
Safety rules - Ecology and the environment

Soil, air, and water quality is important for all industries and life in general. When legislation does not yet rule the treatment of some of the substances that advanced technology requires, sound judgment should govern the use and disposal of products of a chemical and petrochemical nature.

Familiarize yourself with the relative legislation applicable to your country, and make sure that you understand this legislation. Where no legislation exists, obtain information from suppliers of oils, filters, batteries, fuels, anti-freeze, cleaning agents, etc., with regard to the effect of these substances on man and nature and how to safely store, use, and dispose of these substances.

Helpful hints

- Avoid the use of cans or other inappropriate pressurized fuel delivery systems to fill tanks. Such delivery systems may cause considerable spillage.
- In general, avoid skin contact with all fuels, oils, acids, solvents, etc. Most of these products contain substances that may be harmful to your health.
- Modern oils contain additives. Do not burn contaminated fuels and or waste oils in ordinary heating systems.
- Avoid spillage when you drain fluids such as used engine coolant mixtures, engine oil, hydraulic fluid, brake fluid, etc. Do not mix drained brake fluids or fuels with lubricants. Store all drained fluids safely until you can dispose of the fluids in a proper way that complies with all local legislation and available resources.
- Do not allow coolant mixtures to get into the soil. Collect and dispose of coolant mixtures properly.
- The air-conditioning system contains gases that should not be released into the atmosphere. Consult an air-conditioning specialist or use a special extractor to recharge the system properly.
- Repair any leaks or defects in the engine cooling system or hydraulic system immediately.
- Do not increase the pressure in a pressurized circuit as this may lead to a component failure.
- Protect hoses during welding. Penetrating weld splatter may burn a hole or weaken hoses, allowing the loss of oils, coolant, etc.

Battery recycling

Batteries and electric accumulators contain several substances that can have a harmful effect on the environment if the batteries are not properly recycled after use. Improper disposal of batteries can contaminate the soil, groundwater, and waterways. CASE CONSTRUCTION strongly recommends that you return all used batteries to a CASE CONSTRUCTION dealer, who will dispose of the used batteries or recycle the used batteries properly. In some countries, this is a legal requirement.



Mandatory battery recycling

NOTE: The following requirements are mandatory in Brazil.

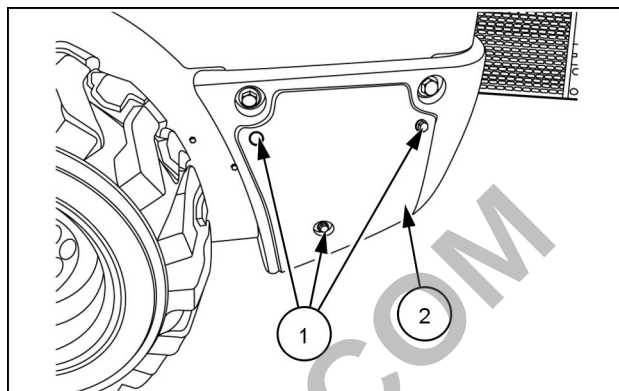
Batteries are made of lead plates and a sulfuric acid solution. Because batteries contain heavy metals such as lead, CONAMA Resolution 401/2008 requires you to return all used batteries to the battery dealer when you replace any batteries. Do not dispose of batteries in your household garbage.

Points of sale are obliged to:

- Accept the return of your used batteries
- Store the returned batteries in a suitable location
- Send the returned batteries to the battery manufacturer for recycling

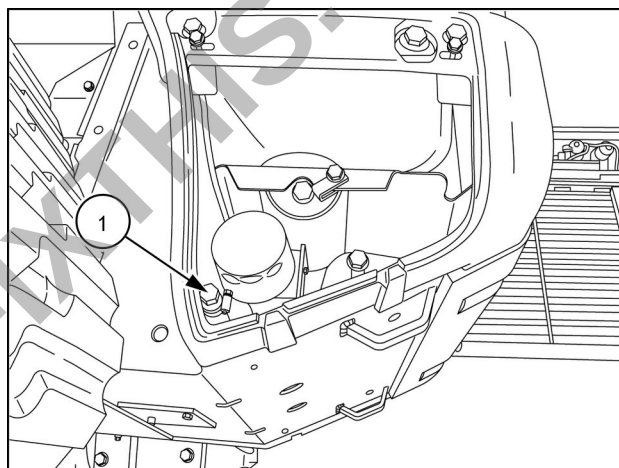
Engine - Drain fluid - Remote oil drain

1. Remove the access cover (2) by removing the mounting bolts (1).



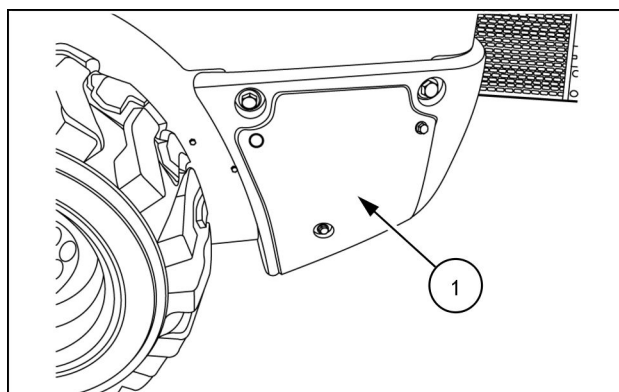
931001637 1

2. Remove the drain plug (1).
3. When the oil has drained from the engine, install the drain plug (1). Torque the drain plug (1) to **68 – 82 N·m (50 – 60 lb ft)**.



RAIL14SSL0709AA 2

4. Install the access cover (1).

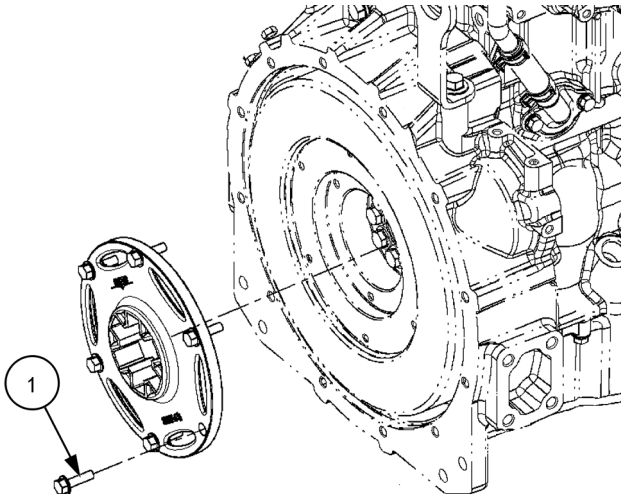


931001637 3

Next operation:

See **Engine - Filling (10.001)** for the proper procedure to refill the engine oil fluid.

Pump-drive coupling - Torque

Component	Identification	Torque	Consumable
Flange bolt (1)	 <p>RAPH14SSL0775BA 1</p>	23 – 31 N·m (204 – 274 lb in)	LOCTITE® 243™

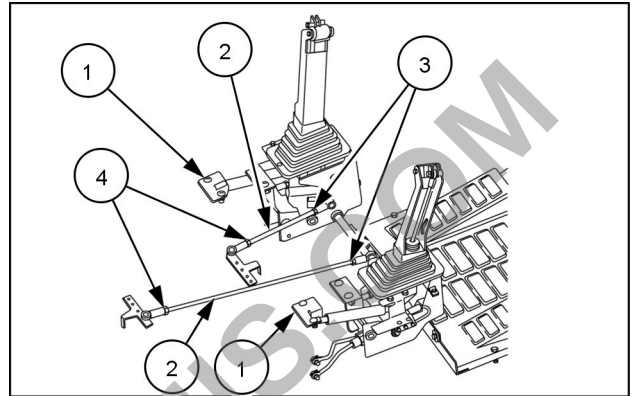
Mechanical control - Adjust - Machines with only hand controls

TV450 TIER 4B (FINAL) [NHM435463 -]

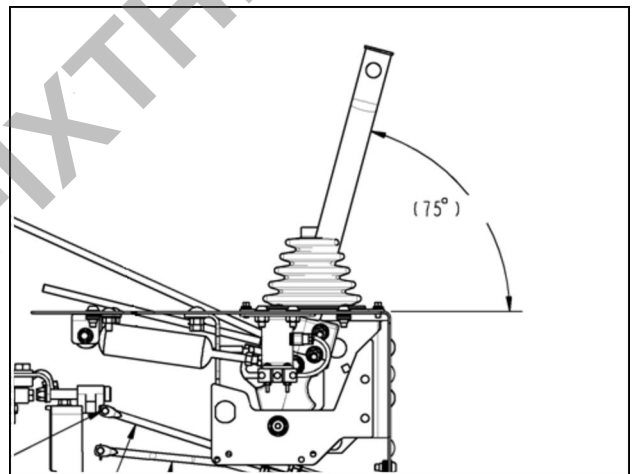
NA (Mechanical hydraulic controls)

NOTE: Inspect the linkage and linkage components for wear and damage before performing the following steps. Replace all worn and/or damaged parts.

1. Loosen the bolts **(1)** that attach the self centering dampeners.
2. Loosen the jam nuts **(3)**, **(4)**.
3. Rotate the rod **(2)** until the handles are in the correct position of **75°** (see image 2).
4. Tighten the jam nuts **(2)**, **(3)**.
5. Tighten the bolts **(1)** that attach the self centering dampeners.
6. Repeat steps **1 – 5** on the other pump.



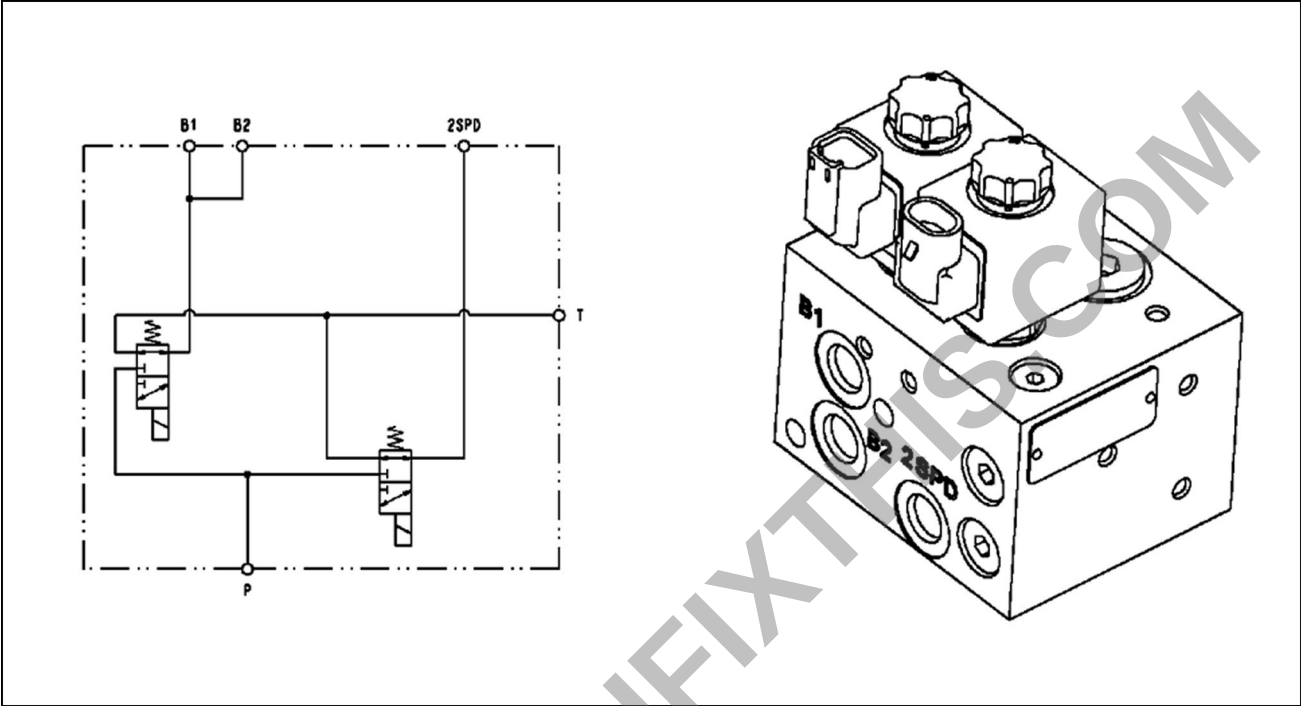
23112921 1



23112922 2

Parking brake control valve or manifold - General specification
- Mechanical drive

TV450 TIER 4B (FINAL) [NHM435463 -] NA (Mechanical hydraulic controls)



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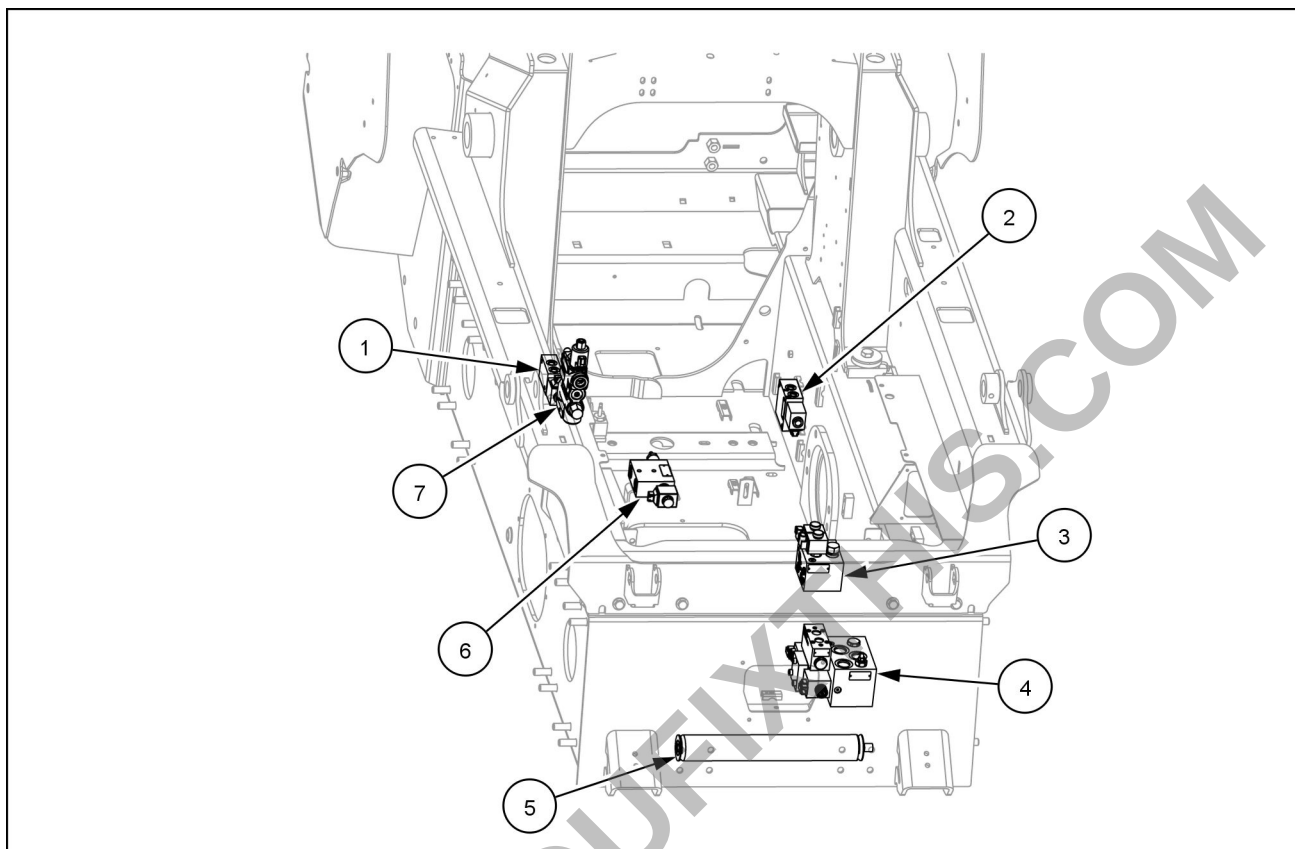
Brake, two speed valve

Hydraulic requirements:	Charge pressure = 24 – 25.5 bar (350 – 370 psi)
	Brake release pressure = 15 bar (218 psi)
Port identification	P - Supply inlet
	T - Tank return
	2SPD - Two speed shift
	B1 - Brake motor 1
	B2 - Brake motor 2

Parking brake control valve or manifold - General specification -
Electro-Hydraulic (EH) drive

TV450 TIER 4B (FINAL) [NHM435463 -] NA (Electro hydraulic controls)

Hydraulic systems - Component localization



RAIL13SSL1004FA 1

Valve location

Valve identification

(1) Ride control valve	(3) Loader pilot interlock, brake, two speed valve	(5) Accumulator	(7) Self level valve
(2) Hydraulic coupler valve	(4) Second auxiliary valve	(6) High flow valve	

Counterweight - Remove

⚠ DANGER

Heavy objects!

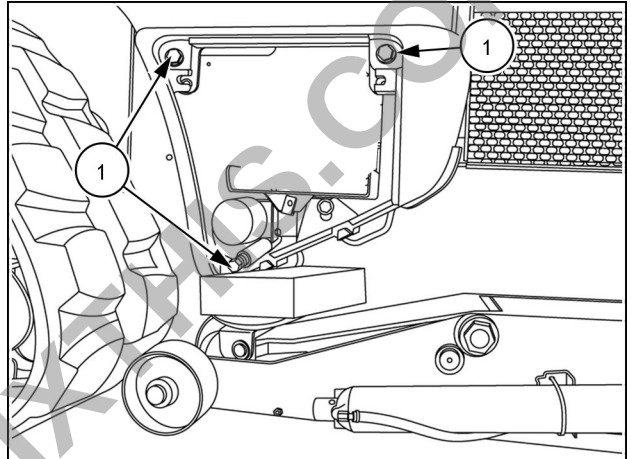
Lift and handle all heavy components using lifting equipment with adequate capacity. Always support units or parts with suitable slings or hooks. Make sure the work area is clear of all bystanders.

Failure to comply will result in death or serious injury.

D0076A

Left hand side

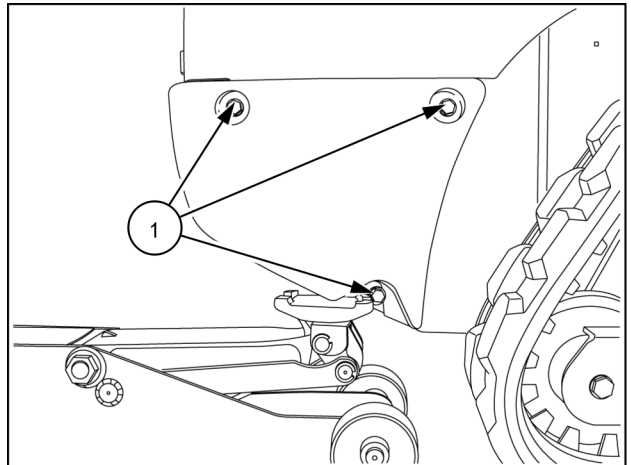
1. Support the counterweight with a suitable lifting device.
Remove corner mounting hardware (1).
2. Remove the counterweight.



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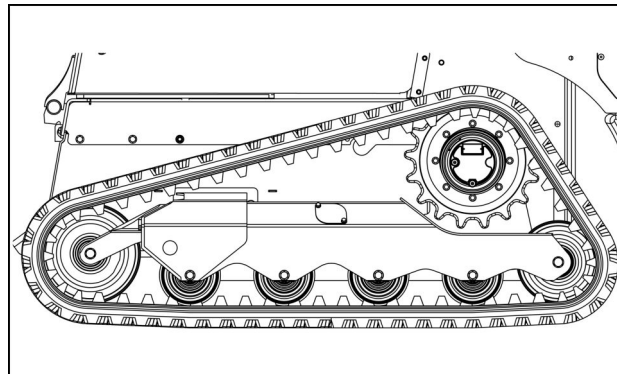
Right hand side

3. Support the counterweight with a suitable lifting device.
Remove corner mounting hardware (1).
4. Remove the counterweight.



RAPH12SSL0041AA 2

Track frame and driving wheels - Overview



Low-Profile Undercarriage

The Compact Track Loaders (CTL) now feature a redesigned undercarriage beginning February 2016, starting serial number (NGM414518 – and beyond). The new low-profile design promotes the same quality and long lasting **Berco®** undercarriage components. The primary change from the older style undercarriage is in the frame design of the undercarriage.

The newer design changes immediately increase the ease of cleanout by eliminating the large angled carrier design used in the older style undercarriage. The updated carrier design features an improved yoke-to-frame engagement which increases track alignment, maximizes the track life, and produces less operating noise. The new design does not affect or increase performance specifications that were met with the older style undercarriage design. The new design allows for an ease of serviceability to the undercarriage which lowers the cost of operation and in time provides undercarriage longevity.

Heater core - Remove

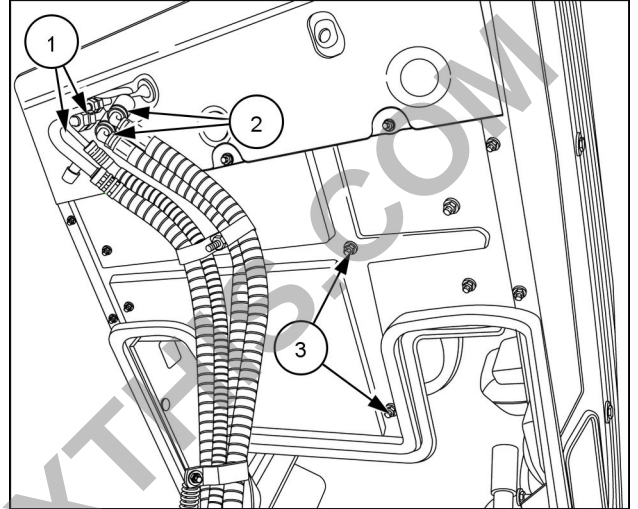
Prior operation:

Tilt the cab. Please see **Cab tilting system - Tilt (90.150)**

Prior operation:

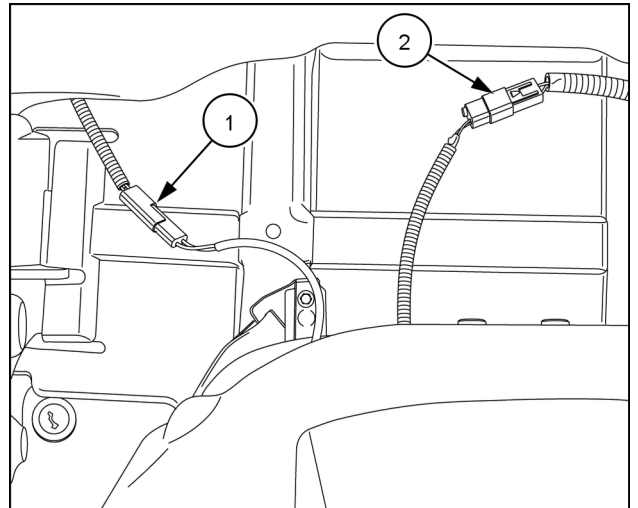
Discharge the A/C (if applicable). Please see **Air conditioning - Discharging (50.200)**.

1. Detach the heater hoses (2) from the heater core.
2. Detach the A/C lines (1) from the evaporator (if applicable).
3. Remove the nuts (3), and detach the seat from the cab.



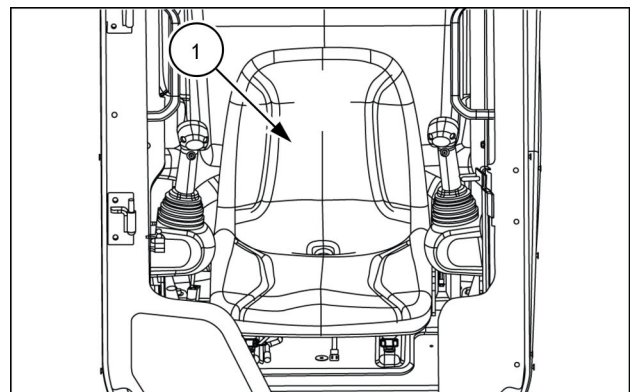
RAIL15SSL0042BA 1

4. Carefully lower the cab. Please see **Cab tilting system - Lower (90.150)** for assistance.
5. Disconnect the seat switch (2) from the wiring harness.
6. Disconnect the seat belt switch (if applicable) (1) from the wiring harness.



RAIL15SSL0041BA 2

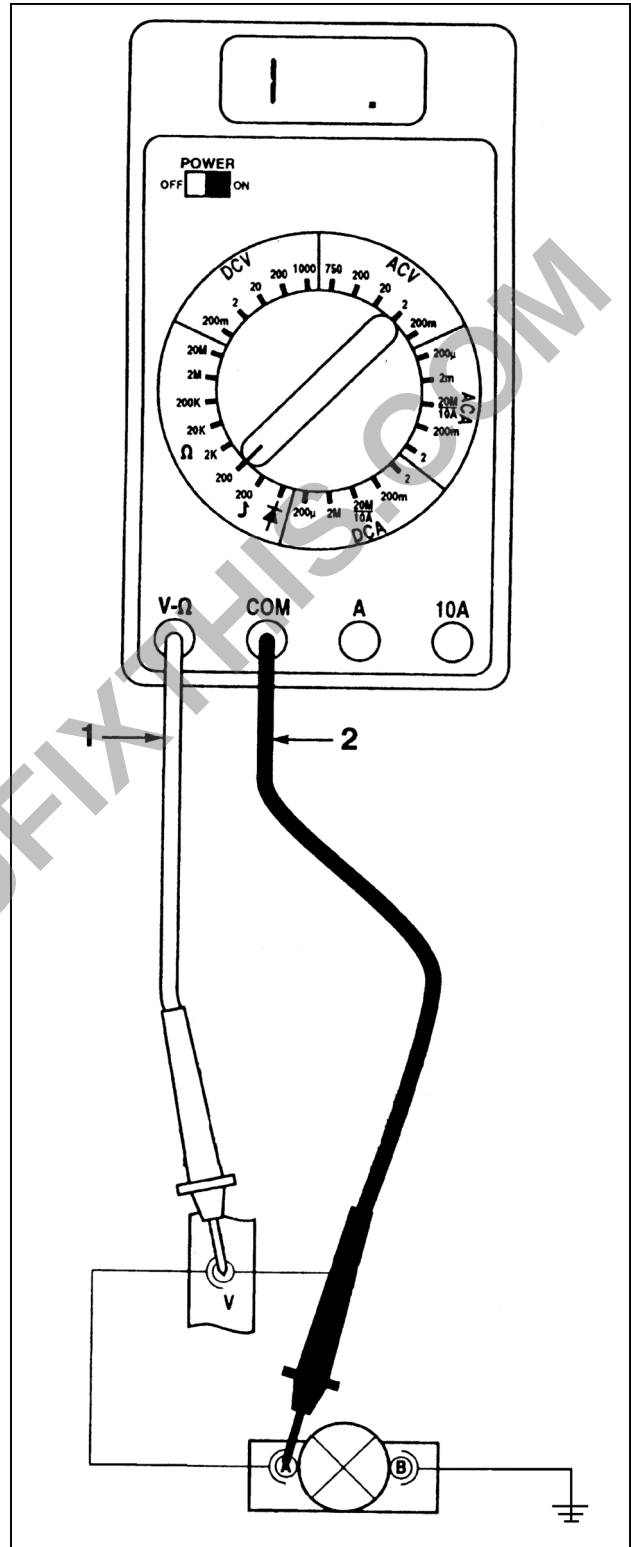
7. Remove the seat (1) from the cab.



93109313 3

3. Set meter to measure resistance or ohms, and measure circuit resistance as illustrated. Use the red meter lead (1) to touch the connector pins, one pin at a time, and avoid contact with the case of metal connectors. Use the black lead (2) to make contact with the connector pin at the other end of the circuit. Avoid contact with other pins in the connector and the connector case, if it is metal.

NOTE: Testing continuity from one connector to another is often not possible given the distance between the connectors. The alternate method used in this service manual requires the use of a jumper wire. Attach the jumper wire between the specified pin in one of the connectors and chassis (frame) ground. Use the red lead of the multi-meter to touch the specified pin of the other connector and touch the black lead to chassis (frame) ground. Using chassis (frame) ground as an integral part of the continuity test requires good electrical contact with the metal frame (chassis). Paint and contaminants serve as insulators and reduce the effectiveness of the electrical connection. If possible use frame (chassis) ground points already established for the black lead and one end of the jumper wire.



26093637 1

4. Determine if measured resistance falls within guidelines specified in the procedure. If the resistance is no more than **3 – 4 ohms**, the circuit is continuous. More resistance usually indicates dirty or corroded terminals in connectors, and **100k ohms** or greater indicates an open circuit.

Harnesses and connectors - Overview

Electrical failure modes

Short Circuit

A short circuit is a connection of comparatively low resistance between two points in an electrical circuit. Typically, when a higher source (positive supply) short circuits to a ground circuit or a frame ground, it causes the circuit protection device, e.g. a fuse, to open and protect the wiring from damage. However, a short circuit can cause damage to the wiring and machine. This damage can occur if a circuit is not properly protected with a circuit protection device. The amount of current allowed to flow through a wire due to a short circuit can cause the wire to overheat. This heat melts the insulation around the wire, adjacent wires, and may lead to a fire. Proper fusing reduces or eliminates damage to the machine resulting from a short circuit. A short circuit may result when a cut, pinched or chafed wire makes contact with a grounded component of the vehicle.

Open Circuit

An open circuit is a loss of connection between two points in a circuit. This condition creates infinite resistance between two circuits and usually results in the malfunction of an electrical component.

An open circuit may result from:

- Pinched/cut wire(s)
- Terminal(s) improperly seated in a connector
- Poor/improper crimping
- Corroded terminal(s)
- Improperly connected Faston connector/ring terminal

Intermittent Circuit

An Intermittent circuit is a condition in the circuit that caused random or repeated failures, and is usually caused by repeatedly opens or shorts in the circuit. In other words, the circuit makes and breaks contact intermittently.

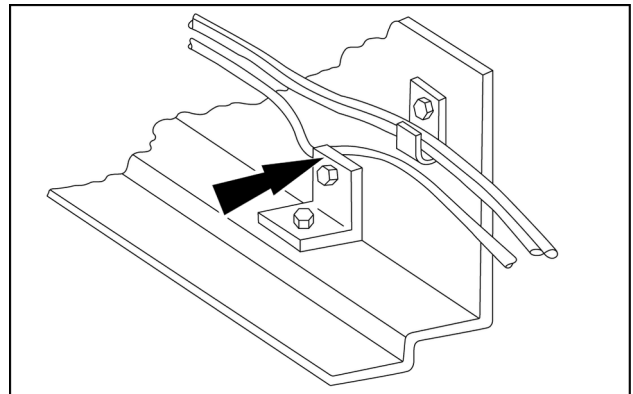
An intermittent circuit may be caused by:

- Pinched wire
- Loose ring terminal
- Improper seating of terminal(s) in a connector
- Incomplete mating of connectors
- Corroded terminals

Examples of common electrical problems

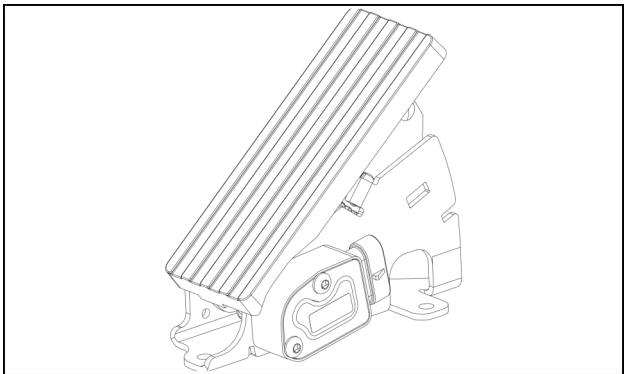
Short circuit

- The wires are pinched between two objects, e.g. a frame and bracket.



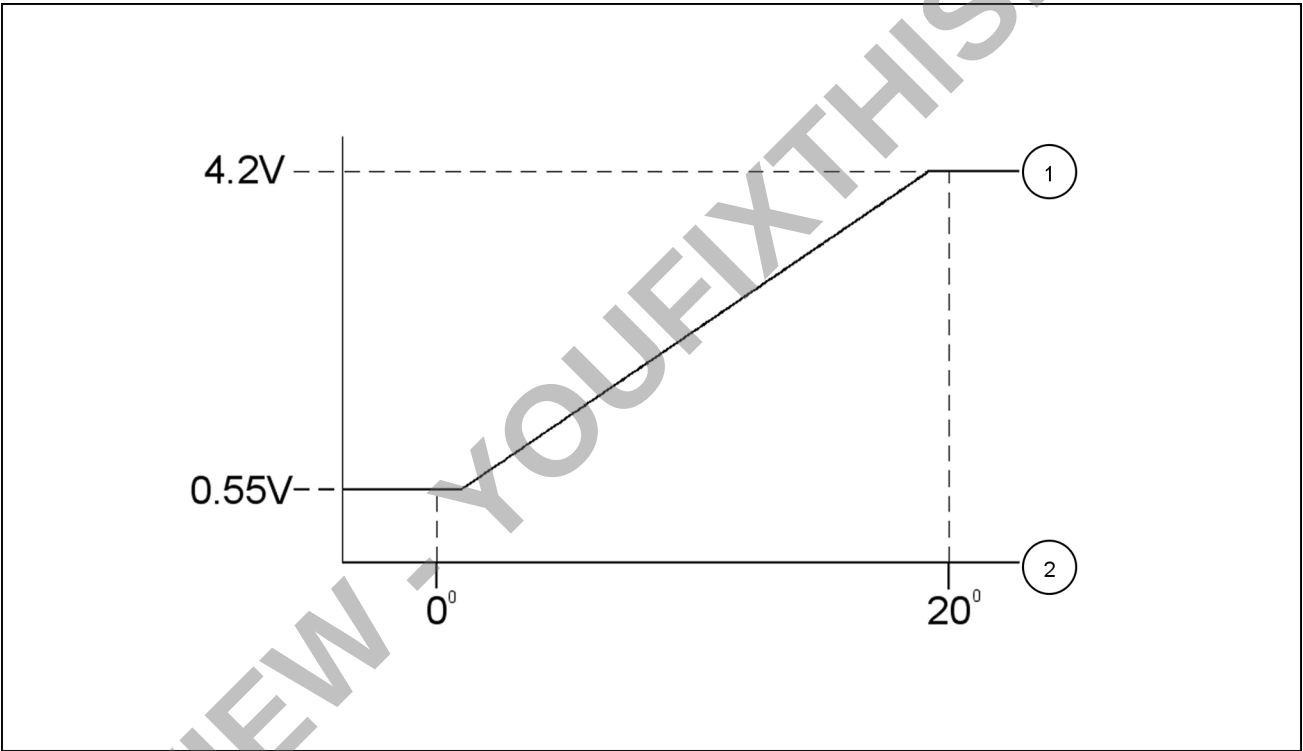
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Throttle pedal - Overview



RAIL17SSL0174AA 1

Foot Throttle Assembly



RCPH10TLB053FAM 2

Signal Voltage from the Foot Throttle Sensor

Throttle Signal Legend	
(1)	Throttle Signal Voltage
(2)	Throttle movement in degrees of travel. 0° equals low idle. 20° equals WOT (Wide Open Throttle).

Disconnect the foot throttle position sensor from the harness.

Disconnect the instrument cluster connector **X-C23 (Male)** .

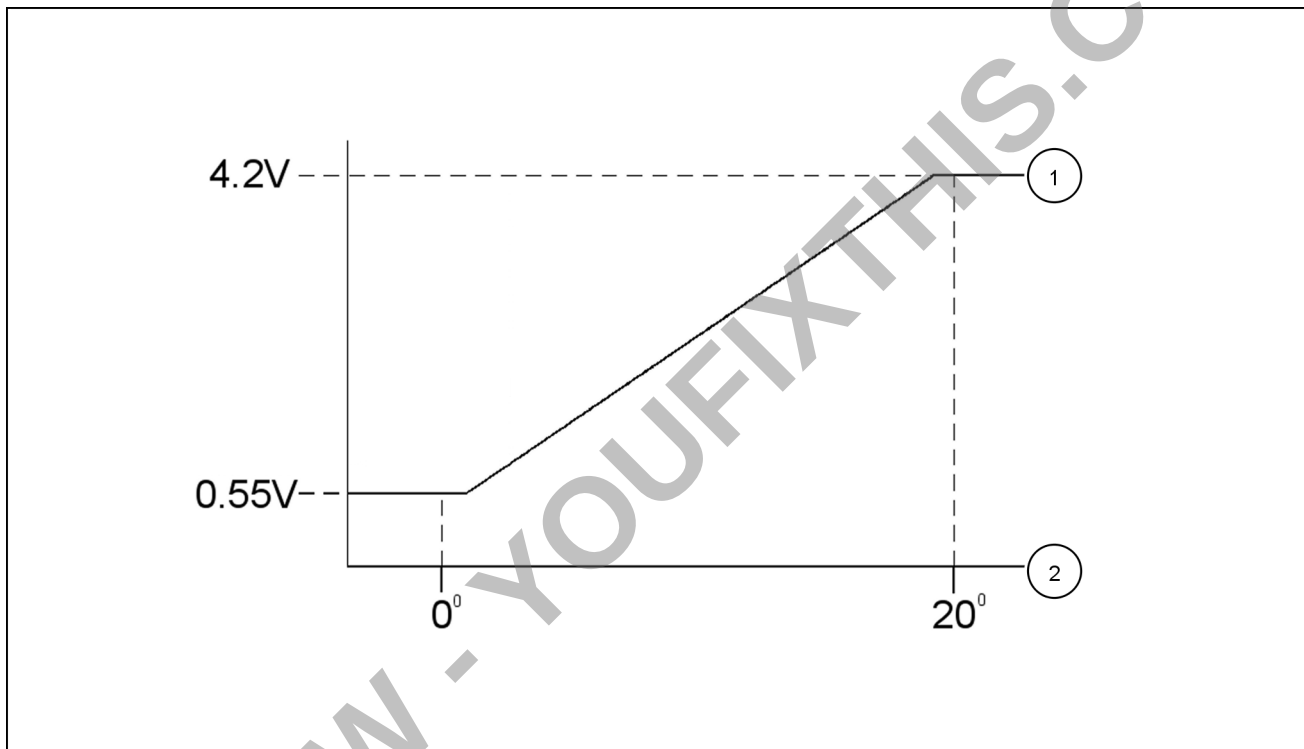
Turn the ignition switch ON.

Measure the voltage between **X-20 (Female) pin A** and chassis ground. The voltage should be less than **0.5 V**. Wiggle the harness during measurement to reveal an intermittent condition.

A. The voltage is less than **0.5 V**. Go to step 5.

B. The voltage is greater than **0.5 V**. There is a short circuit to another voltage source. Repair or replace the wire as required. Return to step 1 to confirm elimination of the fault.

5. Check the signal voltage from the sensor.



RCPH10TLB053FAM 1

Throttle Signal Legend	
(1)	Throttle Signal Voltage
(2)	Throttle movement in degrees of travel. 0° equals low idle. 20° equals WOT (Wide Open Throttle).

This step is used to monitor the throttle signal. The sensor must be connected and active in order to continue. The dealer must build a breakout harness as shown below.

Connect the breakout harness between the foot throttle sensor and the instrument cluster or slide back probes into pin A and pin B.

Turn the ignition switch ON, engine OFF.

Measure the voltage between pin A and pin B. Move the throttle from low idle to WOT (wide open throttle). The voltage should change from approximately **0.55 V** at low idle to **4.2 V** at WOT.

A. The voltage changed from approximately **0.55 V** to **4.2 V**. Go to step 6.

B. The voltage did not change from **0.55 V** to **4.2 V** as the throttle moved from low idle to WOT or the voltage was less than **0.55 V**. Temporarily replace the sensor and retest. Return to step 1 to confirm elimination of fault.

6. Measure the throttle signal from the sensor to the instrument cluster.

Arm - Repair

When the pivot pins fail or the retaining hardware for the bucket release device or the bucket cylinders is loose for an extended period of time, the tapered hole in the bosses become damaged and requires replacement. In this procedure, you will find directions for replacing the upper and lower bosses on the loader arm. Bosses are to be replaced only one at a time. Do not attempt to replace more than one boss at the same time. You will not be able to use the boss alignment tool, part number **380100288**, which is required for this procedure if you attempt to replace more than one boss at a time. All welding procedures are to be performed by a certified welder. Protect your work area from moisture, low temperatures, and excessive wind when repairing the bosses on the loader arm.

Prior operation:

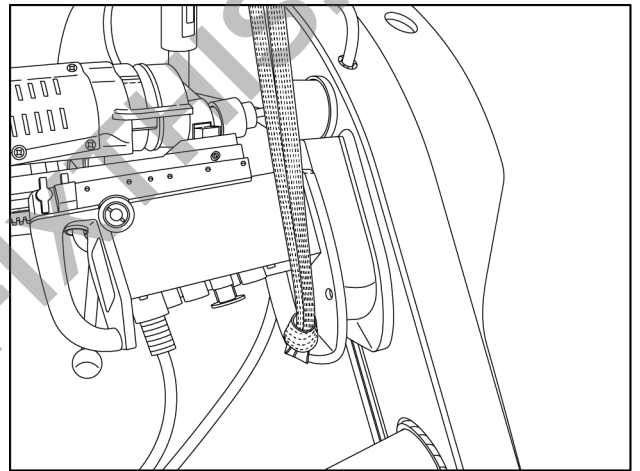
Bucket release device - Remove (82.300)

Prior operation:

Remove the bucket cylinders.

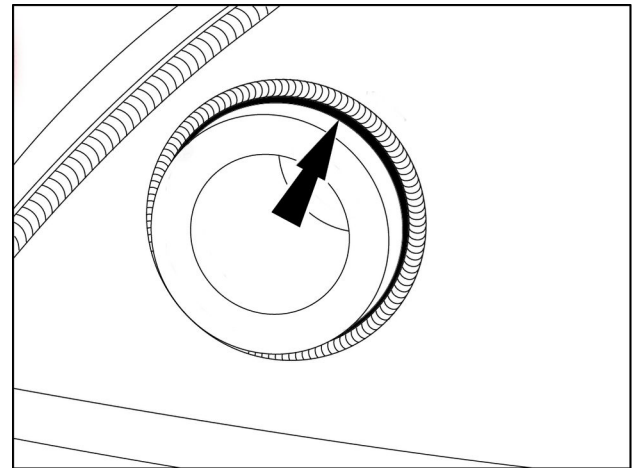
Upper boss repair

1. Attach a magnetic hole drill to the loader arm.



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2. Cut the welds that attach the boss to the loader arm.

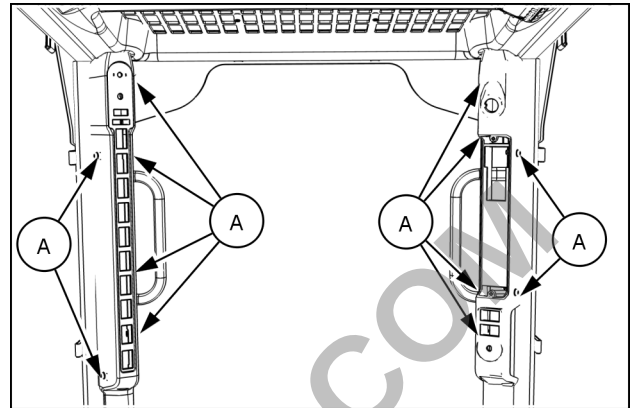


RAIL14SSL0304BA 2

Cab headliner - Remove

1. Remove the console screws (**A**), six per side, on the right-hand and the left-hand sides of the cab. Retain the screws (**A**) for reassembly. See Figure 1 for detail.

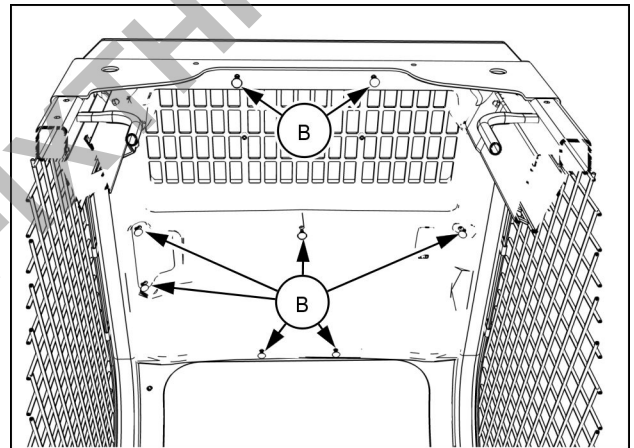
NOTE: Allow the consoles to hang down so that the headliner may be removed.



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Cab radio not installed

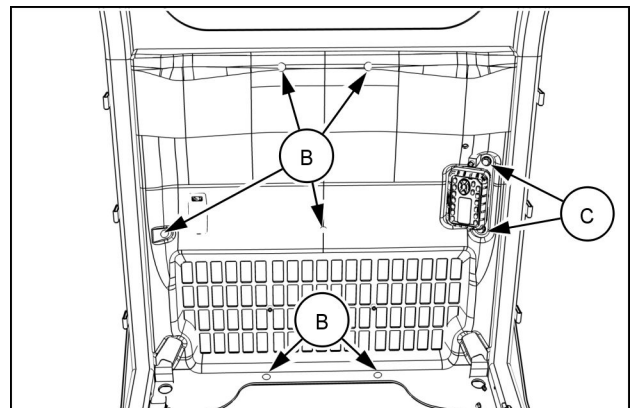
1. Remove the eight push-in fasteners (**B**) from the headliner of the cab.
2. Lower the headliner and remove from the cab.



RAPH15SSL0211BA 2

Cab radio installed

1. Remove the six push-in fasteners (**B**), and the two bolts (**C**) securing the radio to the cab.
2. Lower the headliner and disconnect any further electrical connections. Remove the headliner from the cab.



RAPH15SSL0209BA 3



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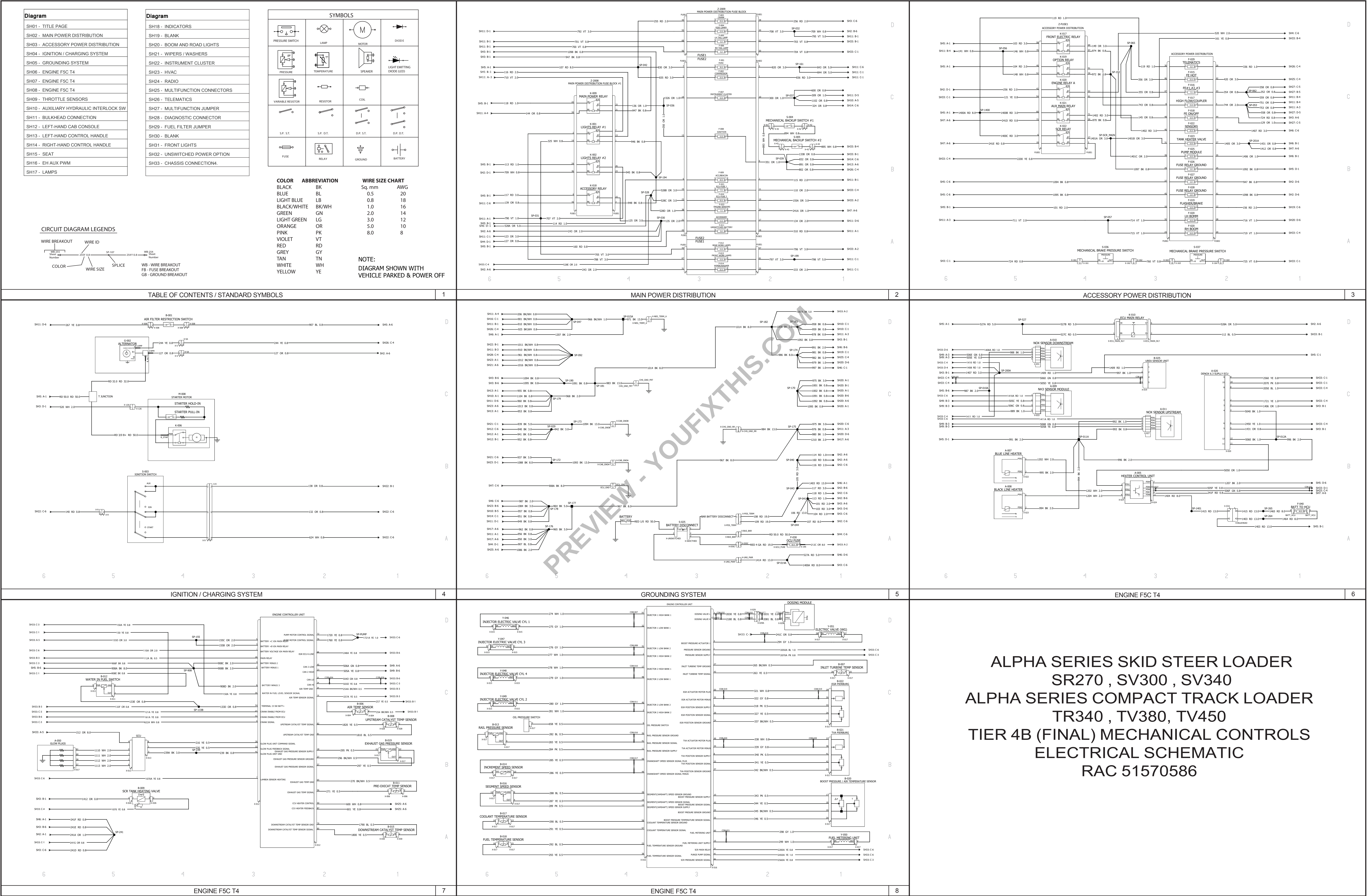
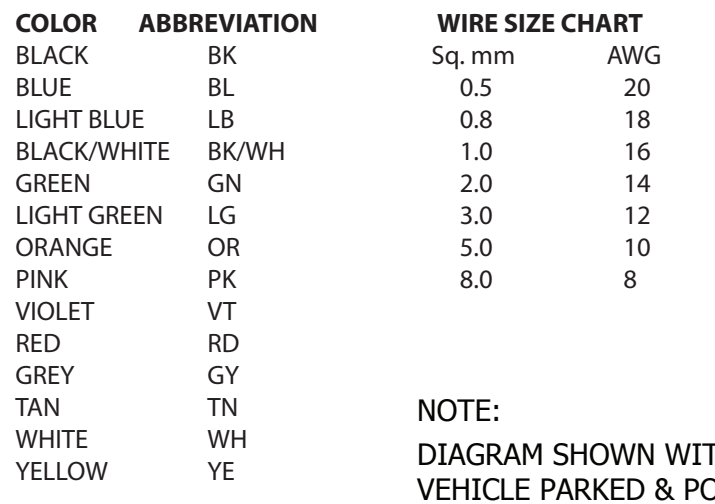
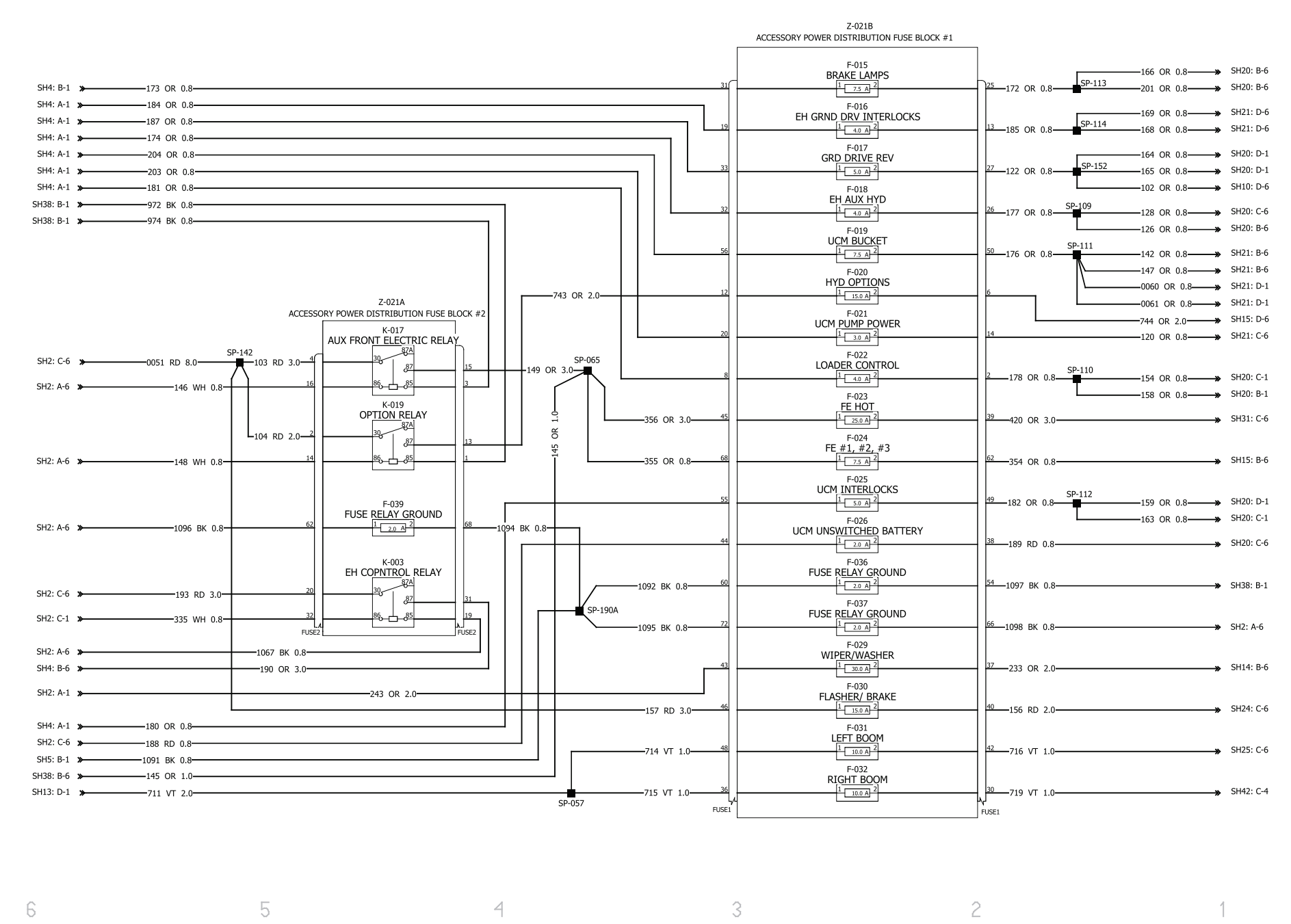
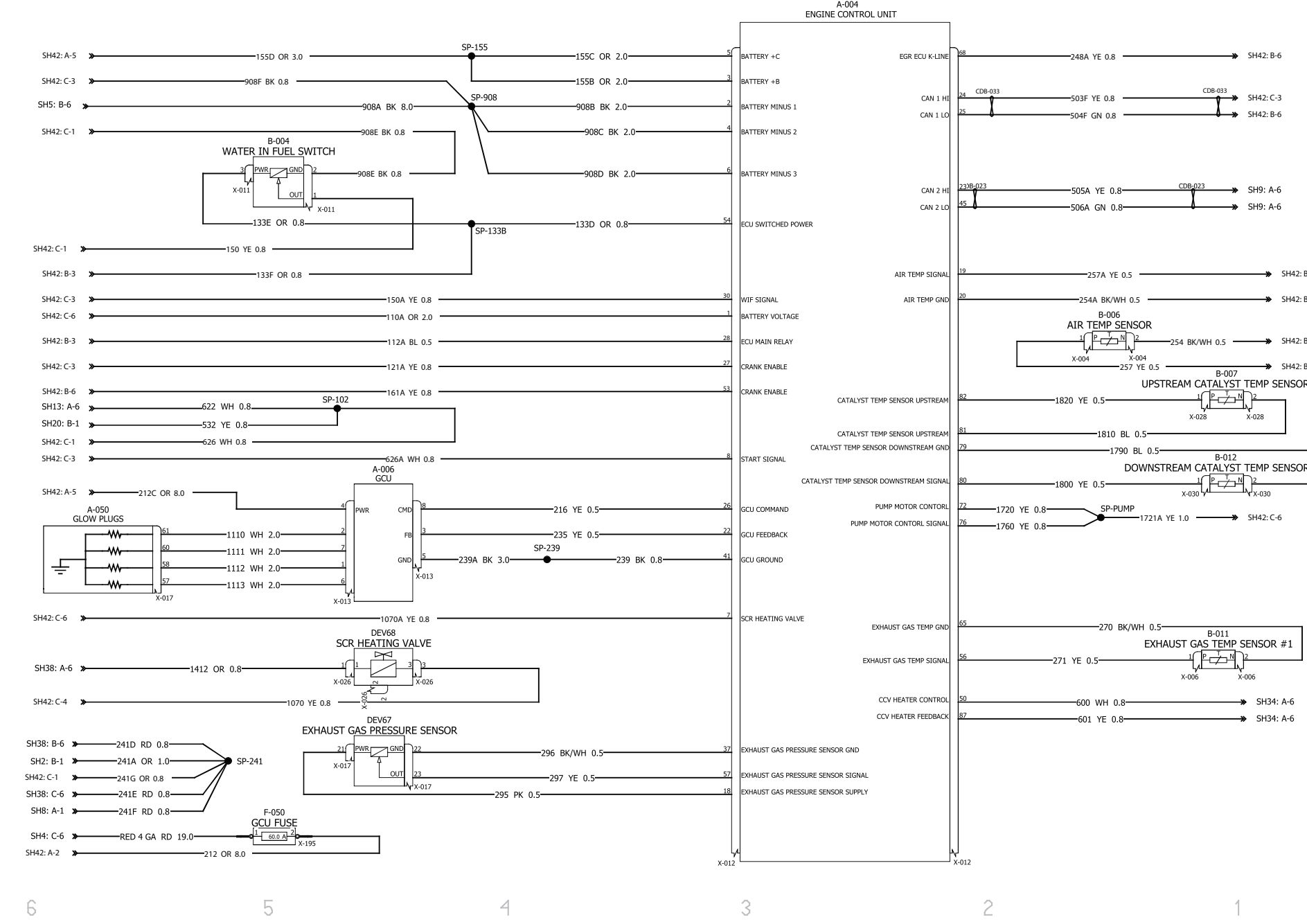
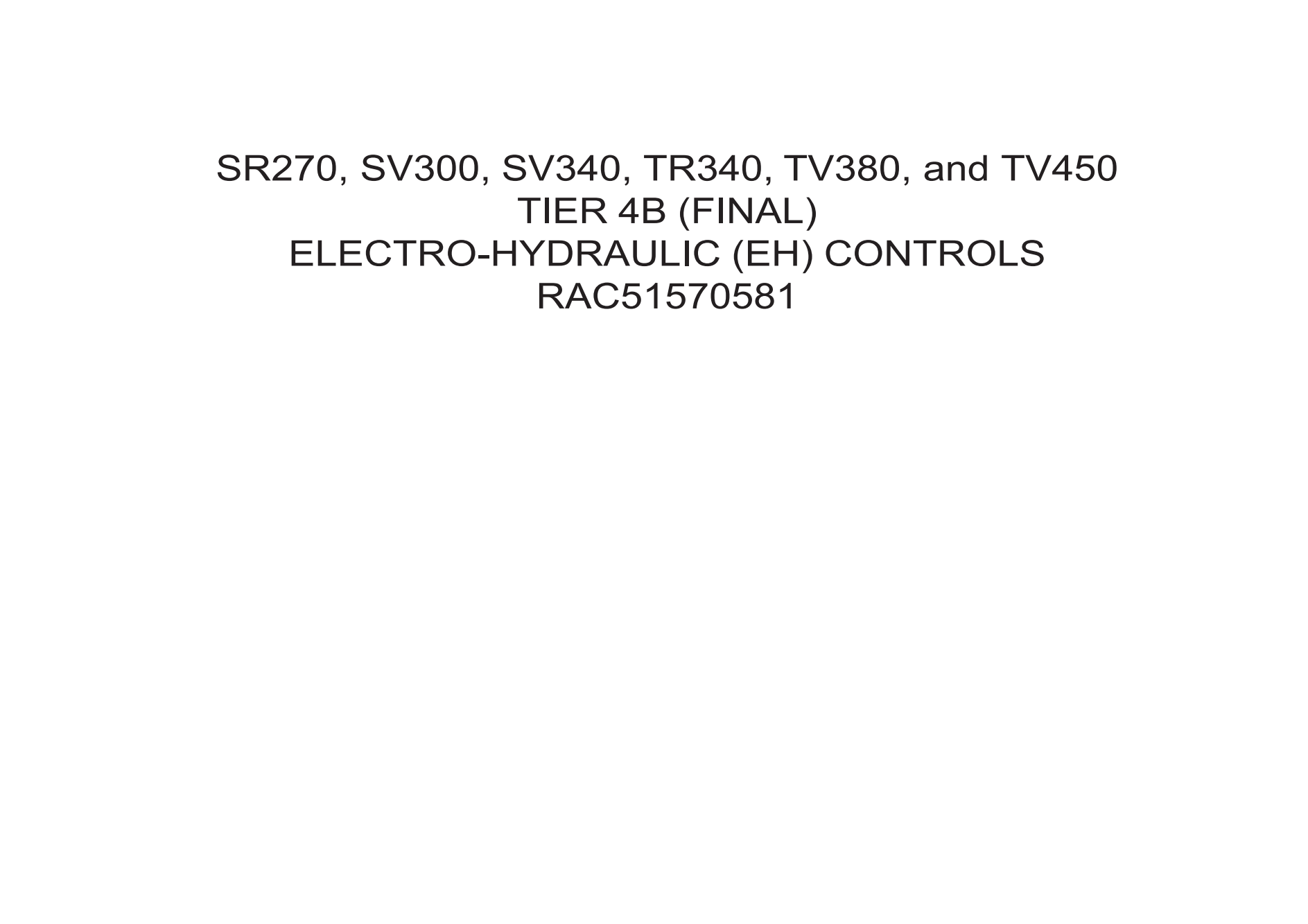


Diagram
SH22 - LAMPS
SH23 - INDICATORS
SH24 - BLANK
SH25 - BOOM AND ROAD LIGHTS
SH26 - WIPERS / WASHERS
SH27 - INSTRUMENT CLUSTER
SH28 - HVAC
SH29 - RADIO
SH30 - UJM CONNECTORS
SH31 - MULTIFUNCTION CONNECTORS
SH32 - TELEMATICS
SH33 - EHF
SH34 - MULTIFUNCTION JUMPER
SH35 - 2ND AUX
SH36 - DIAGNOSTIC CONNECTOR
SH37 - FUEL FILTER JUMPER
SH38 - POWER DISTRIBUTION
SH39 - FRONT LIGHTS
SH40 - BLANK
SH41 - UNSWITCHED POWER OPTIONS
SH42 - CHASSIS INTERCONNECTION



ACCESSORY POWER DISTRIBUTION

ENGINE F5C T4

RAC51570581S1S1

SINGLE-SPEED AND TWO-SPEED
MECHANICAL VALVE ASSEMBLY

RAC 51570577

SR130 / SR150 / SR160

SR175 / SV185 / SR200

SR210 / TR270 / TR310

NOTES:

1 FLUSHING VALVE
-10 BAR SPRINGS
-2 mm FLUSHING ORIFICE
-290 PSI (20BAR) CUTOFF RELIEF

2 LOAD CHECK REMOVED IF HIGH FLOW INSTALLED.

3 IN-LINE ORIFICE AT MANIFOLD BLOCK FOR VERTICAL
MACHINES ONLY.

4 LIFT CYLINDERS ARE CUSHIONED FOR VERTICAL
FRAME MACHINES ONLY.

Auxiliary Pump
Non-Reg Tier 4
34.1cc 36.6cc -F5C
24.9cc 27.8cc -ISM Med Frm
20.4cc 23.7cc -ISM Sml Frm

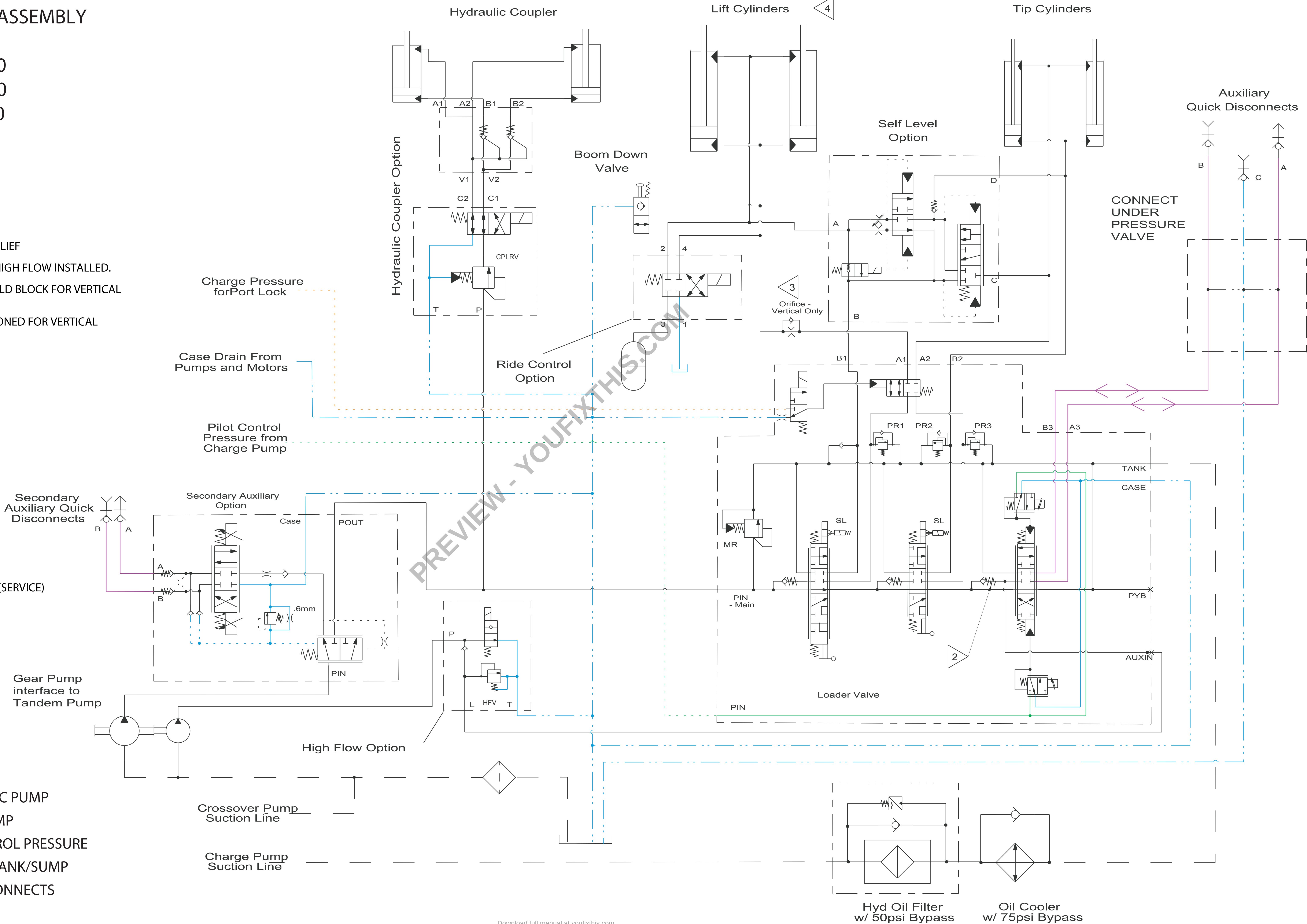
High Flow Pump (as applicable)
Non-Reg Tier 4
18.3cc 20.4cc -F5C 61-67kW
12.5cc 13.7cc -F5C 55kW
12.5cc 13.7cc -ISM Med Frm
Not Avail on Sml Frm

RELIEF PRESSURE TABLE

MAIN 3046 PSI ± 72.5 (210 BAR)
PR1- 3263 PSI +145/-73 (225 BAR)
PR2- 3236 PSI +145/-73 (225 BAR)
PR3- 3771 PSI +145/-73 (260 BAR)
PR3- OPTIONAL 80 BAR OR 100 BAR (SERVICE)
HFV- 3250 PSI (224 BAR)
CPLRV- 2500 PSI (172 BAR)

- HYDROSTATIC PUMP
- CHARGE PUMP
- PILOT CONTROL PRESSURE
- RETURN TO TANK/SUMP
- QUICK DISCONNECTS

MECHANICAL VALVE ASSEMBLY

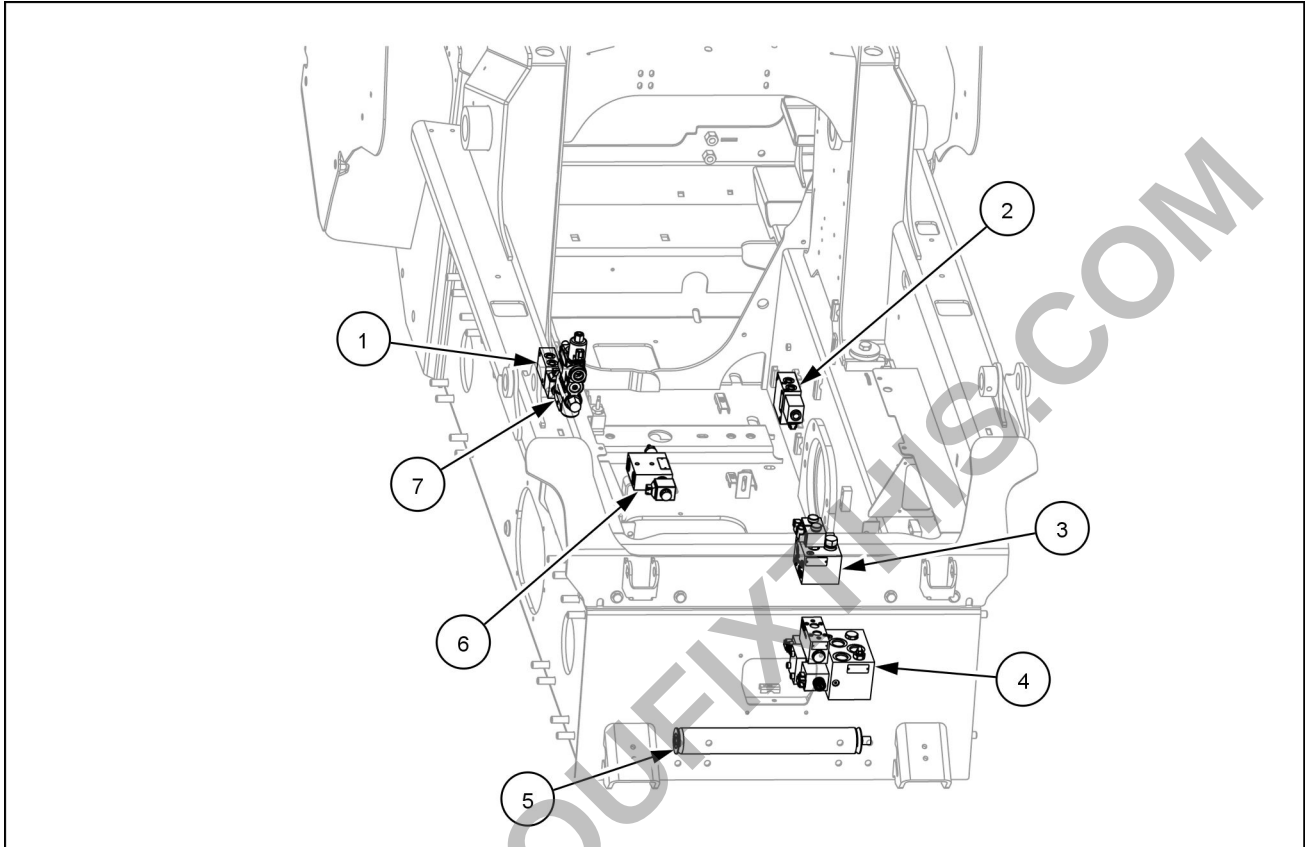


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Loader bucket self-leveling controls - Component localization - Valve

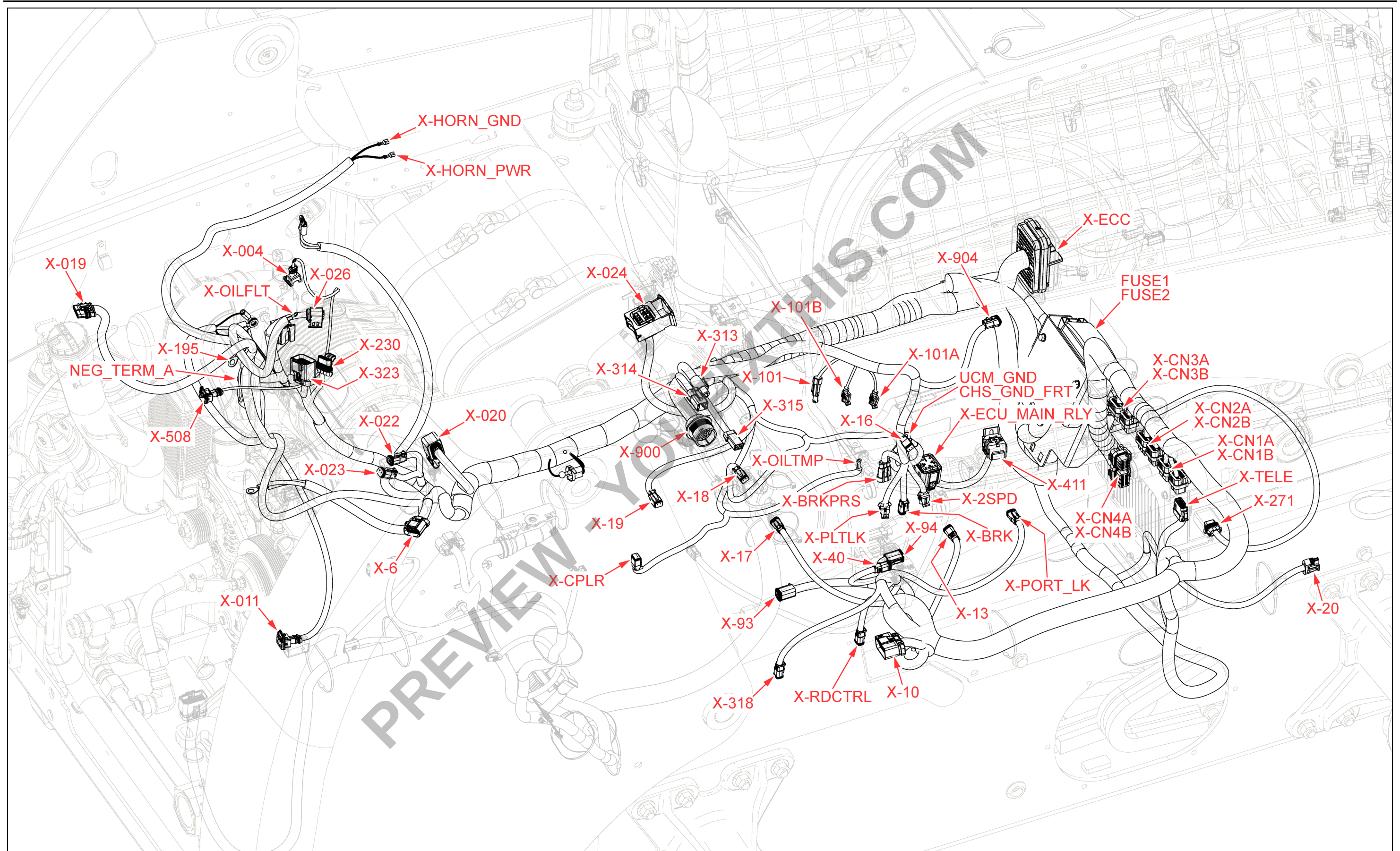


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Valve location

Valve identification

(1) Ride control valve	(3) Loader pilot interlock, brake, two speed valve	(5) Accumulator	(7) Self-leveling valve
(2) Hydraulic coupler valve	(4) Second auxiliary valve	(6) High flow valve	



Electrical components - Ground description

TV450 TIER 4B (FINAL) [NHM435463 -]

NA (Mechanical hydraulic controls)

GND-001 - (Ground)

Component Type	Ground
Wiring frames	SHEET 05 Grounding System

GND-002 - (Ground)

Component Type	Ground
Wiring frames	SHEET 05 Grounding System

GND-003 - (Ground)

Component Type	Ground
Wiring frames	SHEET 32 Unswitched Power Option

GND-006 - (Ground)

Component Type	Ground
Wiring frames	SHEET 11 Bulkhead Connection

GND-007 - (Ground)

Component Type	Ground
Wiring frames	SHEET 05 Grounding System

GND-008 - (Ground)

Component Type	Ground
Wiring frames	SHEET 04 Ignition / Charging System

GND-009 - (Ground)

Component Type	Ground
Wiring frames	SHEET 05 Grounding System

GND-012 - (Ground)

Component Type	Ground
Wiring frames	SHEET 11 Bulkhead Connection

GND-019 - (Ground)

Component Type	Ground
Wiring frames	SHEET 05 Grounding System

GND-020 - (Ground)

Component Type	Ground
Wiring frames	SHEET 05 Grounding System

3253 (DTC E41D) - ECU internal failure - Voltage ratio in ADC monitoring

Context:

The Engine Control Unit (ECU) monitors the efficiency of the Analog to Digital Converter (ADC) using a voltage ratio conversion test. The will count each time the voltage ratio is out of the desired range. If the count exceeds 15 times, this fault will occur.

Solution:

1. Check the ECU for the appropriate software and re-flash, if necessary.
 - A. If the fault has been resolved, return the machine to service.
 - B. If the fault has not been resolved, escalate an ASIST concern.

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17309 (DTC 7D67) - EGR valve control circuit low side shorted to ground

NOTE: Because the Engine Control Unit (ECU) stores historical data relevant to the operation of the Exhaust Gas Recirculation (EGR) valve, it is necessary to perform the "Replacement of the Exhaust Gas Recirculation Valve (EGR) – Reset ECU Data" with the Electronic Service Tool (EST), if the EGR valve is replaced. Refer to the engine service manual **Exhaust Gas Recirculation (EGR) valve - Configure - Reset ECU data (EGR valve) (10.501)**, if necessary.

Context:

The Engine Control Unit (ECU) internally monitors the operation of the H-bridge Pulse Width Modulated (PWM) control circuit for the Exhaust Gas Recirculation (EGR) valve actuator for electrical defects. If the ECU detects a short circuit of the circuit wiring to chassis ground, this fault will occur. For information regarding the functional operation of the EGR valve, refer to the engine service manual **Exhaust Gas Recirculation (EGR) valve - Overview (10.501)**. For more information regarding the technical specifications of the EGR valve, refer to the engine service manual **Exhaust Gas Recirculation (EGR) valve actuator - Technical Data (55.989)**.

Cause:

The ECU is sensing a short to chassis ground condition in the EGR valve motor actuator control circuit.

Possible failure modes:

1. Faulty EGR valve motor, failed internally.
2. Faulty EGR valve circuit wiring, shorted to chassis ground.
3. Faulty ECU, software.

Solution:

1. Verify that the fault is present and active.

Use the Electronic Service Tool (EST) to check the status of this fault.

A. If the fault is present and active, continue with step 2.

B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Continue with step 6.

2. Check the EGR valve motor actuator for a short to ground condition.

Disconnect the EGR valve.

Use a multimeter to check on the component for a grounded condition :

From	To	Result
EGR valve pin 5	Chassis ground	There should be no continuity.

A. If there is no continuity, leave the EGR valve disconnected and continue with step 3.

B. If there is continuity, the EGR valve motor has failed internally, replace the EGR valve. Then use the EST, refer to the engine service manual **Exhaust Gas Recirculation (EGR) valve - Configure - Reset ECU data (EGR valve) (10.501)** if necessary, to perform the "Replacement of the Exhaust Gas Recirculation Valve (EGR) – Reset ECU Data".

3. Check the EGR valve motor actuator control circuit for a short to ground condition.

With the key switch in the OFF position, use a multimeter to check for continuity in the harness :

From	To	Result
EGR valve connector pin 5	Chassis ground	There should be no continuity.

A. If there is continuity, continue with step 4.

B. If there is no continuity, continue with step 5.

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