

# SERVICE MANUAL

**Guardian™ SP.240R**

**Guardian™ SP.275R**

**Tier 3**

**Sprayer**

*PINYDYM00602 and above*

**Part number 47657030**

1<sup>st</sup> edition English

April 2014



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## INTRODUCTION

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## Personal safety

### **⚠ WARNING**

**Maintenance hazard!**

**Before you start servicing the machine, attach a DO NOT OPERATE warning tag to the machine in a visible area.**

**Failure to comply could result in death or serious injury.**

W0004A

Attach a DO NOT OPERATE (TAG) to the machine in an area that is clearly visible whenever the machine is not operating properly and/or requires service.

Complete the tag information for the "REASON" the tag is attached by describing the malfunction or service required. Validate the reason for attaching the tag by signing your name in the designated area on the tag.

The tag should only be removed by the person who signed and attached the tag, after validating the repairs or services have been completed.

|     |                                                              |                                                   |     |
|-----|--------------------------------------------------------------|---------------------------------------------------|-----|
| (A) |                                                              |                                                   | (D) |
| (B) | <p>See Other Side</p>                                        | <p>REASON</p> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> | (E) |
| (C) | <p>CNH Part Number<br/>87358697</p> <p>Printed in U.S.A.</p> | <p>Signed by</p> <hr/>                            | (F) |

87358697 1

### Tag Components

- A. DO NOT REMOVE THIS TAG! - (Warning) The tag should only be removed by the person who signed and attached the tag, after validating the repairs or services have been completed.
- B. See Other Side - (Reference to additional information on opposite side of the tag.)
- C. CNH Part Number - (Request this part number from you Service Parts Dealer to obtain this DO NOT OPERATE tag.)
- D. DO NOT OPERATE - (Warning!)
- E. REASON - (Area for describing malfunction or service required before operation.)
- F. Signed by - (Signature area - to be signed by the person validating the reason for installation of the tag.)

## Torque - Minimum tightening torques for normal assembly

|         |  |
|---------|--|
| SP.240R |  |
| SP.275R |  |

### METRIC NON-FLANGED HARDWARE

| NOM.<br>SIZE | CLASS 8.8 BOLT and<br>CLASS 8 NUT |                     | CLASS 10.9 BOLT and<br>CLASS 10 NUT |                      | LOCKNUT<br>CL.8<br>W/CL8.8<br>BOLT | LOCKNUT<br>CL.10<br>W/CL10.9<br>BOLT |
|--------------|-----------------------------------|---------------------|-------------------------------------|----------------------|------------------------------------|--------------------------------------|
|              | UNPLATED                          | PLATED<br>W/ZnCr    | UNPLATED                            | PLATED<br>W/ZnCr     |                                    |                                      |
| M4           | 2.2 N·m (19 lb in)                | 2.9 N·m (26 lb in)  | 3.2 N·m (28 lb in)                  | 4.2 N·m (37 lb in)   | 2 N·m (18 lb in)                   | 2.9 N·m (26 lb in)                   |
| M5           | 4.5 N·m (40 lb in)                | 5.9 N·m (52 lb in)  | 6.4 N·m (57 lb in)                  | 8.5 N·m (75 lb in)   | 4 N·m (36 lb in)                   | 5.8 N·m (51 lb in)                   |
| M6           | 7.5 N·m (66 lb in)                | 10 N·m (89 lb in)   | 11 N·m (96 lb in)                   | 15 N·m (128 lb in)   | 6.8 N·m (60 lb in)                 | 10 N·m (89 lb in)                    |
| M8           | 18 N·m (163 lb in)                | 25 N·m (217 lb in)  | 26 N·m (234 lb in)                  | 35 N·m (311 lb in)   | 17 N·m (151 lb in)                 | 24 N·m (212 lb in)                   |
| M10          | 37 N·m (27 lb ft)                 | 49 N·m (36 lb ft)   | 52 N·m (38 lb ft)                   | 70 N·m (51 lb ft)    | 33 N·m (25 lb ft)                  | 48 N·m (35 lb ft)                    |
| M12          | 64 N·m (47 lb ft)                 | 85 N·m (63 lb ft)   | 91 N·m (67 lb ft)                   | 121 N·m (90 lb ft)   | 58 N·m (43 lb ft)                  | 83 N·m (61 lb ft)                    |
| M16          | 158 N·m (116 lb ft)               | 210 N·m (155 lb ft) | 225 N·m (166 lb ft)                 | 301 N·m (222 lb ft)  | 143 N·m (106 lb ft)                | 205 N·m (151 lb ft)                  |
| M20          | 319 N·m (235 lb ft)               | 425 N·m (313 lb ft) | 440 N·m (325 lb ft)                 | 587 N·m (433 lb ft)  | 290 N·m (214 lb ft)                | 400 N·m (295 lb ft)                  |
| M24          | 551 N·m (410 lb ft)               | 735 N·m (500 lb ft) | 762 N·m (560 lb ft)                 | 1016 N·m (750 lb ft) | 501 N·m (370 lb ft)                | 693 N·m (510 lb ft)                  |

**NOTE:** M4 through M8 hardware torque specifications are shown in pound-inches. M10 through M24 hardware torque specifications are shown in pound-feet.

## Engine and crankcase - Remove

|         |  |
|---------|--|
| SP.240R |  |
| SP.275R |  |

### **⚠ 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

### **⚠ CAUTION**

#### **Escaping fluid!**

Hydraulic fluid or diesel fuel leaking under pressure can penetrate the skin and cause infection or other injury. To prevent personal injury: Relieve all pressure before disconnecting fluid lines or performing work on the hydraulic system. Before applying pressure, make sure all connections are tight and all components are in good condition. Never use your hand to check for suspected leaks under pressure. Use a piece of cardboard or wood for this purpose. If injured by leaking fluid, see your doctor immediately.

Failure to comply could result in minor or moderate injury.

C0104A

### **⚠ WARNING**

Improper operation or service of this machine can result in an accident.

Before working on any component(s) of the electrical circuit, put the ignition key in the off (shut down) position. When disconnecting batteries, always disconnect the negative (-) cable first. When reconnecting batteries, always connect the negative (-) cable last.

Failure to comply could result in death or serious injury.

W0943A

### **⚠ WARNING**

Improper operation or service of this machine can result in an accident.

Before working on any part of the electrical system, disconnect the battery ground cable. Complete all electrical work before connecting the cable.

Failure to comply could result in death or serious injury.

W0137A

Move the sprayer to a hard and level surface.

Turn the sprayer key to the "OFF" position.

#### **Prior operation:**

Remove the hood **Engine hood - Remove (90.105)**.

#### **Prior operation:**

Remove the cooling package **Engine cooling system - Remove — Cooling package (10.400)**.

#### **Prior operation:**

Remove the fan and drive **Fan and drive - Remove — Fan (10.414)**.

#### **Prior operation:**

Remove the fan shroud **Fan and drive - Remove — Fan shroud (10.414)**.

#### **Prior operation:**

Remove the air cleaner assembly **Air cleaner - Remove — Air cleaner assembly (10.202)**.

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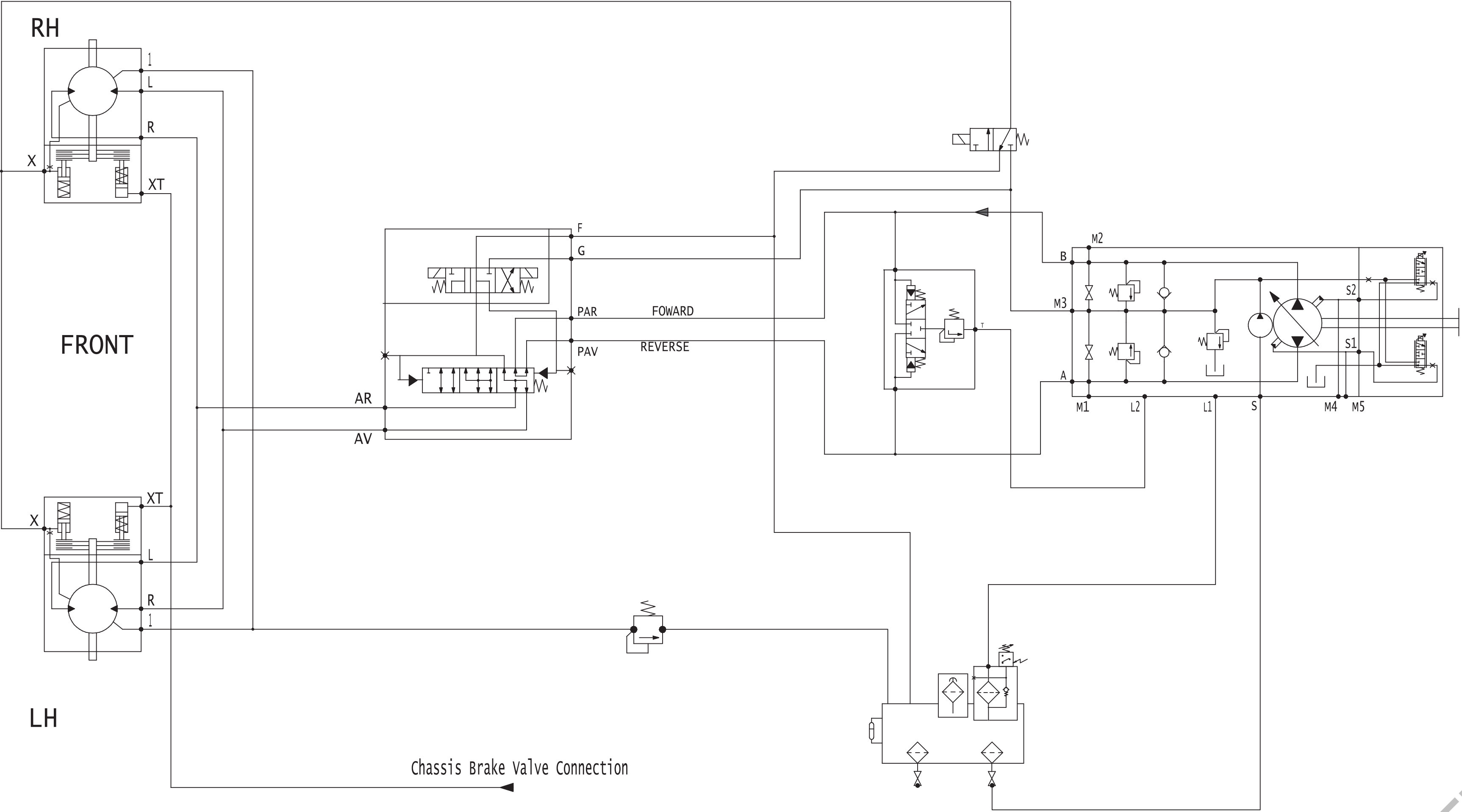
## Engine - 10

### Intake and exhaust manifolds and muffler - 254

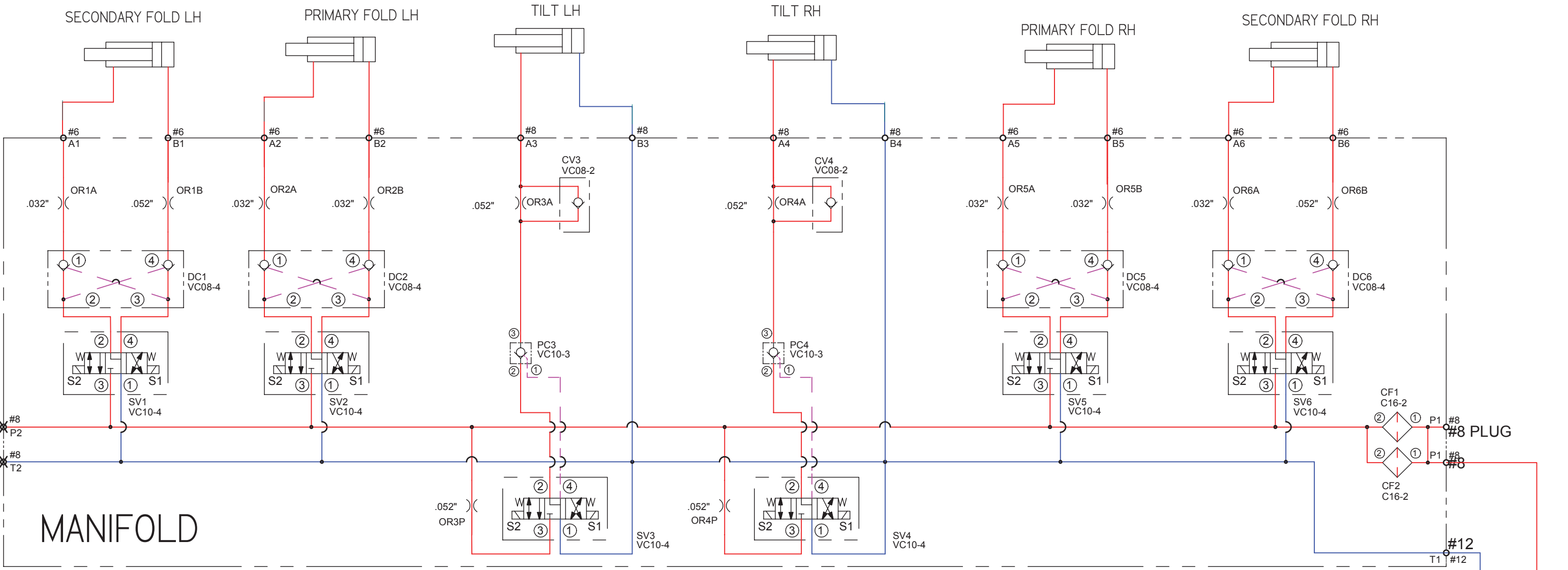
|                                                                    |   |
|--------------------------------------------------------------------|---|
| Exhaust pipes Exhaust stack - Install - Exhaust assembly (*) ..... | 5 |
| Exhaust pipes Exhaust stack - Remove - Exhaust assembly (*) .....  | 3 |

(\*) See content for specific models

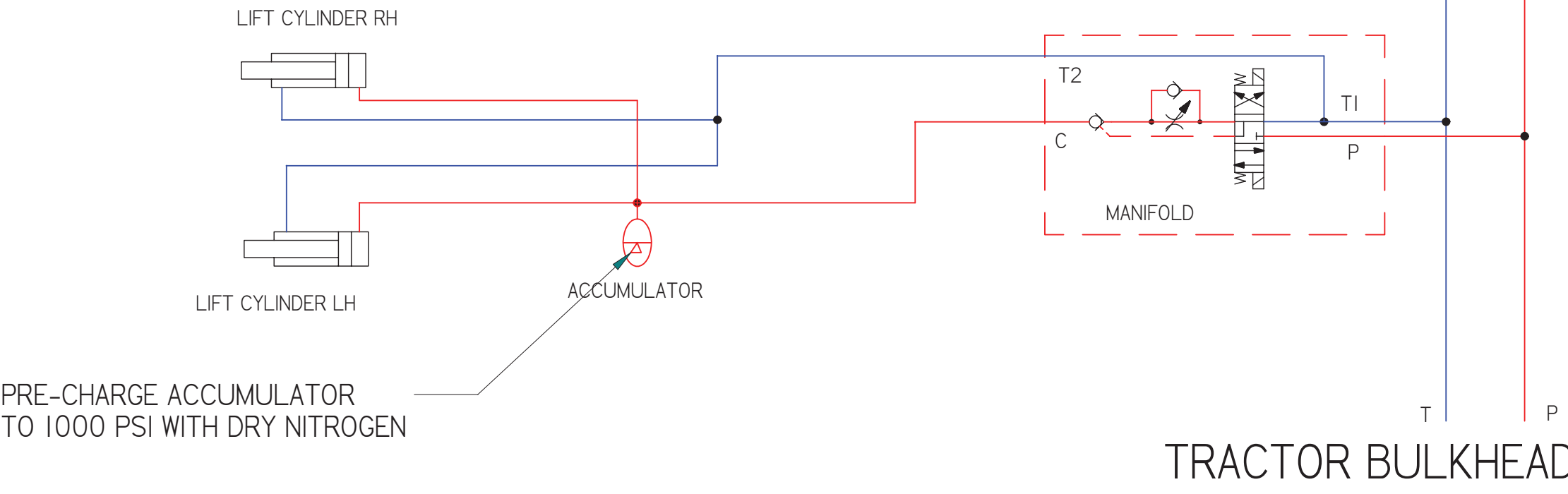
FRONT WHEEL ASSIST



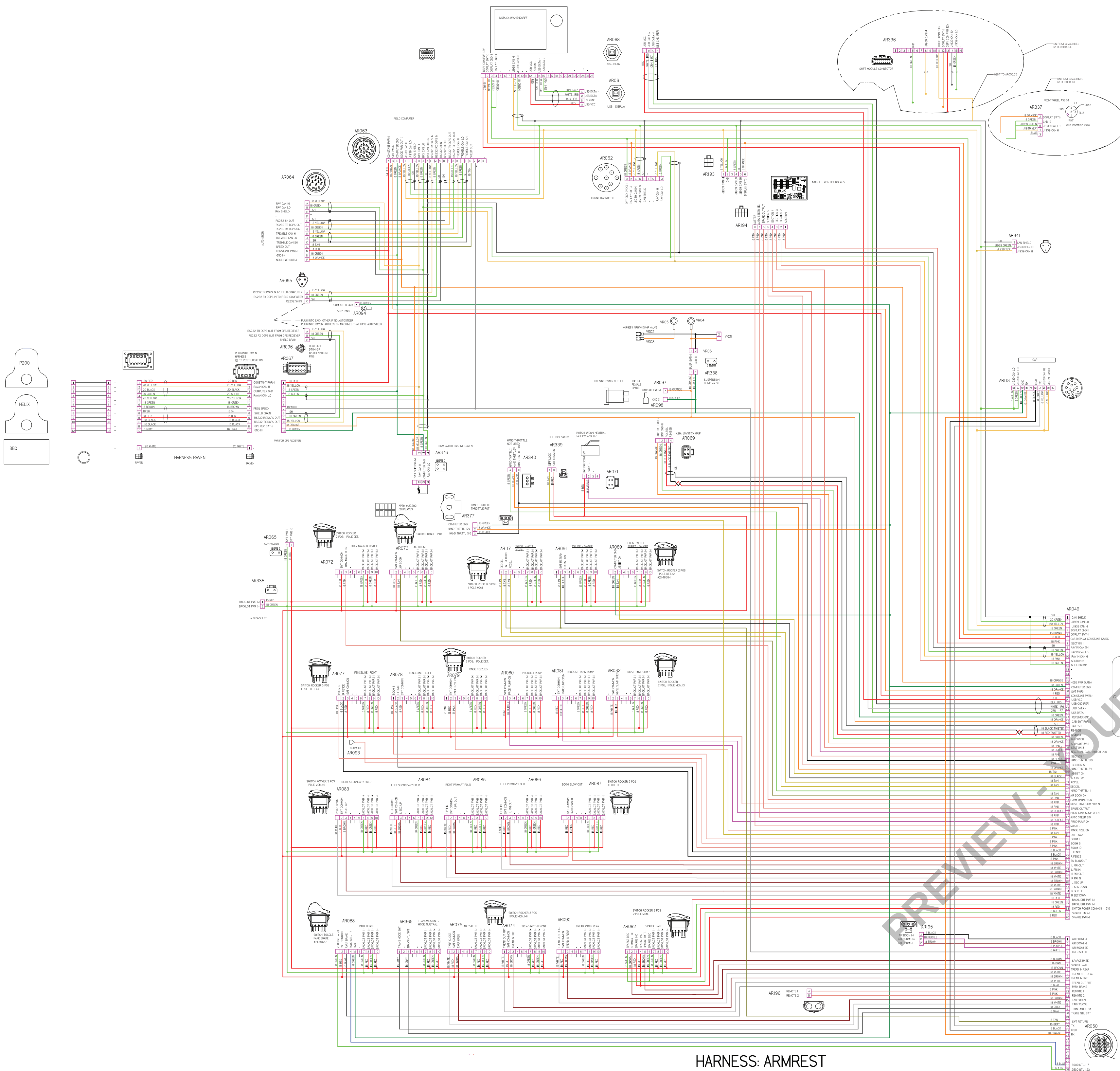
BOOM HYDRAULIC SCHEMATIC



HYDRAULIC SCHEMATIC



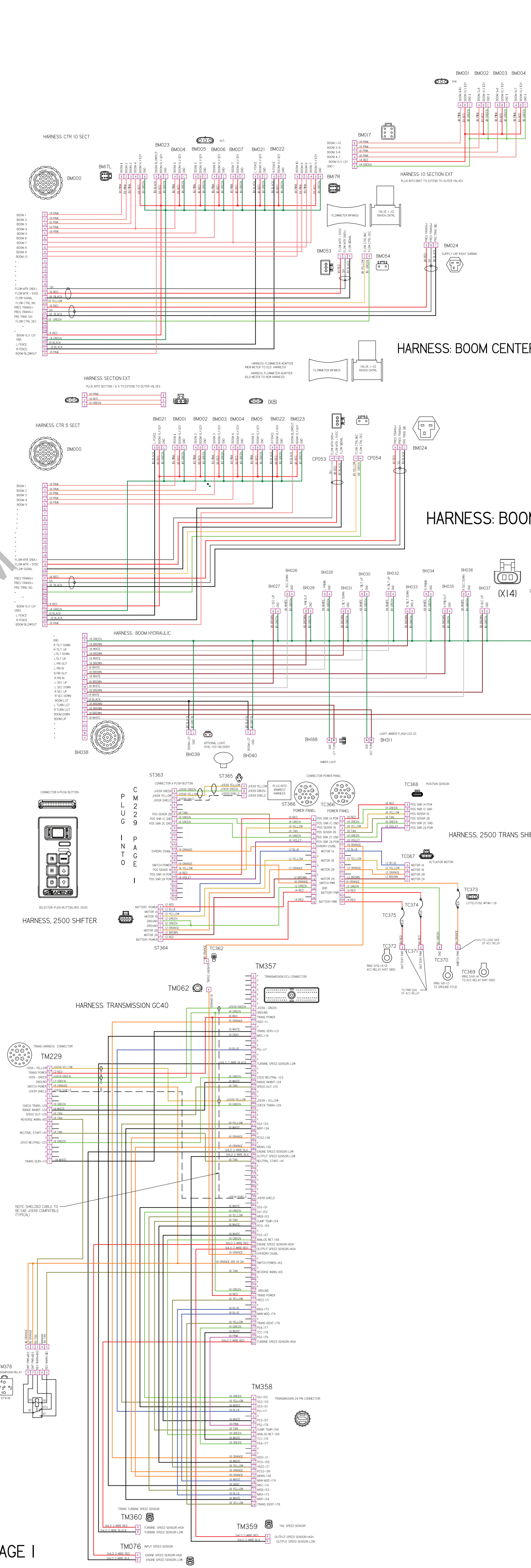
GUARDIAN SP240R, SP275R  
HYDRAULIC SCHEMATIC  
SERIAL NUMBER: YDYM00602 AND AFTER  
RAC 47654935



HARNESS: ARMREST

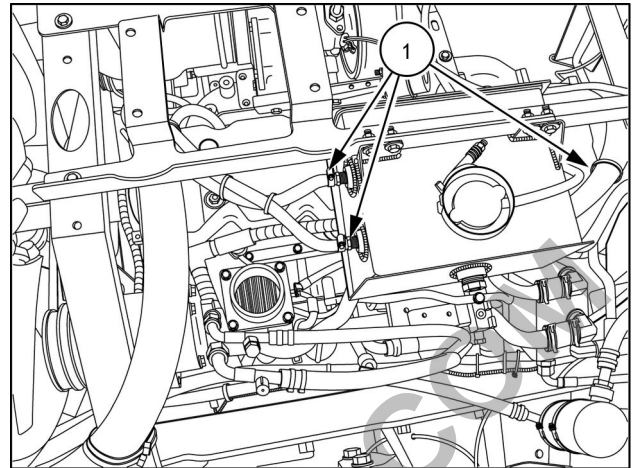
| SWITCH      | POS1/2/3/4 | POS1/2/3/4 |
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| SWITCH K499 | 1 2 3      | 1 2 3      |
| SWITCH K500 | 1 2 3      | 1 2 3      |

SEE CHASSIS MAIN HARNESS PAGE 1



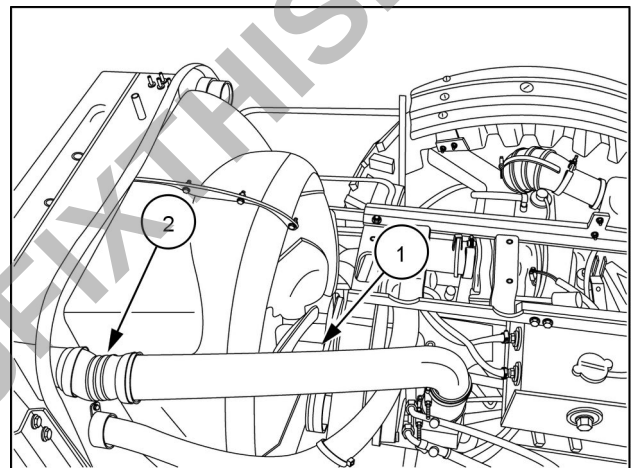
|                                                    |           |
|----------------------------------------------------|-----------|
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| [78.120] Foam marking system.....                  | 78.3      |
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| [90.124] Pneumatically-adjusted operator seat..... | 90.2      |
| [90.150] Cab.....                                  | 90.3      |
| [90.151] Cab interior.....                         | 90.4      |

24. Connect the three hoses (1) to their proper locations on the deaeration tank.



RAIL13SP04723AA 20

25. Install the turbo pipes (1) and secure tightly with the clamps (2).



RAIL13SP04717AA 21

26. Any time the air conditioning system has been opened the receiver/dryer needs to be replaced. Refer to **Receiver/Dryer - Remove (50.200)** and **Receiver/Dryer - Install (50.200)**.
27. Charge the air conditioning system. This task should be performed by a certified technician.

**Next operation:**

Install the fan and drive **Fan and drive - Install — Fan (10.414)**.

**Next operation:**

Install the cooling package **Engine cooling system - Install — Cooling package (10.400)**.

**Next operation:**

Install the fan shroud **Fan and drive - Install — Fan shroud (10.414)**.

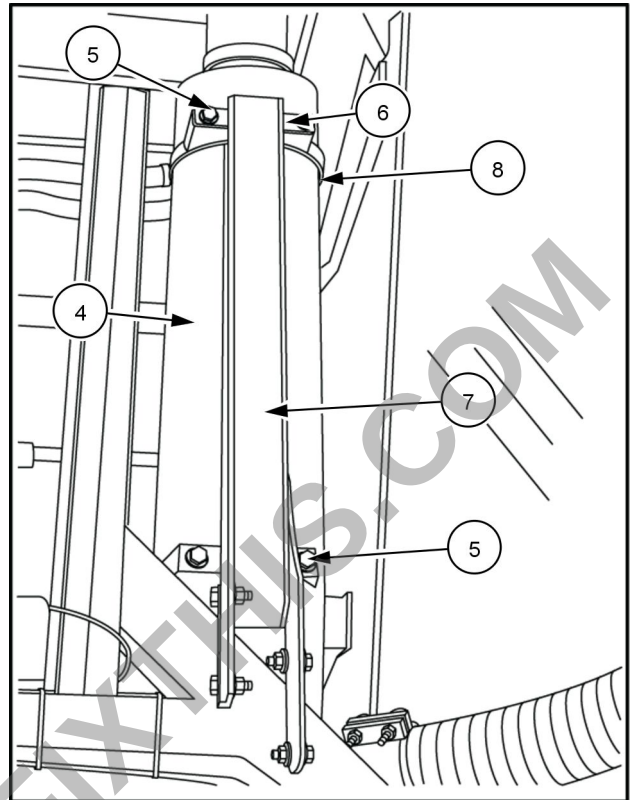
**Next operation:**

Install the air cleaner assembly **Air cleaner - Install — Air cleaner assembly (10.202)**.

**Next operation:**

Install the hood **Engine hood - Install (90.105)**.

3. Remove four hex bolts, eight flat washers, and four locknuts (5) from muffler mounting clamps (6) that secure muffler (4) to upright muffler weldment (7).
4. Remove muffler (4) from upright muffler weldment (7) and lifting device from muffler.



RAIL12SP00328AA 2

Only perform the following muffler mounting clamp removal if replacing the muffler.

5. Loosen two mounting clamp bolts (8) until mounting clamps (6) can be removed from muffler (4). Bolts remain captured in the clamps.

**NOTE:** The above graphic shows muffler still mounted to upright muffler weldment. However, the clamps cannot be removed from muffler until muffler/clamp unit is removed from upright muffler weldment.

## Power shuttle transmission - Dynamic description - Ground Drive System

The ground drive system for the SP.240R and the SP.275R sprayers consists of a transmission, differential, planetary, and drop boxes. The ground drive configuration depends upon the model of vehicle present.

The SP.240R ground drive system uses a transmission connected to a differential via a drive shaft. From the differential power is transferred from short drive shafts to each of the rear wheels. There are two different styles of drives from the differential, angled drive and drop box drive. In the angled drive set up, the drive shafts from the differential connect to planetary hub drives at each wheel. The drop box set up has the drive shafts from the differential connected to drop box assemblies at each rear wheel.

The SP.275R ground drive system uses a transmission connected to a differential via a drive shaft. From the differential power is transferred from short drive shafts to each of the drop boxes at the rear wheels.

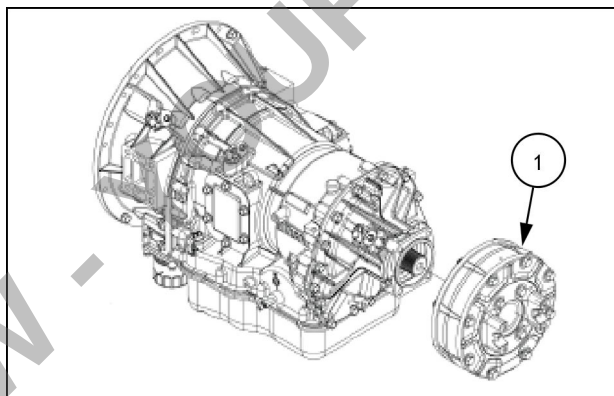
Control of the ground drive system for the SP.240R sprayer uses a chassis mounted transmission controller. The controller is activated through the use of a right hand console mounted Arens shift controller. This controller provides drive mode control.

Control of the ground drive system for the SP.275R sprayer uses a chassis mounted transmission controller. The controller is activated through the use of the grip control. Buttons on the grip are present for forward and reverse and speed shifting.

An option for the SP.275R sprayer is Front Wheel Assist. This option uses hydraulic wheel motor attached to the front wheels in order to provide power transmission to the two front wheels.

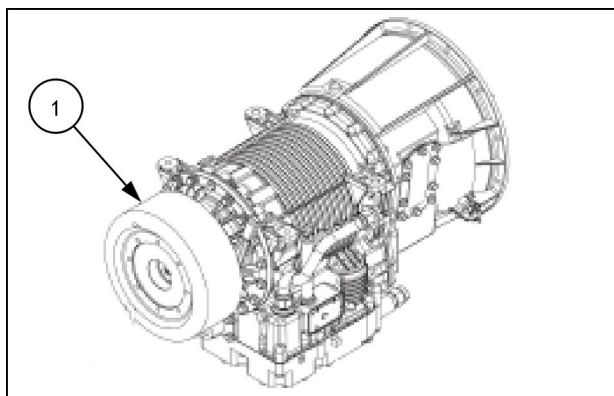
### Transmission

The SP.240R sprayer incorporates an Allison RDS2500 transmission. The transmission is a six speed transmission although only 5 speed are utilized. An external speed shifter motor is attached for shifting of the transmission. The transmission also has a spring applied hydraulic release park brake **(1)** mounted to the output shaft.



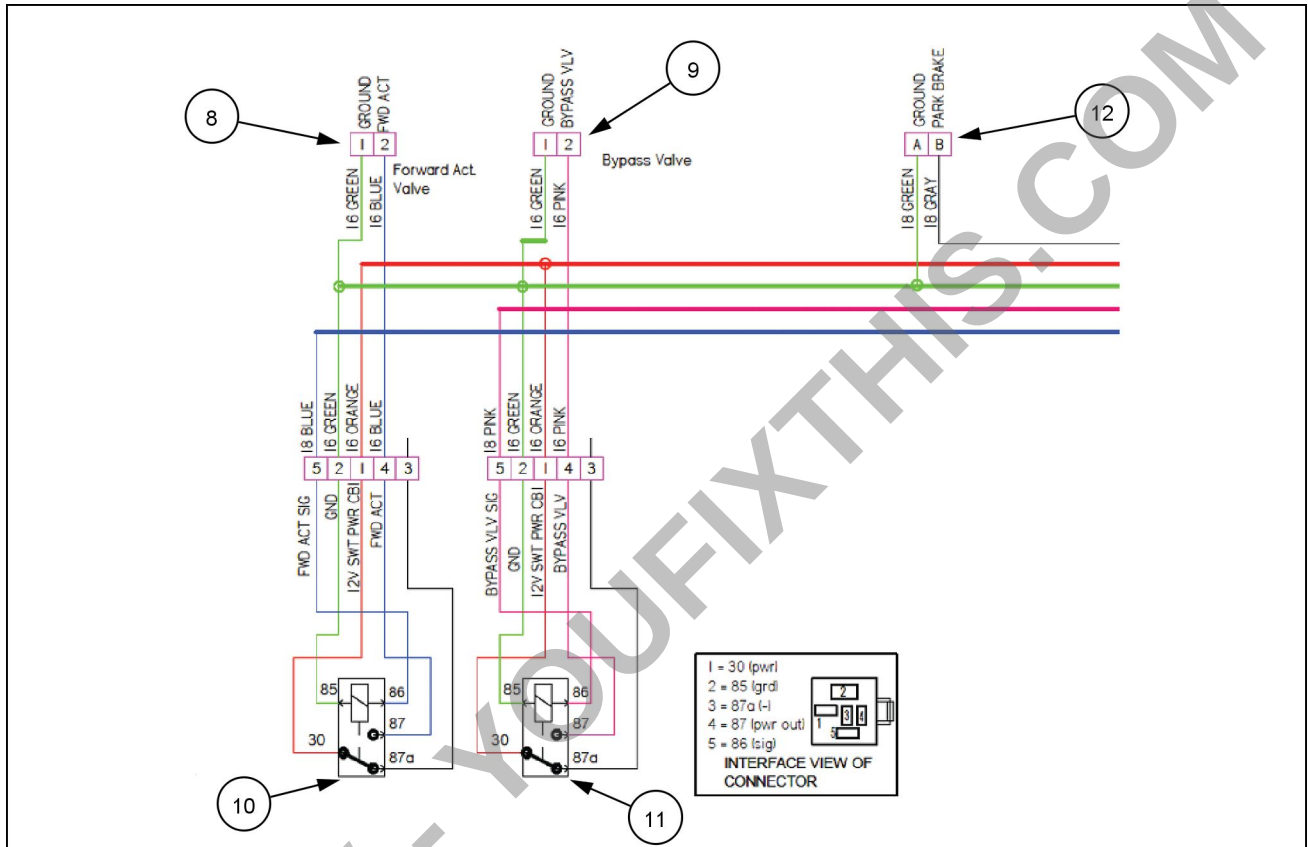
RAIL14SP00303AA 1

The SP.275R sprayer incorporates an Allison RDS3000 transmission. The transmission is a six speed transmission. The transmission has a spring applied hydraulic release park brake **(1)** mounted to the output shaft. There is no external shifting motor since the transmission is shifted electronically.



RAIL14SP00304AA 2

The freewheeling valve engages and disengages the flow from the hydrostat to the two front wheel motors. When engaged by the operator, the FWA switch on the cab console sends 12 volt power to the controller connector FH416 pin 39. When the controller sees 12V on pin 39, it will determine if the system should be OFF or ON based on transmission gear selected (1st, 2nd, and 3rd only). To engage FWA, the controller will energize the Forward Activate Relay (10) which will send 12V to the bottom coil to energize (8) FH401, to open the flow. To disengage the front wheel assist, the FWA switch on the console is turned off (or transmission is in 4th, 5th or 6th gear) and the controller will remove power from the Forward Activate Relay (10) and energize the Bypass Relay (11) which will send 12V to the top coil (9) FH400 which allows the system to 'freewheel'.



RAIL14SP00182FA 4

The park brake release valve (12) is energized with 12V (FH 399) from the Park Brake Release switch on the cab console and opens charge pressure flow to the x ports on each of the drive motors to release the park brakes.

The most common failure of the FWA system is no power to the forward activate coil on the freewheeling valve. The controller activates the relay, the relay energizes the coil. Poor connections at these locations and bad relays are common failures. For machines built before MY13 (Crenlow cabs) there is a coil and relay replacement kit. The kit replaces the original Hirschman connection coils with Deutsch connection coils (including the plugs) and replaces the original relays with new relays. Typically, the coils are shorted due to poor connections and the relay contacts short out too. Replacing the coils with Deutsch connections and replacing the relays will greatly reduce future failures.

## Non-powered front axle - Remove - Front axle (tube, female portion)

|         |  |
|---------|--|
| SP.240R |  |
| SP.275R |  |

### Prior operation:

Support vehicle frame with suitable lifting device before removing components.

### Prior operation:

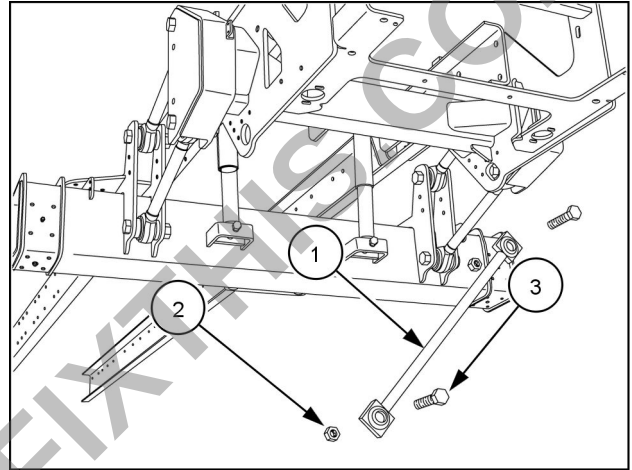
Remove both front fenders.

### Prior operation:

Remove steering cylinders. Refer to **Steering cylinder - Remove (41.216)**.

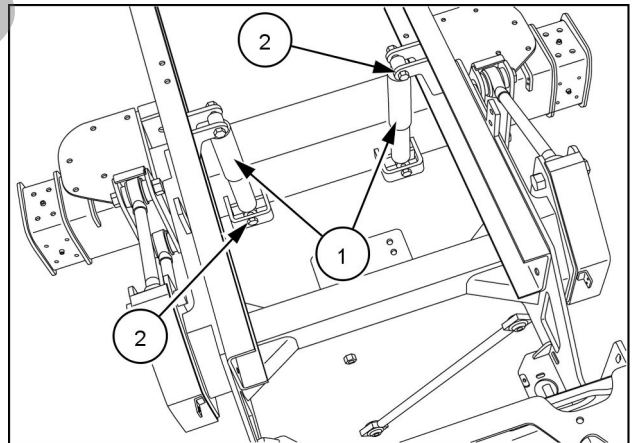
**NOTE:** Front track bar is mounted on backside of front axle assembly, one end near right-hand air bag mount and other end on left side of front axle weldment crossmember. Make note of track bar position for proper reinstallation.

1. Remove front track bar (1) by removing two locknuts (2) and hex bolts (3) that secure front track bar to front axle weldment.
2. Tag and mark and then remove air, hydraulic, and electrical lines on or near front axle. Disconnect P-clamps as needed. Cap and plug lines and fittings as required.
3. Disconnect front air bag height adjustment valves suspension linkage. Refer to **Suspension - Remove — Air bag height control valve (25.400)**.



RAIL12SP00503AA 1

4. Remove two front shocks (1) by removing four locknuts and hex bolts (2) that secure shocks to shock mount flanges of frame and rear axle weldment.
5. Using suitable lifting device, support vehicle by its frame behind front axle.
6. Using a second suitable lifting device, support front axle assembly.
7. Remove front air bags. Refer to **Suspension - Remove — Air bag assembly (25.400)**.
8. Remove front torque arms. Refer to **Suspension - Remove — Front torque arm (25.400)**.
9. Remove front axle assembly from vehicle.



RAIL12SP00504AA 2

PREVIEW - YOUFIXTHIS.COM

## Differential - Disassemble - SP.275R Guardian sprayer

SP.275R

### **⚠ 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.**

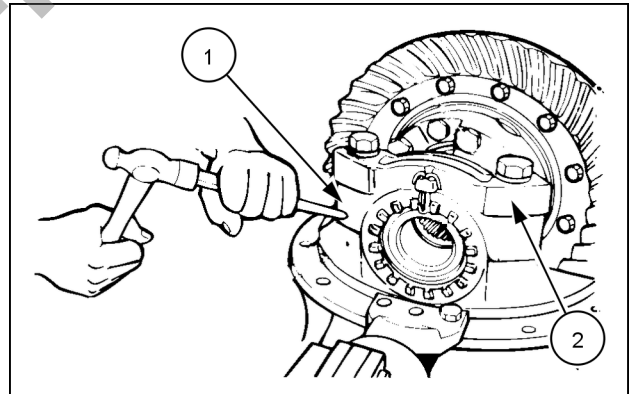
D0076A

### **Prior operation:**

Remove the differential from the machine **Differential - Remove — SP.275R Guardian sprayer (27.106)**

### **Differential and ring gear assembly removal**

1. Place the differential housing in a rotatable repair stand.
2. Place a clean catch pan under the differential housing and remove the drain plug from the differential housing.
3. Collect all of the fluid in the catch pan and set the catch pan to the side.
4. Rotate the differential housing in the repair stand until the ring gear is at the top of the assembly.
5. Using a hammer and a center punch, mark one carrier leg (1) and bearing cap (2) to ensure proper alignment during installation.

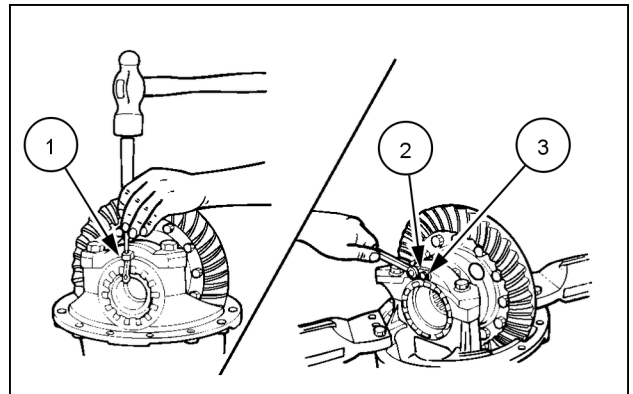


RAIL13SP04834AA 1

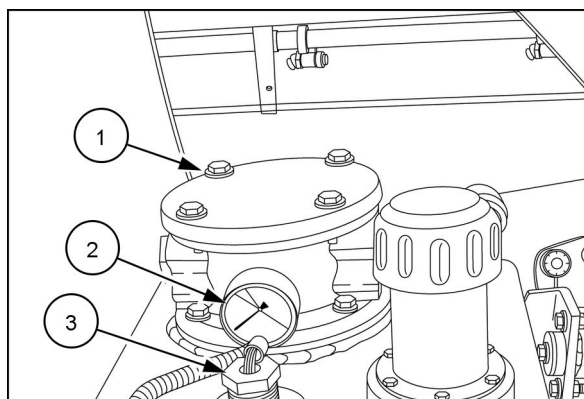
6. Remove the lock plates (2) holding the bearing adjusting rings in position.

**NOTE:** If equipped with pins (1), use a small drift and a hammer to remove the pins.

**NOTE:** If equipped with lock plates (2), remove the two cap screws (3) securing the lock plate in place.



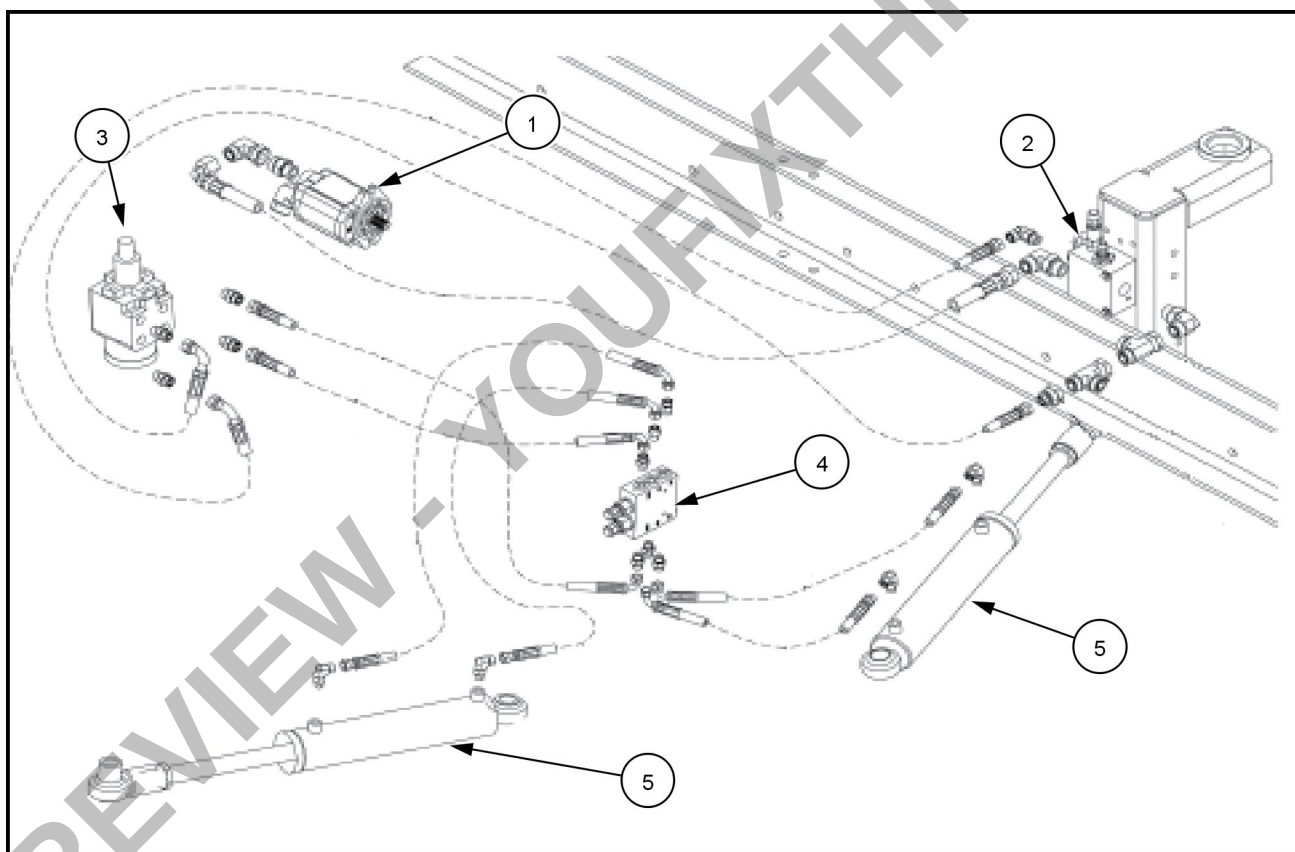
RAIL13SP04818AA 2



RAIL14SP00185AA 3

## Power steering

The power steering system includes the power steering pump, a priority/relief valve, a hand pump, a counterbalance valve, and two steering cylinders.



RAIL14SP00256FA 4

| Item | Description           |
|------|-----------------------|
| 1    | Power steering pump   |
| 2    | Priority/relief valve |
| 3    | Hand pump             |
| 4    | Counterbalance valve  |
| 5    | Steering cylinders    |

The power steering pump is mounted to the engine and is driven from the auxiliary pad on the engine compressor.



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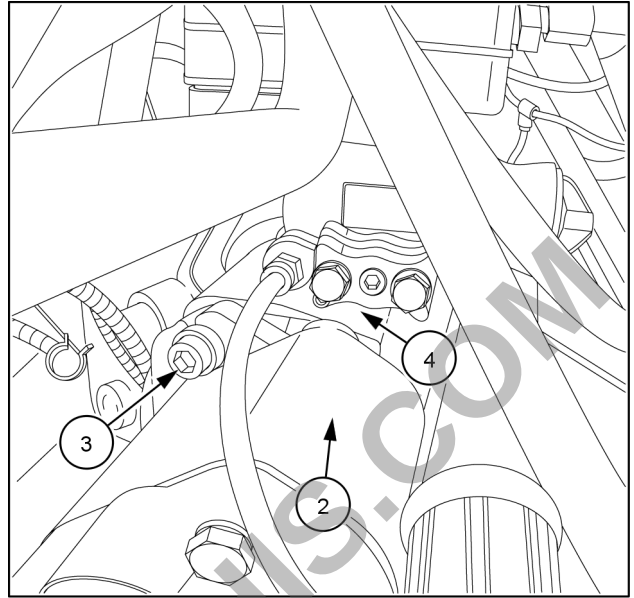
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8. Remove two bolts and washers **(3)** that secure steering hydraulic pump **(2)** to air compressor **(4)**.
9. Remove steering hydraulic pump **(2)** and gasket (not shown).

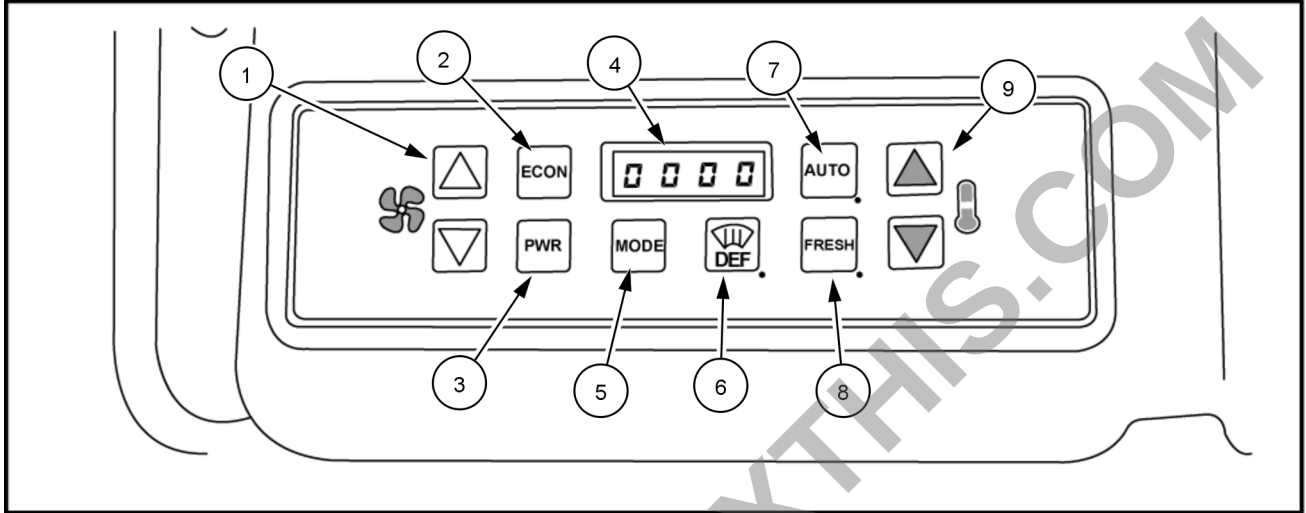


RAIL12SP00388AA 2

## Air conditioning - Overview - Troubleshooting using ATC

Troubleshooting of the air conditioning system may be performed using the automatic temperature control (ATC) display. The following procedure details the steps necessary for display of error codes associated with the system.

Use the ATC control to access the error code in order to troubleshoot the HVAC system. The control is mounted in the headliner at the upper right hand side of the cab interior.



RAIL12SP01141AA 1

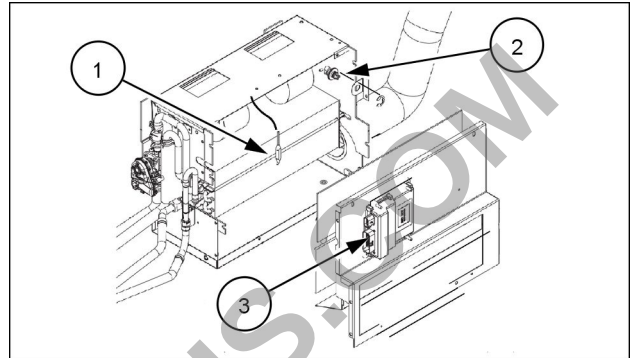
### ATC key descriptions

| Item | Description                         |
|------|-------------------------------------|
| 1    | Fan speed (increase/decrease)       |
| 2    | Economy Mode                        |
| 3    | Power Key                           |
| 4    | Display                             |
| 5    | Mode Key                            |
| 6    | Defrost Key                         |
| 7    | Automatic Mode Key                  |
| 8    | Fresh Key (not used)                |
| 9    | Temperature Key (increase/decrease) |

23. Remove the screws attaching the water valve to the evaporator housing.
24. Remove the evaporator from the evaporator housing.

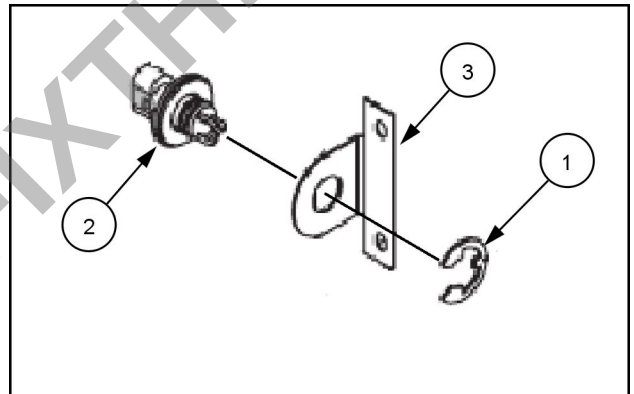
### HVAC components — Premium SprayView Cab

25. The Premium SprayView cab has additional components attached to the evaporator housing. The components are an evaporator probe (1), an air temperature probe thermistor (2), and an AC ECU module (3)
26. Remove the evaporator probe at the electrical connection and remove from the evaporator housing.



RAIL13SP04979AA 17

27. Remove the air temperature probe (2) by disconnecting the electrical connection from the front of the probe.
28. Remove the mounting clip (1) from the back of the air temperature sensor and remove the probe from the mounting bracket (3).

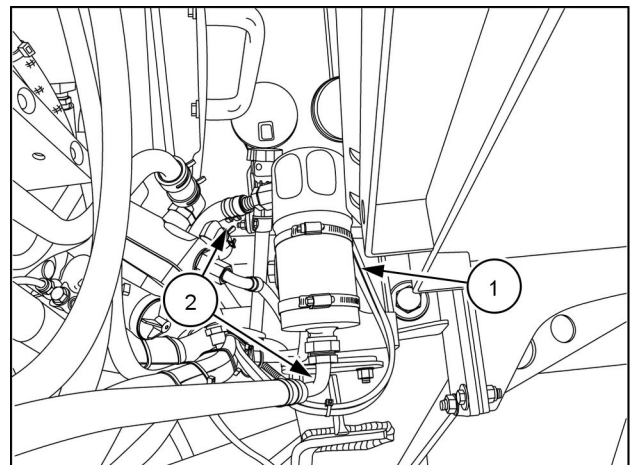


RAIL13SP04980AA 18

29. Remove the AC ECU from the front panel of the evaporator housing by removing the screws attaching the ECU to the panel.

### Accumulator removal:

30. Open the engine hood by unlocking the two hood locking straps.
31. Locate the accumulator (1) towards the rear and at the upper left hand side of the engine. Tag, mark and remove the two air conditioning lines (2) attached to the accumulator.



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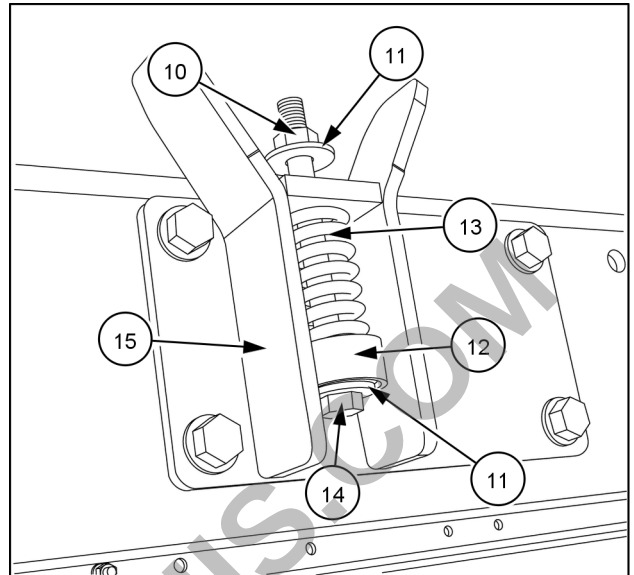
(\*) See content for specific models

9. Remove locknut (10), two flat washers (11), spring weldment guide (12), spring (13), and hex bolt (14) from hold-down assembly (15) and skid weldment flange (16) (see figure 7). Repeat step to remove second product tank hold-down assembly hardware set.

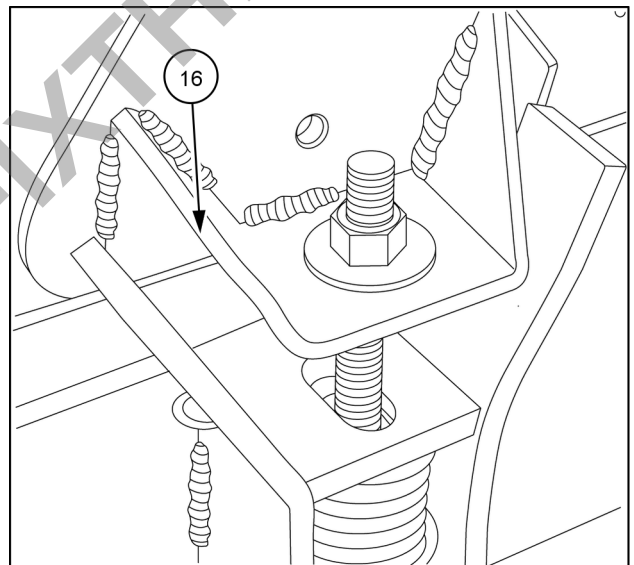
**NOTE:** Removal of only one set of product tank hold-down assembly hardware is shown.

**NOTE:** Product tank remains secured to skid weldments and entire assembly is removed from the vehicle. Tank can then be disengaged from the skid weldments, if necessary, while situated on the ground.

10. Remove product tank/skid weldments assembly from vehicle.
11. If disassembling product tank from skid weldments, leave lifting device attached. If not, remove lifting device from product tank/skid weldments assembly.

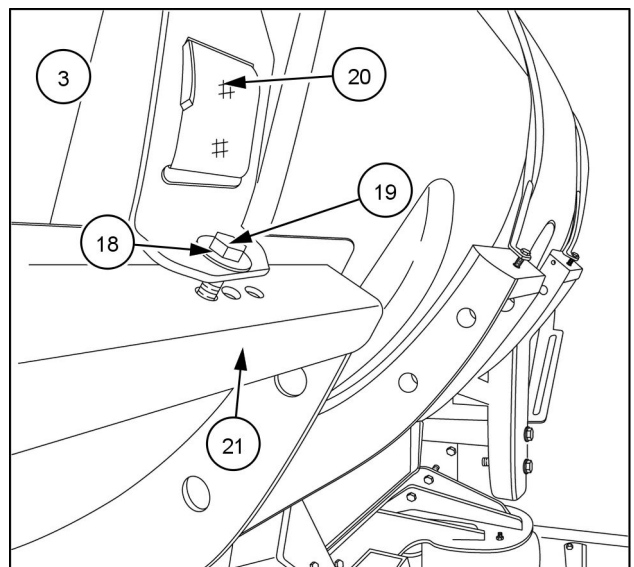


RAIL12SP00513AA 6



RAIL12SP00514AA 7

12. Remove three locknuts, six flat washers (18), and three hex bolts (19), that secure product tank securing straps (20) to skid weldments (21).
13. Set to the side product tank securing straps (20) in such a way as to not interfere with product tank removal from skid weldments.
14. Using lifting device, remove product tank (3) from skid weldments (21).
15. If necessary or desired to remove remaining product tank securing straps from skid weldments, repeat Step 12 for remaining three sets of hardware.
16. Remove lifting device.



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(\*) See content for specific models

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