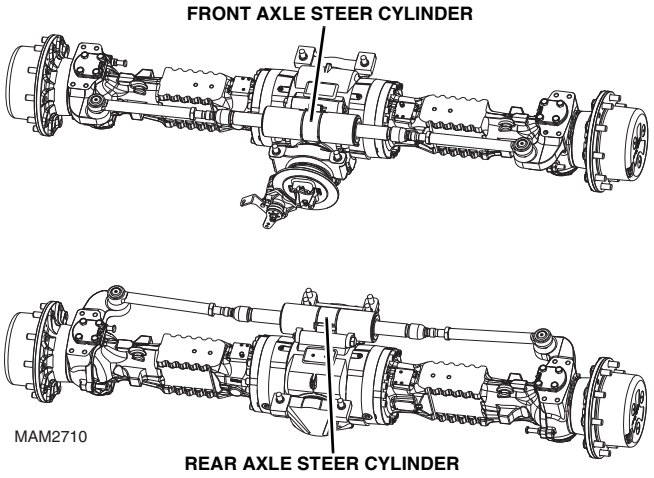
8.11.3 Steering Cylinders

The steer cylinder is attached to each axle center housing. The steer cylinder is covered in the appropriate manufacturer's axle literature.Detailed axle service instructions (covering the axle, differential, brakes and wheel-end safety, repair, disassembly, reassembly, adjustment and troubleshooting information) are provided in the appropriate Axle Disassembly & Assembly Manual.

Machine	Manual P/N
TH336, TH337, TH406, TH407 & TH414	31200453
TH514 & TH417	31200455



8.11.4 Cylinder Torque Specifications

a. Lift/Lower Cylinder

Model	Head	Piston	Set Screw
TH336, TH337, TH406 & TH407	400 Nm (295 lb-ft)	1540 Nm (1136 lb-ft)	10 Nm (7 lb-ft)
TH414	400 Nm (295 lb-ft)	2460 Nm (1814 lb-ft)	10 Nm (7 lb-ft)
TH514 & TH417	400 Nm (295 lb-ft)	3420 Nm (2522 lb-ft)	10 Nm (7 lb-ft)

b. Extend/Retract Cylinder

Model	Head	Piston	Set Screw
TH336, TH337, TH406 & TH407	300-350 Nm (221-258 lb-ft)	540-590 Nm (398-435 lb-ft)	20-25 Nm (15-18 lb-ft)
TH414	320-370 Nm (236-273 lb-ft)	815-865 Nm (601-638 lb-ft)	20-25 Nm (15-18 lb-ft)
TH514	Top: 380-430 Nm (280-317 lb-ft) Bottom: 480-530 Nm (354-391 lb-ft)	1070-1120 Nm (789-826 lb-ft)	20-25 Nm (15-18 lb-ft)
TH417	Top: 420-450 Nm (310-332 lb-ft) Bottom: 340-370 Nm (250-273 lb-ft)	1070-1120 Nm (789-826 lb-ft)	20-25 Nm (15-18 lb-ft)

c. Tilt Cylinder

Model	Piston
All machines	3000 Nm (2212 lb-ft)

d. Compensation Cylinder

Model	Head	Piston
TH336, TH337, TH406 & TH407	800 Nm (590 lb-ft)	1100 Nm (811 lb-ft)
TH414 & TH417	1000 Nm (737 lb-ft)	1100 Nm (811 lb-ft)
TH514	1200 Nm (885 lb-ft)	1000 Nm (737 lb-ft)

e. Frame Level Cylinder

Model	Head	Piston	Set Screw
TH414	400 Nm (295 lb-ft)	740 Nm (545 lb-ft)	10 Nm (7 lb-ft)
TH514 & TH417	400 Nm (295 lb-ft)	855 Nm (630 lb-ft)	10 Nm (7 lb-ft)

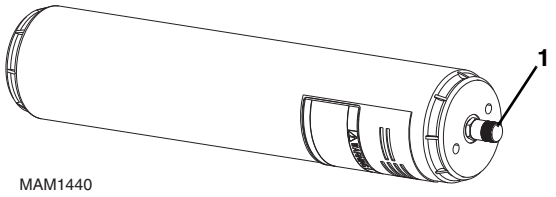
f. Outrigger Cylinder

Model	Head	Piston	Set Screw
TH414	400 Nm (295 lb-ft)	1330 Nm (981 lb-ft)	10 Nm (7 lb-ft)
TH514 & TH417	400 Nm (295 lb-ft)	2160 Nm (1593 lb-ft)	10 Nm (7 lb-ft)

8.12 BOOM RIDE CONTROL (TH336, TH337, TH406, TH407 - IF EQUIPPED)

8.12.1 General Accumulator Information

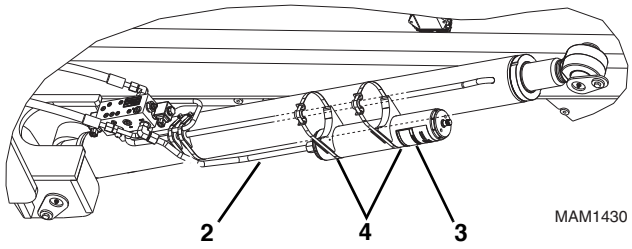
The accumulator is a 275 bar (3988 psi) piston type accumulator.
The pneumatic accumulator is operated by compressed gas. Gas and hydraulic oil occupy the same container. When oil pressure rises, incoming oil compresses the gas. When oil pressure drops, the gas expands, forcing the oil out into the lift side of the lift/lower cylinder.
The gas is separated from the oil by a piston. This prevents the mixing of gas and oil and keeps gas out of the hydraulic system.



The accumulator must be “pre-charged” with gas before use in the hydraulic system. This is done by filling the gas chamber with dry nitrogen to a pressure of 35 bar (507 psi). The schrader valve is located under the protective cap (**1**) at the top of the accumulator. The schrader valve is used for pre-charging and testing the accumulator.

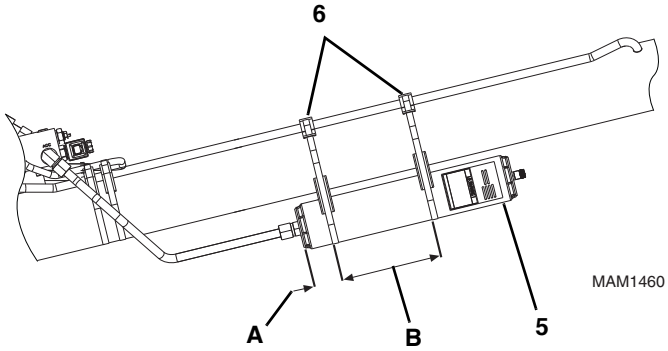
a. Accumulator Removal

1. Remove any attachment from the machine. Park the machine on a firm level surface and fully retract the boom. Raise the boom to allow sufficient work space around the lift/lower cylinder to allow the accumulator to be removed. Support the boom. Place the travel select lever in (N) NEUTRAL, engage the park brake, shut the engine OFF and chock wheels.
2. Place a Do Not Operate Tag on both the ignition key switch and the steering wheel, stating that the machine should not be operated.
3. Open the engine cover. Allow the system fluids to cool.
4. Properly disconnect the battery.



5. Disconnect and cap or plug the hydraulic tube (**2**) at the accumulator (**3**).
6. Remove the two straps (**4**) securing the accumulator to the lift/lower cylinder.
7. Remove the accumulator.
8. Wipe up any hydraulic fluid spillage in, on, near and around the machine, work area and tools.

b. Accumulator Installation



1. Secure the accumulator (**5**) to the lift/lower cylinder with the two straps (**6**) to the proper dimensions:
   A. 57,0 ± 0,10mm (2.25 ± 0.375 in)
   B. 200,0 ± 0,10mm (7.875 ± 0.375 in)
2. Uncap and connect the hydraulic tube to the accumulator.
3. Remove the boom support.
4. Properly connect the battery.
5. Close and secure the engine cover.
6. Remove the Do Not Operate Tag from the ignition key switch and the steering wheel.
7. Refer to Section 8.12.3, “Pre-Charging Accumulator,” for Accumulator pre-charging instructions.

8.12.2 Accumulators

This section covers the charging of the accumulator system.

The accumulator is located and mounted under the lift/lower cylinder. The internal parts of the accumulator are not serviceable. If the internal piston is leaking, or the seals on the top or bottom cap are leaking, the accumulator requires replacement.

The accumulator pre-charge pressure will vary depending on the ambient temperature that the accumulator was pre-charged at and the actual operating temperature of the accumulator.

8.12.3 Pre-Charging Accumulator

Note: *Replacement accumulators are not pre-charged when shipped.*

⚠ WARNING

NEVER fill an accumulator with oxygen! An explosion could result if oil and oxygen are mixed under pressure. Only fill accumulator with dry nitrogen.

Pre-charged the accumulator with nitrogen gas only. Nitrogen gas is free of water vapor and oxygen which makes it harmless to internal parts and will not react if mixed with oil under pressure.

NOTICE

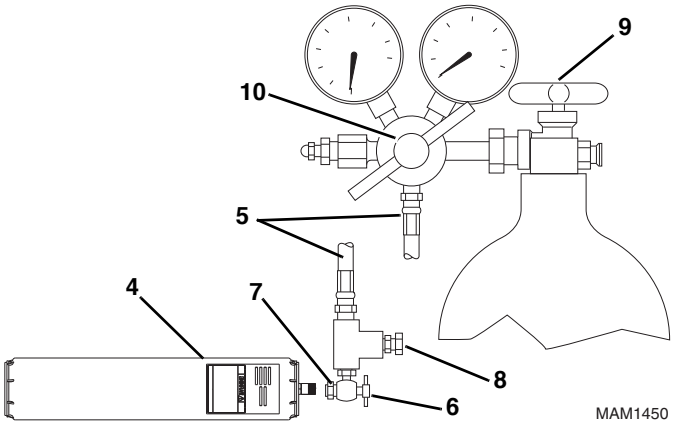
Never fill an accumulator with air. Air contains moisture which can cause corrosion. This corrosion may damage seals and ruin the accumulator.

Never charge an accumulator to a pressure more than specified. The proper pressure for the accumulator is 35 bar (507 psi).

Note: *Make sure the nitrogen bottle, as well as the charging and gauge assembly used is compatible with the schrader valve assembly on the accumulator. The nitrogen bottle and all components must be rated for a pressure at least as high as the nitrogen source. It is strongly recommended that the nitrogen bottle has a high pressure regulator.*

You will require an accumulator fill kit to properly charge the accumulators. Refer to the parts manual or contact the local Caterpillar dealer.

Use the following steps to properly pre-charge each accumulator:

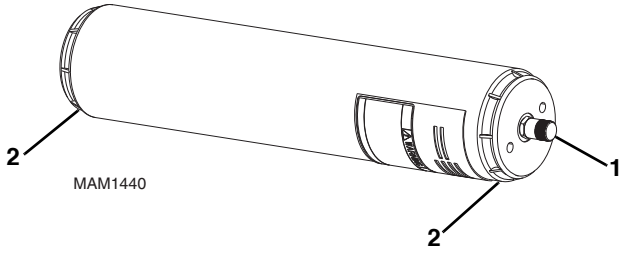


1. Thoroughly clean the top of each accumulator (**4**).
2. Make sure the nitrogen supply is shut off.
3. Attach the accumulator fill kit (**5**) to the nitrogen bottle.
4. Remove the protective cap from the gas valve on the accumulator.
5. Back the “T” handle (**6**) on the accumulator fill kit all the way out (counter-clockwise). Attach the schrader adaptor (**7**) to the gas valve on the accumulator. Tighten securely.
6. Turn the gas valve/bleed valve (**8**) on the accumulator fill kit all the way in.
7. Turn the “T” handle (**6**) all the way in to open the valve core on the accumulator.
8. Open the valve (**9**) on the nitrogen bottle.
9. Slowly adjust the regulator (**10**) on the nitrogen bottle to read 35 bar (507 psi).
10. Close the main valve (**9**) on the nitrogen bottle.
11. Back the “T” handle (**6**) on the accumulator fill kit all the way out (counter-clockwise).
12. Let the pre-charge on the accumulator set for 10-15 minutes. This will allow the gas temperature to stabilize. If the desired pre-charged range is exceeded, turn the “T” handle (**6**) all the way in. With the main valve (**9**) closed on the nitrogen bottle, turn the gas valve/bleeder valve (**8**) out to bleed pressure off the accumulator. Turn the valve all the way in and check the pressure reading on the regulator gauge.
13. When the correct pressure is reached, back the “T” handle (**6**) on the accumulator fill kit all the way out (counter-clockwise). Bleed the pressure from the hose by turning the gas valve/bleed valve out to relieve the pressure.

14. Turn the gas valve/bleed valve (**8**) all the way in and remove the schrader adapter (**7**) from the valve on the accumulator.
15. Reassemble the protective cap onto the gas valve on the accumulator.

8.12.4 Checking Pre-Charge

a. Gas Leaks



1. If an external leak is suspected, apply soapy water to the gas valve (**1**) and the seams of the gas bottle (**2**). If bubbles form, the accumulator has to be replaced.
2. If an internal leak is suspected, check for foaming oil in the hydraulic reservoir and/or no accumulator action. If any of these signs are evident, the accumulator has to be replaced.