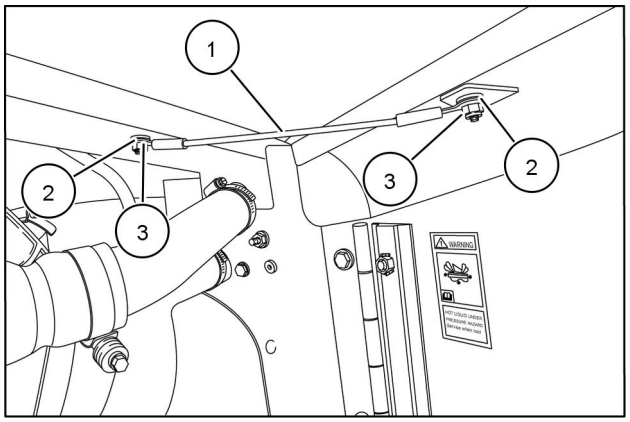
RAPH12FRK0027BA 2

5. Remove nuts **(3)** and washers **(2)**, and remove the side panel strap **(1)**.

⚠ WARNING

Heavy objects!
Lift and handle all heavy components using lifting equipment with adequate capacity. Always support units or parts with suitable slings or hooks. Make sure the work area is clear of all bystanders.
Failure to comply could result in death or serious injury.

W0398A

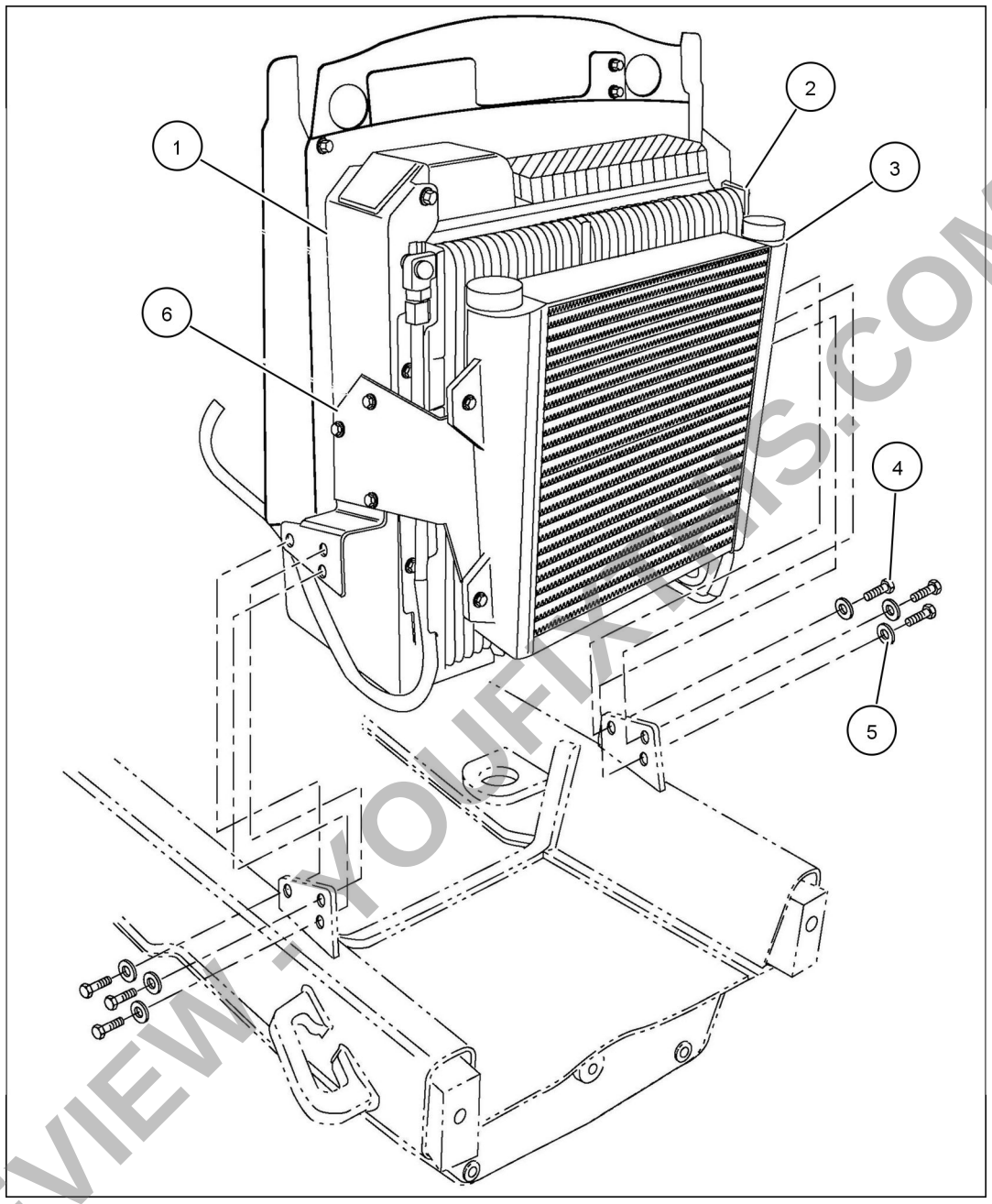


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Radiator - Overview



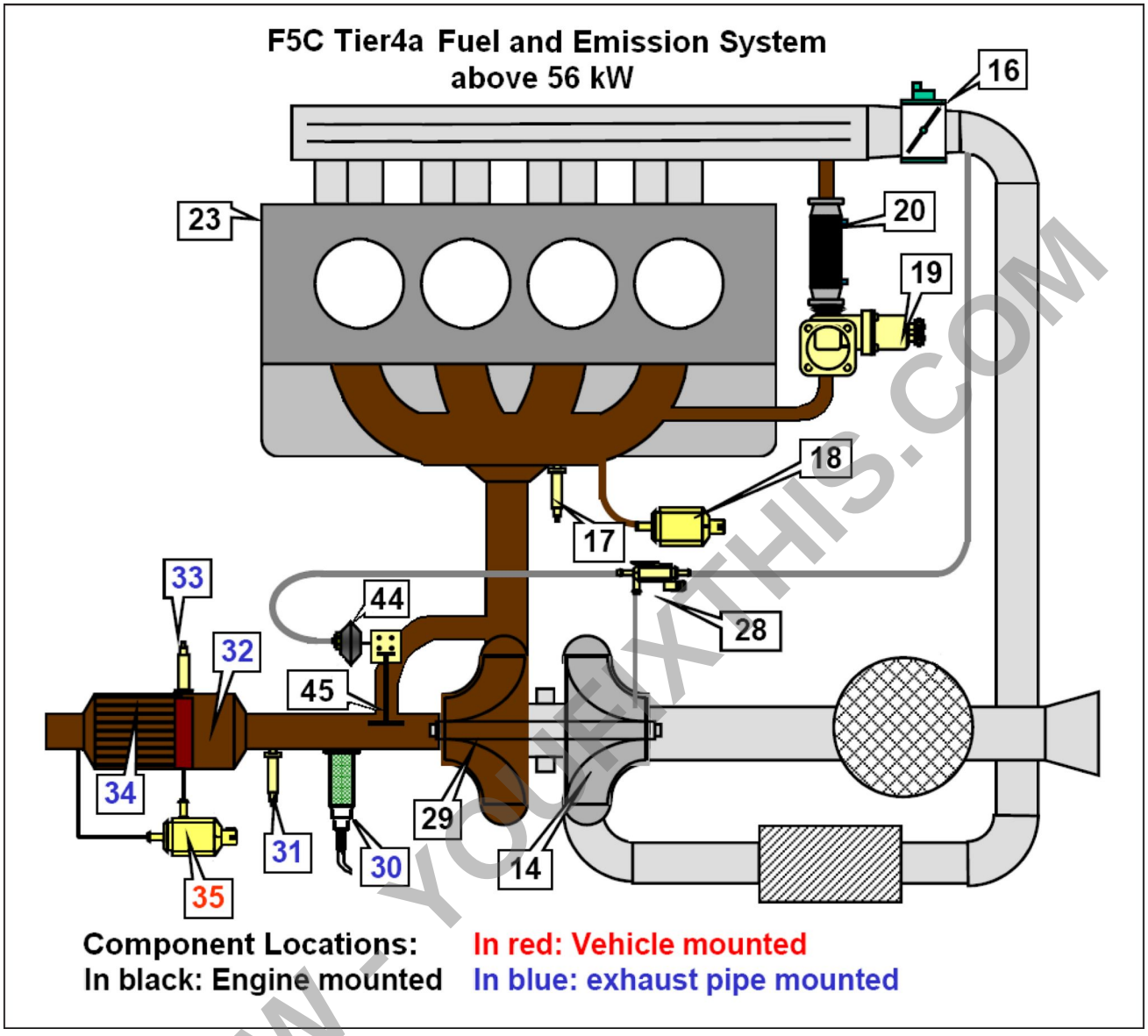
RAPH12FRK0637HA 1

RADIATOR

1–Radiator
2–Coolers
3–Charge Air Cooler
4–Bolts (three each side)
5–Washer (three each side)
6–Bracket

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RAIL12FRK1170GA 2

F5C/F5H Tier 4a Fuel and Emission System – above 56kW

Component Locations:

- Black = Engine mounted
- Red = Vehicle mounted
- Blue = Exhaust pipe mounted

F5C/F5H Tier 4a Diesel Particulate Filter (DPF) System Components	
14. Turbocharger Compressor	30. Heated Exhaust Gas Oxygen Sensor (HEGO)
16. Intake Throttle Valve (TVA)	31. DOC Inlet Temperature Sensor
17. Exhaust Manifold Temperature Sensor (T3)	32. Diesel Oxidation Catalyst (DOC)
18. Exhaust Manifold Pressure Sensor (P3)	33. DPF Inlet Temperature Sensor
19. EGR Valve with Position Feedback	34. Diesel Particulate Filter (DPF)
20. Exhaust Gas Recirculation (EGR) Cooler	35. DPF Differential Pressure Sensor
23. Engine	44. Turbocharger Waste Gate Diaphragm
28. Waste Gate Turbo Pressure Modulator	45. Turbocharger Waste Gate Valve
29. Fixed Geometry Turbocharger Turbine	

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Power Shuttle transmission - Exploded view - Four wheel drive transmission

Four-wheel drive transmission	
1. Tube	13. Breather
2. Hollow bolt	14. Breather pipe
3. Copper washer	15. PTO flange
4. Copper washer	16. O-ring
5. Plug	17. Bolt
6. Plug	18. Rear cover
7. Plug	19. Bolt
8. O-ring	20. Dowel pin
9. Fitting	21. Drain plug
10. Copper washer	22. Rear housing
11. Test port plug	23. Four-wheel drive clutch tube
12. Park brake pressure tube	24. Front housing

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Planetary drive and hub - Exploded view - Wheel hub and final reduction unit

Wheel hub and final reduction unit

(1)	Ring nut
(2)	Inner bearing
(3)	O-ring
(4)	Ring gear (not serviced)
(5)	Bleeder valve
(6)	Shipping plug
(7)	Hub
(8)	Spacer
(9)	Outer bearing
(10)	Cassette seal
(11)	Pad
(12)	Wheel flange
(13)	Snap ring
(14)	Gear
(15)	Snap ring
(16)	Bearing
(17)	Planetary carrier
(18)	Bolt
(19)	Stud

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Powered rear axle - General specification

General specifications	
Backlash for ring gear	**0.20 - 0.25 mm** (**0.008 - 0.010 in**)
Rotating torque for pinion shaft without seal	**1.1 - 2.3 N·m** (**9.74 - 20.36 lb in**)

Lubricant	
Capacity - center bowl	**5.5 l** (**5.8 US qt**)
Capacity - each wheel end	**0.71 l** (**0.75 US qt**)
Type of fluid	Wet brake/Transmission lubricant - **TUTELA TRANSAXLE FLUID SAE 80W-140** MAT3510

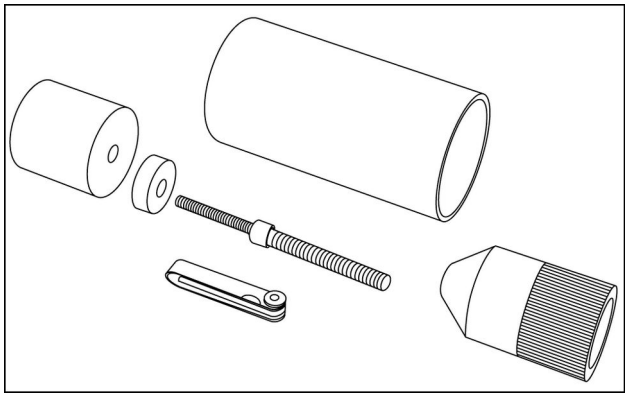
Powered rear axle - Torque

Special torques	
Studs for wheels	**70 N·m** (**51.6 lb ft**)
Allen head bolts for carrier	**25 N·m** (**18.4 lb ft**)
Self locking nut for tie rod ball joint	**165 N·m** (**121.7 lb ft**)
Jam nut for tie rod	**120 N·m** (**88.5 lb ft**)
Nut for ball joint for steering cylinder	**300 N·m** (**221.3 lb ft**)
Bolts for steering cylinder	**120 N·m** (**88.5 lb ft**)
Jam nuts for steering stops	**150 N·m** (**110.6 lb ft**)
Bolts for king pin	**120 N·m** (**88.5 lb ft**)
Bolts for adjusting ring lock	**13 N·m** (**115.1 lb in**)
Bolts for bearing caps	**266 N·m** (**196.2 lb ft**)
Bolts for hub for planetary ring gear	**95 N·m** (**70.1 lb ft**)
Bolts for differential carrier	**169 N·m** (**124.6 lb ft**)
Oil drain plugs in axle housing	**60 N·m** (**44.3 lb ft**)
Oil drain plugs in planetary ends	**80 N·m** (**59.0 lb ft**)
Breather	**10 N·m** (**88.5 lb in**)
Grease zerks	**8 N·m** (**70.8 lb in**)
Wheel nuts	**350 N·m** (**258.1 lb ft**)

Powered rear axle - Special tools

CAS 1839 Pinion setting kit

1. CAS1839-1 Gauge tube
2. CAS1839-2 Gauge block
3. CAS1668 Metric feeler gauge
4. CAS2401 Pilot
5. CAS1596A-4 Handle
6. CAS1596A Stud



RCPH10TLB461ABL 1

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NOTE: *Turning the clevis the same number of turns recorded in the removal procedure will be only a rough adjustment; push rod to piston clearance will still need to be adjusted. The lock nut can be tightened once final adjustment has been made.*

4. Install the clevis **(8)** to the push rod on the master cylinder, turning the clevis the same numbers of turns recorded in the removal procedure.
5. Position and align the brake pedal **(9)** with the clevis, and install the clevis pin **(10)**.
6. Secure the clevis pin with a cotter pin **(11)**.
7. Adjust the free travel of the brake pedal by depressing the brake pedal and allowing the piston to return. Turn the clevis clockwise to decrease or counterclockwise to increase the length. Adjust the push rod to piston clearance to specification.

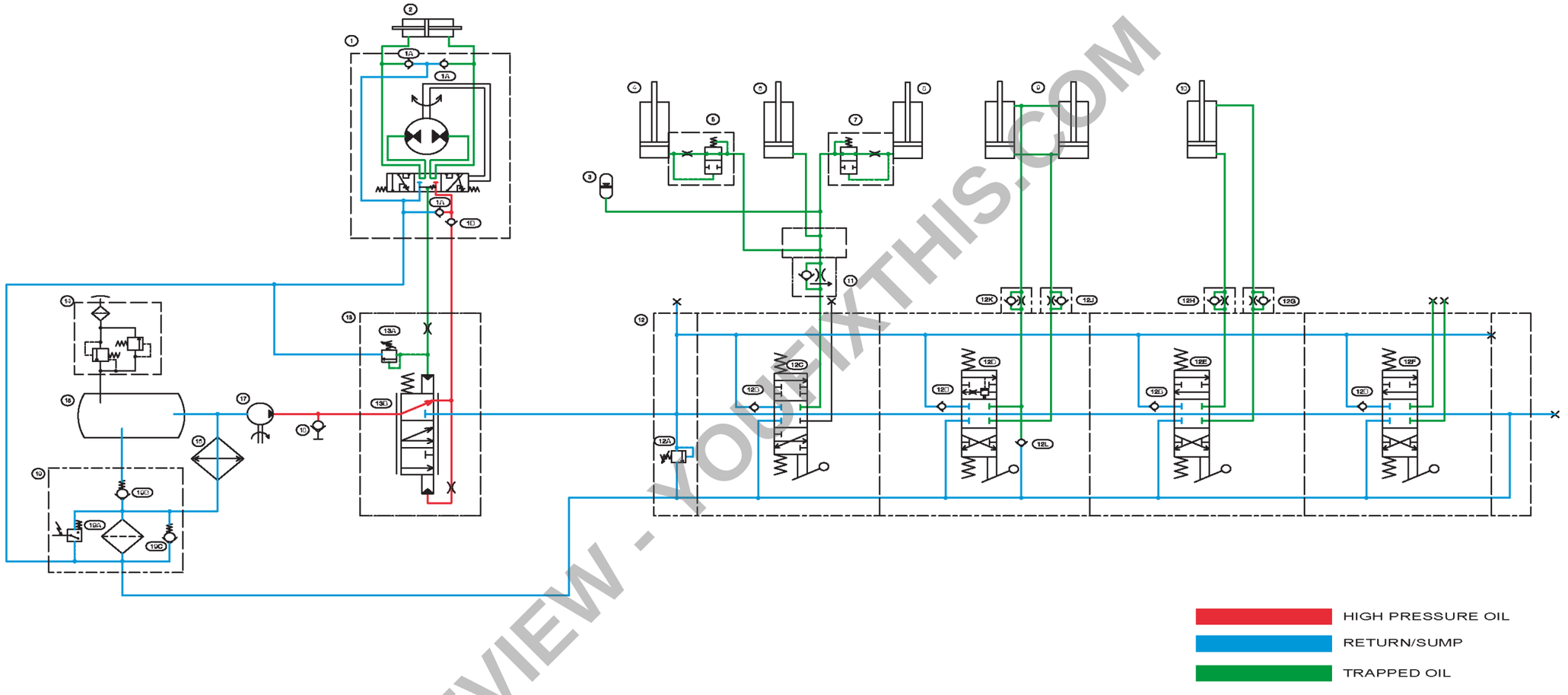
Specification

Free Travel Adjustment	**2 - 4 mm** (**0.08 - 0.16 in**)

8. When adjustment has been made, tighten the lock nut **(12)**.
9. Remove the air from the brake system. See **Brakes - Bleed (33.202)**
10. Check the system for leakage at the master cylinder.

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HYDRAULICS

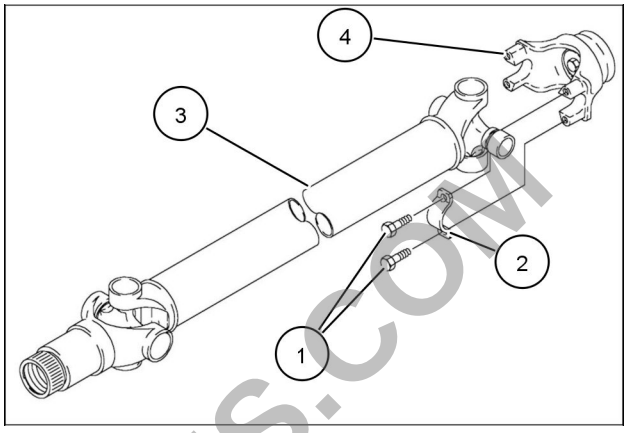
RAIL12FRK1173LA 1

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Fixed displacement pump - Remove

1. Prepare the machine for service.
2. Loosen and remove the bolts **(1)** and retainers **(2)** that fasten the front drive shaft **(3)** to the transmission output shaft **(4)**.
3. Remove the front drive shaft by sliding it off the axle pinion splines.
4. Drain the hydraulic system.



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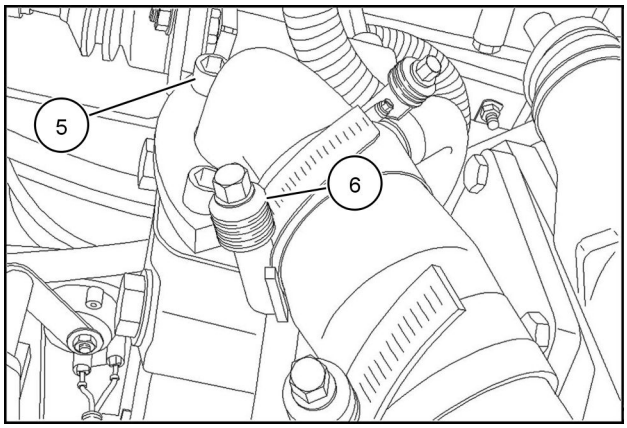
NOTE: *For assembly purposes, identify and label all lines prior to removing.*

⚠ WARNING

Escaping fluid!
Do not connect or disconnect hydraulic quick coupler under pressurized conditions. Make sure all hydraulic pressure is removed from the system before connecting or disconnecting hydraulic quick coupler.
Failure to comply could result in death or serious injury.

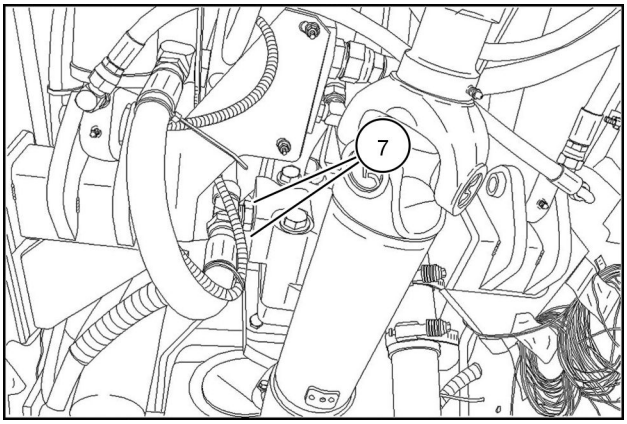
W0095B

5. Remove the three allen head screws **(5)**, and loosen the hose clamp **(6)** on the inlet hose to the pump. Close all openings.



RAPH12FRK0397AA 2

6. Disconnect the hoses **(7)** from the fitting on the outlet of the pump. Close all openings.



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Telescopic arm cylinder - Assemble Standard Cylinder

NOTE: *If a new gland is being installed, record the new part number of the cylinder on the new gland.*

⚠ WARNING

Chemical hazard!
Always wear protective clothing and goggles when cleaning with solvents, acids, or alkaline chemical agents. Always follow the chemical manufacturer's instructions.
Failure to comply could result in death or serious injury.

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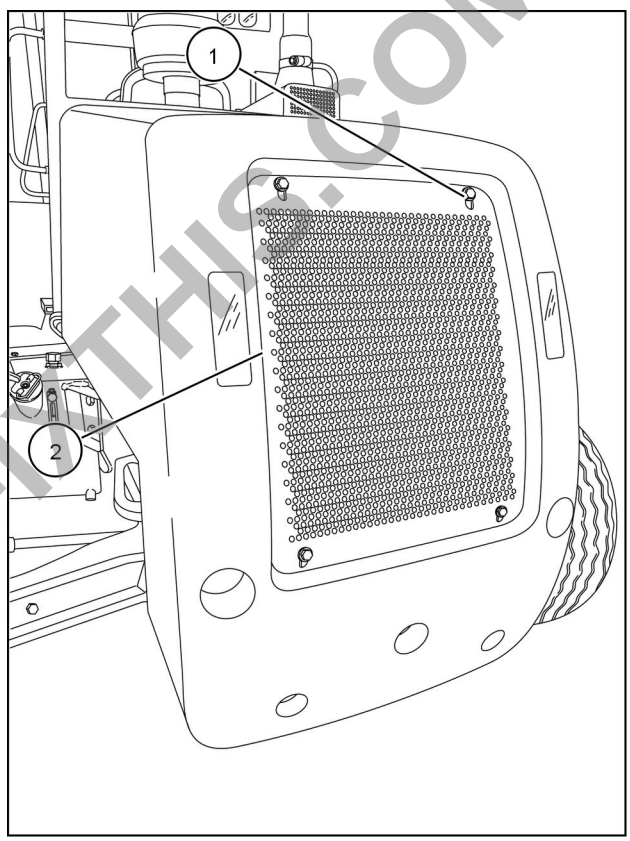
1. Install the buffer seal **(9)** in the gland **(2)**. The side of the buffer seal with the lip must be toward the small end of the gland.
2. Install a new U-cup **(10)** in the gland. The lips of the U-cup must be toward the small end of the gland.
3. Install a new wiper **(8)** in the gland. The lips of the wiper must be toward the large end of the gland.
4. Install a new backup ring **(7)** in the groove on the outside of the gland. If both sides of the backup ring **(7)** are not flat, the side that is not flat must be toward the small end of the gland.
5. Install the O-ring **(6)** next to the backup ring in the groove on the outside of the gland. The O-ring must be toward the small end of the gland.
6. Remove any marks and sharp edges on the chamfer at the end of the piston rod **(5)**.
7. Lubricate the bore of the gland with clean oil.
8. Push the gland onto the piston rod. Be careful not to damage the seals.
9. Fasten the piston rod in a soft-jawed vise. Be careful to prevent damage to the piston rod.
10. Install a new wear ring **(4)** in the end groove on the outside of the piston **(3)**.
11. Lubricate the inside of the tube **(1)** and the piston with clean oil.
12. Push the tube straight onto the piston.
13. Start the tube onto the piston rod assembly. Be careful not to damage the wear ring and seal.
14. Lubricate the O-ring on the gland with clean oil.
15. When the piston is in the smooth part of the tube, start the gland into the tube.
16. Use a spanner wrench to turn the gland into the tube. Tighten the gland.
17. If the hoses were removed with the cylinder, install new O-rings, if equipped, on the hose fittings. Lubricate the O-rings with clean oil. Install the hoses.

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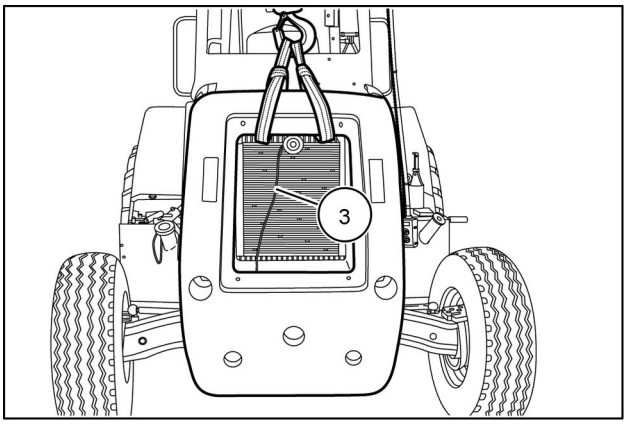
Counterweight - Remove

1. Prepare the machine for service. Refer to **Basic instructions — Prepare machine for service/Return machine to use ()**.
2. Remove the hood from machine. Refer to **Hood - Remove (90.100)**.
3. Remove the side panels from machine. Refer to **Side panels - Remove (90.100)**
4. Remove the four bolts and washers **(1)** securing the grille **(2)** to the counterweight.



RAPH12FRK0031BA 1

5. Disconnect the back-up alarm wire harness connector **(3)**.



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Steering control - Torque

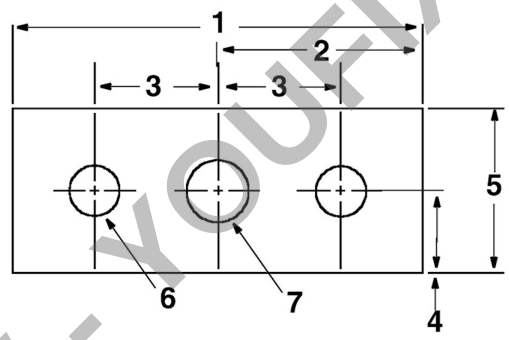
Special Torques

Specifications

Nut for the steering wheel	41–54 N·m (360–480 lb in.)
Cap screws fastening the steering cylinder to the 2WD steering axle	786–944 N·m (580–696 lb ft)
Cap screws fastening the steering cylinder to the 4WD steering axle	162–178 N·m (119–131 lb ft)
Cap screws that hold the rear drive shaft	33–39 N·m (24–29 lb ft)
Cap screws for the 2WD steering axle	156–203 N·m (115–150 lb ft)
Wheel nuts for the 4WD steering axle	112–125 N·m (83–92 lb ft). Then turn the nuts an additional 90 degrees ± 5 degrees
Nut fastening the ball joint to the arm of the swivel housing on the4WD steering axle	165 N·m (122 lb ft)
U-clamp for exhaust pipe	19–27 N·m (14–20 lb ft)

Steering control - Special tools

The tool shown is needed to remove the steering wheel. Make the tool in your shop. This tool is first used on page 4.



RAPH12FRK0994BA 1

Make from 6 mm (1/4 in.) cold rolled steel.

Specifications

1–50 mm (2 in.)	5–19 mm (3/4 in.)
2–5.4 mm (1 in.)	6–Two holes, 5.5 mm (7/32 in.)
3–15.9 mm (5/8 in.)	7–Use No. 4 Drill for 1/4 - 24
4–9.5 mm (3/8 in.)	8–Two 10-32 x 1 in. screws required. Metric thread optional.

CAS2150 or 380100091 Wrench
This tool is used to remove and install the tie rod.
This tool may need to be thinned in the highlighted area to work correctly on the H series machines.

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Front wheels - General specification

General Information

NOTICE: *The front wheel mounting nuts on this machine are metric. Use only the mounting nuts shown in the parts catalog for this machine*

When the machine is new or when a wheel is removed for service, check the wheel nut or bolt torques every 10 hours of operation until the wheel nuts or bolts remain tight.

Check the torque with a dial or click torque wrench. If the nut does not move on the following torques, it is tight and does not need to be torqued:

Specification

Front wheel mounting nuts torque	**305 N·m** (**225.0 lb ft**)

Front wheels - Torque

Specification

Initial torque in sequence	**136 N·m** (**100.3 lb ft**)
Second torque in sequence	**271 N·m** (**199.9 lb ft**)
Final torque in sequence	Additional **30 °** turn

Front wheels - Tire pressure

586H

Specification

19.5L x 24 (2/4WD), 12 PR	**2.3 bar** (**33.4 psi**)
17.5L x 24 (2/4WD), 10 PR	**2.2 bar** (**31.9 psi**)

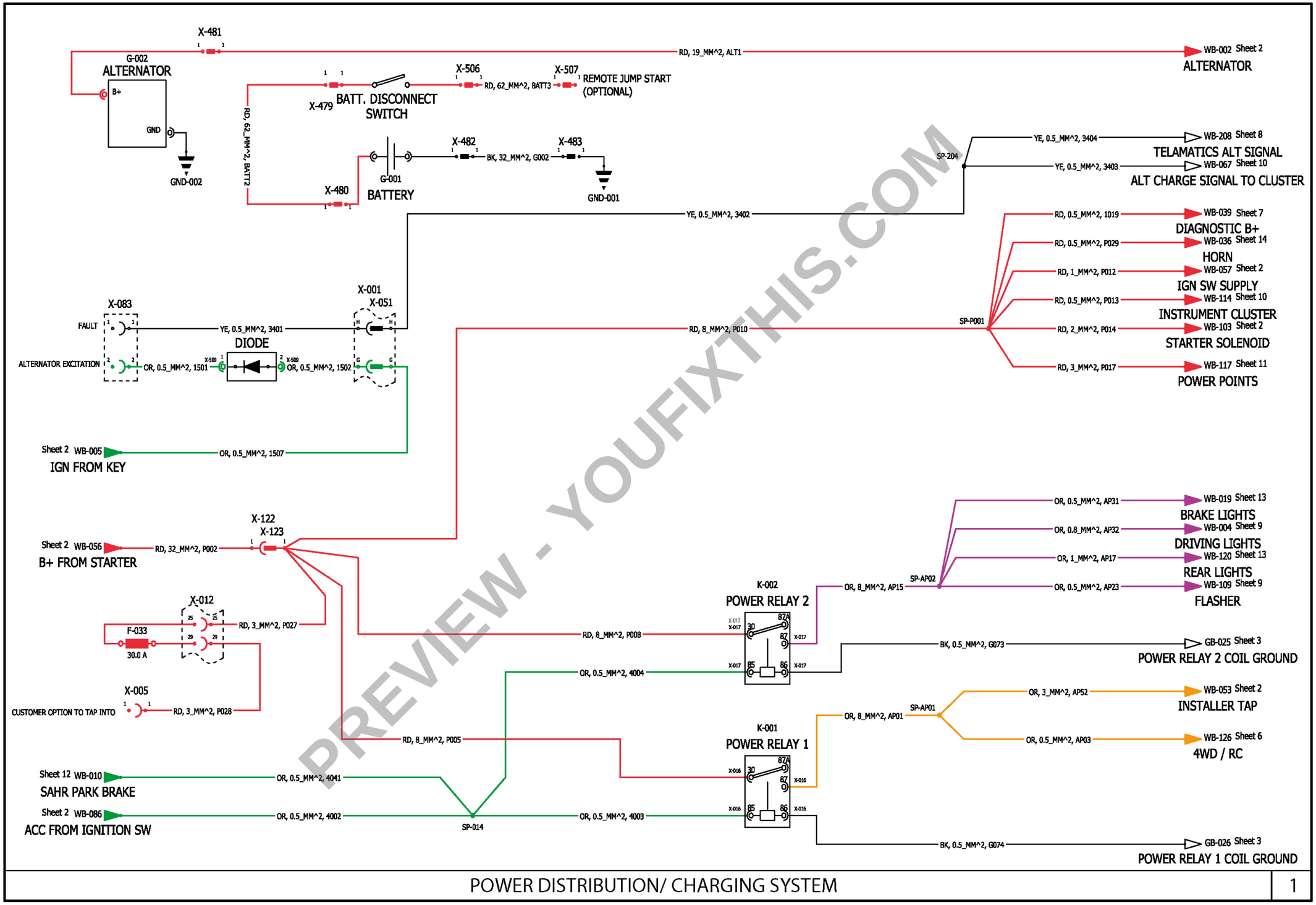
588H

Specification

19.5L x 24 (2/4WD), 12 PR	**2.3 bar** (**33.4 psi**)

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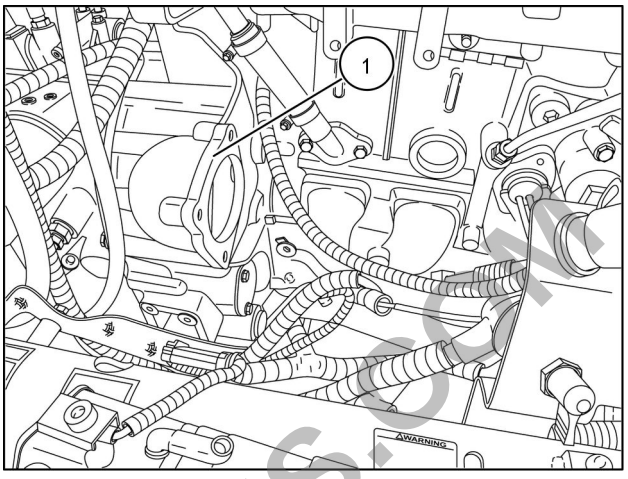


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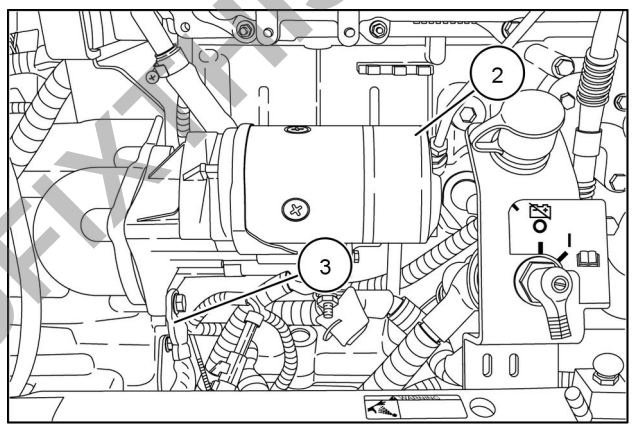
Engine starter - Install

1. Ensure that the mating surface on the flywheel housing **(1)** is clean of any foreign material.



RAPH12FRK0056BA 1

2. Install the starter **(2)** to the flywheel housing.
3. Install the ground strap **(3)**, washers, and starter bolts securing the starter to the flywheel housing. Tighten to specification.

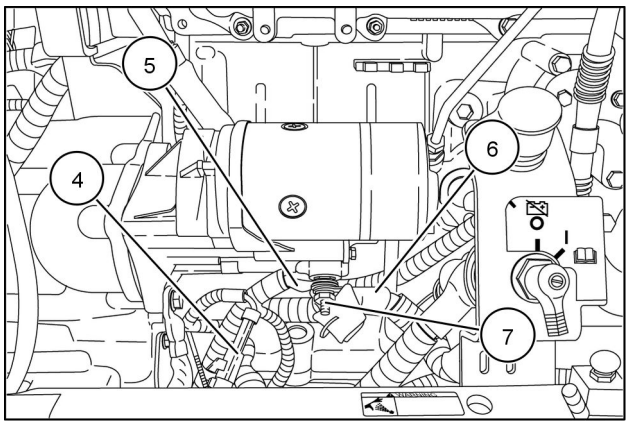


RAPH12FRK0719BA 2

Specification

Starter Bolt Torque	**40 - 47 N·m** (**29.5 - 34.7 lb ft**)

4. Connect the starter solenoid wire harness connector **(4)**.
5. Connect the wire harness **(5)** and positive battery cable **(6)** to the starter terminal **(7)**, and secure with the terminal nut. Tighten to specification.



RAPH12FRK0719BA 3

Specification

Terminal Nut Torque	**17.5 - 24.5 N·m** (**12.9 - 18.1 lb ft**)

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1001-Engine Air Filter Blocked

Context:
The Instrument Cluster detects a signal to ground on pin 11 indicating that the Air Filter Restriction Switch has been tripped. The Warning Lamp will illuminate while the fault is active.

Cause:
The Instrument Cluster detects a signal to ground indicating that the Air Filter Restriction Switch has been tripped.

Possible failure modes:

1. Clogged air filter.
2. Signal wire short circuit to minus battery or chassis ground.
3. Faulty air filter restriction switch.
4. Faulty Instrument Cluster.

Solution:

1. Verify that the fault code is active.

   (1) Use the Electronic Service Tool to clear all fault codes. Prior to clearing fault codes write down all fault codes, number of occurrences, and engine hours at last occurrence.

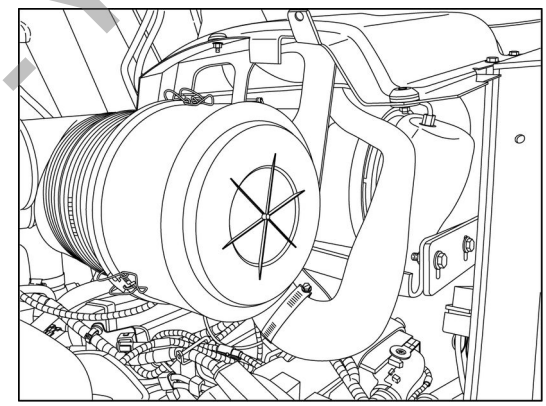
   (2) To check for fault codes: Start and operate machine.

   A. Fault code 1001 is not recorded again. OK to return the machine to service.

   B. Fault code 1001 is active and recorded again. Go to Step **2**.

2. Inspect the engine air filter.

   (1) Inspect the engine air filter. The filter should be clean and free of dirt and debris.



RCPH11TLB004BAD 1

   A. The filter is clean and does not need to be replaced. Go to **3**.

   B. The filter is in poor condition, dirty or is clogged. Replace the filter. Return to Step **1** to confirm elimination of the fault.

3. Verify that the wiring and connectors are free of damage.

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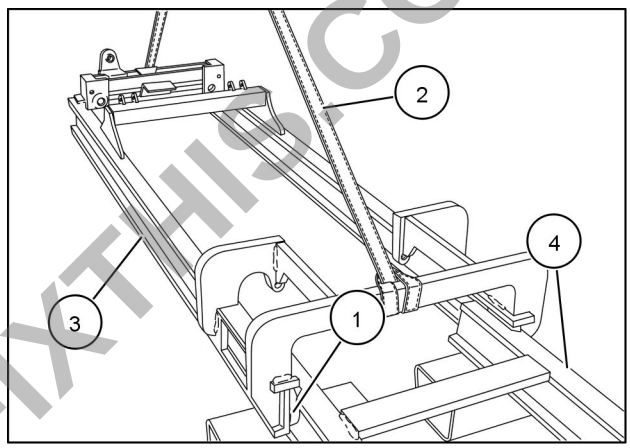
Telescopic arm - Assemble - Forklift mast with standard cylinder

⚠ DANGER

Heavy objects!
Lift and handle all heavy components using lifting equipment with adequate capacity. Always support units or parts with suitable slings or hooks. Make sure the work area is clear of all bystanders.
Failure to comply will result in death or serious injury.

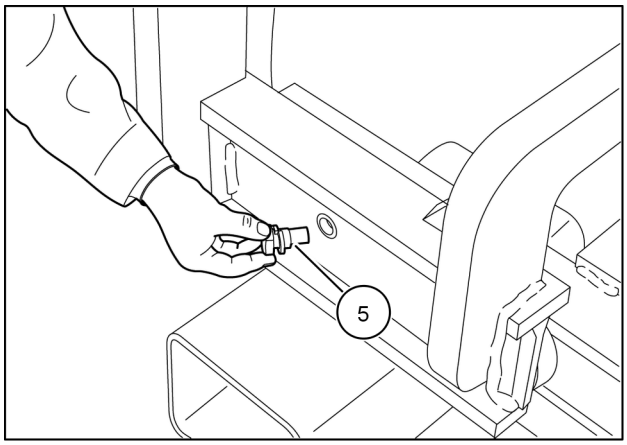
D0076A

1. Install shims and rollers **(1)** if removed during disassembly. Using an appropriate lifting device **(2)**, slide the outer rail assembly **(3)** to the inner rail **(4)**.



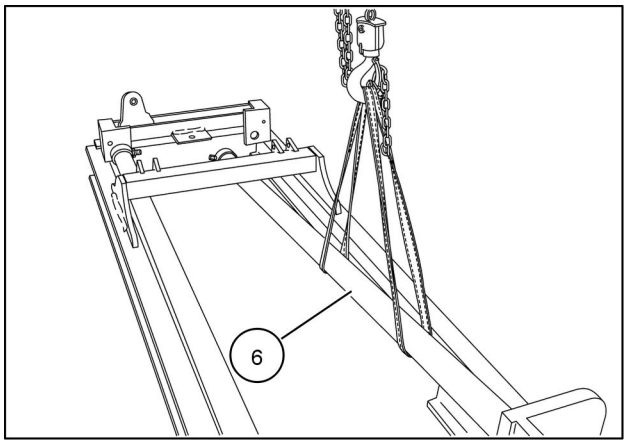
RAPH12FRK0371AA 1

2. Install bolt stops **(5)** to the outer rail assembly.



RAPH12FRK0372AA 2

3. Using an appropriate lifting device, install the cylinder **(6)** to the mast.



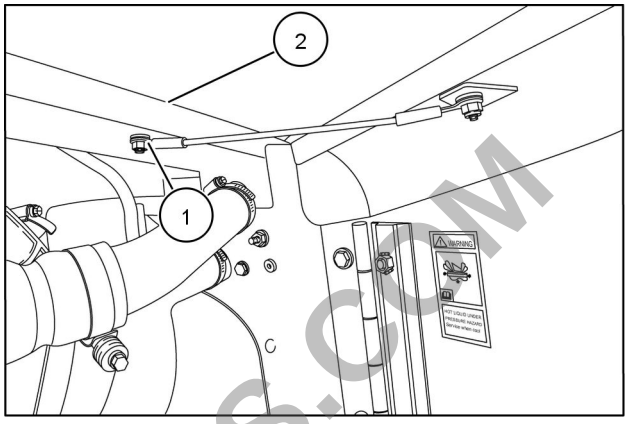
RAPH12FRK0370AA 3

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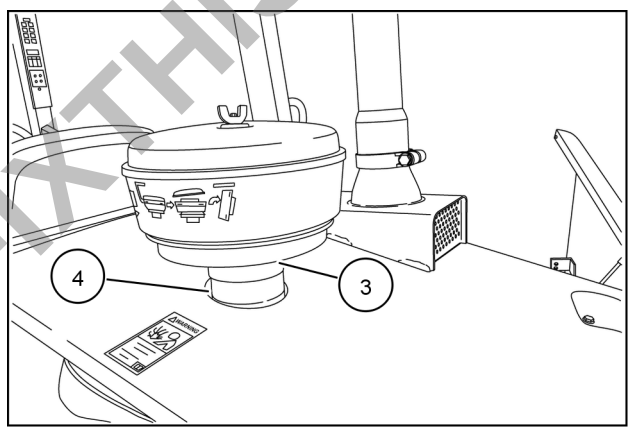
Hood - Remove

1. Prepare the machine for service.
2. Disconnect the right and left side panel straps **(1)** from the hood **(2)**.



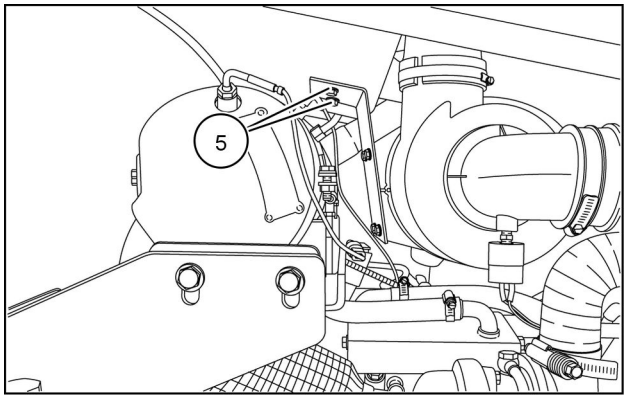
RAPH12FRK0028BA 1

3. Loosen the clamp and remove the pre-cleaner **(3)** from the air cleaner assembly **(4)**.



RAPH12FRK0030BA 2

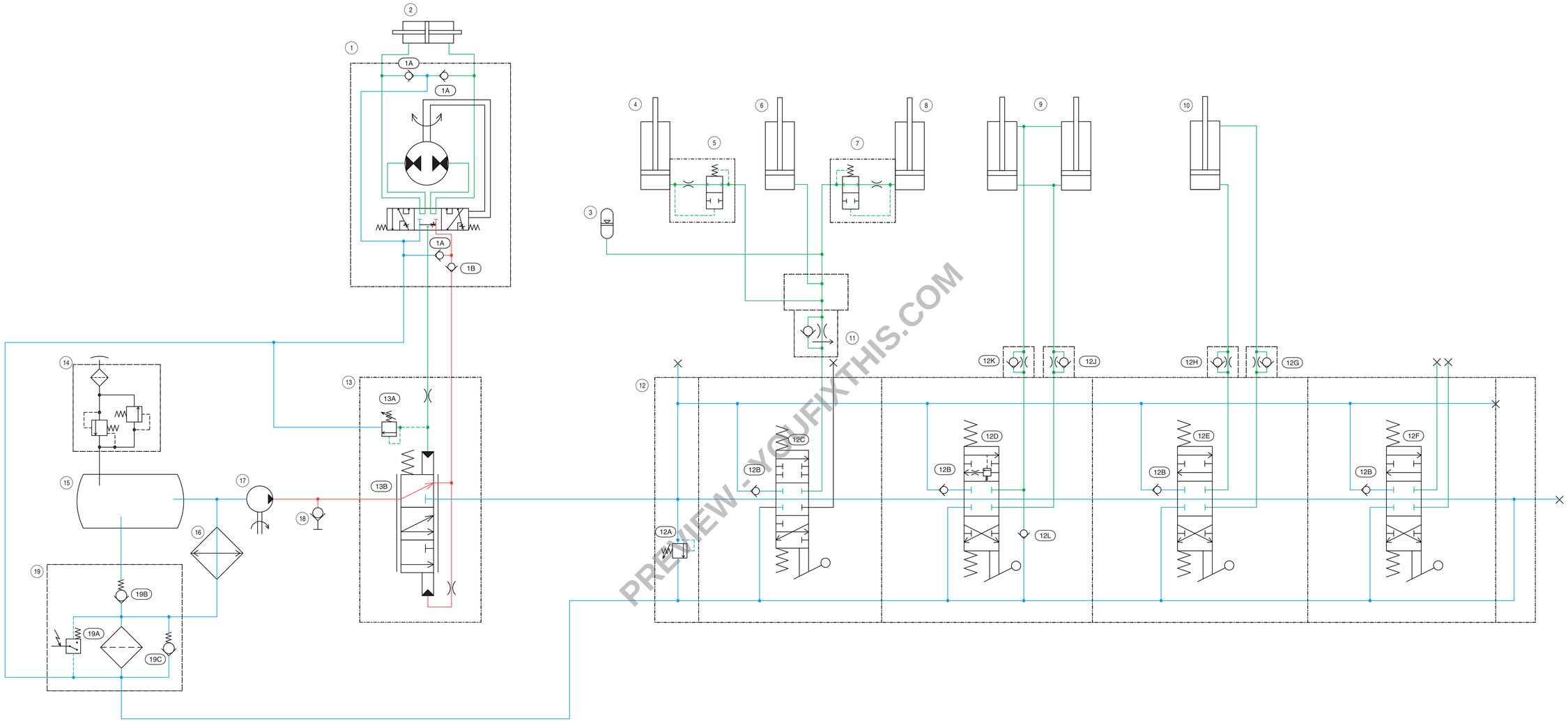
4. Remove the two bolts **(5)** disconnecting the air filter bracket from the hood.



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COMPONENT IDENTIFICATION

1. STEERING CONTROL VALVE
   1A. ANTI-CAVITATION VALVE
   1B. CHECK VALVE
2. STEERING CYLINDER
3. ACCUMULATOR
   24 to 26 bar (350 to 375 psi)
4. FREE LIFT CYLINDER (OPT)
5. FLOW LIMITER VALVE
6. LH RAIL LIFT CYLINDER
7. FLOW LIMITER VALVE
8. RH RAIL LIFT CYLINDER
9. TILT CYLINDERS
10. SIDE SHIFT CYLINDER
11. MANIFOLD VALVE
12. FORK LIFT CONTROL VALVE
    12A. MAIN PRESSURE RELIEF VALVE
    214 to 235 bar (3100 to 3400 psi)
    12B. LOAD CHECK VALVE
    12C. LIFT SPOOL
    12D. TILT SPOOL
    12E. SIDE SHIFT SPOOL
    12F. AUXILIARY HYDRAULICS SPOOL
    12G. ORIFICE 0.047
    12H. ORIFICE 0.047
    12J. ORIFICE 0.095
    12K. ORIFICE 0.082
    12L. ANTI-CAVITATION VALVE
13. FLOW CONTROL PRIORITY VALVE
    13A. STEERING RELIEF VALVE
    141.6 to 148.4 bar (2050 to 2150 psi)
    13B. PRIORITY VALVE
14. HYDRAULIC RESERVOIR BREATHER
15. RESERVOIR
16. OIL COOLER
17. HYDRAULIC PUMP
    586H
    68 L/min at 207 bar at 2200 r/min
    (18 gpm at 3000 psi at 2200 rpm)
    588H
    91 L/min at 207 bar at 2200 r/min
    (24 gpm at 3000 psi at 2200 rpm)
18. TEST PORT
19. HYDRAULIC FILTER
    19A. FILTER CONDITION SWITCH
    19B. COOLER BYPASS
    19C. FILTER BYPASS

HIGH PRESSURE OIL
RETURN/SUMP
TRAPPED OIL

HYDRAULIC SYMBOLS

PRESSURE
PILOT PRESSURE
CASE DRAIN
COMPONENT
54
COMPONENT NUMBER
SHOWS CIRCUIT CROSSING NOT CONNECTED
SHOWS CIRCUIT CONNECTED
CHECK VALVE
RESTRICTOR
FILTER OR SCREEN
OIL COOLER

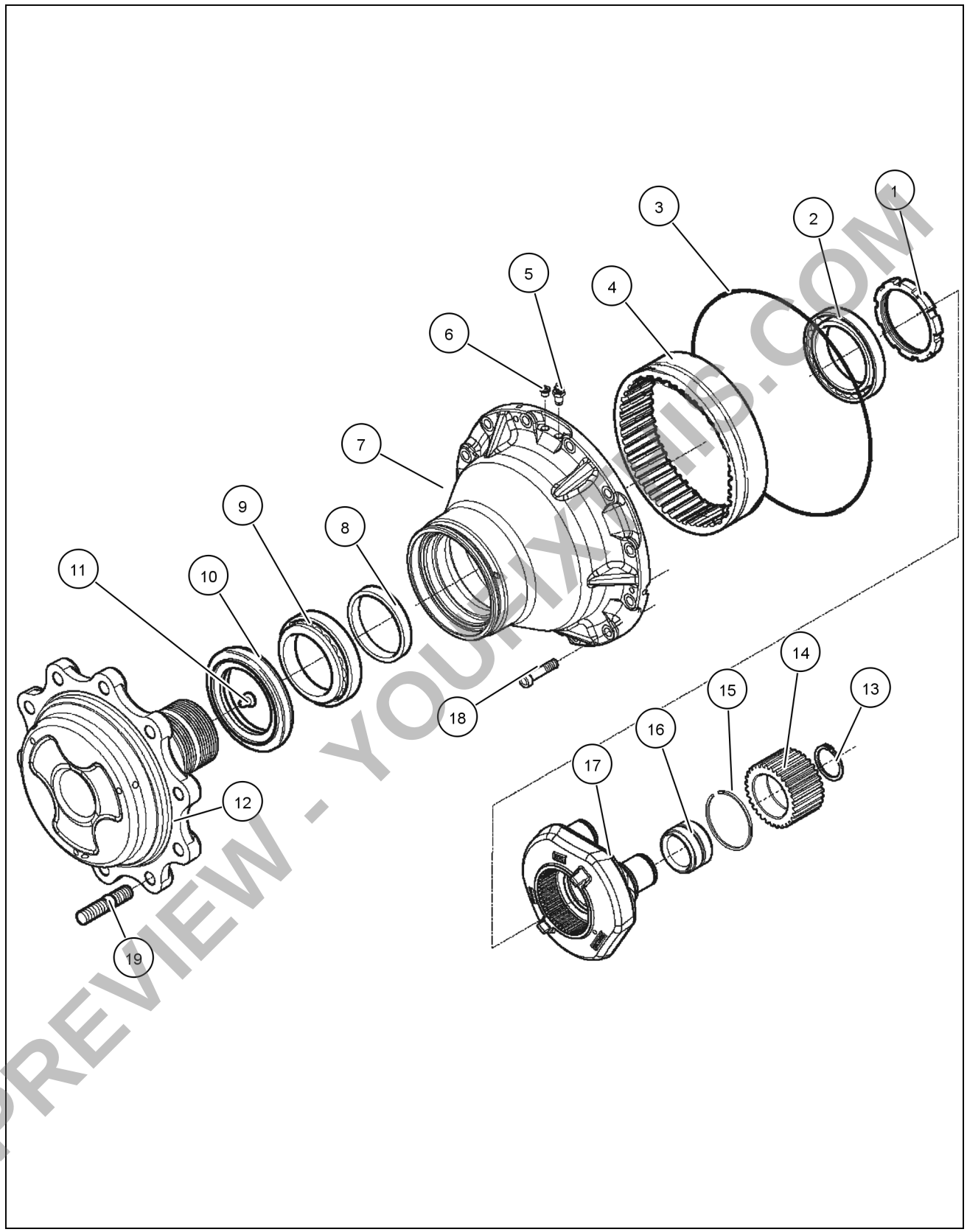
HYDRAULIC SCHEMATIC 47388794
586H/588H Tier 4 Rough Terrain Forklift
(from PIN NCC570000)

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INTRODUCTION

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586H
588H

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3664-EGR command saturation over lower threshold

Context:
The negative limit of EGR valve governor deviation has been exceeded.

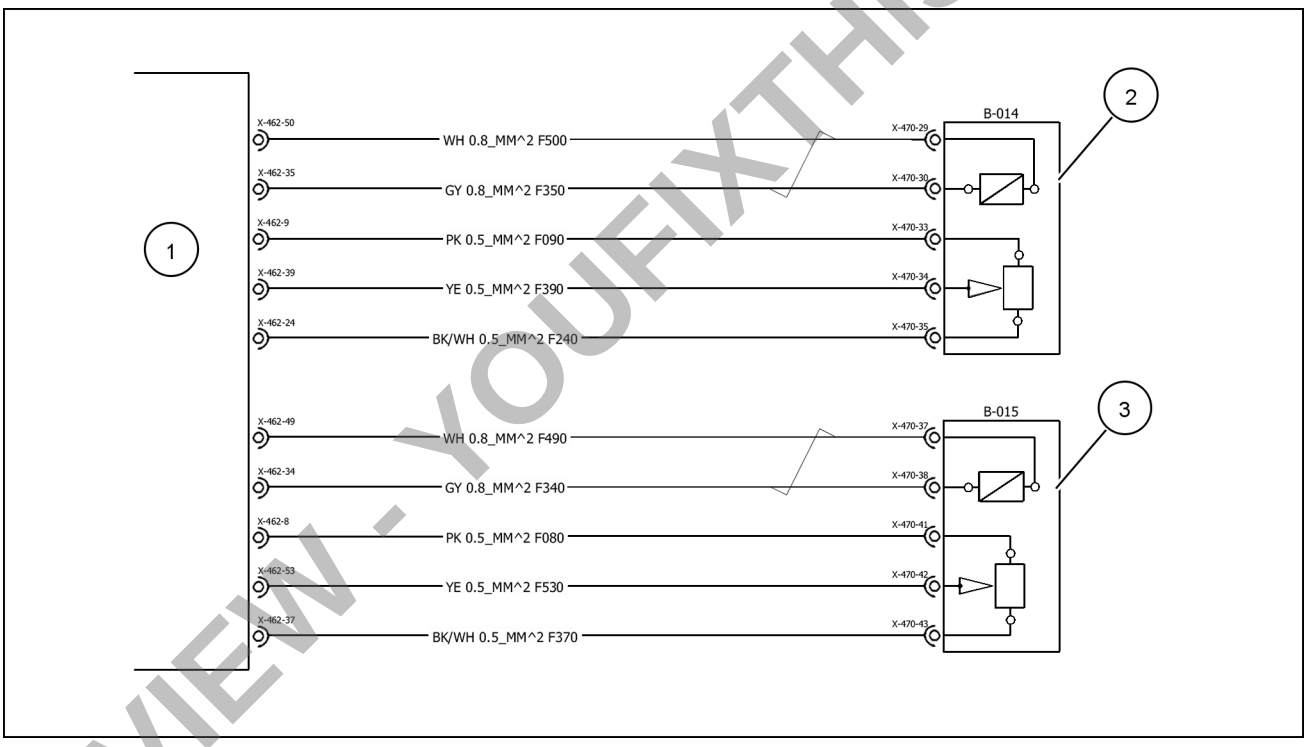
Cause:
Desired EGR valve position can not be reached due to sticking EGR valve. Possible EGR valve position sensor mismatched

Possible failure modes:

1. Faulty wiring
2. EGR valve binding inside assembly

Solution:

1. Verify that the wiring and connectors are free of damage.



RCPH11TLB089FAL 1

(1)	**ECU** connector **X-462**
(2)	**EGR** Valve connector **X-470**
(3)	**TVA** Valve **X-470**

(1) Inspect the **ECU** and the **EGR** valve connections. All connections should be secure, tight, free of corrosion, abrasion and damage.

(2) Inspect the harness from the **ECU** to the **EGR** valve. Verify that the harness is free of damage, corrosion, abrasion or incorrect attachment.

A. OK – The connectors are secure and the harness is free of damage. Go to Step **2**.

B. NOT OK – The connectors or the harness has damage. Repair or replace the harness or connectors as required. Return to Step **1** to confirm elimination of fault.

2. Verify the fault code is still present and in an active state.

A. If the fault is no longer active or present, Ok to return the machine to service.

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